KHARAZMI UNIVERSITY

ISCDB Iranian Society for Cell and Developmental Biology

Iranian Biology Society

Iranian Cell and Tissue Culture Society

ISC

The 2nd National and 1st International Conference on

Cell and Developmental Biology of Iran

16th – 17th October 2025 . Kharazmi University, Tehran, Iran

ABSTRACTS

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بسم الله الرحمن الرحیم



Table of Prologue

National and International Licenses 1
Conference Sponsors 4
Supporting Universities of the Conference 5
Supporting Associations of the Conference 6
Supporting Companies of the Conference 7
Section One: Preface 9
Opening Statement 10
The Necessity of Holding the Conference 13
From the Perspective of a Developmental Cell Biology Graduate 13
Opening Statement 13
Introduction to Kharazmi University.. 16
Introduction to the Iranian Biology Society 17
Organizing of the Conference 18
Conference Policy Council 20
Components of the Conference..... 23
Members of the Conference's Scientific Committees 24
1. Plant Developmental Cell Scientific Committee 25
2. Fertility and Infertility Scientific Committee 27
3. Natural compounds and cancer Committee 29
4 . Cellular & Molecular Science Committee 31
5. Scientific Committee on Stem Cells, Tissue Engineering and Regenerative Medicine 34
6. Animal Cell and Developmental Biology Scientific Committee 36
7. Cell & Tissue Culture Scientific Committee 38
8. Scientific Committee on Developmental Genetics & Omics Studie Committee 41
9. Artificial Intelligence and Developmental Biology Scientific Committee 43
10- Scientific Committee on Animal and Aquatic Reproductive Technology 44
Members of the Executive Committees .45
1- Admission and Registration Committee 46
2. Website and Media Committee ..46
3. Members of the Ceremonial Committee 48
4. Accommodation and Hotel Services Committee 49
5. Public Relations and Promotion Committee 50
6. Members of the Posters Committee 53
7. International Committee 54
8. Publications Committee.....55
9. Resolutions and Hall Management Committee 56
10. Nutrition Committee.....58
11. Specialized Equipment Exhibition Committee 58
Exhibition of Specialized Books 61
The Necessity of a Step Forward: Exhibition of Specialized Books 62
Specialized Conference Workshops.....86
The importance of improving knowledge and skills and the necessity of holding workshops 87
Part two: Scientific articles 95
Keynote Speakers 96

Chapter One Plant Developmental Cell 99
Chapter Two Fertility and Infertility 195
Chapter Three Natural Compounds and Cancer 267
Chapter Four Cellular and Molecular Biology..... 334
Chapter Five Stem Cells, Tissue Engineering and Regenerative Medicine 394
Chapter Six Animal Developmental Cell 454
Chapter Seven Cell and Tissue 511
Chapter Eight Developmental Genetics and Omics 557
Chapter Nine Artificial Intelligence and Developmental Biology.....595
Chapter Ten Livestock and Aquatic Animal Reproduction Technology 609

Table of Authors

A

Aazami, Hossein 401
AbbasAbadi, Reza 615
Abbasi Raki, Negar 223
Abbassian, Fatemeh 633
Abbaszadeh, Soheila 272
Abdollahian, Media 328, 489
Abed, Talieh 193
Abedi, Fatemeh 295
Abedini, Nima 456
Abedinzadeh Shahri, Mina 339
Abedzadeh, Amirhossein 318
Abolmaali, Shamsozoha 360, 387
Abravesh, Zahra 141
Afifi, Mona 466
Afkar, Fereshteh 251
Afkhami Nia, Fatemeh 358
Afkhaminia, Fateme 445
Aflatoonian, Behrouz 212
Aflatoonian, Reza 212, 608
Afshar, Azar 226
Aghaei, Fatemeh 299
Aghaei, Saber 230
Aghajanpour, Fakhroddin 226
Aghamir, Seyed Mohammad Kazem 374
Aghamollaei, Hossein 437, 451, 454, 457, 526, 529
Aghazadeh, Fatemeh 362, 388
Aghilinezhad, Nasrin 316
Ahadi, Ali Mohammad 355
Ahmadi, Abdolreza 370
Ahmadi, Elnaz 186
Ahmadi, Mahdi 505
Ahmadi, Mahtab 307
Ahmadi, Mazaher 471
Ahmadi, Sepideh 236, 237
Ahmadi, Somayeh 367
Ahmadnezhad, Mohaddeseh 632
Ahmadpanahi, Homayon 394, 521
Ahmadpour, Sara 465
Ahmadvand, Rahim 139, 188
Ahmadzadeh, Elham 585, 601, 606
Ai, Jafar 425
Ajili, Fatemeh 186
Akbar Azimian, Hossein 544
Akbari Avilagh, Mahdi 253
Akbari Nargesi, Erfan 632
Akbari, Ali 424, 432, 510
Akbari-Birgani, Shiva 363, 381
Akmali, Vahid 502, 524
Akyash, Fatemeh 212
Alaei, Shima 184
Alani, Farzad 134
Alavi Gharehbagh, Abdolreza 614
Alavi, Seyyed Mohammad Hadi 488
Aliasghari Veshareh, Azam 344
Aliheydari, Elahe 307
Alirezaei, Kazem 466
Aliyari, Parinaz 266
Alizadeh, Fatemeh 507
Allahgholi, Mahsa 228, 260
Allahyar, Zahra 229
Allameh, Abdolamir 335
Almasi, Majid 465
Alshujairi, Alaa K. 494
Amini Mehr, Hadi 166
Amini Shirkouhi, Maryam 593
Amini, Elaheh 250, 476, 489, 495, 503, 509, 540
Amini, Gita 168
Amini, Mohammadmahdi 586
Amini, Sara 477
Amirchaghmaghi, Elham 244, 245
Amirfattahi, Rasoul 420
Amiri, Parsa 471
Amiri, Sara 279
Amiripour, Hilda 132, 178, 203
Amiri-Yekta, Amir 229
Amirjani, Mohammadreza 114
Amirsaadat, Soumayeh 431
Amjad Hamed, Esra 354
Amoozadeh, Mehrsa 383
Amraee, Noora 359
Andresen, Lars 479
Ansari, Asra 292
Ansari, Marzieh 633
Anvari, Alireza 443
Anwer Abdulkareem, Talal 494
Aqababa, Heydar 316, 368
Arab, Mahdi 467
Arabi Mianroodi, Reza 287, 304
Arabi, Mehran 247, 271
Arbabian, Sedigheh 167, 174, 195, 347
Ardebili, Zahra Oraghi 203
Arman, Mitra 507
Arvin, Shabnam 334
Asadi Abkenar, Asad 545
Asadi, Ayda 333
Asadi, Fatemeh 309
Asadzadeh, Fateme 145
Asefi Bakhshayesh, Hadi 406
Asgari, Nafiseh 498, 499, 500
Asghari Moghadam, Nastaran 521
Asheghi, Zahra 391
Ashrafi, Mahmoud Reza 409, 605
Ashtari, Shirin 304
Ataee Roshan, Ensiyeh 570

Atghia, Zahra 190
Aung, ShuhWen 479
Ayat, Hoda 323, 355, 373
Azarakhsh, Mahboobeh 158, 193
Azarmgin, Zahra 427, 449
Azarnia, Mahnaz 250, 489, 509
Azedi, Fereshteh 419, 421
Azimi, Atena Sadat 231, 235
Azizi, Zahra 231, 235, 429
Azmoudeh, Arshia 387

B

B. Rassouli, Fatemeh 370
Babaei Tooran poshti, Parmis 225
Babaei, Esmaeil 275, 305, 358, 445
Babashah, Sadegh 528
Baghaeifar, Zahra 169, 192, 199
Bagheri, Maryam Sadat 161, 298, 382, 459
Bahadori, Mohammad Hadi 220
Baharara, Javad 339, 486, 496, 497, 503, 504, 508
Baheiraei, Nafiseh 428
Bahrami , Naghmeh 425
Bahrami, Ahmadreza 446, 464
Bahri, Zahra 311
Bakhshayeshan-Agdam, Hamideh 185
Bakhshi khaniki, Gholamreza 166
Bakhshian, Atefeh 594
Bakhtiyari, Nadia 547
Bamdad, Kourosh 238
Banaei, Fatemeh 323
Banan Khoshjasteh, Mehdi 266
Bandarian, Fatemeh 588, 593, 594, 597, 598
Barati, Farid 630
Barfar, Mohammadmehdi 419, 421, 434
Barghabani, Fatemeh 249
Barhoon, Mina 296
Barkhori Mehni, Shirin 340
Barzegari Firouzabadi, Fatemeh 330, 436
Barzegari, Abolfazl 410, 431
Bashiri Khoshraftar, Melika 620
Bassiri, Farzaneh 227
Behboudi, Samira 159
Behfar, Maryam 290
Behfarjam, Farinaz 297
Behmanesh, Mehrdad 603
Behzadi Anduhjerdi, Rodabeh 559
Behzadi, Roudabeh 528
Behzadifar, Faegheh 167
Beigdeli, Leila 192
Beirami, Elmira 494
Benabbas, Soheil 137
Bigham Soostani, Sarvenaz 335
Bijary, Narges 130
Bikhof Torbati, Maryam 359, 527, 563, 570
Bisheh, Samin 424
Bohli Bohl, Masoumeh 163
Booalizadeh, Parnoush 605
Boozarpour, Sohrab 356, 390
Boroumand, Amirreza 426

C

Chaparzadeh, Nader 138
Chehregani Rad, Abdolkarim 120, 187
Chehreghani, Mostafa 610
Cheraghi, Ebrahim 239, 267
Cheraghloo, Neda 593

D

Dabagh, Mona 488
Dadfar, Fereshteh 238
Dadkhah-Aghdash, Hamed 117
Daei Hassani, Behrokh 385
Damaghi, Mehdi 350
Dameshghian, Mahsa 314
Daneshfard, Mansoureh 514, 522
Daneshian, Diana 140
Daneshpazhouh, Hamed 550
Darbani, Ali Asghar 256, 269
Darvish Alipour Astaneh, Shakiba 360
Darvishi, Farshad 128
Darvishnia, Hamid 403, 507, 519
Daryani said, Anita 176
Dattilio, Maurizio 227
Dauven, Kristina 479
Davari, Hafezeh 345
Davoodi Asl, Faezeh 222, 230
Dehghan, Shirin 599
Dehghanbanadaki, Hojat 401, 588, 594, 597, 598
Dehghani, Naeimeh 274, 448, 550
Dehnavi, Navid 463
Deilami Khiabani, Zahra 332
Delashoub, Masoud 505
Delkhosh, Aref 505
Devarzadeh, Mehdi 351
Dinarvand, Soudabe 325
Doddaballapur, Dhruti 469
Dolatkhah, Fatemeh 341
Dookhe, Elahe 139, 188
Dorostghoal, Mehran 223, 246
Doroudian, Mohammad 384
Dorudi, Majid 345
Durouhi, Mahla 377

E

E Jaconi, Marisa 474
Ebadi, Mostafa 129, 133, 135, 139, 141, 143, 155, 156, 177, 188, 204, 206, 207, 532, 541, 558
Ebrahimi Vosta Kalaee, Soheila 284
Ebrahimi, Bita 244
Ebrahimi, Zahra 211, 234, 276

Ebrahimi-Barough, Somayeh 425, 473
Edalatmanesh, Mohammad Amin 316, 368
Ehsani, Ehsan 369
Eidi, Akram 493
Eini, Hossein 412
Eisazadeh, Hussein 317, 320
Eivazkhani, Farideh 215
Entezari, Maliheh 389
Entezarian, Fazeleh 277, 590
Erfani, Mehran 316
Ervin, Kimiya 508
Esfandiari, Behnaz 552, 564
Eshaghi, Zahra 321
Eskandari, Fatemeh 457
Eslami Moghaddam, Morteza 611
Eslamifar, Faezeh 585, 601, 606
Esmaeeli Djavid, Gholamreza 418
Esmaeili, Fariba 400
Esmaeili, Nazanin fateme 157
Esmaeili-Rineh, Somayeh 501, 513
Esmaeilkhani Barmi, Fatemeh 310
Esmaili, Parastoo 513
Esmailzadeh, Abdolreza 582
Etemadi, Ali 594
Etemadifar, Masoud 400
Etesami, Seyed Alireza 299
Etesamnia, Nastaran 607
Ettehadpour, Maryam 402

F

Faghihi, Shahab 457
Fahimfar, Noushin 588, 593, 594, 597, 598
Fakhrian, Mohamad 633
Fakhr-Rohani, Fatemeh 537
Fakourzadeh, Mohammad Hossein 420, 557
Fallahi Ghareh Goz, Siamak 385
FallahKohan, Sina 456
Fallahzadeh, Sara 604
Farabi, Saba 302
Farahmand, Somayeh 146, 201, 324, 367
Faramarzi, Farideh 603
Farazmand, Ali 573
Farhadi, Monaa 512
Farhoodi, Mehran 631
Farokhi, Farah 253
Farzadfar, Farshad 594
Farzami Sepehr, Mozhgan . 116, 147, 170, 172, 181, 189, 200
Fatah, Fatemeh 514, 522
Fathi, Mahsa 332
Fathi, Rouhollah 215
Fathi, Zahra 162
Fazaeli, Hoda 222, 230
Fazeli, Farzaneh 160, 313, 327
Fazeli, Nasrin 467
Feyzi, Ehsan 138
Foladi, Mahin 169
Fooladi, Faezeh 555
Foroutan, Fatimah 394
Forouzandeh, Fatemeh 428
Forouzanfar, Mohsen 368

G

Ganji, Fariba 443
Ganji, Farzaneh 516
Ganjizadeh, Maryam 374
Ghaderi, Sonbol 445
Ghadirkhomi, Elham 278
Ghaedi, Kamran 389, 400
Ghaffari Yousefzadeh, Farzaneh 289
Ghaforan, Faeze 549
Ghahramani, Farzam 631
Ghahremani, Mahya 397
Ghamari, Fatemeh 146, 201
Ghanbarzadeh, Kosar 356
Ghanei, Zahra 344
Ghaneie, Maryam 147, 181, 200
Ghanian, Mohammad Hossein 449
Ghannadi, Ali 633
Ghasemi jajelo, Zeynab 371
Ghasemi Lakeh, Narges 512
Ghasemi Moghadam, Hosein 413
Ghasemi, Sara 183
Ghasemi, Sayna 560
Ghasemian, Fatemeh 216, 243, 255, 265
Ghasemi-Dorcheh, Zahra 164
Ghasemizadeh, Fatemeh 258
Ghasempour, Masoumeh 541, 558
Ghazaey Zidanloo, Saeedeh 397, 402
Ghiasvand, Saeedeh 620
Gholami, Shaghayegh 440
Gholipourmalekabadi, Mazaher 457
Ghorbani Nahooji, Majid 324
Ghorbani Yekta, Batool 491
GhVabeshi, Hassan 407
Gol, Ali 258
Golestani, Bahram 302
Golipoor Malekabadi, Mazaher 437
Golshahi, Hannaneh 419, 421, 434
Gorouhi, Danial 632
Goudarzi, Zahra 174
Gourabi, Hamid 252, 268
Grami, Zahra 131
Grillari, Johannes 470

H

Habibi, Masoud 418, 440
Habibi-Rezaei, Mehran 461
Haddadi, Mohadeseh 529
Haghi, Mehdi 311, 333
Haj Rasouliha, Shadi 548
Hajari, Mohammad 223

Haji Mehdi Nouri, Zahra 361
Hajian, Mahdi 626
Hajian, Mohammad 422, 460
Hajihosseini, Saeedeh 212
Hajimousaei , Shiva 423
Hajisharifi, Kamal 250
Hajizade, Zahra 484, 515, 523
Hajizadeh-Tafti, Fatemeh 212
Hallajian, Zahra 566
Hamidieh. Amir ali 290
Hantoushzadeh, Sedigheh 575
Harsini, Roya 483
Hasanvand, Zeinab 152
Hashemi, Masoumeh 511
Hashemi, Mehrdad 389
Hashemi, Seyedeh Sara 436
Hashemian, Jafar 434
Hasnain, Zuhair 118
Hassani, Delaram 426
Hassanlou, Maryam 259, 602, 604
Hassanpour, Halimeh 130
Hassanvand, Arefeh 556, 619
Hatami, Homeira 266, 517
Hayati-Roudbari, Nasim 369, 451, 607
Hedayati, Mohammad Hossein 304
Heidari, Alireza 406
Heidari, Nasrin 536
Hekmat, Azade 135, 177
Helalat, Seyede Yosra 482
Henduei, Hannane 398
Hesampour, Ardeshir 312
Heshmat, Ramin 594, 597
Heshmati, Maesoumeh 437
Heydari, Negar 184
Heydari, Soraya 389
Heydarnejad, Hajar 204
Hojati, Vida 269, 608
Holghoomi, Roghaieh 357
Honarasa, Fatemeh 368
Hoseinpour, Mobina 272
Hosseini Harandeh, Seyyedeh Fatemeh 602
Hosseini, Bahman 385
Hosseini, Fatemehsadat 370
Hosseini, Najmeh 126, 191
Hosseini, Saba 497
Hosseinizadeh, Parisa 406
Hosseinjani, Adel 632
Hosseinkhani Hezaveh, Asiyeh 187
Hosseinkhani, Zohreh 592, 596
Hossein-Nasab, Mehri 185
Hosseinzadeh Bandbafh, Hessan 539, 568
Hosseinzadeh Colagar, Abasalt 358, 396
Hosseinzadeh, Ali 318
Hosseinzadeh, Mohammadreza 357, 370, 375
Hoveizi, Elham 480, 482, 518
Hsanvand, Zeinab 154

I

Ilanloo, Reyhaneh 612
Ilkhani, Tahereh 252, 268, 270
InanlooRahatloo, Kolsoum 456
Iranbakhsh, Alireza 119, 128, 129, 132, 133, 135, 139, 141, 143, 152, 154, 155, 156, 177, 178, 188, 203, 204, 206, 207, 532, 541, 558
Irandoust, Khadijeh 506
Irani , Shiva 423, 433
Iranshahy, Milad 370
Izadi, Nazanin 390

J

Jabari Shahzademohammad, Mojtaba 261
Jabarineitapeh, Mitra 242
Jabary, Nilofar 554
Jadidi, Khosro 526, 529
Jadidi, Khosrow 437, 457
Jafari Barani, Roza 613
Jafari hajati, Razieh 291
Jafari marandi, Sayeh 195, 347
Jafari Rahni, Seyedeh Zeinab 446
Jafari, Fatemeh 375, 396
Jafari, Leila 290
Jafari, Reyhaneh 173
Jafari, Sayeh 334
Jafari, Zohreh 343
Jafarpour, Farnoosh 625
Jalali, Hanieh 438, 439, 472
Jalilzadeh Zehtab, Faraz 613
Jalilzadeh, Elham 545
Jamali, Sepideh 165
Jamshidi, Ameneh 322, 531
Jamshidi1, Samine 175
Jamshidian Ghaleh Sefidi, Hanieh 312
Janatifar, Rahil 234, 276
Jangravi, Zohreh 451, 454
Jannatifar, Rahil 239, 267
Javaheri, Tohid 279
Javanbakht, Atefeh 170
Jazayeri, Raana Sadat 314
Jomehpour, Parsa 488
Jonoubi, Parisa 125, 137, 140, 173, 545, 554
Jorjani, Hassan 364

K

Kadhim Ali, Abdulsahib 294
Kalantari Khalilabad, Hadi 150
Kalhoi, Zahra 500
Kalhor, Naser 222, 230
Kalhori, Zahra 498, 499
KamiShirazi, Maryam alsadat 136
Karami, Azam 519

Karami, Monireh....584
Karamian, Roya....145, 187, 534
Kargar, Mohammadbagher....430
Karimi Atani, Narges....384
Karimi Sabet, Mohammad Javad....630
Karimi, Roghayeh....205
Karimian, Mohammad....346, 492
Karimzadeh Bardeei, Latifeh....161, 298, 328, 382, 420, 494, 506, 530
Kavousi, Kaveh....581
Kazemi, Mohammad Hassan....586
Kehtari, Mousa....600
Kelij, Sedigheh....123, 142, 202
Keshandehghan, Atlas....337
Keshavarz Zamanian, Saeede....351
Keshavarz, Rohollah....631
Keshavarzi Nejad, Amir....444
Keshtmand, Zahra....310, 341, 342
Keshtparvar, Fateme....263, 264, 447, 450
Khabazha, Negin....225
Khadivi Derakhshan, Fatemeh....553
Khajeh, Mina....587
Khalagi, Kazem....593
Khalil Moghaddam, Shiva....570
Khalili, Maedeh....233
Khalili, Niloofar....434
Khalilian, Seyedeh Morvarid....149
Khanalizade Shafie, Shakiba....376
Khanzade Nilooi, Asma....553
Khatami, Fatemeh....374
Khayati, Niloofar....562
Khazaeian, Behzad....155, 156
Kheirabadi, Mitra....261
Khezri, Somayeh....503
Khodadadi, Fatemeh....256
Khodarahmi, Parvin....307
Khorasani, Reza....251
Khorram, Fatemeh....509
Khorsandi Moghadam, Mahsa Sadat....534
Khorshid, Pejman....486
Khoshdel Nezamiha, Farahnaz....287
Khosheghbal Ghorabaei, Fatemeh....144, 322, 531
Khoshsokhan Mozaffar, Maryam....329
Khosravifar, Mona....229
Kiani, Kiandokht....229
Kiarostami, Khadijeh....182
Kiumarsi, Azadeh....286
Kolahi, Maryam....124, 130, 148, 165
Koochaki, Raoufeh....495
Kouhkan, Azam....440
Kouhkan, Fatemeh....600
Koulivand, Maryam....241

L

lak, Mohammad....538
Lange, Lucas....479
Larijani, Bagher....593, 594, 597
Larni, Fatemeh....252, 268, 270
Lashkarboloki, Mina....356, 390
Latif, Robabeh....629, 634
Liaqat, Iram....283
Lohrasebi, Tahmineh....140
Lotfi, Maryam....486
Lotfi, Zolfaghar....395
Lotfinajad, Masomeh....189
Lund Feilberg, Astrid....479

M

M. Matin, Maryam....446, 464
M.Bazzaz, Azar....464
Madahali, Mohammad Hossein....263, 264, 447, 450
Maddah, Seyyedeh Mahdokht....548
Maftoonazad, Ahmadreza....427, 449
Maghami, Parvaneh....206
Mahdavi, Hamid....435
Mahdavi, Mohammad....592, 596
Mahdieh, Nejat....580, 592, 596, 605
Mahmanzar, Mohammadamin....581
Mahmoodi, Gelavij....535, 542, 543
Mahmoodi, Mozaffar....429
Mahmoudi Kurdi, Fatemeh....205
Mahmoudi, Parvaneh....148
Mahmoudi, Solmaz....369
Mahootforoshha, Masoumeh....197
Majd, Ahmad....136, 167, 174, 359
Majidi Zolbin, Masoumeh....414, 608
Majidi, Mohammad Amin....557
Majidi, Ziba....588, 597, 598
Majlesain, Farnoosh....360
MalakpourKolbadinezhad, Salman....352
Malek, Masoumeh....629, 634
Maleki, Kosar....621
Mamani, Zohreh....438
Mamouei, Morteza....630
Manshoori, Mahmood....434
Mansouri, Zahra....199
Manzoori Shalmani, Mahla....244, 245
Marandi, Sayed Mohammad....391
Marandi, Sayeh Jafari....151, 167, 196, 197
Marvi, Anahita....206
Mashayekhi, Farhad....243
Mashayekhi, Mehri....245
Mashhadi Akbar Boojar, Masoud....351
Mashhadi Akbarbojar, Masoud....255
Masoodian, Nahid....256
Masoumi, Tannaz....592, 596
Mayeli Fereidani, Nasim....479
Mehrafza, Anahita....462
Mehralitabar, Hava....249
Mehran, Dorostghoal....240, 241
Mehravar, Zahra....135, 177
Mehregan, Iraj....139, 143, 188
Mehrvarz, Tahereh....435
Memari, Arman....444

Meshkatian, Mostafa....318
Miladi-Gorji, Hossein....364
Mir Mohammadrezaei, Fereshteh....492
Mireshghi, Neginsadat....343
Mirhashem, Melika....565
Mirhashemi Nasab, Seyed Fakhreddin....632
Mirmasoumi, Masoud....562
Mirnia, Kayvan....416, 587
Mirzaei, Mahsa....603
Mirzaei, Mitra....324
Mirzai, Masoumeh....174
Mirzaie Nodoushan, Hossein....141
Mirzapour, Tooba....485
Mirzayan Shanjani, Sanaz....406
Miyan mahalleh, Arefeh....371
Moadabshoar, Leila....286
Moazzenifard, Masoume....438
Modirrousta, Mitra....506
Moghadam honar, Ayda....336
Moghadam, Parisa....363
Moghadamzadegan, Samaneh....335
Moghaddam Matin, Maryam....481
Moghani-Ghoroghi, Fatemeh....221, 277, 590
Mohajel Kazemi, Elham....127, 130, 148, 165, 180, 183, 186
Mohajeri Tehrani, Mohammad Reza....593
Mohajjel Shoja, Hanieh....148, 159, 163, 168, 180
Mohamadhasani Javar, Fereshteh....561, 569
Mohamadi asl, Somayeh....194
Mohammad Sadegh, Majid....631
Mohammadi Alouche, Ramin....225
Mohammadi Bolbanabad, Erfan....128
Mohammadi Nouri, Afsaneh....147
Mohammadi- Sardo, Mohaddeseh....257, 540
Mohammadi, Ghazal....401, 594, 597
Mohammadi, Kiana....452
Mohammadi, Mahdi....186
Mohammadi, Marzieh....355
Mohammadi, Masomeh....220
Mohammadi, Mehdi....439
Mohammadi, Narges Sadat....171
Mohammadi, Parisa....344
Mohammadi, Zahra....273
Mohammadi, Zeinab....244, 245
Mohammadian, Maryam....588, 598
Mohammadishamsabadi, Zeynab....547
Mohammadzadeh Anzabi, Nafiseh....551
Mohammadzadeh, Aqlieh....258
Mohebbi, Ali....578, 585, 586, 587, 601, 606, 608
Mohebbi, Sohameh....602, 604
Mohseni Kouchesfahani, Homa....438, 439, 475
Mohseni, Reihane....221
Mohsennezhad, Fatemeh....166
Mohsenzadeh, Fariba....120
Mohtaj Khorassani, Yalda....426
Mojarrad, Majid....426
Mojgani, Naheed....506
Mokhlesi, Amir....589, 595
Mokhtari, Mohammadreza....444
Molae, Alireza....467
Molavi, Farahnaz....611
Monsefi, Malihezaman....422, 460
Montazeri, Maryam....304
Moradi Alvand, Tayebeh....379
Moradi, Hanieh....559
Moradi, Sharif....415
Moradiani, Kianoush....301
Moradikhah, Farzad....427
Mortazavi, Pejman....491, 493
Mortezaeian, Hojjat....592, 596
Moshkdanian, Ghazaleh....221, 277, 465, 590
Moslemi, Mohammad Kazem....219
Moslemzade, Mahsa....385
Mostafapour, Asma....345
Mostaghimzadeh, Zahra....246
Motamedi, Mina....484, 515, 523
Motesaddi Zarandi, Saeed....491, 493
Motie, Mehrnoosh....521
Mousavi Bolfeh Teymoori, Maryam....378, 386
Mousavi Nadooshan, Rezvan....378, 386
Mousavi, Fateme....178, 203
Mousavi, Mohammad Mehrshad....444
Mousavi-Chelak, Fatemeh....346
Movafeghi, Ali....183
Movahedin, Mansoureh....217, 233, 443
Mozayani, Farnaz....430
MR, Dadfar....223
Myian, Jaleel Ahmad....469

N

Nabavi, Sina....172
Nabavian, Seyede Samane....275, 445
Nabipour, Iraj....593, 594, 597
Nabiuni, Mohammad....161, 248, 298, 328, 331, 378, 382, 386, 420, 459, 489, 494, 495, 506, 530, 557
Naderi Soorki, Maryam....482, 518
Naderi, Nushin....242
Nadimi, Maryam....280
Naeemi, Nasim....475
Najafi, Atefeh....277, 590
Najafi, Hossein....392, 442, 458
Najafi, Leila....459
Najaflou, Meysam....179
Najafzadehvarzi, Hossein....357
Najdi, Nazila....231, 235
Najjar, Niloufar....588, 593, 597, 598
Najmedin, Najme....441
Najmoddin, Najmeh....462
Nakhaei, Niloofar....589, 595
Namdary, Roonak....146, 201
Namvar, Faezeh....536
Namvar-Zahed, Zahra....158
Narimani, Nima....228
Naseh, Vahid....300
Naseri, Mohsen....291
Naserpuor, Leila....222
Nasiri, Bahar....373

Nasiri, Maysam 483
Nasiri, Nahid 440
Nasr-Esfahani, Mohammad Hossein 218, 227, 242
Nasri, Sima 319, 324, 367
Navaian, Majid 487, 511, 537, 567
Nazari, Masomeh 129
Nazari, Mostafa 289
Nazari, Zahra 516
Nazem Bokaei, Zahra 182
Nazifi, Ehsan 142, 202
Negahdari, Babak 585, 601, 606
Nejad Shahrokh Abadi, Khadijeh 339, 486, 496, 497, 504, 508
Nejadsattari, Taher 151
Nejati, Vahid 424, 432, 510
Nejhadali, Masoumeh 552
Nematollahi-Mahani, Seyed Noureddin 221, 277, 590
Nezami, Maryam 496
Niasari naslaji, Amir 628
Nik Akhtar, Fatemeh 552
Nikeysh, Mansooreh 564
Niknam, Vahid 562
Niknejad, Azadeh 509
Nikoukar, Ghazaleh 305, 445
Nikzad, Hossein 224
Noorbakhshnia, Maryam 400
Noorbazargan, Hassan 300
Noorkhah, Nazanin 252, 268, 270
Noorkhajavi, Ghasem 179
Noraei, Farahnaz 315
Noroozi, Neda 365
Norouzi, Mahsa 492
Noshadirad, Elnaz 491

O

Omidi, Behin 551, 555
Omidi, Mohammad Hossein 488
Oraghi Ardebili, Zahra 129, 133, 135, 141, 143, 152, 154, 155, 156, 177, 178, 206, 541, 558
Osanloo, Maryam 439
Ostovar, Afshin 593, 594, 597
Otoodehnejadnematalahi, Fattah 331

P

Pakpour Mahmoudabad, Bahareh 371, 487, 511, 537, 538, 539, 544, 547, 551, 555, 559, 567, 568
Panahi, Nekoo 588, 593, 598
Pandamooz, Sareh 478
Parham, Abbas 435
Parhizgar, Mahla 611
Parhizkari, Narges 437
Parivar, Kazem 491
Parsamehr, Atefeh 372
Partoazar, Alireza 440
Parvaneh Tafreshi, Azita 427, 449, 456
Parvini, Mojde 265
Pasbakhsh, Parichehr 221, 277, 590
Pasha, Laleh 520
Paymani, Zeinab 289
Peymani, Maryam 389
Peyvandi, Maryam 196
Piravar, Zeynab 225, 528, 536, 560
Pourbabaei, Fatemeh 128
Pouresmael, Masoumeh 131
Pourfallah, Mostafa 299, 530
Pourmahdi, Mahsa 445
Pšenička, Martin 624
Puceat, Michel 474

Q

Qaderi, Ardeshir 150
Qavami, Nasrin 150

R

Rabbani, Shahram 425
Rabiei Faradonbeh, Davud 574
Radan, Zahra 452
Raeisi-Ardali, Mahsa 518
Rafie pour, Mostafa 297
Rafiee, Aras 312, 314, 394
Ragerdi Kashani, Iraj 221, 277, 590
Rahim Tayefeh, Aidin 631
Rahimi Mansour, Farima 495
Rahimi, Hamid Reza 426
Rahimi, Mahsa 273
Rahimian, Karim 581
Rahimian, Sana 392, 442, 458
Rahmani, Bita 301
Rahmani, Mahin 256, 269
Rahmanian, Vahid 292
Rahmanifar, Shaghayegh 441
Rajabi, Rozhin 433
Rajabipour, Elham 198
Rajaei, Homa 122
Rajai, Samira 607
Ramezani, Farzaneh 254
Ramezani, Mina 293, 336, 521, 536
Ramezani, Sara 195, 347
Ramezani, Tayabe 248
Ranjbar, Massoud 194
Ranjbar, Zahra 194
Rasekh jahromi, Athar 292
Rashidi Ilzoleh, Raziye 502, 524
Rashno, Fateme 549
Razavi, Razieh 540
Razeghi, Jafar 185, 311, 333
Rezaee, Sona 445
Rezaei Lord, Javid 485
Rezaei, Farhad 572
Rezaei-Golmisheh, Ali 514, 522

Rezaei-Tavirani, Mostafa..... 212, 593, 597
Rezaie, Alireza..... 308
Rezaie, Jafar..... 424, 432, 510
Rezanejad, Farkhondeh..... 126, 131, 191, 208
Rezayatmand, Zahra 175
Rezvani, Zahra..... 465
Riahi, Faezeh 381
Riahi, Mehrshid 153
Riazi-Rad, Farhad 314, 394
Roohi Aminjan, Atabak 629, 634
Roozbahani, Amirmahdi 444
Roshanian Bakhsh, Mehdi 309
Rostami Gilani, Sania 315
Royaee, Zohreh..... 616, 617, 618

S

S, Nasri 282
Saadatmand, Mahdi Il 329
Saadatmand, Sara.....152, 154, 172, 178, 203, 204, 207
Saatchi, Zahra 318
Sabbaghian, Marjan 228, 244, 245, 252, 260, 268, 270
Sabouri, Hossein 356, 390
Sabouri, Zahra 345
Sabzevar, Fatemeh 236, 237
Sadatian, Marziye Sadat 151
Sadeghi, Ehsan..... 502, 524
Sadeghi, Mehdi 387
Sadeghi, Samar 622
Sadeghpoor, Majid..... 232, 340
Sadighi Gilani, Mohammad Ali..... 228, 260, 268, 270
Saeedpour, Mahsa..... 395
Saeidi, Reyhanen 196
Safaei, Setayesh 489
Safari, Fateme 376
Safari, Fatemeh 377, 384
Safari, Nahid..... 579
Safarpour Dehkordi, Maryam 309
Safarzadeh, Arezoo..... 207
Saffarian, Zahra 419, 421
Sahab negah, Sajjad 288
Saidi, Abbas..... 615
Sajadi, Hesamoddin 244
Salehghamari, Ensieh..... 299, 318, 372
Salehi, Mohammad Saeed..... 478
Salehi, Nasrin..... 429
Salehi-Eskandar, Behrooz..... 164
Salehi-Lisar, Seyed Yahya..... 185
Salimi, Ali..... 451, 454
Salimpour, Fahimeh..... 167, 195, 198, 347
Sam Daliri, Fattane 600
Samiei, Afshin 316
Sanaei, Batool 262, 273
Sanjari, Razieh..... 368
Sanjarian, Forough..... 149
Sardar, Rehana..... 115
Sargolzaii, Samira..... 634
Sari, Alireza 490, 627
Sari, Soyar..... 374, 454
Sarkhani, Marjan..... 342
Sayad Bourai, Mohammad..... 632
Schambach, Axel 479
Sehat, Mojtaba 221
Seihoon, Seyed Iman 411
Sepehri, Masoumeh..... 425
Seyed Hosseini, Elahe..... 224
Seyedalipour, Bagher..... 346, 396
Seyedi Jasbi, Akram Sadat..... 454
Seyedjafari, Ehsan..... 427
Shabanzadeh, Masoud..... 359, 563
Shadi, Ahmad..... 453
Shadkhast, Mohammad..... 247, 271
Shadmehr, Zohreh..... 487, 544, 567
Shafaati, Mina..... 182
Shafiee, Gita..... 593, 594, 597
Shaghouli, Melika..... 527, 563
Shahabi, Amirali 378, 386
Shahbazi, Atefeh 418
Shahbazi, Sahba 461
Shahbazi, Soraya..... 337
Shahgolzari, Mehdi 179
Shahhoseini, Maryam..... 245
Shahi Sadrabadi, Fatemeh..... 319
Shahi, Fatemeh..... 367
Shahi, Zahra 314, 394
Shahinkhah, Mahnaz..... 240
ShahMoradi, Negin 501
Shahpasand, Koorosh..... 461
Shahrokhi, Zahra..... 586
Shahsavand-Ananloo, Esmaeil..... 583
Shahvali, Mojtaba 445
Shamohammadi, Fereshteh 322
Shams, Fatemeh 428
Shams, Razieh..... 434
Shamsabadi, Morteza..... 243
Shamsi, Saeme 510
Shamsi, Zahra 288
Shamsizadeh Meymandi, Ali 232, 340
Shamsizadeh Meymandi, Mohammad 232
Shamsizadeh Meymandi, Tayebeh..... 232
Shariatzadeh, Seyed Mohammad Ali .. 231, 235, 239, 267
Shariatzadeh, Syed Mohammad Ali..... 234, 276
Sharie Hosseini, Gohar 366
Sharifi, Fereshteh 423, 433
Sharifi, Sara 184
Shasavarani , Hosein..... 615
Sheikh Hosseini Lori, Abbas..... 239, 267
Sheikh Hosseini, Abbas 230
Sheikholeslami, Azar 214, 222, 230, 369, 459
Shemshadi, Sahar..... 451
Shiassi Arani, Faranak 331
Shirani, Kobra..... 295, 308
Shiri-Shahsavar, Mohammad Reza 301
Shirkhani, Zohreh 121, 137, 153, 173, 554
Shobbar, Zahra Sadat..... 131
Siadat, Fatemeh..... 512
Sinafar, Hirad..... 300
Skov, Søren..... 479

Sohbatzadeh, Farshad 202
Sohrabizadeh, Farideh 531
Soleimani Mehranjani, Malek 220, 231, 234, 235, 236, 237, 239, 267, 276
Solhi, Yaser 360
Soltani, Azin 588, 593, 597, 598
Soltani, Inaz 504
Soltani, Reza 226
Soltani, Roya 140
Sonieshargh, Shima 234, 276
Soori, Hosna 325

T

Tabasi , Setare 614
Tabasi, Saina 614
Tabatabei Vakili, Saleh 630
Tafrihi, Majid 357, 375
Tafvizi, Farzaneh 285, 300, 303, 307, 337, 338, 361
Taghizadeh, Sima 432
Taghvamanesh, Ahang 526
Tahajjodi, Somayyeh Sadat 212
Taheri, Mohammad Mahdi 288
Taheri, Saba 549, 565
Tahmasebi Fard, Zahra 354, 380
Tahmasebimoghadam, Fatemeh 338
Taj Abadi Ebrahimi, Maryam 487, 568
Tajadod, Golnaz 196, 198
Talea, Ali 577
Talebi Mehrdar, Mahboobeh 404
Talebi, Nazanin 202
Talei, Daryush 204, 207
Talkhabi, Mahmood 589, 595
Tamadon, Amin 210
Taravati, Ali 272, 398
Tasafi, Shima 255
Tashakkor, Zakiyeh 326
Tashakori, Maryam 399
Tashtar, Adeleh 436
Taslimi, Negin 434
Tavakol-Afshari, Jalil 426
Tavalaee, Marziyeh 213, 227, 242
Tavasoli, Nafiseh 593
Tofigh, Maryam 222
Tofighi, Cobra 321
Tohidkia, Mohammadreza 311
Toorani Ghazvini, Mahsa 585, 601, 606
Tootoonchi, Mehrangiz 418
Torabi-Farsani, Arezoo 271
Toulabi, Anis 250

V

Vahedi, Negin 406
Valavi, Shadi 133
Vali, Azam 453
Vaziri, Samira 393, 455, 591
Veisi Malekshahi, Ziba 585, 601, 606
Vosughi, Nasim 417

W

Wilson, Jonathan Mark 352
Woods, Niels-Bjarne 479

X

Xiaojie Xian, Nasim 479

Y

Yadollahi Khales, Atefe 400
Yaghoubi kohnedeh, Faezeh 153
Yahyazadeh Jasour, Sana 615
Yari, Siamak 471
Yarmohammadi, Kimia 161, 298, 382
Yasaghi, Saba 142
Yavari, Afagh 179
Yavari, Shima 289
Yazdani Karganrood, Nazli 493
Yazdinejad, Marziyeh 208
Yekta, Amiri 297
Youneszadeh, Behnam 629
Younisi, Fayeqeh 248
Yousefi, Alireza 422, 460
Yousefi, Fatemeh 253
Yousefinejad, Roghieh 548
Yousefnia, Saghar 383

Z

Zabihi, Abbas 309
Zafar, Sara 118
Zahedi, Tahereh 353
Zahiri, Mina 161, 298, 382
Zamani, Mohammadreza 349
Zamanian, Saman 228, 260
Zamani-Badi, Tayyebeh 224
Zandiyeh, Zahra 576
Zarandi-Miandoab, Leila 138
Zare Karizi, Shohreh 331
Zare, Habibeh 616, 617, 618
Zare, Zahra 532
Zarei Baba Arabi, Zahra 292
Zarei Darki, Behrouz 335
Zaremanesh, Hadis 556, 619
Zarezadeh, Somayeh 183
Zargar, Jallal 388
Zargham, Parvin 531
Zarghami, Sana 297
Zarinkamar, Fatemeh 176

Zarinkolah, Azadeh....593
Zarinpanjeh, Nasim....150
Zavareh, Saeed....483
Zayerzadeh, Ehsan....533, 546
Zebhi, Ftemeh....180
Zendegi-Shiraz, Ameneh....306
Zendehboodi, Zahra....379
Zerafatdost, Parisa....138
Zeynali, Bahman....427, 456
Ziaeei, Mojtaba....505
Zibaei, Zohre....305, 445
Zinatbakhsh, Zeinab....490
Ziyamehr, Aysooda....405

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جمهوری اسلامی ایران
وزارت بهداشت درمان و آموزش پزشکی
مرکز تحقیقات بهداشت باروری دانشگاه علوم پزشکی تهران
مرکز آموزش مداوم جامعه پزشکی

بسمه تعالـــی

تاریخ: ۱۴۰۴/۰۶/۲۹
شماره: ۳۴۰۴۸۹

مجوز تخصیص امتیاز آموزش مداوم به شرکت کنندگان و سخنرانان همایش و کنگره

جناب آقای / سرکار خانم: مهسا ناعمی
دبیر محترم علمی برنامه مرکز تحقیقات بهداشت باروری دانشگاه علوم پزشکی تهران

سلام علیکم، احتراماً، به استناد صورتجلسه کمیته تخصیص امتیاز مورخ ۱۴۰۴/۰۶/۱۷ در خصوص تخصیص امتیاز به برنامه سلولی تکوینی در علوم پایه و بالین که به مدت ۲ روز از تاریخ ۱۴۰۴/۰۷/۲۴ لغایت ۱۴۰۴/۰۷/۲۵ توسط مرکز تحقیقات بهداشت باروری دانشگاه علوم پزشکی تهران در شهر تهران برگزار می گردد؛ به استحضار می رساند که اعطای امتیاز به شرکت کنندگان در برنامه و اخذ مبلغ حق ثبت نام از آنها طبق جدول ذیل مورد تایید می باشد

تذکر ۱: هرگونه تغییر در مشخصات برنامه فوق الذکر فقط با مجوز اداره کل آموزش مداوم مجاز خواهد بود
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تذکر ۳: با توجه به مفاد بخشنامه شماره ۵۰۴/۹۳۸/د مورخ ۱۳۹۰/۱۲/۲۴ حداکثر ظرف مدت ۲۰ روز پس از اجرای برنامه نسبت به تکمیل لیست شرکت کنندگان و درج امتیاز آنها اقدام گردد. ثبت مشخصات و امتیاز شرکت کنندگان پس از این زمان حداکثر تا ۷۰ روز پس از اجرای برنامه برای مرکز مجری با لحاظ نمودن امتیاز منفی در اعتبا بخشی مذکور و پس از آن سامانه مسدود و درج امتیاز میسر نمی باشد.

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شماره پیگیری
۱۱۱۸۰۴۰۱

جناب آقای دکتر محمد نیبونی

رئیس محترم هیئت مدیره انجمن زیست‌شناسی ایران

با سلام و احترام،

بازگشت به نامه شماره ۱۸۵۹۱ مورخ ۱۴۰۴/۰۲/۲۱ در خصوص صدور مجوز "دومین کنفرانس ملی و اولین کنفرانس بین‌المللی سلولی تکوینی ایران"، به‌استحضار می‌رساند برگزاری کنفرانس‌های مذکور به‌صورت حضوری و با رعایت مفاد آیین‌نامه همایش‌های علمی مصوب ۱۳۹۷/۱۰/۲۲ از نظر کمیسیون انجمن‌های علمی بلامانع است. خواهشمند است مقرر فرمائید پس از برگزاری کنفرانس، گزارشی از مراحل اجرایی و اقدامات به‌عمل آمده تهیه و به این کمیسیون ارائه شود.

شایان ذکر است که نظارت و مسئولیت حسن برگزاری و کیفیت این کنفرانس برعهده رئیس هیئت مدیره انجمن خواهد بود.

همچنین مطابق ماده ۹ آیین‌نامه همایش‌های علمی شایسته است برای ثبت کنفرانس و مقالات آن در پایگاه استنادی علوم جهان اسلام اقدامات لازم صورت پذیرد.

با آرزوی توفیق الهی
سید عبدالامیر نبوی
دبیر کمیسیون انجمن های علمی ایران

رونوشت: جناب آقای دکتر محمدمهدی علویان مهر رئیس محترم موسسه استنادی علوم و پایش علم و فناوری جهان اسلام ISC) جهت استحضار و دستور اقدام مقتضی)

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Section One: Preface



Opening Statement

In the Name of God, the Compassionate

In today's fluid, hyper-complex, and competitive world—where, following the emergence of Artificial Intelligence, the growth and advancement of science and technology continue at an ever-accelerating pace and global scientific output doubles annually—it has become essential for scientists and researchers in the field of cellular and developmental biology to gather and share the latest scientific achievements in a warm and honest environment.

This introduction aims to underscore the significance and the objectives of holding the International Conference on Cellular and Developmental Biology, elaborating on the necessity of scientific synergy in the present era, the prospects ahead, and the unique role of this discipline in addressing national and global challenges.

The modern world is witnessing breathtaking transformations across scientific and technological domains. The advent and expansion of Artificial Intelligence have revolutionized information processing and the discovery of complex patterns. This transformation, accompanied by remarkable progress in biotechnology, nanotechnology, and data sciences, has led to unprecedented momentum in the growth and enrichment of science and technology. Specifically, in the life sciences, the volume of scientific production is steadily rising—doubling within short cycles of time.

Under such circumstances, the need for scientists and researchers—particularly those in specialized fields such as cellular and developmental biology—to convene is greater than ever. Such gatherings, held in an atmosphere of sincerity and collegiality, provide an ideal platform for sharing the latest scientific insights, exchanging ideas, and initiating collaborative research ventures. These interactions not only contribute to the personal advancement of scientists, but also elevate the collective scientific capacity of the nation.

Technological breakthroughs, such as advanced genome-sequencing tools (NGS: Next-Generation Sequencing), high-resolution microscopy (TEM: Transmission Electron Microscopy and SEM: Scanning Electron Microscopy), and molecular imaging techniques like FISH (Fluorescence In Situ Hybridization), have enabled the acquisition of vast volumes of data. These datasets, spanning molecular, cellular, and tissue levels, require sophisticated analytical approaches and advanced computational methods.

The phenomenon of "doubling scientific output annually" highlights the rapid accumulation of knowledge. While this presents extraordinary opportunities for discovery, it also imposes challenges: researchers must keep abreast of the latest findings and adapt their work swiftly to new knowledge. Conferences serve as critical conduits, offering synthesized overviews of emerging trends and emphasizing breakthrough directions.

One of the core aims of this conference is to set the course and chart a roadmap within cellular and developmental biology for young researchers—leveraging national capacities—to

simultaneously advance the discipline and address urgent national needs and challenges. For emerging scholars, entering the complex and highly specialized world of cellular and developmental biology can be daunting. This conference seeks to guide the new generation by identifying key research domains, presenting cutting-edge methodologies, and highlighting career and research opportunities.

Here, "trend-setting" refers to the creation and steering of new directions in science. Through keynote presentations from leading researchers, group discussions, and training workshops, the conference endeavors to define the future trajectory of research in cellular and developmental biology—a mission of particular significance to early-career scientists.

Sustainable scientific progress requires synergy between universities, research centers, and industry. This conference offers a unique opportunity for professionals from diverse institutions to connect and initiate joint projects. Such national synergy optimizes human, financial, and infrastructural resources; preventing redundancy and ensuring more impactful outcomes—an especially vital principle where resources are limited.

Cellular and developmental biology holds vast potential in solving national challenges in fields such as health, agriculture, environment, and even energy:

• **Health:** Advancing the understanding of mechanisms underlying genetic diseases, cancer, neurodegenerative disorders, and aging, and developing novel therapies based on stem cells and tissue engineering.

• **Agriculture:** Enhancing crop resilience to environmental stressors, increasing productivity, and producing plants with higher nutritional value.

• **Environment:** Developing biology-based solutions for pollution remediation and ecosystem restoration.

Today, a molecular approach in cellular and developmental biology is indispensable. Coupled with knowledge of structure, ultrastructure, gene networks, protein networks, and molecular networks, this perspective promises deeper insight into the mysteries of life in plants, animals, and humans. Understanding life processes at the molecular level is the key to unlocking biological secrets, enabling precise exploration of cellular and developmental phenomena.

Combining and analyzing these vast molecular datasets can yield critical insights into the complexity of life—forming the foundation for basic research while offering expansive applications in regenerative medicine, genetic engineering, and pharmaceuticals.

Aligned with the conference's ten thematic axes, this event has been designed for scientific comprehensiveness. It is anticipated that, with the robust participation of scholars and researchers and the broad scope of national and international collaborations, we will witness significant advancement in these practical and problem-solving sciences.

Comprehensiveness is ensured by covering an array of topics across cellular and developmental biology, catering to a spectrum of participants—from novice students to seasoned professors.

The presence of distinguished researchers from reputable universities and research centers, both domestic and international, enriches the conference with:

• **Learning from pioneers:** Hearing first-hand the latest findings and perspectives from leading scientists.

• **Professional networking:** Connecting with potential collaborators for joint projects.

• **International cooperation:** Extending partnerships beyond geographical boundaries.

• **Cultural and scientific exchange:** Gaining familiarity with diverse scientific approaches practiced in different countries.

Such exchanges enhance the quality of research, nurture innovative thinking, and ultimately drive the development and progression of the life sciences in the country.

Of note, for the first time, this conference achieves meaningful integration between fundamental sciences and clinical sciences—a direction warmly welcomed by the medical community. One of its outstanding strengths lies in focusing explicitly on bridging fundamental research in cellular and developmental biology with its clinical applications in medicine—a focus unprecedented at this scale in our conference series.

This demonstrates a profound understanding of the need to translate laboratory discoveries into diagnostic and therapeutic solutions. The enthusiastic reception from the medical field underscores the urgency of this connection in today's world: clinicians seek deeper insights into the molecular roots of diseases to design more effective, personalized treatments, while basic scientists gain heightened motivation upon witnessing the direct impact of their work on human health.

This synergy offers immense potential to accelerate the "bench-to-bedside" process, ensuring that scientific research ultimately serves to improve public health. By facilitating dialogue between these two groups, the conference takes a decisive step toward realizing this goal.

With utmost respect,

Alireza Iranbakhsh

Secretary-General of the Second National Conference and First International Conference on Cellular and Developmental Biology of Iran

The Necessity of Holding the Conference From the Perspective of a Developmental Cell

The world today faces complex and multifaceted mega-challenges that threaten the foundations of human life and nature in various dimensions. Climate change, population growth, biodiversity loss, and the spread of pollution, which have reduced food production capacity in many regions and posed serious threats to food security, are among these critical challenges. Simultaneously, human health is impacted by chronic and costly diseases, such as cancer, which stems from molecular and developmental disorders, as well as cardiovascular diseases, diabetes, and neurological disorders, whose onset and progression are closely tied to cellular and developmental mechanisms.

Adopting an interdisciplinary approach to deeply explore cellular and developmental mechanisms can play a significant role in providing practical solutions to address these challenges. The successful experiences of our country's scientists and researchers in treating infertility for both domestic and international patients, producing various human and veterinary vaccines, and developing recombinant drugs such as insulin, interferons, and coagulation factors represent only a fraction of these tangible achievements. This demonstrates that scientific and technological capabilities can extend beyond addressing domestic issues, serving as a model for regional and global cooperation to tackle mega-challenges and foster a knowledge-based economy.

The era of genomics and cutting-edge technologies, such as next-generation sequencing (NGS), supercomputers, gene editing with CRISPR-Cas9, and the development of organoid models, has provided unprecedented insights into the mechanisms of life. These advancements have also enabled targeted manipulation of living systems. In medicine, these tools have paved the way for precision therapies and the regeneration of damaged tissues. In agriculture, they have facilitated the development of crop varieties resilient to various stresses and the production of bioactive compounds using plant-based platforms. Thus, despite confronting these mega-challenges, the availability of advanced scientific capabilities and modern tools for studying and manipulating cellular and developmental mechanisms offers a promising vision of a sustainable and healthy future. Scientists and researchers in this field stand at the forefront of these transformative developments.

Cellular and Developmental Biology in Human Health – With the Advancement of Modern Technologies

Cellular and developmental biology, through the precise study of processes related to growth, proliferation, differentiation, and cell death, enables the identification of key points disrupting biological order by analyzing signaling pathways and gene networks. In cancer treatment, understanding the developmental pathways of cancer cells and their interactions with the surrounding environment has opened new horizons, such as immunotherapy, and advanced targeted drug delivery with minimal side effects. In cardiovascular diseases, reliance on stem cell technologies and tissue engineering for regenerating damaged tissues has created promising prospects. In diabetes, the regeneration and functional reprogramming of insulin-producing cells, based on developmental models, offer a hopeful vision for sustainable treatment of this major health challenge.

Furthermore, the use of xenografts or tissue and organ transplantation from non-human species has opened new perspectives for replacing and repairing vital structures. However, this

approach faces challenges related to immune compatibility, requiring innovations in developmental biology to ensure stable integration between host cells and transplanted tissues. Concurrently, the use of transgenic organisms as biological factories for producing therapeutic and vaccine products is expanding. A notable example is the cultivation of insect cells, which, with their ability to express high-quality recombinant proteins, provide promising solutions for the large-scale, safe, and cost-effective production of vaccines and therapeutic antibodies. These technologies have paved the way for rapid responses to emerging disease outbreaks. Such advancements highlight that the integration of developmental biology and bioengineering can lead to a new generation of treatments and biological products, simultaneously addressing mega-challenges and advancing the knowledge-based economy.

Cellular and Developmental Biology in Plant Sciences

In plant development, developmental processes involve complex layers of gene networks, signaling pathways, and tissue interactions. These processes play a critical role in determining a species' stability and adaptability to its environment, shaping how a plant responds to sudden or gradual environmental changes and its capacity for survival and reproduction. In the face of climate change and stresses such as soil salinity, which disrupts ionic and osmotic balance, drought, which impairs metabolic and growth pathways, extreme heat, which alters protein structures, and prolonged cold, which slows biological processes, a deep understanding of cellular and developmental mechanisms is key to precisely manipulating them. This can lead to the development of species and varieties capable of sustaining food production under critical conditions.

Plant cell and tissue culture technologies play a dual and strategic role in this context. On one hand, they enable rapid propagation and screening of superior genotypes. On the other hand, as living factories, they provide tools for producing significant quantities of natural medicinal compounds. A prominent example is the production of taxol, an anticancer drug with a complex structure that is nearly impossible to synthesize chemically but has been scaled up industrially through engineered plant cell culture systems.

Moreover, molecular farming, leveraging plants' biological capacity to express specific proteins and metabolites, has opened broad horizons for producing novel vaccines, therapeutic antibodies, industrial enzymes, and even bio-nanoparticles. In this approach, plants serve not only as food sources but also as sustainable, safe, and cost-effective platforms for producing biological products. This integration of plant developmental biology and bioengineering has created a new infrastructure to address global food and pharmaceutical crises, breaking down the boundaries between agriculture and the biotech industry within a unified and efficient system.

The Iranian Biology Society aims to guide emerging scientific trends with a developmental and interdisciplinary perspective to design and promote sustainable solutions for global mega-challenges. This approach can serve as a platform for converging knowledge and expertise among researchers and specialists, fostering collaborative scientific solutions and paving the way for their development. National achievements in fields such as infertility treatment, production of human and veterinary vaccines using various platforms, and the development of recombinant drugs like interferons, coagulation factors, and insulin, as well as the introduction of plants derived from tissue culture and the development of new agricultural varieties, testify to the country's high scientific and technological capacity. This indicates that such assets can form a robust foundation for expanding scientific and technological collaborations at national, regional, and global levels.

The Second National and First International Conference on Cellular and Developmental Biology in Iran has been organized to enhance these capacities, positioning the country's scientific potential at the core of targeted collaborations. Additionally, it aims to strengthen the link between advanced research and commercialization pathways, thereby elevating innovative products and the knowledge-based economy. Furthermore, it seeks to foster scientific diplomacy and sustainable collaboration networks at regional and global levels to address mega-challenges, enabling the scientific community to respond promptly and cohesively to unforeseen crises. Through this process, new pathways will be opened to enhance health, ensure sustainable food, pharmaceutical, and ecosystem security in Iran, the region, and the world.

With wishes for success,

Hassan Alizadeh

Developmental Biology Graduate

Introduction to Kharazmi University

Kharazmi University, the first higher education institution in Iran with a 106-year history, was established on September 5, 1919 (15 Shahrivar 1297 in the Persian solar calendar) as the "Dar ul-Mualimin Markazi" (Central Teachers' College). Over the years, it underwent several name changes: in 1928 to "Dar ul-Mualimin Ali" (Advanced Teachers' College), in 1933 to "Daneshsara-ye Ali" (Higher Teachers' College), in 1974 to "Tarbiat Moallem University" (Teacher Training University), and finally, on March 2, 2012, to "Kharazmi University." On March 14, 2015, the University of Economic Sciences was merged into Kharazmi University. Currently, the university comprises 5 vice-presidencies, 15 faculties, 6 research institutes, 3 research centers, 2 study centers, 3 scientific hubs, 5 research units, 2 technology incubators, 1 self-governing campus, and 3 affiliated campuses. It employs 482 full-time faculty members, serves 12,055 students, and has 671 staff members. According to the resolution dated December 22, 2020, by the Board of Trustees, the university operates three campuses in Tehran, Karaj, and Garmdareh.

The Biology Department, initially established as the Natural Sciences group in 1919, has been actively engaged in education and training since the university's founding. In 2010, the Biology Department was elevated to the Faculty of Biological Sciences, comprising three academic groups: Plant Sciences, Animal Sciences, and Cellular-Molecular Sciences. The Faculty of Biological Sciences currently offers 19 programs across various academic levels and has 33 full-time faculty members.



Introduction to the Iranian Biology Society

The Iranian Biology Society (IBS) was first established in 1973 (1352 in the Persian solar calendar). In September 1992 (Shahrivar 1371), through the efforts of a group of Iranian biologists who were members of the Biology Planning Council under the Ministry of Science's High Planning Council, the society resumed its activities during the first national gathering of Iranian biologists. Since then, it has organized an annual national conference at various universities across the country.

During its second gathering in September 1993 (Shahrivar 1372), the IBS laid the foundation for publishing the Iranian Journal of Biology by presenting scientific research articles. Today, the society has reached a level of prominence, enabling it to serve as a consultant in various fields and contribute significantly to shaping scientific research, planning higher education, and supporting the Ministry of Education in Iran.

Activities

- **Organizing Conferences**: The IBS has consistently held national and international biology conferences since 1992.
- **Collaboration with Universities**: Partnering in the organization of national and international conferences hosted by universities.
- **Publication of Reference Books**: Producing reference books on various topics in biological sciences.
- **Research Collaboration**: Participating in the implementation of research projects.
- **Engagement with the Academy of Sciences**: Collaborating with the Biology Branch of the Academy of Sciences of the Islamic Republic of Iran.
- **Journal Publication Support**: Assisting in the publication of biology journals at Iranian universities.
- **Student and Educational Engagement**: Collaborating with scientific student associations to organize journal clubs and educational workshops.
- **Establishment of Specialized Branches**: Creating dedicated teacher and student branches in 2016 (1395) to foster effective communication with biology teachers and students.

Journals Published by the Iranian Biology Society

- *Plant Research Quarterly* (Scientific-Research)
- *Animal Research Quarterly* (Scientific-Research)
- *Cellular and Molecular Research Quarterly* (Scientific-Research)
- *Iranian Plant Biology Journal* (Scientific-Research)
- *Applied Biology Biannual Journal* (Scientific-Research)
- *Iranian Biology Biannual Journal* (Scientific-Promotional)

Organizing of the Conference



Organizing Committee of the ۲nd National and ۱st International Conference on Cell and Developmental Biology of Iran

Dr. Mohammad Nabiuni
Conference Chair

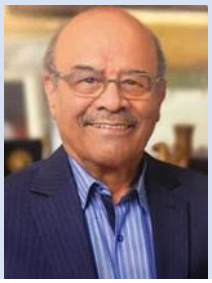
Dr. Alireza Iranbakhsh
Conference Secretary-General

Dr. Simin Tajik Esmaeili
Executive Secretary of the Conference

Dr. Mahnaz Azarnia
Scientific Secretary of the Conference

Dr. Sepideh Bagheri Public Relations and Advertising Committee	Dr. Azar Sheikholeslami Fertility and Infertility Committee
Dr. Mozhgan Farzami Sepehr International Committee	Dr. Alireza Sari Livestock and Aquatic Animals Reproductive Technology Committee
Dr. Masoumeh Ghasempour Reception and Registration Committee	Dr. Zohreh Shirkhani Plant Cell and Developmental Biology Committee
Dr. Shadi Valavi Catering and Protocol Committee	Dr. Javad Baharara Animal Cell and Developmental Biology Committee
Dr. Maryam Asadollahi Accommodation and Hotels Committee	Dr. Masoumeh Majidi Tissue Engineering, Regenerative Medicine and Stem Cells Committee
Ms. Fatemeh Khodabandeh Special Guests and Visits Committee	Dr. Abasalt Hosseinzadeh Cellular and Molecular Committee
Dr. Maryam Bi Khoof Torbati Publications Committee	Dr. Ali Farazmand Developmental Genetics Committee
Dr. Zahra Tahmasebi Resolution and Venues Management Committee	Dr. Sima Nasri Natural Compounds and Cancer Committee
Dr. Ali Mohebi Specialized Equipment Exhibition Committee	Dr. Majid Navaiyan Cell and Tissue Culture Committee
Eng. Hassan Alizadeh Specialized Books Exhibition Committee	Dr. Mostafa Chehergani Rad Artificial Intelligence and Developmental Biology Committee
Dr. Faranak Shiassi Planning and Electronic Poster Presentation Committee	
Dr. Masoud Soltani Workshops Committee	
Ms. Hasti Fahimi Nejad Nutrition Committee	
Eng. Amir Hossein Bandali Website and Media Committee	

Conference Policy Council

No.	Position	Full Name	Organizational Details	Photo
1	Member	Dr Kazem Parivar	Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	
2	Member	Dr Ahmad Majd	Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	
3	Member	Dr Shahrbanoo Orian	Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	
4	Member	Dr Mehran Habibi rezaei	Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	

No.	Position	Full Name	Organizational Details	Photo
5	**Committee chairman**	**Dr mohammad nabiuni**	Conference Chair and Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	
6	**Committee Secretary**	**Dr Alireza Iranbakhsh**	Secretary-General of the Conference and Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	
7	**Member**	**Dr Mahnaz Azarnia**	Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	
8	**Member**	**Dr Homa Rajaei**	Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	

No.	Position	Full Name	Organizational Details	Photo
9	Member	Dr Adele Divsalar	Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	
10	Member	Dr Bahman Zeynali	Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	
11	Member	Dr Alireza Harifi	Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	

Components of the

No.	Position	Full Name	Organizational Details	Photo
1	**Committee chairman**	**Dr mohammad nabiuni**	Conference Chair and Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	
2	**Committee Secretary**	**Dr Alireza Iranbakhsh**	Secretary-General of the Conference and Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	
3	**Scientific Secretary**	**Dr Mahnaz Azarnia**	Member of the Policy-Making Council of the 2nd National and 1st International Conference on Developmental Cell Biology of Iran	
4	**Executive Secretary**	**Dr. Simin Tajik Esmaeili**	Assistant Professor, Department of Plant Sciences, Faculty of Biological Sciences, Kharazmi University, Tehran	

Members of the Conference's Scientific Committees

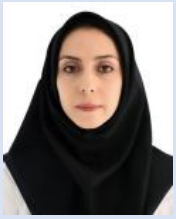


1. Plant Developmental Cell Scientific Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Zohreh Shirkhani	Assistant Professor, Department of Plant Sciences, Faculty of Biological Sciences, Kharazmi University, Tehran	
2	Member	Dr. Alireza Iranbakhsh	Professor at Islamic Azad University,Science and Research Branch	
3	Member	Dr. Siddiqa Klich	Assistant Professor of Plant Sciences Department, Mazandaran Faculty of Basic Sciences	
4	Member	Dr. Farkhunde Rezanjad	Associate Professor, Department of Biology, Faculty of Science, Shahid Bahonar University of Kerman, Kerman	
5	Member	Dr. Abdul Karim Chehargani Rad	Associate Professor, Department of Biology, Faculty of Science, Boali Sina University, Hamedan	
6	Member	Dr. Simin Tajik Esmaeili	Assistant Professor, Department of Plant Sciences, Faculty of Biological Sciences, Kharazmi University, Tehran	
7	Member	Dr. Zahra Baghaei Far	Associate Profesor of Biology at Payam Noor University	

No.	Position	Full Name	Organizational Details	Photo
8	Member	Dr. Parisa Jonoubi	Associate Professor of Plant Biology, Life Sciences, Kharazmi University, Tehran	
9	Member	Dr. Maryam Kolahi	Assistant Professor, Faculty of Sciences, Shahid Chamran University, Ahvaz	
10	Member	Dr. Elham Mohajel Kazemi	Associate Professor of Biology,University of Tabriz	
11	Member	Dr. Kolthoum Azizi	Associate Professor, Department of Biology, Faculty of Science, Bu-Ali Sina University, Hamedan	
12	Member	Dr. Fatemeh Zarrinkamar	Professor, Department of Developmental Biology, Faculty of Biological Sciences, Tarbiat Modares University, Tehran	
13	Member	Dr. Fatemeh Mahmoudi Kordi	Associate Professor, Department of Biology, Faculty of Science, Azarbaijan Shahid Madani University, Tabriz	
14	Member	Dr. Akbar Safipour Afshar	Associate Professor, Department of Biology, Neyshabur Branch, Islamic Azad University, Neyshabur	

2. Fertility and Infertility Scientific Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Azar Sheikholeslami	Assistant Professor, Academic Center for Education, Culture and Research, Qom Branch	
2	Member	Dr. Zahra Ebrahimi	Obstetrician and Gynecologist, Academic Center for Education, Culture and Research, Qom Branch	
3	Member	Dr. Mohammad Kazem Moslemi	Urologist and Assistant Professor, Qom University of Medical Sciences	
4	Member	Dr. Mansoureh Movahedin	Professor of Anatomical Sciences Faculty of Medical Sciences Tarbiat Modares University	
5	Member	Dr. Behrouz Aflatoonian	Associate Professor Director of Stem Cell Biology Research Center, Yazd Reproductive Sciences Institute, Shahid Sadoughi University of Medical Sciences, Yazd	
6	Member	Mohammad Hossein Nasr Esfahani	Professor, Royan Institute, Isfahan	

No.	Position	Full Name	Organizational Details	Photo
7	Member	Dr. Amin Tamadon	Professor,West Kazakhstan Marat Ospanov Medical University	
8	Member	Dr. Elaheh Amini	Assistant Professor, Department of Animal Sciences, Faculty of Biological Sciences, Kharazmi University	
9	Member	Dr. Fatemeh Ghasemian	Associate Professor, Faculty of Basic Sciences/Biology, University of Guilan	
10	Member	Dr. Somayeh Tavana	Assistant Professor, Reproductive Medicine Research Institute (Royan Institute)	
11	Member	Dr. Rouhollah Fathi	Associate Professor, Reproductive Medicine Research Institute (Royan Institute)	
12	Member	Dr. Marziyeh Tavalaee	Associate Professor, Royan Institute, Isfahan	

3. Natural compounds and cancer Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Sima Nasri	Associate Professor of Biology, Payam Noor University, Tehran	
2	Member	Dr. Mohsen naseri	Shahed University Traditional Medicine Clinical Trial Research Center	
3	Member	Dr. Somayeh Farahmand	Assistant Professor, Faculty of Basic Sciences, Payam Noor University, Tehran	
4	Member	Dr. Fatemeh Emadi	Shahed University Traditional Medicine Clinical Trial Research Center	
5	Member	Dr.Majid Ghorbani Nahoji	Assistant Professor, Medicinal Plants Research Institute	
6	Member	Dr. Fereshteh Dadfar	Assistant Professor of Biology, Payam Noor, Shiraz	
7	Member	Dr. Azadeh Kiumarsi	Assistant Professor of Pediatric Hematology and Oncology Department of Pediatrics, School of Medicine Children's Medical Center Tehran University of Medical Science	

No.	Position	Full Name	Organizational Details	Photo
8	Member	Dr. Reza Arabi Mianroudi	Professor at the Pasteur Institute	
9	Member	Dr. Farzaneh Tafvizi	Associate Professor of Biology - Cellular and Molecular Parand Branch	
10	Member	Dr. Soheila Ebrahimi Vosta Kalaee	Research Associate Professor, Mazandaran Agricultural Education and Extension Research Center	
11	Member	Dr. Gholamreza Bakhshi Khaniki	Professor of Biology, Payam Noor University, Tehran	
12	Member	Dr. Mina Ramezani	Associate Professor of Biology - Development Soft Tissue Engineering Central Tehran Branch	
13	Member	Dr. Fatemeh Khosheghbal Ghorabaee	Professor, Hormozgan Province Agricultural and Natural Resources Research and Education Center	
14	Member	Dr. Fatemeh Shahi Sadrabadi	Assistant Professor of Biology, Payam Noor University, Pakdasht, Tehran	
15	Member	Dr. Elham Safarpour	IVF Fertility Laboratory, Orange County, USA	

4 . Cellular & Molecular Science Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Abasallt Hosein zade	Faculty of Basic Sciences - University of Mazandaran	
2	Member	Dr. Mehran Habibi Rezaei	Biochemistry and Biophysics Research Center, University of Tehran	
3	Member	Dr. Mohammad Reza Zamani	Member of the academic staff of the National Institute of Genetic Engineering and Biotechnology	
4	Member	Dr. Shams Alzoha Abollmaali	Associate Professor, Department of Biology, Faculty of Basic Sciences, Semnan University	
5	Member	Dr. Ali Mohamad Ahadi	Associate Professor of Genetics, Faculty of Basic Sciences, Shahrekord University	
6	Member	Dr. Hosein Naderi Manesh	Full Professor Faculty of Biological Sciences Tarbiat Modares University	

No	Position	Full Name	Organizational Details	Photo
7	Member	Dr. Zivar Salehi	Professor Department of Biology Faculty of Basic Sciences University of Guilan	
8	Member	Dr. Khosro Khajeh	Professor Faculty of Biological Sciences Tarbiat Modares University	
9	Member	Dr. Iraj Saadat	Associate Professor Department of Biology Shiraz University	
10	Member	Dr. Mostafa Matlabi	Professor at the National Research Institute of Genetic Engineering and Biotechnology	
11	Member	Dr. Seyed Mahmoud Arab Najafi	Associate Professor Faculty of Biology University of Tehran	
12	Member	Dr. Faramarz Mehr Nezhad	Professor Interdisciplinary Faculties of Science and Technology Bioscience Engineering Nanobiotechnology	
13	Member	Dr. Ahmad Reza Bahrami	Professor Ferdowsi University of Mashhad	

No.	Position	Full Name	Organizational Details	Photo
14	Member	Dr. Morahem Ashengrof	Professor Faculty of Basic Sciences University of Kurdistan	
15	Member	Dr. Amir Jalali	Assistant Professor, Faculty of Basic Sciences, University of Arak	
16	Member	Dr. Saman HoseinKhani	Professor Faculty of Biological Sciences Tarbiat Modares University	
17	Member	Dr. Zahra Tahmasebi Fard	Associate Professor of Cellular and Molecular Biology, Department of Biology Islamic Azad UniversityRoudehen Branch	

5. Scientific Committee on Stem Cells, Tissue Engineering and Regenerative Medicine

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Masoumeh Majidi	Faculty member at Tehran University of Medical Sciences and Associate Professor at the School of Anatomical Sciences	
2	Member	Dr. Mahmoudreza Ashrafi	Professor of Pediatric Neurology , Tehran University of Medical Sciences	
3	Member	Dr. Hossein Aini	Department of Anatomy, School of Medicine, Iran University of Medical Sciences	
4	Member	Dr. Seyed Iman Seihoun	Faculty Member and Assistant Professor, Department of Tissue Engineering and Applied Cell Sciences, Tehran University of Medical Sciences	
5	Member	Dr. Sharif Moradi	Assistant Professor, Royan Institute	

No.	Position	Full Name	Organizational Details	Photo
6	Member	Dr. Nasim Vousooghi	Associate Professor of Pharmacology, School of Novel Medical Technologies, Cognitive and Behavioral Sciences Research Center, Tehran University of Medical Sciences	
7	Member	Dr. Keyvan Mirnia	Associate Professor of Neonatal-Perinatal Medicine. Department of Pediatrics. School of Medicine	
8	Member	Dr. Abolfazl Barzegari	Faculty Member, Department of Medical Biotechnology, Tabriz University of Medical Sciences	
9	Member	Dr. Hossein Ghasemi Moghaddam	Faculty Member, Tabriz University of Medical Sciences	

6. Animal Cell and Developmental Biology Scientific Committee

No.	Position	Full Name	Organizational Details	Photo
1	Member	Dr. Javad Baharara	Professor of Biology, Islamic Azad University, Mashhad Branch	
2	Member	Dr. Farhad Masha yekhi	Professor of Cell and Developmental Biology, Department of Biology, Faculty of Sciences, University of Guilan	
3	Member	Dr. Bahman Zainali	Associate Professor Faculty of Sciences, Faculty of Biology, University of Tehran	
4	Member	Dr. Mohammad Nabiuni	Professor, Department of Cell and Molecular Biology Faculty of Biological Sciences, Kharazmi University	
5	Member	Dr. Mahnaz Azarnia	Professor, Department of Animal Sciences, Faculty of Biological Sciences, Kharazmi University	

No.	Position	Full Name	Organizational Details	Photo
6	Member	Dr. Homa Mohseni kouchesfahani	Professor, Department of Animal Sciences, Faculty of Biological Sciences, Kharazmi University	
7	Member	Dr. Seyed mohammad ali Shariat Zadeh	Professor, Department of Biology, Faculty of Basic Sciences, University of Arak	
8	Member	Dr. Maryam Moghaddam Matin	Professor, Department of Biology, Faculty of Science, Ferdowsi University of Mashhad	
9	Member	Dr. Vida Hojati	Associate Professor, Islamic Azad University, Damghan Branch	
10	Member	Dr. Nasim Hayati	Associate Professor Converging Sciences and Technologies Faculty, Islamic Azad University, Science and Research Branch	

7. Cell & Tissue Culture Scientific Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Majid Navaeian	Assistant Professor, Department of Biology, Faculty of Basic Sciences, Yadegar-e-Imam Khomeini (RA) Shahre Rey Branch, Islamic Azad University, Tehran	
2	Member	Dr. Khosro Jadidi	Fellowship in Cornea, Member of the Vision Health Research Center, Semnan University of Medical Sciences, and Faculty Member at Baqiyatallah University of Medical Sciences, Tehran	
3	Member	Dr. Saeed Abroun	Ph.D. in Clinical Hematology, Assistant Professor, Tarbiat Modares University, Tehran	
4	Member	Dr. Bahareh Pakpour	Assistant Professor, Department of Biology (Biological Sciences and Technologies), Faculty of Basic Sciences, Central Tehran Branch, Islamic Azad University, Tehran	
5	Member	Dr. Seyyed Mahdokht Maddah	Assistant Professor, Department of Biology, Faculty of Basic Sciences, Yadegar-e-Imam Khomeini (RA) Shahre Rey Branch, Islamic Azad University, Tehran	
6	Member	Dr. Hossein Aghamolaei	Assistant Professor of Medical Biotechnology, Chemical Injury Research Center, Systems Biology and Toxicology Research Institute, Baqiyatallah University of Medical Sciences, Tehran	

No.	Position	Full Name	Organizational Details	Photo
7	Member	Dr. Siamak Yari	Faculty Member, Department of Basic Sciences, Bu-Ali Sina University, Hamedan	
8	Member	Dr. Seyyedeh Nafiseh Hassani	Associate Professor, Royan Institute for Stem Cell Biology and Technology, Tehran	
9	Member	Dr. Zeinab Piravar	Assistant Professor, Department of Animal Developmental Biology, Faculty of Basic Sciences, Central Tehran Branch, Islamic Azad University, Tehran	
10	Member	Dr. Maryam Bikhof Torbati	Assistant Professor, Department of Biology, Faculty of Basic Sciences, Yadegar-e-Imam Khomeini (RA) Shahre Rey Branch, Islamic Azad University, Tehran	
11	Member	Dr. Azam Dalman	Assistant Professor, Royan Institute for Stem Cell Biology and Technology, Tehran	
12	Member	Dr. Mohaddeseh Mohammadi Sardoo	Assistant Professor, Department of Animal Science, Jiroft University, Jiroft	

No.	Position	Full Name	Organizational Details	Photo
13	Member	Dr. Hossein Shirvani	Faculty Member, Baqiyatallah University of Medical Sciences, Tehran	
14	Member	Dr. Fatemeh Rostamkhani	Assistant Professor, Department of Biology – Animal Sciences, Cellular and Developmental Biology Division, Yadegar-e-Imam Khomeini (RA) Shahre Rey Branch, Islamic Azad University, Tehran	
15	Member	Dr. Ali Asghar Majrouhi	Assistant Professor, Department of Biology, Yadegar-e-Imam Khomeini (RA) Shahre Rey Branch, Islamic Azad University, Tehran	
16	Member	Dr. Masoumeh Ghasempour	Board Member of the Iranian Biology Society and Lecturer at Islamic Azad University, Science and Research Branch, Tehran	

8. Scientific Committee on Developmental Genetics & Omics Studie Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Ali Farazmand	Chair of the Committee and Professor of Genetics, University of Tehran	
2	Member	Dr. Sedigheh Hantoushzadeh	Specialist in Obstetrics and Subspecialist in Perinatology, Tehran University of Medical Sciences	
3	Member	Dr. Farhad Rezaei	Specialist in Genetics and Systems Biology, Erasmus University, the Netherlands	
4	Member	Dr. Ali Mohibi	PhD in Developmental Animal Cell Biology, Tehran University of Medical Sciences	
5	Member	Dr. Reza Aflatounian	Specialist in Reproductive Medicine, Royan Institute	
6	Member	Dr. Mohammad Amin Mahmanzar	Specialist in Bioinformatics, University of Hawaii, USA	
7	Member	Dr. Mohammad Hadi Giviyanrad	PhD in Analytical Chemistry, Islamic Azad University	

No.	Position	Full Name	Organizational Details	Photo
8	Member	Dr. Nejat Mahdieh	Specialist in Medical Genetics, Iran University of Medical Sciences	
9	Member	Dr. Zahra Zandieh	Specialist in Reproductive Biology, Iran University of Medical Sciences	
10	Member	Dr. Nahid Safari	Specialist in Applied Proteomics, Iran University of Medical Sciences	
11	Member	Dr. Vida Hojjati	Specialist in Developmental Animal Cell Biology, Islamic Azad University	
12	Member	Dr. Kolsoom Enanloo	Specialist in Cell and Molecular Biology, University of Tehran	
13	Member	Dr. Nasim Hayati Roodbari	Specialist in Developmental Animal Cell Biology, Islamic Azad University	
14	Member	Dr. Farideh Razi	Head of the Metabolomics and Genomics Research Center, Endocrinology and Metabolism Research Institute, Tehran University of Medical Sciences	

9. Artificial Intelligence and Developmental Biology Scientific Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Mostafa Haghir Chehreghani	Assistant Professor, Department of Computer Engineering , Amirkabir University of Technology	
2	Member	Dr. Ahmad Nikabadi	Assistant Professor of Computer Engineering , Amirkabir University of Technology	
3	Member	Dr. Mir Hossein Dezfoulian	Professor Emeritus of Computer Engineering, Bu-Ali Sina Univers	
4	Member	Dr. Mehdi samii	Lecturer and postdoctoral researcher , University of Malaysia	

10- Scientific Committee on Animal and Aquatic Reproductive Technology

No.	Position	Full Name	Organizational Details	Photo
1	Secretary of the Committee	Dr. Alireza Sari	Professor, PhD in Zoology, University of Tehran	
2	Member of the Committee	Dr. Amir Niasari Naslaji	Professor, PhD in Veterinary Mediciner, , University of Tehran	
3	Member of the Committee	Dr. Mohammad Hossein Nasr Esfahani	PhD in Clinical Embryology, Founder and Director of Isfahan Biotechnology Research Center, Faculty Member at Isfahan University of Medical Sciences	
4	Member of the Committee	Dr. Maryam Monsef Shokri	PhD, Research Assistant Professor, International Sturgeon Research Institute	
5	Member of the Committee	Dr. Mehdi Hajian	Associate Professor, Head of the Animal Biotechnology Research Group at Royan Institute, Faculty Member of Royan Institute	
6	Member of the Committee	Dr. Farnoosh Jafarpour	Assistant Professor, Department of Biology, PhD in Anatomy and Embryology (Veterinary Medicine), Royan Research Institute	

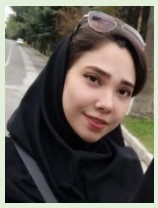
Members of the Executive Committees



1- Admission and Registration Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Masoumeh Ghasempour	Lecturer and Researcher in the field of Cellular–Developmental Biology, Islamic Azad University	
2	Member	Zohreh Shadmehr	PhD Student in Microbiology, Islamic Azad University, Science and Research Branch	
3	Member	Hassan Hosseinzadeh	M.Sc. in Pathogenic Microbiology, Islamic Azad University, Central Tehran Branch	
4	Member	Mehdi Hosseinzadeh Foumani	M.Sc. in Pathogenic Microbiology, Islamic Azad University, Central Tehran Branch	
5	Member	Maryam Ghanei	Master's degree in biochemistry, Payam Noor University, center of Tehran	
6	Member	Fatemeh Gholami	Master's student in the Department of Animal Developmental Cell Biology, Khawarizmi University	

2. Website and Media Committee

No.	Position	Full Name	Organizational Details	Photo
7	Member	Narges Shamayeli	Master's student in the Department of Animal Developmental Cell Biology, Khawarizmi University	
8	Member	Hananeh Shadmehr	B.Sc. in Microbiology, Islamic Azad University, Shahre Qods Branch	
9	Member	Zahra Yesaqi	Master's student in the Department of Animal Developmental Cell Biology, Khawarizmi University	

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Engineer Amirhosein Bandli	Office Specialist at the Iranian Biological Society	

3. Members of the Ceremonial Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Shadi Valavi	PhD student in Plant cell and Developmental Biology ,Islamic Azad University, Science and Research branch	
2	Deputy	Tannaz Ghazanfri	Bachelor of Science student in Cellular and Molecular Biology, Islamic Azad University, Shahr-e Qods Branch.	
3	Member	Farnaz Mohebi	Bachelor of Science student in Cellular and Molecular Biology, Islamic Azad University, Shahr-e Qods Branch.	
4	Member	Erfan Khoshbaten	Bachelor of Science student in Cellular and Molecular Biology, Islamic Azad University, Shahr-e Qods Branch.	
5	Member	Zahra Nazari	Bachelor of science in Biology - Animal Science, Shahid Beheshti University	
6	Member	Asal Zarin	Bachelor student of cellular and molecular biology, Islamic Azad University, Quds branch	
7	Member	Zahra Zare Haghighi	Bachelor student of cellular and molecular biology, Islamic Azad University, Quds city branch	
8	Member	Shamim Zahedian	Bachelor student of cellular and molecular biology, Islamic Azad University, Quds branch	

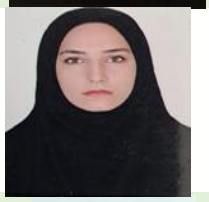
No.	Position	Full Name	Organizational Details	Photo
9	Member	Zahra Khodayari	Bachelor student of cellular and molecular biology, Islamic Azad University, Quds city branch	
10	Member	Samane Ebrahimzad Fazli	Bachelor student of cellular and molecular biology, Islamic Azad University, Quds city branch	
11	Member	Zahra Emami	Bachelor student of cellular and molecular biology, Islamic Azad University, Quds city branch	

4. Accommodation and Hotel Services Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Maryam Sadat Asadollahi	PhD in Plant Cell and Developmental BiologyIslamic Azad University, Science and Research Branch	
2	Member	Sheyda Hashtroudi	Bachelor of Science in Microbiology, Islamic Azad University Shahre Qods Branch	
3	Member	Yasmin Nabipour	Bachelor of Science student in Cellular and Molecular Biology, Islamic Azad University, Shahre Qods Branch	

5. Public Relations and Promotion Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Sepideh Bagheri	PhD in Biology, Islamic Azad University, Lecturer and Researcher in Clinical Treatment, Health and Beauty	
2	Deputy	Kiana Mohammadi	PhD Student In Molecular Genetics, Islamic Azad University Damghan Branch	
3	Deputy	Nafiseh Sadat Karamali Nazer	Bachelor of Science in Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
4	Deputy	Mitra Mirzaei	Master of Science in Microbial Biotechnology, payame noor university East Theran Branch	
5	Deputy	Hediyeh Ghandali	Bachelor of Science Student in Microbiology, Islamic Azad University Damghan Branch	
6	Deputy	Armina Shakiba	Bachelor of Science in Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	

No.	Position	Full Name	Organizational Details	Photo
7	Member	Tara Ranjbar Lail	Bachelor of Science Student In Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
8	Member	Saba Khazali	Bachelor of Science Student In Microbiology, Islamic Azad University Shahre Qods Branch	
9	Member	Setayesh Eskandar	Bachelor of Science Student In Plant Biology, Karazmi University	
10	Member	Maedeh Saberi	Bachelor of Science Student In Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
11	Member	Saba Khorramdel	Bachelor of Science Student In Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
12	Member	Kiarash Abolghasemi	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
13	Member	Fatemeh Alizadeh	Bachelor of Science Student In Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
14	Member	Ahmad Reza Norouzi	Bachelor of Science Student In Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	

No.	Position	Full Name	Organizational Details	Photo
15	Member	Mehdi Mohammadi	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
16	Member	Farnaz Zahiri	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
17	Member	Atieh Pour Haidar	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
18	Member	Rosha Khodarzi	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
19	Member	Reyhaneh Ahmadi	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
20	Member	Sima Gol Ahmadi	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
21	Member	Maryam Snghin Abadi	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	

No.	Position	Full Name	Organizational Details	Photo
22	Member	Minoo Sadat Mottaghi	Bachelor of science student in Microbiology, Islamic Azad University, central Tehran Branch	
23	Member	Mohammad Zahiri	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	
24	Member	Amir Hossein Ahmadi	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University Shahre Qods Branch	

6. Members of the Posters Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Faranak Shiassi Arani	PhD student in Cellular and Molecular Biology, Islamic Azad University, Tehran Science and Research Branch	
2	Deputy	Maryam Tashakori	PhD student in Cellular and Molecular Biology, Tehran University.	
3	Member	Bita Avarki	Student of Cellular and Molecular Biology, Islamic Azad University.	
4	Member	Mohammad Jafari Rahaghi	BSc Student in Microbiology, Islamic Azad University, Tehran North Branch	

No.	Position	Full Name	Organizational Details	Photo
5	Member	Fateme Abbaspour	Student of Biological Anthropology, Tehran University	
6	Member	Zahra Fallah Parvizi	Bs Student in Cellular and Molecular Biology Islamic University, Qods city	
7	Member	Sahar kark abadi	Master's Degree Student in Genetics, Damghan Branch, Islamic Azad University.	
8	Member	Minoo Sadat Mottaghi	Student of microbiology, Islamic Azad University	

7. International Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Mozhgan Farzami Sepehr	PhD in Biology-Plant Physiology Simon Fraser University,Canada	

8. Publications Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Maryam Bikhof torbati	Ph.D in Cellular and Molecular Biology, Islamic Azad University,Yadgar-e-imam (RAH) Shahre- rey Branch	
2	Committee Secretary	Dr. Zahra Tahmasebi Fard	Ph.D in Cellular and Molecular Biology, Department of Biology, Islamic Azad University	
3	Committee member	Shida Aghazadeh Yamcheloo	PhD student in Cellular and Molecular biology, Department of Biology, Islamic Azad University, Science and Research Branch	
4	Committee member	Melika Shagholi	PhD student in Cellular and Molecular Biology, Department of Biology, Islamic Azad University, North Tehran Branch	
5	Committee member	Maryam Taghizadeh Badrian	PhD student in Cellular and Molecular Biology, Department of Biology, Islamic Azad University, North Tehran Branch	

No.	Position	Full Name	Organizational Details	Photo
6	Committee member	Sama Babajani	PhD student in Cellular and Molecular Biology, Department of Biology, Islamic Azad University, North Tehran Branch	
7	Committee member	Hossein Jalilvand	Bachelor's degree student in Biotechnology, Department of Biology, Islamic Azad University, Yadgar-e- imam (RAH) Shahre- rey Branch.	
8	Committee member	Amir Hossein Ekrami Namin	Bachelor's degree student in Biotechnology, Department of Biology, Islamic Azad University, Yadgar-e- imam (RAH) Shahre- rey Branch.	

9. Resolutions and Hall Management Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Zahra Tahmasebi Fard	Ph.D in Cellular and Molecular Biology, Department of Biology, Islamic Azad University of Roudehen Branch	
2	Member	Negin Tavakoli Rad	Bachelor of Science Student in Biotechnology, University of Tehran	

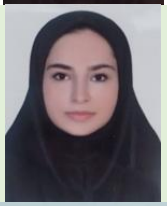
No.	Position	Full Name	Organizational Details	Photo
3	Member	Fatemeh Daryabeigi	Bachelor of Science in Microbiology, University of Tehran	
4	Member	Yasamin Hashemifard	Bachelor of Science Student in Biotechnology, Islamic Azad University, Central Tehran Branch	
5	Member	Helia Dehghan	Bachelor of Science in Biotechnology, University of Tehran	
6	Member	Parmida Noroozi	Bachelor of Science in Biotechnology, University of Tehran	
7	Member	Mobina Mogheise	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University, Science and Research Branch	
8	Member	Mahdis Moeini Korbekandi	Bachelor of Science in Cellular and Molecular Biology, Ale-Taha Institute of Higher Education	

10. Nutrition Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Hasti Fahimi Nezhad	M.A. in Islamic Art, Sooreh International University Responsible Expert Journal of New Findings in Biological Sciences	
2	Member	Arshia Alizadeh	Bachelor of Science student in Cellular and Molecular Biology, Islamic Azad University, Shahre Qods Branch	
3	Member	Kimia Hedayat	Bachelor of Science student in Cellular and Molecular Biology, Islamic Azad University, Shahre Qods Branch	

11. Specialized Equipment Exhibition Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Dr. Ali Mohebi	PhD in Developmental Cell Biology, Eexpert and Laboratory Manager of Reference Laboratory, Tehran University of Medical Science, Member of the Research Council of Fetal and Child Cardiovascular Health and Prevention Research Centre, Tehran University of Medical Science	

2	Member	Fatemeh Fallahati Nejad	Bachelor of Science student in Microbiology, Islamic Azad University, Damghan Branch	
3	Member	Helia Madihi	Bachelor of Science student in Microbiology,Islamic Azad University, Damghan Branch	
4	Member	Mohammad Mahdi Masoudi	Master of science student in Electrical Power Engineering, Islamic Azad University, Damghan Branch	
5	Member	Samin Rostami Monfared	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University, Shahre Qods Branch	
6	Member	Mobina Asadi	Bachelor of Science Student in Cellular and Molecular Biology, Islamic Azad University, Shahre Qods Branch	

12. Workshops Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Masood Soltani	PhD candidate Molecular and Cellular Biology, Ferdowsi University of Mashhad	
2	Member	Media Abdollahian	Master of Science in Cellular and Molecular Biology, Kharazmi University, Tehran	

3	Member	Mohammad Hossein Fakourzadeh	Master of science in Medical Engineering, Isfahan University of Technology	
4	Member	Elika Ramezani Savadkouhi	Bachelor of science in Biology-Animal Science,Islamic Azad University, Central Tehran branch	

13. Special Guests and Visit Committee

No.	Position	Full Name	Organizational Details	Photo
1	Committee Secretary	Fatemeh Khodabandeh Shahraki	Master of Science in Cell and Developmental Biology Kharazmi Unuiversity, Tehran	
2	Member	Mohammad Gholizadeh	Bachelor of science in Biology -Animal Science, Kharazmi Unuiversity, Tehran	
3	Member	Fatemeh Davarzani	Bachelor of science in Biology -Animal Science, Kharazmi Unuiversity, Tehran	
4	Member	Mohadeseh Raadi	Bachelor of science in Biology -Animal Science, Kharazmi Unuiversity, Tehran	

Exhibition of Specialized Books



The Necessity of a Step Forward: Exhibition of Specialized Books

In an era where the domains of science and technology are undergoing unprecedented transformations, cellular and developmental biology has achieved a foundational role in the understanding, prevention, and treatment of diseases, as well as in ensuring sustainable food security and preserving ecosystems. This critical position demands robust support from credible and authoritative resources. As researchers or students embark on the journey to unravel the mechanisms of life, access to specialized and up-to-date books not only facilitates deep and precise learning but also fosters interdisciplinary scientific dialogue. Consequently, this sparks innovation within the nation's scientific community.

Organizing a dedicated exhibition at this conference to showcase Persian-language books in the field of cellular and developmental biology can provide a structured platform for sharing ideas and findings within the scientific community, paving new pathways for advancing education and research. Such an exhibition, by offering a curated collection of credible resources, can effectively address the challenge of fragmented information. It thus transforms existing knowledge into a shared intellectual asset, enabling researchers to take bolder strides forward.

This event is not merely a gathering of books but a vital link in the chain of advancing biological sciences in the country, strengthening the connection between education, research, and innovation. It lays the groundwork for the production of new works and the promotion of valuable resources, enabling us to adequately address domestic scientific needs while maintaining an active presence in regional and global arenas. With this approach, the book exhibition will evolve into a sustainable institution that nurtures the next generation of biologists and delineates new horizons for scientific and practical progress at national, regional, and global levels.


کتاب
آزمایشگاه فیزیولوژی تولید مثل
مؤلفین
دکتر سیما نصری
دکتر سهیلا ابراهیمی وسطی کلایی
ناشر
دانشگاه پیام نور
سلولی تکوینی ایران
آزمایشگاه فیزیولوژی تولید مثل


کتاب
فیزیولوژی تولید مثل
مؤلفین
دکتر سیما نصری
دکتر سهیلا ابراهیمی وسطی کلایی
ناشر
دانشگاه پیام نور
سلولی تکوینی ایران
فیزیولوژی تولید مثل


کتاب
گونه و گونه زایی
مؤلفین
دکتر سیما نصری
دکتر مینا رمضانی
ناشر
دانشگاه پیام نور
سلولی تکوینی ایران
گونه و گونه‌زایی


کتاب
مبانی زیست شناسی تکوینی
مؤلفین
دکتر فاطمه شاهی صدر آبادی
حکمت علیخانی مهرجردی
ناشر
دانشگاه پیام نور
سلولی تکوینی ایران
مبانی زیست‌شناسی تکوینی

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کتاب
ژنتیک مولکولی
مؤلفین
فرزانه تفویضی
کاظم پریور
ناشر
دانشگاه آزاد اسلامی
سلولی تکوینی ایران
ژنتیک مولکولی
فرزانه تفویضی
کاظم پریور


کتاب
فراساختار عملکردی ،
اطلس زیست شناسی و آسیب شناسی بافت
مترجمین
دکتر مهناز آذرنیا ، دکترالهه امینی،
دکتر محدثه محمدی ساردو
سیده غدیره میر ابوالقاسمی
ناشر
جهاد دانشگاهی
سلولی تکوینی ایران
فـــراساختار
عملکـــردی


کتاب
بیولوژی سلولی و مولکولی سرطان
،وقتی سلول ها قوانین را می شکنند و
تنظیمات را دور می زنند
مترجمین
رئوفه کوچکی
دکتر الهه امینی
زیر نظر دکتر محمد نبیونی
ناشر
دکتر خلیلی
سلولی تکوینی ایران
بیولوژی سلولی و مولکولی سرطان


کتاب
کشت سلول:
مفاهیم،تکنیک های پایه و مولکولی
مؤلفین
دکتر الهه امینی، مریم حسن پور،
رئوفه کوچکی
ناشر
جهاد دانشگاهی
سلولی تکوینی ایران
کشت سلول:
مفاهیم، تکنیک های پایه و مولکولی


کتاب
مبانی زیست‌شناسی تکوینی
مؤلفین
جواد بهار آرا ، زهرا زاهدی‌فر
ناشر
دانشگاه آزاد اسلامی
مبانی
زیست‌شناسی تکوینی


کتاب
مبانی زیست شناسی تکوینی
مؤلفین
مینا رمضانی
زینب پیراور
ناشر
دانشگاه آزاد اسلامی
مبانی
زیست‌شناسی تکوینی


کتاب
تکامل در موجودات زنده
مؤلفین
دکتر مینا رضانی
دکتر زینب پیراور
ناشر
تدبیر شناس
تکامل
در موجودات زنده


کتاب
تمایز سلول‌های جانوری
مبانی، مکانیسم‌ها و کاربردها
مؤلفین
محدثه محمدی ساردو،
الهه امینی،رئوفه کوچکی،
فریما رحیمی منصور
ناشر
دانشگاه خوارزمی
تمایز سلول‌های جانوری
مبانی، مکانیسم‌ها و کاربردها


کتاب
پیدایش و تکامل سلول
مؤلفین
علیرضا ایرانبخش،
سعید حسامی تکلو
صبا مهربانی فر
ناشر
دانشگاه آزاد اسلامی
پیدایش وتکامل سلول
سلولی تکوینی ایران


کتاب
نقش آنزیم های تخریب کننده تومور
در درمان سرطان
مؤلف
روناک نامداری
ناشر
الماس قرمز
مولف : روناک نامداری
نقش آنزیم های تخریب کننده تومور
در درمان سرطان
سلولی تکوینی ایران


کتاب
فیزیولوژی جانوری
مؤلفین
دکتر بهاره پاکپور
دکتر مجید نوائیان،
تحت نظارت دکتر سید علی حائری روحانی
ناشر
انجمن زیست شناسی ایران
فیزیولوژی جانوری
سلولی تکوینی ایران


کتاب
مبانی ژنتیک انسانی
مترجمین
دکتر جواد بهارآرا
مهرداد رستم پور
ناشر
دانشگاه آزاد اسلامی
مبانی
ژنتیک انسانی
سلولی تکوینی ایران


کتاب
بیوشیمی کروماتین
مؤلفین
دکتر شهریار سعیدیان،
دکتر بهزاد لامع راد،
دکتر عباس گلبداق
ناشر
دانشگاه پیام نور
بیوشیمی کروماتین
سلولی تکوینی ایران
انجمن زیست شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
کاربرد بیولوژیک ترکیبات طبیعی ، جلد اول
،سندرم تخمدان پلی کیستیک
مؤلف
دکتر محمد نبیونی
لطیفه کریم زاده باردیی
اکرم تایانلوی بیک
حبیبه غفورنیان
ناشر
نشر مهر
کاربرد بیولوژیک ترکیبات طبیعی
سندرم تخمدان پلی کیستیک
سلولی تکوینی ایران
انجمن زیست شناسی ایران
Iranian Biology Society
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کتاب
ابزارها و روش‌ها در زیست شناسی
مؤلفین
دکتر محمد نبیونی
زهره قمبری
لطیفه کریم زاده
ناشر
نشر مهر
ابزارها و روش ها در
زیست شناسی سلولی
سلولی تکوینی ایران
انجمن زیست شناسی ایران
Iranian Biology Society
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کتاب
مقدمه ای بر بیوتکنولوژی
کاربردهای علمی_فناوری پزشکی
مترجمین
فاطمه سلیمیان
دکتر محمد نبیونی
ناشر
رهام اندیشه
مقدمه ای بر بیوتکنولوژی
کاربردهای علمی – فناوری پزشکی
سلولی تکوینی ایران
انجمن زیست شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
زیست شناسی تکوینی بوم شناختی
مترجمین
علیرضا صاحبی
دکتر لطیفه کریم زاده باردیی
دکتر محمد نبیونی
ناشر
جهاد دانشگاهی
زیست شناسی تکوینی بوم شناختی
سلولی تکوینی ایران


کتاب
جنین شناسی انسان و زیست شناسی تکوینی
مترجمین
دکتر مهناز آذرنیا، محدثه محمدی ساردو، الهه امینی، سیده غدیره میر ابوالقاسمی، مجید رجبی و ساره رجبی
ناشر
دانشگاه خوارزمی
جنین‌شناسی انسان
و
زیست‌شناسی تکوینی
سلولی تکوینی ایران


کتاب
زیست شناسی با رویکرد مولکولی
مترجمین
علی آل محمد، منیژه رحمانی
،علیرضا ساری، الهه علوی،
شهریار غریب زاده،
محمد کرام الدینی، وحید نیکنام
ناشر
انتشارات فاطمی
زیست‌شناسی
با رویکرد مولکولی
سلولی تکوینی ایران


کتاب
زیست شناسی سلولی و مولکولی
مؤلفین
دکتر احمد مجد،
دکتر سید محمد علی شریعت زاده
ناشر
انتشارات آییژ
زیست شناسی
سلولی و مولکولی
سلولی تکوینی ایران


کتاب
سلول،جلد اول
مترجمین
دکتر احمد مجد، دکتر رضا پیله چینان،
دکتر رضا محمدی، خدیجه عنصری،
دکتر فیروزه چلبیان، دکتر کامبیز اکبری توغابی
ناشر
آییژ
سلول
جلد اول


کتاب
سلول،جلد دوم
مترجمین
دکتر احمد مجد، دکتر رضا پیله چینان،
دکتر رضا محمدی، خدیجه عنصری،
دکتر فیروزه چلبیان، دکتر کامبیز اکبری توغابی
ناشر
آییژ
سلول
جلد دوم


کتاب
جنین شناسی
مؤلف
دکتر کاظم پریور
ناشر
مبتکران
جنین شناسی
دکتر کاظم پریور


کتاب
مبانی زیست شناسی تکوینی
مترجمین
دکتر هانیه جلالی، دکتر محمد نبیونی
ناشر
انجمن فرهنگی ناشران دانشگاهی
مبانی
زیست شناسی
تکوینی


کتاب
جنین شناسی نظری
مؤلف
دکتر کاظم پریور
ناشر
دانشگاه پیام نور
جنین شناسی نظری
سلولی تکوینی ایران
انجمن زیست شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
کشت سلول ،بافت،اندام و جنین
،تئوری و روش های آزمایشگاهی
مؤلفین
کاظم پریور ،مونا فرهادی
ناشر
دانشگاه آزاد اسلامی
کشت سلول ، بافت ، اندام و جنین
سلولی تکوینی ایران
انجمن زیست شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
جنین شناسی بی مهرگان
مترجمین
دکتر کاظم پریور،
دکتر مجید رجبی،
دکتر کاظم تهمتنی
ناشر
مبتکران
جنین شناسی بی مهرگان
سلولی تکوینی ایران
انجمن زیست شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
جنین شناسی عملی
مؤلفین
کاظم پریور ،
هما محسنی کوچصفهانی
ناشر
پیام نور
جنین شناسی عملی
سلولی تکوینی ایران
انجمن زیست شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
مبانی ژنتیک
مترجمین
دکتر کاظم پریور
رضا پیله چیان لنگرودی
ناشر
شرکت سهامی انتشار
مبانی ژنتیک
سلولی تکوینی ایران
انجمن زیست شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
تکامل زیستی (تغییر و تحول موجودات زنده)
مؤلفین
دکتر کاظم پریور ،دکتر محمد نبیونی
ناشر
مبتکران
تکامل زیستی
سلولی تکوینی ایران
انجمن زیست شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
زیست شناسی سلولی و مولکولی
مؤلفین
دکتر کاظم پریور، احمد مظفری جوین
ناشر
مبتکران
زیست شناسی
سلولی و مولکولی
سلولی تکوینی ایران
انجمن زیست شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
مبانی تکوینی سلول های جنسی در مهره داران
مؤلفین
دکتر هما محسنی کوچصفهانی
دکتر پروانه هواسی
ناشر
دانشگاه خوارزمی
مبانی تکوینی
سلول‌های جنسی در مهره داران
سلولی تکوینی ایران
انجمن زیست شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
ژنتیک پزشکی تامسون
مترجمین
دکتر زیور صالحی ،دکتر فرهاد مشایخی ،ندا منصوری،سمیه کریمی،حوریه رسولی،مهسان بنی جمالی،محمد حسین احمدیان ،سعید کاظمی رودسری
ناشر
نشر ارجمند
ارجمند
سلولی تکوینی ایران
زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society
نوسعاد، مک‌اینس، ویلارد
ژنتیک پزشکی
تامپسون


کتاب
زیست شناسی سلولی و مولکولی لودیش ، جلد اول
مترجمین
دکتر نیما یزدان بخش، دکتر فرهاد مشایخی
دکتر زیور صالحی ،دکتر عبدالحسین ستوده ،نیا ،دکتر پروا نمیرانیان ،دکتر پارسا قوام، زهرا محمدی ،دکتر محمد حسین قربانی
ناشر
نشر ارجمند
ارجمند
سلولی تکوینی ایران
زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society
جلد ۱
زیست شناسی سلولی و مولکولی
لودیش
۲۰۱۶
ویرایش هشتم
لودیش، برک، کیسر، کریگر
بریچر، پلوخ، امون، مارتین


کتاب
زیست شناسی سلولی و مولکولی لودیش ، جلد اول
مترجمین
دکتر نیما یزدان بخش، دکتر فرهاد مشایخی
دکتر زیور صالحی ،دکتر عبدالحسین ستوده ،نیا ،دکتر پروا نمیرانیان ،دکتر پارسا قوام، زهرا محمدی ،دکتر محمد حسین قربانی
ناشر
نشر ارجمند
ارجمند
سلولی تکوینی ایران
زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society
جلد ۱
زیست شناسی سلولی و مولکولی
لودیش
۲۰۱۶
ویرایش هشتم
لودیش، برک، کیسر، کریگر
بریچر، پلوخ، امون، مارتین


کتاب
زیست شناسی سلولی و مولکولی لودیش ، جلد دوم
مترجمین
دکتر فرهاد مشایخی، دکتر زیور صالحی، دکتر پارسا قوام، دکتر مهشید نیک پور، دکتر نادیا فغانی ،دکتر محمد حسین قربانی، دکتر محمد ظهوری
ناشر
نشر ارجمند
ارجمند
Iranian Biology Society
Iranian Cell and Tissue Culture Society
جلد ۲
زیست شناسی سلولی و مولکولی
لودیش
۲۰۱۶
ویرایش هشتم
لودیش، برک، کیسر، کریگر
بریچر، پلوخ، امون، مارتین


کتاب
جنین شناسی
مؤلف
دکتر فرهاد مشایخی
ناشر
دانشگاه گیلان
جنین شناسی


کتاب
زیست‌شناسی تکوینی کاربردی
گرداورندگان
دکتر فرهاد مشایخی ،
ارغوان جفره ای
ناشر
دانشگاه گیلان
زیست‌شناسی تکوینی
کاربردی


کتاب
ساختار و ریخت‌شناسی گیاهی
مؤلفین
دکتر صدیقه کلیج
زینب حسین‌زاده
ناشر
دانشگاه مازندران
ساختار و ریخت‌شناسی گیاهی


کتاب
مبانی زیست‌شناسی سلولی و تکوینی
گیاهی _ با رویکرد مولکولی
تصنیف
دکتر علیرضا ایرانبخش
ناشر
جهاد دانشگاهی
واحد استان البرز
مبانی زیست شناسی سلولی
و تکوینی گیاهی- با رویکرد
مولکولی


کتاب
رویان شناسی گیاهان گلدار
واژگان و مفاهیم
جلد۱: اندام‌های زایشی گل
مترجمین
فرخنده رضانژاد
عبدالکریم چهرگانی
ناشر
دانشگاه
شهید باهنر کرمان
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society
رویان شناسی گیاهان گلدار
واژگان و مفاهیم
اندام‌های زایشی گل
تی. پی. باتی گینا
ترجمه فرخنده رضانژاد و عبدالکریم چهرگانی


کتاب
رویان شناسی گیاهان گلدار
واژگان و مفاهیم
جلد۲: دانه (قسمت اول)
مترجمین
فرخنده رضانژاد
عبدالکریم چهرگانی
ناشر
دانشگاه
شهید باهنر کرمان
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society
رویان شناسی گیاهان گلدار
واژگان و مفاهیم
جلد۲: دانه (قسمت اول)
تی. پی. باتی گینا
ترجمه فرخنده رضانژاد و عبدالکریم چهرگانی


کتاب
رویان‌شناسی گیاهان گلدار
واژگان و مفاهیم
جلد ۲: دانه (قسمت دوم)
مترجمین
فرخنده رضانژاد
عبدالکریم چهرگانی
ناشر
دانشگاه
شهید باهنر کرمان
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society
رویان‌شناسی گیاهان گلدار
واژگان و مفاهیم
جلد۲: دانه (قسمت دوم)
تی. پی. باتی گینا
ترجمه فرخنده رضانژاد و عبدالکریم چهرگانی


کتاب
اطلس تشریح و مورفلژی گیاهی
سلول و بافت
(جلد اول)
مؤلفین
دکتر علیرضا ایرانبخش
دکتر احمد مجد
دکتر مصطفی عبادی
ناشر
دانشگاه آزاد اسلامی
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society
اطلس تشریح و مورفولژی گیاهی
سلول و بافت
تالیف:
دکتر علیرضا ایرانبخش
دکتر احمد مجد
دکتر مصطفی عبادی


کتاب
اطلس تشریح و مورفلژی گیاهی
اندام‌های رویشی
(جلد دوم)
مؤلفین
دکتر علیرضا ایرانبخش
دکتر مصطفی عبادی
دکتر زهرا اوراقی اردبیلی
ناشر
دانشگاه آزاد اسلامی
سلولی تکوینی ایران
جلد دوم
اطلس تشریح و مورفولژی گیاهی
اندام‌های رویشی


کتاب
اطلس تشریح و مورفولژی گیاهی
اندام های زایشی
(جلد سوم)
مؤلفین
دکتر علیرضا ایرانبخش
دکتر مصطفی عبادی
دکتر زهرا اوراقی اردبیلی
ناشر
دانشگاه آزاد اسلامی
سلولی تکوینی ایران
جلد سوم
اطلس تشریح و مورفولژی گیاهی
اندام‌های زایشی


کتاب
راهنمای آزمایشگاهی گیاه‌شناسی
(تکوین، تشریح و ریخت شناسی گیاهی)
مترجمین
دکتر فرخنده رضانژاد
دکتر خسرو منوچهری کلانتری
ناشر
دانشگاه
شهید باهنر کرمان
سلولی تکوینی ایران
راهنمای آزمایشگاهی گیاه‌شناسی
(تکوین، تشریح و ریخت‌شناسی گیاهی)


کتاب
اطلس ساختار سلول گیاهی
مترجمین
علیرضا ایرانبخش
الهه دوخه
ناشر
دانشگاه آزاد اسلامی
سلولی تکوینی ایران
اطلس
ساختار سلول گیاهی
ترجمه:
علیرضا ایرانبخش
الهه دوخه


کتاب
ژنوم، ژنتیک و ژن‌های گیاهی
مترجمین
پروفسور علیرضا ایرانبخش
فرزانه دریغ
هیلدا امیری پور
ناشر
کانون نشر علوم
و انجمن کشت سلول و بافت ایران
ژنوم، ژنتیک وژن‌های گیاهی
سلولی تکوینی ایران


کتاب
نهادهای تن‌کارشناسی گیاهی
مجلد اول
مؤلف
دکتر مژگان فرزامی سپهر
ناشر
دانشگاه آزاد اسلامی
نهادهای تن کارشناسی گیاهی
سلولی تکوینی ایران


کتاب
مبانی فیزیولوژی گیاهی عملی
مؤلف
دکتر مژگان فرزامی سپهر
ناشر
جهاد دانشگاهی
مبانی فیزیولوژی گیاهی عملی
سلولی تکوینی ایران


کتاب
اسکلت سلولی
(میکروفیلامنت‌ها، نانو فیلامنت‌ها و
میکروتوبول‌ها)
مؤلفین
علیرضا ایرانبخش
مصطفی عبادی
محمد مهدی حمدی
ناشر
دانشگاه آزاد اسلامی
اسکلت سلولی
(میکروفیلامنت‌ها، نانوفیلامنت‌ها، و میکروتوبول‌ها)
سلولی تکوینی ایران


کتاب
کشت بافت و سلول گیاهی
مؤلفین
علیرضا ایرانبخش
مصطفی عبادی
ناشر
دانشگاه آزاد اسلامی
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
گیاه شناسی
مقدمه ای بر زیست شناسی گیاهی
مترجمین
دکتر مه لقا قربانلی
دکتر مژگان فرزامی سپهر
ناشر
مبتکران
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
اصول، مفاهیم و روش‌های آزمایشگاهی
در زیست‌شناسی گیاهی
مؤلفین
دکتر علیرضا ایرانبخش
دکتر زهرا اوراقی اردبیلی
ناشر
دانشگاه آزاد اسلامی
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
ساز و کارهای مولکولی در سازگاری
گیاهان
مترجمین
دکتر علیرضا ایرانبخش
دکتر سعید حسامی تکلو
ناشر
دانشگاه آزاد اسلامی
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society
سازوکارهای مولکولی
در سازگاری گیاهان
روسا ای. لیتین


کتاب
مقدمه‌ای بر
بیوتکنولوژی مولکولی
مبانی مولکولی، روشها و کاربردها در بیوتکنولوژی مدرن
ترجمه
دکتر محمد نبیونی
احمدرضا کاتوزیان
الهه امینی
حسن میرمنصف
ناشر
انتشارات دانشگاه آزاد
مقدمه ای بر
بیوتکنولوژی مولکولی
مبانی مولکولی، روشها و کاربردها در بیوتکنولوژی مدرن
مایکل ویتکر
سلولی تکوینی ایران


کتاب
بافت‌شناسی مقایسه‌ای اندام‌ها
(اورگانولوژی)
نویسندگان
دکتر سید محمد حسین نوری موگهی
دکتر مهناز آذرنیا دکتر باقر مینایی زنگی
ناشر
دانشگاه آزاد اسلامی
بافت‌شناسی مقایسه‌ای اندامها
(اورگانولوژی)
سلولی تکوینی ایران


کتاب
سلول و بافت شناسی مقایسه‌ای
(بافت‌های اصلی)
نویسندگان
دکتر سید محمد حسین نوری موگهی
دکتر مهناز آذرنیا
دکتر باقر مینایی زنگی
ناشر
دانشگاه آزاد اسلامی
سلول و بافت‌شناسی مقایسه‌ای
(بافت‌های اصلی)
سلولی تکوینی ایران


کتاب
اطلس رنگی
بافت‌شناسی اختصاصی
نویسندگان
دکتر مهناز آذرنیا
سید غدیره میر ابوالقاسمی
ناشر
دانشگاه خوارزمی
اطلس رنگی
بافت شناسی اختصاصی
سلولی تکوینی ایران


کتاب
مقدمه‌ای بر تولید مثل جانوری
نویسندگان
دکتر مهناز آذرنیا
یاسر تهمتنی
مجید رجبی
ناشر
جهاد دانشگاهی
سلولی تکوینی ایران
مقدمه ای بر
تولید مثل جانوری


کتاب
زیست شناسی غشا سلول
مولفان
دکتر سید محمد علی شریعتزاده دکتر
علی اکبر ملکی راد
دکتر علی اصغر پیله وریان
ناشر
انتشارات آییژ
سلولی تکوینی ایران
زیست شناسی
غشا سلول


کتاب
روش‌های آزمایشگاهی پایه در
علوم زیستی
مترجمان
علی فرازمند
محسن بدل زاده
ناشر
مرکز نشر دانشگاهی
سلولی تکوینی ایران
روش‌های آزمایشگاهی پایه
در علوم زیستی


کتاب
اطلس رنگی
بافت‌شناسی عمومی
نویسندگان
دکتر مهناز آذرنیا
سید غدیره میر ابوالقاسمی
زیرنظر دکتر عباس شکور
ناشر
جهاد دانشگاهی
سلولی تکوینی ایران
اطلس رنگی
بافت‌شناسی
عمومی


کتاب
آپوپتوزیس
مرگ سلولی برنامه ریزی شده
روش های سنجش انواع مرگ سلولی
مولفان
دکتر سید محمد علی شریعتزاده
دکتر ملک سلیمانی
دکتر حمیدرضا مومنی
ناشر
انتشارات دانشگاه اراک
سلولی تکوینی ایران
آپوپتوزیس
مرگ سلولی برنامه ریزی شده


کتاب
بافت شناسی
مولفان
دکتر عبدالرحمن دزفولیان
دکتر سید محمد علی شریعتزاده
ناشر
آییژ
سلولی تکوینی ایران
بافت شناسی


کتاب
اگزوزوم تراپی
(کاربرد وزیکول‌های خارج سلولی، فیزیولوژیک و پاتولوژیک)
مولفان
دکتر سید محمد علی شریعتزاده دکتر
ملک سلیمانی مهرنجانی
پارمیس نطقی
ناشر
انتشارات دانشگاه اراک
سلولی تکوینی ایران
اگزوزوم تراپی


کتاب
راهنمای عملی زیست‌شناسی سلولی و مولکولی
مولفان
دکتر سید محمد علی شریعتزاده دکتر احمد مجد
ناشر
انتشارات دانشگاه اراک
سلولی تکوینی ایران
راهنمای عملی
زیست شناسی سلولی و مولکولی


کتاب
مکانیسم های اپی‌ژنتیک و نقش آن در سلامت و بیماری
مؤلفان
دکتر سید محمد علی شریعتزاده دکتر ملک سلیمانی مهرنجانی سیده معصومه محمدی کفاش
ناشر
انتشارات دانشگاه اراک
مکانیسم‌های اپی‌ژنتیک
و نقش آن در سلامت و بیماری
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
روش‌های هیستوشیمی و ایمنو هیستوشیمی
مؤلفان
دکتر سید محمد علی شریعتزاده، دکتر ملک سلیمانی مهرنجانی، دکتر احمد همتا، دکتر محمد حسین آبنوسی
ناشر
انتشارات دانشگاه اراک
مهندسی بافت و پزشکی بازساختی
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
مهندسی بافت و پزشکی بازساختی
مؤلفان
دکتر سید محمد علی شریعتزاده دکتر ملک سلیمانی مهرنجانی زهرا عزیزی
ناشر
انتشارات دانشگاه اراک
مهندسی بافت و پزشکی بازساختی
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
زیست‌شناسی اسید هیالورونیک کاربرد آن در علوم زیستی، پزشکی و مهندسی بافت
مؤلفان
دکتر سید محمد علی شریعتزاده دکتر ناصر مهدوی شهری کاملیا کهن نژاد
ناشر
انتشارات دانشگاه اراک
زیست شناسی
اسید هیالورونیک
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society


کتاب
رادیکال‌های آزاد و آنتی‌اکسیدان‌ها
اثرهای آن‌ها در سلامت و بیماری
مولفان
دکتر سید محمد علی شریعت‌زاده علی
اکبر ملکی‌راد
دکتر علی فانی
دکتر عبدالرحمن دزفولیان
ناشر
انتشارات آییژ
سلولی تکوینی ایران
رادیکال های آزاد و آنتی اکسیدان ها
اثرهای آنها در سلامت و بیماری


کتاب
فناوری چاپ سه بعدی در مهندسی
بافت استخوان از آزمایشگاه تا بالین
مولفان
دکتر اعظم یار احمدی
دکتر محمد ربیعی
دکتر لطیفه کریمزاده
زیر نظر دکتر مهناز آذرنیا
ناشر
جهاد دانشگاهی
سلولی تکوینی ایران
فناوری چاپ سه بعدی در
مهندسی بافت استخوان


کتاب
مبانی زیست شناسی ترمیم
مولفان
دکتر سید محمدعلی شریعت زاده
دکتر ناصر مهدوی شهری
امیر توسلی
فهیمه شهابی پور
ناشر
انتشارات آییژ
سلولی تکوینی ایران
مبانی زیست شناسی
ترمیم


کتاب
مهندسی بافت مبانی و رویکردهای
نوین
مولفان
دکتر بهناز بخشنده، دکتر زهره جهان
افروز، مهندس زهرا دهقانی، دکتر
لطیفه کریمزاده باردیی، دکتر سید بهنام
عبدالهی برانی
ناشر
انتشارات دانشگاه تهران
سلولی تکوینی ایران
مهندسی بافت
مبانی و رویکردهای نوین


کتاب
اطلس جنین شناسی و جنین شناسی تجربی
مؤلفان
دکتر کاظم پریور
هما محسنی کوچصفهانی
ناشر
جهاد دانشگاهی واحد استان البرز
سلولی تکوینی ایران
اطلس جنین شناسی و جنین شناسی تجربی


کتاب
مکانیسم مولکولی فتوسنتز
مؤلفین
دکتر محمدرضا امیرجانی
دکتر علیرضا ایرانبخش
دکتر محمد حسین آبنوسی
ناشر
دانشگاه اراک
سلولی تکوینی ایران
مکانیسم مولکولی فتوسنتز


کتاب
مبانی آزمایشگاه گیاهی
تدوین
فاطمه خانعلی پور
سهیلا کمالی
شادی ولوی
ناشر
انتشارات ابجد
سلولی تکوینی ایران
مبانی آزمایشگاه گیاهی


کتاب
مقایسه ساختار تشریحی – تکوینی
ریشه، ساقه و برگ گیاه
قبل و بعد از همزیستی با باکتری
تألیف
سهیلا کمالی
ناشر
انتشارات ابجد
سلولی تکوینی ایران
مقایسه ساختار تشریحی- تکوینی
ریشه، ساقه و برگ گیاه
Medicago sative L.
قبل و بعد از همزیستی با باکتری
Rhizobium
تالیف سهیلا کمالی


کتاب
زیست‌شناسی تکوینی
(فرم، الگو، ریخت‌شناسی)
مؤلف
دکتر مریم شمس‌لاهیجانی
ناشر
دانشگاه شهید بهشتی
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society
زیست شناسی تکوینی
(فرم ، الگو ، ریخت شناسی)


کتاب
جنین‌شناسی
اندام‌زایی در جانوران
با نگرش به الگوها، مدل‌ها و مکانیسم‌ها
مؤلف
دکتر مریم شمس‌لاهیجانی
ناشر
دانشگاه شهید بهشتی
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society
جنین شناسی
اندام زایی در جانوران
با نگرش به الگوها، مدل ها و مکانیسم ها


کتاب
جنین‌شناسی
تولید مثل و جنین‌زایی در جانوران
بی‌مهره و مهره‌دار کوچک
مؤلف
دکتر مریم شمس‌لاهیجانی
ناشر
دانشگاه شهید بهشتی
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society
جنین شناسی
تولید مثل و جنین زایی در جانوران
بی مهره و مهره دار کوچک


کتاب
بافت‌شناسی جانوری
مؤلف
دکتر مریم شمس‌لاهیجانی
ناشر
دانشگاه پیام نور
سلولی تکوینی ایران
انجمن زیست‌شناسی ایران
Iranian Biology Society
Iranian Cell and Tissue Culture Society
بافت‌شناسی جانوری


کتاب
جداسازی ترکیبات شیمیایی
از منابع گیاهی
تألیف
دکترسهیلا کمالی
زهرا عزت‌پور قدیم
عسل فرخ اسلاملو
سروناز مقصودی
ناشر
انتشارات ابجد
سلولی تکوینی ایران
جداسازی ترکیبات شیمیایی
از منابع گیاهی


کتاب
ریخت‌زایی و اندام‌زایی در گیاهان
تألیف
فریده دخت سید مظفری
ناشر
دانشگاه پیام نور
سلولی تکوینی ایران
ریخت زایی و اندام زایی در گیاهان


کتاب
ارگانوژنز (اندام زایی) و
مورفوژنز (ریخت زایی) گیاهی
نویسنده
دکتر مرتضی عطری
ناشر
انتشارات جهاد دانشگاهی
سلولی تکوینی ایران
ارگانوژنز (اندام‌زایی)
مورفوژنز (ریخت‌زایی) گیاهی

Specialized Conference Workshops



The importance of improving knowledge and skills and the necessity of holding workshops

Introduction

The rapid scientific and technological advancements in the present era have made the continuous enhancement of individual and organizational knowledge and skills more necessary than ever. Relying solely on past knowledge and capabilities is no longer sufficient to address complex and multidimensional challenges, and both individuals and organizations are compelled to constantly adapt to changing conditions. In this context, effective and purposeful training plays a key role in empowering human capital. One of the most effective approaches in this regard is conducting training workshops, which, with an interactive and practice-based approach, provide opportunities to improve knowledge and skills.

Main Text

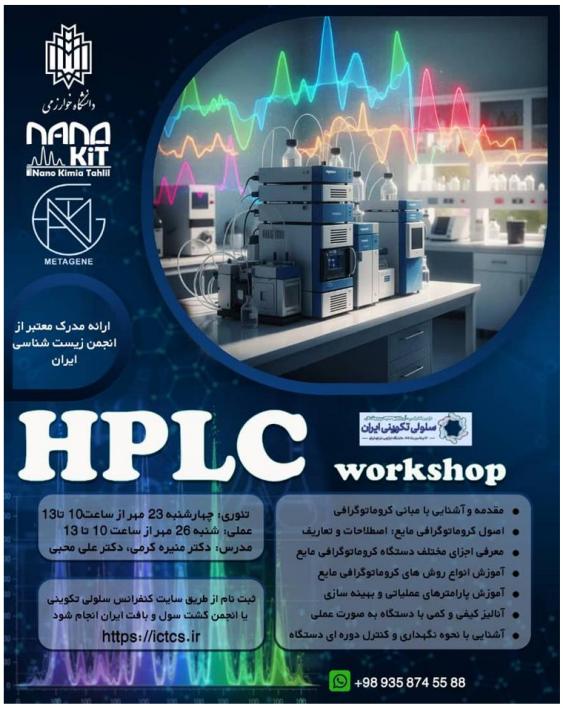
In the contemporary world, where scientific and technological developments are occurring at an accelerating pace, the enhancement of individual and organizational knowledge and skills has become an undeniable necessity. Expanding knowledge and competencies not only improves individual performance but also contributes to the sustainable growth and development of organizations and, ultimately, to the advancement of society.

Enhancing knowledge allows individuals to access up-to-date information and become familiar with new methods and approaches, thereby making them more capable of addressing challenges and leveraging opportunities. Furthermore, strengthening practical and specialized skills leads to greater proficiency in performing tasks and increases overall productivity.

Conducting training workshops, as one of the effective strategies in the learning process, plays a prominent role in developing knowledge and skills. These workshops provide an interactive and practical environment that facilitates active learning, experience sharing, and direct engagement with real-world issues. In such a setting, participants can bridge theoretical knowledge with practice and tangibly enhance their capabilities.

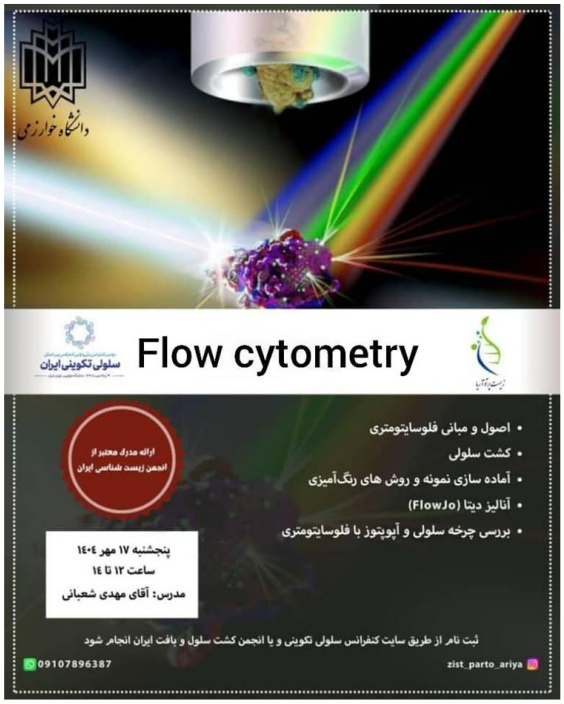
Beyond educational aspects, workshops also help strengthen motivation, boost self-confidence, and provide a foundation for professional and personal growth. Therefore, conducting continuous and purposeful training and skill-building workshops is a fundamental necessity for organizations and individuals to pave the way for progress, innovation, and success.

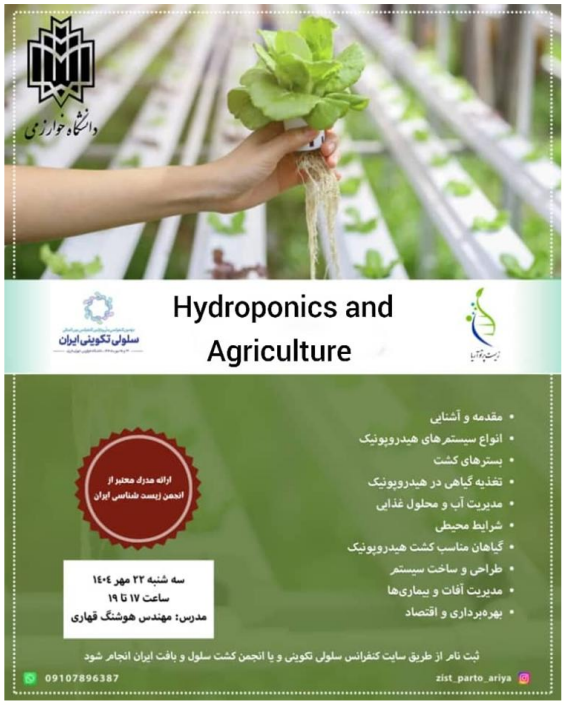
Row	The Title of the Seminar Workshop	Quick Registration	Type of Presentation	Date	Time	lecturer	organizer
1	Plant tissue culture	Click	In -Person	Oct 7	9AM-12.30 PM	Dr. Arezo Ghasempour/Dr. Shadi Volvi	Zist Parto Ara
2	Real Time PCR	Click	Online	Oct 7	14-16	Amirhossein Tohidi	Zist Parto Ara
3	Working with Image J Software	Click	Online	Oct 7	17-19	Dr. Frank Shiasi	Zist Parto Ara
4	Histotechniques	Click	Online	Oct 8	18-20	Firuzeh Keshavarziyan	Zist Parto Ara
5	Flow Cytometry	Click	Online	Oct 9	12-14	Mehdi Shabani	Zist Parto Ara
6	Achievements of Artificial Intelligence in the Study, Prevention and Treatment of Cancer	Click	Online	Oct 9	14-16	Dr. Morvarid Ebrahimi	Zist Parto Ara
7	Protein Modeling	Click	Online	Oct 11	14-16	Dr. Sepideh Sepehri	Zist Parto Ara
8	Mesenchymal Stem Cells: from Isolation to Clinical Applications	Click	Online	Oct 11	16-18	Masoumeh Kohandani	Zist Parto Ara
9	Principles of Good Laboratory Practices (GLP)	Click	Online	Oct 12	14-16	Dr. Morvarid Ebrahimi	Zist Parto Ara
10	Molecular Docking	Click	Online	Oct 13	14-16	Benjamin Mashhadhi	Zist Parto Ara
11	Sperm DNA Breakage Assessment Techniques	Click	Online	Oct 13	17-19	Dr. Alemeh Rafai	Zist Parto Ara
12	Essay Writing in the Age of Artificial Intelligence	Click	Online	Oct 14	10-12	Dr. Sohyal Kamali	Zist Parto Ara
13	Hydroponics and the Future of Modern Agriculture	Click	Online	Oct 14	17-19	Houshang Ghahari	Zist Parto Ara
14	Application of NGS in Infertility	Click	Online	Oct 15	12-14	Dr. Kiana Mohammadi	Zist Parto Ara
15	HPLC	Click	In -Person	Oct 15,18	10AM - 15PM	Dr. Monireh Karami/Dr. Ali Mohebbi	Nano Kimia Tahlil
16	PCR and Electrophoresis	Click	In -Person	Oct 15	10AM -16	Faiza Falhi	GenIran
17	Using Chat GPT in Biology Studies	Click	Online	Oct 15	14-16	Alireza Moghdisi	GenIran
18	Laboratory Rodent Surgery	Click	In -Person	Oct 15	15-20	Dr. Masoud Soltani	GenIran
19	Principles of IVF in animals	Click	Online	Oct 15	16-19	Atefeh Mohsennejad	GenIran
20	Eliza	Click	In -Person	Oct 18	10-16	Mehrdad Izadi Rad	GenIran
21	Design and Printing of Tissue Engineering Scaffolds	Click	In -Person	Oct 19	10-16	Hossein Sehbafar / Mohammad Gerami	GenIran

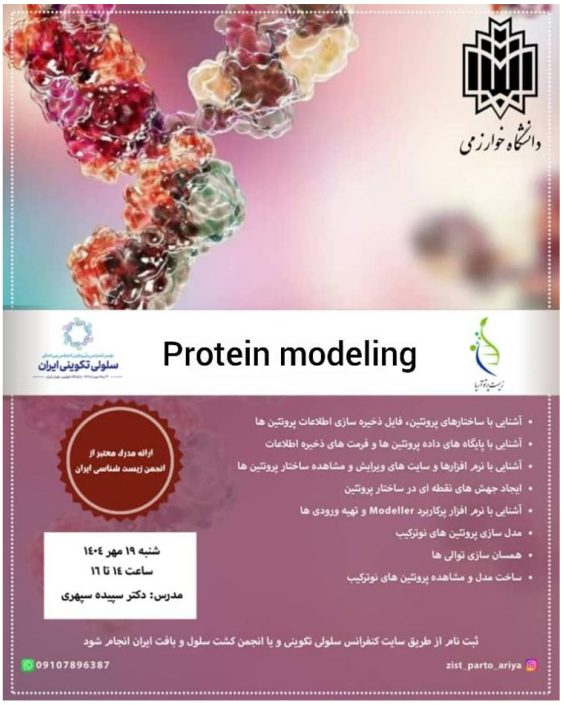

دانشگاه خوارزمی
NANO KiT
Nano Kimia Tahlil
METAGENE
ارائه مدرک معتبر از انجمن زیست شناسی ایران
HPLC
workshop
سلولی تکوینی ایران
تئوری: چهارشنبه 23 مهر از ساعت10 تا13
عملی: شنبه 26 مهر از ساعت 10 تا 13
مدرس: دکتر منیره گرمی، دکتر علی محبی
ثبت نام از طریق سایت کنفرانس سلولی تکوینی یا انجمن کشت سول و بافت ایران انجام شود
https://ictcs.ir
مقدمه و آشنایی با مبانی کروماتوگرافی
اصول کروماتوگرافی مایع: اصطلاحات و تعاریف
معرفی اجزای مختلف دستگاه کروماتوگرافی مایع
آموزش انواع روش های کروماتوگرافی مایع
آموزش پارامترهای عملیاتی و بهینه سازی
آنالیز کیفی و کمی با دستگاه به صورت عملی
آشنایی با نحوه نگهداری و کنترل دوره ای دستگاه
+98 935 874 55 88


دانشگاه خوارزمی
سلولی تکوینی ایران
Working with Image j Software
ارائه مدرک معتبر از انجمن زیست شناسی ایران
مقدمه : شامل معرفی نرم افزار نصب و دانلود و آشنایی با فضای کار نرم افزار
عملیات اولیه: تنظیم اندازه و وضوح تصویر. نحوه ی مقیاس گذاری، اندازه گیری طول و مساحت ، اندازه دانه ها ، نحوه خروجی گرفتن
عملیات پیشرفته تر: آشنایی با پلاگین ها ، کاربرد پلاگین تست خراش، شمارش سلول یا دانه ها.
سه شنبه ۱۵ مهر ۱۴۰۴
ساعت ۱۷ تا ۱۹
مدرس: دکتر فرانک شیاسی
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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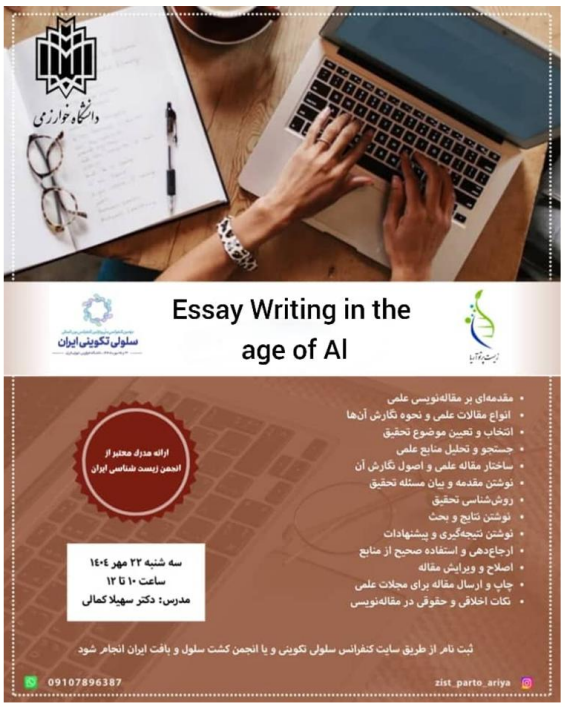

دانشگاه خوارزمی
Good Laboratory Practice
(GLP)
سلولی تکوینی ایران
ارائه مدرک معتبر از انجمن زیست شناسی ایران
مقدمه ای بر شیوه های مطلوب آزمایشگاهی (GLP)
چارچوب مقررات و راهنماهای GLP
نقش ها و مسئولیت ها در GLP
الزامات تجهیزات و تاسیسات
روش های اجرایی استاندارد (SOPs)
برنامه ریزی و اجرای مطالعه بر اساس GLP
تضمین کیفیت(QA) در GLP
مدیریت و صحت داده ها
گزارش دهی و بایگانی
پایش انطباق و بازرسی های GLP
چالش های رایج و بهترین رویه ها در GLP
روندهای آینده در GLP
یکشنبه ۲۰ مهر ۱۴۰۴
ساعت ۱۴ تا ۱۶
مدرس: دکتر مروارید ابراهیمی
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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دانشگاه خوارزمی
Flow cytometry
سلولی تکوینی ایران
ارائه مدرک معتبر از انجمن زیست شناسی ایران
اصول و مبانی فلوسایتومتری
کشت سلولی
آماده سازی نمونه و روش های رنگ‌آمیزی
آنالیز دیتا (FlowJo)
بررسی چرخه سلولی و آپوپتوز با فلوسایتومتری
پنجشنبه ۱۷ مهر ۱۴۰۴
ساعت ۱۲ تا ۱۴
مدرس: آقای مهدی شعبانی
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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دانشگاه خوارزمی
Hydroponics and Agriculture
سلولی تکوینی ایران
زیست و فناوری
مقدمه و آشنایی
انواع سیستم‌های هیدروپونیک
بسترهای کشت
تغذیه گیاهی در هیدروپونیک
مدیریت آب و محلول غذایی
شرایط محیطی
گیاهان مناسب کشت هیدروپونیک
طراحی و ساخت سیستم
مدیریت آفات و بیماری‌ها
بهره‌برداری و اقتصاد
ارائه مدرک معتبر از انجمن زیست شناسی ایران
سه شنبه ۲۳ مهر ۱۴۰۴
ساعت ۱۷ تا ۱۹
مدرس: مهندس هوشنگ قهاری
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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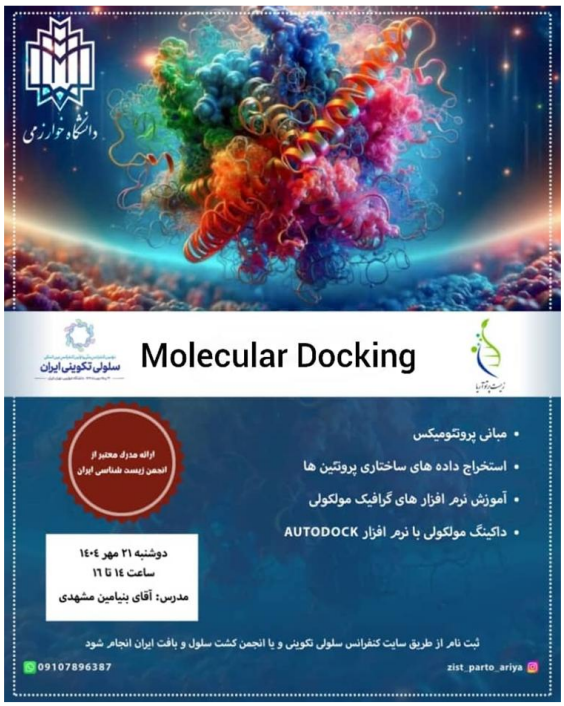

دانشگاه خوارزمی
Protein modeling
سلولی تکوینی ایران
زیست و فناوری
آشنایی با ساختارهای پروتئین، فایل ذخیره سازی اطلاعات پروتئین ها
آشنایی با پایگاه های داده پروتئین ها و فرمت های ذخیره اطلاعات
آشنایی با نرم افزارها و سایت های ویرایش و مشاهده ساختار پروتئین ها
ایجاد جهش های نقطه ای در ساختار پروتئین
آشنایی با نرم افزار پرکاربرد Modeller و نهیه ورودی ها
مدل سازی پروتئین های نوترکیب
همسان سازی توالی ها
ساخت مدل و مشاهده پروتئین های نوترکیب
ارائه مدرک معتبر از انجمن زیست شناسی ایران
شنبه ۱۹ مهر ۱۴۰۴
ساعت ۱۴ تا ۱۶
مدرس: دکتر سپیده سپهری
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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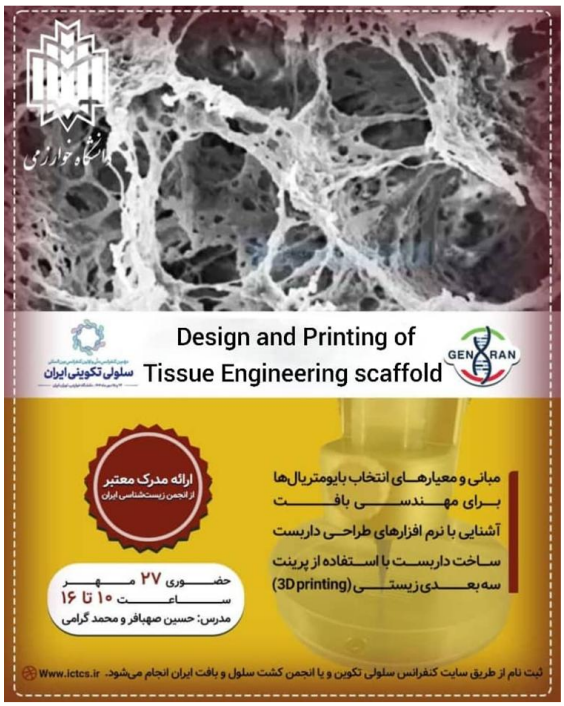

دانشگاه خوارزمی
Techniques for assessmenting sperm DNA ragmentation
سلولی تکوینی ایران
زیست و فناوری
مقدمه ای بر ناباروری مردان
آشنایی با ساختار کروماتین اسپرم و تاثیر آن بر ناباروری
اهمیت سلامت DNA اسپرم در باروری مردان
منشا آسیب های DNA اسپرم
تکنیک های ارزیابی شکست DNA اسپرم شامل:
TUNEL assay
Comet assay
رنگ آمیزی CMA3
تکنیک SCSA
تست SCD
رنگ آمیزی AOT
رنگ آمیزی TB و AB
ارائه مدرک معتبر از انجمن زیست شناسی ایران
دوشنبه ۲۱ مهر ۱۴۰۴
ساعت ۱۷ تا ۱۹
مدرس: دکتر عالمه رفایی
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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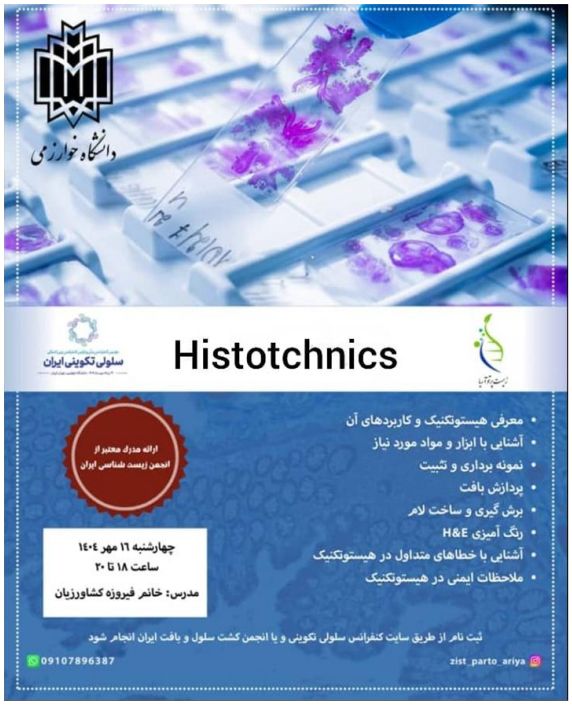

دانشگاه خوارزمی
Essay Writing in the age of AI
سلولی تکوینی ایران
زیست و فناوری
مقدمه‌ای بر مقاله‌نویسی علمی
انواع مقالات علمی و نحوه نگارش آن‌ها
انتخاب و تعیین موضوع تحقیق
جستجو و تحلیل منابع علمی
ساختار مقاله علمی و اصول نگارش آن
نوشتن مقدمه و بیان مسئله تحقیق
روش‌شناسی تحقیق
نوشتن نتایج و بحث
نوشتن نتیجه‌گیری و پیشنهادات
ارجاع‌دهی و استفاده صحیح از منابع
اصلاح و ویرایش مقاله
چاپ و ارسال مقاله برای مجلات علمی
نکات اخلاقی و حقوقی در مقاله‌نویسی
ارائه مدرک معتبر از انجمن زیست شناسی ایران
سه شنبه ۲۲ مهر ۱۴۰۴
ساعت ۱۰ تا ۱۲
مدرس: دکتر سهیلا کمالی
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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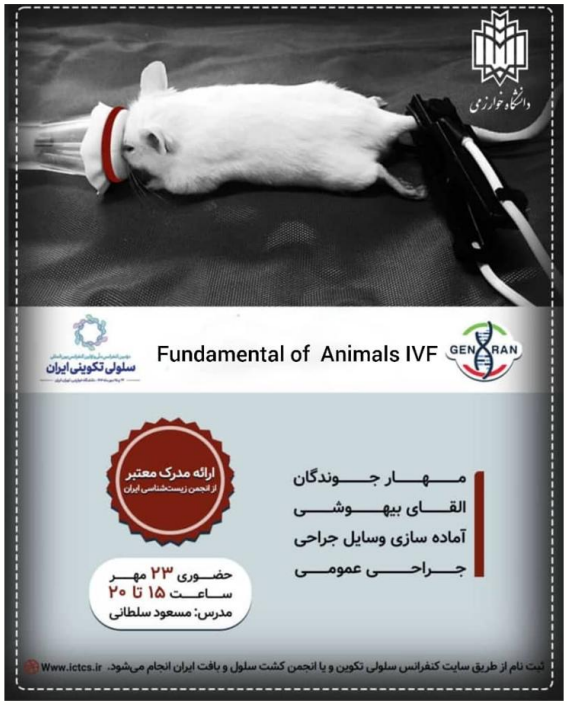

دانشگاه خوارزمی
Real Time PCR
سلولی تکوینی ایران
ارائه مدرک معتبر از انجمن زیست شناسی ایران
• اصول و کاربرد های Real time PCR
• تفاوت بین Real time PCR و PCR معمولی
• کاربرد های Real time PCR
• طراحی پرایمر برای Real time
• تفسیر دیتای Real time یا CT value
• ترابل شوتینگ های Real time
سه شنبه ۱۵ مهر ۱۴۰۴
ساعت ۱۴ تا ۱۶
مدرس: آقای امیرحسین توحیدی
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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دانشگاه خوارزمی
Plant tissue culture
سلولی تکوینی ایران
از تئوری تا تولید انبوه گیاهان تجاری
بخش تئوری :
• مقدمه ای بر کشت بافت گیاهی
• اصول زیستی و فیزیولوژیکی کشت بافت
• اصول استریل و جلوگیری از آلودگی
• محیط های کشت گیاهی
• انواع کشت بافت گیاهی
• اصول ریز نمونه گیری و تکثیر کلونال
بخش عملی :
• آشنایی با تجهیزات و لوازم آزمایشگاه
• آماده سازی محیط کشت و استریل کردن وسایل
• انتخاب و اماده سازی نمونه ها
• کشت اولیه و انتقال به محیط کشت
• نگهداری و مراقبت از کشت‌ها
• تکثیر و ریشه‌زایی
ارائه مدرک معتبر از انجمن زیست شناسی ایران
سه شنبه ۱۵ مهر ۱۴۰۴
ساعت ۹ تا ۱۲:۳۰
مدرسان: دکتر معصومه قاسمپور
دکتر شادی ولوی
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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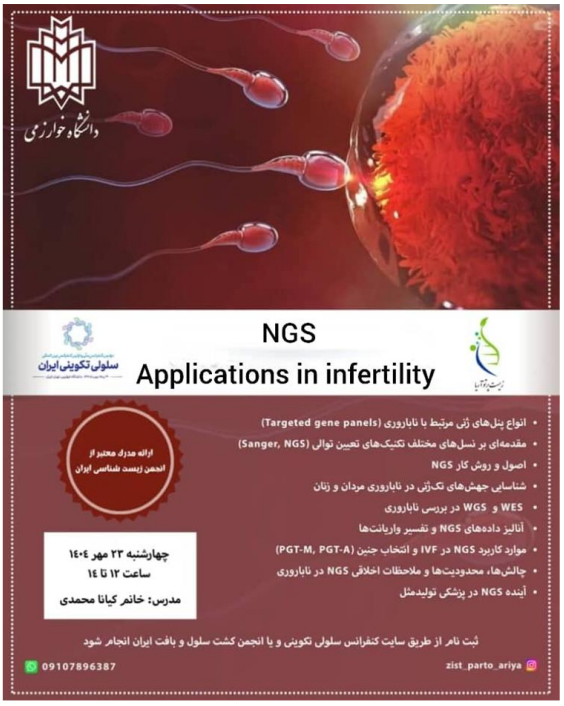

دانشگاه خوارزمی
Molecular Docking
سلولی تکوینی ایران
• مبانی پروتئومیکس
• استخراج داده های ساختاری پروتئین ها
• آموزش نرم افزار های گرافیک مولکولی
• داکینگ مولکولی با نرم افزار AUTODOCK
ارائه مدرک معتبر از انجمن زیست شناسی ایران
دوشنبه ۲۱ مهر ۱۴۰۴
ساعت ۱۴ تا ۱۶
مدرس: آقای بنیامین مشهدی
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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دانشگاه خوارزمی
Design and Printing of
Tissue Engineering scaffold
سلولی تکوینی ایران
GEN IRAN
ارائه مدرک معتبر
از انجمن زیست‌شناسی ایران
مبانی و معیارهای انتخاب بایومتریال‌ها
برای مهندسی بافت
آشنایی با نرم افزارهای طراحی داربست
ساخت داربست با استفاده از پرینت
سه بعدی زیستی (3D printing)
حضوری ۲۷ مهر
ساعت ۱۰ تا ۱۶
مدرس: حسین صهبافر و محمد گرامی
ثبت نام از طریق سایت کنفرانس سلولی تکوین و یا انجمن کشت سلول و بافت ایران انجام می‌شود. Www.ictcs.ir

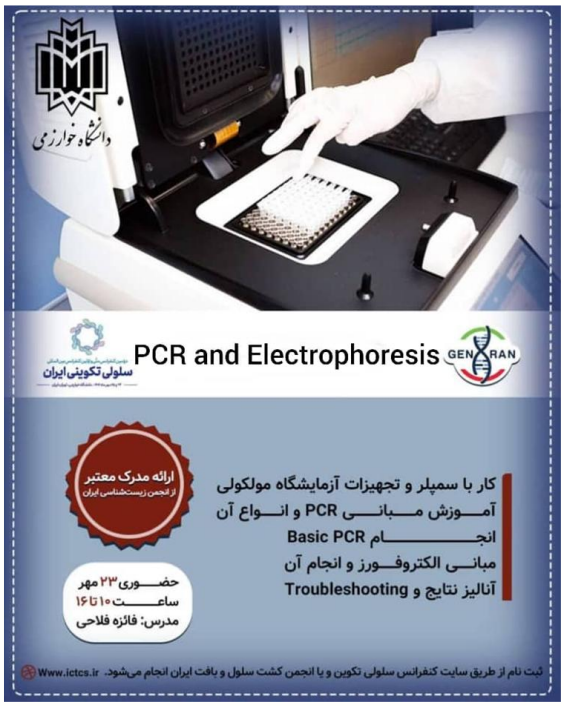

دانشگاه خوارزمی
Histotchnics
سلولی تکوینی ایران
ارائه مدرک معتبر از انجمن زیست شناسی ایران
• معرفی هیستوتکنیک و کاربردهای آن
• آشنایی با ابزار و مواد مورد نیاز
• نمونه برداری و تثبیت
• پردازش بافت
• برش گیری و ساخت لام
• رنگ آمیزی H&E
• آشنایی با خطاهای متداول در هیستوتکنیک
• ملاحظات ایمنی در هیستوتکنیک
چهارشنبه ۱۶ مهر ۱۴۰۴
ساعت ۱۸ تا ۲۰
مدرس: خانم فیروزه کشاورزیان
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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دانشگاه خوارزمی
Fundamental of Animals IVF
GEN RAN
سلولی تکوینی ایران
ارائه مدرک معتبر
از انجمن زیست‌شناسی ایران
مهار جوندگان
القای بیهوشی
آماده سازی وسایل جراحی
جراحی عمومی
حضوری ۲۳ مهر
ساعت ۱۵ تا ۲۰
مدرس: مسعود سلطانی
ثبت نام از طریق سایت کنفرانس سلولی تکوین و یا انجمن کشت سلول و بافت ایران انجام می‌شود. Www.ictcs.ir


دانشگاه خوارزمی
Histotechniques
سلولی تکوینی ایران
ارائه مدرک معتبر از انجمن زیست شناسی ایران
• معرفی هیستوتکنیک و کاربردهای آن
• آشنایی با ابزار و مواد مورد نیاز
• نمونه برداری و تثبیت
• پردازش بافت
• برش گیری و ساخت لام
• رنگ آمیزی H&E
• آشنایی با خطاهای متداول در هیستوتکنیک
• ملاحظات ایمنی در هیستوتکنیک
چهارشنبه ۱۶ مهر ۱۴۰۴
ساعت ۱۸ تا ۲۰
مدرس: خانم فیروزه کشاورزیان
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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دانشگاه خوارزمی
NGS
Applications in infertility
سلولی تکوینی ایران
ارائه مدرک معتبر از انجمن زیست شناسی ایران
• انواع پنل‌های ژنی مرتبط با ناباروری (Targeted gene panels)
• مقدمه‌ای بر نسل‌های مختلف تکنیک‌های تعیین توالی (Sanger, NGS)
• اصول و روش کار NGS
• شناسایی جهش‌های تک‌ژنی در ناباروری مردان و زنان
• WES و WGS در بررسی ناباروری
• آنالیز داده‌های NGS و تفسیر واریانت‌ها
• موارد کاربرد NGS در IVF و انتخاب جنین (PGT-M, PGT-A)
• چالش‌ها، محدودیت‌ها و ملاحظات اخلاقی NGS در ناباروری
• آینده NGS در پزشکی تولیدمثل
چهارشنبه ۲۳ مهر ۱۴۰۴
ساعت ۱۲ تا ۱۴
مدرس: خانم کیانا محمدی
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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دانشگاه خوارزمی
AI Advance in Cancer research rodent surgery
سلولی تکوینی ایران
ارائه مدرک معتبر از انجمن زیست شناسی ایران
• مقدمه ای بر هوش مصنوعی در سرطان شناسی
• هوش مصنوعی در پژوهش و مطالعه سرطان
• هوش مصنوعی در پیشگیری از سرطان
• هوش مصنوعی در تشخیص سرطان
• هوش مصنوعی در درمان سرطان
• هوش مصنوعی در کشف و توسعه داروهای ضد سرطان
• هوش مصنوعی در پایش و پیگیری بیماران سرطانی
• چالش ها و محدودیت های هوش مصنوعی در سرطان شناسی
• مسیرهای آینده و نوآوری ها
• مطالعات موردی و کاربردهای واقعی
پنجشنبه ۱۷ مهر ۱۴۰۴
ساعت ۱۴ تا ۱۶
مدرس: دکتر مروارید ابراهیمی
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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دانشگاه خوارزمی
PCR and Electrophoresis
سلولی تکوینی ایران
GENARAN
ارائه مدرک معتبر از انجمن زیست شناسی ایران
کار با سمپلر و تجهیزات آزمایشگاه مولکولی
آموزش مبانی PCR و انواع آن
انجام Basic PCR
مبانی الکتروفورز و انجام آن
آنالیز نتایج و Troubleshooting
حضوری ۲۳ مهر
ساعت ۱۰ تا ۱۶
مدرس: فائزه فلاحی
ثبت نام از طریق سایت کنفرانس سلولی تکوین و یا انجمن کشت سلول و بافت ایران انجام می‌شود. Www.ictcs.ir


دانشگاه خوارزمی
ارائه مدرک معتبر از انجمن زیست شناسی ایران
حضوری ۲۶ مهر
ساعت ۱۰ تا ۱۶
مدرس: مهرداد ایزدی‌راد
ELISA
سلولی تکوینی ایران
GENARAN
مفاهیم پایه در علم ایمونولوژی
تعریف آنتی ژن و آنتی بادی
انواع کلاس‌های آنتی بادی
TROUBLESHOOTING
تعریف الایزا
انواع الایزا
منحنی استاندارد
ثبت نام از طریق سایت کنفرانس سلولی تکوین و یا انجمن کشت سلول و بافت ایران انجام می‌شود. Www.ictcs.ir


دانشگاه خوارزمی
"Exploring AI Applications in Biology
سلولی تکوینی ایران
GENARAN
ارائه مدرک معتبر از انجمن زیست شناسی ایران
نگاهی به ساختارها در هوش مصنوعی
آموزش معماری ترنسفورمر در پردازش توالی
استفاده از Large Language Models (LLM)
کاربرد مدل‌های زبانی در زیست شناسی
پروژه های کاربردی زیستی با استفاده از LLM
استفاده از مدل‌های زبانی در بیوانفورماتیک
آنلاین ۲۳ مهر
ساعت ۱۴ تا ۱۶
مدرس: علیرضا مقدسی
ثبت نام از طریق سایت کنفرانس سلولی تکوین و یا انجمن کشت سلول و بافت ایران انجام می‌شود. Www.ictcs.ir


دانشگاه خوارزمی
سلولی تکوینی ایران
Mesenchymal stem cells
From isolation to clinical Applications
ارائه مدرک معتبر از انجمن زیست شناسی ایران
شنبه ۱۹ مهر ۱۴۰۴
ساعت ۱۶ تا ۱۸
مدرس: خانم معصومه کهندانی
• مقدمه‌ای بر زیست‌شناسی سلول‌های بنیادی
• مروری بر اصول کشت سلولی
• جداسازی سلول بنیادی مزانشیمی از مغز استخوان
• جداسازی سلول بنیادی مزانشیمی از بافت چربی
• پروتکل‌های پشتیبان
• سلول های بنیادی در محیط داربست سه‌بعدی
• کاربرد بالینی سلول بنیادی مزانشیمی در پزشکی بازساختی
ثبت نام از طریق سایت کنفرانس سلولی تکوینی و یا انجمن کشت سلول و بافت ایران انجام شود
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Part two: Scientific articles



Keynote Speakers



Keynote Speakers



Keynote Speakers



Chapter One
Plant Developmental Cell



23904 – Keynote oral presentation

Recent Advancements in Protochlorophyllide Reduction in Higher Plants

Mohammadreza Amirjani[1 *]

1-Department of Biology, Faculty of Basic Sciences, University of Arak

*Corresponding Author: rezaamirjani@gmail.com

Abstract

Protochlorophyllide (Pchlide) reduction to chlorophyllide (Chlide) by light-dependent NADPH:protochlorophyllide oxidoreductase (POR) is a pivotal step in chlorophyll biosynthesis, integral to plant greening. This review synthesizes recent advancements in higher plants, exploring POR's structural dynamics, enzymological mechanism, genetic and environmental regulation, and promising biotechnological applications. Structural breakthroughs—including cryo-EM and X-ray crystallography—have revealed POR's oligomeric forms, active site architecture, and adjacency to etioplast membranes. Biochemical analyses have clarified light-driven hydride and proton transfers and highlighted lipid and pigment-phase environments as functional modulators. Genetic studies have elucidated regulation by light, phytochrome, circadian rhythms, hormones, histone modification, and hypoxic conditions. Advances in biotechnology showcase POR overexpression as a strategy for photooxidative protection and metabolic improvements in tocopherol content, and pave paths toward engineering dark chlorophyll synthesis. The article concludes with unresolved questions photochemical intermediates, POR isoform specialization, structural assembly in plastids and outlines future prospects for crop innovation.

Keywords: Protochlorophyllide, Chlorophyll biosynthesis, Plant greening, POR, Biotechnology

23933- Keynote oral presentation

Polyethylene Glycol Mitigates Cadmium Toxicity in *Raphanus sativus* L. by Regulating Enzymatic and Nonenzymatic Antioxidant Defence Mechanisms

Rehana Sardar[1 *]

1-Department of Biological and Environmental Sciences, Emerson University, Multan, Pakistan

*Corresponding author: rehana.sardar@eum.edu.pk

Abstract

The negative effects of heavy metal toxicity on crop growth and yield have become a global issue. Cadmium (Cd) is a harmful heavy metal that does not undergo redox reactions and increases the synthesis of reactive oxygen species (ROS), subsequently initiating cellular apoptosis. The primary goal of the current study was to examine the beneficial effects of priming seeds with polyethylene glycol (PEG) on the biochemical, morphological, and physiological characteristics of *Raphanus sativus* L. (radish) under Cd-spiked conditions. During this study, it was assumed that PEG has the potential to alleviate Cd stress. For this purpose, *R. sativus* seeds were primed with 10%, 20%, 30%, and 40% PEG solutions. The current study revealed that cadmium had toxic effects on diverse physiological mechanisms in plants, including photosynthesis, transpiration, and nutrient uptake. These effects ultimately lead to impaired growth and limited biomass accumulation. Cadmium exposure has been found to limit plant growth, diminish the content of photosynthetic pigments and soluble proteins, disrupt parameters concerning gaseous exchange, and increase the efficacy of a diverse spectrum of antioxidant enzymes (Peroxidases (POD), catalase (CAT) and superoxide dismutase (SOD). Moreover, experimental studies suggested that PEG increases proline, hydrogen peroxide (H2O2) and malondialdehyde (MDA) contents in treated R. sativus plants. Compared with those subjected to Cd-induced stress, the PEG-primed seeds presented notable increases in germination (71.59%) and photosynthetic rates (46.13%), as well as elevated rates of plant height (44.84%) and shoot fresh biomass production (59.61%) and an elevated MTI index (57.34%). In summary, the findings of our study suggest that PEG application enhances the ability of plants to withstand stress by modulating the antioxidant system, and the observed properties of PEG position it as a promising protective agent for mitigating the adverse effects of Cd on plants and improving yield.

Keywords: Growth, PEG, Enzymatic system, Proline, Cadmium

23935- Keynote oral presentation

CRISPER-Based Industrial Crop Improvements

Mozhgan Farzami Sepehr[1 *]

1- Department of Biology, Simon Fraser University, Burnaby, British Columbia, Canada
*Corresponding author: mozhgan_farzami_sepehr@sfu.ca

Abstract

The growing global population, climate change, and environmental challenges have made creative and sustainable agricultural practices essential. CRISPR-Cas9, a revolutionary genome-editing technology, has emerged as a promising tool for improving industrial crops. This system, inspired by bacteria's natural defense mechanisms, uses the Cas9 protein guided by programmable RNA to precisely target and modify specific genes in crop genomes. Such precision allows scientists to enhance traits like yield, nutritional quality, and resilience to stress conditions such as drought, salinity, and extreme temperatures. By reducing the need for chemical pesticides and fertilizers, CRISPR also supports environmentally friendly farming. Beyond improving productivity and nutrition, CRISPR-based innovations can help address global food security by creating crops better suited to changing climates. However, these advancements also raise ethical and regulatory concerns. Different countries apply varying laws to gene-edited crops—some treat them as conventional plants, while others regulate them like genetically modified organisms (GMOs). Issues of intellectual property and equitable access further complicate the technology's global adoption. To fully realize CRISPR's potential in agriculture, a balanced approach is required—one that fosters scientific innovation while ensuring safety, fairness, and transparency. With responsible implementation and international cooperation, CRISPR-Cas9 could usher in a new era of resilient, sustainable, and equitable food production worldwide.

Keywords: CRISPR-Cas9, Genome editing, Agricultural innovation, Sustainable agricultural, Crop improvement

22675 - Keynote oral presentation

Responses of Plant Growth and Development to Air Pollution in Urban Ecosystems

Hamed Dadkhah-Aghdash [1 *]

1- Department of Science and high technology, University of Insubria, Como, Italy
*Corresponding Author: hameddadkhah92@gmail.com

Abstract

Air pollution is a major environmental challenge in urban ecosystems, impacting both the abiotic and biotic components. Among the different organs of plants, leaves are the most sensitive and are able to accumulate air pollutants, hiding their harmful effects. There are diverse responses by plant species to air pollution in urban ecosystems, which focus on its detrimental effects on plant growth, development, reproduction, and overall health. Special attention is given to the ecophysiological mechanisms that plants employ to mitigate or adapt to pollutant stress. The ecological functionality of urban forests depends on understanding these responses. The extent and nature of these responses depend on plant function type, pollutant concentration, exposure duration, and interactions with other urban stressors. Currently, measuring these responses in plants allows us to employ them in biomonitoring studies (when the plants are sensitive) and in phytoremediation approaches (when the plants are tolerant). By investigating how plant species tolerate and survive in polluted environments, we can gain critical insights into the mechanisms that allow them to continue delivering key ecosystem services. This integrative approach not only improves our understanding of plant resilience but also informs urban planning and species selection strategies for a more sustainable green infrastructure. It will help botanists, ecologists, and environmental scientists to know the responses of different plant species to urban air pollution, and to investigate nature-based solutions to monitor and counteract this phenomenon.

Keywords: Development responses, Urban forests, Plant species, Air pollution stress

23903- Keynote oral presentation

Synergistic Role of Melatonin and Indole-3-Acetic Acid in Alleviating Salinity Stress in Maize through Regulation of Antioxidant Defense Mechanism and Nutrient Uptake

Zuhair Hasnain[1], Sara Zafar[2*]

1-PMAS, Arid Agriculture University, Rawalpindi, Pakistan
2-Department of Botany, Government College University, Faisalabad, Pakistan

*Corresponding Author: zuhair@yahoo.com

Abstract

Soil salinity substantially impedes global food security and sustainability, with changing climatic conditions intensifying pressure on soil and agriculture. This study aimed to evaluate the effects of melatonin (Mel, 600 µM) and indole-3-acetic acid (IAA, 2 mM), both individually and in combination, on mitigating the adverse effects of sodium chloride (NaCl) stress in maize genotypes Pearl and Akbar. Salinity stress led to substantial declines in developmental and physiological parameters while enhancing antioxidant activity. Maize plants exposed to NaCl stress exhibited elevated levels of malondialdehyde (MDA) and hydrogen peroxide (H2O2), indicating oxidative damage. Compared to IAA alone, the combined foliar application of Mel and IAA improved plant height, biomass, and the uptake of nitrogen (N), zinc (Zn), calcium (Ca), and iron (Fe). Both Mel and IAA, either alone or in combination, significantly reduced the uptake of sodium (Na) and chloride (Cl). The combined application of 600 µM Mel and 2 mM IAA resulted in 51% and 29% improvements in chlorophyll a content in Pearl and Akbar, respectively, whereas IAA alone enhanced it by 24% and 10%, and Mel alone increased it by 22% and 10%. The heat map and principal component analysis revealed a distinct separation of attributes related to the Mel and IAA treatments. The combined application of Mel and IAA was more effective than their individual use in alleviating salinity stress in maize plants.

Keywords: Salinity stress, Melatonin, Indole-3-Acetic Acid, Maize, Antioxidants, Nutrient uptake

23869 - Invited oral presentation

Some Strategies for the Development and Advancement of Cellular and Developmental Biology in Iran

Alireza iranbaksh[1*]

1-Department of Biology, Faculty of Convergent Sciences & Technologies, Islamic Azad University, Science & Research Branch, Tehran, Iran.

*Corresponding Author: iranbakhsh@iau.ac.ir

Abstract The rapid and remarkable advancement of science and technology in the modern era has also encompassed cellular and developmental biology. Harnessing the expertise of specialists and researchers, alongside modern technologies and advanced instrumentation, this discipline has achieved a commendable level in uncovering the astonishing mysteries of life and responding to human needs. At this juncture in history, several critical priorities should be addressed:
1. Identifying all experts and specialized personnel in cellular and developmental biology, and establishing honest, dynamic national and international scientific networks.
2. Training and educating specialized researchers through academic programs and targeted workshops to elevate knowledge and skill levels.
3. Establishing a national bio-bank and enabling shared access among domestic stakeholders.
4. Creating shared laboratory networks equipped with state-of-the-art technology, avoiding monopolization and sectionalism.
5. Advancing education and capacity-building in imaging technologies, including fluorescence, laser, electron, and confocal microscopy, for precise observation of cellular and embryonic growth stages and live imaging throughout development.
6. Developing genetic and molecular techniques, notably CRISPR technology, for gene editing and functional analysis via knock-out and RNAi assays.
7. Employing novel experimental models beyond the currently established plant and animal systems. 8. Fostering interdisciplinary collaborations by integrating biology with mathematics, physics, computer science, artificial intelligence, and bioinformatics to model developmental processes and analyze big data to discover growth algorithms and patterns.
9. Promoting open access to protocols and data through global platforms such as BioRxiv and PubMed.
10. Advancing organoid research to investigate organ development in vitro, study developmental diseases, and evaluate chemicals and drugs affecting them.
It is vital to avoid narrow-mindedness, monopolistic attitudes, and individualism, instead fostering active, collaborative scientific networks to wholeheartedly contribute to the growth, excellence, and maturation of this discipline.

Keywords: Cell and Developmental Biology, Scientific networks, Laboratory networks, Bio-bank.

23850 – Invited oral presentation

Plant Vaccines: A New Window in to Biotechnology and Plant Development

Abdolkarim Chehregani Rad[1 *], Fariba Mohsenzadeh[1]

1- Department of Biology, Faculty of Science. Bu-Ali Sina University. Hamedan, Iran
*Corresponding Author: chehregani@basu.ac.ir

Abstract

The use of edible fruits and leaves of plants as vaccines has been considered in recent years. The aim of the present study is to design an edible plant vaccine against *Helicobacter pylori* infection. Helicobacter pylori infections affect more than 50% of the world's population. In this study, first, the B subunit gene of the urease enzyme of *H. pylori* was selected as an antigen with immunogenic properties and its specific primers were designed using Vector NTI software and the gene sequence with accession number AY295085.1 available in the NCBI gene database. In order to extract the gene encoding this antigen from the NCTC11637 strain of this bacterium using the PCR process. These primers also contained the restriction enzyme cleavage sites BamHI and SacI, and in this way their cleavage sequence was also placed in the vicinity of the above gene. The gene obtained from the bacteria was placed in the T/A plasmid and transferred to the susceptible bacterial host (*E.Coli* DH5a) by heat shock method to propagate therein. In the next stage, after screening the bacterial recombinant colonies in LB medium containing IPTG and X-Gal, the recombinant plasmid was removed from the bacteria by alkaline digestion method and after cutting the recombinant T/A plasmid with BamHI and SacI restriction enzymes, we isolated the relevant gene and placed it in the pBI121 expression vector which was also cut with the previous restriction enzymes. This dual expression vector was also placed in the bacterial host by heat shock method and after propagation, it was extracted from it by alkaline digestion method and transferred to the susceptible *Agrobacterium tumefaciens* bacteria. In the continuation of the work, hypocotyl microsamples of bell pepper cultivar California Wonder were infected with bacteria carrying a recombinant expression plasmid so that, with the mediation of this prokaryotic engineer, the gene in question was introduced into its new eukaryotic host and expressed in its cells. After gene transfer and complete regeneration of the plants, to ensure the presence of the urease enzyme B subunit gene in the plant cells, PCR was performed using specific primers and its product was separated by horizontal agarose gel electrophoresis. Also, in order to confirm the expression of this gene in the host cells, RNA molecules were first extracted from different organs of the aerial part of the transgenic plants using the RNaXPlus method and cDNA molecules were synthesized u

Keywords: Herbal vaccine, *Helicobacter pylori*, Urease, Bell pepper

23851 - Invited oral presentation

Microplastics and Changes in Plants Development

Zohreh Shirkhani[1 *]

1- Department of Plant Sciences, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: z.shirkhani@khu.ac.ir

Abstract

Microplastics, defined as plastic particles smaller than 5 mm, have emerged as a global environmental concern with increasing relevance for terrestrial ecosystems. While much attention has been directed toward aquatic systems, soils are now recognized as major sinks for microplastics, where they can directly and indirectly affect plant development. Microplastics alter soil physicochemical properties, water retention, and microbial communities, thereby influencing plant growth. Evidence also shows that microplastics may be taken up by roots and translocated to aerial tissues, disrupting seed germination, root elongation, and leaf morphology. At the physiological level, microplastics interfere with photosynthesis, nutrient uptake, and hormonal regulation, while biochemically they trigger oxidative stress and antioxidant responses. These processes ultimately reduce biomass accumulation, reproductive success, and crop productivity. Understanding how microplastics interact with plants is essential for evaluating ecological risks in agroecosystems and for developing sustainable strategies to safeguard food security.

Keywords: Soil pollution, Oxidative Stress, Food security

23770 - Invited oral presentation

Plant Developmental Biology Through Time: Approaches and Challenges

Homa Rajaei[1 *]

1- Department of Biology, Shiraz University, shiraz, IRAN

*Corresponding Author: rajaei@shirazu.ac.ir

Abstract

Meristems comprise the most fascinating aspect of plant development. The tissue and organ- forming apical meristems, with their unique behavior of indeterminate vegetative growth and repetitive pattern, have been the subject of vast studies for nearly two centuries. Researches have been performed with three different, yet complementary, approaches, based on the purpose of the study and the available tools. Descriptive studies aimed to find the relationship between meristem initials and their resulting mature tissues, led to multiple theories on the organization of RAM and SAM, for a century. Analytical approach, blooming in mid 20th century, questioned the already admitted apical initiation. Multiple techniques revealed zones of different cyto histological criteria and variable developmental. capacities in both RAM & SAM. The existence of a relatively less active zome, crucial for meristem integrity, is now widely accepted. Unfolding the genes which control the initiation, organization, maintenance and activity of the apical meristems characterizes the third app roach and is the ongoing field. Inspite the differences in position, organization and activity between RAM & SAM, Similarities between the two became a promising fact. plants seem to use a unified developmental logic across different organ systems. Research on the reproductive phase followed the same path as the vegetative phase, and has led to the recognition of the genes responsible for both the meristem identity and floral organ patterning. The field is moving toward an integrated system, i.e., the interaction. between epigenetic factors, gene networks and hormonal signals. This promising approach fits better into the broader context of development in general.

Keywords: Meristem, Initial, Organization, Ontogeny, Development

23810 - Invited oral presentation

Simulating Plant Development: Bridging Biological Data and Predictive Models

Sedigheh Kelij[1 *]

1- Department of plant biology, University of Mazandaran, Babolsar, Iran
*Corresponding Author: s.kelij@umz.ac.ir

Abstract

Plant development simulation is an advanced approach for digitally reconstructing plant growth and development, creating a bridge between biological data and accurate future predictions. By utilizing mathematical models, programming algorithms, scientific libraries, and methods such as machine learning and data analysis, it becomes possible to simulate plant growth processes with high accuracy and efficiency. The outcomes of these models should demonstrate the ability to predict plant responses to environmental conditions and to optimize agricultural processes. This approach can serve as an effective tool in biology and agriculture for developing resistant plant varieties and conducting virtual experiments. Moreover, the proposed learning pathway offers practical guidance for researchers interested in entering the field of plant development simulation.

Keywords: Plant development, Simulation, Modeling, Data analysis

23801 - Invited oral presentation

Biology of Aging with a Developmental Approach: Transition from Cell to Complex Systems with Emphasis on Plant Models

Maryam Kolahi[1 *]

1- Shahid chamran university
*Corresponding Author: m.kolahi@scu.ac.ir

Abstract

Cellular aging is a natural process where cells become senescent, contributing to inflammation and age-related diseases. First described by Carl Vogt in 1842, it arises from genetic damage or cellular stress. In a developmental approach, aging transitions from the cellular level to complex systems like tissues and organs. Plants serve as ideal models for this transition due to their high developmental plasticity, enabling continuous regeneration via meristems. Apical meristems in roots and shoots maintain pluripotent stem cells, allowing indefinite growth and replacement of damaged modules. Genetic factors in plant aging include telomere shortening, genomic instability, proteostasis loss, and epigenetic changes. However, plants possess unique mechanisms to defy aging, such as gene duplication, constant telomerase activity, and phytohormones (e.g., cytokinins suppressing aging). Long-lived plant models, like the 4,000-year-old Sarv-e Abarkuh cypress or the 4,800-year-old Methuselah tree, demonstrate resilience in complex systems. These embody a complex systems approach, where aging emerges from network interactions across scales, involving emergence, interaction networks, and resilience. Major projects like the Longevity Project explore psycho-social factors, while SALT Trials test anti-aging drugs like metformin. iPSC cells aid in tissue repair. In plants, autophagy (Ohsumi, Nobel 2016) and cellular reprogramming (Gurdon, Nobel 2012) are pivotal. These insights from plant models can inform human aging research, highlighting differences like the absence of replicative senescence in plant stem cells.

Keywords: Aging, Development, Oxidative stress, Plant stem cell

23868 - Invited oral presentation

Redesigning Plant Development: The Role of Synthetic Biology in Next-Generation Plant Engineering

Parisa Jonoubi[1 *]

1-Department of Plant Sciences, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: jonoubi@khu.ac.ir

Abstract

Synthetic biology, a subfield of bioengineering, involves the design and construction of complex biological systems that perform functions beyond those found in nature. This discipline integrates principles of engineering, biochemistry, and genetics to provide innovative opportunities for redesigning plant developmental processes. Plant development is a dynamic and intricate process regulated by genetic, hormonal, and environmental networks that control plant growth, morphology, and function. Synthetic biology employs advanced tools such as Golden Gate DNA assembly toolkits, synthetic promoters and terminators, optogenetic induction systems, multiplex regulation systems, and synthetic genetic circuits, enabling spatiotemporal control over gene expression and engineering of developmental pathways. Branching architecture can be engineered by regulating auxin-responsive circuits, which may enhance plant architecture by increasing the number of branches and leaves to improve photosynthesis or reduce branching to enhance wind resistance. Redesigning root architecture in terms of length and branching pattern increase water and nutrient uptake, soil stabilization, and enhances drought tolerance. Optogenetics allows gene activation through light, offering high spatiotemporal precision along with reversibility. All these architectural modifications achieved via synthetic biology lead to improved photosynthetic efficiency and plant yield. Given the rapid rise of the world population and with the imminent threats of climate change, there is an urgent need for novel technologies to achieve more sustainable and environment-adaptive agriculture. In this regard, synthetic biology-enabled redesign of plant growth and development represents the next "Green Revolution."

Keywords: Golden Gate DNA assembly toolkits, Multiplex regulation systems, Optogenetic induction systems, Synthetic genetic circuits

23934 - Invited oral presentation

Unusual Structures in Plants: Gall Structure and their Development

Farkhondeh Rezanejad[1*], Najmeh Hosseini[1]

1- Department of Biology, Shahid Bahonar University of Kerman, Kerman, Iran
*Corresponding Author: frezanejad@uk.ac.ir

Abstract

Plants often develop abnormal structures in response to genetic or environmental factors, many of which have been studied as key models in developmental biology and plant–microbe/insect interactions. Within the ABCDE model, mutations or misexpression of homeotic genes lead to distinct alterations in floral architecture. Striking abnormalities caused by pathogens and symbionts exploit host developmental pathways. Agrobacterium transfers a segment of T-DNA into the host genome, activating genes that deregulate hormone metabolism, resulting in uncontrolled cell proliferation and tumor-like crown galls or hairy roots. Insect herbivores and plant-parasitic nematodes also manipulate host development, secrete effectors that redirect plant hormonal pathways, producing novel nutritive and protective structures. Understanding these processes provides insights into fundamental plant biology and offers opportunities for improving resistance in crops. This study investigated the morphological, anatomical, and developmental characteristics of galls induced by insects, nematodes, fungi, and bacteria on a variety of host plants, using cytological and histological approaches. Some findings are reported for the first time worldwide. Host species producing galls were *Pistacia vera*, *Pistacia atlantica*, *Pistacia khinjuk*, *Rosa beggeriana*, *Prunus persica*, *Prunus armeniaca*, *Salix pycnostachia*, *Salix babylonica*, *Ulmus*, *Artemisia sieberi*, *Tanacetum*, *Populus nigra*, *Populus euphratica*, *Haloxylon ammodendron*, *Eucalyptus*, *Ephedra* sp., *Juglans regia*, *Daphne* sp., *Ziziphus* sp., *Cuscuta*, *Quercus*, *Tamarix*, *Acer*, *Quercus, Juniperus* sp., *Bongardia chrysogonum*. In some species, multiple gall types were observed. In most cases, insects were identified as gall inducers, but in 3-4 cases fungi or bacteria and in one case, nematode were identified. The galls displayed remarkable morphological diversity, including pea-shaped, spherical, crescent-shaped, cockscomb-like, banana-shaped, bag-like, rolled, blister-like, cottony, broom-like, funnel-shaped, spiral, spindle-shaped, nail-like, cup-shaped, pear-shaped, conical, bubble-like, as well as irregular and amorphous forms. Galls originated from various plant organs, including flowers, receptacle, fruits, apical and lateral buds, leaves, petioles, and stems. Plant galls are not just pathological curiosities, they are rich resources with pharmaceutical, industrial, ecological, and scientific value. Further, they remain an important bridge between plant pathology, human culture, and biotechnology.

Keywords: Gall-producing plants, Nematodes, Aphids, tannin, Phenolic compounds

24004 - Invited oral presentation

Developmental Plasticity: The Key to Plant Survival in Dynamic Environments

Elham Mohajel Kazemi[1,2*]

1-Department of Plant, Cell and Molecular Biology, Faculty of Natural Science, University of Tabriz, Tabriz, Iran.
2-Nuclear Agriculture School, Nuclear Science and Technology Research Institute (NSTRI), Atomic Energy Organization of Iran (AEQI), Karaj, Iran
*Corresponding author: E.mohajel.K@gmail.com

Abstract

Developmental plasticity is a key characteristic of plants, enabling their survival and success in dynamic and fluctuating environments. This concept is defined as the capacity of an organism to phenotypically adapt to environmental changes through intrinsic regulatory mechanisms. The fundamental mechanisms underpinning this resilience include genetic diversity, phenotypic plasticity, and complex ecological interactions. Phenotypic plasticity, particularly in reproductive processes, allows plants to effectively align their reproductive strategies with varying environmental conditions. This dynamic adaptation ensures reproductive success even under unfavorable environmental circumstances, thereby minimizing the risk of reproductive failure. Consequently, these adaptive responses are crucial for the stability and resilience of plant populations in changing environments. This review focuses on reproductive phenotypic plasticity in plants, investigating the underlying mechanisms of this phenomenon. The aim is to understand how environmental cues influence molecular and hormonal pathways that alter the identity, development, and behavior of reproductive organs. Examples from diverse plant species will be analyzed to elucidate these complex dynamics. Ultimately, evolutionary resilience, mediated by phenotypic plasticity, acts as a significant driving force in adaptation and speciation processes. A deeper understanding of the molecular mechanisms of this plasticity will not only provide invaluable insights into how species survive in an era of climate change but can also lead to the development of novel strategies in sustainable agriculture and biodiversity conservation.

Keywords: Developmental plasticity, Reproduction, Climate change

23920 - Oral

Biosynthesis of Silver Nanoparticles by Yeast *Yarrowia lipolytica* and Investigating their Effect on Active Ingredients and Molecular Mechanisms of *Cannabis sativa* L. In vitro Culture

Fatemeh Pourbabaei[1], Farshad Darvishi [2*], Alireza Iranbakhsh[1], Erfan Mohammadi Bolbanabad[2]

1-Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2- Department of Microbiology, Faculty of Biological Sciences, Alzahra University, Tehran, Iran
*Corresponding author: f.darvishi@ymail.com

This study aimed to biosynthesize silver nanoparticles (AgNPs) extracellularly using *Yarrowia lipolytica* and evaluate their effects on callus growth and cannabinoid gene expression in *Cannabis sativa* L. AgNP synthesis was confirmed by color change, UV-vis spectrophotometry (absorption peak at 420 nm), scanning electron microscopy (SEM), and energy-dispersive X-ray spectroscopy (EDX). Calli were cultured on MS medium containing different concentrations of 2,4-D hormone and AgNPs (5, 10, and 20 mg/L). The combination of 2 mg/L hormone and 20 mg/L AgNPs showed the highest impact on callus growth, fresh and dry weight, and diameter. HPLC analysis revealed increased levels of THC (0.31%) and CBD (0.26%) in the 20 mg/L AgNP treatment compared to the control. Real-time PCR using the ΔΔCt method revealed significant upregulation of THCA and CBDA genes at concentrations of 10 and 20 mg/L. A positive correlation was observed between morphological traits and phytochemical content. These findings suggest that biosynthesized AgNPs can act as effective nanofertilizers to enhance the production of secondary metabolites and in vitro growth of *Cannabis sativa*.

Keywords: Biosynthetic nanofertilizer, Gene expression, Callogenesis, Secondary metabolites, Phytochemistry

21746 - Oral

The Long Term Effect of Nanopolyethylene PENP the Growth, Development of Stress Related Enzymes, and Molecular Mechanisms in *Solanum Lycopersicum* L. under Hydroponic Culture Conditions

Masomeh Nazari[1] , Alireza Iranbaksh[1*], Mostfa Ebadi[2], Zahra Oraghi ardebili[3]

1- Department of Biology, Faculty of Converging Sciences and Technologies, Science and Research Branch, Islamic Azad University, Tehran, Iran.
2- Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran.
3- Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran.

*Corresponding Author: iranbakhsh@iau.ac.ir

Abstract

This research investigated the morphological, physiological, molecular, and epigenetic responses of tomato (*Solanum lycopersicum* L. var. cerasiforme) to contamination with polyethylene nanoplastics (PENP) under hydroponic cultivation conditions. The experimental factor was polyethylene nanoplastics (PENP) at three levels: zero (control), 0.01, 0.1, and 1 gram per kilogram. Contamination with polyethylene nanoplastics led to severe changes in plant morphogenesis. PENP treatments caused a reduction in internode length, delayed flowering, and prolonged fruit ripening. This study showed that PENP at a concentration of 0.1 g/kg increased biomass, activated lateral buds, and strengthened the root system, while at 1 g/kg it caused reduced growth intensity and severe toxicity. The abnormal flowers and fruits observed in seedlings exposed to PENP support the occurrence of genetic changes and meristem dysfunction. Yield, number of flowers, and number of fruits also showed a significant decrease at the concentration of 1 g/kg of PENP. Furthermore, PENP stimulated the levels of leaf non-protein thiols, leaf ascorbate content, and leaf soluble phenols under cultivation conditions. The levels of PAL (phenylalanine ammonia-lyase), phenol, and flavonoids increased proportionally with the increasing concentration under cultivation conditions. The levels of ascorbate, glutathione, and antioxidant enzymes (peroxidase, superoxide dismutase, glutathione reductase) also increased proportionally with the treatment concentration compared to the control under normal irrigation conditions. PENP increased the expression of the histone deacetylase gene HDA3 and the transcription factor R2R3MYB. However, the AP2a gene decreased in response to PENP. Additionally, PENP epigenetically contributed to changes in DNA methylation. The concentration of proline, soluble phenols, and flavonoids showed an increasing trend in response to the applied PENP treatments. These findings raise concerns about the hazardous aspects of polyethylene nanoplastics for agricultural ecosystems and food security.

Keywords: Gene expression, Development, Cherry tomato, Polyethylene nanoplastics.

21794 - Oral

Evaluation of the Effect of Cadmium on the Content of Total Phenolic and Flavonoid in Chamomile (*Matricaria chamomilla* L.) Cell Suspension Culture

Narges Bijary[1], Elham Mohajel Kazemi[2 *], Maryam Kolahi[3], Halimeh Hassanpour[4]

1- Department of Plant, Cell and Molecular Biology, Faculty of Natural Sciences, University of Tabriz, Tabriz, Iran
2- Nuclear Agriculture School, Nuclear Science and Technology Research Institute (NSTRI), Atomic Energy Organization of Iran (AEOI), Karaj, Iran
3- Department of Biology, Faculty of Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran
4- Aerospace Research Institute, Ministry of Science Research and Technology, Tehran 14665-834, Iran

[*]Corresponding Author: e.mohajel.k@gmail.com

Abstract

Phenolic and flavonoid compounds are secondary metabolites in plants that increase in response to stress. Heavy metal stress, such as cadmium exposure, induces the cellular antioxidant defense system and the biosynthesis of secondary metabolites. Cell suspension culture is one of the plant cell culture techniques to produce secondary metabolites. In this study, aimed to evaluate the effect of cadmium on total phenolic and flavonoid content in *Matricaria chamomilla* L. under different cadmium treatments. The Cell suspension was initiated from the friable callus derived from hypocotyl tissue in MS liquid medium supplemented with 2-4-dichlorophenoxyacetic acid (2-4-D), Kintin (Kin) and sucrose at pH = 5.7 for two weeks. Then, the cell suspension was transferred into MS medium treated with CdCl2 at concentrations of 0, 2.5, 5, 7.5 and 10 µM for three weeks. The total phenolic and flavonoid content was determined in Cadmium- treated cells. The results showed that the total phenolic and flavonoid contents increased significantly compared to the control, with the maximum content of phenolic compounds (164.01 µg/mg DW) and flavonoids (45.61 µg/mg DW) identified in cells treated with 7.5 µM Cd ($p < 0.05$). However, the flavonoids content decreased significantly (17.06 µg/mg DW), in cells treated with 2.5 µM compared to the control (22.37 µg/mg DW). Therefore, total phenolic and flavonoid content showed antioxidant secondary metabolites could increase with cadmium treatment in cell suspension culture. This finding can lay the ground work for further investigation on molecular mechanisms of defense metabolites in exposed plants to heavy metal stress

Keywords: Secondary metabolite, Cadmium treatment, Cell suspension culture, *Matricaria chamomilla* L.

22148 - Oral

Evaluation of Differential Expression Patterns of Transcription Factors Associated with Cold Stress Tolerance in Threshold Genotypes of Desi Type Chickpea

Zahra Grami[1], Farkhondeh Rezanejad[1 *], Zahra Sadat Shobbar[2], Masoumeh Pouresmael[3]

1- Shahid Bahonar University of Kerman
2- Department of Systems Biology, Agricultural Biotechnology Research Institute of Iran (ABRII), Agricultural Research, Education and Extension Organization (AREEO), Karaj, Iran.
3- Shahid Bahonar University of Kerman

*Corresponding Author: frezanejad@uk.ac.ir

Abstract

Climate change and the adverse impact of terminal drought stress on chickpea production have made the identification of cold-tolerant genotypes suitable for autumn sowing essential. Transcription factors are key regulators of gene expression in specific genotypes or tissues. To investigate the expression patterns of cold-responsive transcription factor genes, the effect of cold stress on the relative expression changes of DREB5A, MYB4, NAC47, TCP4, and DREB1E was evaluated in four desi chickpea genotypes (two tolerant and two sensitive) under control (20°C) and cold stress (4°C) conditions. All genotypes were grown under controlled greenhouse conditions, and plants at the 4–5 leaf stage were subjected to the treatments for 12 hours. Following treatment, samples were collected for RNA extraction, and gene expression patterns were analyzed using Real-Time PCR. The results showed that cold treatment increased the expression of NAC47 and DREB1E in all genotypes; however, the increase in DREB1E was more pronounced in both tolerant genotypes, while NAC47 showed the highest upregulation in the most tolerant genotype. A significant increase in TCP4 expression was observed only in the tolerant genotypes. Moreover, DREB5A expression increased in one tolerant genotype but significantly decreased in the others. In contrast, MYB4 expression was reduced under cold treatment across all genotypes. These findings confirm the roles of NAC47, DREB1E, TCP4, and DREB5A transcription factors as key regulatory elements involved in differential responses to cold stress in desi chickpea genotypes.

Keywords: Environmental stress, *Cicer arietinum*, Gene expression, Transcription factor.

22506 - Oral

Increase of Glucosinolate Content in *Eruca sativa* L. in Response to Microgravity Effects through Regulation of Biosynthetic Pathway Genes in In Vitro Culture

Hilda Amiripour[1], Alireza Iranbakhsh[1 *]

1- Department of Biology, Science and Research Branch, Islamic Azad University, 1477893855, Tehran, Iran.

*Corresponding Author: iranbakhsh@iau.ac.ir

Abstract

Under microgravity conditions, plants undergo significant changes in their physiological and metabolic processes, which can influence secondary metabolites such as glucosinolates. Glucosinolates, as protective compounds with high medicinal properties, play a crucial role in plant defense. Studying the effects of microgravity on the concentration of these metabolites is essential for understanding plant responses to stress conditions. In this study, the impact of clinostat rotation on *Eruca sativa* L. seedlings was investigated from genetic and total glucosinolate content perspectives, as these compounds are key markers of the plant. A completely randomized design experiment was conducted with treatments including control (natural gravity without elicitor) and microgravity (clinorotation for 10 days). Results demonstrated that microgravity significantly increased the total glucosinolate content in clinorotated seedlings compared to control conditions (from 6.43 µmol/g dry weight to 12.4 µmol/g dry weight). Correspondingly, gene expression analysis of FMO, SUR, and BAC, which are downstream genes in the glucosinolate biosynthetic pathway, showed that compared to the control, FMO expression increased 61-fold, SUR 22-fold, and BAC 430-fold. These findings indicate that the glucosinolate biosynthesis pathway is highly sensitive to clinorotation effects, and plants likely adopt an adaptive strategy by elevating these secondary metabolites to modulate microgravity stress impacts. Based on the data, this effect appears to be mediated through the activation of gene signaling and metabolic pathways with high potential. From the perspective of enhancing the content of valuable natural compounds in this plant, these insights open new avenues for further studies on exploiting diverse gravitational conditions to optimize plant cultivation and secondary metabolite production.

Keywords: Biosynthetic Pathway, Gene, Microgravity Stress, Secondary Metabolites, Signaling.

21785 - Oral

Investigation of the Effect of Polyethylene (PE) Nano plastic Particles on Growth, Development, Phytochemistry, Stress Enzymes in *Capsicum Annum* L. Plant in Hydroponic Conditions Culture

Shadi Valavi[1], Alireza Iranbakhsh[1 *], Mostafa Ebadi[2], Zahra Oraghi Ardebili[3]

1- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2 Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran
3 Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran

*Corresponding Author: iranbakhshar@yahoo.com

Abstract

Nanoplastics, as emerging environmental pollutants, have potential effects on plant health that have not yet been fully understood. This study aimed to investigate the effects of polyethylene nanoplastics at concentrations of 0.1, 1, and 2 g/L on growth, development, phytochemistry, chlorophyll content, and antioxidant enzyme activity in *Capsicum annuum* L. grown in a hydroponic system. The results demonstrated that nanoplastics caused a significant reduction in root and stem length, as well as fresh and dry weights of both aerial parts and roots. Moreover, increasing nanoplastic concentrations led to delayed emergence of true leaves and decreased leaf number. The content of chlorophyll *a*, *b*, and total chlorophyll significantly decreased in treatments with 1 and 2 g/L compared to the control. Analysis of phytochemical compounds, including total phenols and total flavonoids, also revealed a marked reduction, indicating a decline in the plant's defensive capacity against oxidative stress. Additionally, the activity of antioxidant enzymes such as peroxidase and catalase was significantly reduced in nanoplastic-treated plants, suggesting impairment of the plant's antioxidant defense system. These findings highlight the negative effects of polyethylene nanoplastics on the physiology and metabolism of green chili pepper under controlled hydroponic conditions, emphasizing the need for monitoring and controlling nanoplastic pollution in cultivation systems. Future studies are recommended to employ advanced microscopy techniques to trace the pathways of nanoplastics and their impact on nutrient distribution in plants.

Keywords: Nanoplastic pollution, Green chili pepper, Hydroponic cultivation, Oxidative stress, Physiological response

22069 - Oral

Interaction of Microgravity and Environmental Factors in Regulating Plant Development and Secondary Metabolism: Focus on *Physalis alkekengi*

Farzad Alani[1 *]

1- Graduate of Ph.D. program, Islamic Azad University, Science and Research Branch

*Corresponding Author: farzad13628alani@gmail.com

Abstract

Microgravity is a key factor in space biology that can fundamentally alter the developmental and molecular pathways of plants. Evidence from global studies and recent research in Iran indicates that microgravity affects cell division, oxidative responses, DNA repair, and epigenetic remodeling, subsequently regulating secondary metabolism pathways. Data obtained from model species such as Arabidopsis thaliana, rice, and tobacco highlight the sensitivity of defense- and metabolism-related genes to gravitational changes. Among medicinal plants, *Physalis alkekengi*, known for producing physalins and phenolic compounds, serves as an excellent model to investigate these phenomena. A recent international study (Alani et al., 2023) demonstrated that simulated microgravity has a stronger effect than light quality in stimulating growth and the expression of key secondary metabolite genes. Furthermore, epigenetic modifications, particularly DNA methylation, correlated with increased expression of HMGR, DXS2, DXR, HYD1, and SQS genes, as well as the accumulation of phenolic compounds. Other research in Iran has confirmed similar findings regarding the interplay between environmental conditions and developmental signals in regulating metabolic pathways. Overall, existing evidence suggests that microgravity, as a developmental and metabolic stimulus, can provide novel opportunities for space biotechnology and sustainable production of plant-derived medicinal compounds.

Keywords: Microgravity, *Physalis alkekengi*, DNA methylation, Plant development, Secondary metabolites

22573 - Oral

Effect of Melatonin on Vegetative Growth, Germination, and Tropane Alkaloid Production in (*Hyoscyamus niger* L.) under In Vitro Culture

Zahra Mehravar[1], Alireza Iranbakhsh[1 *], Azade Hekmat[1], Zahra Oragh Ardebili[2], Mostafa Ebadi[2]

1- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran.
2- Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran

*Corresponding Author: iranbakhsh@iau.ac.ir

Abstract

: Melatonin in plants is a strong growth regulator and antioxidant that aids vegetative growth, stress resistance, and photosynthesis processes. Acting as a biostimulator, it increases the expression of genes involved in gibberellin biosynthesis, improving seed germination and plant growth. Structurally similar to auxin, melatonin can exert effects through auxin receptors, positively influencing plant development. A study on the medicinal plant *Hyoscyamus niger* L. examined the effects of melatonin at different concentrations (0, 25, 50, 75, and 100 micromolar) on vegetative growth, seed germination, and tropane alkaloid content under in vitro culture conditions. The results showed that melatonin at 50 micromolar significantly increased morphological parameters such as leaf number and area, root length, and fresh and dry weight. The levels of alkaloids hyoscyamine and scopolamine also increased significantly at this concentration. At concentrations higher than 50 micromolar, growth and some traits decreased. Melatonin, with its antioxidant properties as a plant growth regulator, improves plant response to stresses and enhances growth quality. In summary, melatonin, with its combined role as a growth regulator and antioxidant, has significant potential to improve growth, stress resistance, and the quality of medicinal plants, making it an effective tool in agriculture and in vitro cultivation.

Keywords: Melatonin, *Hyoscyamus niger* L., Hyoscyamine, Scopolamine, In vitro culture

22077 - Oral

Comparative Effects of Magnetic and Electromagnetic Fields on Germination, Seedling Growth, and Antioxidant Enzymes in *Satureja hortensis* L.

Maryam alsadat KamiShirazi[1 *], Ahmad Majd[2]

1- · Department of Biological Science, Tehran Islamic Azad University of Medical Sciences, Tehran, IRAN
2. Department of Biological Science,Tehran Islamic Azad North branch , Tehran, IRAN

*Corresponding Author: mkamishirazi@gmail.com

Abstract

Plants possess the ability to recognize and respond to biotic and abiotic stresses in their environment. Magnetic and electromagnetic fields represent significant stress factors influencing plant growth and development. This study aimed to compare the effects of magnetic and electromagnetic fields on seed germination and seedling development in the medicinal plant *Satureja hortensis* L. Results indicated that germination percentage increased significantly in seeds treated with magnetic fields compared to controls ($P \leq 0.001$ in select treatments), but decreased in those exposed to electromagnetic fields, with significant reductions in some cases ($P \leq 0.001$). Magnetic treatments yielded higher germination percentages than electromagnetic ones ($P \leq 0.001$). Germination rate increased in both field types relative to controls, though not significantly ($P > 0.001$), with electromagnetic treatments showing slightly higher rates than magnetic ones (non-significant). Root length in seedlings increased significantly under both fields compared to controls ($P \leq 0.001$ in certain treatments), with electromagnetic treatments on dry seeds exhibiting greater increases than magnetic ones ($P \leq 0.001$). However, no consistent pattern was observed in wet seeds. Hypocotyl length decreased significantly in both treatments relative to controls ($P \leq 0.001$), with magnetic treatments resulting in longer hypocotyls than electromagnetic ones ($P \leq 0.001$). Enzyme activities were elevated in treated samples. Catalase (CAT) activity increased compared to controls (non-significant in some), with magnetic treatments showing significantly higher levels than electromagnetic ($P \leq 0.001$ in select cases). Peroxidase (POX) activity rose slightly (non-significant), higher in magnetic treatments. Superoxide dismutase (SOD) activity increased significantly ($P \leq 0.001$), again higher in magnetic treatments (non-significant). Antioxidant activity increased overall (non-significant in some), but was significantly higher in electromagnetic treatments than magnetic ($P \leq 0.001$). Anatomical observations revealed enhanced stem and root growth under fields, with electromagnetic effects more pronounced. Leaf mesophyll showed reduced density, and vegetative meristems became more voluminous. These findings suggest magnetic fields may promote growth parameters, while electromagnetic fields induce stronger stress responses, potentially enhancing antioxidant properties in *S. hortensis*.

Keywords: Magnetic fields, Electromagnetic fields, *Satureja hortensis*, Seedling growth, Antioxidant enzymes

22452 - Oral

Studying and Optimisation of Proliferation of CAB11E Rootstocks (*Prunus cerasus*) in Traditional Jars and in Bioreactors

Parisa Jonoubi[1 *], Zohreh Shirkhani[1], Soheil Benabbas[1]

1- Department of Plant Sciences, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran

[*]Corresponding Author: jonoubi@khu.ac.ir

Abstract

The CAB11E rootstock (*Prunus cerasus* Var. CAB11E) is a relatively new cherry and sour cherry rootstock recently introduced to the country. The present research first investigates the effect of basal culture medium and hormones on the in-vitro culture of this plant. Subsequently, the effect of bioreactor culture on shoot proliferation yield will be examined, and finally, the rooting of this plant will be studied. In the first stage, virus-free CAB11E explants were cultured in 12 treatments combining three basal media (WPM, MS, and DKW) with different concentrations of BA and IBA hormones. The best treatment was the MS base medium with 1 mg L^{-1} BA and 0.1 mg L^{-1} IBA, resulting in a proliferation rate of 4.4 and a shoot length of 3.5 cm. In the next stage, to evaluate the effect of the bioreactor on shoot proliferation, explants were cultured simultaneously: one set in a liquid medium within a bioreactor and another set in a semi-solid medium in jars, both using the best medium from the previous stage. In this experiment, the average proliferation rate in the bioreactor reached 14.5. For rooting, plantlets were cultured in treatments with MS basal medium and VS basal medium (which is MS with FeNaEDDHA chelate replacing FeNaEDTA chelate as the iron source), each with full- and half-strength macronutrients and different concentrations of IBA. In the best treatment, VS medium with half-strength macronutrients and 0.1 mg L^{-1} IBA, 100% of the plantlets developed roots.

Keywords: Micropropagation, Proliferation, MS base medium, BA hormone

21962 - Oral

The Role of the psy Gene Regulation in the Development of *Dunaliella salina* Chloroplast, an In-silico Study

Ehsan Feyzi[1 *] , Leila Zarandi-Miandoab[2], Parisa Zerafatdost[3], Nader Chaparzadeh[4]

1- Master's degree student in Biochemistry, Department of Biology, Faculty of Science, Shahid Madani University of Tabriz
2- Associate Professor, Department of Biology, Faculty of Science, Shahid Madani University of Tabriz
3- Master's degree student in Biochemistry, Shahid Madani University
4- Professor, Department of Biology, Faculty of Science, Shahid Madani University of Tabriz

*Corresponding Author: johnshopkins1995@gmail.co,

Abstract

The microalgae *Dunaliella salina* is of interest due to its ability to produce and accumulate beta-carotene and convert chloroplasts into colored plastids under stressful environmental conditions. This study investigated the role of phytoene synthase (psy) gene regulation in chloroplast development using in silico methods. Using databases such as NCBI and bioinformatics tools, transcription factors involved in the promoter regulatory regions of psy1 (KAF5842225.1) and psy2 (KAF5828011.1) genes and interactions of known miRNAs with phytoene synthase transcripts were predicted and identified. The results showed that the psy1 promoter is capable of binding to Homeodomain and bZIP transcription factors. While the psy2 promoter is capable of interacting with AP2 and Myb/SANT. Analysis of environmental stresses associated with the aforementioned transcription factors showed that high temperature and salinity are the most important environmental factors that affect the transcription of the two phytoene synthase gene by engaging the above transcription factors. Also, miRNAs such as dsa-mir25 and Pc-3p-61971-13 form stable interactions with mRNAs MN732755.1 and JQ762451.1, respectively, and play a role in post-transcriptional regulation. These miRNAs are particularly under the control of environmental salinity and can control the biosynthesis and accumulation of carotenoids by inhibiting translation or reducing mRNA stability. These findings indicate the complexity of the molecular regulation of psy and its importance in the adaptation of D. salina to harsh environmental conditions. It is suggested that experimental studies be conducted to validate these interactions and investigate the role of the predicted transcription factors and miRNAs, and that the results be used in the work of researchers to produce valuable carotenoids.

Keywords: Chloroplast, Transcription factor, Phytoene synthase, miRNA, *Dunaliella salina*

21960 - Oral

The Role of the Proteolytic System in Arbuscular Mycorrhizal Fungi-Mediated Water Deficit Resilience in Wheat Roots

Elahe Dookhe[1], Alireza Iranbakhsh[1*], Rahim Ahmadvand[2], Mostafa Ebadi[3], Iraj Mehregan[1]

1 Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran.
2 Department of Vegetables Research, Seed and Plant Improvement Institute, Agricultural Research, Education & Extension Organization, Karaj, Iran.
3 Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran.

[*]Corresponding Author: iranbakhsh@iau.ac.ir

Abstract

Water deficit (WD) is a primary factor limiting the productivity of wheat (*Triticum aestivum* L.) globally. The symbiosis with arbuscular mycorrhizal fungi (AMF) is known to improve plant resilience to drought, yet the specific molecular adjustments remain an active area of research. This study focused on the role of proteases and their inhibitors, key components of the cellular degradome, in the AMF-mediated drought response in wheat roots. Using RNA-seq, we compared the transcriptomes of wheat roots under water deficit (WD) with and without AMF colonization (Funneliformis mosseae). The analysis revealed a significant upregulation of genes encoding several major classes of proteases, including serine, cysteine, aspartic, and metalloproteases, as well as their corresponding inhibitors. Functional annotation linked these upregulated genes to a wide array of crucial cellular processes. Notably, these proteases are involved in abiotic and biotic stress responses, regulated cell death (RCD), immunity, and senescence. Concurrently, the upregulation of protease inhibitors suggests a sophisticated regulatory network to control proteolytic activity, which is vital for processes like meristem growth and plastid maintenance. These results indicate that AMF symbiosis enhances drought tolerance in wheat by strategically modulating the root degradome. This fine-tuned regulation of protein turnover and degradation allows the plant to remobilize resources, manage stress-induced damage, and maintain developmental homeostasis under water-limited conditions.

Keywords: Wheat, Arbuscular Mycorrhizal Fungi (AMF), Protease, Protease Inhibitor, degradome, RNA-seq.

22045 - Poster

Comparative Anatomical and Morphological Study of BADH Transgenic and Non-Transgenic Tomato (*Solanum lycopersicum* L.) under Osmotic Stress

Roya Soltani[1 *], Parissa Jonoubi[1], Tahmineh Lohrasebi[2], Diana Daneshian[3]

1- Department of Plant Sciences, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
2- Plant Bioproducts Groupe, Institute of Agricultural Biotechnology, National Institute of Genetic Engineering and Biotechnology, Tehran, Iran
3- Graduate of Biotechnology, Central Branch of Islamic Azad University, Tehran, Iran
*Corresponding Author: roya.soltani1371@yahoo.com

Abstract

Water deficiency, particularly in drought-prone countries, represents a major challenge for agricultural productivity. The present study was conducted to enhance drought tolerance in tomato through increasing the accumulation of glycine betaine (GB), an osmolite known to play a crucial role in maintaining cellular hydration and stability under stress conditions. To this aim, the betaine aldehyde dehydrogenase (BADH) gene, a key enzyme in GB biosynthesis, was cloned and transferred into two tomato cultivars, Rio grade and CH of *Solanum lycopersicum*, using *Agrobacterium tumefaciens* strain LBA4404. Transgenic plants were confirmed by PCR analysis and selected based on kanamycin resistance. Osmotic stress tolerance thresholds were then evaluated by applying different concentrations of mannitol to simulate drought conditions. Results showed that control plants exhibited growth reduction, chlorosis, stunted morphology, and high sensitivity under osmotic stress. In contrast, transgenic plants tolerated osmotic pressures up to –5 and –6 bar while maintaining a healthy green phenotype. Furthermore, the density of protective and glandular trichomes increased in the transgenic plants. Anatomical analyses revealed reductions in both the number and size of xylem and phloem bundles, along with modifications in xylem structure indicative of increased lignification as a possible defense strategy. These findings highlight the significance of BADH gene cloning and glycine betaine accumulation in improving drought tolerance in tomato.

Keywords: Betaine aldehyde dehydrogenase, Drought stress, Glycine betaine, Mannitol

21726 - Poster

The Effect of Spraying of Selenium Nanoparticles and Sodium Selenate on the Vegetative Meristem Anatomical Structure of *Thymus fallax*

Zahra Abravesh[1], Alireza Iranbakhsh[1 *], Hossein Mirzaie Nodoushan[2], Mostafa Ebadi[3], Zahra Oraghi Ardebili[4]

1- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2- Biotechnology Department, Research Institute of Forests and Rangelands, Teheran, Iran.
3- Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran.
4- Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran.
*Corresponding Author: iranbakhsh@iau.ac.ir

Abstract

Thymus is one of the best-known medicinal plants in the Lamiaceae family, which has economic importance in the pharmaceutical, food, and health industries. Although morphogenesis stages in the vegetative organs of flowering plants are similar. However, under effects of abiotic stresses, there is possibility of non-uniform responses to developmental conditions in organs, which can result in activation or suppression of gene expression. To understand the changing conditions of organogenesis and morphogenesis in plants, it is necessary to understand cellular differentiation and plant molecular aspects. Anatomical structure of the vegetative meristem of plant stems were investigated by foliar application of selenium nanoparticle and sodium selenate treatments at concentrations of 0, 2, 4, and 8pmm. Plant vegetative meristems were fixed in F.A.A fixative solution and past through preparation steps of molding, sectioning with a microtome, staining with hematoxylin-eosin, observation with a light microscope, and photographing at 100x magnification. Findings showed that the meristem anatomical structure is prominent and includes two cellular regions: Tunica and Corpus, So that at 2ppm concentration of selenium nanoparticles and sodium selenate, stretched prominence, and at 4 and 8ppm concentrations, the prominence intensity reduced. Distinct reaction to different concentration may be, in part, due to their difference uptake rate, change in signaling hormones such as ethylene, auxin, salicylic acid, and cytokinin. It is suggested to investigate the changes between relationship in the stem meristem anatomical structure and the genes expression pattern related to hormonal regulation in response to spraying of selenium nanoparticles and sodium selenate in plants.

Keywords: Tunica, Corpus, Meristem, Nanoparticle, Thymus fallax

22606 - Poster

Effects of Explant Type and Plant Growth Regulator Concentrations on Callus Induction in the Endangered Plant *Convolvulus persicus* L.

Sedigheh Kelij[1 *], Ehsan Nazifi[1], Saba Yasaghi[2]

1- Assistant professor, Department of plbiology, University of Mant azandaran, Babolsar, Iran
2- MSC student, Department of plbiology, University of Mant azandaran, Babolsar, Iran
*Corresponding Author: s.kelij@umz.ac.ir

Abstract

Convolvulus persicus L., a psammophyte halophyte of the Caspian Sea coast, is experiencing severe population decline due to habitat destruction and anthropogenic pressures. This study aimed to identify the most effective explant type and optimal levels of plant growth regulators for callus induction in seedlings of this endangered species. Explants including radicle, hypocotyl, and cotyledon were cultured on 1/2 MS medium supplemented with various concentrations of IBA (0, 0.1, and 0.5 mg L^{-1}) and BA (0, 1, and 2.5 mg L^{-1}). After 40 days of culture, callus induction percentage and parameters such as callus growth and surface area were recorded weekly. The results showed that hormonal treatments had a significant effect on callus induction percentage ($p<0.05$), with the highest values observed in treatments 1, 2, and 3 (100%) and the lowest in treatment 5 (52%). Callus area was also significantly affected by the treatments ($p<0.05$), with the highest mean observed in treatment 3 (33.66 mm^2) and the lowest in treatment 5 (5.34 mm^2). Among the explants, cotyledons exhibited the highest callus induction percentage and mean callus area, although the differences were not statistically significant ($p>0.05$). Different explants responded variably to the growth regulators, and optimizing these factors plays a crucial role in the conservation and in vitro propagation of this endangered species.

Keywords: *Convolvulus persicus*, Callus, Auxin, Cytokinin, Conservation

22436 - Poster

The Synergistic Effect of Mycorrhiza Symbiosis and Sodium Nitroprusside Treatment on Wheat Growth Indices under Water Deficit Stress

Fahimeh Arab Bafrani[1], Alireza Iranbakhsh[1 *], Iraj Mehregan[1], Mostafa Ebadi[2], Zahra Oraghi Ardebili[3]

1- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran,
2- Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran
3- Department of biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran

*Corresponding Author: iranbakhsh@iau.ac.ir

Abstract

Water deficit stress is a serious limiting factor for growth and yield of agronomic crops such as wheat (*Triticum aestivum* L.), leading to reduction in crop growth indices through impaired physiological and metabolic processes. The potential of biological and chemical elicitors can alleviate these negative impacts of water deficit stress. This study assessed the impact of arbuscular mycorrhiza (AM) fungal symbiosis and the application of sodium nitroprusside (SNP) on wheat growth indices under water deficit stress conditions. The experiment was conducted as a factorial in a randomized complete block design (RCBD) with three replications, with treatments as follows: control, mycorrhiza, sodium nitroprusside and mycorrhiza with sodium nitroprusside. Results revealed water deficit stress significantly reduced shoot dry weight, root and shoot length, leaf area, leaf area index (LAI), and relative growth rate (RGR). Mycorrhiza and sodium nitroprusside treatments, especially combined mycorrhiza with sodium nitroprusside resulted in a significant increase in growth indices under water deficit stress conditions, compared to water deficit stressed control. Based on these results, the synergistic effects of mycorrhiza and sodium nitroprusside could serve as an innovative method to decrease the negative impacts of water deficit stress and improve wheat growth indices under water deficit conditions.

Keywords: Wheat, Water deficit, Mycorrhiza, Sodium nitroprusside, Growth indices

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22492 - Poster

The Effects of Foliar Application of Chitosan and Sargassum Macroalgae on the Growth and Photosynthetic Pigments of *Cymbopogon citratus*

Fatemeh Khosheghbal Ghorabaei[1 *]

1- Department of Natural Resources Research, Agricultural and Natural Resources Research Center of Hormozgan Province, Agricultural Research, Education and Extension Organization (AREEO), Bandar Abbas, Iran
*Corresponding Author: khosheghbalf@yahoo.com

Abstract

One of the environmentally friendly approaches to enhance the growth and yeid of medicinal and agricultural plants is the use of biotic elicitors such as chitosan and seaweed extracts. This study was conducted to investigate the effect of chitosan at concentrations of 0.25 and 0.5 g/l and liquid macroalgae fertilizer from *Sargassum* seaweed at concentrations of 2 and 5 ml/l on some growth parameters and photosynthetic pigments of the medicinal plant lemongrass (*Cymbopogon citratus*) in a pot experiment with three replications at the Payam Noor University campus in Qeshm in 2022. The foliar spraying was performed one month after seed sowing on 30-day-old seedlings every 15 days. According to the results obtained, the liquid *Sargassum* seaweed fertilizer, unlike chitosan at both concentrations, especially at the higher concentration, caused a significant increase in photosynthetic pigments including chlorophyll a and b, total chlorophyll, carotenoids, as well as growth parameters such as plant height, number of leaves, fresh and dry weight of the plant compared to the control group. The negative effect of chitosan on some measured traits such as plant height and chlorophyll pigments compared to the control was statistically significant. Overall, based on the results of this study, the liquid *Sargassum* seaweed fertilizer is a better option than chitosan and can be used to improve the growth and yeild of the medicinal plant lemongrass.

Keywords: Alga, Chitosan, Elicitor, Extract, Lemongrass

21831 - Poster

The Effect of Foliar Application of Proline and Ascorbate on Secondary Metabolites of Saffron (*Crocus sativus* L.) under Drought Stress

Roya Karamian[1 *], Fateme Asadzadeh[1]

1- Department of Biology, Faculty of Basic Sciences, Bu-Ali Sina University, Hamedan, Iran
*Corresponding Author: karamian.roya@gmail.com

Abstract

This study investigated the effects of foliar application of proline and ascorbate on total phenol, flavonoid, and anthocyanin contents in saffron leaves under three irrigation levels (25%, 50%, and 75% of field capacity). Results showed that reduced irrigation significantly increased total phenol content; at 50% and 25% field capacity, phenol levels were 26.69% and 34.66% higher than the control, respectively. The highest flavonoid content (136.31 mg g^{-1} fresh weight) was obtained from the combined proline + ascorbate treatment. Under drought stress, the accumulation of phenols and flavonoids, acting as non-enzymatic antioxidants, played a key role in neutralizing free radicals and reducing oxidative damage. Ascorbate functioned as an enzymatic cofactor, while proline acted as a compatible osmolyte, both enhancing stress tolerance. Overall, foliar application of proline and ascorbate proved to be an effective approach for increasing secondary metabolite production and antioxidant capacity in saffron under water-deficit conditions.

Keywords: Phenol, Flavonoid, Anthocyanin, Anticancer, Antioxidant

22211 - Poster

Evaluation of the Inhibitory Effect of Cinnamon (*Cinnamomum* spp.) Extract on α-Glucosidase and Its Antioxidant Properties: A Perspective in Type 2 Diabetes Management

Somayeh Farahmand[1], Fatemeh Ghamari[2], Roonak Namdary[3 *]

1- Department of Biology, Payame Noor University, Tehran, Iran

*Corresponding Author: roonaknamdary@yahoo.com

Abstract

Type 2 diabetes is one of the most common and growing metabolic disorders worldwide, characterized by elevated blood glucose levels due to impaired insulin secretion or function. Unhealthy lifestyle changes are among the major contributing factors to the increasing prevalence of this disease. In recent years, medicinal plants have attracted attention as effective and low-side-effect options for diabetes management. Cinnamon (*Cinnamomum* spp.) is one such plant whose antidiabetic effects, particularly through α-glucosidase inhibition, have been reported. In the present study, the inhibitory activity of hydroalcoholic cinnamon extract against α-glucosidase was evaluated by cannoli method at 37 c for 30 minutes at wavelength 405 nm, its total phenolic content, and antioxidant capacity were evaluated by ABTS method at a wavelength 734 nm at different concentrations were evaluated. Data were analyzed using one-way ANOVA and Duncan's test at a significance level of 0.05. The findings revealed that at a concentration of 2.5 mg/mL, cinnamon extract inhibited 74.8% of α-glucosidase activity, while demonstrating an antioxidant capacity of 66.97%. The total phenolic content of the extract was determined as 27.9 mg gallic acid equivalent per gram. GC-MS analysis identified major compounds such as cinnamaldehyde (62%) and benzaldehyde (50%), which are previously recognized for their roles in improving insulin sensitivity and reducing oxidative stress. These results suggest that cinnamon extract, through its antioxidant activity and capacity to inhibit digestive enzymes, may serve as a complementary approach in diabetes management. However, further studies in animal models and clinical trials are required to confirm its efficacy and safety.

Keywords: Glucose metabolism, Herbal medicine, Insulin, Oxidative stress, Phenolic compounds.

22201 - Poster

Evaluation of Antioxidant, Phenolic, and Anthocyanin Compounds in the Pericarp of Three Iranian Pumpkin (Cucurbitaceae) Cultivars Grown in Saveh

Maryam Ghaneie[1 *], Mozhgan Farzami sepehr[1], Afsaneh Mohammadi nouri[1]

1- Department of Biology, Saveh Branch, Islamic Azad University, Saveh, Iran

*Corresponding Author: ghaneimaryam27@gmail.com

Abstract

Antioxidants are vital substances which possess the ability to protect the body from damage caused by free radical induced oxidative stress. Little information is available about its chemical composition and biological activity. this research was conducted to Evaluation antioxidant activity, anthocyanin and phenolic content of pericarp of Cucurbita. Despite wide cultivation this plant in Iran and its remedial and medicinal effects, Experiments did on three kinds of Iranian Cucurbita including pumpkin (*C. maxima*), spaghetti squash (*C. pepo* L.) and butternut (*C. moschata*) cultivated in Saveh in 1390. Statistical analysis with SPSS statistical software and test of Duncan performed. Differences were significant at $p<0.05$ in 3 cultivars. The results showed that the highest total phenol (13.08 ± 1.89 m/mg), anthocyanin (0.57 ± 0.02 m/mg) content and antioxidant activity (1.18 ± 0.024 m/mg) were found in pumpkin and the lowest levels in spaghetti squash. Also, correlations between the chemical content of each cultivar and the antioxidant index(R=0.01) were observed. The results suggest that chemicals such as anthocyanin and phenolic compounds are the contributors to the antioxidant activity in the plant.

Keywords: Cucurbitaceae, DPPH, Total phenols, Anthocyanins, Antioxidant activity.

22298 - Poster

Evaluation of the Defensive Mechanisms of Tobacco Plants under Conditions of Heavy Metal Cadmium Pollution

Hanieh Mohajjel Shoja[1 *], Parvaneh Mahmoudi[1], Elham Mohajel Kazemi[1], Maryam Kolahi[2]

1- Department of Plant Biology, Faculty of Natural Sciences, University of Tabriz, Tabriz, Iran
2- Department of Biology, Faculty of Sciences, Shahid Chamran University of Ahvaz, Ahvaz, Iran
*Corresponding Author: mohajelh@yahoo.com

Abstract

The heavy metal cadmium (Cd), recognized as an environmental pollutant, induces oxidative stress and disrupts the normal functioning of plants due to its high toxicity and propensity for accumulation in plant tissues. The objective of this research is to investigate the defensive mechanisms of the tobacco plant (*Nicotiana tabacum*), an important agricultural species and a commonly used model organism, in response to varying concentrations of 0, 1, 1.5, 2-, and 2.5-mM cadmium chloride ($CdCl_2$). The results indicated that with an increase in the concentration of $CdCl_2$, there was a significant reduction in the activity of the antioxidant enzyme superoxide dismutase (SOD), suggesting a compensatory role of increased activities of the protective enzymes catalase (CAT), ascorbate peroxidase (APX), and peroxidase (POD). The highest activities of these enzymes were observed at concentrations of 2, 2.5, and 2 mM, respectively. Additionally, the total phenolic content exhibited a significant increase with rising concentrations of $CdCl_2$, with the most pronounced increase occurring at a concentration of 1 mM. The total flavonoid content in treated plants was comparable to that of the control group. The findings of this study may contribute to a better understanding of the defensive mechanisms employed by tobacco plants under cadmium pollution conditions and provide insights for developing strategies to enhance plant resistance in contaminated environments.

Keywords: Antioxidant enzyme, Ascorbate peroxidase, Catalase, Phenolic content, Superoxide dismutase

22067 - Poster

Assessing the Efficiency of Hairy Root Culture of Chicory for Sustainable Production of Secondary Metabolites Influenced by Methyl Jasmonate

Seyedeh Morvarid Khalilian[1 *], Forough Sanjarian[1]

1- Department of Plant Bio-products, Institute of Agricultural Biotechnology (IAB), National Institute of Genetic Engineering and Biotechnology (NIGEB), Tehran

[*]Corresponding Author: khalilianmorvarid@gmail.com

Abstract

Chicory (*Cichorium intybus* L.), a medicinally important Asteraceae species, produces valuable bioactive compounds for pharmaceutical and food industries. Hairy root culture, known for its rapid growth, stable metabolite production, and genetic consistency, was employed to enhance these compounds. Hairy roots were induced from cotyledon leaves using *Agrobacterium rhizogenes* strain A4. Following propagation, the hairy roots were treated with methyl jasmonate (0, 50, 100, 150 µM) for 48 and 72 hours. A factorial completely randomized design assessed total phenolic components and sugars contents, with SPSS 26 for analysis. Harvest time, methyl jasmonate concentration, and their interaction significantly influenced total phenolic components and total sugar content ($p < 0.05$). The highest phenolics (808.99 ± 52.31 µg/mg Dw) occurred at 150 µM methyl jasmonate after 72h, while the lowest (152.80 ± 11.95 µg/mg Dw) was in controls after 48h. Conversely, the peak sugar content (200.48 ± 8.19 µg/mg Fw) was observed in the control group, while the lowest sugar content (107.40 ± 7.31 µg/mg Fw) was recorded at 150 µM methyl jasmonate, both measured after 48 h. Overall, an increase in methyl jasmonate concentration correlated with a rise in phenolic compounds and a decrease in sugar content, suggesting that sugars may serve as an energy source and precursor for the biosynthesis of phenolic compounds.

Keywords: *Agrobacterium rhizogenes*, *Cichorium intybus* L.

21415 - Poster

Induction of Stem Differentiation from *Cannabis sativa* Callus

Nasim Zarinpanjeh[1 *], Nasrin Qavami[1], Ardeshir Qaderi[1], Hadi Kalantari Khalilabad[1]

1- Medicinal Plants Research Center, Institute of Medicinal Plants, ACECR, Karaj, Iran

*Corresponding Author: zarinpanjeh@imp.ac.ir

Abstract

Cannabis sativa is an annual, herbaceous, dioecious plant and an important medicinal, fibrous, oil and edible plant and one of the oldest plants known to man, which has been an important source of food, medicine and fiber in Asia and Europe for thousands of years. *Cannabis* is very complex in terms of phytochemical composition and more than 480 different chemical compounds have been identified in it. Therefore, cannabis is a real factory producing secondary metabolites that are of high value in the pharmaceutical industry. Tissue culture is a fast, efficient alternative method to traditional plant propagation. In vitro regeneration has been reported in different genotypes and sources of cannabis explants, but with limited success. In the present study, cannabis leaves were used as explants to induce callus tissue in vitro. In the next step, calluses were established in different stem tissue induction media including MS culture medium as basal medium along with plant growth regulators and amino acid complexes at different concentrations. Based on the results obtained, MS medium containing 0.5 mg/L TDZ and 5 mL/L amino acid complex was determined to be the best indirect shoot generation medium in terms of shoot generation percentage (70%) and number of regenerated shoots per explant (2.5). In conclusion, this study introduces an efficient and reproducible method for cannabis regeneration from leaf-derived callus, which is useful for mass propagation and in vitro conservation of this important medicinal plant.

Keywords: Hemp, Indirect shoot differentiation

21362 - Poster

The Survey of Air Pollution Effect on Generative Meristem and Male Gametophyte Development in *Rosa banksiae* var.lutea

Sayeh Jafari Marandi[1], Taher Nejadsattari[2], Marziye Sadat Sadatian[3*]

1-Faculty member of Islamic Azad University, North Tehran Branch
2-Faculty member, Islamic Azad University, Science and Research Branch of Tehran
3-Graduate student at the Islamic Azad University, Science and Research Branch of Tehran
*Corresponding Author: ms.sadatian@yahoo.com

Abstract

The pollution phenomenon is one of the major problems around the world and Tehran is considered as one of the most polluted cities in the world due to air, soil and water pollution as a result of uncontrolled increase of vehicles. On the other hand, different biotic and abiotic tensions have affected plants fertility. The air pollutants may directly affect plants anther and other organs as well as the growth, performance, speed and rate of crops. *Rosa banksiae* var.lutea from the rosaceae family which is planted increasingly and is a native plant as a perennial shrub from west and central China with plenty of clustered flowers and full of petals and fewer flags. Plants cultivated in polluted air under treatment and clean air were sampled and their reproductive meristems were compared. The samples were demonstrated and then preparation steps were performed for molding with paraffin. By the aid of Microtome device model Leica, thin pieces were prepared and painted Hematoxylin and eosin and assessed by optic microscope model Zeiss. Moreover, pollens imaged by SEM microscope model EM3200. Results indicate that air pollution cause plant development to be accelerated from the vegetative to reproductive stage. Facilitated formation of primordium of the pistil and flag is one of the major effects of pollution in samples taken from those plants cultivated in polluted air. The ultrastructure study of pollen by electron microscope SEM indicate that the plant pollen is oval with three porous grooves and in polar view the edges are convex and the pores are round or square. The surface ornamentation of grooved exine with recessed and raised pattern are parallel in the tricolporated part. Under the effect of pollution treatment, abnormal ornamentations and frills were observed on the pollen surface. Moreover, the shape of pollens has been changed. Some of pollen were longer in their polar axis. The size of pollen in treated plants was very smaller than that of the equatorial axis and the length and diameter of the main groove and the length of the polar axis were smaller than the control.

Keywords: Air pollution, Development, Reproductive organs, Pollen

21420 - Poster

Exploring Effectiveness of Salicylic Acid and Methyl Jasmonate Elicitors in Influencing Growth Performance, Epigenetic Regulation, Gene Transcription, and Secondary Metabolism in Pepper (*Capsicum annuum* L.); an In-vitro Biological Assessment

Zeinab Hasanvand[1], Alireza Iranbakhsh[1 *], Sara Saadatmand[1], Zahra Oraghi Ardebili[2]

1- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran.
2- Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran
*Corresponding Author: iranbakhsh@iau.ac.ir

Abstract

Plants control epigenetic factors through their complex signaling networks. This study addresses how pepper (*Capsicum annuum*) seedlings respond to the incorporation of salicylic acid (SA; 0 and 10 µM) and/or methyl jasmonate (MJ; 0 and 10 µM) into the culture medium. The most pronounced morphological responses to the mixed MJ and SA treatments were the reinforced root system, stem shortening, and expanded leaves, implying possible changes in hormonal balance. SA was individually more effective than MJ in triggering changes in the DNA methylome profiles. The epigenetic cytosine methylation in the MJ+SA group differed from that of the individual treatments. The individual SA treatment led to severe DNA hypermethylation, which was modified with the MJ application. Besides, the MJ and/or SA-mediated upregulation in the histone deacetylase (HDA) gene confirmed the epigenetic regulation. The MJ elicitor showed greater effectiveness in influencing the transcription of target genes than the SA. The MJ and SA supplements synergistically upregulated the expression of the MAPK kinase and ethylene-responsive transcription factor (EREB) genes. The applied treatments contributed to a significant increase in root and leaf proline concentrations. The simultaneous application of MJ and SA supplements effectively stimulated secondary metabolism, indicated by increased soluble phenols and activity of the phenylalanine ammonia-lyase enzyme. The significant increase in catalase activity resulted from the elicitors applied. In addition to providing novel comparative insights into the action mechanism of MJ and SA elicitors, this study can provide a foundation for designing in-vitro culture systems and implementing field-scale designs.

Keywords: DNA methylation, Elicitor, Epigenetic, Gene regulation, In-vitro culture

22236 - Poster

Investigating the Moderating Effect of Silicon Nanoparticles on the Germination Stage of *Allium cepa* L. under Copper Stress

Faezeh Yaghoubi kohnedeh[1], Zohreh Shirkhani[1*], Mehrshid Riahi[1]

1- Department of Plant Sciences, Faculty of Biological Sciences, Kharazmi University, P. O. Box, 17719-14911, Tehran, Iran

[*]Corresponding Author: z.shirkhani@khu.ac.ir

Abstract

The expansion of the world population, rapid industrialization, and urbanization processes have led to an increase in pollutants, including pesticides, petroleum products, and heavy metals, in natural resources, which have toxic effects on plants. One of the essential heavy metals for plant nutrition is copper, which plays a crucial role in metabolic processes; however, this metal becomes toxic to plants in high concentrations. Silicon is the second most abundant element in soil and a non-essential metal for plants, but this element can stimulate plant growth and reduce the effects of various biotic and abiotic stresses. In this study, the effect of silicon nanoparticles (25 mg L^{-1}) on germination and early stages of onion (*Allium Cepa*) seedling growth under copper treatment (7.5, 15, 22.5 mg L^{-1}) was studied. Seed treatments were performed to calculate the parameters of germination percentage, germination rate, germination index, average germination time, average daily germination, and daily germination rate. According to the results obtained, in general, high copper concentration reduced germination parameters and seedling growth. The results showed that a concentration of 25 mg L^{-1} of silicon nanoparticles increased the parameters of germination percentage (18%), germination index (11%), germination rate (15%), mean germination time (12%) of onion under copper stress and had no significant effect on mean daily germination. According to the results obtained, the use of silicon nanoparticles reduced the negative effects of high copper metal concentration and increased the initial growth of seedlings and germination parameters, which confirms the hypotheses of the studies.

Keywords: Nanosilicon, Abiotic stress, Liliaceae, Germination, Copper sulfate

21413 - Poster

Exploring Effectiveness of Methyl Jasmonate on Growth, Biochemical, Phytochemical Responses and Expression of Some Genes of Green Pepper Plant (*Capsicum annuum* L.) under In vitro Conditions

Zeinab Hsanvand[1], Alireza Iranbakhsh[1 *], Sara Saadatmand[1], Zahra Oraghi ardebili[2]

1- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran.
2- Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran
*Corresponding Author: iranbakhshar@yahoo.com

Abstract

Methyl jasmonate (MJ) plays an important role in regulating the responses of green bell pepper plants to hormonal treatments. This substance is activated as a signaler in plant defense responses and helps to cope with damaging factors by stimulating the production of defense compounds such as phytoalexins. This study investigates the response of green bell pepper plants (*Capsicum annuum* L.) to methyl jasmonate (MJ) treatment at concentrations of 0 and 10 µM. Morphological responses resulting from these treatments cause strengthening of the root system and shortening of the stem along with expansion of the leaves, which indicates a change in the hormonal balance of the plant. This hormone has a significant effect on the transcription of target genes and especially stimulates the expression of MAPK kinase genes and the EREB transcription factor. Also, MJ increases the concentration of proline in roots and leaves, which plays a role in improving the plant's tolerance to stress. In addition, methyl jasmonate increased the activities of phenylalanine ammonia-lyase and catalase enzymes, indicating stimulation of secondary metabolism and increased antioxidant capacity of the plant. Overall, MJ is known as an effective factor in improving growth, stimulating defense and regulating metabolism in green bell pepper. This study shows that the use of MJ treatments can be an effective way to exploit hormonal and complementary treatments in MS culture medium in vitro.

Keywords: Plant response regulation, Secondary metabolism, Defense enzymes, Gene regulation, In vitro culture

21358 - Poster

Investigation of the Effect of Microgravity and Nitric Oxide on the Regulation of Peroxidase and Superoxide Dismutase Genes and Photosynthetic Pigments of *Capsicum annuum* In vitro

Behzad Khazaeian[1], Alireza Iranbakhsh[1 *], Mostafa Ebadi[2], Zahra Oragi ardabili[3]

1- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran.
2- Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran
3- Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran
*Corresponding Author: iranbakhsh@iau.ac.ir

Abstract

Microgravity is one of the abiotic stresses that affects on plant growth and development. In this study, the effect of simulated microgravity (7 days using a two-dimensional clinostat device; 1.12 ×10-3 g) and nitric oxide (SNP; 100 µM) into the culture medium on the regulation of antioxidant genes expression (peroxidase and superoxide dismutase) and photosynthetic pigments content in pepper (*Capsicum annum* L.) was investigated. The expression of the POX gene displayed an upward trend in response to the individual or mixed treatments of NO and microgravity (especially the mixed one). However, the observed difference between the NO and microgravity treatments was a non-significant variation at $p \leq 0.05$. Microgravity and nitric oxide treatments upregulated the SOD gene transcription compared to the control treatment, and considering the amount of SOD gene transcription, the difference recorded between microgravity and microgravity +nitric oxide treatments was a non-significant variation at $p \leq 0.05$. All three treatments of microgravity, nitric oxide, and nitric oxide+microgravity induced chlorophyll a and chlorophyll b. These findings can be applied to practical applications in fulfilling sustainable agriculture expectations.

Keywords: Elicitor, Clinoacetat, Antioxidants, Epigenetic

21337 - Poster

Investigation of the Effect of Microgravity and Nitric Oxide on DNA Methylation and Some Physiological and Phytochemical Characteristics of Pepper (*Capsicum annuum* L.) In vitro

Behzad Khazaeian[1], Alireza Iranbakhsh[1 *], Mostafa Ebadi[2], Zahra Oragi ardabili[3]

1- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2- Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran
3- Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran
*Corresponding Author: iranbakhsh@iau.ac.ir

Abstract

This study aimed to investigate the effect of microgravity, nitric oxide and their combination on DNA methylation and some physiological and phytochemical characteristics such as the amount of glycine betaine, protein, phenol, malondialdehyde and antioxidant enzyme activity of pepper (*Capsicum annuum* L.) in vitro. Microgravity is one of the abiotic stresses that affects on plant growth and development. In this study, the effect of simulated microgravity using a two-dimensional clinostat device (7 days , g: 1.12×10 -3) and nitric oxide (Sodium nitroprusside: 100 µm) were used in the culture medium both alone and in combination. Compared to the control, Microgravity, No, and Microgravity + No treatments resulted in 47%, 39% and 32% DNA hypomethylation, respectively. Glycine betaine content increased in all three treatments compared to the control with the highest being in the Microgravity + No treatment (39.7%), and this value was evaluated as 29.7% in the Microgravity and No treatment compared to the control. Protein content also improved in the Microgravity, No and the Microgravity+NO treatment by 13%, 36%, and 73% compared to the control, respectively. Catalase activity increased in the Microgravity, No treatment and the Microgravity + No treatment by 67.3%, 35% and 48% compared to the control, respectively. A decrease in malondialdehyde was observed in all three treatments, with the largest decrease being in the No treatment. These findings can be applied to practical applications in fulfilling sustainable agriculture expectations.

Keywords: Epigenetic, Elicitor, Antioxidants, Sodium nitroprusside

21487 - Poster

Investigation of the Antibacterial Effects of Hydroalcoholic Extract of Yarrow Plant on Two Strains of Gram-Positive and Gram-Negative Bacteria

Nazanin fateme Esmaeili[1 *]

1- Department of Cell and Molecular Biology, Roudehen, Islamic Azad University,
*Corresponding Author: nazaninesmaeili46@gmail.com

Abstract

Plant-derived extracts have shown significant medicinal and antibacterial properties. In this study, we investigated the antimicrobial properties of Yarrow extract on Escherichia coli and Lactobacillus acidophilus. Yarrow was collected from a natural herbarium, and the extraction was performed using alcohol soaking. The antimicrobial properties of Yarrow extract against Escherichia coli and Lactobacillus acidophilus were evaluated using the disk diffusion method and determination of the Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC).The results of this study showed that Yarrow extract has proper antimicrobial effects, which were more prominent against Gram-negative bacteria. According to this study, the highest MIC and MBC values were related to Lactobacillus acidophilus. Based on the findings of this study and comparison with previous studies, the hydroalcoholic extract of Yarrow has high antimicrobial potential and can be used as a natural antimicrobial agent and a suitable alternative to antibiotics in some microbial infections. This study can serve as a foundation for more detailed investigations of Yarrow's properties. However, further studies are necessary for definitive therapeutic use.

Keywords: MIC MBC, Medicinal Plants, Bacteria

21480 - Poster

Studying the Expression of Cytokinin Transport Genes in *Medicago truncatula*

Mahboobeh Azarakhsh[1 *], Zahra Namvar-Zahed[1]

1-Department of Cell and Molecular Biology, Faculty of Basic Sciences, Kosar University of Bojnord, Bojnord, Iran
*Corresponding Author: mahboobeazarakhsh@gmail.com

Abstract

Nitrogen fixation occurs through a symbiosis between plants of the legume family and bacteria of the Rhizobium family. As a result of this symbiosis, an organ called a nodule forms on the roots of the plants, which can convert or, in other words, fix molecular nitrogen (N2) into ammonia, which is the absorbable form of nitrogen. In this symbiotic relationship, both parties benefit. The plant receives absorbable nitrogen compounds, while the plant provides a habitat and a source of the necessary sugar for the bacteria. The cytokinin hormone plays an important role in the process of infection formation in the epidermis, as well as in stimulating the division of root cortex cells and nodule formation. Recently, it has been shown that the cytokinin transporter MtABCG56 (CK ATP-binding cassette (ABC) transporter) functions in the root epidermis in response to Rhizobium. This transporter can cause the efflux of cytokinin from the epidermis and consequently affect the process of nodule organogenesis in the cortex. The aim of this research is to study the expression of cytokinin transport genes during nodule development in *Medicago truncatula*. In this study, we first investigated the possibility of MtABCG gene expression in nodules formed under symbiotic conditions using transcriptomic data. Then, using the Symbimics database, the expression of each gene in the nodule was studied in comparison to the root. The resulting data show an increase in the expression of Medtr1g050525, Medtr4g011620, Medtr4g011630, Medtr7g098890, Medtr4g113070, Medtr8g014360, Medtr2g102660, Medtr2g102670, Medtr2g102640, and Medtr1g011650 genes in the nodule compared to the root.

Keywords: Cytokinin hormone, Nitrogen-fixing nodules, Cytokinin transport, ABCG genes

22297 - Poster

Investigation of Biochemical Parameters of *Aptenia cordifolia* before and after Flowering due to Treatment with Titanium Dioxide (TiO_2) Nanoparticles

Hanieh Mohajjel Shoja[1 *], Samira Behboudi[1]

1- Department of Plant Biology, Faculty of Natural Sciences, University of Tabriz, Tabriz, Iran
*Corresponding Author: mohajelh@yahoo.com

Abstract

In recent years, titanium dioxide nanoparticles (TiO_2-NPs) have garnered significant attention in biology and agriculture, owing to their high chemical stability, photocatalytic activity, and antibacterial properties. This study aimed to investigate the effects of varying levels of TiO_2-NPs (0%, 0.03%, and 0.05%), applied as a foliar spray, on selected biochemical indices of the medicinal and ornamental plant *Aptenia cordifolia* at two developmental stages: flowering initiation and full flowering. The experiment was conducted using a completely randomized design with three replications. The results indicated that foliar application of TiO_2-NPs increased phenol and flavonoid contents at the onset of flowering, but led to a decrease in their levels at full flowering. At the full flowering stage, the levels of all pigments including chlorophyll a, chlorophyll b, total chlorophyll, carotenoids, and anthocyanins increased. In contrast, at the onset of flowering, all pigments showed an increase except chlorophyll a. Additionally, increasing the concentration of TiO_2-NPs led to protein levels and a reduction in soluble sugars at both growth stages. TiO_2-NPs treatment also affected antioxidant enzyme activities. At the onset of flowering, catalase (CAT) activity decreased, while ascorbate peroxidase (APX) and peroxidase (POD) activities increased. In contrast, at full flowering, CAT and APX activities increased, whereas POD activity decreased. These changes suggest that the application of TiO_2-NPs stimulates the plant's defense system in response to nanoparticle-induced stress. To optimize their use, further research is recommended to determine the optimal dosage and to elucidate the molecular mechanisms underlying plant responses to TiO_2-NPs.

Keywords: Antioxidant enzymes, Defense system, Flowering, Photosynthetic pigments, Soluble sugar

21752 - Poster

Evaluation of the Effect of Aqueous Chamomile Extract (*Matricaria chamomilla*) on Healing of Second-Degree Burn Wounds in Male Wistar Rats

Farzaneh Fazeli[1 *]

1- Department of biology, Payame Noor University (PNU)
*Corresponding Author: seacorales@yahoo.com

Abstract

In this experimental study, the effect of aqueous extract of chamomile (*Matricaria chamomilla*) on healing second-degree burn wounds in adult male Wistar rats was evaluated. Burn wounds measuring 1 cm² were induced on the backs of anesthetized animals using a standard heat source. Rats were randomly divided into three groups: control (no treatment), sham (treated with Alpha burn ointment), and experimental (treated daily with chamomile extract at doses of 5, 10, 15, and 20 mg/cm²). Wound healing was assessed over 14 days by measuring wound area on days 3, 7, 10, and 14 using digital imaging and analysis software. Results showed that the chamomile-treated group had a significant reduction in wound size at all time points compared to the control and sham groups ($p < 0.05$). On day 14, the average wound size in the experimental group was approximately 40% smaller than in the control group. Histological analysis revealed an increase in fibroblasts and epithelial cells in the wound area of treated rats. H&E staining showed thicker epithelial layers, more organized tissue structure, and reduced inflammatory cell infiltration. These findings indicate that aqueous chamomile extract can accelerate wound healing and improve tissue regeneration by reducing inflammation and promoting cell growth. Chamomile may be considered a natural and effective option for treating second-degree burn injuries.

Keywords: Chamomilla extract, Burn wound, Wistar rat, Inflammation

21498 - Poster

Investigation of Filtration Effects on the Purity and Size of Plant-Derived Nanovesicles from *Salvia officinalis* L. Using PEG Precipitation

Maryam Sadat Bagheri[1]. Kimia Yarmohamadi[1]. Mina Zahiri[1] .Latife Karimzadeh Bardei[2]. Mohamad Nabiuni[1*]

1-Department of Cell and Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
2-Laboratory Animal Center & Cellular and Molecular Research Laboratory, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran

[*]Corresponding Author: nabiuni@khu.ac.ir

Abstract

Plant-derived exosome-like nanoparticles (PDENs) have shown significant potential in drug delivery and biotechnology. In this study, extracellular nanovesicles were isolated from *Salvia officinalis* L. leaves using polyethylene glycol (PEG6000) precipitation. Since many protocols lack specific details on filtration, we aimed to evaluate the effect of filter type and timing on exosome quality. In the first group, a single filtration step using a 0.22 µm mixed cellulose ester (MCE) membrane was performed before PEG addition. In the second group, an additional filtration step with a 0.22 µm cellulose acetate (CA) membrane was added after the final centrifugation. DLS analysis showed a more uniform size distribution in the CA group, with a dominant peak between 100-200 nm, whereas the MCE group exhibited polydisperse particles, including some larger than 1000 nm. Bradford assay indicated comparable protein concentrations: 294 µg/mL for MCE and 285 µg/mL for CA, suggesting no significant yield loss due to extra filtration. SEM imaging confirmed spherical morphology with diameters of 150–250 nm, slightly larger than DLS results, which is expected due to differences in measurement principles. Overall, these findings suggest that applying an additional filtration step using CA membranes can enhance exosome purity and size uniformity without reducing yield. This adjustment may serve as a valuable refinement in PEG-based isolation protocols for plant-derived exosomes.

Keywords: Plant exosome, *Salvia officinalis*, Filtration

21464 - Poster

Investigation of Multi-Walled Carbon Nanotubes on Physiological Indicators in the Developmental Stages of *Ricinus communis*

Zahra Fathi[1 *]

1- Department of Biology, Tehran University of Science and Research- Teacher and Head of Biology Department, Education Organization of Tabas, South Khorasan Province
*Corresponding Author: zhr.fathi@gmail.com

Abstract

Today, nanotechnology, as a new tool in biological and agricultural sciences, has provided numerous opportunities for improving plant growth and performance. Carbon nanotubes act as plant growth regulators and can change the morphology and physiology of plant cells. Castor oil plant (*Ricinus communis* L.), belonging to the family of Perennials, is an important medicinal plant. The aim of this study was to investigate the effect of MWCNTs on physiological characteristics related to the developmental stages of castor plant. For this purpose, foliar spray of different treatments of carbon nanotubes (0, 75, 100, 125, 250 and 500 µg/ml) was carried out for 45 days and their effects on indices such as chlorophyll a, b, a+b and total, superoxide dismutase, Catalase and polyphenol oxidase were investigated at different growth stages. The results showed that the highest amount of chlorophyll a, b, a+b and total was observed in the treatment of 1100 µg ml, the highest CAT activity was observed in the treatment of 75, and the highest PPO and SOD activity was observed in the treatment of 100. The increase in the activity of antioxidant enzymes at low concentrations of MWCNTs indicates the stimulation of the defense response. Low concentrations of nanotubes caused the antioxidant defense response against oxidative damage, but high concentrations of nanotubes may lead to oxidative damage, chloroplasts and DNA and reduce enzyme activity due to cytotoxicity and high production of ROS. These findings indicate the sensitivity of developmental stages to nanotube concentration, which can be a path to the targeted use of nanotechnology in improving the growth and performance of medicinal plants such as castor.

Keywords: MWCNTs, *Ricinus communis*, Chlorophyll, Antioxidant enzymes

22296 - Poster

Effect of Titanium Dioxide (TiO_2) Nanoparticles on Biochemical parameters of (*Aptenia cordifolia*) Across Three Vegetative Growth Stages

Hanieh Mohajjel Shoja[1 *], Masoumeh Bohli Bohl[1]

1- Department of Plant Biology, Faculty of Natural Sciences, University of Tabriz, Tabriz, Iran
*Corresponding Author: mohajelh@yahoo.com

Abstract

Titanium dioxide nanoparticles (TiO_2-NPs) have emerged as influential agents in plant biotechnology due to their unique physicochemical properties, impacting growth regulation, stress tolerance, and metabolic modulation. This study investigated the effects of foliar-applied TiO_2-NPs at concentrations of 0, 0.03%, and 0.05% on biochemical parameters in the medicinal and ornamental plant *Aptenia cordifolia*. Treatments were implemented in a completely randomized design with three replications and evaluated at 7-, 14-, and 21-day post application. Initial results showed that increasing TiO_2-NPs concentration caused a decrease in photosynthetic pigments (chlorophyll a, chlorophyll b, total chlorophyll, and carotenoids) and anthocyanins at 7 days, followed by a significant increase at 14 and 21 days. Phenolic content decreased at 7 days but increased by day 14, while flavonoid levels remained stable throughout. Protein content rose at 7 days under the 0.03% treatment and at 14 and 21 days with 0.05% TiO_2-NPs. Antioxidant enzyme activities were differentially affected; catalase (CAT) activity decreased at 7 and 21 days but increased at 14 days, ascorbate peroxidase (APX) activity significantly increased only at 7 days, and peroxidase (POD) activity steadily increased across all time points. These findings indicate a time and dose dependent activation of the antioxidant defense system and biochemical modulation in response to TiO_2-NPs stress. It is recommended that, when using TiO_2-NPs, the dose and timing of application be carefully considered to effectively induce adaptive and cellular responses in plants.

Keywords: Antioxidant enzymes, Defense system, Nanoparticle stress, Photosynthetic pigment, Protein content

22052 - Poster

Evaluation of Growth and Anatomic Changes in Witches' Broom Gall of *Salix alba*

Behrooz Salehi-Eskandar[1 *], Zahra Ghasemi-Dorcheh[2]

1- Department of Biology, Payame Noor University, Tehran, Iran
2- Department of Biology Education, Farhangian University, Tehran, Iran, Mailbox:14665-889
*Corresponding Author: behsalehi@gmail.com

Abstract

Phytoplasma causes witches' broom in the branches of willow trees (*Salix* spp.), which is transmitted by gall-inducing agents, and is characterized by dramatic deformation of the galled branches. This study aims to examine growth and anatomical changes by evaluating internode distance, leaf length, width, area, and cross-sectional stem structure in galled branches compared to symptomless branches. The ungalled and galled branches of Salix alba were collected from Najvan Park, Isfahan. Sampling was done randomly. Results showed that the length of internodes of the symptomless branches was 14-fold greater than galled branches of S. alba. The length and width of the leaves of symptomless were 8.8- and 2.7-fold, respectively, greater than those of leaves of witches' broom structure in S. alba. The leaf area in diseased S. alba branches was decreased by 93% as compared with that of healthy control leaves. The diameter of the stem cross-section in symptomatic branches was 1.7-fold of healthy branches. The stem cross-section of healthy branches was circular, in contrast to the stem of witches' broom branches (structure) in S. alba, which was irregular in shape. The cortex of healthy branches contained air cavities, which were less observable in the symptomless ones. The reduction in growth, accompanied by a decrease in leaf length and width and internode distances, indicates a change in the gene expression pattern in galled branches. This alteration in growth results in the unique gall structure, which provides optimal nutrients and a microenvironment and protects the galler from the threats of its natural enemies.

Keywords: Anatomy, Cross-section, Gall, Internodes, Willow

22617 - Poster

Morphological and Anatomical Study of Vegetative Structure of Tomato under Drought Stress

Elham Mohajel Kazemi[1 *], Sepideh Jamali[1], Maryam Kolahi[2]

1- Nuclear Agriculture School, Nuclear Science and Technology Research Institute (NSTRI), Atomic Energy Organization of Iran (AEQI), Karaj, Iran
2- Department of Biology, Faculty of Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran
*Corresponding Author: e.mohajel.k@gmail.com

Abstract

Drought stress is one of the major challenges for global agriculture, negatively affecting the growth and reproduction of plants, particularly crops like tomatoes. This stress can lead to reduced yield, product quality, and ultimately impact farmers' income. The present project investigates the anatomy of tomato plants (both tolerant and sensitive varieties) under drought stress (100%, 75%, 50%, and 25% of field capacity). For this purpose, samples were collected from different tissues of the plants, including leaves, stems, and roots, under drought stress treatments. Subsequently, thin sections of the sampled tissues were prepared and examined under a light microscope to analyze the anatomical structure and the changes resulting from drought stress. The results indicate that drought stress leads to an increase in the number of epidermal layers in the roots, while the diameter size of the roots does not show significant differences compared to the control plants. Epidermal cells in stressed plants exhibit a wrinkled and irregular shape, whereas those in the control plants are regular and elongated. In the stem anatomy, there is an increase in the thickness of the transverse wall of the vascular bundles in stressed plants, which is attributed to higher lignin deposition. Additionally, stressed plants show a greater number of trichomes compared to the control plants. In the leaf anatomy, significant changes in the vascular system were observed, indicating a decrease in the number of vessels in stressed plants; at the same time, the thickness of the vessel walls also increased. Overall, the findings of this study suggest that under drought stress conditions, the tolerant variety of tomato achieves significant anatomical adaptations, which can lead to better tolerance to water stress. These anatomical changes contribute to a better understanding of plant adaptability under environmental stresses and provide insights for breeding strategies to enhance drought resistance in tomatoes.

Keywords: Tolerant variety, Root, Stem, Leaf, Lignin

21377 - Poster

Pollen Morphology and Development of 27 Species of the Genus *Fritillaria*

Fatemeh Mohsennezhad[1 *], Hadi Amini mehr[1], Gholamreza Bakhshi khaniki[1]

1-Department of Biology, Payam Noor University, Tehran, Iran.

*Corresponding Author: fatemeh_mohsennezhad@pnu.ac.ir

Abstract

Fritillaria, from the Liliaceae family, includes species with a wide geographical distribution and high morphological diversity. It is one of the valuable plants native to the mountainous regions of Iran, which has high ecological and genetic importance due to its beauty, medicinal properties, and risk of extinction. In this study, in order to investigate Pollinological characteristics and help in species identification and differentiation, the structure and surface decoration of pollen grains of several species of this genus were studied using scanning electron microscopy (SEM). 27 species from four subgenera of the 10 known subgenera *Fritillaria*, *Rhinopetalum* Fisch., *Theresia* Koch and *Petilium* L. Endl. of the genus *Fritillaria* were studied. Control specimens are kept in the herbarium of the University of Gothenburg, GB, Sweden. The results showed that pollen grains in all species were tricolpate, and differences were observed in terms of overall shape (elliptical, spherical) and the type of surface decoration reticulate, verrucate, rugulate and psilate. These differences can be used as useful palynological traits in determining phylogenetic relationships and identifying closely related species. The results of this study demonstrate the importance of pollen grains in the intragenus *Fritillaria* phylogeny. The studies conducted can be used in breeding programs and germplasm conservation of the *Fritillaria*.

Keywords: *Fritillaria*; Polinology, Electron microscopy, Pollen grains, Surface decoration, Plant systematic.

21630 - Poster

Anatomical Structure Survey of Vegetative Organs,Ontogeny of generative organs in (*Heracleum persicum* Desf. ex Fischer.)

Sayeh Jafari Marandi[1], Faegheh Behzadifar[1], Ahmad Majd[1], Fahimeh Salimpour[1], Sedigheh Arbabian[1]

1- Department of Biology, Faculty of Biological Sciences, North Tehran Branch, Islamic Azad University
*Corresponding Author:Jafarisayeh@Gmail.com

Abstract

Heracleum persicum is a perennial herbaceous pastureland plant belongs to Apiaceae family, which has been recorded in Iranian traditional medicine. In this report developmental reproductive steps were studied. Flower buds at different developmental stages were collected and fixed in FAA then maintained in Ethanol (%70). After preparation and embedding samples in paraffin, the samples were sectioned by microtome and stained with Hematoxyline-Eosine respectively and analyzed with a photomicroscope and suitable samples were photographed. The results of this study showed that the sequence of floral organ establishment follows an apical order. Stamen and gynoecium formation occurred with the time interval. The flower consists of five sepals, five isolated petals, five stamens and the inferior ovary with two carpels. The anther wall consists of the epidermis, mechanical layer, Middle layer was transient and tapetum was of secretory type. The anthers are tetra sporangiate type and pollen grains are binuclear and have three colpates. Embryo sac is formed corresponding to the polygonum type.

Keywords: Ontogeny, Heracleum persicum, Anther, Pollen grains, Apiaceae.

22324 - Poster

Evaluation of Antioxidant Enzyme Activities in Transgenic Tobacco Seedlings under In Vitro

Gita Amini[1 *], Hanieh Mohajjel Shoja[1]

1- University of Tabriz, Faculty of Natural sciences

*Corresponding Author: gita.amini85@gmail.com

Abstract

Agrobacterium rhizogenes are Gram-negative soil bacteria known to induce diseases in plants, particularly dicotyledons. The rolA, rolB, and rolC genes of *A. rhizogenes* are implicated in the hairy-root syndrome and have been demonstrated to elevate antioxidant enzyme activities in infected plants. This study examines the effect of the rolC gene and its homolog, designated as trolC, on the activities of antioxidant enzymes in transgenic *Nicotiana tabacum* under in vitro conditions. To this aim, transgenic tobacco seeds carrying rolC and trolC were cultured on Murashige and Skoog (MS) medium in Petri dishes. Four-week-old seedlings from all treatments were cultured to prepare crude extracts, and enzyme activities were assayed spectrophotometrically. Given that the promoters of both genes are inducible, transgenic lines were subjected to dexamethasone treatment, while untreated seedlings served as controls. Results indicate a rise in the activities of key antioxidant enzymes, including peroxidase (POD) and ascorbate peroxidase (APX), in induced seedlings relative to controls, whereas catalase (CAT) activity exhibited a corresponding decline. Superoxide dismutase (SOD) did not show a statistically significant difference between control and induced plants. Data were analyzed using Microsoft Excel and SPSS. The parallel patterns observed across both tobacco lines suggest that, over time and during plant development, the functional characteristics of the trolC gene are conserved.

Keywords: *Agrobacterium rhizogenes*, *Nicotiana tabacum*, rolC/trolC

22634 - Poster

Study of Phytochemical & Antioxidant of Sympatric Plants; *Hypericum scabrum* and *H. perforatum*

Zahra Baghaeifar[1 *], Mahin Foladi[1]

1- Department of Bilogy, Faculty of Basic Science, Payame Noor University , Thehran, Iran
*Corresponding Author: z_baghaeifar@pnu.ac.ir

Abstract

The aim of this research is to investigate the effect of different stages of development on some secondary metabolites and antioxidant activity of plants from the same habitats in the western of Iran. For this purpose, the desired plants were first collected, the samples were dried powder was prepared extracts were extracted by methanolic method. The amount of total phenol and flavonoid was measured by Folin-Ciocaltio method and aluminum chloride colorimetric method, respectively. To measure the antioxidant activity of the extracts, the method of measuring the reduction of radical capacity with the help of the stable radical 2-2-diphenyl-1-picrylhydrazyl (DPPH) was used. Statistical analysis was done with SPSS software and comparison of averages was done with Duncan's test. The amount of total phenol in the leaves of gerbera grown in Cherdavel (7.53 ± 1.01 and 7.07 ± 0.21 mg of gallic acid per dry weight, respectively), the total flavonoid content of the vegetative part (leaf) (respectively 11 2.63 ± 0.2 and 2.27 ± 0.21 mg of quercetin per gram of dry weight), and the higher antioxidant capacity of gerbera leaves in Cherdavel habitat (70.73 ± 4.13 mg/ml; the lowest IC50) and The vegetative part (flower) in Al-Shatre habitat with 101.89 ± 5.43 mg/ml had the highest IC50 value, that is, the lowest antioxidant activity. The results showed that there is a difference between the amounts of antioxidant activity in different ecological conditions and different parts of the plant. The higher of these values is due to the lower altitude and higher average temperature of the Cherdavel habitat compared to Elshtar, and of course the plant produces a higher amount of secondary metabolites in order to deal with environmental stresses.

Keywords: Vegetative part, Developmental stage, Marigold flower, Antioxidant capacity, Secondary metabolites

22189 - Poster

Phytochemical Investigation of Medicinal Compounds in *Stachys lavandulifolia* L. from Kharqan and Nobaran Areas of Saveh City, Markazi Province

Mozhgan Farzami sepehr[1 *], Atefeh Javanbakht[1]

1- Department of Biology, Saveh Branch, Islamic Azad University, Saveh, Iran
*Corresponding Author: mfsepehr48@gmail.com

Abstract

Stachys lavandulifolia L. (mountain tea), a medicinal species of the genus Stella, has long been valued for its therapeutic effects in treating anxiety, digestive disorders, and genital tumors. Since the medicinal properties of plants are influenced by ecological factors, this study examined the chemical composition of essential oils from plants collected in two regions of Markazi province (Kharqan and Nobaran). Aerial parts were harvested in May 2016, dried, and subjected to essential oil extraction using both the Clevenger apparatus and microwave-assisted methods. The oils were analyzed by gas chromatography–mass spectrometry (GC–MS) to identify bioactive compounds. Results indicated significant differences in essential oil yield and composition between the two regions and extraction methods. In Kharqan samples, oxygenated compounds such as 1,8-cineole, chrysanthenone, camphor, borneol, and α-terpineol, along with monoterpene hydrocarbons like α-pinene and paraxylene, were more abundant under microwave extraction, while germacrene D decreased. In Nobaran samples, oxygenated compounds (e.g., 1,8-cineole, pinocarvone, lavandulyl acetate) and sesquiterpenes (e.g., caryophyllene, aromadendrene, α-humulene) were higher with microwave extraction, though α-amorphene and dihydroaromadendrene were lower.Overall, microwave extraction at 700 W produced greater essential oil yield and higher concentrations of bioactive compounds, with clear regional differences highlighting the medicinal potential of *Stachys lavandulifolia*.

Keywords: Mountain tea, medicinal compounds, essential oils, GC–MS, Nobaran, Kharqan

21392 - Poster

Comparative Study of the Structure and Development of Male Reproductive Organs of *Suaeda maritima* and *Salsola crassa* Plants from the Amaranthaceae Family in the Presence of Industrial Wastewater Pollutants

Narges Sadat Mohammadi[1 *]

1- Zand Institute of Higher Education
*Corresponding Author: mohamadijahromin@gmail.com

Abstract

Heavy metal pollution can cause new damage to plants from different aspects. One of these damages is the changes that occur on the developmental stages of different plant organs, and if the reproductive organs are also affected, it may affect the life of the plant and subsequent generations. In this study, the developmental stages of male reproductive organs in two halophyte plant species, *Salsola crassa* and *Suaeda maritima*, are examined and compared. Plants were selected and delimited at the beginning of their developmental stages in their natural environment. Three 1.5×1.5 m2 areas were irrigated as control with tap water, and three areas with similar characteristics were irrigated with industrial wastewater, for three months. Male reproductive organs were separated and fixed in FAA, then, dehydrated and sectioned using a microtome device. Light microscope was used to observe, while Quantitative analysis of structural studies was performed using stereology software. The results show that *Salsula* and *Suaeda* plants usually undergo flowering from late August, the mature pollen grains are spherical, have decorations, two exine and intine layers, and two vegetative and generative nucleous. the treated pollen grains in both species showed a significant decrease in number, size, shape, mechanical layer thickness and pollen grain diameter. The longitudinal split in the treated pollen sacs formed earlier and the pollen grains were released earlier, as well. The treated flowers were also smaller in size and formed later than the control samples. Finally, industrial pollutants affect some structural aspects, but not their survival.

Keywords: Halophytes, Heavy Metals, Anatomy, Flower, Pollution

22187 - Poster

Optimizing the Production of Kampucha Fermented Tea to Produce More Medicinally Useful Bioactives

Mozhgan Farzami sepehr[1 *], Sina Nabavi[2], Sara Saadatmand[2]

1- Department of Biology, Saveh Branch, Islamic Azad University, Saveh, Iran
2- Department of Biology, Faculty of College of Convergent Sciences and Technologies, Islamic Azad University, Science and research Branch, Tehran, Iran
*Corresponding Author: mfsepehr48@gmail.com

Abstract

The growing consumer demand for fermented and functional beverages has encouraged the development of new pharmaceutical formulations. In this study, kombucha tea (SCOBY) was produced using Echium tea, chamomile tea, and honey as substrates. The fermentation process was evaluated by measuring pH, acidity, turbidity, acetic acid concentration, reducing sugars, and sensory indicators of taste and aroma on the 14th day of cultivation. Results showed that honey significantly influenced pH and sensory properties ($P < 0.05$). Chamomile tea exerted a greater effect on fermentation compared to other substrates. Culture media containing honey exhibited higher acidity, turbidity, and reducing sugar levels compared to the control. The highest values of acidity, acetic acid, reducing sugars, and turbidity were observed in Echium tea with honey, although this sample received the lowest sensory scores. Conversely, the highest pH values were recorded in chamomile tea with honey and chamomile tea with sugar substrates. The best sensory evaluations were obtained from black tea with honey and black tea with sugar. Overall, the findings suggest that honey serves as a suitable substrate and carbon source, while Echium tea and chamomile tea enhance the production of bioactive compounds with potential medicinal benefits.

Keywords: Kombucha, Echium tea, Chamomile tea, Honey, Fermentation, Bioactive Compounds

22419 - Poster

Optimization of Regeneration and Enhancement of Total Terpenoid Content in the Medicinal Plant *Lallemantia iberica* Using Chitosan

Reyhaneh Jafari[1], Parisa Jonoubi[1 *], Zohreh Shirkhani[1]

1- Department of Plant Sciences, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: jonoubi@khu.ac.ir

Abstract

Medicinal plants are widely recognized as valuable natural resources due to their extensive applications in pharmaceutical, food, cosmetic, and healthcare industries. The Lamiaceae family is particularly rich in bioactive secondary metabolites, whose sustainable production can be enhanced through tissue culture and elicitation strategies. In this study, an efficient in vitro regeneration protocol was developed for the endemic medicinal plant *Lallemantia iberica*, with the additional aim of evaluating the influence of chitosan on total terpenoid accumulation. Sterilized seeds demonstrated 70% germination in hormone-free basal medium without mineral salts, whereas the presence of MS salts markedly inhibited germination. Cotyledonary leaf explants obtained from 10-day-old seedlings were cultured on regeneration media with varying plant growth regulators. The highest regeneration frequency (80%) was achieved on MS medium supplemented with 1 mg L^{-1} BA and 3 mg L^{-1} kinetin. Subsequent shoot multiplication revealed optimal proliferation (30%) on MS medium containing 3 mg L^{-1} kinetin, 1.5 mg L^{-1} TDZ, and 0.5 mg L^{-1} NAA. To enhance the accumulation of secondary metabolites, chitosan treatments at concentrations of 0, 100, 200, and 300 mg L^{-1} were applied, and measurements were performed after 0, 5, and 10 days. The maximum terpenoid content was observed at 300 mg L^{-1} chitosan after 10 days, indicating its strong elicitor effect. Overall, the results demonstrate that chitosan significantly enhances terpenoid biosynthesis in *L. iberica*, while the optimized regeneration and proliferation protocols provide a reliable platform for biotechnological applications.

Keywords: Elicitor, Proliferation, Seed germination, Shoot regeneration, Secondary metabolite

22503 - Poster

Biochemical and Antioxidant Responses of Medicinal Sage (*Salvia officinalis*) under Electromagnetic Field Exposure

Zahra Goudarzi [1], Sedigheh Arbabian[*1], Masoumeh Mirzai[1], Ahmad Majd[1]

1- Department of Biological Science, Islamic Azad University, Tehran North branch, Tehran, Iran
*Corresponding Author: arbabias@gmail.com

Abstract

Since electronic devices are prevalent, living organisms have come into higher exposure to electromagnetic fields (EMFs). The EMFs as environmental stresses have the potential to affect plant physiological processes. Antioxidant defense is one of the adaptive mechanisms against oxidative stress induced by EMFs in plants. Although numerous research studies have investigated the effects of EMFs on living organisms, most of them have focused on animal systems, and limited information exists regarding plant antioxidant responses. This research was conducted to assess the impact of a 3 mT electromagnetic field, when the exposure duration was set to 30 and 60 minutes, on medicinal sage (*Salvia officinalis*). The seeds were treated with EMF and then cultivated. During the vegetative phase, the leaves' methanolic extracts were made, and the amounts of phenolic compounds, flavonoids, and anthocyanins, and the activities of catalase, peroxidase, and superoxide dismutase were assessed. The total antioxidant capacity by the method of DPPH was also measured. The experiment revealed significant increases in antioxidant enzyme activity and phenolic, flavonoid, and anthocyanin compound buildup by comparison with the control. The maximal stimulation was found in the 60-min treatment. From the experiment, it can be deduced that extremely low-frequency EMFs are capable of stimulating the formation of reactive oxygen species (ROS), thus triggering the defense mechanisms of the plant and elevating antioxidant potential. Overall, the result implies the possibility of the EMFs acting like a biostimulant, increasing the value of medicinal crops and the production of bioactive compounds. The result could pave the way to new perspectives of the selective exploitation of the EMFs, aside from sustainable farming, also in the alimentary and in the pharmaceutical industries.

Keywords: Electromagnetic field, *Salvia officinalis*, Antioxidant, Antioxidant enzymes, Phenolic compounds, ROS

22443 - Poster

The Effect of Ultrasonic Waves on Photosynthetic Pigments in Callus Culture of *Artemisia aucheri* Boiss

Samine Jamshidi[1], Zahra Rezayatmand[1*]

1- Department of Biology, Falavarjan Branch, Islamic Azad University, Isfahan, Iran
Corresponding Author: zrezayatmand12@yahoo.com

Abstract

This study investigated the effects of ultrasonic waves on the content of photosynthetic pigments in whole plants and callus of *Artemisia aucheri* Boiss. Ultrasonic treatments were applied using an ultrasonic bath at frequencies of 45 and 60 kHz, for durations of 60 and 120 seconds, with one and two application cycles, to in vitro-grown plants and calli. Twenty-one days after the final treatment, photosynthetic pigment content was measured according to the method described by Lichtenthaler and Wellburn (1983). The results demonstrated that the effect of ultrasonic waves depends on tissue type (whole plant vs. callus), frequency, duration, and number of treatment applications. In callus, the highest chlorophyll a and b content was observed in the treatment at 60 kHz for 60 seconds with one application cycle. Additionally, the highest carotenoid content in callus was obtained with the treatment at 45 kHz for 60 seconds with two application cycles. In aerial plant parts, a reduction in all three pigments was observed compared to control plants. The most significant decrease occurred in the treatment at 60 kHz for 60 seconds with two application cycles. Overall, it can be concluded that ultrasonic waves significantly alter the content of photosynthetic pigments. These changes may be attributed to induced oxidative stress and disruption of the plant's physiological balance in response to the applied stress. The differential response of callus and whole plants is likely due to differences in tissue o

Keywords: Callus, *Artemisia aucheri*, Photosynthetic pigments, In vitro culture

21505 - Poster

The Effect of Different Concentrations of Salicylic acid on Anthocyanins, Total Phenols, Flavonoids, and Plant Hormones Content of *Thymus daenensis* Celak under In vitro Conditions

Anita Daryani said[1], Fatemeh Zarinkamar[1 *]

1- Department of plant sciences, Faculty of biological sciences, Tarbiat modares university, Tehran city.
*Corresponding Author: zarinkamar@modares.ac.ir

Abstract

Thymus daenensis, from the Lamiaceae family, is of medical and economic importance due to its bioactive compounds such as monoterpenes (like thymol and carvacrol), sesquiterpenes, phenols, and flavonoids. Salicylic acid (SA), as an endogenous signaling molecule,plays a pivotal role in regulating the physiological and biochemical responses of plants to enviromental stresses. TO investigate the mechanisms of SA effects, a study was conducted on *T. daenensis* under tissue culture condition. Sterilized seeds were placed on MS medium containing 30 g/L sucrose and 2 g/L phytagel. After 21 days, uniform seedings were transferred to MS medium containing 0,25,50 and 100 micromolar SA. After two weeks, the content of anthocyanins, phenols, and flavonoids was measured with spectrophotometer, and the content of abscisic acid, gibberellic acids, indole acetic acid, and methyljasmonate hormones were quantified using HPLC. The results showed that the total phenolic content increased at 50 and 100 micromolar SA concentrations, reaching its maximum at 100 micromolar. In contrast, anthocyanin content significantly decreased at 50 and 100 micromolar concentrations. Abscisic acid, gibberellic acid, and indole acetic acid hormones decreased under SA treatments, while methyl jasmonate increased, reaching its maximum at 50 micromolar. The results indicated that salicylic acid at different concentrations induces complex changes in the biosynthetic pathways of secondary metabolites and hormonal balance in *T.daenensis*.

Keywords: Metabolites, Salicylic acid, *Thymus daenensis*, Tissue culture

22575 - Poster

Effect of Melatonin on Morphological Growth of the Medicinal Plant *Hyoscyamus niger* L. under In Vitro Culture Conditions

Zahra Mehravar[1], Alireza Iranbakhsh[2 *], Azade Hekmat[2], Zahra Oraghi Ardebili[2], Mostafa Ebadi[2], Azade Hekmat[1]

1- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran.
2-Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran

[*]Corresponding Author: iranbakhsh@iau.ac.ir

Abstract

Melatonin is recognized as a strong growth regulator and antioxidant in plants, playing a crucial role in enhancing vegetative growth and strengthening plant resistance against environmental stresses. This study investigated the effects of melatonin at different concentrations on the morphology and vegetative growth of the medicinal plant *Hyoscyamus niger* L. under in vitro culture conditions. The results showed that melatonin at the highest concentration used significantly increased the morphological parameters of the plant. These improvements included an increase in the number of leaves, leaf surface area, root length, and fresh and dry weight, indicating better growth and greater development of the plant's vegetative structures. Melatonin, due to its antioxidant properties, helps reduce the harmful effects of environmental stresses and enhances biochemical processes related to plant growth. The chemical structure of melatonin is similar to the hormone auxin, allowing it to activate growth and developmental pathways through specific receptors. Additionally, melatonin improves germination and vegetative growth by upregulating genes involved in the biosynthesis of growth hormones such as gibberellins. These combined characteristics make melatonin an effective supplement in agriculture and laboratory culture. Ultimately, melatonin positively influences morphological growth and increases plant resistance, serving as an important tool for improving the quality and yield of medicinal plants. These findings suggest that melatonin can be used as a natural and eco-friendly method to enhance plant health and performance

Keywords: Melatonin, *Hyoscyamus niger* L., Anti Oxidan, Morphology, In vitro culture

22523 - Poster

The Effect of Melatonin in Modulating the Impact of Microgravity on the Morphological Traits of *Eruca sativa* L. in In Vitro Culture System

Hilda Amiripour[1], Alireza Iranbakhsh[1], Sara Saadatmand[2], Fateme Mousavi[3], Zahra Oraghi Ardebili[3 *]

1- Department of Biology, Science and Research Branch, Islamic Azad University, 1477893855, Tehran, Iran.
2-Air and Space Physiology Research Group, Aerospace Research Institute (ARI), Ministry of Science, Research and Technology (MSRT), Tehran, Iran.
3-Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran.
*Corresponding Author: zahraoraghi@yahoo.com

Abstract

Living in space and conducting space missions require cultivating plants under specialized conditions where various stresses, including microgravity, affect plant growth. The application of elicitors is recognized as an effective and promising approach to enhance plant tolerance against diverse abiotic stresses. In this study, the effect of the elicitor melatonin on alleviating the impacts of clinostat rotation on the seedlings of *Eruca sativa* L. (rocket) was investigated from structural and morphological perspectives. A completely randomized design experiment was conducted with treatments including control (without elicitor and natural gravity), melatonin (100 µM), microgravity, and microgravity combined with melatonin. Results demonstrated that microgravity significantly disrupted plant growth and morphology, while exogenous melatonin improved growth parameters under stress conditions. Under microgravity, compared to the control group (stem length 9.1 mm and root length 8.03 mm, respectively), a 46.15% reduction in stem length (4.9 mm) and 41.44% reduction in root length (4.7 mm) were observed. Moreover, melatonin application under clinorotation conditions did not show a significant difference in stem length compared to the control. Additionally, root length improved to 7.30 mm under these conditions compared to 4.70 mm in microgravity-stressed plants, and total fresh weight and dry weight increased to 0.33 g and 0.015 g, respectively. Exogenous application of melatonin (100 µM) modulated the clinorotation effects on structural indices. This effect is likely mediated through the activation of gene signaling pathways and metabolic processes. Investigating these dimensions opens new avenues for further studies on the use of elicitors to optimize plant cultivation in space environments exposed to harsh conditions.

Keywords: Melatonin, Morphology, Abiotic Stress, Clinorotation, Microgravity

22377 - Poster

Impact of Auxin-Derived Carbon Dots Nonopriming on Wheat (*Triticum aestivum* L.) Seed Performance

Afagh Yavari[1 *], Ghasem Noorkhajavi[2], Meysam Najaflou[3], Mehdi Shahgolzari[3]

1- Department of Biology, Payam Noor University, Tehran, Iran
2- Department of Microbiology and Immunology, Faculty of Medicine, Ardabil University of Medical Sciences, Ardabil, Iran
3- Department of Medical Nanotechnology, Faculty of Modern Medical Sciences, Tabriz University of Medical Sciences, Tabriz, Iran
*Corresponding Author: yavari.afagh@pnu.ac.ir

Abstract

Carbon dots (CDs), due to their outstanding optical properties and multifunctional performance, are recognized as promising nanomaterials for bioimaging and agricultural applications. In this study, auxin-derived carbon dots (Aux-CDs) were synthesized via a one-step hydrothermal method in an environmentally friendly and cost-effective manner. This approach involved introducing a mixture of auxin and water into a reactor. The synthesized carbon dots were characterized using UV transilluminator, UV-Vis spectroscopy (absorption at 470 nm), dynamic light scattering (DLS), photoluminescence spectroscopy (PL), scanning electron microscopy (SEM), transmission electron microscopy (TEM), and Fourier-transform infrared spectroscopy (FT-IR). Subsequently, the effects of Aux-CD nanopriming on wheat seeds (Drum and Ehsan cultivars) were investigated. The presence of fluorescence in Aux-CDs and their uptake by seedlings were confirmed using a UV transilluminator. The carbon dots exhibited a total quantum yield of 43%, a zeta potential of −37.8 mV, and an approximate size of 10 nm. Nanopriming of wheat seeds with Aux-CDs significantly improved seed germination rate and performance index in Drum and Ehsan cultivars at low concentration (1 µg/mL) compared to high concentration (10 µg/mL). The results demonstrated that Aux-CDs synthesized via the one-step hydrothermal method possess high quantum yield and biocompatibility, and can serve as multifunctional nanomaterials for bioimaging and enhancing plant growth in agricultural research.

Keywords: Carbon dot (CD), Bioimaging, Hydrothermal synthesis, Wheat seeds

22165 - Poster

The Effect of Zinc Oxide Nanoparticles on the Anatomy of Pollen Grains in Spinach

Elham Mohajel Kazemi[1 *], Ftemeh Zebhi[2], Haniyeh Mohajjel Shoja[2]

1- Department of Plant, Cell and Molecular Biology, Faculty of Natural Science, University of Tabriz, Tabriz, Iran.
2-Nuclear Agriculture School, Nuclear Science and Technology Research Institute (NSTRI), Atomic Energy Organization of Iran (AEQI), Karaj, Iran

*Corresponding Author: e.mohajel.k@gmail.com

Abstract

Nanoparticles, with their extremely small dimensions and unique physical and chemical properties, are currently widely applied in biological fields. Among these, pollen grains play a crucial role as a fundamental reproductive system in flowering plants, essential for the survival and reproduction of species. This research investigates the effect of zinc oxide nanoparticles on spinach plants, particularly during the reproductive stage, focusing on the anatomy of pollen grains. In this study, zinc oxide nanoparticles (at concentrations of 35, 75, and 150 mg/l) were applied to the spinach plants. The results indicated that at higher concentrations of zinc oxide nanoparticles, the size of the pollen grains showed a significant reduction compared to the control samples. Microscopic examinations revealed the destruction of the cytoplasm of pollen grains in plants treated with concentrations of 75 and 150 mg/l of zinc oxide nanoparticles, with the impact at 150 mg/l being particularly severe; pollen grains became mostly non-viable and amorphous (lacking a definite shape). These findings clearly demonstrate that zinc oxide nanoparticles, especially at high concentrations, can have detrimental effects on the structure and anatomical function of pollen grains.

Keywords: Microscopic study, Cytoplasm

22191 - Poster

The Effect of Blue Light on Proline Precursors and Enhanced Salt Tolerance in Wheat Seedlings

Maryam Ghaneie[1 *], Mozhgan Farzami sepehr[1]

1- Department of Biology, Saveh Branch, Islamic Azad University, Saveh, Iran
*Corresponding Author: ghaneimaryam27@gmail.com

Abstract

Salt stress is one of the most important environmental factors limiting plant growth and crop production. This limitation is due to the impact of salt stress on various physiological aspects and the growth and development of plants. Plant structure is regulated by light signals emitted from the environment. Light is a source of energy for photosynthetic organs, and the wavelength of light plays a significant role in plant growth. To investigate the effect of blue light on delta-1-pyrroline-5-carboxylate (a proline precursor) in seedlings of two wheat cultivars—one salt-tolerant (Bam) and one salt-sensitive (Tajan)—plants were grown in culture media under five salinity treatments (0 [control], 50, 100, 150, and 200 mM NaCl) and exposed to both white and blue light. After five days of growth, several parameters were measured: growth indices (fresh weight, dry weight, and shoot length), proline, chlorophyll a and b, sodium and potassium ion concentrations, peroxidase enzyme activity, malondialdehyde content, and the level of pyrroline-5-carboxylate (proline precursor). Data were analyzed using Duncan's multiple range test.

Keywords: Wheat, Proline, Proline precursor, Salt stress, Blue light

22135 - Poster

Effect of Calcium Nitrate on Rooting and Growth Indices of *Arctium lappa* L. Under Soilless Cultivation

Mina Shafaati[1], Khadijeh Kiarostami[1 *], Zahra Nazem Bokaei[1]

1- Department of Plant Sciences, Faculty of Biological Sciences, Alzahra University, Tehran, Iran

[*]Corresponding Author: kh.kiarostami@alzahra.ac.ir

Abstract

Arctium lappa L., a biennial member of the Asteraceae, is recognized as a high-value medicinal species owing to its substantial accumulation of secondary metabolites such as arctiin, inulin, chlorogenic acid, and flavonoids. The root system not only plays a primary role in water and mineral acquisition but also contributes critically to physiological homeostasis and drives the biosynthesis of biomass enriched with pharmaceutically significant compounds. Calcium nitrate serves as a dual nutrient source, providing both calcium and nitrate ions. Beyond its structural function in fortifying cell walls and maintaining tissue cohesion, calcium operates as an essential secondary messenger mediating cell division, elongation, and differentiation. In this study, the growth and physiological responses of *A. lappa* were assessed under three calcium nitrate regimes—baseline Hoagland concentration, 0.5× baseline, and 2× baseline—applied in rockwool substrate under a completely randomized design with three replicates. Plants received calcium nitrate–enriched Hoagland solution for 90 days, followed by harvest two weeks post-treatment. Growth metrics included plant height, root length, fresh and dry biomass of roots and shoots, and leaf relative water content. The 0.5× baseline treatment markedly enhanced root length and both fresh and dry root biomass, reflecting a strategic shift in assimilate allocation toward root system development. In contrast, control plants achieved the highest shoot biomass, indicative of preferential aerial growth. Although the 2× baseline treatment increased leaf RWC, it conferred no significant advantage in other growth indices, likely due to ionic imbalance and a concomitant reduction in growth efficiency. Collectively, the findings underscore the importance of fine-scale optimization of the calcium-to-nitrogen ratio in soilless culture to reinforce root growth without compromising shoot performance.

Keywords: *Arctium lappa* L., Calcium nitrate, Growth indices, Rockwool substrate, Soilless culture

22363 - Poster

Nutrient Stress Effects on Protein, Lipid and Astaxanthin Production in *Haematococcus lacustris*

Sara Ghasemi[1*], Elham Mohajel Kazemi[1], Ali Movafeghi[1], Somayeh Zarezadeh[1]

1. Department of Natural Sciences, Plant Sciences Group, Cellular and Molecular, Tabriz University, Tabriz, Iran.

[*]Corresponding Author: ghariana123@gmail.com

Abstract

Astaxanthin, a red ketocarotenoid, is one of the strongest natural antioxidants with extensive biotechnological and industrial applications. Among natural producers of astaxanthin, the green microalga *Haematococcus lacustris* stands out as the major source, where its synthesis is triggered under stressful conditions, including strong light, elevated temperature, and nutrient deprivation. This study examined the effect of nutrient stress on the accumulation of astaxanthin, protein, and lipids. Microalgae were cultured in BBM medium at different concentrations (control, 1/2, 1/3, 1/4, and 1/5). Each test was conducted in triplicate over two weeks. During these 14 days, protein levels increased by day 7 in the control and nutrient-rich treatments but declined sharply under severe stress. By day 14, mild nutrient limitation (1/2 and 1/4) exhibited higher protein levels, indicating cellular adaptation. Lipid content was highest in the control at day 7, whereas stressed cultures showed lower values. However, by day 14, lipids decreased markedly in the control, while moderate stress (1/2 and 1/3) induced the greatest lipid accumulation. Astaxanthin content increased consistently under nutrient stress throughout the experiment. Overall, the findings demonstrate that full nutrient supply favors short-term lipid accumulation, whereas moderate nutrient limitation stimulates long-term lipid storage and enhances protein and astaxanthin production. These responses highlight the adaptive mechanisms of H. lacustris under nutrient stress and underscore its potential for biotechnological applications.

Keywords: *Haematococcus lacustris*, Astaxanthin, Stress, Biomass

22379 - Poster

The Effect of AgNps (AgNanoparticles) on the Growth of *Foeniculum vulgare* L. In vitro Condition

Shima Alaei[1 *], Sara Sharifi[2], Negar Heydari[3]

1- Plant Biotechnology Research Center, Ker.C., Islamic Azad University, Kermanshah, Iran
2- Department of Biology, Ker.C., Islamic Azad University, Kermanshah,Iran
3- Department of Medicinal Plants,ACECR Institute of Higher Education, Kermanshah, Iran
*Corresponding Author: shimaalaei@iau.ac.ir

Abstract

The fennel plant (*Foeniculum vulgare*) is of significant importance due to its widespread applications in the food, pharmaceutical, and healthcare industries. This plant contains secondary metabolites such as phenols, flavonoids, and photosynthetic pigments, which exhibit antioxidant, anti-inflammatory, and anticancer properties. Tissue culture of fennel is considered an effective method for enhancing the production of these metabolites. In this context, a factorial experiment was conducted in a completely randomized design with four replications to examine the effects of plant growth regulators and silver nanoparticles on the growth of fennel tissue culture. The first factor included various concentrations of 2,4-D (0, 1, 2, and 4 mg/L) combined with 0.5 mg/L BAP, while the second factor involved silver nanoparticles at concentrations of 0, 2, and 5 mg/L. This experiment was carried out in the Plant Tissue Culture Laboratory at the Biotechnology Research Center of the Islamic Azad University, Kermanshah Branch, in 2023.The results of this study demonstated that the 2,4-D hormone and silver nanoparticles had significant effects on callogenesis, callus growth, and relative water content in fennel callus. Also, results showed a high rate callus formation in the control and treatment with combination of 2 mg/L 2,4-D and 5 mg/L silver nanoparticle, indicating the high efficiency of these compounds for producing more callus. Whereas, increasing the concentration of both factors led to a decrease in callogenesis and callus growth, while necrosis increased. At the highest concentrations of 2,4-D (4 mg/L) and silver nanoparticles (5 mg/L), callogenesis and callus growth were completely inhibited. However, high concentrations of AgNPs may cause damage to the cell wall and plasma membrane, and disturb different plant processes.

Keywords: *Foeniculum vulgare*, Tissue culture, Silver nanoparticle

22178 - Poster

Allelopathic Effects of *Caulerpa* on *Spirulina*

Mehri Hossein-Nasab[1], Jafar Razeghi[1], Seyed Yahya Salehi-Lisar[1], Hamideh Bakhshayeshan-Agdam[1*]

1- Department of Plant, Cell and Molecular Biology, Faculty of Natural Sciences, University of Tabriz, Tabriz, Iran
[*]Corresponding Author: h_bakhshayeshan@tabrizu.ac.ir

Abstract

Allelopathy is a common phenomenon in aquatic ecosystems. Algae are one of the main components of these ecosystems that affect each other through allelopathic interactions. *Caulerpa* is a macroalga native to the Persian Gulf, which has many allelopathic compounds and therefore has many negative effects on other algae, especially microalgae. *Spirulina* is an important microalga in the food industry. In the seas, this alga is exposed to the allelopathic interactions of macroalgae such as *Caulerpa*, which disrupts its growth. Hence, in order to evaluation of physiological aspects of *Caulerpa* allelopathic effects on Spirulina, an experiment was conducted as factorial based on the completely randomized design with three replications. *Spirulina* microalgae was cultivated in laboratory conditions in BG11 medium and treated with different concentrations of *Caulerpa* leachate. *Caulerpa* leachate decreased the performance of photosystem II, increased the content of photosynthetic pigments, especially carotenoids which are also involved in the xanthophyll cycle, induced oxidative stress, and then increased the malonaldehyde content, which was dose-dependent and ultimately it reduced growth and biomass in *Spirulina*. Therefore, from the allelopathy point of view, due to the negative effects of *Caulerpa* allelopathic compounds on various aspects of the physiology of the target algae, *Caulerpa* leads to a decrease in the growth and finally the death of the treated algae, which is considered a kind of ecological superiority.

Keywords: Allelopathy, macroalgae, microalgae, physiological parameters

22615 - Poster

Cytological and Developmental Changes in the *Scenedesmus obliquus* under Dairy Wastewater Stress

Elham Mohajel Kazemi[1 *], Mahdi Mohammadi[1], Fatemeh Ajili[1], Elnaz Ahmadi[1]

1- Nuclear Agriculture School, Nuclear Science and Technology Research Institute (NSTRI), Atomic Energy Organization of Iran (AEQI), Karaj, Iran
[*]Corresponding Author: e.mohajel.k@gmail.com

Abstract

Dairy industries generate a significant volume of wastewater containing organic materials, nutrients (nitrogen and phosphorus), fats, proteins, sugars, and detergents. This wastewater can cause serious environmental pollution. The microalga *Scenedesmus obliquus* has garnered attention due to its high potential for nutrient absorption and organic load reduction in dairy wastewater. However, the presence of high concentrations of organic matter, fats, and detergents in these wastewaters can impose significant stress on *S. obliquus*. For the study, a sample of dairy wastewater was collected from the dairy workshop at the University of Tehran. The filtered dairy wastewater was diluted with sterile basic medium (BBM) to prepare treatments with different dilutions (0%, 25%, 50%, 75%, and 100%). A specific volume of pre-cultured S. obliquus was inoculated into each of the wastewater treatments. Upon exposure to dairy wastewater, the cells of S. obliquus demonstrated changes in shape and size. At certain concentrations, the cells became larger and more spherical, while at higher concentrations, the cells became smaller and more irregular. These morphological changes are likely due to the cell's effort to adapt to the stressful environment and absorb the nutrients present in the wastewater. Nutrient stress (resulting from an imbalance in wastewater composition) or the presence of toxic substances in dairy wastewater contributed to increased lipid accumulation in *S. obliquus* cells. This lipid accumulation may act as a defensive mechanism for energy storage and protection against stress. Dairy wastewater treatment at 50% dilution significantly inhibited the growth of S. obliquus due to the high concentration of organic matter and possibly the presence of detergents. This growth inhibition may result from reduced photosynthetic efficiency, damage to cellular organelles, and disruption of nutrient absorption. Wastewater stress led to disturbances in the colony formation of S. obliquus. The cells grew as single cells or formed unusual colonies with irregular cell numbers. Dairy wastewater can have negative effects on the cell biology, growth, and reproduction of S. obliquus. Understanding these effects and providing appropriate solutions to cope with the stress caused by dairy wastewater can enhance the effectiveness of using this microalga for wastewater treatment and biomass production.

Keywords: *Scenedesmus obliquus*, Lipid, Cytology, Colony

21499 - Poster

Development of Ovule and Embryo Sac in the Medicinal Plant *Centella asiatica*

Asiyeh Hosseinkhani Hezaveh[1 *], Abdolkarim Chehregani Rad[1], Roya Karamian[1]

1- Department of Biology, Faculty of Sciences, Bu-Ali Sina University, Hamedan, Iran
*Corresponding Author: a.hosseinkhani@sci.basu.ac.ir

Abstract

Centella asiatica, a medicinal plant of the Apiaceae family, is known for its wound-healing, antioxidant, anti-inflammatory, and antitumor properties, with broad applications in pharmaceutical and food industries. However, uncontrolled harvesting threatens its conservation. This study aimed to examine the developmental features of the female reproductive organ to facilitate sustainable propagation. The research was conducted in 2024 in the greenhouse of Bu-Ali Sina University (Hamedan, Iran). Seedlings were cultivated in a standard medium, and flowers were sampled at different developmental stages. Samples were fixed, dehydrated, embedded, sectioned, and stained for microscopic observation. The results revealed that the flowers are bisexual, small, actinomorphic, and arranged in umbels, consistent with other Apiaceae species. The inferior ovary comprises two carpels, each containing a single anatropous ovule. Female organ development occurs later than male organs (intragynous protandry), and megasporogenesis to embryo sac formation follows the Polygonum-type, the most common embryo sac development pattern. Calcium oxalate crystals were detected in the ovary wall, similar to their accumulation in vegetative parts. A nectar-secreting stylopodium was also observed above the ovary. These findings provide insights for controlled propagation and conservation strategies of this valuable species.

Keywords: Calcium oxalate, Actinomorphic, Stylopodium, Anatropous ovule, Megasporogenesis

21961 - Poster

The Cytochrome P450 Gene Family: A Key Player in the Molecular Dialogue between Wheat Roots and Arbuscular Mycorrhizal Fungi, under Water Deficit Stress

Elahe Dookhe[1], Alireza Iranbakhsh[1*], Rahim Ahmadvand[2], Mostafa Ebadi[3], Iraj Mehregan[1]

1 Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran.
2 Department of Vegetables Research, Seed and Plant Improvement Institute, Agricultural Research, Education & Extension Organization, Karaj, Iran.
3 Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran.

*Corresponding Author: iranbakhsh@iau.ac.ir

Abstract

Symbiosis with arbuscular mycorrhizal fungi (AMF) plays a vital role in enhancing wheat (*Triticum aestivum* L.) tolerance to drought stress. However, the molecular mechanisms underlying this interaction remain largely unexplored. This study investigated the role of the cytochrome P450 (CYP) gene family in regulating drought tolerance mediated by AMF in wheat roots. To assess the effects of mycorrhizal inoculation (inoculated and non-inoculated with Funneliformis mosseae) and varying irrigation levels (normal irrigation and water deficit) on CYP gene expression, RNA sequencing (RNA-seq) was employed. Results revealed that numerous CYP genes were significantly upregulated in AMF-inoculated roots under water deficit conditions. Notably, genes from the CYP71, CYP72, CYP76, CYP81, CYP86, CYP90, CYP708, CYP711, and CYP722 families exhibited prominent differential expression. Functional Gene Ontology (GO) analysis indicated that these genes participate in key metabolic pathways associated with drought adaptation and symbiotic signaling. According to the findings, genes related to the biosynthesis of plant hormones such as brassinosteroids (CYP90B1, CYP86B1) and strigolactones (CYP711A) are essential for plant growth and the establishment of AMF symbiosis. Additionally, genes involved in the production of defense compounds, including flavonoids (CYP81K, CYP81D) and phytoalexins (CYP71A, CYP72A1), facilitated enhanced biotic and abiotic stress responses. Furthermore, the upregulation of genes linked to suberin biosynthesis (CYP86B1) suggests a critical role in modifying root structure to improve water retention and drought tolerance. Overall, these results demonstrate that AMF enhances wheat drought resistance by selectively modulating the expression of CYP gene family members, thereby regulating hormone levels, strengthening defense mechanisms, and promoting symbiosis.

Keywords: *Triticum aestivum*, Arbuscular Mycorrhizal Fungi, Cytochrome P450, Water deficit stress, RNA-seq

22147 - Poster

Green Synthesis of Nanoparticles Using Ashwagandha (*Withania somnifera*) and Comparison of Their Medicinal Properties with Natural Extracts of the Plant

Mozhgan Farzami sepehr[1 *], Masomeh Lotfinajad[1]

1- Department of Biology, Saveh Branch, Islamic Azad University, Saveh, Iran
*Corresponding Author: mfsepehr48@gmail.com

Abstract

Ashwagandha (*Withania somnifera* (L.) Dunal) has long been valued in Eastern medicine for its therapeutic effects. Recently, its cultivation has expanded to desert provinces of Iran, such as Kerman, where it shows strong adaptability to local conditions, encouraging farmers to grow it on barren lands. This study aimed to assess the medicinal and antioxidant properties of Iranian-cultivated Ashwagandha and explore the synthesis of copper nanoparticles from the plant. Plant samples were analyzed for phenolic compounds, flavonoids, tannins, and DPPH radical scavenging activity. Root powder showed higher antioxidant activity than leaves and fruits, attributed to its greater phenolic and flavonoid content, and was therefore selected for nanoparticle synthesis. Nanoparticle formation was confirmed by UV–visible spectroscopy and X-ray diffraction (XRD), while morphology and size were determined using transmission electron microscopy (TEM). The antibacterial activity of the green copper nanoparticles was evaluated against Escherichia coli (Gram-negative) and Staphylococcus aureus (Gram-positive) using the tube dilution method (MIC, MBC). Results showed stronger antibacterial effects against E. coli, while *S. aureus* displayed greater resistance to the nanoparticles. Overall, Ashwagandha root proved an effective source for green nanoparticle synthesis, offering notable antioxidant and antibacterial potential

Keywords: Ashwagandha, Antioxidant compounds, Green nanoparticle synthesis, Antimicrobial activity

22674 - Poster

Design and Fabrication of an Intelligent Microscope Integrated with Chromatic & Acoustic Feedback Sensors for High-Resolution Imaging, Automated Spectral Calibration, and Advanced Optimization of Plant Biotechnology Applications.

Zahra Atghia[1 *]

1-Department of Biology, Islamic Azad University Science & Research, Tehran, Iran

[*]Corresponding Author: z.atghia@gmail.com

Abstract

In this study, a next-generation intelligent microscope was designed and developed, which—through the integration of deep learning algorithms and advanced color and spectral sensors—enables real-time and highly accurate identification of optimal wavelengths for imaging plant tissues. In addition to precise color processing of samples, the system employs intelligent musical–acoustic modules that encode spectral variations of the sample into auditory signals, thereby providing acoustic feedback that facilitates both manual and automatic adjustment of the optical system. The integration of high-sensitivity color sensors, multichannel spectral sensors, and intelligent acoustic modules allows the system not only to deliver highly accurate visual data but also to provide simultaneous auditory analysis for the operator. Practical experiments demonstrated that the system achieves over 98.3% accuracy in selecting optimal wavelengths, while enhancing image resolution by up to 42% compared with conventional microscopes. Furthermore, optimized light-path algorithms reduced the image processing time to less than 0.8 seconds per frame. From an application standpoint, this novel architecture—by combining plant biotechnology, biophysics, and genetics—offers a powerful tool for molecular structure analysis and cellular dynamics in advanced plant research. This approach enables precise identification of genetic mutations, investigation of protein behavior, and tracking of biochemical pathways. In the domain of plant disease diagnostics and therapeutics, particularly for disorders caused by genetic mutations or environmental pathogens, this technology—through super-resolution imaging and deep spectral analysis—can guide the design of more targeted therapeutic strategies. In addition, the capability to integrate spectral and molecular data with machine learning algorithms provides a pathway for developing predictive systems in genetic engineering and the production of disease-resistant plants.

Keywords: Advanced Microscope, Intelligent Bio-Spectral Data Analysis, Optical and Acoustic Technology, Plant Biotechnology, Super-Resolution Imaging, Deep Learning, Genetic Engineering, Disease-Resistant Plants.

21743 - Poster

Nematode-Induced Floral Gall in *Bongardia chrysogonum* (Berberidaceae): Its Effect on Flower Structure

Najmeh Hosseini, Farkhondeh Rezanejad[1 *]

1- Department of Biology, Shahid Bahonar University of Kerman, Kerman, Iran
*Corresponding Author: frezanejad@uk.ac.ir

Abstract

Plant galls are newly formed structures that develop due to the influence of gall-inducing organisms, providing them with shelter, protection, and nourishment. The most commonly studied galls are caused by insects. Plant parasitic nematodes (PPNs) induce gall formation in various parts of plants, primarily targeting the roots. Reports on their effects on aerial parts, especially flowers, are rare. In this study, floral galls induced by *Ditylenchus* sp. (Anguinidae) in *Bongardia chrysogonum* (Berberidaceae) were introduced for first time. The structural traits of galls were analyzed using microscopic studies. The levels of total phenolic compounds and anthocyanins were measured by spectrophotometric methods. Intact flowers had thin sepals and petals with 3–5 cell layers, tetrasporangiate anthers, and a thin pleated gynoecium, while the galled floral parts lacked morphological and anatomical similarity to the intact organs. These galling organisms triggered the regeneration and reorganization of floral parts, leading to abnormal and swollen growths. The number of modified floral whorls in produced gall ranged from 1 to 3, indicating that nematode infection affected some or all floral organs. Microscopic sections of all galls showed homogeneous parenchyma with large intercellular spaces, lacking a gall chamber, and containing numerous nematodes within the tissue. Galled flowers showed red coloration and higher phenolic compound concentrations than normal flowers, as revealed by cytochemical and biochemical analyses. The reorganization of floral parts and the large intercellular spaces can be used for nematode survival and dispersal. High levels of phenolic compounds suggested host plant defense against the nematode.

Keywords: Anthocyanin, Parenchyma, Tannin, Gall structure, Cytochemistry

22624 - Poster

The Secondary Metabolites and Antioxidant Activity of *Smyrnium cordifolium* Boiss,

Zahra Baghaeifar[1 *], Leila Beigdeli[1]

1- Department of Bilogy, Faculty of Basic Science, Payame Noor University , Thehran, Iran
*Corresponding Author: z_baghaeifar@pnu.ac.ir

Abstract

Familiarity with different plants grown in different habitats is one of the important principles of sustainable development of any region. *Smyrnium cordifolium* is a food-medicinal plant belonging to the Detharian family in Iran, which is grown in the western and southwestern regions of our country. What's this? What is the name of the character? It is Lorestan and Ilam province. Vines in the shade, its extract is prepared by 80% methanol. The amount of total phenol and flavonoid was determined by the Folin-Ciocaltio method and the Renges-Neji method of Chloride Company, respectively. What was the name of DPPH (2,2-diphenylpicrylhydrazyl)? This research was done on a completely random basis and in three replications. There is a significant difference in terms of IC50) of the methanolic extract in two vegetative and reproductive and two vegetative stages ($P<0.05$). The amount of phenol and flavonoid is from plant parts and other habitats. In the study of the amount of antioxidant activity using the DPPH method, it is also found that NASDAQ's phenolic fraction and total flavonoids have higher IC50 values.

Keywords: Avondol, Medicinal plants, Secondary metabolites, Antioxidant

21490 - Poster

Study of Auxin Transport Gene Expression in *Medicago truncatula*

Mahboobeh Azarakhsh[1 *], Talieh Abed[1]

1- Department of Cell and Molecular Biology, Faculty of Basic Sciences, Kosar University of Bojnord, Bojnord, Iran
*Corresponding Author: mahboobeazarakhsh@gmail.com

Abstract

Root nodules in legume plants form through a symbiotic relationship with *Rhizobia* bacteria. The primary function of these nodules is to provide a suitable environment for the maintenance and metabolic integrity of dense populations of nitrogen-fixing bacteria. The hormone auxin acts as a key regulator of the nodule development process. For example, in the absence of Rhizobia, auxins induce the formation of Nodule-Like Structures (NLSs) on legume roots. A number of ABCB family transporters play an essential role in polar auxin transport. These proteins regulate the directional flow of auxin by facilitating its export from the plasma membrane and preventing its re-uptake. In the model plant *Medicago truncatula*, studies on the interaction between Rhizobia and the host plant, especially in the first 72 hours after inoculation, have shown that the induction of nodule primordium and the infection process are accompanied by changes in the expression of cytokinin transport genes. The aim of this study is to investigate the expression of ABCB family genes. In this research, we first examined the potential expression of ABCB family genes in nodules formed under symbiotic conditions, using transcriptome data. Then, using the Symbimics database, the expression of each gene in the nodule was compared to the root, and also examined in different parts of the nodule. The resulting data show an increase in the expression of ABCB5, ABCB7, ABCB14, ABCB17, ABCB25, ABCB26, ABCB32, ABCB35 genes in the nodule compared to the root.

Keywords: Auxin hormone, Nitrogen-fixing nodules, Auxin transport, ABCB genes

22028 - Poster

Cytotaxonomic and Micromorphological Study of Sect. *Microlophus* of the genus *Centaurea* L. in Iran

Somayeh Mohamadi asl[1*],Massoud Ranjbar[2], Zahra Ranjbar[3]

1-Mirbod 1 School, Education department, District 5 , Isfahan, Iran
2-Department of Biology, Faculty of Sciences, Bu-Ali Sina University, Hamadan, Iran
3-Research and Development Unit, Caspian Sabz Company, Tehran, Iran

[*]Corresponding Author: s.mohamadi6868@gmail.com

Abstract

The genus *Centaurea* L. with 200 to 250 species is one of the largest genus in Asteraceae and it is the second large genus in the tribe Cardueae. It has problematic taxonomy in point of classification. In this study, we examined the taxonomic problems at the Sect. *Microlophus* in morphology, anatomy and cytotaxonomy. The results of morphology study showed that, nine taxa from this section are distributed in Iran. In cytotaxonomy study, basic chromosome numbers x=8, 9, 10 was record in this section. There are three types of scale multicellular long, multicellular short and hook cell. Furthermore, size of stomata was different and classified in different groups. In general, morphology, cytotaxonomy and micromorphology studies were useful to separation of species in this section.

Keywords: Cytotaxonomy, Micromorphology, Scale, Stomata, *Microlophus*

21331 - Poster

Microscopic Study of Cellular and Developmental Structures in the Medicinal Species *Polygonum bistorta* L.

Sayeh Jafari marandi[1 *], Sara Ramezani[1], Sedigheh Arbabian[1], Fahimeh Salimpour[1]

1- Department of Biology, NT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: jafarisayeh@gmail.com

Abstract

Growth and development in plants is a gradual, complex, and coordinated process leading to the formation of specialized vegetative and reproductive organs. A detailed examination of this process can provide valuable insights into biological mechanisms, ecological adaptations, and the phylogenetic position of plant species. *Polygonum bistorta* L., a medicinal species from the family Polygonaceae, is among the important native plants of Iran. However, its anatomical characteristics have been scarcely explored. In this study, specimens were collected from natural habitats in Hamadan province and, after appropriate preparation, their structural features were analyzed under light and scanning electron microscopy. In the stem, a high density of surface trichomes, extensive intercellular spaces, and a tri-collateral vascular system were observed. The root exhibited a similar structure, reflecting a structural consistency between underground and aerial parts. The leaves were simple, oppositely arranged, and covered with short glandular hairs. In the reproductive organs, spike-like inflorescences, trilocular ovaries, and pollen grains with a folded exine surface were identified, indicating diagnostic value. Analyzing these structures contributes to more accurate identification of this species within Iran's flora and supports its relevance in taxonomic, developmental biology, and pharmacognostic research.

Keywords: Plant anatomy, Development of vegetative and reproductive organs, Microscopic structures, Scanning electron microscopy (SEM), *P .bistorta*

22152 - Poster

A Developmental Study of Reproductive Organs in *Trachyspermum ammi* L.

Reyhanen Saeidi[1], Golnaz Tajadod[1 *], Sayeh Jafari Marandi[1], Maryam Peyvandi[1]

1- Department of Biology, NT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: tajadodg@gmail.com

Abstract

Trachyspermum ammi (L.) Sprague, belonging to the family Apiaceae, is naturally distributed in Ethiopia, Egypt, and India, and is cultivated in Iran due to its considerable medicinal value. The general characteristics of flowers in this family are usually uniform; however, high morphological diversity of flowers is observed. Considering the medicinal importance of *T. ammi*, the development of male and female reproductive organs was investigated. Flowers and buds at different developmental stages were fixed, preserved, and embedded in paraffin. Sections were stained with hematoxylin–eosin. According to the results, asynchronous development of flowers was observed in umbels and umbellets, with peripheral umbellets appearing earlier than central ones. The staminal filament remained folded and curved inside the bud from the early stages of development until anthesis. Stamens are isostemonous; the tapetum is secretory; microspore tetrads are of the tetrahedral type; microspores are dumbbell-shaped; mature pollen grains are three-celled and tricolpate. Asynchronous microspore development was detected both in anthers of the same flower and in pollen sacs of a single anther. Moreover, male and female gametophyte development was not simultaneous within a flower. The ovule is anatropous, pendent, and unitegmic; the megaspore tetrad is linear; the chalazal megaspore remains functional; and the embryo sac corresponds to the Polygonum type.

Keywords: Development, Ovule, Pollen, Embryo sac

21984 - Poster

A Developmental Study of *Luffa* Plant Organs: from Vegetative Structures to Reproductive Processes

Masoumeh Mahootforoshha[1], Sayeh Jafari Marandi[1 *]

1- Department of Biology, NT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: s_jafari@iau.ac.ir

Abstract

The Cucurbitaceae family consists of diverse species in tropical and subtropical ecosystems. It is of significant interest due to its anatomical characteristics and medicinal and industrial applications. *Luffa cylindrica* is highly valued for its fruit fiber, which is used in cosmetic products, and its medicinal properties in treating diseases such as fever, asthma, and digestive issues. This study investigates the development stages of this species' vegetative (root, stem, leaf, and petiole) and reproductive (pollen and ovule) organs. Samples from various plant parts were collected and preserved in a glycerin alcohol fixative. After manual sectioning, the samples were stained (double-staining method, carmine red—methylene blue). A microtome and hematoxylin-eosine staining were used for apical meristems and flower sectioning. The results showed that the root and stem are multi-layered from outside to inside, including the epidermis, cortex, and central cylinder. The leaves exhibited palisade and spongy mesophyll, and the petioles showed a characteristic hypodermal collenchyma. The vascular bundles in the root and stem were arranged in a collateral pattern. Similar to other family members, the leaf had dorsiventral mesophyll. However, differences in the number of vascular bundles were observed in the stem and petiole. In the reproductive organs, pollen development includes the meiotic division of the microsporocyte and the formation of a bicellular pollen grain. Ovule development was anatomic and unilayered, with the egg cell forming at the center of the embryo sac. These results could be significant in more accurate classification, understanding phylogenetic relationships, enhancing agricultural and medicinal productivity, and preserving biodiversity.

Keywords: Cucurbitaceae, Development, Ovule, Pollen

22280 - Poster

Development Study of Vegetative and Reproductive Organs in *Satureja edmondi* L.

Elham Rajabipour[1], Golnaz Tajadod[1 *], Fahimeh Salimpour[1]

1 Department of Biology, NT.C., Islamic Azad University, Tehran, Iran *Corresponding Author: tajadodg@yahoo.com

Abstract

Satureja edmondi (Lamiaceae) is an endemic species in the dry habitats of Iran, possessing both medicinal and ecological significance. To date, no comprehensive study has been carried out on the anatomical and developmental features of its vegetative and reproductive organs. The present research aimed to investigate these characteristics. Plant samples were collected from the Dalahoo Mountains (Kermanshah), identified, and herbarium specimens were prepared. For developmental studies, vegetative and reproductive organs were fixed in FAA solution, dehydrated with ethanol, cleared with xylene, and embedded in paraffin. Sections of 8–10 mm thickness were prepared using a microtome and stained with three methods: Safranin–Fast Green, Hematoxylin–Eosin, and Carmine–Alum–Methylene Blue. The results showed that the root system is straight and vertical with lateral branches and secondary xylem. The stem is quadrangular with a uniseriate epidermis bearing glandular and non-glandular trichomes, while the leaves exhibited a dorsiventral structure. Stomata were diacytic and mainly located on the abaxial epidermis. In reproductive structures, floral development started with changes in the receptacle meristem, followed by initiation of sepal, petal, stamen, and carpel primordia. In the anther, meiosis resulted in the formation of pollen tetrads and ultimately binucleate pollen grains. The ovary was four-loculed, containing unitegmic, anatropous ovules with a Polygonum-type embryo sac. The phenomenon of protandry was also observed. Overall, the vegetative and reproductive features of *S. edmondi* demonstrate its adaptation to rockyhabitats. The high density of glandular trichomes emphasizes its medicinal importance, while distinctive developmental traits such as protandry and unitegmic ovules can provide valuable taxonomic and phylogenetic insights.

Keywords: Rock sage, Anther structure, Anthropos egg, Floral meristem, Stomata, Diacytic

22631 - Poster

The Comparison of Metabolites and Antioxidant Activity of *Nectaroscordum tripedale* and *Allium jesdianum*

Zahra Baghaeifar[1 *], Zahra Mansouri[1]

1- Department of Bilogy, Faculty of Basic Science, Payame Noor
*Corresponding Author: z_baghaeifar@pnu.ac.ir

Abstract

Two native plant species, *Nectaroscordum tripedale* and *Allium jesdianum*, are native to Zagros mountains in Iran. The purpose of the present study is to investigate the effect of different developmental stages on the amount of some secondary metabolites and antioxidant activity of two plants. After collecting, they were extracted by methanolic method. The content of total phenol, total flavonoid and antioxidant capacity with the ability to inhibit free radicals (with IC50 value) respectively using Folin-Ciocalteu method, aluminum chloride colorimetric assay and 2,2 diphenyl-1-picrylhydrazyl (DPPH) free radical inhibition method. SPSS software was used to perform statistical analysis and Duncan's multiple range test was used to compare the averages with each other. The results of this research showed that the vegetative parts (stems and leaves) of Ben Sorkh and Khargrio have the highest extract yield (respectively 5.47 and 4.55 grams of extract per gram of dry matter of the plant), the highest amounts of total phenol (respectively 81. 18.43 ± 2 and 16.51 ± 3.01 mg of gallic acid per gram of dry weight) and total flavonoids (4.93 ± 0.92 and 3.87 ± 1.02 mg of quercetin per gram of dry weight, respectively). The same parts (stems and leaves) in Ben-Sorkh and Khargrio had higher antioxidant capacity (with lower IC50 value). There is a direct relationship between the synthesis of secondary metabolites and the level of antioxidant activity. It is suggested that the vegetative stage of these two plants with more secondary metabolites with more antioxidant activity are more suitable for collection and use

Keywords: Developmental stage, Secondary metabolite, Khargrio, Bon Sorekh, Plants of the same biome

22190 - Poster

Comparing the Amount of Bioactive Substances in Two Chemotypes of Lemongrass at Two Different Levels of Irrigation

Maryam Ghaneie[1 *], Mozhgan Farzami sepehr[1]

1- Department of Biology, Saveh Branch, Islamic Azad University, Saveh, Iran
*Corresponding Author: ghaneimaryam27@gmail.com

Abstract

Lemongrass (*Aloysia citrodora*) is a valuable medicinal plant in Asia, particularly Iran. This study investigated the effects of irrigation frequency and chemotype on bioactive compounds in two A. citrodora chemotypes. A factorial experiment was conducted using a randomized complete block design with three replications in a private greenhouse in Saveh, Iran. The two factors included: (1) irrigation interval (every 7 vs. 14 days), and (2) chemotype (citral – tetraploid, and linalool – triploid). Analysis of variance revealed that irrigation significantly affected all measured traits at the 1% level. Chemotype also had a significant effect on several traits: at the 1% level on leaf number, and at the 5% level on plant height, fresh and dry weights, leaf length, essential oil percentage, and levels of geranial and neral. Interaction between irrigation and chemotype significantly influenced leaf number, leaf fresh weight, and total plant fresh weight. Findings showed that increasing irrigation frequency (every 7 days) led to a reduction in plant height, biomass (fresh and dry weights), number of leaves, leaf dimensions, and essential oil content (including geranial and neral). However, it increased proline accumulation in the plant. Overall, the citral chemotype under 14-day irrigation produced the highest levels of essential oil and active compounds, indicating that less frequent irrigation improves both qualitative and quantitative yields in this chemotype. These findings support optimized irrigation strategies to enhance medicinal quality in lemongrass cultivation

Keywords: Lemongrass, Chemotype, Essential oil percentage, Irrigation rate, Yield

22151 - Poster

Inhibition of α-Amylase and α-Glucosidase Enzymes and Antioxidant Activity of *Nigella sativa* Extract: A Novel Approach in Type 2 Diabetes Management

Fatemeh Ghamari[1], Somayeh Farahmand[1], Roonak Namdary[1 *]

1- Department of Biology, Payame Noor University, Tehran, Iran

*Corresponding Author: roonaknamdary@yahoo.com

Abstract

Type 2 diabetes is one of the most significant global health challenges, requiring effective and safe therapeutic approaches. In recent years, the use of plant-derived compounds has attracted attention due to their multiple effects and fewer side effects. *Nigella sativa* is among the plants reported to possess antidiabetic potential. In this experimental study, the inhibitory effects of alcoholic extract of *N. sativa* on α-amylase and α-glucosidase enzymes, phenolic content, and antioxidant activity at various concentrations were investigated. Data were analyzed using one-way ANOVA and Duncan's test at a significance level of 0.05. The results showed that the antioxidant activity of *N. sativa* extract increased in a dose-dependent manner, ranging from 31.3% at 0.15625concentration to 79.3% at 2/5concentration ($P<0.05$). Moreover, α-glucosidase inhibition of 46.4% was observed at 5 mg/mL, and α-amylase inhibition of 12.8% was observed at 2.5 mg/mL. The total phenolic content of the extract was determined to be 144.6 mg gallic acid equivalents per gram. GC-MS analysis revealed that the extract contained several compounds, including n-hexadecanoic acid (7.34%), 9,12-octadecadienoic acid (7.34%), and phenol (2.7%), many of which have previously been reported to exhibit antioxidant and antidiabetic effects. The presence of these compounds may explain the observed mechanisms in the inhibition of digestive enzymes and the antioxidant activity of the extract. *N. sativa* extract, with strong antioxidant activity and the ability to inhibit digestive enzymes, could be considered a potential option for diabetes management. However, in vivo and clinical studies are required to determine its effective dose and safety.

Keywords: Phenolic compounds, Biological activity, Medicinal plants, Hyperglycemia management, Digestive enzyme inhibition

22639 - Poster

Micromorphology and Anatomy of the Seed Coat in *Convolvulus persicus* L.

Nazanin Talebi[1], Sedigheh Kelij[1 *], Ehsan Nazifi[1], Farshad Sohbatzadeh[2]

1- Department of plant biology, University of Mazandaran, Babolsar, Iran
2- Department of Nuclear and Molecular Physics, University of Mazandaran, Babolsar, Iran
*Corresponding Author: s.kelij@umz.ac.ir

Abstract

Mechanical resistance caused by the hard seed coat is recognized as an inhibitory factor for germination and a cause of seed dormancy in many plant species. *Convolvulus persicus*, an endemic species of the southern Caspian Sea coasts, is experiencing a severe population decline, and seed dormancy has been reported in this species. To investigate the potential role of the seed coat in dormancy, the micromorphology and structural characteristics of the seed coat were examined using scanning electron microscopy (SEM) and light microscopy, applying standard histological techniques. Microscopic observations of the seed surface revealed a thick, groove-free, and pore-free coat composed of densely packed epidermal cells with irregular polygonal shapes and wavy anticlinal walls. Anatomical analysis of the seed coat indicated that the exotesta, consisting of Malpighian cells of the macrosclereid type, is the primary factor contributing to coat thickness, hardness, and the prevention of water penetration. The mesotesta was mainly composed of parenchymal cells, with tannin-secreting cells present in certain areas, providing protective functions against pathogens. The innermost region contained the endotesta and a cuticular layer adjacent to the endosperm. These findings suggest that the multilayered structure and protective mechanisms of the seed coat play a significant role in the induction and maintenance of seed dormancy in C. persicus.

Keywords: Seed coat structure, SEM, Seed dormancy

22505 - Poster

The Role of Combined Microgravity and Chitosan Treatment on the Enzymatic Antioxidant System Activity in *Eruca sativa* L. under In Vitro Culture Conditions

Hilda Amiripour[1], Alireza Iranbakhsh[1*], Sara Saadatmand[1], Fateme Mousavi[2], Zahra Oraghi Ardebili[3]

1-Department of Biology, Science and Research Branch, Islamic Azad University, 1477893855, Tehran, Iran.
2-Air and Space Physiology Research Group, Aerospace Research Institute (ARI), Ministry of Science, Research and Technology (MSRT), Tehran, Iran.
3-Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran.

[*]Corresponding Author: *iranbakhsh@iau.ac.ir

Abstract

One of the indicators of microgravity-induced changes in plant models is the alteration of oxidative balance. Notably, plants, which are sensitive to oxidative stress, also exhibit sensitivity to changes in gravitational force. To investigate the response mechanisms of *Eruca sativa* L. (rocket) seedlings, used as an in vitro culture model under microgravity conditions simulated by clinostat rotation, chitosan was applied concurrently as an elicitor. This study examined the effect of the elicitor chitosan on mitigating the impacts of clinostat rotation on the enzymatic antioxidant system of rocket seedlings. A completely randomized design experiment was conducted with treatments including control (normal gravity without elicitor), chitosan (230 mM), microgravity, and microgravity combined with chitosan. Assessment of antioxidant enzyme activities revealed that simulated microgravity imposed stressful conditions on the plants. Clinorotatory rotation significantly increased the activities of antioxidant enzymes, with POD, SOD, and CAT activities rising by 75.13%, 72.67%, and 53.42%, respectively, compared to the control group. Chitosan treatment further enhanced these enzyme activities by up to 70.61% for SOD, over 80% for CAT, approximately fivefold for POD, and 42.38% for GPX. These results demonstrate the effective role of chitosan in strengthening the antioxidant defense system of plants. The concurrent presence of chitosan under these conditions likely enhances reactive oxygen species scavenging mechanisms and activates enzymatic systems, thereby aiding the plants in tolerating stressful environments. These findings pave the way for further research and broader application of biological elicitors to help plants overcome harsh environmental stresses

Keywords: Chitosan, Antioxidant enzymes, Abiotic stress, Clinorotation, Reactive oxygen species.

21771 - Poster

The Role of Melatonin and Salicylic Acid on Physiological and Antioxidant Traits of *Andrographis paniculata* Plant under Cadmium Stress

Hajar Heydarnejad[1], Alireza IranBakhsh[1 *], Daryush Talei[2], Sara Saadatmand[3], Mostafa Ebadi[3]

1- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2-Medicinal Plants Research Center, Shahed University, Tehran, Iran
3-Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran

[*]Corresponding Author: iranbakhshar@yahoo.com

Abstract

Andrographis paniculata is a plant from the Acanthaceae family. This medicinal plant produces approximately 20 diterpenoids and more than 10 flavonoids, of which andrographolide is its main compound. Melatonin and salicylic acid, as biostimulants, enhance plant tolerance to biotic and abiotic stresses, thereby improving plant growth and development. Cadmium is one of the heavy metals that, by producing various types of reactive oxygen species, causes damage to proteins, carbohydrates, and DNA, ultimately leading to oxidative stress. To investigate the effects of melatonin and salicylic acid on the physiological and antioxidant responses of the Nainhavandi plant under cadmium stress, an experiment was conducted as a factorial in a completely randomized design with three replications. The experimental factors included melatonin at three levels (0, 1.2, and 2.4 mg/L), salicylic acid at three levels (0, 0.07, and 0.14 mg/L), and cadmium at three levels (0, 0.46, and 0.92 mg/L). The results showed that different concentrations of melatonin, salicylic acid, and cadmium had significant effects on the physiological and antioxidant compounds of the plant. With increasing concentrations of melatonin and salicylic acid, the amount of photosynthetic pigments and the enzymatic activities of CAT and SOD significantly increased, and the amount of protein and MDA decreased. The results showed that the use of melatonin and salicylic acid reduced cadmium toxicity and could increase growth, performance, and activity of antioxidant compounds.

Keywords: Antioxidant, Salicylic acid, Cadmium, Melatonin

22680 - Poster

The Role of ZnO Nanoparticles in Enhancing Callus Induction of the Medicinal Plant *Heracleum persicum* Desf. ex Fisch

Fatemeh Mahmoudi Kurdi[1 *], Roghayeh Karimi[1]

1- Department of Biology, Faculty of Sciences, Azarbaijan Shahid Madani University, Tabriz, Iran

*Corresponding Author: fmahmoodi2 @yahoo.com

Abstract

Heracleum persicum Desf. ex Fisch., is one of the valuable medicinal plants native to Iran, which holds a special place in the pharmaceutical and food industries due to its bioactive compounds, including furanocoumarins, flavonoids, and aromatic essential oils. Improving secondary metabolite production and enhancing biomass of this plant through tissue culture techniques and the application of nanotechnology has recently attracted the attention of researchers as a novel approach. Recent studies indicate that metal nanoparticles, particularly zinc and silver nanoparticles, can significantly enhance callus induction by influencing physiological pathways and regulating plant hormones. The proposed mechanisms include improving nutrient availability, modulating oxidative stress, and stimulating signaling pathways related to cell division. In the present study, a review of published data along with the results of experiments conducted on *H. persicum* callus culture revealed that zinc nanoparticles at a concentration of 30 mg/L had the greatest effect on biomass increase, leading to significant growth compared to control treatments. These findings highlight the dose-dependent role of nanoparticles in plant developmental processes and emphasize the importance of selecting the optimal concentration in the biotechnological applications of medicinal plants. Overall, the use of nanoparticles, particularly zinc in tissue culture media can serve as an effective tool for enhancing biomass production and secondary metabolite accumulation in medicinal plants.

Keywords: Biotechnology, Secondary metabolite, *Heracleum persicum*, Nanoparticle.

21843 - Poster

The Role of Nitric Oxide and Melatonin on Photosynthetic Pigments and Antioxidant Compounds of *Datura innoxia* Plant

Anahita Marvi[1], Alireza Iranbakhsh[1 *], Mostafa Ebadi[3], Zahra Oraghi ardebili[2], Parvaneh Maghami[1]

1-Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2-Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran
3-Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran

[*]Corresponding Author: iranbakhshar@yahoo.com

Abstract

Datura innoxia L. is an herbaceous, perennial, or annual subshrub belonging to the Solanaceae family. The plant often has a shrubby appearance due to its branched structure. All compounds of this plant contain tropane alkaloids such as atropine, scopolamine, and hyoscyamine. Melatonin is a multifunctional hormone derived from the amino acid tryptophan that plays several vital roles in medicinal plants. Nitric oxide is a gaseous signaling molecule that regulates plant growth, development, and response to biotic and abiotic factors. In order to investigate the effects of different concentrations of melatonin and nitric oxide on photosynthetic pigments and antioxidant compounds of *D. innoxia*, a factorial experiment was conducted in a completely randomized design with 2 factors and 3 replications. The experimental factors included different concentrations of melatonin with 3 levels (0, 0.25, and 0.5 µM) and different concentrations of nitric oxide with 4 levels (0, 25, 50, and 100 µM). The results of the experiment showed that different concentrations of melatonin and NO had significant effects on photosynthetic pigments and antioxidant compounds. With increasing concentrations of melatonin and NO, the amount of total chlorophyll, carotenoids, and enzymatic activities of CAT and SOD increased significantly, and the amount of protein and MDA decreased. This study showed that the combined use of melatonin and nitric oxide as effective biostimulants can increase growth and activity of antioxidant compounds.

Keywords: Antioxidant, Photosynthesis, Melatonin, Nitric oxide

21686 - Poster

The Role of Chitin and Nitric Oxide on Physiological and Antioxidant Traits of Nain-e Havandi Plant under Nickel Stress

Arezoo Safarzadeh[1], Alireza Iranbakhsh[1*], Daryoosh Talei[2], Sara Saadatmand[3], Mostafa Ebadi[3]

1-Department of Biology Faculty of Convergent Sciences and Technologies, Islamic Azad University, Tehran, Iran
2-Medicinal Plants Research Center, Shahed University, Tehran, Iran
3-Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran

[*]Corresponding Author: iranbakhshar@yahoo.com

Abstract

Andrographis paniculata, with its Persian name Nain-e Hawandi and English name King of bitters, is a plant from the Acanthaceae family. Nitric oxide and chitin are known as important regulators of physiological processes under various abiotic stresses. Nickel accumulation as a heavy element is toxic to plant growth and development and can significantly inhibit plant growth and reduce plant yield. In order to investigate the effects of chitin and nitric oxide on the physiological and antioxidant responses of Nain Hawandi, a factorial experiment was conducted in a completely randomized design with 3 factors and 3 replications. The experimental factors included different concentrations of chitin with 3 levels (0, 15, and 30 µM), different concentrations of nitric oxide with 3 levels (0, 0.5, and 1 g/L), and Ni at 3 levels (0, 0.4, and 0.8 g/L). The experimental results showed that both chitin and NO effectively reduced the harmful effects of Ni, promoted growth, and improved photosynthetic efficiency. Increased antioxidant enzyme activities were observed, indicating an adaptation mechanism to oxidative stress induced by Ni toxicity. This study highlights the potential of chitin and nitric oxide as effective biostimulants that can enhance plant resistance under Ni stress and increase the production of plant phytochemicals.

Keywords: Antioxidant, Chitin, Nitric oxide, Nickel

21768 - Poster

Pollen Features in *Bunium* and *Elwendia* (Apiaceae) from Iran

Farkhondeh Rezanejad[1 *], Marziyeh Yazdinejad[2]

1- Department of Biology, Shahid Bahonar University of Kerman, Kerman, Iran
2- Shahid Bahonar University of Kerman
*Corresponding Author: frezanejad@uk.ac.ir

Abstract

Due to recent molecular studies, *Elwendia* with its center of diversity in Central Asia, has been restored by the inclusion of eastern species of *Bunium*. In this study, pollen morphology of five species of *Bunium* and seven species of the recently separated *Elwendia* were examined. Light and Scanning electron microscopy were used to assess taxonomic significance of pollen characteristics in distinguishing the two genera and their species. Statistical analysis was applied to quantitative data to assess relationships and variations. Pollen grains in both genera are tricolporate, isopolar and long colpus. The two genera exhibit distinct diagnostic differences in pollen morphology. In *Bunium* species, pollen grains possess a cylindrical outline in the equatorial view, while in *Elwendia*, they display a rhomboidal-ellipsoidal or rhomboidal outline. In *Bunium*, the exine outline concave to concave-straight, whereas in *Elwendia* species, it is convex. Pollen grains in *Bunium* species are medium-sized, whereas those in *Elwendia* species are small-sized. In equatorial view, *Bunium* species exhibit pollen grains with obtuse to rounded polar caps, while *Elwendia* species display acute, subacute, or rounded apices. The polar axis (P), equatorial diameter (E), P/E ratio and ornamentation were more valuable for separating species. In species of *Bunium*, polar axes ranged from 25.47 to 26.59µm, equatorial axes from 12.65 to 15.26 and P/E from 1.68 to 2.1, while in *Elwenia*, these traits ranged from 20.74 to 24.72, 10.94 to 14.32 and 1.69 to 1.85 respectively. Pollen characteristics confirm the separation of the genera, although species within each genus exhibit relatively similar features.

Keywords: Zireh, Tricolporate pollen, Isopolar pollen, Equatorial view, Polar view

Chapter Two
Fertility and Infertility



23820 – keynote oral presentation

Emerging Exosome-Based Therapies for Infertility: Mechanisms, Delivery Strategies, and Translational Outlook

Amin Tamadon[1,2,3,4*]

1- Center of Exosome and Cell Therapy, West Kazakhstan Marat Ospanov Medical University, Aktobe, Kazakhstan
2- Department of Natural Sciences, West Kazakhstan Marat Ospanov Medical University, Aktobe, Kazakhstan
3- Stem Cells Technology Research Center, Shiraz University of Medical Sciences, Shiraz, Iran
4- PerciaVista R&D Co. Shiraz, Iran
*Corresponding Author: amintamaddon@yahoo.com

Abstract

Infertility affects ~10–15% of couples worldwide, with limited curative options for gonadal dysfunction, endometrial receptivity defects, and inflammatory reproductive disorders. Exosomes—nanoscale extracellular vesicles that shuttle bioactive cargo—have emerged as cell-free therapeutics capable of modulating inflammation, apoptosis, angiogenesis, and tissue regeneration. This narrative mini-review synthesizes recent preclinical and early clinical evidence on exosome therapy for reproductive medicine across male (azoospermia, varicocele-related injury, chemo-/ischemia-induced testicular damage) and female (premature ovarian insufficiency, polycystic ovary syndrome, endometriosis, thin endometrium, implantation failure) indications. Mesenchymal stromal cell–derived exosomes (bone marrow, adipose, umbilical cord, endometrial) and reproductive tract–derived vesicles (Sertoli, epididymal, endometrial epithelial) deliver pro-repair miRNAs (let-7 family, miR-21, miR-126), lncRNAs, and proteins that suppress NF-κB–mediated inflammation, inhibit granulosa and Sertoli cell apoptosis, restore angiogenic balance (VEGF/eNOS), and enhance steroidogenesis and oocyte/embryo competence. Advances in bioengineering—including hypoxic or 3D preconditioning, small-molecule priming, cargo loading (electroporation, sonication), and surface functionalization (RGD, CXCR4/SDF-1 axis)—improve potency and reproductive tract homing. Local delivery (intra-ovarian, intra-uterine, intratesticular) and sustained-release formats (thermosensitive hydrogels, decellularized matrices) increase retention and therapeutic index. Safety profiles are favorable in animal models; however, challenges remain in GMP-grade manufacturing, potency assays, dose scheduling, and biodistribution tracking. A few pilot clinical studies are underway, but high-quality randomized trials are lacking. We propose a translational roadmap prioritizing standardized characterization (MISEV-aligned), indication-specific biomarkers (AMH/FSH, AFC, endometrial receptivity arrays, semen DNA fragmentation), and registries for long-term reproductive and offspring outcomes. Exosome therapy holds promise as a scalable, cell-free strategy to restore fertility, pending rigorous clinical validation.

Keywords: extracellular vesicles; exosomes; infertility; ovarian insufficiency; endometrial receptivity; azoospermia; mesenchymal stromal cells; miRNA; hydrogel delivery; regenerative medicine

23941 – Invited oral presentation

New approaches in the diagnosis and treatment of female infertility

Zahra Ebrahimi[1*]

1- Department of Cell Biology and Regenerative Medicine, Academic Center for Education, Culture, and Research (ACECR), Qom, Iran
*Corresponding Author: Dr.zahra.ebrahimi@gmail.com

Abstract

Assisted reproductive technologies (ART) have revolutionized reproductive medicine, offering hope to millions facing fertility problems through methods like artificial insemination to cutting-edge gene editing. While established techniques such as in vitro fertilization and intracytoplasmic sperm injection are widely used today, emerging technologies such as in vitro gametogenesis, gene therapies, and stem cell-based therapies are expanding the boundaries of what is possible. ART is a rapidly advancing field, but the use of certain novel and emerging technologies in humans is still highly experimental, tightly regulated, and surrounded by ethical and legal challenges. Many innovations in ART are being tested only on animal models, yet some have successfully transitioned to human applications, including preimplantation genetic testing, mitochondrial replacement therapy, time-lapse imaging, and in vitro maturation. Furthermore, artificial intelligence is transforming reproductive medicine by enabling precise embryo selection, optimizing clinical protocols, and predicting treatment outcomes. This report explores data from the CAS Content Collection™ to outline the research progress in ART and identify key emerging concepts and challenges to better understand how ART is shaping the future of reproductive healthcare.

Keywords: Assisted reproductive technologies (ART), diagnosis, female infertility.

23815 – Invited oral presentation

Human in vitro gametogenesis as a model for investigating the shift of the metabolites concentrations during gametogenesis.

Behrouz Aflatoonian [1*], Saeedeh Hajihosseini [2], Fatemeh Akyash [1], Somayyeh Sadat Tahajjodi [1], Fatemeh Hajizadeh-Tafti [1], Reza Aflatoonian [3], Mostafa Rezaei-Tavirani [4]

1- Stem Cell Biology Research center, Yazd Reproductive Sciences Institute, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
2- Medical Nanotechnology and Tissue Engineering Research Center, Yazd Reproductive Sciences Institute, Shahid Sadoughi University of Medical Science, Yazd, Iran.
3- Department of Endocrinology and Female Infertility, Reproductive Biomedicine Research Centre, Royan Institute for Reproductive Biomedicine, Tehran, Iran.
4- Faculty of Paramedical Sciences, Proteomics Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
*Corresponding authors: b.aflatoonian@ssu.ac.ir

Abstract

It has shown that metabolic co-dependence of the oocyte and cumulus cells have an essential role in determining oocyte developmental competence. Moreover, several studies in different species have indicated that secreted factors by reproductive nursing cells such as testicular cells, cumulus cells and granulosa cells in culture medium have supportive effect on in vitro maturation, and also in vitro gametogenesis using different sources of stem cells. Our recent reports in the conditioned medium from testicular cells and cumulus cells to investigate their effect on oocyte in vitro maturation in mice and in vitro gametogenesis in human have shown their supportive effect. Our results confirmed previous studies using different cells source in different species. Moreover, we have assessed the shift of metabolites' concentrations during days of differentiation of human embryonic stem cells to germ cells. This new finding can pave novel insights on role of metabolites on gamete development and help infertility treatments in the future.

Keywords: testicular cells, shift of metabolites concentrations, gametogenesis.

23817 – Invited oral presentation

The Role of Sperm Molecular Factors in Oocyte Activation and Their Clinical Implications for Improving ICSI Outcomes through AOA

Marziyeh Tavalaee [1*]

1- Department of Animal Biotechnology, Reproductive Biomedicine Research Center, Royan Institute for Biotechnology, ACECR, Isfahan, Iran.
*Corresponding authors: Tavalaee.royan@gmail.com

Abstract

Background: Oocyte activation is a pivotal step in successful fertilization, predominantly triggered by sperm-derived molecular factors. In the context of intracytoplasmic sperm injection (ICSI), deficiencies in these factors may result in fertilization failure. Among them, phospholipase C zeta (PLCζ), postacrosomal sheath WW domain-binding protein (PAWP), and actin-like protein 7a (ACTL7a) have been identified as key mediators of intracellular calcium oscillations and subsequent initiation of embryonic development.Objective: This lecture aims to elucidate the roles of sperm-borne activating factors in oocyte activation and to highlight artificial oocyte activation (AOA) as a promising adjunctive strategy to improve ICSI outcomes in couples experiencing repeated fertilization failure.Findings: Reduced expression or functional impairment of PLCζ, PAWP, and ACTL7a has been reported in patients with severe male factor infertility. Such deficiencies are strongly associated with low fertilization and blastocyst formation rates following ICSI. Application of AOA—particularly through calcium ionophore exposure —has been shown to overcome these defects, resulting in improved fertilization rates and embryonic development. Nevertheless, concerns regarding the long-term safety, including potential genetic and epigenetic implications, remain to be fully addressed.Conclusion: A deeper understanding of sperm molecular factors such as PLCζ, PAWP, and ACTL7a provides new perspectives in the diagnosis and management of male infertility. The combination of ICSI with AOA represents a novel and promising approach; however, further studies are required to standardize protocols and evaluate long-term safety.

Keywords: Oocyte activation, ICSI, PLCζ, PAWP, ACTL7a.

23819 – Invited oral presentation

Recent Advances in Cell Therapy and Regenerative Medicine for Infertility Treatment

Azar Sheikholeslami[1]*

1- Department of Cell Biology and Regenerative Medicine, Academic Center for Education, Culture, and Research (ACECR), Qom, Iran
*Corresponding Author: azareslami10@gmail.com

Abstract

Infertility affects approximately 10–15% of couples worldwide and arises from genetic, environmental, hormonal, and structural factors. Despite major progress in assisted reproductive technologies (ART), these approaches address only part of the problem and remain associated with risks of adverse pregnancy outcomes and congenital defects. In this context, cell therapy and regenerative medicine have emerged as innovative strategies offering new perspectives for infertility management. Mesenchymal stem cells (MSCs), with their differentiation capacity, immunomodulatory functions, and secretion of paracrine factors, have shown promise in restoring damaged ovarian, testicular, and endometrial tissues. Preclinical and early clinical studies demonstrated that MSCs can promote spermatogenesis and folliculogenesis, enhance endometrial receptivity, and improve ovarian function in conditions such as premature ovarian failure and polycystic ovary syndrome. Moreover, induced pluripotent stem cells (iPSCs) and embryonic stem cells (ESCs) possess the potential to generate germ cells and even correct inherited defects, although ethical and safety concerns still limit their widespread application. Other sources, including menstrual blood-derived, umbilical cord, and amniotic fluid stem cells, have shown encouraging results in repairing the endometrium and treating intrauterine adhesions or thin endometrium. Beyond whole cells, cell-secreted products such as exosomes are gaining attention as a safer alternative with lower tumorigenic risk. Nevertheless, challenges remain in optimizing transplantation methods, standardizing cell sources, and ensuring long-term safety. Overall, recent advances in cell therapy and regenerative medicine not only complement current infertility treatments but also pave the way toward more definitive and personalized therapeutic strategies.

Keywords: Infertility, Cell Therapy, Regenerative Medicine, Stem Cells

23940 – Invited oral presentation

Cryobiology and new approaches to fertility preservation

Farideh Eivazkhani [1], Rouhollah Fathi [1]*

1- Department of Embryology, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran
*Corresponding Author: rfathi79@royaninstitute.org

Abstract

The science of storing the biomaterials using cold has played an important role in human life for many years. Storing food in natural refrigerators is one example of this. The increasing complexity of human life has expanded the need for storing biological materials to the point where freezing and long-term preservation of sex cells and reproductive tissues has become a priority in infertility treatment programs. A science that has long been known as cryobiology. Although freezing plays a fundamental role in the infertility treatment process and fertility preservation, its damaging aspects can also be significant. Damage to cell membranes, nuclei, DNA, mitochondria and other cellular organelles and, consequently, the incidence of subsequent abnormalities is part of these damages. On the other hand, the use of chemical antifreezes, although it can be effective in preventing the formation of ice crystals, creates a toxic environment for the cell and leads to serious damage to the structure and genome of the cells. Today, several strategies are designed to prevent cell damage during freezing so that the resulting organism from the freezing and thawing process is in maximum physical and genetic health. Using the capacity of interdisciplinary researches has been able to largely address this need. Microfluidic systems, chips, the use of a magnetic field called FAC: Field Assisted Cryopreservation, nanotechnology, and also the use of artificial intelligence in the evaluation of sex cells rescued from thawing have been able to reduce the damage caused by freezing on the one hand and increase the rate of healthy babies born on the other. The present study has examined and analyzed new methods in cryobiology and its application in fertility preservation.

Keywords: cryobiology, fertility preservation, biomaterials

23816 – Invited oral presentation

Artificial Intelligence-Driven Personalized Medicine: A New Era in Infertility Treatment

Fatemeh Ghasemian [1*]

1- Department of Biology, Faculty of Sciences, University of Guilan, Rasht, Iran.

*Corresponding Author: Ghasemian@guilan.ac.ir

Abstract

Infertility, affecting an estimated 10–15% of couples worldwide, is a multifactorial condition shaped by a complex interplay of genetic, epigenetic, endocrine, environmental, and lifestyle factors. The inherent heterogeneity in its etiology and clinical presentation poses significant challenges for conventional diagnostic and therapeutic approaches, which are often limited by their generalized, "one-size-fits-all" design. This underscores the urgent need for personalized medicine strategies that can tailor care to the unique biological, clinical, and psychosocial profile of each patient.Recent advances in systems biology, high-throughput sequencing, and biomarker discovery have expanded our understanding of reproductive physiology and pathology, paving the way for precision interventions. At the same time, artificial intelligence (AI) has emerged as a transformative tool capable of integrating vast, multidimensional datasets—including clinical records, imaging, omics profiles, and lifestyle parameters—into predictive and decision-support models. Machine learning and deep learning algorithms, in particular, have demonstrated significant potential in optimizing ovarian stimulation protocols, forecasting ovarian reserve and response, improving embryo viability assessment, enhancing sperm selection, and predicting implantation and pregnancy outcomes in assisted reproductive technologies.By harnessing AI-driven analytics, clinicians can move beyond conventional heuristics to identify hidden, non-linear patterns, enabling more accurate diagnoses and individualized treatment pathways. Such integration not only has the potential to increase success rates and reduce treatment burden but also to minimize risks and costs associated with ineffective cycles. Furthermore, AI-powered personalized medicine opens opportunities for dynamic, adaptive models that continuously learn and refine recommendations based on new patient data and outcomes.Nevertheless, critical challenges remain in translating these innovations into routine clinical practice, including issues of data standardization, privacy and security, algorithm transparency, ethical considerations, and equitable access across diverse populations. Addressing these challenges is essential to ensure that the convergence of AI and personalized medicine fulfills its promise of transforming infertility treatment into a more precise, effective, and patient-centered discipline.

Keywords: Infertility, artificial intelligence, Personalized Medicine, Machine Learning, Predictive Modeling.

23818 – Invited oral presentation

Genetics and Epigenetics in Reproductive Biology

Mansoureh Movahedin [1*]

1- Anatomical Sciences Dept., Medical Sciences Faculty, Tarbiat Modares University, Tehran, Iran

*Corresponding Author: movahed.m@modares.ac.ir

Abstract

Infertility is a multifactorial condition affecting millions worldwide, with genetic and epigenetic mechanisms playing pivotal roles in its etiology. Genetic factors such as chromosomal abnormalities, single-gene mutations, and polymorphisms can disrupt gametogenesis, hormone regulation, and embryo development. However, emerging evidence highlights that epigenetic modifications—heritable changes in gene expression without alterations in DNA sequence—are equally critical in reproductive health.Epigenetic mechanisms, including DNA methylation, histone modifications, and non-coding RNAs, regulate gene activity during germ cell development and early embryogenesis. Disruption of these processes, often triggered by environmental stressors such as intrauterine hyperglycemia, can impair primordial germ cell (PGC) differentiation and reduce fertilityUnderstanding the interplay between genetic predisposition and epigenetic regulation is essential for developing targeted therapies and preventive strategies. Advances in epigenomic profiling and gene editing may pave the way for personalized infertility treatments. As research evolves, integrating genetic and epigenetic diagnostics into clinical practice could revolutionize reproductive medicine and improve outcomes for affected individuals.Assisted reproductive technologies (ART), including in vitro fertilization (IVF) and intra cytoplasmic sperm injection (ICSI), have revolutionized infertility treatment. However, growing evidence suggests that ART procedures may influence epigenetic programming during early embryonic development. Epigenetic modifications—such as DNA methylation, histone modifications, and non-coding RNA activity—are critical for regulating gene expression, imprinting, and cellular differentiation. Disruption of these processes during ART may lead to altered developmental trajectories and increased susceptibility to metabolic and neurodevelopmental disorders.Studies have shown that embryos conceived via ART exhibit differences in DNA methylation patterns at imprinted genes such as H19, IGF2, and KCNQ1OT1, which are essential for growth and placental function. These changes may result from culture conditions, oxygen tension, or hormonal stimulation during ovarian hyper stimulation. Although most ART-conceived children are healthy, subtle epigenetic alterations have been linked to increased risks of low birth weight, preeclampsia, and imprinting disorders like Beckwith-Wiedemann syndrome.Understanding the epigenetic consequences of ART is vital for optimizing protocols and ensuring long-term health outcomes. Future research should focus on refining culture environments and minimizing epigenetic disruption during gamete and embryo manipulation.

Keywords: Reproduction, Epigenetic modification, ART

23821 – Invited oral presentation

Mindful Nutrition, Successful Fertility, and a Healthier Next Generation: A Comprehensive Overview of the Role of Nutrition from Preconception to Birth

Mohammad Hossein Nasr-Esfahani [1*]

1- Department of Animal Biotechnology, Reproductive Biomedicine Research Center, Royan Institute for Biotechnology, ACECR, Isfahan, Iran. Pooyesh & Rooyesh Fertility Center, Isfahan Health Center, Isfahan, Iran.

*Corresponding Author: Tavalaee.royan@gmail.com

Abstract

Background: Nutrition is one of the fundamental pillars of reproductive health and the foundation of a healthier next generation. However, reproductive success is not solely dependent on nutrition; other critical factors such as parental age and environmental conditions also play decisive roles. Scientific evidence indicates that dietary patterns, parental age, and exposure to environmental factors from the preconception period through birth can influence fertility quality, embryo development, and even the risk of chronic diseases in future generations.Objective: This lecture provides a comprehensive overview of the role of mindful nutrition, parental age, and environmental factors in enhancing fertility, improving pregnancy outcomes, and preventing adverse consequences for future generations.Findings: A balanced diet rich in key micronutrients such as folate, zinc, vitamin D, and omega-3 fatty acids plays an essential role in improving gamete quality and supporting fetal health. Advanced maternal age is associated with diminished ovarian reserve, reduced oocyte quality, and an increased incidence of chromosomal abnormalities, whereas advanced paternal age is linked to reduced sperm quality and a higher risk of genetic disorders in offspring. Furthermore, environmental exposures—including air pollution, agricultural toxins, smoking, oxidative stress, and unhealthy lifestyle habits—can negatively affect gamete quality, implantation processes, and embryo development. Combining a healthy dietary pattern with optimal reproductive timing and minimizing environmental exposures can significantly improve pregnancy success and contribute to healthier future generations.Conclusion: Mindful nutrition is a simple yet powerful intervention for promoting fertility, ensuring healthy pregnancies, and securing the well-being of the next generation. Nutritional education and interventions should begin before conception and continue throughout pregnancy and lactation.

Keywords: Preconception nutrition, reproductive health, parental age, environmental factors, gamete quality, fetal development, future generation health, oxidative stress, lifestyle.

24012 – Invited oral presentation

Integrated Surgical and Medical Management of Male Infertility: A Urologists Perspective.

Mohammad Kazem Moslemi [1*]

1- Professor of Urology, Rooya Jahad Daneshgahi Infertility Center, Qom university Medical sciences, Qom, Iran.
*Corresponding Author: moslemi_urologist@yahoo.com

Abstract

Male infertility affects approximately 7% of the male population and represents a complex clinical challenge requiring multidisciplinary management. From the urologists standpoint, understanding both surgical and medical management is essential for optimizing outcomes. To review current advances and outcomes in the surgical and medical treatment of male infertility, emphasizing evidence -based approaches and individualized patient care. A narrative review of recent literature was performed, highlighting urologic procedures and adjunctive medical therapies used in clinical practice. Microsurgical varicocelectomy remains the gold standard to varicocele repair, with proven improvement in semen parameters and spontaneous pregnancy rates. Advances in microdissection testicular sperm extraction (micro-TESE) have significantly enhanced sperm retrieval success in men with NOA while minimizing testicular damage. OA can be effectively managed through vasoepididymostomy or vasovasostomy. On the medical front, hormonal therapy; including gonadotropins, antiestrogens and aromatase inhibitors- plays a critical role in selected cases of hypogonadotropic hypogonadism and idiopathic infertility. Antioxidant therapy, lifestyle modification, and management of metabolic syndrome serve as crucial adjuncts. Platelet rich plasma (PRP) and stem cell therapy show encouraging results. Continued innovation in surgical techniques and translational research into molecular and regenerative therapies will further refine male infertility management.

Keywords: Male infertility, microsurgery, varicocelectomy, micro-TESE, antioxidative therapy, Hormonal therapy.

21985 – Oral

The effect of theobromine on the acrosomal reaction, mitochondrial membrane potential, and DNA fragmentation in Asthenozoospermic Men During Freezing-Thawing

Masomeh Mohammadi[1 *], Malek Soleimani Mehranjani[1], Mohammad Hadi Bahadori[2]

1- Department of Biology, Arak University, Arak, Iran
2- Department of Anatomy, Guilan university of Medical Sciences, Guilan,Iran
*Corresponding Author: masomehmohammadi274@yahoo.com

Abstract

Sperm cryopreservation, as a key technique in assisted reproductive technology, often results in significant damage to sperm quality. Theobromine has many positive effects on sperm quality due to its antioxidant properties. In this study, the effect of theobromine on sperm of asthenospermic men during sperm Freezing-Thawing was investigated. Semen samples were collected from 30 men with asthenozoospermia, and then each sample was divided into three groups: control, cryopreservation, and cryopreservation + theobromine (10 mM). Acrosomal reaction was assessed by staining with FITC-PSA labeled with fluorescein isothiocyanate, mitochondrial membrane potential was assessed by staining with rhodamine123, and DNA fragmentation analysis was performed using the SDFA kit. Statistical analysis was performed using the Repeated Measure Analysis method and Bonferroni post hoc test. In the freeze group, there was a significant increase in the mean level of sperm DNA fragmentation and a significant decrease in both the percentage of sperm with intact acrosomes and mitochondrial membrane potential, compared to the control group ($P<0.001$). In the freeze + theobromine group, DNA fragmentation increased significantly ($P<0.05$), and mitochondrial membrane potential improved significantly ($P<0.001$) compared to the freeze group. However, the percentage of sperm with intact acrosomes showed no significant change ($P>0.05$). The results of this study demonstrated that sperm freezing impairs quality by increasing DNA damage and reducing acrosome integrity and mitochondrial function. Theobromine improved mitochondrial potential but failed to protect acrosome integrity and increased DNA fragmentation.Keywords: Asthenozoospermia, Cryopreservation, Theobromine, Acrosome Reaction, mitochondrial membrane potential, DNA fragmentation.

keywords: Asthenozoospermia, Cryopreservation, Theobromine, Acrosome Reaction, mitochondrial membrane potential, DNA fragmentation.

22279 - Oral

Synergistic Effect of Melatonin and Calcitonin on Implantation via Endometrial HB-EGF Upregulation in Mouse Model

Fatemeh Moghani-Ghoroghi[1], Iraj Ragerdi-Kashani[1], Parichehr Pasbakhsh[1 *], Reihane Mohseni[2], Ghazaleh Moshkdanian[2], Mojtaba Sehat[3], Seyed Noureddin Nematollahi-Mahani[4]

1- Department of Anatomy, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran
2- Gametogenesis Research Center, Kashan University of Medical Sciences, Kashan, Iran
3- Department of Social Medicine, Faculty of Medicine, Kashan University of Medical Sciences, Kashan, Iran
4- Department of Anatomy, Afzalipour School of Medicine, Kerman University of Medical Sciences, Kerman, Iran
*Corresponding Author: pasbakhsh@hotmail.com

Abstract

Implantation failure is a significant obstacle in assisted reproductive technology (ART). Calcitonin is involved in uterine receptivity and implantation of the embryo, and melatonin enhances embryo quality and implantation. The present study assessed the impact of melatonin-pretreated blastocysts and calcitonin administration on heparin binding-epidermal growth factor (HB-EGF) expression in murine endometrium. Two-cell embryos were recovered from 1.5-day pregnant NMRI mice and cultured to blastocyst stage in GTM medium with or without 10-9 M melatonin. Pregnant and pseudo-pregnant mice were given intraperitoneal injections of 2 IU calcitonin, and 24 hours later, the blastocysts were transferred into pseudo-pregnant mice uteri. Two days later, the implantation sites were counted, and HB-EGF mRNA and protein were detected by qRT-PCR and Western blot. Statistics were analyzed with one-way ANOVA and Tukey's post hoc test. Melatonin pretreatment with calcitonin significantly enhanced HB-EGF expression ($P<0.001$) in pseudo-pregnant mice, while calcitonin alone increased HB-EGF levels in naturally pregnant mice ($P<0.001$). The number of implantation sites was greater in the melatonin group (4.6 ± 0.5, $P<0.05$), calcitonin group (7 ± 1, $P<0.001$), and combined group (8.6 ± 0.5, $P<0.001$) as compared to controls (2.6 ± 0.5). Additionally, calcitonin increased calcitonin receptor mRNA ($P<0.001$) and protein ($P<0.05$) expression in naturally pregnant and pseudo-pregnant mice. In summary, melatonin-pretreated blastocysts along with calcitonin enhanced implantation through increasing HB-EGF expression, which may be a potential tool for improving ART success.

keywords: blastocycst, Calcitonin, HB-EGF, Implantation, Melatonin

22145 - Oral

Comparative Effects of Extracellular Vesicles Derived from Menstrual Blood–Derived Mesenchymal Stem Cells and Ginger on Ovarian Function Restoration in a Mouse Model of Premature Ovarian Failure

Faezeh Davoodi Asl[1], Hoda Fazaeli[1], Naser Kalhor[1], Leila Naserpuor[1], Azar Sheikholeslamii[1 *], Maryam Tofigh[2]

1- Department of Cell Biology and Regenerative Medicine, Academic Center for Education, Culture, and Research (ACECR), Qom, Iran
2- Department of Biotechnology Engineering, Shahab Danesh University, Qom, Iran
*Corresponding Author: Sheikholeslami@acecr.ac.ir

Abstract

Premature ovarian failure (POF), also known as primary ovarian insufficiency (POI), is a clinical disorder defined by the early loss of ovarian function, reduced estrogen production, elevated gonadotropins, and infertility. Its global prevalence is about 3.5%, with etiologies including chromosomal abnormalities, genetic mutations, autoimmune diseases, metabolic dysfunctions, or infections, though in most cases the cause remains unclear (1). POF/POI has profound health and psychological impacts, highlighting the need for innovative therapeutic strategies.Recently, exosomes have gained attention as potential treatment tools. In this study, premature ovarian failure was induced in female C57BL/6 mice (6–8 weeks old, 16–18 g) by intraperitoneal cisplatin injection for 10 consecutive days (2). Animals were divided into four groups: negative control, positive control (cisplatin), and treatment with either menstrual blood–derived stem cell exosomes (CEVs) or ginger-derived exosomes (GEVs). Exosomes were isolated and characterized using DLS and TEM. Protein concentration was determined by BCA assay, and effective doses were delivered via tail vein injection on days 1, 5, and 10. After 22 days, serum and ovarian samples were collected, and levels of estradiol (E2), anti-Müllerian hormone (AMH), and follicle-stimulating hormone (FSH) were measured using ELISA.Results demonstrated that both CEVs and GEVs displayed appropriate size and morphology consistent with standard exosome criteria. Hormone analysis revealed that treatment significantly increased E2 and AMH levels while reducing FSH compared to the POF group ($p < 0.05$), indicating partial recovery of ovarian function and hypothalamic–pituitary–ovarian axis activity.Overall, these findings suggest that exosomes of both cellular and plant origin hold promise as effective therapeutic agents for improving ovarian function and maintaining reproductive health in POF.

keywords: Ovarian Failure (POF), Extracellular Vesicles (EVs), Ginger, Mesenchymal Stem Cells (MSCs).

22107 - Oral

Association between sperm parameters andGPx1 and GPx4 transcripts content in men with varicocele

Negar Abbasi Raki[1 *], Mehran Dorostghol[1], Mohammad Hajari[1], Dadfar MR[2]

1- Department of Biology, Faculty of Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran.
2- Department of Urology, School of Medicine, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
*Corresponding Author: abbasirakinegar@gmail.com

Abstract

One of the main causes of male infertility is varicocele that its exact pathophysiology are still completely unknown. Present study was done to better understand the molecular mechanisms of varicocele-associated damages to spermatogenesis. GPx1 (Glutathione peroxidase 1) and GPx4 (Glutathione peroxidase 4) plays a very important role in protecting cell membranes from oxidative damage. The associations of sperm transcripts content of GPx1 and GPx4 with sperm parameters were assessed in men with varicocele. In normozoospermic men (n=30) and patients with varicocele (n=30), sperm concentration, motility and morphology were evaluated and sperm content of GPx1 and GPx4 transcripts were analyzed. Sperm concentration, motility and normal morphology in men with varicocele were significantly ($p<0.05$) lower than normozoospermic men. In patients with varicocele, significantly ($p<0.05$) lower GPx1 and GPx4 transcripts contents in ejaculated spermatozoa were observed compared to normozoospermic men. Significant ($p<0.05$) associations were observed between the sperm content of GPx1 and GPx4 transcripts and the sperm concentration, motility and normal morphology. Our findings show that varicocele may lead to male infertility by causing the expression of GPx1 and GPx4, and also sperm content GPx1 and GPx4 transcripts could reflect the sperm quality and be useful for predicting male infertility.

keywords: Varicocele, Semen quality, Oxidative stress, GPx1, GPx4.

22426 - Oral

From Inflammation to ECM: A Molecular Insight into Polycystic Ovary Syndrome

Tayyebeh Zamani-Badi[1], Elahe Seyed Hosseini[2], Hossein Nikzad[2 *]

1- Anatomical Sciences Research Center, Institute for Basic Sciences, Kashan University of Medical Sciences, Kashan, Iran.
2- Gametogenesis Research Center, Kashan University of Medical Sciences, Kashan, Iran.
*Corresponding Author: hnikzad2025@gmail.com

Abstract

Polycystic ovary syndrome (PCOS) is a prevalent endocrine and reproductive disorder in women of reproductive age, characterized by follicular arrest and ovulatory dysfunction. Follicular fluid, as a complex environment, is crucial for the interaction between oocytes and granulosa cells. In this setting, cytokines and matrix metalloproteinases (MMPs) influence extracellular matrix (ECM) remodeling, follicle selection, and oocyte maturation. Evidence suggests that the disruption of these pathways may contribute to the pathogenesis of PCOS. This study aimed to investigate the expression of interleukin-1 beta (IL1β) and transforming growth factor beta (TGFβ), as well as the activity of MMP2. This case–control study involved collecting granulosa cells and follicular fluid samples from 20 women with PCOS and 15 control women. Gene expression of IL1β and TGFβ was evaluated through real-time PCR, and MMP2 enzymatic activity was determined via gelatin zymography. Bioinformatic analyses identified related molecular pathways. Independent t-tests were conducted, with a p-value <0.05 deemed statistically significant. Results showed that IL1β ($p=0.0097$) and TGFβ ($p=0.0022$) expression were significantly elevated in PCOS patients compared with controls. MMP2 activity exhibited a trend toward increase but was at the threshold of statistical significance ($p=0.0536$). Bioinformatic analysis confirmed the association of these factors with ECM remodeling and ovulation. The elevated inflammatory cytokines and altered MMP2 activity indicate a disrupted follicular microenvironment in PCOS, which may contribute to follicular arrest and ovulatory dysfunction. These findings underscore the importance of inflammatory pathways and ECM remodeling in the pathogenesis of PCOS.

keywords: Granulosa Cells; Follicular Fluid; Interleukin-1 beta; Transforming Growth Factor beta; Matrix Metalloproteinase 2

22317 - Oral

Effect of Green-Synthesized Titanium Dioxide Nanoparticles Using Ziziphus jujuba Fruit Extract on Testicular Tissue and Sperm Parameters in NMRI Male Mice: Assessment of MDA, DFI, and Antioxidant Enzymes SOD and GPx

Parmis Babaei Tooran poshti[1], Negin Khabazha[2 *], Zeinab Piravar[2], Ramin Mohammadi Alouche[2]

1- Central Tehran Branch of Islamic Azad University Faculty of Science
2- Central Tehran Branch of Islamic Azad University Faculty of Science
*Corresponding Author: negiiiin.khabazha@gmail.com

Abstract

Nanotechnology, through the engineering of materials at the nanoscale, has wide applications in medicine. Titanium dioxide nanoparticles (TiO_2) are attractive due to their stability, photocatalytic activity, and antibacterial properties; however, evidence shows they can cross the blood–testis barrier and impair reproductive function via oxidative stress. In this study, TiO_2 nanoparticles were synthesized by chemical and green methods using aqueous extract of Ziziphus jujube, and characterized by FESEM, XRD, FTIR, DRS, and EDAX. Their effects on reproductive parameters of male NMRI mice were then evaluated. Results showed that sperm count in the green-synthesized group significantly increased compared to the chemical group ($P<0.001$), and sperm motility was also higher ($P<0.001$). DNA fragmentation index (DFI) in the green group was significantly lower than the chemical group ($P<0.05$). Antioxidant enzyme activity indicated increased SOD in the chemical group versus control ($P<0.01$), decreased GPx in the chemical group compared to the jujube extract group ($P<0.01$), and significantly lower MDA in the green group relative to the chemical group ($P<0.001$). Testosterone levels were higher in the jujube extract group compared with control and chemical groups ($P<0.01$), while FSH was elevated in the green group versus the chemical group ($P<0.05$). Histological evaluation showed better preservation of seminiferous tubule structure, Leydig cells, and spermatids in the green group ($P<0.001$). Jujube extract alone also induced moderate improvements. These findings suggest that green synthesis of TiO_2 nanoparticles using Ziziphus jujube is a safe, effective, and eco-friendly approach with potential applications in reproductive health and biomedical sciences.

keywords: TiO_2 nanoparticles ،sperm ،oxidative stress ،reproductive toxicity.

21892 - Oral

The Impact of Photobiomodulation Therapy on Enhancing Spermatogenesis and Blood-Testis Barrier Integrity in Adult Male Mice Subjected to Scrotal Hyperthermia

Reza Soltani[1 *], Fakhroddin Aghajanpour[1], Azar Afshar[1]

1- Department of Biology and Anatomical Sciences, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran
*Corresponding Author: rezasoltanikazemii@gmail.com

Abstract

Introduction: Unhealthy lifestyle choices such as alcohol, chemicals, and heat stress can worsen male infertility. Heat stress can cause damage to the essential structure known as the blood-testis barrier (BTB). Photobiomodulation therapy (PBMT) has been employed in various studies to enhance sperm quality in individuals with genital inflammatory conditions in recent times. The current research sought to study how laser therapy affects spermatogenesis and the structure of the BTB in a mouse model of scrotal heat exposure.Methods: Thirty adult male NMRI mice, 8 weeks old, were divided into three groups: Control, Hyperthermia, and Hyperthermia+Laser 0.03 J/cm2. No intervention was performed in the control group. In the injury group, The animals in the hyperthermia group had their testicles exposed to water at 43 °C for 20 minutes five times every other day. In the treatment group, after induction of hyperthermia, the testicles were exposed to laser radiation every other day for 35 days, lasting 3 minutes each time, with an energy density of 0.03 J/cm2. Finally, animals were sacrificed, and sperm parameters, reactive oxygen species (ROS) and glutathione (GSH) levels, stereological parameters, and gene expression were evaluated.Results: At the end of the experiment, statistical analyses were performed using one-way ANOVA. The results of this study showed that sperm quality, spermatogenic cell count, and testicular tissue volume were significantly increased in the treatment group compared to other groups. Also, ROS and GSH levels were significantly decreased and increased in the treatment group compared to other groups, respectively. Gene expression related to the blood-testis barrier also showed a significant increase in the treatment group compared to other groups.Conclusion: Currently, PBMT is a novel approach for addressing male infertility by preserving the integrity of the BTB in Sertoli cells, which in turn supports the growth and specialization of germ cells.

keywords: Blood-testis barrier, Hyperthermia, Laser therapy, Spermatogenesis.

22479 - Oral

Impact of One-Carbon Cycle Antioxidant Support on Chromatin Structure and DNA Integrity in Infertile Men Undergoing Assisted Reproductive Technology Programs

Farzaneh Bassiri[1], Marziyeh Tavalaee[1], Maurizio Dattilio[2 *], Mohammad Hossein Nasr-Esfahani[1, 3*]

1- Coworker Department of Reproductive Biotechnology, Reproductive Biomedicine Research Center, Royan Institute for Biotechnology, ACECR, Isfahan, Iran
2. R&D Department, Parthenogen, Piazza Indipendenza 11, Lugano 6900, Switzerland
3. Isfahan Fertility and Infertility Centre, Isfahan, Iran
*Corresponding Authors: mh.nasr-esfahani@royaninstitute.org, maurizio.dattilo@parthenogen.ch

Abstract

Oxidative stress is a major risk factor for male infertility. Reactive oxygen species (ROS) induce sperm DNA damage, reducing fertilization potential, embryo quality, and pregnancy outcomes in ART. Nutritional support targeting the one-carbon cycle, with indirect antioxidant activity, has been associated with reduced sperm DNA fragmentation. This study evaluated the effect of micronutrient supplementation in infertile men whose partners had experienced ART failure. Men with infertility, defined as partners of couples who had experienced at least one failed ART cycle with a DNA fragmentation index (DFI) >20% assessed by the TUNEL assay, were enrolled in the study. Participants received a 4-month course of oral supplementation containing folates, B vitamins, zinc, and cysteine. Semen parameters, sperm DNA fragmentation (TUNEL), nuclear maturation (CMA3 and aniline blue staining), and lipid peroxidation (BODIPY) were analyzed before and after supplementation. Clinical outcomes were evaluated through systematic follow-up of the couples. A total of 43 patients completed the treatment program; however, complete pre- and post-treatment data were available for only 25 patients. While sperm concentration and motility remained unchanged after oral micronutrient supplementation, a significant improvement in sperm morphology was observed. Nuclear maturation, DNA fragmentation, and lipid peroxidation also showed significant improvement post-treatment. During follow-up, 10 clinical pregnancies (23.3%) and 4 live births (9.3%) were achieved. This study demonstrates that micronutrient supplementation, by supporting the one-carbon cycle, reduces oxidative stress levels and improves chromatin packaging, which in turn decreases DNA damage and increases the likelihood of fertilization in infertile candidates for ICSI.

Keywords: One carbon cycle, sperm, oxidative stress, DNA fragmentation, male infertility.

22328 - Oral

Comparative Analysis of Sperm DNA Fragmentation and Protamination Before and After Zeta Potential Selection

Mahsa Allahgholi[1], Mohammad Ali Sadighi Gilani[1], Marjan Sabbaghian[1 *], Nima Narimani[2], Saman Zamanian[3]

1- Department of Andrology, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran.
2- Department of Urology, Hasheminejad Kidney Center (HKC), Iran University of Medical Sciences (IUMS), Tehran, Iran
3- Department of Stem Cell Technology and Tissue Regeneration, Faculty of New Biological Science and Technologies, University of Science and Culture, ACECR, Tehran, Iran
*Corresponding Author: m.sabbaghian@royaninstitute.org

Abstract

Sperm DNA fragmentation (SDF) is a key biomarker of chromatin integrity, with elevated levels linked to impaired fertility and suboptimal ART outcomes. The zeta potential technique is an advanced ART method that selects sperm with superior quality based on their surface electrical charge. This study aimed to compare sperm DNA fragmentation index (DFI) and high DNA stainability (HDS) before and after Zeta potential selection using various techniques.In this before-and-after study, semen from 15 infertile men with DFI >25% was processed using the zeta potential technique. DFI was assessed by Sperm Chromatin Dispersion) SCD (and sperm chromatin structure assay SCSA, HDS by SCSA, and protamination by CMA3 staining.After zeta potential selection, DFI significantly decreased as measured by SCD (41.67% ± 0.14 to 28.67% ± 0.14, $p < 0.001$) and SCSA (43.93% ± 0.17 to 40.13% ± 0.17, $p < 0.05$). Protamination, assessed by CMA3 staining, improved markedly (30.33% ± 0.10 to 20.47% ± 0.08, $p < 0.001$), while HDS showed no significant change (11.83% ± 0.11 to 13.73% ± 0.23, $p = 0.265$).SCD, SCSA, and CMA3 methods provided consistent and complementary assessments of sperm DNA fragmentation and protamination. Such improvements suggest that zeta potential selection could serve as a valuable adjunct in assisted reproduction strategies.Zeta potential selection effectively reduces sperm DNA fragmentation and enhances protamination, as confirmed by consistent findings from multiple assays.The fertilization potential of sperm selected by the zeta potential method should be further evaluated.

keywords: Male Infertility, Zeta Potential Selection, Sperm DNA Fragmentation, Protamination.

22282 - Oral

Genetic Variant Analysis Associated with Infertility in a Patient with Endometriosis Using Whole Exome Sequencing

Zahra Allahyar[1], Mona Khosravifar[1], Amir Amiri-Yekta[1], Kiandokht Kiani[2 *]

1- Department of Genetics, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran
2- Department of Endocrinology and Female Infertility, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran.
*Corresponding Author: k.kiani@royan-rc.ac.ir

Abstract

Endometriosis is a prevalent gynecological disorder among women of reproductive age and is frequently associated with infertility. Increasing evidence highlights the role of genetic factors in its pathogenesis. The present study aimed to identify candidate pathogenic variants potentially associated with infertility in a patient with endometriosis using whole exome sequencing (WES).A 39-year-old female patient with a history of endometriosis and infertility, born to consanguineous parents and whose mother had uterine fibroids, was referred for genetic evaluation. Peripheral blood was collected and genomic DNA was extracted. Whole exome sequencing was performed, and FASTQ files were analyzed through multiple databases, including FRANKLIN, VARSOM, OMIM, GeneCards, MobiDetails and NCBI, to detect potential pathogenic variants.Analysis revealed several pathogenic gene variants, including MGAT4C, NAA35, UNC5C, DZIP1L, ZC3H15, CACNA1E, TMC1, and IGF2R.Functional evidence from previous studies suggests that these genes are involved in diverse biological pathways with potential relevance to endometriosis and infertility. MGAT4C participates in N-linked glycosylation of cell surface receptors, potentially influencing cell adhesion and signaling in reproductive tissues. NAA35 functions in N-terminal acetylation, regulating protein stability and apoptosis. UNC5C is a netrin-1 receptor implicated in apoptosis regulation; alterations may contribute to survival of ectopic endometrial cells. DZIP1L, essential for ciliogenesis, has been linked to ciliary dysfunction, which is associated with female infertility due to impaired tubal transport. ZC3H15 enhances EGFR signaling and may promote abnormal endometrial proliferation. CACNA1E encodes an R-type calcium channel, and altered calcium signaling may affect endometrial microenvironment and pelvic pain. Variants in TMC1, primarily known for hereditary hearing loss, may represent incidental findings reflecting the patient's consanguineous background. Importantly, IGF2R regulates IGF-II signaling and endometrial receptivity, potentially contributing to infertility.These findings underscore the utility of WES in uncovering candidate pathogenic variants in endometriosis-associated infertility and highlight novel molecular targets for future diagnostic and therapeutic research.Precision medicine- Reproductive genetics- Infertility

keywords: Precision medicine, Reproductive genetics, Infertility.

21972 - Oral

Comparing the Efficacy of Mesenchymal Stem Cell-Derived and Ginger- Derived Exosomes in Preserving Post-Thaw Sperm Quality

Hoda Fazaeli[1], Faeze Davoodi Asl[1], Naser Kalhor[1], Azar Sheikhoeslami[1 *], Saber Aghaei[2], Abbas Sheikh Hosseini[3]

1- Department of Cell Biology and Regenerative Medicine, Academic Center for Education, Culture, and Research (ACECR), Qom, Iran
2- Department of Biology, Faculty of Science, Islamic Azad university of Qom, Qom, Iran
3- Department of Biology, Faculty of Science, Arak University, Arak, Iran
*Corresponding Author: sheikholeslami@acecr.ac.ir

Abstract

Sperm cryopreservation is widely used to preserve male fertility in medical and assisted reproduction. However, the freeze–thaw process can damage sperm through osmotic, oxidative, and structural stress (1). Adding antioxidants to freezing media is a promising strategy to improve post-thaw sperm quality (2). Exosomes carrying bioactive molecules have recently emerged as cryoprotective agents. Mesenchymal stem cell-derived exosomes (MSC-Exos) have been reported to show such effects (3). Plant-derived exosomes, such as ginger-derived exosomes (Ginger-Exos), are rich in natural antioxidants and may also protect sperm during cryopreservation (4). This study comparatively evaluated the efficacy of MSC-Exos and Ginger-Exos in preserving sperm quality after freezing–thawing. Exosomes were isolated from the conditioned medium of menstrual blood-derived MSCs (MenSCs) and ginger juice. Each semen sample was allocated into three groups: control, MSC-Exo, and Ginger-Exo. In the control group, samples were cryopreserved using commercial freezing medium without additional treatment. In the MSC-Exo and Ginger-Exo groups, samples were incubated with 50 µg/mL MenSCs and ginger-derived exosomes for 45 minutes, respectively, before cryopreservation. After thawing, sperm motility parameters, DNA fragmentation index (DFI), and reactive oxygen species (ROS) levels were assessed and compared. Results showed that in the MSC-Exo group, ROS production and DFI significantly decreased, while total motility increased versus control ($P \leq 0.05$). Ginger-Exo treatment only reduced DFI compared to control ($P \leq 0.05$). Therefore, MenSCs-derived exosomes demonstrated superior cryoprotective effects, likely due to stronger antioxidant and DNA-protective properties. Further studies are needed to elucidate mechanisms and optimize dosing for clinical use.

keywords: Sperm Cryopreservation, Mesenchymal Stem Cells, Ginger, Exosome, Anti-Oxidant.

21452 - Oral

Melatonin protects sperm function against cryodamage in asthenozoospermic men: an in vitro study

Zahra Azizi[1], Malek Soleimani Mehranjani[1*], Seyed Mohammad Ali Shariatzadeh[1], Atena Sadat Azimi[1], Nazila Najdi[2]

1- Department of Biology, Faculty of Science, Arak University, Arak, Iran
2- Department of Obstetrics and Gynecology, School of Medicine, Arak University of Medical Science, Arak, Iran.
*Corresponding Author: m-soleimani@araku.ac.ir

Abstract

Sperm motility is essential for oocyte penetration and fertilization. According to the World Health Organization (WHO), asthenozoospermia—defined as total sperm motility below 42%—is a leading cause of male infertility. Melatonin is known for its antioxidant properties in various cell types. This study investigated the in vitro effects of melatonin supplementation on sperm from asthenozoospermic men during the freeze-thaw process. Semen samples from 30 asthenozoospermic men were collected and divided into three groups: control, freeze, and freeze + melatonin (1 mM, 30-min incubation). Sperm motility was assessed based on the (WHO, 2021) guidelines, viability was evaluated using eosin-nigrosin staining, DNA fragmentation was analyzed using the Halosperm assay, and apoptosis-related genes expression (Bcl-2 and Bax) was measured by real-time qPCR. Data were analyzed using repeated measures analysis with Bonferroni post hoc test. Cryopreservation significantly reduced sperm motility, viability, and Bcl-2 expression ($p < 0.001$). while it increased DNA fragmentation and Bax expression compared to the control group ($p < 0.01$). However, these adverse effects were significantly reversed in the freeze + melatonin group compared to the freeze group ($p < 0.01$). Sperm motility, viability, and DNA integrity are key factors in successful fertilization. Melatonin supplementation during sperm cryopreservation improved post-thaw sperm quality and reduced DNA damage and apoptosis. Therefore, melatonin may enhance the success rate of assisted reproductive techniques and help preserve the genetic integrity of future generations.

keywords: Asthenozoospermia, sperm motility, DNA fragmentation, Apoptosis.

21720 - Oral

Reprogramming Mouse Fibroblasts into Primordial Germ Cells via the Wnt/β-catenin Pathway: A Novel Approach for Male Infertility Treatment

Ali Shamsizadeh Meymandi[1 *], Mohammad Shamsizadeh Meymandi[2], Tayebeh Shamsizadeh Meymandi[3], Majid Sadeghpoor[4]

1- Professional Doctorate in Veterinary Medicine, Islamic Azad University, Baft Branch, Kerman, Iran – Member of the Iranian Society of Microbiology and Surgery
2- Professional Doctorate in Medicine, Kerman University of Medical Sciences
3- Specialist in Internal Medicine, Kerman University of Medical Sciences
4- Master's Degree in Microbiology – Member of the Iranian Society of Microbiology
*Corresponding Author: ali.shamsizadeh96@gmail.com

Abstract

Male infertility is a prevalent global health issue, often caused by the absence or dysfunction of functional germ cells, limiting effective treatment options. Recent advances in cellular and molecular biology, particularly in induced pluripotent stem cells (iPSCs) and cellular reprogramming technologies, have opened new avenues for innovative therapies. This study aimed to investigate the potential of reprogramming mouse skin fibroblasts into primordial germ cells (PGCs) through activation of the Wnt/β-catenin signaling pathway.Mouse fibroblasts were isolated and cultured in DMEM medium, then reprogrammed into iPSCs via transfection with Yamanaka factors (Oct4, Sox2, Klf4, and c-Myc). Subsequently, cells were treated with CHIR99021, a Wnt pathway activator, for 10 days. The expression levels of key germ cell markers, including Blimp1, Prdm14, and Stella, were evaluated using quantitative RT-PCR.Results showed a significant upregulation of these germ cell-specific genes in the CHIR99021-treated group compared to controls ($P < 0.01$). These findings suggest that activation of the Wnt/β-catenin pathway promotes the differentiation of iPSCs into primordial germ cells. This approach holds promise as a potential therapeutic strategy for treating male infertility..

keywords: Cellular reprogramming, primordial germ cells, male infertility, Wnt/β-catenin pathway, induced pluripotent stem cells

21491 - Oral

The effects of plasma rich in growth factors (PRGF) on the development of eight-cell mouse embryos following vitrification

Maedeh Khalili[1], Mansoureh Movahedin[1 *]

1- Department of Anatomical Sciences, Faculty of Medical Sciences, Tarbiat Modares University, Tehran,Iran.
*Corresponding Author: movahed.m@modares.ac.ir

Abstract

Cryopreservation of sperm, oocyte, and embryo is widely used in the reproductive field. Vitrification leads to exposure of the embryos to non-physiological conditions and causes adverse consequences. This study uses plasma rich in growth factors containing autologous platelets and multiple growth factors at a supra-physiological level to improve the embryo and vitrification culture media. After superovulation in female mice and mating, the animals were evaluated for the presence of vaginal plaque. 8-cell embryos were obtained on day 3. The embryos of control group 1 were cultured without freezing for three days. The embryos of control group 2 were vitrified/warmed at the 8-cell stage. Experimental groups were evaluated similarly by supplementing plasma rich in growth factors. The optimum dose of PRGF was determined at 2.5%, 5% and 10% in the non-vitrified groups. The 10% PRGF dose was selected as the optimal dose due to a significant increase in blastocyst hatching rate compared to the control group and a decrease in degeneration rate compared to the 2.5% and 5% doses. Also, the developmental and hatching rates at the selected dose in the vitrified group were significantly increased compared to the control group. As a result, considering that vitrification can lead to zona hardening and impair blastocyst hatching, this study indicates that the use of 10% PRGF was able to improve this situation and increase embryo development.

keywords: Vitrification،Personalized medicine، Mouse embryo development

21545 - Poster

The role of metformin in modulating inflammatory factors and insulin resistance in patients with polycystic ovary syndrome undergoing intracytoplasmic sperm injection (ICSI)

Shima Soniesharg[1 *], Syed Mohammad Ali Shariatzadeh[1], Malek Soleimani Mehranjani[1], Rahil Janatifar[2], Zahra Ebrahimi[3]

1- Department of Biology, Faculty of Sciences, Arak University, Arak, Iran
2- Department of Reproductive Biology, Academic Center for Education, Culture and Research (ACECR), Qom, Iran
3- Department of Mesenchymal Stem Cells, Academic Center for Education Culture and Research (ACECR), QOM, Iran
*Corresponding Author: soniesharghshima@yahoo.com

Abstract

Polycystic ovary syndrome (PCOS) is an endocrine disorder characterized by insulin resistance(1), mild inflammation(2), and impaired ovulation(1) . Metformin, an antidiabetic drug commonly used in the treatment of PCOS, may play an important role in the treatment of infertility in these patients by improving insulin resistance and reducing inflammation(2, 3) .The aim of this study was to investigate the effects of metformin on the levels of insulin, inflammatory factors interleukin-6 (IL-6), and tumor necrosis factor (TNF-α) in serum and follicular fluid of women with PCOS. Women with PCOS (n=40) were randomly divided into two groups. Metformin (1500 mg) and placebo (25 mg ORS solution) were both administered for 8 weeks. Treatment was started two months before the ovulation cycle and continued until the day of oocyte retrieval. Insulin, IL-6, and TNF-α levels in serum and follicular fluid of these patients were measured by ELISA. Data were analyzed using the independent T-Test, and the difference between means was considered significant at the $P<0.05$ level. A significant decrease in serum IL-6 ($P<.001$), TNF-α ($P<0.01$), and insulin ($P<.001$) levels was observed in the metformin group, but no significant difference was observed in follicular IL-6, TNF-α, and insulin levels between the two groups ($P>0.05$). Based on the findings of this study, metformin may improve insulin resistance and reduce inflammatory factors, creating a more suitable environment for the growth and maturation of follicles and oocytes.

keywords: Polycystic ovary syndrome; Metformin; Insulin; IL-6; TNF-α.

21455 - Poster

Can Papaverine Treatment Before Cryopreservation Improve Biochemical and Functional Parameters of Sperm in Asthenozoospermic Men?

Zahra Azizi[1 *], Malek Soleimani Mehranjani[1], Seyed Mohammad Ali Shariatzadeh[1], Atena Sadat Azimi[1], Nazila Najdi[2]

1- Department of Biology, Faculty of Science, Arak University, Arak, Iran
2- Department of Obstetrics and Gynecology, School of Medicine, Arak University of Medical Science, Arak, Iran
*Corresponding Author: zahraazizi4049@gmail.com

Abstract

Asthenozoospermia is one of the common causes of male infertility and is often associated with increased reactive oxygen species (ROS), oxidative stress, and apoptosis. The freeze-thaw process further enhances ROS production, damaging sperm motility and viability. This experimental study aimed to investigate the protective effect of papaverine, a phosphodiesterase inhibitor, on sperm from asthenozoospermic men during cryopreservation. After liquefaction, semen samples from 30 asthenozoospermic men were divided into three groups: control (fresh), freezing (untreated), and freezing + papaverine (100 µM, 30 min). Sperm motility based on (WHO, 2021), viability (eosin-nigrosin staining), and mitochondrial membrane potential (MMP) (rhodamine-123 staining) were assessed. In addition, malondialdehyde (MDA) level were measured using ELISA, and ROS level were evaluated by flow cytometry. Data were analyzed using repeated measures analysis with Bonferroni post hoc test. Compared to the control group, the freezing group showed significant decrease in the mean percentages of motility, viability, and MMP ($p < 0.001$), and a significant increase in MDA and ROS levels ($p < 0.01$). In contrast, the freezing + papaverine group showed significant improvement in the mean percentage of motility, viability, and MMP ($p < 0.001$), along with a significant reduction in MDA ($p < 0.001$) and ROS levels ($p < 0.05$) compared to the freezing group. These findings suggest that papaverine, may enhance sperm quality during the freeze-thaw process in asthenozoospermic men by improving motility, viability, and mitochondrial function, and by reducing oxidative stress markers. Therefore, papaverine may be considered a potential antioxidant candidate in sperm cryopreservation protocols.

keywords: Asthenozoospermia, papaverine, Oxidative stress, Cryopreservation.

21992 - Poster

The Effect of Simultaneous Treatment of Sitagliptin and Myo-inositol on the Quality of Testicular Tissue and in Diabetic Mice

Sepideh Ahmadi[1 *], Malek Soleimani Mehranjni[1], Fatemeh Sabzevar[1]

1- Department of Biology, Faculty of Science, Arak University, Arak, Iran.
*Corresponding Author: sepidehahmadi358@gmail.com

Abstract

Sitagliptin as a dipeptidyl peptidase-4 inhibitor is approved for the treatment of patients with type 2 diabetes. Despite its therapeutic effects, it induces oxidative stress and negatively impact reproduction. This study investigated the effect of myo-inositol, recognized for its antioxidant properties, on the quality of testicular tissue in diabetic mice treated with sitagliptin. Thirty adult male NMRI mice were divided into 5 groups (n=6): control group, diabetic group (150 mg/kg/day streptozotocin + 110 mg/kg/day nicotinamide), diabetic + sitagliptin group (30 mg/kg/day), diabetic + myo-inositol group (300 mg/kg/day), and diabetic + sitagliptin + myo-inositol group. After 35 days of treatment, the mice were dissected, and the left testis was isolated for stereological studies and evaluation of spermatogenesis indices. The volume of the testis, the volume of seminiferous tubules, the volume of interstitial tissue, the length, diameter, height of the germinal epithelium, and the thickness of the basement membrane in the seminiferous tubules, as well as the number of spermatogenic cells, Sertoli cells, and Leydig cells, spermatogenesis indices and Jansen score showed a significant decrease in the diabetic group compared to the control group ($p<0.05$). In the diabetic + sitagliptin group, there was no significant difference in these parameters compared to the diabetic group ($p>0.05$). These adverse effects were compensated in the diabetic + sitagliptin + myo-inositol group compared to the diabetic + sitagliptin group. The results indicated that co-administration of sitagliptin and myo-inositol improves the quality of testicular tissue, highlighting myo-inositol's potential protective role against sitagliptin-induced reproductive damage in diabetic mice.

keywords: Stereology, Streptozotocin, Seminiferous tubules, Leydig cells.

21993 - Poster

Effect of Selenium on Serum Biochemical Factors in Adult Mice Following Treatment with Cyclophosphamide

Sepideh Ahmadi[1 *], Malek Soleimani Mehranjni[1], Fatemeh Sabzevar[1]

1- Department of Biology, Faculty of Science, Arak University, Arak, Iran.
*Corresponding Author: sepidehahmadi358@gmail.com

Abstract

Cyclophosphamide is a commonly used anticancer and immunosuppressive drug drug, but it increases reactive oxygen species (ROS) and oxidative stress. Therefore, this study investigated the protective effect of selenium as a potent antioxidant on biochemical factors in adult mice treated with cyclophosphamide. Thirty-two adult male NMRI mice, with an average weight of 36 ± 2 g, were randomly divided into four groups: control, cyclophosphamide (100 mg/kg/bw), selenium (1 mg/kg/bw), and cyclophosphamide + selenium. After a 35-day treatment period, blood samples were collected from the hearts of the mice. Following serum preparation, serum levels of malondialdehyde (MDA) and total antioxidant capacity (TAC) were evaluated. The obtained data were analyzed using SPSS software with one-way ANOVA and Tukey's test. Differences between means were considered significant at $p<0.05$. In the cyclophosphamide group, a significant decrease in serum TAC levels and a significant increase in serum MDA levels were observed compared to the control group ($p<0.001$). However, in the cyclophosphamide + selenium group, serum TAC levels showed a significant increase compared to the cyclophosphamide group ($p<0.05$). Furthermore, serum MDA levels in the cyclophosphamide + selenium group significantly decreased compared to the cyclophosphamide group ($p<0.001$). Our results demonstrated that selenium mitigates cyclophosphamide-induced oxidative stress in NMRI male mice. These findings suggest that selenium may serve as a potential antioxidant agent to mitigate cyclophosphamide-induced oxidative damage in reproductive tissue.

keywords: Malondialdehyde, Total antioxidant capacity, Oxidative stress, Reactive oxygen species.

22504 - Poster

Effects of ionizing and non-ionizing radiation on male infertility

Fereshteh Dadfar[1] *, Kourosh Bamdad[1]

1- Department of Biology, Payame Noor University, Tehrah, Iran.
*Corresponding Author: fdadfar@pnu.ac.ir

Abstract

One of the problems facing society today is infertility and it,s increasing prevalence, some of which is caused by the use of ionizing, non-ionizing radiation and the use of radioactive materials in the treatment of various diseases. Ionizing radiation includes alpha particles, beta particles, X-rays and gamma rays and radiation emitted from medical equipment such as radiology, mammography, MRI, and CT scans. The highest exposure comes from X-ray diagnostic procedures. Electromagnetic waves are also classified as non-ionizing radiation, and the increasing use of devices that generate electrical waves, especially tablets and mobile phones, and the side effects resulting from their use have raised many concerns about the harmful effects of these communication devices on human health. Among the most useful radioactive materials are radioactive isotopes of iodine-129 and 131. Due to the increasing use of ionizing and non-ionizing radiation, the effects of these factors can cause changes in various tissues of the body, including the reproductive system. The gonads, especially the testis, are sensitive organs to radiation. Gamma radiation causes damage to the germinal epithelium of the testicular tissue, spacing of the seminiferous tubules, and reduction in sperm count. Radiation at lower doses causes damage to the germinal epithelium, at higher doses it leads to a decrease in sperm count and at much higher doses it also affects leydig cells, causing complete sterility in men. X-ray radiation causes damage to sperm DNA, leading to a decrease in sperm count, decreased sperm motility, an increase in the number of abnormal sperm and damage to spermatogonia.Electromagnetic waves emitted from Wi-Fi waves cause atrophy of the seminiferous tubules, decrease in leydig cells, decrease in the total number of sperm and their motility. one of the reasons for which could be due to an increase in apoptosis in the sex cells in the testis. Possible pathways of sperm damage by electromagnetic waves include DNA damage, changes in the spermatogenesis process and decreased testosterone, all of which lead to reduced sperm count, reduced sperm motility and changes in sperm morphology. In patients treated with iodine-131; problems have occurred such as disruption of the spermatogenesis process, dysfunction in the seminiferous tubules, testicular germ cells, damage to interstitial cells, reduction in sperm count and motility. Considering the destructive effects that diagnostic radiation and radioactive materials have on fertility and the male reproductive system, therefore, it is essential to use permissible doses when using these treatment methods and to take necessary measures to reduce radiation exposure to the gonads to minimize the possibility of sexual disorders.

Keywords: Electromagnetic waves,X-Ray, Iodine131, Infertility, Male

22325 - Poster

Protective Effects of Theophylline on Oxidative Stress and Sperm Quality during Cryopreservation in Asthenozoospermic Men

Abbas Sheikh Hosseini Lori[1 *], Malek Soleimani Mehranjani[1], Seyed Mohammad Ali Shariatzadeh[1], Ebrahim Cheraghi[2], Rahil Jannatifar[3]

1- Department of Biology, Faculty of Sciences, Arak University, Arak, Iran
2- Department of Biology, Faculty of Sciences, University of Qom, Qom, Iran
3- Department of Reproductive Biology, Academic Center for Education Culture and Research (ACECR), Qom, Iran
*Corresponding Author: sh.hosseini993@gmail.com

Abstract

Asthenozoospermia, characterized by reduced sperm motility, is a major cause of male infertility. Cryopreservation, though essential in assisted reproductive technologies (ART), often worsens oxidative stress in low-motility samples, increasing reactive oxygen species (ROS) and impairing mitochondrial function. Theophylline, which enhances motility by modulating intracellular signaling, may counter oxidative damage during freeze–thaw. This study evaluated the impact of theophylline supplementation on ROS levels and sperm quality in asthenozoospermic men. Semen samples from 30 asthenozoospermic men (Roya Infertility Treatment Centre, Qom, Iran) were divided into three groups: fresh (control), freeze (cryoprotectant only), and freeze + theophylline (0.05 mM). Cryopreservation was performed using a rapid freezing protocol. Plasma membrane integrity was assessed by the hypoosmotic swelling test (HOST), mitochondrial membrane potential (MMP) by Rhodamine 123 staining, and reactive oxygen species (ROS) levels by flow cytometry with DCFH-DA. Data were analyzed using repeated measures analysis, with statistical significance set at $p < 0.05$. A significant reduction in MMP and plasma membrane integrity, along with elevated intracellular ROS levels, was seen in the freeze group when compared with the control ($p < 0.001$). Conversely, Theophylline treatment during freezing significantly improved MMP and plasma membrane integrity while reducing ROS levels in the freeze + Theophylline group compared with the freeze group ($p < 0.001$). Cryopreservation impaired mitochondrial function, membrane integrity, and increased ROS in asthenozoospermic sperm. Theophylline supplementation alleviated these effects, preserving sperm quality and reducing oxidative stress, highlighting its potential as an additive to improve post-thaw outcomes.

keywords: Asthenozoospermia, Cryopreservation, Theophylline, Oxidative Stress, Sperm Parameters.

22046 - Poster

Effects of Prunus scoparia leaf extract on oxidative status and reproductive parameters in male rats

Mahnaz Shahinkhah[1], Dorostghoal Mehran [1 *]

1- Department of Biology, Faculty of Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran.
*Corresponding Author: mahnazshahinkhah@gmail.com

Abstract

Abstract: During the last decades, there are numerous reports about the incre asing rate of infertility in various populations. Prunus scoparia leaf is believed traditionally to have several therapeutic properties such as fertility-enhancing properties. The aim of present study was to assess the effects of Prunus scoparia leaf extract on the reproductive parameters in adult Wistar male rats. In this experimental study, 40 healthy adult male Wistar rats (8 wk old, 220-240 gr body weight) were randomly divided (n = 10/each) as control and groups treated with 50, 100, and 200 mg/kg/day of Prunus scoparia leaf ethanolic extract via gavage for 70 days. Histological and histometrical assay and analysis of testicular antioxidant enzymes and lipid peroxidation and serum hormonal levels were done in each experimental group. Weights of testis and epididymis increased significantly ($p<0.05$) in male rats treated with 200 mg/kg. Higher levels ($p<0.05$) of serum testosterone observed at 100 and 200 mg/kg Prunus scoparia leaf extract treated groups. Lower levels ($p<0.05$) of malondialdehyde and higher activity ($p<0.05$) of superoxide dismutase and glutathione peroxidase was seen in testicular tissue of extract-treated rats. Our findings demonstrated that Prunus scoparia leaf extract has beneficial effects on reproductive parameters in male rats, which may be a result of both its antioxidant and androgenic properties.

keywords: Prunus scoparia, Reproductive health, Spermatojenesis, Oxidative stress.

22034 - Poster

Protective effects of Pistacia Atlantica fruit extract on lead-induced testicular toxicity in male rats

Maryam Koulivand[1 *], Dorostghoal Mehran [1 *]

1- Department of Biology, Faculty of Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran.
*Corresponding Author: koulivand99@gmail.com

Abstract

Oxidative stress toxicity caused by heavy metals affect male reproduction health. Pistacia Atlantica fruit is used in Iranian folk medicine for its supposed fertility-enhancing properties. The present study was done to evaluate whether the extract of Pistacia Atlantica fruit could protect male rats against lead-induced testicular oxidative stress. In this experimental study, adult Wistar rats were treated with 0.1% lead acetate in drinking water alone or with 100, 200, or 400 mg/kg body weight of Pistacia Atlantica fruit ethanolic extract via gavage once daily for 70 days. Reproductive organs weights, serum hormones levels, testicular histometric parameters and oxidative stress status were analyzed. The testis weight, seminiferous tubule diameter, serum testosterone level, and testicular levels of superoxide dismutase and glutathione peroxidase were significantly reduced ($p<0.05$) in the lead-treated rats. Moreover, testicular malondialdehyde levels were higher significantly ($p<0.05$) in the lead-exposed group compared to the control rats. However, reproductive parameters were improved significantly ($p<0.05$) in the lead-treated rats co-administrated with Pistacia Atlantica fruit extract. Our findings revealed that Pistacia Atlantica fruit extract has the potential to ameliorate oxidative toxicity induced by lead and to diminish the adverse effects of lead on male reproductive health

keywords: Pistacia Atlantica, Lead acetate, Reproductive health, Oxidative stress.

21664 - Poster

Adverse Effects of Excess L-Carnitine on Sperm Nuclear Quality and Liver Health in Healthy Male Mice

Nushin Naderi[1] *, Mitra Jabarineitapeh[1], Marziyeh Tavalaee[1], Mohammad Hossein Nasr-Esfahani[1]

1- a Department of Animal Biotechnology, Reproductive Biomedicine Research Center, Royan Institute for Biotechnology, ACECR, Isfahan, Iran b ACECR Institute of Higher Education (Isfahan Branch), Isfahan 84175-443, Iran.
*Corresponding Author: naderi.royan@gmail.com

Abstract

L-carnitine (LC) is a vital molecule involved in lipid metabolism, facilitating the transport of fatty acids into mitochondria for energy production. In addition to its metabolic role, LC possesses antioxidant, anti-inflammatory, and anti-apoptotic properties that contribute to cellular protection. This study aimed to evaluate the potential adverse effects of LC supplementation at doses of 20, 100, and 500 mg/kg body weight over four weeks on spermatogenesis and sperm function in healthy NMRI male mice (n = 10 per group). Key sperm parameters—motility, concentration, and morphology—were examined along with oxidative stress markers in sperm and testicular tissue. DNA and chromatin integrity were assessed using Aniline Blue (histone retention), CMA3 (protamine deficiency), and Acridine Orange (DNA fragmentation) staining techniques. Fertility outcomes were also recorded. While LC treatment did not significantly affect sperm parameters or oxidative stress levels, the high-dose LC500 group showed a notable increase in liver weight and hepatic lipid accumulation, suggestive of early-stage non-alcoholic fatty liver disease (NAFLD). Moreover, this group exhibited a significant decline in sperm DNA and chromatin integrity ($P < 0.05$), although fertility indices were not markedly altered. These results indicate that excessive LC intake may impair sperm nuclear quality and pose risks to liver health without improving fertility. Thus, while LC is essential for energy metabolism, high-dose supplementation may lead to detrimental effects on male reproductive and hepatic health, underscoring the importance of appropriate dosing.

keywords: L-carnitine, Over-supplementation, Oxidative stress, Male reproductive health, Inflammation.

22340 - Poster

The association of SNRPN gene (rs220030T>C) polymorphism and its link to idiopathic male infertility

Morteza Shamsabadi[1 *], Farhad Mashayekhi[1], Fatemeh Ghasemian[1]

1- Department of Biology, Faculty of Sciences, University of Guilan, Rasht, Iran.
*Corresponding Author: shamsmorteza_216@yahoo.com

Abstract

Abstract: Infertility is defined as failure to conceive a child after 1 year of unprotected regular sexual intercourse. Approximately half of all cases of infertility are caused by factors related to the male. The aim of this study is to analyze the association of SNRPN gene variety and idiopathic male infertility. Two mL of blood samples were collected from 100 patients diagnosed with idiopathic male infertility and 100 control subjects. Genomic DNA was extracted from the samples and genotyped using tetra-primer amplification refractory mutation system PCR (T-ARMS-PCR). Finally, the statistical analysis was conducted using MedCalc software (Version 17.9.7, Mariakerk, Belgium). The SNRPN genotype frequencies amongst the cases were T/T = 70%, T/C = 12%, and C/C = 18%; the T and C allele frequencies were 76% and 24%, respectively. The genotype frequencies amongst the controls were T/T= 49%, T/C = 29% and C/C = 22%; the T and C allele frequencies were 63% and 36%, respectively. The results indicated that the TC heterozygous genotype has a protective effect on infertility, and people who have at least one mutant allele have a protective effect compared to the normal homozygous (p = 0.001, OR = 0.28, 95% CI 0/13- 0.62), and also that the frequency distribution of the genotype was in Hardy-Weinberg equilibrium. Our results suggest that the SNRPN rs220030T>C polymorphism is associated with male infertility. Moreover, future studies with larger numbers of patients and controls are required to confirm our results.

keywords: SNRPN gene, idiopathic male infertility, gene polymorphi

22312 - Poster

Assessment of BAG6 gene expression in Sperm of men with IUI failure and success

Zeinab Mohammadi[1,2], Mahla Manzoori Shalmani[1,2], Bita Ebrahimi[3], Hesamoddin Sajadi[2], Elham Amirchaghmaghi[4], Marjan Sabbaghian[2 *]

1- Department of Developmental Biology, Faculty New Biological Sciences and Technologies, University of Science and Culture, ACECR, Tehran, Iran. Department of Andrology, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran
2- Department of Andrology, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran

3- Department of Embryology, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran
4- Department of Endocrinology and Female Infertility, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran ACECR, Tehran, Iran
*Corresponding Author: m.sabbaghian@royaninstiute.org

Abstract

Sperm-oocyte recognition involves multiple molecular interactions between gametes that is a critical step in fertilization, considering that disruptions in sperm function can significantly affect assisted reproductive technologies (ART) outcomes. This cohort study focuses on sperm BCL-2-associated athanogene 6 (BAG6), which acts as a molecular chaperone and stabilizer for heat shock protein A2 (HSPA2). BAG6 interacts with HSPA2 during spermatogenesis, sperm maturation and capacitation. Any disruption in BAG6 expression may impair protection of sperm against oxidative stress (ROS), HSPA2's regulatory role in the complex of sperm binding to the zona pellucida and ultimately affecting fertilization potential. Due to sperm-oocyte recognition is essential for intrauterine insemination (IUI) success, In this cohort study, 300 men (BMI ≤30 kg/m², age ≤45 years) whose partners were undergoing IUI at the Royan Institute were enrolled. Semen samples were collected, seminal plasma removed by centrifugation, and sperm washed prior to RNA extraction using the Trizol method. Following cDNA synthesis, BAG6 gene expression was quantified by real time RT-PCR and normalized to β-actin. Participants were stratified into IUI success and IUI failure groups according to biochemical pregnancy tests. Statistical analyses were performed using independent t-tests (SPSS) and $p < 0.05$ considered significant. Analysis of 20 cases in IUI failure group 10 cases in IUI success group (20.96 ± 54.28, 4.13 ± 9.12 P value = 0.34) demonstrated no significant difference in gene expression between two groups. Initial findings are inconclusive and completing sample size is needed to revealing the role of BAG6/HSPA2 complex in unexplained male infertility.

keywords: Infertility; IUI; Sperm; Sperm-oocyte interaction; BAG6 Gene expression.

22427 - Poster

Evaluation of SPAM1 Gene Expression in Sperm and Its Association with Intrauterine Insemination (IUI) Outcome

Mahla Manzoori Shalmani[1], Zeinab Mohammadi[1], Mehri Mashayekhi[2], Elham Amirchaghmaghi[2 *], Maryam Shahhoseini[3], Marjan Sabbaghian[4]

1- Department of Developmental Biology, Faculty New Biological Sciences and Technologies, University of Science and Culture, ACECR, Tehran, Iran
2- Department of Endocrinology and Female Infertility, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran
3- Department of Genetics, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran
4- Department of Andrology, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine. ACECR, Tehran, Iran
*Corresponding Author: e.amirchaghmghi@royan-rc.ac.ir

Abstract

Intrauterine insemination (IUI) is an effective approach for treating couples with unexplained infertility or mild male factor issues. Proteins on the sperm surface are involved in sperm-oocyte interaction. One of these proteins, Sperm Adhesion Molecule 1 (SPAM1), acts as a hyaluronidase and enables sperm penetration through the hyaluronic acid surrounding the oocyte. The aim of this study was to evaluate the relationship between level of SPAM1 mRNA expression and IUI outcome. In this cohort study, 300 men (age ≤45 yr, body mass index (BMI) ≤30 kg/m²) whose wives were candidate for IUI enrolled. Semen samples were collected in the day of IUI cycle from embryology laboratory at Royan Institute. Following washing sperms with phosphate buffer saline (PBS), RNA was extracted from sperms using the TRIzol, and cDNA synthesis was performed with SMOBio kit. After primer designing, SPAM1 & β-actin gene expression levels were quantitively analyzed using Real-time PCR. To date, 10 samples in IUI Success group & 20 samples in IUI Failure group were assessed. The mean±SD of SPAM1 gene expression in IUI success & IUI failure groups were 0.97±0.91 and 5.12±7.2, respectively. The expression level was higher in the IUI success group compared to the IUI failure group; however, the difference was not statistically significant (P=0.08). According to preliminary data, final conclusion is not possible now. Sample collection will be continued until completing total sample size (at least 30 men in each group).

keywords: Male infertility, SPAM1, Sperm, Gene expression, intrauterine insemination.

21930 - Poster

Proline supplementation during sperm preparation improve functional parameters

Mehran Dorostghoal[1*], Zahra Mostaghimzadeh[1]

1- Department of Biology, Faculty of Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran
*Corresponding Author: mdorostghoal@scu.ac.ir

Abstract

In vitro sperm preparation may damage sperm functional characteristics and reduce the chances of pregnancy. Antioxidants supplementation is suggested to reduce sperm damage induced by ROS. L-proline has been reported that protect cells from oxidative damage because of its antioxidant effects.The aim of present study was to assess the effects of adding L-proline to sperm preparation medium on functional parameters. Semen sample from ten normozoospermic men were aliquoted into four portions. Aliquots were supplemented with 1, 2, and 4 mmol/L concentrations of L-proline into Ham's F10 medium. Sperm parameters including motility, viability, morphology and membrane and acrosomal integrity were analyzed for each aliquot pre and post swim up preparation technique. Our results showed that adding 4 mmol/L of L-proline to sperm preparation medium improve sperm motility and viability in compared with the control group. Moreover, the presence of 4 mmol/L of L-proline in preparation medium during the swim up preparation technique had a beneficial effect on the sperm membrane and acrosomal integrity. Our study showed that supplementation of L-Proline in the preparation medium preserves sperm functional parameters during swim up technique.

Keywords: L-Proline, Swim up, Spermatozoa, Oxidative stress.

22457 - Poster

Indene and Reproductive Health in Male Rats

Mehran Arabi[1 *], Mohammad Shadkhast[2]

1- Department of Animal Biology, Shahrekord University, Shahrekord University, Iran.

2. Faculty of Veterinary Medicine, Shahrekord University, Shahrekord, Iran.
*Corresponding Author: mehranarabi@hotmail.com

Abstract

Indene (IND) is a type of polycyclic aromatic hydrocarbons (PAHs). PAHs as products of incomplete combustion are recognized environmental pollutants that possess toxic, carcinogenic, mutagenic and teratogenic potential, which have caused worldwide concerns. IND is extracted from coal tar with major applications in industrial activities. In the time of utilization, IND is easy to enter the ecosystem and affects organisms. IND is considered as an initiator of oxidative stress (OS). OS as a marker, is used to evaluate the cytotoxicity of exogenous pollutants in organisms. It is an imbalance between reactive oxygen species (ROS) generation and antioxidant function in animal's body that impairs cell insistency. The OS induction has a pivotal role in toxicity of environmental pollutants. In this study, the changes in the OS biomarkers as reproductive health index in the testes of IND-exposed mice were measured. Animal groups were as negative control (intact), pseudo-control (sham), and experimental groups (receiving doses of 0.1, 0.2 and 0.4 mg/kg b.w. of IND, every other day for 21 days, via IP). The changes in amount of OS biomarkers namely ROS, lipoperoxidation (LPO/MDA; a marker for cell membrane consistency), catalase (CAT), and total antioxidant capacity (TAC) value were measured in testes homogenates. Results revealed that following IND exposures, the levels of ROS, MDA, and CAT were increased, but TAC value was declined, in a dose-dependent manner. Briefly, PAHs, particularly IND, exposures could induce OS in testes leading to impaired reproductive health and infertility.

keywords: PAHs, Indene, Infertility, Testis, Oxidative stress.

22406 - Poster

Protective Effects of Carrot Seed Essential Oil on Oxidative Damage Induced by the Pesticide Mancozeb in Sertoli

Fayeqeh Younisi[1], Tayabe Ramezani[2*], Mohammad Nabiuni[1]

1. Department of Biology, Kharazmi University, Tehran, Iran.
2. Farzanegan Campus of Semnan University, Semnan, Iran
*Corresponding Author: tayeberamezani@semnan.ac.ir

Abstract

Infertility is defined as the failure to achieve pregnancy after one year of unprotected sexual intercourse. Currently, one of the major factors affecting male fertility is oxidative stress caused by pesticides such as the fungicide Mancozeb, is widely used in agriculture. In traditional medicine, carrot seeds are used to improve male fertility due to their unique antioxidant and anti-inflammatory properties. In this context, the present study scientifically investigated the antioxidant effects of carrot seed (Daucus carota var. sativus) essential oil (DEO) on oxidative stress induced by the pesticide Mancozeb in TM4 Sertoli cells. Carrot seeds were obtained from the Seed and Seedling Research Institute. DEO was extracted from the seeds using the hydro-distillation method. The cytotoxic effects of Mancozeb and DEO on TM4 Sertoli cells were assessed using the MTT assay. A concentration of Mancozeb that significantly inhibited cell growth and proliferation, and a concentration of carrot seed essential oil that showed no cytotoxic effects, were determined and applied simultaneously. Oxidative stress levels in TM4 Sertoli cells were measured using the malondialdehyde (MDA) assay. Data were analyzed using SPSS version 24 at a significance level of $p \leq 0.05$. The findings showed that 1.5 µM Mancozeb reduced cell viability by 50% and induced oxidative stress in Sertoli cells. In contrast, DEO at a concentration of 20 µg/mL increased cell viability (5 %) and reduced oxidative stress compared to the control. The combined application of carrot seed essential oil with Mancozeb significantly inhibited cell death (30%) and reduced Mancozeb-induced oxidative stress (9.4 nm/L) in TM4 cells. DEO exhibits antioxidant activity that effectively protects Sertoli cells against oxidative damage.

keywords: Infertility, Mancozeb, Sertoli Cells, Carrot Seed Essential Oil.

22453 - Poster

Studying the effect of olive leaf extract on LH and FSH hormones in female mice

Fatemeh Barghabani[1], Hava Mehralitabar[1 *]

1- Department of Basic Sciences, Hakim sabzevari University, Sabzevar City, Iran Country
*Corresponding Author: hmehralitabar@gmail.com

Abstract

In the ovary, ROS plays a role in regulating oocyte growth, meiosis, ovulation, and other physiological processes. In a healthy individual, there is a balance between free radicals (reactive oxygen and nitrogen species) and intracellular antioxidants, but when this balance is disrupted in favor of an increase in free radicals (such as under stressful conditions), oxidative stress occurs. This study investigates the effect of olive leaf extract on LH and FSH hormone levels. A total of 36 female mice, weighing approximately 20-25 grams, were prepared and randomly divided into 6 groups. The total duration of the experiment was 21 days, and injections were performed regularly on a daily basis. The first group (control group) received no injections. The second group received only normal saline, and groups 3 to 6 received 25, 50, 100, and 200 mg/kg of olive leaf extract, respectively. 24 hours after the last injection, anesthesia was performed, and blood was drawn from the heart to measure the levels of LH and FSH hormones using the ELISA method. The findings and results of this research showed that the levels of LH and FSH hormones in the 25 and 50 groups showed a significant increase compared to the control group ($P<0.05$). Based on the results of this research, it is suggested that the potential and positive effects of olive leaf extract on ovarian tissue and related follicles should be further investigated.

keywords: Antioxidant, Olive leaf, Oxidative stress, LH and FSH hormones.

21270 - Poster

Investigation of the effect of platelet-rich plasma-derived nanovesicles on bleomycin-induced damage in Wistar rat testicular tissue cells

Anis Toulabi[1], Elaheh Amini[2 *], Mahnaz Azarnia[2], Kamal Hajisharifi[2]

1- Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
2- Department of Physics and Institute for Plasma Research, Kharazmi University, Tehran, Iran
*Corresponding Author: elaheh.amini@khu.ac.ir

Abstract

According to a report published in 2023 by the World Health Organization (WHO), male-related infertility is the main cause of infertility in 50% of couples. Spermatogonial stem cells (SSCs) are a group of mature stem cells in the testis that serve as the basis for spermatogenesis and male fertility. Maintaining the self-renewal of SSCs and maintaining the colony of these cells is important in maintaining fertility. Bleomycin is used as an anticancer agent in combination regimens such as the combination regimen of bleomycin, etoposide, and cisplatin in the treatment of many types of cancer, especially testicular tumors. These drugs are gonadotoxic and collectively lead to irreversible impairment in fertility. Exosome-like nanovesicles are nanoscale bilayer extracellular vesicles (approximately 20–150 nm) secreted by cells and act as carriers of various biological information. Platelet-rich plasma (PRP) is rich in growth factors (platelet-derived growth factors, transforming growth factor-beta) and cytokines such as interleukin-4 and -6. PRP has attracted attention due to its safety, standardized preparation, and relatively affordable cost. PRP-derived nanovesicles are rich in bioactive factors. In this study, SSCs and Sertoli cells were isolated from Wistar rat testicular tissue, cultured in 96-well plates, and treated with PRP-derived nanovesicles and bleomycin. The results of the MTT assay showed that treatment with PRP-derived nanovesicles had the greatest increase in cell viability and colony number compared to the control group. These findings suggest that PRP-derived nanovesicles under controlled conditions can serve as a non-invasive therapy to increase SSCs viability.

keywords: Male infertility, Spermatogonial stem cells, Platelet-rich plasma, Nanovesicle, Bleomycin.

22288 - Poster

Investigation of OMV Group B Streptococcus(GBS)effects on Pregnant Rats

Fereshteh Afkar[1], Reza Khorasani[2 *]

1- School of Medicine, Kermanshah University of Medical Sciences, Kermanshah, Iran.
2- Department of Toxicology and Pharmacology, Faculty of Pharmacy and Pharmaceutical Sciences Research Center, Tehran University of Medical Sciences, Tehran, Iran.
*Corresponding Author: rkhorasani@gamil.com

Abstract

Group B Streptococcus (GBS) is a ß-hemolytic bacterium that is a normal inhabitant in recto-vaginal mucosae in healthy women. Ascending GBS infection during pregnancy involves bacterial trafficking from the vagina, ultimately leading to bacterial invasion of placental membrane (chorion and amnion), The amniotic cavity, and the fetus. So, GBS experimental infection of rats was done and investigated their complications. Outer Membrane Vesicles (OMV) of GBS are produced by bacteria that are non-replicative vesicles and contains intrinsic immunostimulatory features that are based on their particulate composition and nature. GBS bacterial strain (ATCC 13813) was cultivated in the Nutrient Broth and after 18 hours it was centrifuged at 2500 rpm and in 5 minutes to separate the B Cell of the bacteria, then Centrifuged again at 15000 rpm and in 30 minutes. The rats received 4 doses of OMV and DW (distilled water) via intraperitoneal injection and next the animals were mated and after being pregnant, they were intra-vaginally inoculated with 108 CFU/ml of GBS colonies in 3rd week. The results showed that GBS is still one of the threaten agents that causes abortion by infection the amniotic sac and embryo in the form of retrograde that results to fetus death. Also in the infected group as control, it was observed that GBS causes to both preterm delivery and fetus death. And there were obvious effects for CRL and weight in OMV group rather than the DW groups.

keywords: GBS bacteria, Experimental Infection, Stillbirth, Weight, CRL.

22322 - Poster

Genetic Screening of the c.545dupT variant in the TSGA10 gene in Iranian patients with Acephalic Sperm Syndrome

Fatemeh Larni[1 *], Nazanin Noorkhah[1], Tahereh Ilkhani[1], Hamid Gourabi[2], Marjan Sabbaghian[3]

1- Department of Genetics, Faculty of Biological Sciences, University of Science and Culture, Tehran, Iran.
2- Department of Genetics, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, Tehran, Iran.
3- Department of Andrology, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran.
*Corresponding Author: lafateme902@gmail.com

Abstract

Acephalic spermatozoa syndrome (ASS) is a rare, severe form of teratozoospermia characterized by headless spermatozoa and abnormal head-tail junctions, leading to male infertility. Previous studies identified several pathogenic variants in the TSGA10 gene associated with ASS. Among them, the c.545dupT mutation in exon 8 of TSGA10 was identified as a homozygous mutation in a Chinese patient with 82% acephalic spermatozoa.This study aims to investigate the c.545dupT and other genetic variations in exon 8 of this gene in patients.This study was conducted on ten infertile men diagnosed with acephalic spermatozoa syndrome, defined by the presence of more than 60% acephalic sperm. DNA samples were obtained from the DNA bank of the Royan Institute. Primers were designed using PerlPrimer software. PCR amplification was performed, and PCR products were sequenced using the Sanger sequencing method. The obtained sequences were analyzed using NCBI BLAST to identify potential genetic mutations.Sanger sequencing of exon 8 of the TSGA10 gene in this group did not reveal any mutations in any of the individuals studied.Although previous studies have reported mutations in exon 8 of the TSGA10 gene in a Chinese patient, these findings indicate that this mutation is not a common cause of acephalic spermatozoa syndrome in Iranian patients.Although c.545dupT has been reported in previous studies, our data indicate that this variant is absent in Iranian ASS patients.Larger studies using whole-gene or whole-exome sequencing in more patients are needed to identify genetic factors in diverse ethnic groups.

keywords: Acephalic spermatozoa syndrome, Male infertility, Teratozoospermia, Spermatogenesis, Sanger Sequencing.

22032 - Poster

The Role of Immunological, Hormonal, and Inflammatory Factors in the Pathogenesis and Infertility Associated with Endometriosis

Mahdi Akbari avilagh[1], Fatemeh Yousefi[1], Farah Farokhi[1 *]

1- Department of biology,Faculty of science,Univerity of Urmia,Urmia,Iran.
*Corresponding Author: f.farokhi@urmia.ac.ir

Abstract

Endometriosis is a chronic estrogen-dependent disease characterized by the presence of endometrium-like tissue outside the uterine cavity, affecting about 10% of women of reproductive age. This condition is commonly associated with pelvic pain, dysmenorrhea, dyspareunia, and infertility, and its pathogenesis involves immunological, hormonal, genetic, and environmental factors. In this review study, a literature search was conducted in PubMed, SID, Civilica, and Google Scholar databases up to June 2025. The inclusion criteria covered studies related to immunological, hormonal, and inflammatory mechanisms of endometriosis and its associated infertility. Findings indicated that impaired clearance of ectopic endometrial cells, increased inflammatory cytokines, and progesterone resistance are key contributors to disease persistence. Infertility associated with endometriosis may result from pelvic adhesions, reduced oocyte quality, impaired implantation, and altered endometrial receptivity. Moreover, oxidative stress in follicular and peritoneal environments negatively impacts oocyte and embryo quality. Considering the multifactorial nature of the disease, its management requires a combined approach including medical interventions, surgery, and assisted reproductive technologies. Future studies should focus on identifying reliable biomarkers and developing targeted therapies to improve fertility outcomes and reduce disease recurrence.

keywords: Endometriosis, Infertility, Immune System, Oxidative Stress, Endometrial Receptivity.

21472 - Poster

An examination of the RBM5 genes common variants and their association with male infertility

Farzaneh Ramezani[1 *]

1- Genomics Research Laboratory, National School of Biotechnology, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
*Corresponding Author: farzanehr380@gmail.com

Abstract

Male infertility is a complex, multifactorial problem accounting for around half of all cases of infertility in couples. In other words, around 50 million men worldwide are affected by infertility. Among the genetic factors involved, genes located on the Y chromosome, such as RBM5, play a key role in spermatogenesis. Studies show that this gene is located in the AZF region of the Y chromosome, and variants of it can cause disruption to sperm production and function. Bioinformatics databases such as NCBI, dbSNP, Ensemble, ClinVar, KEGG, Reactome, Human Protein Atlas and SIFT were used to find information in this field.It is predicted that common variants in the RBM5 gene effectively regulate mRNA splicing in relation to the differentiation and survival of male germ cells.According to the bioinformatics study of the present project, as well as previous studies of the RBM5 gene, which plays a role in germ cell differentiation signalling pathways, the spliceosome pathway and apoptosis regulation, it is expected that key pre-mRNA genes will lead to the production of various proteins in germ cells by binding to RBM5. The precise function of these proteins in the stages of meiosis and sperm maturation is thought to cause the cessation of spermatogenesis in the meiotic stage, The impact of RBM5 variants on infertility, diagnostic methods, and clinical outcomes were discussed.

keywords: Bioinformatics, AZF, Gene.

22458 - Poster

Overexpression of the SGMS1 gene in asthenospermia: evidence of cephingolipid imbalance in sperm membrane homeostasis

Shima Tasafi[1 *], Fatemeh Ghasemian[1], Masoud Mashhadi Akbarbojar[2]

1- Department of Biology, Faculty of Science, University of Guilan, Rasht, Iran.
2- Department of Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran.
*Corresponding Author: shimatasafi926@gmail.com

Abstract

Asthenozoospermia, characterized by reduced sperm motility, is a common cause of male infertility and is closely linked to alterations in sperm membrane lipid composition and lipid raft integrity. The SGMS1 (Sphingomyelin Synthase 1) gene encodes an enzyme that catalyzes the conversion of ceramide and phosphatidylcholine into sphingomyelin and diacylglycerol, playing a crucial role in sphingolipid homeostasis and membrane dynamics. Dysregulation of this pathway may affect membrane fluidity and signaling platforms essential for sperm function. In this study, we investigated SGMS1 gene expression in sperm samples from 15 normozoospermic and 15 asthenozoospermic men using quantitative real-time PCR (qPCR), with normalization to reference genes (GAPDH and ACTB). Statistical analysis was performed using an independent samples t-test. Our results revealed a significant overexpression of SGMS1 in the asthenozoospermic group (13.75 ± 0.85) compared to the normozoospermic group (1.021 ± 0.39), representing a 12.73-fold increase ($P < 0.0001$). This upregulation may shift the sphingomyelin-to-ceramide ratio, increase diacylglycerol levels, disrupt lipid raft organization, and reduce membrane fluidity—factors that are critical for sperm motility and capacitation. These findings suggest that aberrant SGMS1 expression contributes to the molecular pathogenesis of asthenozoospermia. However, further studies in larger cohorts, along with proteomic validation and functional assays in animal models, are needed to confirm the causal role of SGMS1 and its potential as a diagnostic or therapeutic target in male infertility.

keywords: SGMS1, Asthenozoospermia , Male infertility , Sphingolipid metabolism , Real-time PCR.

22520 - Poster

Serum Leptin and Testosterone Profiles and Their Association with Sperm Quality in Fertile and Infertile Men: A Case–Control Study

Mahin Rahmani[1] *, Nahid Masoodian[1], Ali Asghar Darbani[1], Fatemeh Khodadadi[1]

1- Department of Biology, Islamic azad university, damghan, Iran.
*Corresponding Author: mahinrahmani419@gmail.com

Abstract

Leptin, a major adipokine, plays a pivotal role not only in energy metabolism but also in male reproductive function. After crossing the blood–testis barrier and binding to its receptor in hypothalamic neurons and Leydig cells, leptin activates signaling cascades, particularly the JAK/STAT pathway, influencing spermatogenesis and steroidogenesis. Recent genetic studies have implicated LEPR polymorphisms in male infertility, but human evidence remains limited. In this case–control study, serum leptin and testosterone levels were measured in 100 infertile and 100 fertile men. Leptin concentrations were significantly higher in fertile men ($p<0.05$) and showed a positive correlation with sperm quality, whereas testosterone levels were slightly higher in infertile men but without statistical significance. Subgroup analysis revealed that teratozoospermic patients exhibited lower leptin and higher testosterone compared to asthenozoospermic patients. These findings underscore leptin's dual regulatory role in gonadotropin secretion and testicular steroidogenesis, while leptin deficiency or resistance may impair reproductive performance. Study limitations included sample size and lack of genotyping. Overall, integrating hormonal profiling with genetic assessment could provide a novel diagnostic approach for male infertility and facilitate the development of rapid diagnostic kits and personalized leptin-based therapies.

keywords: Adipokine, Spermatogenesis, Male infertility, *LEPR*, Testosterone.

21341 - Poster

Progressive Cell Death Over Time: Temporal Impact of Cadmium on the Viability of Male Germ Cells

Mohaddeseh Mohammadi- Sardoo[1 *]

1- Department of Biology, Faculty of Sciences, University of Jiroft, Jiroft, Iran.
*Corresponding Author: m.mohammadisardoo@ujiroft.ac.ir

Abstract

Cadmium (Cd) is one of the heavy metals that, due to its toxicity, bio-accumulative nature, and long biological half-life, is considered a priority environmental pollutant worldwide and a serious threat to both human health and wildlife. Although its use has been significantly restricted in many developed countries, cadmium is still employed in specific industrial applications. Among its biological targets, the male reproductive system is particularly vulnerable and directly targets sperm cells, rendering them dysfunctional, immotile, or dead. Despite existing literature, limited attention has been given to the time-dependent nature of these effects at a defined concentration. Building on this gap, the present study investigates time-dependent changes in sperm viability following cadmium exposure. Sperm samples obtained from adult male mice were exposed to a single concentration of 170 µM CdCl2 for 30, 60, 90, and 120 minutes in an in vitro culture system. Sperm viability was assessed using the Eosin-Nigrosine staining method. The results indicated that sperm viability remained relatively unchanged during the first 30 minutes of cadmium exposure compared to the control. However, a marked decline of approximately 40% in viability was observed after 60 minutes. At 90 and 120 minutes, nearly 80% of the sperm cells were non-viable, indicating a progressive time-dependent cytotoxic effect. The present study demonstrates a clear time-dependent toxic effect of cadmium on the viability of mouse sperm. These findings emphasize the importance of considering exposure duration in toxicological evaluations. Therefore, it is essential to reassess the duration of exposure to this metal and to investigate molecular pathways in future studies.

keywords: Cadmium toxicity, In vitro, sperm viability, Time- dependent exposure.

22177 - Poster

The effect of diallyl disulfide dissolved in ethanol on reducing reproductive system injury caused by renal ischemia-reperfusion.

Fatemeh Ghasemizadeh[1], Aqlieh Mohammadzadeh[1 *], Ali Gol[1]

1- Department of Biology, Faculty of Sciences, Shahid Bahonar University of Kerman, Iran.
*Corresponding Author: a_mohammadzadeh@sci.uk.ac.ir

Abstract

Renal ischemia-reperfusion (IR) injury, by causing systemic oxidative stress, in addition to renal dysfunction, causes distant injury to organs including the reproductive system. This study investigated the effect of diallyl disulfide (DADS) - the active compound in garlic with antioxidant and anti-inflammatory properties - on these injuries.Male rats were divided into four groups: 1) Sham, 2) IR, 3) IR+DADS (25 mg/kg), 4) IR+DADS (50 mg/kg). DADS dissolved in ethanol was administered intraperitoneally 30 min before ischemia and 6 h after reperfusion.The results showed that IR group experienced an increase in serum creatinine (a marker of kidney injury) and a decrease in serum testosterone (a marker of distant testicular injury) compared to control group. Administration of both doses of DADS resulted in a decrease in creatinine and a significant increase in testosterone levels compared to IR group. Increased testosterone level in the DADS-receiving groups indicated reduced reproductive injury caused by renal IR.These findings suggest that DADS modulates both local renal injury and reproductive dysfunction in a dose-dependent manner. Studies have shown that DADS improves renal function and fertility in IR-treated rats by reducing serum creatinine and increasing testosterone.The present study confirms the protective role of DADS against systemic consequences of renal IR, especially on the reproductive system.It is suggested that oxidative stress indices and its role in IR-induced reproductive injury be investigated.

keywords: Serum testosterone, serum creatinine, garlic.

22423 - Poster

Effect of Lentil Savigh in Menstrual Bleeding Reduction and Menorrhagia Relief

Maryam Hassanlou[1 *]

1- Department of Biology, Farzanegan Campus, Semnan University, Semnan, Iran.
*Corresponding Author: m.hassanlou@semnan.ac.ir

Abstract

Menorrhagia refers to heavy menstrual bleeding that happens at regular intervals, lasting over seven days, and/or involves blood loss exceeding 80 mL during each cycle. Menorrhagia leads to anemia and inability to conceive in women. An herb suggested in Iranian traditional medicine for treating menorrhagia is lentil savigh, the flour produced from roasted lentils (Lens culinaris medic). In this study, the effect of lentil savigh on the amount of menstrual bleeding was studied as a before-and-after study. 10 Patient's bleedings were evaluated by the pictorial blood loss assessment chart (PBAC), before and after of the treatment cycles. The results show that the mean (SD) of PBAC scores significantly decreased after consuming lentils savigh. It seems that lentil savigh were effective in menstrual bleeding reduction, and improved the quality of life. Therefore, lentil savigh, as a functional food, could be introduced as a good initial choice for menorrhagia treatment.

keywords: lentil savigh; alternative medicine; Menorrhagia; infertility; traditional medicine.

22370 - Poster

Effect of Tobacco Use on Sperm Parameters and DNA Fragmentation Index

Saman Zamanian[1], Mahsa Allahgholi[2], Mohammad Ali Sadighi Gilani[2], Marjan Sabbaghian[2*]

1- Department of Basic Science and Advanced Technologies in Biology, University of Science and Culture, Tehran, Iran.
2- Department of Stem Cell Technology and Tissue Regeneration, Faculty of New Biological Science and Technologies, University of Science and Culture, ACECR, Tehran, Iran.
*Corresponding Author: m.sabbaghian@royaninstitute.org

Abstract

Background: Sperm DNA Integrity plays a critical role in fertilization and the development of healthy offspring, with elevated DNA fragmentation recognized as a major factor contributing to male infertility. Exposure to toxins from smoking can adversely affect spermatogenesis, impair sperm function and negatively influence semen parameters. This study aimed to investigate the effects of tobacco use on sperm parameters and DNA Fragmentation Index (DFI).Materials and Methods: This case-control study examined semen samples from 40 men (20 chronic tobacco users and 20 non-users) referred to Royan Institute. DFI was assessed using the Sperm Chromatin Dispersion (SCD) method, and Lifestyle parameters were extracted from detailed medical records of the study participants.Results: The case group (tobacco users) exhibited a significantly higher DFI (37% ± 0.14) compared to the control group (24% ± 0.10, $p < 0.05$), indicating a marked effect of tobacco use on DFI. Although sperm morphology (2.10% ± 0.10 vs. 2.40% ± 0.10) and total motility (64% ± 0.19 vs. 68% ± 0.20) were lower in the case group. Statistical analysis confirmed that DFI was the only parameter showing a significant difference between groups.Conclusion: These findings indicate that smoking negatively impacts both sperm quality and DNA integrity, highlighting the importance of lifestyle modification in improving male reproductive health.Discussion: Sperm DNA fragmentation is a key factor affecting male fertility and smoking is associated with increased DFI.Suggestion: The impact of modifiable lifestyle factors, such as smoking, on sperm DNA integrity and ART outcomes should be further evaluated.

keywords: Male Infertility, Sperm DNA Fragmentation, Sperm Chromatin Dispersion, Lifestyle.

22352 - Poster

The effect of oregano extract on the reproductive system of male mice

Mojtaba Jabari Shahzademohammad[1], Mitra Kheirabadi[1 *]

1- Department of Basic Sciences, Hakim Sabzevari University, Sabzevar, iran.
*Corresponding Author: mitrakheirabadi@yahoo.com

Abstract

The side effects of chemical drugs used in fertility or infertility treatments have prompted researchers to explore cost-effective herbal compounds. Medicinal plants like oregano (Mentha pulegium), due to their natural effects and affordability, are considered suitable options for regulating fertility. These compounds can influence sperm production and hormones such as follicle-stimulating hormone (FSH) to modulate fertility. This study investigates the effect of pennyroyal extract on sperm count and FSH levels in male rats. In this experiment, rats were divided into two groups: a control group (fed a standard diet) and a treatment group (fed a diet containing pennyroyal extract). After 7 weeks, the animals were sacrificed, and blood samples were collected from the heart to measure FSH levels, while the epididymis was removed for sperm counting. Sperm count was assessed using a hemocytometer slide, and FSH levels were analyzed using an ELISA kit. One-way analysis of variance (ANOVA) revealed a significant difference ($P<0.05$) between the groups. The results showed that the treatment group exhibited a significant reduction in sperm count (56.82%) and FSH concentration (42.11%) compared to the control group. These findings confirm the potential of pennyroyal as a natural contraceptive and highlight the need for further research and collaboration with health organizations to evaluate long-term effects and formulate health policies.

keywords: Pennyroyal, Spermatogenesis, Follicle-Stimulating Hormone.

22518 - Poster

Combination of Cryoprotective Agents (CPAs) for Vitrification of Mammalian Oocyte: A Systematic Review

Batool Sanaei[1 *]

1- Department of Biology Education, Farhangian University, P.O. Box 14665-889Tehran, Iran.
*Corresponding Author: b.sanaei91@gmail.com

Abstract

Vitrification of mammalian oocyte, as a vital component of reproductive science, relying heavily on cryoprotective agents (CPAs). Numerous cryoprotectant combinations are employed, yet the most effective formulations remain to be determined. This review aimed to evaluate the efficacy of various cryoprotectant mixtures used in oocyte vitrification protocols across different mammalian species. An extensive literature search was performed across multiple electronic platforms, including PubMed, Web of Science, Scopus, and Google Scholar, to gather relevant research articles. Study quality was assessed using the Critical Appraisal Skills Program (CASP) checklist, and data extraction followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure systematic analysis. Key findings from the analyzed studies demonstrated that a combination of 40% ethylene glycol (EG) + 40% dimethyl sulfoxide (DMSO) yielded the highest survival (86.11%) and maturation (53.47%) rates for Camelus dromedarius oocyte. For equine and porcine oocytes, mixtures of EG with DMSO or propylene glycol (PG) showed superior performance, though post-thaw fertilization rate remained lower than fresh controls. The inclusion of 0.5 M sucrose, enhanced morphological integrity and cumulus cell expansion in buffalo oocyte. Conversely, protocols using 1,2-propanediol (PrOH) were associated with increased toxicity and reduced viability due to incomplete water removal. The results underscore that factors such as CPA type, concentration, species-specific requirements, and supplementary additives critically influence vitrification success. Consequently, these findings emphasize the need for precise optimization of cryoprotectant parameters to advance oocyte cryopreservation techniques and improve assisted reproductive technology outcomes.

keywords: Cryoprotectant, Dimethyl sulfoxide, Ethylene glycol, Oocyte, Vitrification.

21444 - Poster

Molecular Interactions Between Cumulus Cells and Oocytes: Implications for Oocyte Competence, Embryo Development, and Assisted Reproductive Technologies

Mohammad Hossein Madahali[1 *], Fateme Keshtparvar[1]

1- Department of Anatomy and Reproductive biology, Isfahan University of Medical Sciences, Isfahan, Iran.
*Corresponding Author: maddahalimh@yahoo.com

Abstract

The development of oocytes, including their growth, maturation, and fertilization, is closely connected to cumulus cells, forming the cumulus-oocyte complex (COC). This complex relies on a two-way molecular exchange that is essential for oocyte competence. Understanding these interactions is important for improving assisted reproductive technologies (ART) and fertility outcomes. The study reviews recent research on molecular interactions between cumulus cells and oocytes, examining their effect on oocyte quality and embryo development. Communication occurs mainly through gap junctions made of connexin 43 (CX43), which facilitate the exchange of essential molecules for oocyte maturation. Physical links called transzonal projections (TZPs) also play a critical role in supporting follicle development. Oxidative stress can harm this communication and compromise oocyte quality, though antioxidants like sericin can help preserve it, enhancing development. Gene expression in cumulus cells correlates with embryo success, with specific genes acting as markers for oocyte quality. Additionally, IL1–IL1R1 signaling can trigger detrimental effects on oocyte aging, but inhibiting this pathway may help maintain oocyte viability. Maintaining COC structure and function, alongside molecular indicators from cumulus cells, can optimize ART outcomes in selecting competent oocytes and improving embryo quality. Future ART techniques can benefit from a better understanding of cumulus-oocyte interactions.

keywords: cumulus-oocyte complex, assisted reproductive technologies, Oxidative stress, Embryo Development.

21481 - Poster

Epigenetic Alterations in Sperm: Implications for Early Embryonic Axis Formation and Fertility Treatments

Mohammad Hossein Madahali[1 *], Fateme Keshtparvar[1]

1- Department of Anatomy and Reproductive biology, Isfahan University of Medical Sciences, Isfahan, Iran.
*Corresponding Author: maddahalimh@yahoo.com

Abstract

Assessing male fertility has often relied on semen characteristics like sperm count and motility. However, these factors do not always reflect infertility or predict success in assisted reproductive technologies (ART). New research in reproductive epigenetics shows that sperm carry essential epigenetic information that affects embryo development and offspring health. This includes DNA methylation patterns, histone modifications, and non-coding RNAs, which are crucial for gene expression and the formation of the body axes. Abnormal epigenetic markers in sperm, common in infertile men, can disrupt these processes, leading to developmental issues in embryos. The study reviewed relevant articles to uncover how sperm epigenetics influence early gene expression in embryos. Key findings highlight that sperm transmit a unique epigenetic landscape that can affect gene regulation and development. Defects in this landscape can lead to abnormal embryonic axis formation and other complications, such as delayed development and implantation failure. Identifying sperm epigenetic changes can improve fertility treatments by enhancing diagnostic accuracy, predicting ART success, and minimizing risks to offspring. Integrating epigenetic assessments into fertility evaluations can personalize treatments and improve reproductive outcomes. Future efforts should focus on developing clinical epigenetic biomarkers for better reproductive medicine.

keywords: sperm, epigenetic, chromatin, methylation, infertility.

21529 - Poster

Changes in Sphingosine-1-Phosphate Levels in the Testis tissue of Immature, Adult, and Azoospermic Mice

Mojde Parvini[1 *], Fatemeh Ghasemian[1]

1- Department of Biology, Faculty of Sciences, University of Guilan, Rasht, Iran.
*Corresponding Author: mojdeparvini@gmail.com

Abstract

Azoospermia, defined as the absence of sperm in the ejaculate, is a major cause of male infertility. Sphingolipids are a class of lipids involved in various cellular processes, including differentiation and apoptosis. Among them, sphingosine-1-phosphate (S1P) is a key metabolite known to regulate cell signaling, growth, anti-apoptotic responses, and migration. This experimental study aimed to investigate the changes in S1P levels in testicular tissue of immature, mature, and azoospermic mice. Twenty-four NMRI mice were divided into three groups: (I) immature mice (2 weeks old, n = 8), (II) mature mice (8 weeks old, n = 8), and (III) azoospermic mice induced by a single dose of busulfan (40 mg/kg, n = 8). Testes were collected, and S1P levels were measured using high-performance liquid chromatography (HPLC). The results showed significant differences in S1P levels among all groups. The mature group had the highest S1P concentration (19.12 µmol/L), while the immature group showed the lowest (9.4 µmol/L). The azoospermic group displayed an intermediate S1P level (13.55 µmol/L), significantly lower than the mature group and significantly higher than the immature group ($p < 0.0001$ for all comparisons). These findings suggest that S1P plays a vital role in the regulation of spermatogenesis, and its altered levels may contribute to impaired fertility. Sphingolipid metabolites such as S1P may serve as potential biomarkers or therapeutic targets in the assessment and treatment of male infertility.

keywords: Sphingosine 1-phosphate, Spermatogenesis, Azoospermia, Mouse.

22459 - Poster

Histological and stereological changes of male rats' testis during copper sulfate toxicity and Ascorbic acid treatment

Parinaz Aliyari[1], Homeira Hatami[2], Mehdi Banan Khoshjasteh[2 *]

1- M.Sc. Student in Animal Physiology, Faculty of Natural Sciences, University of Tabriz, Tabriz, Iran.
2- Associate Professor. Department of Animal Biology, Faculty of Natural Sciences, University of Tabriz, Tabriz, Iran.
*Corresponding Author: smbanan@tabrizu.ac.ir

Abstract

Excessive amounts of copper in living organisms can lead to tissue damage and infertility. This study investigated histological alterations in the testes of male rats following copper-induced toxicity and treatment with vitamin C. A total of 36 male rats were randomly divided into six groups (n=6). The groups included control, copper sulfate (10 mg/kg), vitamin C (80 and 100 mg/kg) as an antioxidant, and combined copper sulfate with vitamin C (80 and 100 mg/kg). After 10 days of treatment, the testes were removed; the right testis was fixed in 15% formalin for histological and stereological analysis. Following microtome sectioning and hematoxylin-eosin staining, the samples were examined microscopically. The observations revealed significant changes in blood vessel tissues and cellular morphology compared to the control group ($P < 0.05$). Copper toxicity resulted in shrinkage of seminiferous tubule walls, increased interstitial space, severe degeneration of the germinal epithelium, and reductions in total testis volume and the number of spermatocytes, spermatids, and spermatogonia, with damage increasing in a dose-dependent manner. Treatment with vitamin C alone at different doses did not cause remarkable histological changes, and the tissues appeared relatively normal. However, simultaneous administration of copper and vitamin C largely prevented the aforementioned tissue damage, and the histology was more comparable to the control group. Therefore, it can be concluded that the concurrent use of antioxidants may serve as an effective therapeutic approach in preventing such damage, ultimately reducing the risk of male infertility.

keywords: Histological changes; Seminiferous tubules; Spermatocyte.

22438 - Poster

Selenium Protects Sperm from Freeze–Thaw Damage in Asthenozoospermic Men

Abbas Sheikh Hosseini Lori[1 *], Malek Soleimani Mehranjani[1], Seyed Mohammad Ali Shariatzadeh[1], Ebrahim Cheraghi[2], Rahil Jannatifar[3]

1- Department of Biology, Faculty of Sciences, Arak University, Arak, Iran
2- Department of Biology, Faculty of Sciences, University of Qom, Qom, Iran
3- Department of Reproductive Biology, Academic Center for Education Culture and Research (ACECR), Qom, Iran
*Corresponding Author: sh.hosseini993@gmail.com

Abstract

Cryopreservation of human sperm, essential for ART and fertility preservation, induces damage through cold shock and oxidative stress, impairing membranes, mitochondria, and fertilization capacity. Selenium, a potent antioxidant trace element, maintains redox balance and sperm stability. This study evaluated selenium's effects on ROS, mitochondrial membrane potential, and plasma membrane integrity in sperm from asthenozoospermic men during the freeze–thaw process. Semen samples from 30 asthenozoospermic men (Roya Infertility Centre, Qom, Iran) were assigned to fresh (control), freeze (cryoprotectant only), and freeze + selenium (2 µg/mL) groups. Cryopreservation was performed using rapid freezing with commercial medium. After thawing, plasma membrane integrity was measured by hypoosmotic swelling test (HOST), mitochondrial membrane potential (MMP) by Rhodamine 123 staining, and intracellular ROS by flow cytometry with DCFH-DA. Data were analyzed using repeated measures, with significance at $p < 0.05$. A significant reduction in mean MMP and plasma membrane integrity, along with an increase in intracellular ROS levels, was observed in the freezing group compared with the control ($p < 0.001$). In contrast, supplementation with selenium during freezing increased MMP and plasma membrane integrity and significantly reduced ROS levels in the selenium + freeze group compared with the freezing group ($p < 0.001$). Cryopreservation of human sperm caused oxidative stress and structural damage, reducing function. Selenium supplementation during freeze–thaw decreased ROS, preserved mitochondrial activity, and improved membrane integrity, highlighting selenium as a promising supplement to enhance post-thaw sperm quality and mitigate cryodamage.

keywords: Cryopreservation, Selenium, Oxidative Stress, Asthenozoospermia.

22319 - Poster

Population-Specific Intronic Signal in TSGA10 Gene: Insights from Iranian Men with Acephalic Spermatozoa Syndrome

Tahereh Ilkhani[1], Nazanin Noorkhah[1], Fatemeh Larni[1], Mohammad Ali Sadighi Gilani[2], Marjan Sabbaghian[2 *], Hamid Gourabi[3]

1- Department of Genetics, Faculty of Biological Sciences, University of Science and Culture, Tehran, Iran
2- Department of Andrology, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran
3- Department of Genetics, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, Tehran, Iran
*Corresponding Author: m.sabbaghian@royaninstitute.org

Abstract

Abstract :Acephalic spermatozoa syndrome (ASS) is an uncommon sperm disorder causing male infertility by disrupting the connection between sperm head and tail. Genetic mutations in several genes related to sperm tail assembly, including TSGA10—which is testis-specific and involved in sperm structure—have been linked to ASS. Although pathogenic TSGA10 mutations have been reported in other populations, their profile in Iranian men remains unclear.This study aims to identify potential pathogenic variants in the TSGA10 gene among Iranian men with ASS to better understand the genetic basis of this condition.This case–control study included 10 infertile Iranian men with ASS and 10 fertile controls with normal semen analysis. PCR was performed on DNA samples .PCR primers amplified TSGA10 exons 1–7 along with their flanking intronic regions. PCR products were purified and sequenced by Sanger sequencing, and the results were analyzed using FinchTV and compared with reference sequences in NCBI.Although the primary focus was on coding exons of TSGA10, sequencing exon–intron boundaries revealed a shared intronic variant, c.797+1270t>c, present in all individuals. In silico analyses showed no significant splicing impact.A novel intronic variant was identified in the examined regions, with no mutations detected in the coding exons.The identified TSGA10 intronic variant is unlikely to be associated with ASS, and given its distance from the splice sites, it is considered likely benign. Broader studies are needed to validate its frequency and potential relevance to sperm morphology.

keywords: Male infertility، Genetic polymorphism، Sanger sequencing، Non-coding variant.

22525 - Poster

Design of Hormone-Sensitive Microbial Biosensors for Monitoring the Menstrual Cycle and Enhancing Assisted Reproductive Technologies in Women

Mahin Rahmani[1 *], Vida Hojati[1], Aliasghar Darbani[1]

1- Department of Biology, Society of plant Microbiology, Islamic Azad University, Damghan, Iran.
*Corresponding Author: mahinrahmani419@gmail.com

Abstract

Female infertility is a major challenge in reproductive medicine, often associated with impaired hormonal regulation and a disrupted implantation window. In this study, microbial biosensors were designed using synthetic genetic circuits capable of detecting key reproductive hormones, including estrogen, progesterone, and LH. Engineered circuits were integrated into E.coli and Lactobacillus spp., followed by in silico simulations and in vitro culture experiments. Computational modeling predicted circuit activation within physiological hormone ranges (20–45 mIU/mL for LH, 150–280 pg/mL for estrogen, and 9–14 ng/mL for progesterone), producing measurable fluorescence responses. Preliminary in vitro assays in an endometrium-mimicking culture system demonstrated 87% sensitivity and 90% specificity for identifying the fertile window. Data analysis suggests that microbial biosensors can serve as accurate, non-invasive tools for monitoring reproductive cycles and improving assisted reproductive technology outcomes. Limitations include the lack of direct clinical testing in human subjects and the need for further optimization of circuit stability in vivo. Overall, the findings highlight that combining synthetic biology with microbial biosensors opens new horizons for infertility treatment and reproductive health management. Future studies are recommended to evaluate the application of this system in animal models and wearable biosensing platforms.

keywords: Synthetic biotechnology، Menstrual cycle، Synthetic genetics، Hormonal monitoring، Assisted reproductive technology.

22329 - Poster

Genetic Screening of Exon 16 in TSGA10 and Clinical Outcomes of ICSI in Patients with Acephalic Spermatozoa

Nazanin Noorkhah[1*], Fatemeh Larni[1], Tahereh Ilkhani[1], Mohammad Ali Sadighi Gilani[2], Marjan Sabbaghian[2]

1- Department of Genetics, Faculty of Biological Sciences, University of Science and Culture, Tehran, Iran.
2- Department of Andrology, Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran.
*Corresponding Author: m.sabbaghian@royaninstitute.org

Abstract

Acephalic spermatozoa syndrome (ASS) is a rare disorder causing defective sperm head–tail junctions, resulting in headless spermatozoa. The TSGA10 gene is mainly expressed in the testis, and mutations in this gene may affect sperm morphology and function. Previous studies found no pathogenic mutations in exon 16 of TSGA10. Intracytoplasmic sperm injection (ICSI) is the main assisted reproductive technique (ART) used for ASS patients, although success rates are often low.The aim of this study is to investigate pathogenic mutations in exon 16 of TSGA10 in ASS patients and assess their ICSI outcomes.This study included ten patients with over 60% acephalic spermatozoa. DNA samples were extracted from peripheral blood using the salting-out method. PCR and sequencing were performed, and sequencing results were compared with reference sequences in datasets using NCBI BLAST. Medical records were reviewed to assess ART history and outcomes.No mutations were found in exon 16 of TSGA10. Six patients did not pursue ART. Four couples received ART treatments, mainly ICSI, with most undergoing one or two cycles. However, all treatments failed, resulting in no pregnancies or live births.The absence of mutations in exon 16 suggests it is not involved in ASS. The complete lack of successful ICSI outcomes emphasizes the need for improved diagnostics and therapies.Exon 16 showed no mutations; however, all ICSI attempts failed, indicating limited efficacy of current ART in ASS.Investigating other regions of TSGA10 is recommended, and exploring advanced ART techniques could enhance therapeutic success in ASS.

keywords: Male infertility, Teratozoospermia, Acephalic spermatozoa syndrome

22482 - Poster

Fenoxycarb and Possible Infertility in Male Rats:Oxidative Damage

Mehran Arabi[1 *], Arezoo Torabi-Farsani[1], Mohammad Shadkhast[2]

1- Department of Animal Biology, Shahrekord University, Shahrekord University, Iran.
2- Faculty of Veterinary Medicine, Shahrekord University, Shahrekord, Iran.
*Corresponding Author: mehranarabi@hotmail.com

Abstract

Fenoxycarb (FXC), a carbamate insecticide, functions as a juvenile hormone agonist to inhibit pests, and its detection in surrounding environments is concerning because of its widespread application. FXC prevents the insects from reaching maturity. There is insufficient data regarding the impact of FXC on the testes. Pesticides are capable to induce oxidative stress (OS) leading to oxidative damages to cells and tissues. The OS is pivotal mechanism for many environmental pollutants. In this reproductive study male rats were dosed every other day for 14 days via IP with FXC at 0.25, 0.5 & 0.75 mg/kg body weight. Other animal groups were as negative control (intact) and pseudo-control (sham, receiving FXC vehicle). We evaluated the alterations in the OS biomarkers of FXB-treated rats viz. reactive oxygen species (ROS), marker of cell membrane consistency (LPO), antioxidant enzyme glutathione S-transferase (GST), and total antioxidant capacity (TAC) value in testes homogenates. Resulting data showed that FXC exposures could augment levels of ROS, MDA, and GST, but decline TAC values in a dose-dependent trend. In conclusion, our data suggest that FXC has a potential threat to reproduction health via induction of testicular toxicity/OS leading to possible infertility.

keywords: Fenoxycarb, ROS, Oxidative stress, Testis.

21951 - Poster

CircRNA–miRNA–mRNA Regulatory Axis Reveals Key Differentially Expressed Genes in Preeclampsia

Mobina Hoseinpour[1], Ali Taravati[1 *], Soheila Abbaszadeh[2]

1-Department of Biochemistry, Faculty of Basic Sciences, University of Mazandaran, Babolsar Iran.
2- Infertility and Reproductive Health Research Center,Health Research Institute,Babol University of Medical Sciences,Babol,Iran.
*Corresponding Author: a.taravati@umz.ac.ir

Abstract

Preeclampsia is a complex multisystem disorder of pregnancy and a major contributor to maternal and perinatal morbidity and mortality. Although clinically significant, its molecular mechanisms remain incompletely understood. Circular RNAs (circRNAs) are emerging as important regulators in pathological processes via competing endogenous RNA (ceRNA) networks, yet their role in preeclampsia is unclear. To elucidate these post-transcriptional mechanisms, we applied an integrated bioinformatic pipeline. Placental circRNA expression profiles from GEO datasets were analyzed using the Limma R package to identify differentially expressed circRNAs (DECs). Target miRNAs were predicted via circBank, and downstream mRNA targets via miRWalk, then intersected with differentially expressed genes (DEGs) from placental transcriptomic data. A ceRNA network of DECs, DEmiRs, and DEGs was constructed in Cytoscape, followed by GO and KEGG enrichment and network topology analyses. This analysis revealed significant enrichment in immune-related pathways, including lymphocyte and leukocyte activation and cytokine–cytokine receptor interaction. Network analysis identified ten hub genes, including IL6, ITGAL, and SPI1, which are central to inflammatory signaling and immune cell adhesion; and were regulated by key miRNAs such as hsa-miR-3657 and hsa-miR-3613-3p; these miRNAs were in turn modulated by core circRNAs including hsa_circ_0000320 and hsa_circ_0000345. Ultimately, this integrated analysis reveals complex circRNA–miRNA–mRNA regulatory networks in preeclampsia and identifies potential biomarkers and therapeutic targets for disease management.

keywords: circular RNA, biomarkers, regulatory network, ceRNA.

22495 - Poster

A Comprehensive Review of Varicocele: Etiology and Minimally/Non-Invasive Therapeutic Approaches

Zahra Mohammadi[1], Mahsa Rahimi[1], Batool Sanaei[1 *]

1- Department of Biology Education, Farhangian University, P.O. Box 14665-889Tehran, Iran.
*Corresponding Author: b.sanaei91@gmail.com

Abstract

Varicocele, recognized as the most common treatable cause of male infertility, is characterized by abnormal dilation of the pampiniform plexus veins within the scrotum. Given the multifactorial nature of varicocele and the interplay of anatomical, hemodynamic, hormonal, oxidative, and genetic mechanisms, conducting a systematic review to synthesize existing evidence is imperative. This descriptive-analytical review was performed by searching PubMed, Google Scholar, SID, Magiran, and Civilica databases using standardized keywords, including varicocele, male infertility, oxidative stress, and related terms. Results from the analyzed studies indicate that multifactorial mechanisms—such as oxidative stress, hormonal alterations, testicular hyperthermia, and genetic/epigenetic factors (e.g., polymorphisms, mtDNA mutations, and methylation changes)—collectively impair semen parameters. Regarding treatment, evidence supports the efficacy of surgical approaches and assisted reproductive technologies. Strong synergistic effects were observed with combined therapy (surgery + pharmacotherapy): antioxidants (vitamin E, alpha-lipoic acid, curcumin, and N-acetylcysteine) and anti-inflammatory agents (celecoxib) significantly reduced oxidative stress and improved sperm quality. Additionally, herbal compounds (saffron and linden) demonstrated complementary beneficial effects. The ultimate conclusion underscores the superiority of personalized treatment strategies based on patients' oxidative and genetic profiles. Future studies should focus on developing individualized therapeutic protocols incorporating oxidative, genetic, and clinical indicators to provide more robust evidence for clinical decision-making.

keywords: Antioxidants, Spermogram, Testosterone, Male Infertility, Varicocele.

22367 - Poster

A review of damage to oocyte during freezing.

Naeimeh Dehghani[1 *]

1- Department of biology, payamenoor university, Tehran, Iran.
*Corresponding Author: naeimehdehghani8@gmail.com

Abstract

Oocyte Cryopreservation is a technique in which eggs are frozen to preserve fertility in the future. This technique is used in infertility centers as an auxiliary method for preserving fertility and also in reproductive biotechnology research. Recently, worldwide, and for various reasons, including the elimination of age-related infertility in women, the increase in the relative success rate of egg freezing using the vitrification method, and the equal pregnancy rates resulting from in vitro fertilization of frozen and fresh eggs, the demand for egg freezing has increased significantly in most infertility centers. Therefore, the aim of this review article is to review the current status of oocyte freezing, genetic damage to oocytes during freezing, common techniques, fertility success rates, and future outcomes. For this purpose, a systematic search was conducted in Web of Science and PubMed from January 1980 to March 2025. The keywords used in this systematic search were 'freezing injuries', 'oocyte freezing', 'oocyte cryopreservation', 'oocyte vitrification', 'fertility preservation', 'genetic damage from freezing'. In a general conclusion, it can be said that vitrification of oocytes causes damage to the oocyte cytoskeleton and changes the expression of various mitochondrial, apoptosis, autophagy, etc. genes. Pre-incubation of mature mouse oocytes with taxanes (docetaxel and paclitaxel) before vitrification can inhibit cytoskeleton and gene damage to the oocyte as much as possible. These results can be used to improve assisted reproductive techniques and increase the success rate of in vitro fertilization.

keywords: oocyte, freezing, damage, gene expression, taxan.

22481 - Poster

The Role of Exosomes in Epigenetic Regulation of Endometrial Receptivity and Recurrent Implantation Failure (RIF): Potential Applications in Non-Invasive Diagnostics and Personalized Assisted Reproductive Technologies

Seyede Samane Nabavian[1], Esmaeil Babaei[1 *]

1- Department of Animal Biology, Faculty of Natural Science, University of Tabriz, Tabriz, Iran.
*Corresponding Author: babaei2539@gmail.com

Abstract

In 10-15% of in vitro fertilization procedures, recurrent implantation failure (RIF) still remains a daunting problem in assisted reproductive technologies (ART). Exosomes are tiny extracellular vesicles loaded with microRNAs, proteins, and lipids. These regulate embryo-endometrium interactions through epigenetic means. This review (2023-2024) explores exosomes in endometrial receptivity, RIF pathogenesis, and their potential for diagnostics and therapeutics in personalized ART. Endometrial exosomes deliver miRNAs such as miR-30d and miR-200c, regulating HOXA10 and integrin β3 in favour of decidualization. In RIF situations, abnormal miRNAs (e.g., miR-155) exacerbate inflammation and depress receptivity. Embryonic exosomes upregulate LIF and VEGF to support implantation. Exosomes within uterine fluid and plasma (e.g., miR-486-5p) might be non-invasive biomarkers for implantation success, with 85% accuracy in prediction. Therapeutic uses of exosomes include miR-30d mimics that provide restoration of receptivity and result in improved implantation rates as documented in recent trials. Although unresolved challenges like standardization of exosome isolation remain, the merging of exosome technology and artificial intelligence could revolutionize the ART. An innovative non-invasive diagnostic tool and therapeutic option, exosomes represents the future of personalized repro-med.

keywords: Exosomes, RIF, Endometrial Receptivity, ART, Biomarkers.

21544 - Poster

The role of empagliflozin treatment on oxidative stress levels in women with polycystic ovary syndrome

Shima Soniesharg[1 *], Syed Mohammad Ali Shariatzadeh[1], Malek Soleimani Mehranjani[1], Rahil Janatifar[2], Zahra Ebrahimi[3]

1- Department of Biology, Faculty of Sciences, Arak University, Arak, Iran.
2- Department of Reproductive Biology, Academic Center for Education, Culture and Research (ACECR), Qom, Iran.
3- Department of Mesenchymal Stem Cells, Academic Center for Education Culture and Research (ACECR), QOM, Iran.
*Corresponding Author: soniesharghshima@yahoo.com

Abstract

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder in women (1)and is associated with increased oxidative stress(2) .Empagliflozin (EMPA), a sodium-glucose cotransporter 2 (SGLT2) inhibitor, may be effective in reducing the symptoms of this disease by improving insulin resistance and oxidative stress (3). This study investigated the effects of EMPA on oxidative stress and antioxidants in serum and follicular fluid of these patients. Forty women with PCOS were randomly divided into two groups. Empagliflozin (25 mg) and placebo (25 mg ORS solution) and were administered for 8 weeks. Treatment was started two months before the ovulation cycle and continued until the day of oocyte retrieval. Malondialdehyde (MDA), total antioxidant capacity (TAC), and glutathione reductase/glutathione reductase (GPX/GRD) levels in serum and follicular fluid of these patients were measured by ELISA. Data were analyzed using the Independent T-Test, and the difference between means was considered significant at the $P<0.05$ level. A significant decrease in serum MDA ($P<0.01$) and follicular MDA ($P<0.05$) was observed in the EMPA group. Serum TAC increased significantly in the EMPA group ($p<0.001$), but follicular TAC did not differ significantly ($P>0.05$). There was no significant difference in serum and follicular GPX, as well as serum GR between the two groups ($P>0.05$). However, a significant increase in follicular GR was observed in the EMPA group ($P<0.05$). Our results showed that EMPA, by reducing MDA levels, increasing serum TAC and follicular GR, reduced oxidative stress in women with PCOS and therefore could play an effective role in reducing disorders in these patients.

keywords: polycystic ovary syndrome, Empagliflozin, total antioxidant capacity, Malondialdehyde, glutathione reductase/glutathione reductase.

22374 - Poster

Melatonin Induces Expression of ErbB1 and ErbB4 in Pre-implantation Mouse Embryos

Ghazaleh Moshkdanian[1], Fazeleh Entezarian[2], Fatemeh Moghani-Ghoroghi[3], Parichehr Pasbakhsh[3], Atefeh Najafi[3], Iraj Ragerdi Kashani[3 *], Seyed Noureddin Nematollahi-Mahani[4]

1- Gametogenesis Research Center, Kashan University of Medical Sciences, Kashan, Iran
2- Anatomical Sciences Research Center, Institute for Basic Sciences, Kashan University of Medical Sciences, Kashan, Iran
3- Department of Anatomy, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran
4- Department of Anatomy, Afzalipour School of Medicine, Kerman University of Medical Sciences, Kerman, Iran
*Corresponding Author: ragerdi@tums.ac.ir

Abstract

The aim of this study is to evaluated the effects of melatonin on early embryo competence and the expression rate of the primary implantation receptors (ErbB1 and ErbB4). Therefore, two-cell mouse embryos were cultured in 3 groups: simple media, melatonin-treated (10-9 M melatonin) and Luzindole-treated (10-9 M luzindole). Then, the rate of ErbB1 and ErbB4 gene and protein expression, the level of intracellular ROS, antioxidant capacity, and also the number of cells were evaluated and compared with the fourth group in vivo developed blastocysts (control group). The obtained data from the present study showed that melatonin significantly up-regulated the ErbB1 and ErbB4 gene and protein expression, decreased intracellular ROS, increased the total antioxidant capacity, and also elevated the cell numbers in the melatonin-treated group compared with the other groups ($P \leq 0.05$). Thus, the use of melatonin may be a helpful factor in improving the embryo quality and enhancing the expression of ErbB1 and ErbB4, two important implantation-related genes and proteins.

keywords: Antioxidant, ErbB1, Melatonin, Pre-implantation embryo, Reactive oxygen species.

22223 - Poster

The Role of microRNAs in Fertility and Early Embryonic Development

Elham Ghadirkhomi[1 *]

1- Academic Center for Education, Culture, and Research (ACECR), East Azerbaijan, Iran.
*Corresponding Author: ghadirkhomi@acecr.ac.ir

Abstract

Infertility being among the prominent reproductive health issues affects nearly 10–15% of couples worldwide. Identification of molecular participants in fertility can offer new avenues for prevention, diagnosis, and treatment of infertility. MicroRNAs (miRNAs), already proven as crucial post-transcriptional regulators of gene expression, have attracted significant attention in reproductive biology in recent years. These small non-coding RNAs control target mRNA translation and subsequently impact numerous important biological processes. Increasing evidence highlights their most important roles during oocyte maturation, sperm maturation, fertilization, and early embryonic development. An overview of current studies reveals that aberrant regulation of some miRNAs has a direct impact on gamete quality and consequently rates of success of assisted reproductive technologies (ART), most notably in vitro fertilization (IVF). For instance, miR-21 has been implicated in the survival and maturation of the oocyte, miR-34c in the induction of embryonic cleavage following fertilization, and miR-125 in apoptosis regulation. Dysregulation of all these miRNAs has been associated with reduced oocyte quality, embryonic arrest, or habitual miscarriage. Besides, miRNA expression pattern identification holds promise as stable biomarkers for IVF success prediction and can potentially bring in miRNA-directed therapeutic approaches. This review synthesizes the latest evidence on the role of miRNAs in fertility and early embryonic development, with an emphasis on their possibility as diagnostic and therapeutic molecules for the optimization of infertility treatment.

keywords: Infertility, microRNA, early embryonic development, IVF, biomarkers.

21941 - Poster

The Emerging Role of CRISPR in Personalized Infertility Treatment: Integrating Omics Approaches with IVF and Genome Editing Technologies

Sara Amiri[1 *], Tohid Javaheri[2]

1- Department of Biology, Faculty of Sciences, Mashhad Branch, Islamic Azad University, Mashhad, Iran.
2- Department of Biology, Faculty of Sciences, University of Guilan, Rasht, Iran.
*Corresponding Author: amirisara570@gmail.com

Abstract

Infertility is a complex issue. Assisted reproductive technologies (ART), like in vitro fertilization (IVF), provide hope for couples facing this challenge. Recent advancements in CRISPR-Cas9 technology allow for precise genome editing. This makes it possible to correct genetic mutations in reproductive cells and early embryos. A thorough literature review was done, focusing on studies published between 2020 and 2025. The sources included PubMed, Scopus, and Web of Science databases. This review highlights how CRISPR-Cas9 is combined with omics approaches, such as genomics, proteomics, and metabolomics, to improve IVF outcomes. Preclinical studies show successful restoration of fertility in animal models through CRISPR's correction of mutations that affect spermatogenesis. Still, challenges like mosaicism, off-target effects, and unintended genomic changes remain. More research is needed to improve the accuracy and safety of editing. Ethical questions, especially about germline editing, continue to spark debate in the scientific community. This review emphasizes the promising potential of combining CRISPR-Cas9 with omics-informed IVF strategies. This approach could lead to personalized infertility treatments. Future research should refine genome editing techniques, integrate multi-omics data for better embryo profiling, and create ethical guidelines for responsible clinical use.

keywords: CRISPR-Cas9, in vitro fertilization (IVF), Omics; personalized infertility treatment, genome editing.

22501 - Poster

The Role Of CRISPR-Cas9 Gene Editing in Improving Fertility Processes and Reducing Hereditary Infertility

Maryam Nadimi[1 *]

1- PhD Student in Microbiology, Department of Microbiology, Faculty of Basic Sciences, Shahrekord Branch, Islamic Azad University, Iran.
*Corresponding Author: m_nadimi2011@yahoo.com

Abstract

Infertility affects an estimated 10–15% of couples worldwide, with a significant proportion attributable to inherited genetic abnormalities. These include defects in gametogenesis, hormonal regulation, or structural abnormalities in reproductive tissues. CRISPR-Cas9, a versatile and cost-effective genome-editing technology, offers unprecedented opportunities to correct pathogenic mutations, improve gamete and embryo quality, and advance reproductive medicine. This review aims to comprehensively examine the role of CRISPR-Cas9 in enhancing fertility processes and reducing hereditary infertility. It synthesizes mechanistic insights, preclinical and translational findings, and explores the challenges, risks, and future directions associated with integrating CRISPR-Cas9 into fertility treatments. A structured literature search was conducted using PubMed, Scopus, and Web of Science databases, focusing on publications from 2013 to 2025. Keywords combined "CRISPR-Cas9," "fertility," "hereditary infertility," "gene therapy," and related terms. Studies were included if they addressed molecular mechanisms, animal or human models, ethical or regulatory considerations, or translational applications. CRISPR-Cas9 has demonstrated efficacy in targeting key fertility-related genes (e.g., SYCP3, ZP1–ZP4, GNRHR) to restore gametogenesis and improve embryonic viability in animal models. Its potential extends to correcting monogenic causes of infertility and integrating with in vitro gametogenesis (IVG) and preimplantation genetic testing (PGT). Nonetheless, significant challenges remain, including off-target editing, mosaicism, complex polygenic inheritance, delivery limitations, and ethical governance. Emerging approaches—such as base/prime editing, epigenome modulation, and multiplex gene targeting—offer pathways to overcome these limitations. Responsible translation will require robust safety validation, equitable access, and globally harmonized regulatory frameworks.

keywords: CRISPR-Cas9, Fertility Enhancement, Hereditary Infertility, Reproductive Medicine, Gene Editing.

Chapter Three
Natural Compounds and Cancer



22582- Invited oral presentation

The effect of medicinal plants on male infertility

Nasri S*[1]

1-Biology Department, Payame Noor University, Tehran, Iran

*Corresponding Author: s_nasri2000@yahoo.com

Abstract

Infertility, defined as the inability to conceive after one year of intercourse without the use of contraception. About %30-50 of infertility cases are due to problems in men. Using scientific information in papers searched in Science Direct, PubMed, Scopus, etc. between 2000-2025, it was determined that different medicinal plants have an effect on male fertility including: Apium graveolens, Cinnamomum camphora, Cornus mas, Satureja khuzestanica, Withania somnifera, Fumaria parviflora, zingiber officinale, cinnamomum zeylanicum, Phoenix dactylifera, Crocus sativus,Amigdalus communis, Tribulus terrestris, Seasamum indicum, Zingiber offinale, Tribulus terrestris, Glycine max, Spinacia oleracea, Urtica dioica . Medicinal plants could be useful in rising male fertility due to antioxidant properties and lower side effects. Scientific research is needed to standardize them for using in clinical trials.

keywords: male infertility, medicinal plants

23912 - Invited oral presentation

Quorum Sensing inhibitory effect by Algal Compounds against Marine Biofilms

Iram Liaqat[1 *]

1- Tenured Associate Professor, Department of Zoology, Government College University, Lahore, Pakistan
*Corresponding Author: iramliaq@hotmail.com

Abstract

We examined that whether patulin and penicillic acid, two well-known quorum sensing inhibitors (QSI) for human pathogen Pseudomonas aeruginosa PAO1, can prevent biofilm formation. The study aims for amplification of a putative luxS gene homologue in the marine microorganism H. pacifica ATCC 27122, as well as monitoring AI-2 QS in marine organisms. Degenerated primers were designed based on the luxS protein sequence of ten gram-negative α-, β- and γ- proteobacteria, and used for luxS gene amplification in H. pacifica. AI-2 assays were carried out using the well-established Vibrio harveyi BB170 AI-2 bioluminescence assay. Effect of penicillic acid on AI-2 induction of H. pacifica showed strong inhibitory effect at non-growth inhibitory concentrations compared to patulin having adverse effect at the highest concentration (25 μM) tested in our study. QSIs effect on biofilm forming capability of marine isolates was isolate specific. Detection of bioluminescence in the autoinducer bioassay and the presence of a putative luxS gene orthologue are biochemical and genetic evidence for the production of a signalling molecule(s) and provide a first step in characterizing H. pacifica quorum sensing. Our study emphasize that QSI compounds must be selected in the specific system in which they are to function and they cannot easily be transferred from one QS system to another.

keywords: Biofilm formation, H. pacifica, AI-2 assay, LuxS gene, Patulin, Penicillic acid

22690 - Invited oral presentation

Reprogramming Cell Fate: The Role of Natural Compounds in Differentiation and Cancer Suppression

Soheila Ebrahimi Vosta Kalaee[1 *]

1- Department of Animal Sciences Research, Mazandaran Province Agricultural and Natural Resources Research Center, Agricultural Research, Education and Extension Organization, Sari, Iran
*Corresponding Author: soheilaebrahimi121@gmail.com

Abstract

Cancer remains one of the most complex challenges in human health, requiring innovative therapeutic approaches. Current treatments, such as chemotherapy, are often associated with limitations including drug resistance, side effects, and reduced quality of life. In recent years, attention has shifted toward natural compounds derived from plants, microbes, and marine sources, which often possess multi-targeted and biocompatible properties. This keynote lecture explores the role of natural compounds in reprogramming cell fate, illustrating how they can stimulate cell differentiation, activate apoptotic pathways, and suppress tumor growth by modulating oxidative stress and angiogenesis. Key challenges in developing these compounds, including low bioavailability, standardization, and limited clinical data, will also be discussed. Finally, the lecture emphasizes the necessity of interdisciplinary collaboration among cell biologists, pharmacologists, agricultural scientists, and food technologists, as the safe and scientific exploitation of natural resources can only be achieved through coordinated efforts. The concluding message is: "Reprogramming cell fate through nature's wisdom may redefine the future of cancer therapy".

keywords: Cell Fate Reprogramming, Apoptosis, Natural Compounds, Cancer Suppression

22602 - Invited oral presentation

Comparative Assessment of the Anticancer Activities of Various Probiotic Fractions: Insights into Their Mechanisms of Action

Farzaneh Tafvizi[1 *]

1- Department of Biology, Pa.c., Islamic Azad University, Parand, Iran
*Corresponding Author: farzanehtafvizi54@gmail.com

Abstract

Probiotics, defined as live microorganisms that confer health benefits to the host, have recently gained increasing attention beyond their traditional role in gut microbiota modulation, emerging as promising agents in cancer prevention and therapy. In addition to viable probiotics, their non-viable derivatives, collectively termed postbiotics, represent a novel avenue in anticancer interventions. These bioactive fractions include cell-free supernatants, exopolysaccharides, bacterial cell wall components, heat-killed cells, specific metabolites such as short-chain fatty acids (notably butyric acid), and extracellular vesicles (EVs), including outer membrane vesicles (OMVs) and extracellular membrane vesicles (EMVs). Growing evidence indicates that these fractions exert potent anticancer activities by modulating key molecular pathways. Their functional mechanisms involve the induction of apoptosis through regulation of pro-apoptotic anti-apoptotic gene expression, and the generation of reactive oxygen species (ROS) leading to targeted oxidative stress in cancer cells, modulation of signaling cascades such as PI3K/Akt, MAPK, and P53, and inhibition of cell cycle progression. This comparative evaluation highlights the diverse anticancer potential of probiotic- and postbiotic-derived fractions and underscores their emerging role as complementary or alternative strategies in cancer therapeutics.

keywords: probiotic, postbiotic, paraprobiotic, apoptosis, cancer

23907 - Invited oral presentation

Preparation of Your Submission for the First International and Second National Conference on Cell and Developmental Biology of Iran Exploring the therapeutic potential of natural compounds in pediatric solid tumors

Azadeh Kiumarsi[1 *] , Leila Moadabshoar[2]

1- Department of Pediatric Hematology and Oncology, Children's Medical Center Hospital, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran
2- Department of Radiation Oncology, Hakim Hospital, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.
*Corresponding Author: akiumarsi@tums.ac.ir

Abstract

Natural phytochemicals are being actively explored as adjunct or alternative therapies for pediatric solid tumors. In preclinical models, a wide range of natural agents (notably polyphenols such as curcumin, resveratrol, genistein and quercetin) induce apoptosis and cell-cycle arrest in tumor cells. In neuroblastoma and osteosarcoma cell lines, these agents trigger caspase-mediated death and downregulate proliferative signals. In rhabdomyosarcoma cultures, curcumin likewise reduced viability and enhanced the effects of standard drugs (e.g. vincristine, dactinomycin) while impairing migration and clonogenicity. Many phytochemicals have reported to act as anti-angiogenic and anti-metastatic agents. In a Wilms' tumor model, immune-modulation via NF-κB inhibition by curcumin have been described. Notably, natural agents can also attenuate toxicity from conventional therapy. Several reviews report that combining phytochemicals with chemo/radiation can selectively sensitize cancer cells and reduce side effects, improving tolerability. A small pediatric trial showed curcumin supplementation mitigated vincristine-induced neuropathy. Nonetheless, clinical evidence in children remains sparse: most data are in vitro or in vivo models, and dedicated pediatric trials are lacking. Moreover, many natural drugs have poor bioavailability (curcumin's aqueous solubility is only ~11 ng/mL) and rapid metabolism, limiting in vivo efficacy. To overcome these hurdles, novel formulations are in development which can markedly boost tumor uptake and potency. Ongoing work on nanoformulations, analogs and combination regimens aims to improve potency and delivery. In sum, plant-derived compounds represent promising adjuncts in pediatric oncology, but rigorous clinical studies are needed to confirm safety, dosing and efficacy in young patients.

keywords: natural compounds, pediatric, solid tumors, children

22641 - Invited oral presentation

Animal Peptides as Valuable Resources in Cancer Therapy: Scorpions and Spiders

Reza Arabi Mianroodi[1 *], Farahnaz Khoshdel Nezamiha[1]

1- R&D Dept. Research and Production Complex, Pasteur Institute of Iran, Karaj, Iran
[*]Corresponding Author: arabi552@yahoo.com

Abstract

Cancer remains one of the most challenging diseases of our time, creating a pressing need for the development of new drugs with novel mechanisms of action and reduced toxicity. In this context, the animal kingdom, particularly venomous arthropods such as scorpions and spiders, represents a rich source of bioactive molecules with high therapeutic potential. These creatures produce a complex cocktail of toxins for prey capture and defense, primarily composed of small peptides and proteins. Many of these venom peptides specifically target ion channels and membrane receptors on cells. Interestingly, some of these same channels and receptors are overexpressed in cancer cells and play a key role in their growth, proliferation, metastasis, and survival. This review article explores the peptides derived from scorpion and spider venoms that exhibit anti-cancer activity. Their mechanisms of action are discussed, including the selective inhibition of specific ion channels (such as potassium, chloride, and sodium channels), induction of apoptosis (programmed cell death), inhibition of angiogenesis (tumor vasculature formation), and disruption of cell membrane integrity. Finally, despite the challenges associated with using these peptides (such as systemic toxicity, drug stability, and large-scale production), their immense potential as templates for designing novel anti-cancer drugs and targeted therapeutic agents is emphasized.

keywords: Anticancer peptides, Ion channels, Cell membrane, Apoptosis, Targeted cancer therapy

23840 - Invited oral presentation

Nano-Encapsulated Natural Compounds: A Novel Adjuvant Therapeutic Strategy Against Glioblastoma Multiforme

Mohammad Mahdi Taheri[1], Zahra Shamsi[2], Sajjad Sahab negah[3 *]

1- Department of Pharmaceutical Biomaterials, Pharmacy Faculty, Tehran University of Medical Science, Tehran, Iran.
2- Department of surgery and diagnostic imaging, faculty of veterinary medicine, Urmia University, Urmia, Iran.
3- Sina MS Research Center, Tehran University of Medical Science, Tehran, Iran.
*Corresponding Author: sahabnegahs@tums.ac.ir

Abstract

Glioblastoma multiforme (GBM) continues to be a therapeutic challenge due to its aggressive nature, high recurrence rate, and the formidable blood-brain barrier (BBB), which restricts effective drug delivery. The need for innovative, adjuvant therapies to complement standard treatments is critical. Natural bioactive compounds like curcumin and crocin show strong anti-tumor, anti-angiogenic, and radio-sensitizing effects. However, their clinical use is limited by poor bioavailability, rapid metabolism, and instability. This highlights the urgent need for further research into advanced delivery systems to maximize their therapeutic potential. Cutting-edge research shows that nano-encapsulation (e.g., in liposomes, polymeric nanoparticles, or exosomes) greatly improves the stability, bioavailability, and BBB penetration of these compounds. These nano-formulations enable targeted delivery to tumor sites, minimizing off-target effects and enhancing efficacy in pre-clinical models. Despite encouraging results, challenges remain, including potential toxicity of synthetic carriers, difficulties in large-scale manufacturing, and a lack of extensive clinical trials. Future efforts should focus on developing biocompatible, targeted nano-carriers, exploring combination therapies with temozolomide and radiation, and launching rigorous clinical studies to confirm the safety and effectiveness of nano-natural adjuvants, ultimately aiming to improve survival rates and quality of life for GBM patients.

keywords: Glioblastoma multiforme, blood-brain barrier, polymeric nanoparticles, exosomes, nano-carriers

23905 - Invited oral presentation

Natural Product-Based Radiopharmaceuticals For Cancer Diagnosis and Therapy

Zeinab Paymani[1 *], Mostafa Nazari[1], Shima Yavari[1], Farzaneh Ghaffari Yousefzadeh[1]

1- Department of Nuclear Medicine, Children Medical Center, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding Author: paymaniz@yahoo.com

Abstract

Radiopharmaceuticals enable both diagnosis and targeted therapy in oncology. While synthetic compounds dominate current development, natural product–based radiopharmaceuticals represent an emerging frontier with unique advantages. This lecture explores the potential of bioactive natural molecules particularly curcumin and its analogs, flavonoids, and marine-derived peptides—as scaffolds for radiopharmaceutical design. These compounds display diverse pharmacological activities, including anticancer, anti-inflammatory, antioxidant, and antimicrobial effects, which make them attractive candidates for molecular imaging and therapy. Advances in radiolabeling strategies, allow the incorporation of isotopes like gallium-68, technetium-99m, fluorine-18, and iodine isotopes into these natural frameworks. Notable examples include radiolabeled curcuminoids for amyloid imaging, flavonoid derivatives for cancer and neurodegenerative disease detection, and marine peptides with potent antitumor activity. Despite challenges such as structural complexity, poor solubility, and stability limitations, innovative chemical modifications and labeling approaches are addressing these barriers. Harnessing the chemical diversity and biological specificity of natural products offers new avenues for the development of theranostic agents, bridging the gap between traditional pharmacognosy and cutting-edge nuclear medicine. This integration may significantly expand the cancer treatment arsenal, delivering radiopharmaceuticals with improved selectivity, reduced toxicity, and multifunctional therapeutic potential.

keywords: Radiopharmaceuticals, Curcumin, Flavonoids, Marine Peptides, Cancer Therapy

23910 - Invited oral presentation

Cell and Gene Therapy in Cancer

Amir ali Hamidieh[1 *], Maryam Behfar[1], Leila Jafari[1]

1- Pediatric Cell and Gene Therapy Research Centre, Gene, Cell & Tissue Research Institute, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding Author: aahamidieh@tums.ac.ir

Abstract

Cancer remains one of the leading causes of morbidity and mortality worldwide, necessitating the development of innovative treatment strategies beyond conventional modalities such as surgery, chemotherapy, and radiation. Cell and gene therapies have emerged as promising frontiers in hematology-oncology, offering highly specific and personalized approaches to target malignant cells while minimizing damage to healthy tissues. Cell therapy primarily focuses on harnessing and enhancing the patient's immune system response to struggle cancer. Techniques such as adoptive cell transfer involve the isolation and expansion of tumor-reactive immune cells, including tumor-infiltrating lymphocytes (TILs) and genetically engineered chimeric antigen receptor T-cells (CAR-T cells). CAR-T therapy, in particular, has revolutionized the treatment of hematological malignancies by enabling immune cells to recognize and eliminate cancer cells with remarkable specificity. Additionally, natural killer (NK) cells and dendritic cell-based vaccines are being explored to augment anti-tumor immune responses. Gene therapy in cancer involves the targeted modification of genetic material within cells to correct mutations, inhibit oncogenes, restore tumor suppressor function, or sensitize tumor cells to therapeutic agents. Advances in gene editing technologies, such as CRISPR-Cas9, have greatly enhanced the precision and efficiency of gene manipulation. Strategies include the delivery of therapeutic genes via viral and non-viral vectors, gene silencing using RNA interference, and the introduction of suicide genes to selectively induce tumor cell death. Despite significant clinical successes, especially in hematologic malignancies, challenges remain in the broader application of these therapies to solid tumors. Tumor heterogeneity, immune evasion, off-target effects, and manufacturing complexities need to be addressed to optimize efficacy and safety. In summary, cell and gene therapies represent a paradigm shift in cancer treatment, offering the potential for durable and curative outcomes. Continued interdisciplinary efforts integrating immunology, molecular biology, and bioengineering are essential to fully realize the therapeutic potential of these innovative modalities across diverse cancer types.

keywords: Tumor-Infiltrating Lymphocytes, CAR-T therapy, Natural killer (NK) Cells Therapy

23784 - Invited oral presentation

Traditional Iranian medicine and the development of traditional medicine research with a focus on infertility research

Mohsen Naseri[1 *] , Razieh Jafari hajati[1]

1- Shahed University Traditional Medicine Clinical Trial Research Center
*Corresponding Author: naseri@shahed.ac.ir

Abstract

AbstractInfertility in traditional Iranian medicine is known as "Aqer". Multiple etiologies have been considered for infertility and Aqer. Various methods have been proposed for treating infertility based on its causes; among them: 1) lifestyle management, especially diet; 2) medicinal treatments; 3) surgical treatments and other manual procedures. In one study at the Traditional Medicine Clinical Trials Research Center, the effects of a warming diet in infertile patients receiving hormonal medications were examined. This diet increased the chance of pregnancy in infertile women by 30%; the article will discuss authentic traditional Iranian medicine and some infertility treatment methods used. In another clinical trial, the effects of a medicine based on classical medical sources called Ovulamam capsule—derived from asafoetida—were evaluated in patients with ovarian cysts and infertility. Results showed this capsule increased pregnancy by 50%.

keywords: Iranian Metabolic Diet (MPD), Ovulam capsule, Asafetida, Polycystic Ovary Syndrome (PCOS)

23839 - Invited oral presentation

Comparative Effect of Nigella Sativa+ Black Pepper and Letrozole + Tamoxifen on Female Infertility in Women with Polycystic Ovarian Syndrome: A Randomized Clinical Trial

Athar Rasekh jahromi[1 *], Asra Ansari[2], Zahra Zarei baba arabi[3], Vahid Rahmanian[4]

1- Obstetrics and Gynecologist, Departments of Obstetrics and Gynecology, Jahrom University of Medical Sciences, Jahrom, Iran
2- M.Sc. Developmental Cell Biology, Larestan University of Medical Sciences, Larestan, Iran
3- Midwif, Research Center for Non communicable Diseases, Jahrom University of Medical Sciences, Jahrom, Iran
4- Assistant professor of Epidemiology, Department of Public Health, Torbat Jam Faculty of Medical Sciences, Torbat Jam, Iran
*Corresponding Author: drrasekh@yahoo.com

Abstract

The aim is to compare Nigella sativa + black pepper with letrozole + tamoxifen as a treatment for infertile women with polycystic ovary syndrome (PCOS).90 PCOS infertile women aged 18 and 42 who were referred to Jahrom infertility clinic. Patients were randomly assigned intervention and control groups. The control group received letrozole and tamoxifen. In contrast, Nigella sativa and black pepper were administered in the intervention group (from the third to the seventh day of the menstrual cycle). Throughout therapy, transvaginal ultrasound measures such as ovarian follicular size, number, and endometrial thickness were monitored, and the medication regimen was maintained according to these characteristics.In the intervention and control groups, the pregnancy rates were 22 (48.8%) and 5 (11.1%) respectively ($p=0.021$). On day 12 of the menstrual cycle, there was a significant difference between the two groups in terms of endometrial thickness, size, and number of follicles ($p<0.05$). The incidence of ovarian hyperstimulation syndrome (OHSS) was not significantly different between the two groups ($p<0.05$).The increased pregnancy rate is ultimately due to the favorable effects of Nigella sativa and black pepper on the size and number of follicles and endometrial thickness. In conclusion, despite the necessity for standardization by the applied research laboratory of medicinal plants and further clinical trial research, we recommend the use of this low-cost and low-complication regimen for the treatment of infertile patients with polycystic ovary syndrome.

keywords: Infertility, black pepper, black seed, letrozole, tamoxifen

22651 - Invited oral presentation

The Role of Probiotics in the Treatment of Fatty Liver

Mina Ramezani[1 *]

1- Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: mina.ramezani@iau.ac.ir

Abstract

Non-alcoholic fatty liver disease (NAFLD) is one of the most common chronic liver disorders worldwide and is closely associated with obesity, type 2 diabetes, and metabolic syndrome. Current therapeutic strategies mainly focus on lifestyle modification, weight loss, and dietary changes, while no definitive pharmacological treatment has yet been established. In recent years, increasing attention has been paid to the role of gut microbiota in the pathogenesis of NAFLD. Dysbiosis of intestinal bacteria can contribute to disease progression through increased intestinal permeability, production of toxic metabolites, and induction of systemic inflammation. Therefore, the use of probiotics has been proposed as a novel therapeutic approach. Probiotics are live microorganisms that can restore the balance of gut microbiota and improve immune function when administered adequately. Animal and human studies have demonstrated that certain probiotic strains, particularly Lactobacillus and Bifidobacterium, can reduce insulin resistance, control inflammation and oxidative stress, and improve lipid metabolism. Evidence also suggests that probiotic supplementation may lower liver enzyme levels and improve liver histology in patients with NAFLD. Nevertheless, inconsistencies in clinical trial outcomes and the lack of consensus regarding the optimal dosage and specific strains remain significant challenges in standardizing probiotic therapy. Overall, probiotics may serve as an effective adjunct therapy in managing non-alcoholic fatty liver disease alongside lifestyle interventions. However, further large-scale and long-term clinical trials are necessary to establish more definitive evidence.

keywords: Non-alcoholic fatty liver, probiotic, gut microbiota, oxidative stress, adjuvant therapy

23911 - Invited oral presentation

Applications of Gene Expression in the Study of Human Cancer Disease

Abdulsahib Kadhim Ali[1 *]

1- Iraqi Atomic Energy Commission, Radiological and Nuclear Application and Laboratories, Baghdad, Iraq
*Corresponding Author: sahib1966@yahoo.com

Abstract

Gene expression analysis plays a crucial role in cancer research. By examining which genes are activated or suppressed, researchers can classify tumors more accurately, identify biomarkers for early diagnosis, and predict patient prognosis. Modern techniques such as microarray analysis and RNA sequencing allow scientists to detect gene expression patterns linked to specific cancer types. These findings are applied in personalized medicine, guiding the choice of targeted therapies and improving treatment outcomes. Thus, studying gene expression provides valuable insights into cancer development, progression, and response to therapy. 1. Introduction Gene expression refers to the process by which the information stored in DNA is transcribed into messenger RNA and then translated into proteins. These proteins are essential for controlling cell growth, division, differentiation, and survival. In healthy cells, gene expression is strictly regulated. However, in cancer cells, this regulation is frequently disrupted. Some genes, called oncogenes, become overexpressed, driving uncontrolled cell growth. Others, such as tumor suppressor genes, may be underexpressed or completely silenced, removing the normal brakes that prevent tumor formation. Therefore, studying gene expression allows us to understand how normal cells become malignant, and it provides powerful tools for cancer diagnosis, classification, and treatment.2. Methods of Studying Gene ExpressionOver the past two decades, several technologies have revolutionized our ability to analyze gene expression which including Microarray analysis, RNA sequencing (RNA-seq) and Quantitative PCR (qPCR) .These technologies generate “gene expression profiles,” which are unique patterns of gene activity in different types of cancer.3. Applications in Cancer Research and Medicinea) Tumor Classificationb) Early Detection and Biomarkersc) Prognosis and Disease Progressiond) Personalized and Targeted Therapy4. Case ExampleA well-known example is the use of the Oncotype DX test in breast cancer. This test measures the expression of a panel of 21 genes to predict the risk of recurrence and guide decisions about whether chemotherapy is necessary. Another important example involves the genes BRCA1 and BRCA2.Mutations or altered expression in these genes significantly increase the risk of developing breast and ovarian cancers.5. ConclusionGene expression analysis has become a cornerstone of modern cancer research and

keywords: Gene expression, Oncogene, Tumor Suppressor gene, Human Cancer

21809 - Oral

Protective effects of Allium ampeloprasum Subsp Iranicum on cyclophosphamide-induced immunosuppression in NMRI mice: a potential natural cancer immunomodulator

Kobra Shirani[1 *], Fatemeh Abedi[1]

1- Department of Toxicology, Faculty of Medicine Sciences, Tarbiat Modares University, Tehran, Iran.
*Corresponding Author: k.shirani@modares.ac.ir

Abstract

Abstract: Cyclophosphamide (CTX) is a potent anticancer agent, yet its toxicity to normal human tissues limits its therapeutic window. This study aimed to evaluate the in vivo immunomodulatory effects of Allium ampeloprasum against CTX-induced toxicity in mice.An extract of the whole plant of A. ampeloprasum was prepared by maceration, and its total phenolic and flavonoid contents were quantified using spectrophotometric methods. Mice received daily oral administration (PO) of the extract at 150 mg/kg for 14 days, administered alone or together with an intraperitoneal (IP) injection of CTX at 20 mg/kg. The study assessed the extract's impact on body weight, spleen weight, white blood cell (WBC) count, serum antibody titer by hemagglutination (HA), delayed-type hypersensitivity (DTH), lymphocyte proliferation, cytokine production, and histopathology. Treatment with A. ampeloprasum improved several parameters, including spleen weight ($p<0.001$), WBC ($p<0.001$), lymphocyte count ($p<0.05$), monocyte count ($p<0.01$), HA titer ($p<0.05$), and DTH response ($p<0.01$). Notably, the extract enhanced lymphocyte proliferation in response to PHA ($p<0.01$) and LPS ($p<0.05$) and restored levels of interferon-γ (IFN-γ) ($p<0.001$) and interleukin-4 (IL-4) ($p<0.001$) in immunosuppressed mice. A. ampeloprasum also reversed CTX-induced histopathological alterations. These findings indicate that A. ampeloprasum can modulate immunity and bolster host immune responses. The observed immunostimulatory effect may be attributed to the high content of flavonoids and dipropyl trisulfide compounds.

keywords: Allium ampeloprasum Subsp Iranicum, Immune System, Cancer, Chemotherapy Drug

22416 - Oral

Computational Evaluation of Natural Quercetin Derivatives as Inhibitors of Pyruvate Dehydrogenase Kinase 3 (PDK3) in Cancer Metabolism

Mina Barhoon[1 *]

1- Bioinformatics Lab., Department of Biology, School of Sciences, Razi University, Kermanshah, Iran
*Corresponding Author: m.barhoon@stu.razi.ac.ir

Abstract

Pyruvate dehydrogenase kinase 3 (PDK3), a mitochondrial kinase that inactivates the pyruvate dehydrogenase complex, drives a metabolic shift from oxidative phosphorylation to glycolysis, a hallmark of malignant transformation. Overexpression of PDK3 has been reported in hepatocellular carcinoma, non-small cell lung cancer, breast cancer, and colorectal cancer, correlating with poor prognosis and chemoresistance. Natural polyphenols, particularly quercetin, have demonstrated inhibitory activity against PDK3 with anti-proliferative effects. Building on this evidence, thirty-two naturally sourced quercetin derivatives, all satisfying Lipinski's rules, were retrieved, energy-minimized using the AMBER force field, and docked into the ATP-binding pocket of PDK3 (PDB ID: 1Y8O) using UCSF DOCK6. Among them, 6-Prenylquercetin 3-methyl ether, abundantly found in Curcuma longa, emerged as the most potent binder (docking score –47.25), surpassing quercetin (–35.84) and the reference inhibitor radicicol (–33.85). Structural analysis revealed hydrogen bonds with Gly325, Gly327, and Leu328, π-cation and π–σ interactions with Arg254 and Leu328, alkyl interactions with Val255 and Val292, multiple van der Waals contacts, and a critical metal-acceptor bond with the Mg^{2+} cofactor, rationalizing its enhanced affinity. ADME profiling predicted inhibition of fewer CYP isoforms compared to quercetin, alongside higher LogP, lower TPSA, and favorable passive membrane permeability compatible with mitochondrial targeting. ProTox3 indicated a non-toxic safety profile. These findings highlight 6-Prenylquercetin 3-methyl ether as a promising natural PDK3 inhibitor with potential anti-cancer activity. Molecular dynamics simulations are recommended to evaluate binding stability, and subsequent experimental validation in enzymatic and cellular models is warranted.

keywords: Pyruvate dehydrogenase kinase 3 (PDK3); Molecular docking; Polyphenols; Anticancer natural products; Structure-based drug discovery

22168 - Oral

Clinical and Functional Characterization of the TP53 rs909222931 Variant in Breast Cancer

Sana Zarghami[1], Farinaz Behfarjam[1 *], Amiri Yekta[1], Mostafa Rafie pour[2]

[1]Royan institute, Tehran, Iran

[2]University of science and culture, Tehran, Iran

[*]Corresponding Author: behfarjam.farinaz@gmail.com

Abstract

Breast cancer is a leading cause of cancer-related mortality among women worldwide, and genetic alterations play a pivotal role in its development. TP53, known as the "guardian of the genome," is the most frequently mutated tumor suppressor gene in breast cancer, regulating apoptosis, cell cycle arrest, and genomic integrity.In this study, we focused on the rs909222931 variant, located in the DNA-binding domain of TP53. Breast tumor samples were analyzed using next-generation sequencing (NGS). Raw FASTQ files underwent quality control, adapter trimming, and alignment to the human reference genome (hg38) with BWA. Variant calling was performed with GATK, and annotation was conducted using VEP, ClinVar.Bioinformatics predictions classified rs909222931 as a pathogenic variant, consistently identified as deleterious across multiple algorithms. Functional analyses suggested that the variant compromises TP53 transcriptional activity, reducing activation of downstream effectors such as CDKN1A (p21) and BAX, which are essential for cell cycle regulation and apoptosis.Clinically, rs909222931 was observed in a subset of invasive ductal carcinoma patients and was associated with poor prognosis and reduced chemotherapy response. These findings highlight the potential clinical utility of TP53 variant screening. Integrating genomic profiling into breast cancer diagnostics may improve patient stratification and guide precision therapy.

keywords: Breast Cancer, TP53, rs909222931, NGS, Pathogenic Variant, Precision Oncology

21463 - Oral

Assessment of the Reproducibility of Plant-Derived Extracellular Vesicle isolation from Peppermint Using PEG: Evaluating Consistency in the Development of Cancer Therapeutic Platforms

Mina Zahiri[1], Kimia Yarmohammadi[1], Maryam Sadat Bagheri[1], Mohammad Nabiuni[1 *], Latifeh Karimzadeh Bardeei[2]

1- Department of Cell and Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran.
2- Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran.
*Corresponding Author: nabiuni@khu.ac.ir

Abstract

Plant-derived extracellular vesicles (PDEVs) have gained increasing attention due to their biocompatibility and promising biomedical applications, particularly in the field of drug delivery for cancer therapy. However, while the quality and quantity of PDEVs may be influenced by plant growth conditions, the reproducibility of their isolation has been less extensively studied. This study investigates the reproducibility of PDEV isolation from fresh peppermint (Mentha piperita) leaves using the polyethylene glycol (PEG) precipitation method. Three independent and consecutive isolations were conducted following the same protocol. The extracted PDEVs were characterized using Dynamic Light Scattering (DLS). The first isolation yielded PDEVs with an average hydrodynamic diameter of 89.4 nm and a very low PDI of 0.0451, indicating a uniform size distribution. In contrast, the second and third isolations showed main PDEV peaks at 125.6 nm and 134.9 nm, respectively, with increased PDIs of 0.2288 and 0.335. Moreover, the presence of larger secondary peaks (594 nm in the second sample and 372 nm in the third) was observed. These results indicate that although the PEG method is capable of isolating PDEVs from peppermint, achieving complete reproducibility and uniformity of the final product across different isolation batches may be challenging. Minor variations in raw material preparation, environmental conditions, or operator errors can affect product quality. Therefore, stringent quality control at each stage is essential, and further studies are recommended to identify and control the factors influencing reproducibility, as achieving such consistency is a critical step for developing reliable therapeutic platforms in oncology.

keywords: Plant-derived exosomes, plant exosome-like nanoparticles, peppermint, cancer, polyethylene glycol

21541 - Oral

LC-MS Profiling of Metabolites in Streptomyces tendae strain M5 culture Extract with Anticancer Activity Against MCF-7 Breast Cancer

Fatemeh Aghaei[1], Seyed Alireza Etesami[1], Ensieh Salehghamari[2 *], Mostafa Pourfallah[3]

1- Roshdazma Ltd, 31977-85966, Karaj, Iran

2-Department of Cell and Molecular Biology, Faculty of Engineering and Science, Kosar University of Bojnord, Bojnord, Iran

3-Department of Cell and Molecular Sciences, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran

*Corresponding Author: esaleh@kub.ac.ir

Abstract

Abstract: Cancer is a leading cause of morbidity and mortality worldwide. Natural anticancer compounds from microbial sources have attracted interest due to their potential therapeutic advantages. Actinomycetes produce approximately 45% of bioactive secondary metabolites highlighting their potential for anticancer agents. This study evaluated Streptomyces tendae M5 extract on MCF-7 breast cancer cells through in vitro following LC-MS analysis. The bacterial extract contained bioactive compounds such as 1,2,3-trimethoxybenzene, sclareol, diosgenin, methylevoxine, contributing to anticancer activities. Cytotoxic effect of bacterial extract was evaluated on MCF-7 using MTT and flow cytometry. Cells were treated with different extract concentrations (5 to 200 µg/ml) over different time (24, 48, 72 and 96 hours). The extract inhibited MCF-7 cell proliferation in a dose- and time-dependent manner (IC50: 50-65 µg/ml at 72 -96 hours), suggesting its anticancer potential. Selective cytotoxicity was observed in MCF-7 cells, leading to apoptosis, as evidenced by flow cytometry analysis. This indicates that the bacterial extract effectively induces apoptotic cell death in MCF-7 cells. These results confirm the potential of S. tendae M5 extract as a promising alternative treatment for breast cancer.

keywords: Cancer, Actinobacteria, Cytotoxicity, flow cytometry, Apoptosis

22238 - Oral

Cisplatin-Loaded Zinc-Functionalized Mesoporous Silica Nanoparticles Enhance Apoptosis in Colorectal Cancer Cells While Preserving Normal Cell Viability

Hirad Sinafar[1], Farzaneh Tafvizi[1], Vahid Naseh[1 *], Hassan Noorbazargan[2]

1- Department of Biology, Pa.c., Islamic Azad University, Parand, Iran
2- Department of Biotechnology, School of Advanced Technologies in Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran
*Corresponding Author: vahid55vet@yahoo.com

Abstract

Colorectal cancer is the third most commonly diagnosed malignancy and the second leading cause of cancer-related mortality worldwide. In this study, cisplatin-loaded mesoporous silica nanoparticles functionalized with amino groups and zinc (Zn-MSN-NH_2-CP) were synthesized via a sol–gel method and evaluated for their therapeutic efficacy against colorectal cancer cells under in vitro conditions. HT-29 and HUVEC cell lines were cultured in supplemented DMEM medium, and cytotoxic effects were assessed using the MTT assay. Alterations in apoptotic gene expression in HT-29 cells exposed to CP, Zn-MSN-NH_2, and Zn-MSN-NH_2-CP were determined by real-time PCR, while flow cytometry was employed to evaluate necrosis as well as early and late apoptotic events. The structural and physicochemical characteristics of the nanoparticles were confirmed by SEM, TEM, DLS, and FT-IR analyses. Drug release studies demonstrated that surface modification of Zn-MSN-NH_2-CP enabled a more controlled and sustained release of cisplatin with improved stability at 4 °C. Both CP and Zn-MSN-NH_2-CP exhibited significant cytotoxicity toward cancer cells, whereas Zn-MSN-NH_2 alone minimized off-target toxicity and preserved normal cell viability. Treatment with IC_{50} concentrations of Zn-MSN-NH_2-CP and CP significantly upregulated pro-apoptotic gene expression while downregulating BCL-2 mRNA levels. Consistently, flow cytometry revealed a marked increase in apoptotic cell populations following Zn-MSN-NH_2-CP treatment. Collectively, these findings demonstrate that Zn-MSN-NH_2 is an effective nanocarrier capable of enhancing the bioavailability and anticancer activity of cisplatin while reducing its cytotoxic impact on non-malignant cells, supporting its potential as a promising platform for advanced colorectal cancer therapy.

keywords: Mesoporous silica nanoparticles, Colon cancer, Cisplatin, Cytotoxicity, Apoptosis

21945 - Oral

Identification of bioactive compounds from Artemisia absinthium as potential inhibitors of cancer-related proteins using molecular docking

Kianoush Moradiani[1], Bita Rahmani[2 *], Mohammad Reza Shiri-Shahsavar[3]

1- Department of Biological Sciences, Faculty of Science, University of Kurdistan, Sanandaj, Iran
2- Cellular and Molecular Research Center, Qazvin University of Medical Sciences, Qazvin, Iran
3- Department of Nutrition, School of Health, Qazvin University of Medical Sciences, Qazvin, Iran
*Corresponding Author: rahmanibita6@gmail.com

Abstract

Cancer remains a leading cause of mortality worldwide, demanding for novel therapeutic agents. Artemisia absinthium is a medicinal plant, known for its anti-inflammatory and anti-malarial properties. This study investigates the binding affinity of A. absinthium compounds against key proteins in cancer pathways. 32 bioactive compounds from A. absinthium were evaluated using molecular docking against three cancer-associated targets: BCL-2 (2W3L), AKT1 (4EKL), and mTOR (4JT5). Ligand structures were obtained from PubChem, protein structures from the RCSB Protein Data Bank, and reference drugs from DrugBank. Docking simulations were conducted using PyRx AutoDock Vina. Docking grids were defined based on known binding sites, and six approved drugs were used as comparative standards for each protein. All protein-ligand interactions were ranked per targetpocket based on binding affinity and binding site overlap with reference drugs. Several compounds demonstrated superior binding affinities compared to standard drugs in the same pockets for each target. Against AKT1, two flavonoids—Rutin and Cynaroside—exhibited stronger binding affinities (–10.0 and –9.9 kcal/mol, respectively) than drug Capivasertib (–9.7 kcal/mol). Against mTOR, the sesquiterpene lactone Absinthin showed the highest overall score (–11.2 kcal/mol), outperforming the drug Temsirolimus (–9.5 kcal/mol). Additionally, a triterpenoid, Olean-12-ene-3β,16β,22α-triol (–10.7 kcal/mol), surpassed the drug Sirolimus (–10.2 kcal/mol). Against BCL-2, although no compound outperformed the top-performing drug Venetoclax (–9.6 kcal/mol), Absinthin moderate competitive potential (–8.8 kcal/mol). This virtual screening highlights Absinthin, Rutin, Cynaroside, and Olean-12-ene-3β,16β,22α-triol as top promising phytochemicals from A. absinthium, suggesting its potential as a source of novel anticancer leads. Further in vitro and in vivo validation is warranted.

keywords: Natural Products, Cancer, Drug Discovery, Molecular Docking, Bioinformatics

21954 - Oral

In Silico Design and Codon Optimization of a LukS-PV Fusion Toxin Targeting Leukemia Cells for Expression in Escherichia coli

Saba Farabi[1 *], Bahram Golestani[1]

1- Department of Biology, Ur.C., Islamic Azad University, Urmia, Iran
*Corresponding Author: saba.farabi1378@gmail.com

Abstract

The Panton–Valentine leukocidin subunit LukS-PV from Staphylococcus aureus exhibits potent cytotoxicity against cancer cells, but its therapeutic potential is limited by insufficient tumor specificity. Here, we report the in silico design of a recombinant fusion protein selectively targeting the IgV domain of the CD33 receptor on leukemia cells. The construct comprised a CD33-derived signal peptide, a CD33-specific single-chain variable fragment (scFv), a flexible Gly_4–Cys_1 linker, the LukS-PV toxin domain, and a C-terminal His-tag. Three-dimensional structure prediction was performed using AlphaFold, followed by structural validation via Ramachandran plot and ProSA-web, and energy minimization with UCSF Chimera. The IgV domain of CD33 (receptor) and the scFv moiety (ligand) were prepared through water removal, hydrogen addition, and charge assignment. Molecular docking was conducted in AutoDock Vina, and optimal poses were selected based on binding free energy and RMSD. Interaction mapping with LigPlot+ and Chimera revealed stable CDR–IgV contacts, indicating preserved antigen recognition despite the toxin fusion. Physicochemical properties and stability were analyzed using ProtParam, while ligand-binding pockets were identified via CASTp. The codon sequence of the chimeric gene was optimized for Escherichia coli expression using JCat, reducing rare codon frequency and improving host compatibility. The final in silico model demonstrated high stability, strong target-binding affinity, and no major structural disruptions. These findings provide a computational foundation for subsequent in vitro and in vivo validation toward the development of targeted leukemia immunotoxins.

keywords: Toxin fusion; leukemia-specific ligand; bioinformatics design; codon optimization; Escherichia coli

22563 - Oral

Engineering a 3D Bioprinted Gelatin–Alginate Scaffold for Localized Delivery of Letrozole-Loaded Niosomes: Toward Effective Breast Cancer Therapy

Farzaneh Tafvizi[1 *]

1- Department of Biology, Pa.c., Islamic Azad University, Parand, Iran
*Corresponding Author: farzanehtafvizi54@gmail.com,

Abstract

Three-dimensional (3D) bioprinted scaffolds are emerging as effective platforms for tissue engineering and drug delivery, due to their ability to mimic the extracellular matrix, support cell adhesion, and allow controlled biodegradation. Gelatin–alginate (Gel–AL) hydrogels are particularly attractive because of their biocompatibility, tunable mechanical properties, and porous structure that facilitates nutrient and drug diffusion. Niosomes, vesicular carriers composed of non-ionic surfactants, offer stability, low toxicity, and sustained, targeted drug release. Letrozole, a third-generation aromatase inhibitor, is widely used in hormone-dependent breast cancer therapy, but its clinical efficacy is limited by poor solubility, low bioavailability, and dose-related systemic side effects. To address these limitations, we developed a 3D bioprinted Gel–AL scaffold incorporating letrozole-loaded niosomes (Let/Nio@Gel-AL-SC) as a localized drug delivery system.Engineered niosomes exhibited spherical morphology and high stability, while the Gel–AL scaffolds demonstrated biodegradability and prolonged drug release, with slower release under acidic conditions compared to physiological pH. Cytotoxicity assays showed significant inhibition of MCF-7 cell growth. Gene expression analysis revealed downregulation of BCL2, CCND1, MMP2, and CDK4 and upregulation of BAX and P53, accompanied by increased caspase-3/7 activity. Flow cytometry confirmed enhanced apoptosis and reduced necrosis, while ROS levels were significantly elevated in treated cells.In conclusion, embedding letrozole-loaded niosomes within a 3D Gel–AL scaffold improved therapeutic efficacy through sustained release, apoptosis induction, and reduced non-specific toxicity. This hybrid system offers a promising approach for next-generation breast cancer therapy.Keywords: Breast cancer; 3D bioprinted gelatin–alginate scaffold; Letrozole-loaded niosomes; Apoptosis; Sustained release; ROS

keywords: Breast cancer; 3D bioprinted gelatin–alginate scaffold; Letrozole-loaded niosomes; Apoptosis; Sustained release; ROS

21526 - Oral

Bioinformatic Screening of Spider and Scorpion Venom Gland Peptides: Identification of a Candidate Anticancer and Antimicrobial Peptide

Shirin Ashtari[1], Maryam Montazeri[1], Mohammad Hossein Hedayati[2], Reza Arabi Mianroodi[3 *]

1- Department of Biotechnology, Faculty of Advanced Science and Technology, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran
2- Dept. of Quality Control, Research and production complex, Pasteur Institute of Iran, Tehran, Iran
3- R&D department, Research and Production Complex, Pasteur Institute of Iran, Tehran, Iran
*Corresponding Author: r_arabi@pasteur.ac.ir, arabi552@yahoo.com

Abstract

Natural peptides derived from microbial, plant, and animal sources have attracted significant attention as therapeutic agents due to their structural diversity and specific biological activities, particularly in targeted cancer and infectious disease treatment. This study aimed to screen venom gland transcriptomes of spiders and scorpions to identify a peptide with potential anticancer and antimicrobial properties.Multiple peptides with predicted therapeutic potential were identified by using bioinformatics databases including StraPep, Venomzone, and NCBI. A top-ranking candidate was selected through predictive servers such as CellPPD, CAMPR4, and AntiCP2, and its three-dimensional structure was modeled using SwissModel, I-TASSER, and AlphaFold.The selected peptide, SCP5-a, originates from the spider Cupiennius salei. It consists of 17 amino acids, is cationic, and demonstrates high cell membrane penetrating capability. SCP5-a scored 0.71 (RF), 0.99 (SVM), and 0.74 (ANN) in the CAMPR4 server, and 0.87 (SVM) in the AntiCP2 server, indicating high antimicrobial and anticancer potential. Structural modeling confirmed that SCP5-a adopts an alpha-helical conformation, a common motif in bioactive peptides with membrane activity.These findings suggest that SCP5-a is a promising candidate for further experimental studies as an anticancer and antimicrobial agent in both in vitro and in vivo models.

keywords: Peptide ،Anticancer ،Antimicrobial ،Spider Venom

21921 - Oral

Study the expression of cisplatin resistant gene on MDA-MB-468 breast cancer cell lines before and after treatment with Gemini curcumin

Ghazaleh Nikoukar[1], Zohre Zibaei[1], Esmaeil Babaei[1 *]

1- University of Tabriz, Faculty of Natural science,Department of Animal Biology
*Corresponding Author: babaei2539@gmail.com

Abstract

Breast cancer is one of the most common malignancies in women, and triple-negative breast cancer (TNBC) is characterized by the absence of hormone receptors and HER2 expression, leading to poor prognosis and high drug resistance. The MDA-MB-468 cell line is a well-established model for studying TNBC resistance. Cisplatin, a widely used chemotherapeutic agent, has shown efficacy in several cancers; however, the emergence of resistance remains a major challenge in clinical management. In recent years, nanotechnology-based formulations, particularly those derived from natural compounds, have been widely explored for their potential to increase chemosensitivity. Gemini curcumin, a nano-formulated derivative of curcumin, exhibits promising anticancer activity through apoptosis induction and regulation of resistance-related genes. In the present study, the effect of gemini curcumin on cisplatin response in MDA-MB-468 cells was investigated. Cells were treated with cisplatin, gemini curcumin, or their combination, and cytotoxicity as well as IC50 values were determined using the MTT assay. Results revealed that the IC50 of cisplatin after 48 hours was 370 µM, which significantly decreased to 65 µM in combination with gemini curcumin. Moreover, the IC50 of gemini curcumin in combination treatment was 20 µM. Flow cytometric analysis demonstrated that the combined therapy induced G2 phase arrest. Additionally, Real-time PCR analysis showed that XRCC2 gene expression, a key player in DNA repair, was markedly reduced in the combination group compared to control. Overall, these findings suggest that gemini curcumin, in combination with cisplatin, enhances therapeutic efficacy by inhibiting DNA repair pathways and overcoming drug resistance in TNBC cells. This strategy may provide a novel basis for the development of effective therapeutic approaches in resistant breast cancer.

keywords: Breast cancer, Combination therapy, MTT, TNBC, XRCC2 gene

22167 - Oral

Greenly synthesized silver nanoparticles from Amaranthus retroflexus leaf extract: A biogenic nanoplatform with dual anticancer and drug delivery functions

Ameneh Zendegi-Shiraz[1 *]

1- Department of Chemistry, Islamic Azad University Science and Research Branch, Tehran, Iran
*Corresponding Author: amenezendegi@gmail.com

Abstract

In this study, biogenic silver nanoparticles (AgNPs) were synthesized via a green chemistry approach using the aqueous extract of Amaranthus retroflexus leaf, a medicinal plant known for its rich reservoir of antioxidants and phytochemicals. The synthesis resulted in stable spherical nanoparticles that were fully characterized by UV-Vis spectroscopy, Fourier transform infrared (FTIR) analysis, and electron microscopy. The plant compounds in the extract acted synergistically as reducing and capping agents, facilitating the formation of environmentally friendly and efficient nanoparticles. In addition to the sustainable synthesis, the silver nanoparticles showed significant biomedical potential. Their high surface area, colloidal stability, and biocompatibility make them effective nanocarriers for anticancer agents, enhancing targeted drug delivery and therapeutic efficacy. Notably, silver nanoparticles have also shown novel intrinsic anticancer activity in studies by scientists, inducing cytotoxicity in cancer cell lines through mechanisms including oxidative stress and apoptosis. These findings hold promise for A. retroflexus-mediated silver nanoparticles as a multifunctional nanoplatform in cancer nanomedicine integrating drug delivery capabilities with direct therapeutic function and highlight a novel and sustainable strategy for integrated cancer therapy.

keywords: AgNPs, Biogenic, Anticancer, Amaranthus retroflexus

22336 - Oral

Gingerol-Loaded Nanoniosomes: An Innovative Nanocarrier Strategy to Enhance Anticancer Efficacy in Gastric Cancer Cells

Elahe Aliheydari[1], Farzaneh Tafvizi[1 *], Mahtab Ahmadi[1], Parvin Khodarahmi[1]

1- Department of Biology, Pa.c., Islamic Azad University, Parand, Iran
*Corresponding Author: farzanehtafvizi54@gmail.com, farzaneh.tafvizi@iau.ac.ir

Abstract

Gastric cancer is one of the major global health challenges, and the development of innovative therapeutic strategies is essential. Gingerol, a bioactive compound extracted from Zingiber officinale, exhibits remarkable anticancer properties; however, its clinical application is limited due to poor solubility, insufficient stability, and low bioavailability.Novel drug delivery technologies, particularly nanotechnology-based systems, provide a promising approach to overcoming these limitations. Among them, niosomes—vesicular carriers composed of nonionic surfactants—are considered suitable platforms for hydrophobic compounds by enhancing solubility, improving stability, enabling controlled release, and providing targeted delivery. Their biocompatibility, ease of surface modification, and ability to protect sensitive compounds from degradation further highlight their potential in anticancer applications.In this study, gingerol-loaded niosomes were designed and evaluated. The MTT assay demonstrated that this nanoformulation induced significantly higher dose- and time-dependent cytotoxicity in gastric cancer (AGS) cells compared to free gingerol. Flow cytometry analysis revealed apoptosis induction rates of 20% and 30% after 48 and 72 hours, respectively, along with cell cycle arrest at the subG1 phase. These findings indicate that encapsulation of gingerol in niosomes not only enhances its antitumor effect but also activates apoptosis pathways and cell cycle arrest.Overall, delivery of gingerol through niosomes represents a novel and promising strategy to improve therapeutic efficacy and overcome pharmacokinetic limitations in gastric cancer. These results underscore the transformative potential of nanotechnology in cancer therapy and introduce gingerol-loaded niosomes as a next-generation platform for drug delivery.

keywords: Gastric cancer; Gingerol; Niosome; cell cycle arrest; drug delivery

21807 - Poster

Allium jesdianum as an immunomodulatory agent in cyclophosphamide-induced toxicity in mice

Kobra Shirani[1 *], Alireza Rezaie[1]

1- Department of Toxicology, Faculty of Medicine Sciences, Tarbiat Modares University, Tehran, Iran
*Corresponding Author: k.shirani@modares.ac.ir

Abstract

Abstract: Cyclophosphamide (CTX) is a potent chemotherapeutic drug for the treatment of cancer, but its use is limited due to its toxic effects on healthy human tissues. This study aimed to investigate the immunomodulatory effects of Allium jesdianum on CTX-induced toxicity in NMRI mice. A hydroalcoholic extract of the whole plant A. jesdianum (AJE) was prepared by maceration method and its total phenolic and flavonoid content was measured. Mice received AJE orally at a dose of 200 mg/kg for 14 days, either as a stand-alone treatment or in combination with intraperitoneal injection of CTX at a dose of 20 mg. The effects of the extract on body weight and relative organ weight, white blood cell (WBC) count, liver biochemical markers, serum antibody titer (hemagglutination, HA), delayed hypersensitivity reaction (DTHR), lymphocyte proliferation, cytokine production, and histopathological features of spleen and liver were evaluated. It effectively restored several parameters that were affected by CTX-induced immunosuppression, including body and organ weight, white blood cell (WBC) count, liver biochemical markers, HA, DTHR, lymphocyte proliferation capacity, and cytokine production. Notably, AJE significantly stimulated lymphocyte proliferation and enhanced cellular and humoral immunity, restored interferon (IFN)-γ and interleukin (IL)-4 levels, and reversed splenic white pulp atrophy in immunosuppressed mice. Analyses have shown that AJE exerts protective effects on the immune system of CTX-treated animals by enhancing cellular and humoral immunity, without hepatotoxicity being observed.

keywords: Allium jesdianum, Hepatotoxicity, Immunosuppression, Chemotherapeutic Drug

21257 - Poster

Computational prioritization uncovers FAP as an angiogenic hub targetable by hsa-miR-30a-5p in gastric cancer

Mehdi Roshanian Bakhsh[1 *], Abbas Zabihi[2], Fatemeh Asadi[3], Maryam Safarpour Dehkordi[4]

1- Nursing Deputy, Asadabad Faculty of Medical Sciences, Asadabad, Hamadan, Iran.
2- Department of Biology, Faculty of Basic Sciences, Islamic Azad University, Rasht, Iran.
3- Department of Genetics, Marvdasht Branch, Islamic Azad University, Marvdasht, Iran
4-Department of Biology, Faculty of Basic Sciences, Islamic Azad University, Shahrekord, Iran
*Corresponding Author: roshanian.0811@gmail.com

Abstract

Gastric cancer remains a major global health burden, with over one million new diagnoses each year. This study used integrative bioinformatics to uncover genes differentially expressed during gastric tumorigenesis and progression, and to examine regulatory microRNAs that may modulate angiogenesis-related pathways. The GSE118916 dataset was obtained from GEO to compare expression profiles between 15 gastric adenocarcinoma (GAC) tumors and 15 matched non-tumor gastric samples. Differential expression analysis was performed using GEO2R, with an adjusted P-value < 0.01 and |log2 fold change| > 2.5 set as significance thresholds. Candidate genes were prioritized using the GeneCards database, and pathway enrichment was evaluated via KEGG. Potential regulatory microRNAs targeting the top candidate were identified using miRDB. A total of 29 differentially expressed genes were detected. According to GeneCards-based prioritization and KEGG pathway mapping, FAP emerged as a key gene linked to angiogenic processes in gastric cancer. Network and pathway evidence suggest that FAP may modulate VEGF-A expression indirectly through effects on the AKT and ERK signaling cascades. In silico miRNA prediction indicated that hsa-miR-30a-5p could target FAP, implying a putative mechanism by which this miRNA may attenuate angiogenesis and tumor cell proliferation. Our bioinformatics analyses nominate FAP as a potential biomarker and regulator of angiogenesis in gastric cancer and propose hsa-miR-30a-5p as a candidate therapeutic molecule to suppress FAP-driven pro-angiogenic signaling. Experimental validation is required to confirm these computational predictions.

keywords: Fibroblast activation protein (FAP), hsa-miR-30a-5p, Gastric adenocarcinoma, Angiogenic signaling (AKT/ERK – VEGF axis), Geo

22224 - Poster

Antioxidant effect of bergenin -carrying nano-chitosan on colon tissue of mice with colon cancer

Zahra Keshtmand[1 *], Fatemeh Esmaeilkhani Barmi[1]

1- Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: zahra.keshtmand@iau.ac.ir

Abstract

Colorectal cancer (CRC) is one of the most common malignant tumors worldwide. Long-term and systematic use of chemotherapeutic drugs causes dose-dependent toxicity in target cells, tissues and organs. The aim of this study was to investigate the effect of nanochitosan containing bergenin on the activity levels of glutathione peroxidase, catalase and malondialdehyde in colon tissue of mice Balb/C with colon cancer.In this experimental study, 28 adult male Wistar rats were divided into 4 groups of 7:control, mice induced with 1 × 106 CT29 colon cells receiving nanochitosan and colon cancer model mice +nanochitosan containing bergenin (80 mg/kg). After the end of the experiment, the mice were dissected and colon tissue was extracted to measure the levels of catalase, glutathione peroxidase and malondialdehyde.Data analysis was performed in different groups using SPSS software and one-way variance statistical test, and $P<0.05$ was considered significant.The results of measuring the levels of glutathione peroxidase, catalase, and malondialdehyde in colon tissue in the cancer group compared to the control group showed a significant decrease and increase ($P<0.05$).While in the treatment group with nano chitosan carrying bergenin, a significant decrease in malondialdehyde and an increase glutathione peroxidase and catalase in colon tissue were observed ($P<0.05$).Based on the results of the present study, it is likely that the antioxidant properties of nano-chitosan carrying bergenin can significantly improve the level of activity of factors effective in the antioxidant-oxidant system in the colon tissue of cancerous mice, and nano-chitosan carrying bergenin is probably a suitable option for combating colon cancer. Keywords: Colon cancer, Oxidative stress markers, nanochitosan, bergenin, mice.

keywords: Colon cancer، Oxidative stress markers، nanochitosan، bergenin، mice

21522 - Poster

The Effect of Salicin on the Expression of Apoptotic Genes in the JIMT-1 Breast Cancer Cell Line

Zahra Bahri[1], Jafar Razeghi[1 *], Mehdi Haghi[2], Mohammadreza Tohidkia[3]

1- Department of plant, Cellular and Molecular Biology, Faculty of Natural Science, University of Tabriz, Tabriz, Iran
2- Department of animal biology, Faculty of Natural Science, University of Tabriz, Tabriz, Iran
3- Medical Education Research and Development, Pharmaceutical Microtechnology Research center, Tabriz, Iran
*Corresponding Author: jafar_razeghi@tabrizu.ac.ir

Abstract

Breast cancer is the most common cancer in women worldwide and the leading cause of cancer death in women. Current treatments for breast cancer, such as chemotherapy, hormone therapy, radiation therapy, and surgery have many side effects. Salicin is a natural β-glucoside produced in the bark of the willow (Salix) tree. Some studies on salicin have shown its anti-cancer properties. The current study has investigated the effect of salicin on the expression of apoptotic genes in breast cancer JIMT-1 cells and delineates its probable therapeutic role. JIMT-1 Cells were treated with salicin at concentrations of 70 to 200 µM for 24 and 48 hours. Untreated JIMT-1 cells served as controls, and all experiments were performed in triplicate. Cytotoxicity was assessed via MTT assay, revealing a dose- and time-dependent reduction in cell viability, with an IC50 value of approximately 148 µM after 48 hours. qRT-PCR analysis demonstrated a 3.1-fold increase in the expression of the pro-apoptotic gene BAX, and a 2.4-fold decrease in the anti-apoptotic gene BCL-2, compared to controls. Apoptosis was further confirmed by flow cytometry and fluorescence microscopy, which showed a significant increase in the percentage of apoptotic cells. These findings showed that salicin increases the expression of apoptotic genes and induces cell death in JIMT-1 breast cancer cells. Findings above thus suggest the need for further trials concerning its mechanistic aspect and benefits before declaring salicin's role as a possible therapeutic agent in breast cancer treatment.

keywords: Breast cancer; Apoptosis; Natural compounds; BAX gene; BCL-2 gene

21645 - Poster

The Effect of Lactobacillus acidophilus Extract and Resveratrol on Autophagy-Apoptosis Induced Cell Death in Colon Cancer Cells

Aras Rafiee[1 *], Hanieh Jamshidian Ghaleh Sefidi[1], Ardeshir Hesampour[1]

1- Department of biology, CT.C., Islamic Azad University, Tehran, Iran
[*]Corresponding Author: aras_rafiee@yahoo.com

Abstract

Colon cancer is a leading cause of cancer-related mortality worldwide. Probiotic Lactobacillus acidophilus partakes in the treatment of colorectal cancer via apoptosis stimulation. This study examines the impact of autophagy on the apoptotic effectiveness of L. acidophilus extract, both during autophagy stimulation (using Resveratrol) and inhibition (using Chloroquine). Lactobacillus acidophilus was cultured and its extract prepared for subsequent analysis on HT-29 colon cancer cells. To modulate autophagy, both Resveratrol and Chloroquine were used. At two time points (6 hours and 24 hours), cell viability, along with the expression of Beclin 1 and LC3-II genes, were assessed under treatment with the extract, Chloroquine, and Resveratrol. The MTT assay was used to measure cell viability, while gene expression was analyzed by Real-time PCR. Apoptosis was evaluated via flow cytometry. Data were analyzed with FlowJo and GraphPad Prism software. The MTT assay showed dose- and time-dependent pattern of cell viability. The lowest viability, at 60%, was seen in the presence of 4000 µg/mL bacterial extract, 50 µM Resveratrol, and 20 µM Chloroquine resulting in cell viability. Flow cytometry analysis revealed that the highest level of apoptosis occurred in the L.acidophilus + resveratrol group, followed by L.acidophilus alone, and then L.acidophilus + Chloroquine. These results suggest that the combination of L. acidophilus and Resveratrol enhances anti-cancer effects by promoting autophagy. Furthermore, the L.acidophilus + Resveratrol group significantly increased the expression of Beclin 1 and LC3-II in colorectal cancer cells compared to the control while Chloroquine reduced these genes' expression. The combination of resveratrol and Lactobacillus acidophilus extract has been shown to inhibit the growth of colon cancer cells and induce apoptosis by enhancing autophagy. This synergistic effect suggests that this combination could serve as a promising novel therapeutic strategy for colorectal cancer treatment

keywords: Colon cancer, Lactobacillus acidophilus, Resveratrol, Chloroquine, Autophagy

22048 - Poster

The Therapeutic Effects of Aged Garlic Extract on DMH-Induced Colorectal Cancer in Rats

Farzaneh Fazeli[1 *]

1- Department of biology, Payame Noor University (PNU)
*Corresponding Author: seacorales@yahoo.com

Abstract

This study investigates the therapeutic effects of aged garlic extract (AGE) on colorectal cancer in a DMH-induced rat model. The 30 adult male Wistar rats were divided into five groups: a healthy control group, a DMH-induced cancer group, and three treatment groups receiving AGE at doses of 100, 200, and 400 mg/kg body weight per day. The extract was administered via gavage daily from two weeks prior to the initiation of DMH injection until the end of the eight week. At the end of the study, indices of cellular proliferation (Ki-67), programmed cell death (cleaved-caspase-3), and oxidative stress (MDA, SOD, GSH) were measured. Statistical analysis was performed using ANOVA and Tukey's test, with significance defined at $p < 0.05$. Results indicated that the treatment groups receiving AGE at all doses exhibited a significant reduction in the number of precancerous lesions (ACF), the number and severity of adenomas and adenocarcinomas, as well as cellular proliferation activity ($p < 0.05$). Additionally, AGE significantly reduced oxidative stress by increasing the activity of antioxidant enzymes such as SOD and GSH and decreasing the level of MDA. These findings suggest that aged garlic extract may serve as an effective preventive and therapeutic agent in colorectal cancer. However, clinical studies are necessary to confirm these results and to further investigate its effects in humans.

keywords: Aged Garlic Extract (AGE), Colorectal Cancer, Cellular Proliferation, Oxidative Stress, Wistar rat

21643 - Poster

Dysregulation of oncogenic mir-155 and tumor suppressive mir-31 in response to fungicides and insecticides in Mus musculus

Aras Rafiee[1 *], Raana Sadat Jazayeri[1], Mahsa Dameshghian[1], Farhad Riazi-Rad[2], Zahra Shahi[3]

1- Department of biology, CT.C., Islamic Azad University, Tehran, Iran
2- Department of Immunology, Pasteur Institute of Iran, Tehran, Iran
3- Department of Biomedical Engineering, C.T.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: aras_rafiee@yahoo.com

Abstract

Several epigenetic modifications such as miRNA dysregulation may mediate environmental toxicant effects. The purpose of this study was to evaluate the potential of mir-155 and mir-31 as biomarkers of pesticide's benomyl, carbaryl, malathion and diazinon exposure. 72 BALB/c mice were classified into 6 groups, including control and five other groups that were gavaged with malathion, carbaryl, benomyl, diazinon and mixture of all pesticides for 60 days. We examined the expression of mir-155 and mir-31 in the serum of BALB/c mice by Real-Time PCR. The results showed that the expression level of oncogenic mir-155 increased in all treatment groups during two months. Mir-155 had the greatest change in expression against benomyl and carbaryl. The expression of tumor suppressive mir-31 was significantly less than control during the entire experiment but it increases (at least 1.2-fold to the most 5.3-fold) on the day 60th than the day 30th. This may be expected that potential targets of mir-31 could contain genes encoding oncogenic proteins. Our data indicate the relation between mir-155 and mir-31 dysregulation and the exposure to pesticides which may increase their carcinogenic potential. Also these miRNAs might be suitable as a biomarker for detecting toxic chemicals and have a diagnostic value.

keywords: Pesticide, Toxicity, Biomarker, MiRNA

21345 - Poster

The connection between natural compounds and cancer

Farahnaz Noraei[1 *], Sania Rostami Gilani[2]

1- Assistant Professor, Department of Biology, Faculty of Basic Sciences, Payam Noor University, Tehran, Iran
2-Medical student, Department of Medical Sciences, Faculty of Medicine, University of Medical Sciences, Tehran, Iran
*Corresponding Author: noraei@pnu.ac.ir

Abstract

This review focuses on anticancer agents and their effects on cancer prevention and treatment. Given the increasing prevalence of cancer, the identification and development of anticancer agents is of particular importance. In this research, different types of anticancer agents, their mechanisms of action, and the results of clinical studies are reviewed. A study published in the journal "Cancer Epidemiology, Biomarkers & Prevention" shows that the consumption of fresh fruits and vegetables is significantly associated with a reduced risk of colon and breast cancers. Turmeric, known for its active ingredient, curcumin, has received much attention as a spice with anticancer properties. Curcumin can help inhibit the growth of cancer cells in various types of cancer. Research has shown that some plants and natural substances can have anticancer properties. These substances include compounds such as flavonoids and antioxidants. Ultimately, by including cancer-fighting foods in our daily diet and paying attention to healthy choices, we can effectively reduce our risk of developing cancers. These foods, including vegetables, fruits, healthy fats, and rich sources of antioxidants, not only help prevent disease, but also promote overall health.

keywords: Anticancer substances, curcumin, natural substances, flavonoids, antioxidant sources

22562 - Poster

effects of atorvastatin on ARID1A gene expression and growth and migration in SW480 and HCT116 colorectal cancer cell lines

Nasrin Aghilinezhad[1], Mohammad Amin Edalatmanesh[1], Afshin Samiei[2 *], Mehran Erfani[2], Heydar Aqababa[3]

1- Department of Biology, Shi. C., Islamic Azad University, Shiraz, Iran
2- Molecular Medicine Research Center, Hormozgan Health Institute, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
3- Department of Biology, Ars. C., Islamic Azad University, Arsanjan, Iran
*Corresponding Author: afshin.samiei@gmail.com

Abstract

Epithelial-mesenchymal transition (EMT) plays a pivotal role in cancer metastasis by granting cancer cells enhanced migratory and invasive capabilities. Atorvastatin, a widely used statin, has shown potential anticancer effects, but its role in modulating ARID1A expression and metastatic behavior in colorectal cancer (CRC) remains poorly understood. This study sought to evaluate the effects of atorvastatin on ARID1A expression and the metastatic potential of HCT116 and SW480 colorectal cancer cell lines. We assessed the expression of ARID1A using quantitative real-time PCR. Wound healing assays and colony formation assays were conducted to evaluate the impact of atorvastatin on cell migration and clonogenicity. Our results demonstrated that atorvastatin significantly upregulated ARID1A expression in both cell lines. Furthermore, atorvastatin treatment markedly inhibited wound closure and reduced colony formation, suggesting its potential to suppress metastatic behavior. These findings underscore the therapeutic potential of atorvastatin in targeting ARID1A and metastasis in colorectal cancer, providing a foundation for further preclinical and clinical investigations.

keywords: ARID1A. Atorvastatin. Colorectal cancer (CRC). Epithelial-mesenchymal transition (EMT)

21363 - Poster

Evaluation of the Effect of Zataria multiflora Boiss. Essential Oil on Bax Gene Expression and Mitochondrial Apoptosis Induction in Human Breast Cancer Cell Line (MCF-7)

Hussein Eisazadeh[1 *]

1- Department of Agriculture, Afagh University, Urmia, Iran
*Corresponding Author: hoseinisazadeh@yahoo.com

Abstract

Zataria multiflora Boiss. essential oil, rich in phenolic compounds such as carvacrol and thymol, has been recognized as a natural product with potential anticancer activity (Hosseinzadeh et al., 2017; Salehi et al., 2018). Previous studies have demonstrated its ability to activate apoptotic pathways by modulating key gene expression in cancer cells (Shafiee et al., 2013; Azizi et al., 2016). The present study aimed to investigate the effects of Z. multiflora essential oil on the expression of the pro-apoptotic gene Bax in the human breast cancer cell line MCF-7.The essential oil was obtained by hydrodistillation, and its composition was confirmed using gas chromatography–mass spectrometry (GC-MS). MCF-7 cells were treated with different concentrations of the essential oil (25, 50, and 100 µg/mL) for 24 hours, and Real-time PCR was used to evaluate Bax expression.Results indicated that Z. multiflora essential oil significantly upregulated Bax expression in MCF-7 cells, showing approximately a 1.7-fold increase at 50 µg/mL and a 2.3-fold increase at 100 µg/mL compared with untreated controls ($p < 0.05$). These changes suggest activation of the mitochondria-dependent apoptotic pathway and induction of programmed cell death in breast cancer cells.The findings are consistent with previous reports on the pro-apoptotic potential of Z. multiflora and its possible synergistic role in cancer therapy (Hashemi et al., 2015). Overall, this study highlights the potential of Z. multiflora essential oil as a natural adjuvant in anticancer strategies. Further animal studies and detailed investigations of its active compounds are recommended to validate these results.

keywords: “natural anticancer compounds”, “apoptosis-related genes”, “breast cancer”

22270 - Poster

Evaluation of Streptomyces thinghirensis Extract as a Potential Anticancer Agent Against Breast Cancer Cell Lines

Ensieh Salehghamari[2 *], Ali Hosseinzadeh[1], Amirhossein Abedzadeh[1], Mostafa Meshkatian[1], Zahra Saatchi[1]

1- Department of Cell and Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
2- Microbiology Lab, Department of Cell and Molecular Sciences, Faculty of Biological Sciences, Kosar University, Bojnord, Iran
*Corresponding Author: esaleh@kub.ac.ir

Abstract

The genus Streptomyces constitutes a prolific reservoir of bioactive secondary metabolites with demonstrated antiproliferative efficacy, yet Streptomyces thinghirensis remains largely uncharacterized despite its distinctive biosynthetic capabilities. This investigation assessed the differential cytotoxic activity of S. thinghirensis extract against breast adenocarcinoma cell lines relative to non-malignant mammary epithelial cells. Bacterial cultures were grown under optimized conditions, and bioactive compounds were extracted using ethyl acetate solvent extraction method. Three distinct cell lines were employed in this investigation: MDA-MB-231 (triple-negative breast cancer), T47D (luminal breast cancer), and MCF10A (normal breast epithelial cells). Cell viability was assessed using the MTT colorimetric assay across multiple temporal intervals (48, 72, and 96 hours) with S. thinghirensis extract concentrations spanning 6.25-900 µg/ml. Cell viability was measured as a percentage compared to untreated cells.Cell line sensitivity analysis revealed that MDA-MB-231 exhibited the lowest IC_{50} values, with concentrations decreasing from 281 µg/ml at 48h to approximately 114 µg/ml at 96h and IC_{50} = 218 µg/ml at 72h. T47D cells showed intermediate resistance with IC_{50} value of 387 µg/ml at 72h. Normal MCF10A cells demonstrated the highest resistance across all time points, maintaining IC_{50} = 896 µg/ml at 72h, indicating minimal sensitivity to treatment.S. thinghirensis extract demonstrates preferential cytotoxicity toward breast cancer cell lines, particularly MDA-MB-231, with enhanced selectivity over time. The differential sensitivity patterns between malignant and normal cells suggest potential therapeutic selectivity, requiring further mechanistic investigation and optimization for anticancer drug development.

keywords: Antiproliferative activity; Natural products; IC50 determination; Cell viability assay; cytotoxicity

22642 - Poster

Investigating the effect of Salix acmophylla on viability of MCF-7 cell line by Trypan blue assay

Sima Nasri[1 *], Fatemeh Shahi Sadrabadi[1]

1- Department of biology, Payame Noor University, Tehran, Iran
*Corresponding Author: nasri@pnu.ac.ir

Abstract

Breast cancer is the most common female cancer. Due to the disease's aggressiveness, rapid growth, and heterogeneity, it is crucial to investigate different therapeutic approaches for treatment. According to the World Health Organization (WHO), Plant-based therapeutics continue to be utilized as safe/non-toxic complementary or alternative treatments for cancer. The species of genus Salix, commonly known as Willow, represent a valuable source of biologically active compounds. The aim of this study was to investigate the effect of S. acmophylla extract on the viability of MCF-7 breast cancer cells by Trypan blue method. MCF-7 cells were treated with different concentrations of plant extract (0, 20, 40, 80, 160 µg/ml) at specific time intervals of 24, 48, and 72 hours. Our results showed that the viability of MCF-7 cells was reduced by S. acmophylla treatment in a time- and concentration-dependent manner ($P<0.001$). The highest cytotoxic effect of this plant's extract on MCF-7 cells was observed at a concentration of 160 µg/ml. It seems that S. acmophylla is effective in breast cancer therapy; probably, it causes to cell death by apoptosis induction.

keywords: Salix acmophylla, MCF-7 cells, Breast cancer

21635 - Poster

Assessment of the Effects of Zataria multiflora Boiss. Essential Oil on Bcl-2 Gene Expression and Modulation of Bax/Bcl-2 Ratio in Human Breast Cancer Cell Line (MCF-7)

Hussein Eisazadeh[1 *]

1- Department of Agriculture, Afagh University, Urmia, Iran
*Corresponding Author: hoseinisazadeh@yaoo.com

Abstract

Zataria multiflora Boiss. essential oil, rich in phenolic compounds such as carvacrol and thymol, has been recognized as a natural agent with potential anticancer properties (Hosseinzadeh et al., 2017; Salehi et al., 2018). Previous studies have demonstrated its ability to modulate apoptotic signaling and induce cell death in various carcinoma cell lines (Shafiee et al., 2013; Azizi et al., 2016). The present study aimed to evaluate the effect of Z. multiflora essential oil on Bax gene expression, a key pro-apoptotic regulator of the mitochondrial apoptosis pathway, in the human breast cancer cell line MCF-7.The essential oil was extracted via hydrodistillation, and its composition was confirmed by gas chromatography–mass spectrometry (GC-MS). MCF-7 cells were treated with different concentrations of essential oil (25, 50, and 100 µg/mL) for 24 hours. Gene expression analysis of Bax was performed using Real-time PCR.The results showed that Z. multiflora essential oil significantly upregulated Bax expression in MCF-7 cells, with an approximate 1.7-fold increase at 50 µg/mL and a 2.3-fold increase at 100 µg/mL compared with untreated controls ($p < 0.05$). This upregulation indicates the activation of the mitochondria-mediated apoptotic pathway, supporting the role of Z. multiflora essential oil in promoting programmed cell death.Overall, the findings suggest that Z. multiflora essential oil, through Bax induction, could serve as a natural source for developing complementary or alternative anticancer strategies. Further in vivo studies are warranted to validate these effects (Hashemi et al., 2015).

keywords: "natural anticancer compounds", "apoptosis-related genes", "breast cancer"

21485 - Poster

Cytotoxic Effects of Lavandula officinalis L. extract on ovarian cancer Cell Line (A2780)

Cobra Tofighi[1 *], Zahra Eshaghi[1]

1- Department of Biological Sciences, Danesh Alborz University, Abeyek, Iran
*Corresponding Author: tofighi86gmail.com

Abstract

Ovarian cancer is one of the most common types of cancer among women worldwide. In recent years, due to the undesirable side effects of chemotherapy, the use of natural compounds as complementary therapies has garnered attention. The purpose of this study was to investigate the cytotoxic effects of Lavandula officinalis extract on human ovarian cancer cell lines. In this study, A2780 ovarian cancer cell lines were treated with various concentrations (10, 30, and 90 µg/mL) of ethanolic Lavandula plant extract for 24, 48, and 72 hours. Cell viability was assessed using the MTT assay. The results were statistically analyzed using one-way ANOVA with SPSS software. The findings revealed that different concentrations of Lavandula extract exhibited dose- and time-dependent cytotoxic effects on ovarian cancer cells. The highest percentage of growth inhibition was observed at a concentration of 90 µg/mL after 72 hours, which was statistically significant ($P \leq 0.05$). Therefore, due to its phytochemical compounds with antioxidant properties such as polyphenols, terpenoids, tannins, coumarins, and flavonoids, lavender extract possesses anticancer potential in eliminating ovarian cancer cells and could be considered for complementary treatment of this disease.

keywords: Ovarian cancer, MTT, Lavender, cytotoxic effect

22183 - Poster

Study of the anti-inflammatory effect of the essential oil of Morkhosh petals on small mice

Ameneh Jamshidi[1 *], Fereshteh Shamohammadi[1], Fatemeh Khosh-eghbal Qorabaei[2]

1- Department of Biology, Payam Noor University, P.O. Box 3697-19395, Tehran, Iran
2- Department of Natural Resources Research, Agricultural and Natural Resources Research Center of Hormozgan Province, Agricultural Research, Education and Extension Organization (AREEO), Bandar Abbas, Iran
*Corresponding Author: ameneh.jamshidi@gmail.com

Abstract

Abstract: Inflammation is a natural defense response of the body and a common complication of many diseases that can lead to infection, weakening of the immune system, and delay in the healing process. Morkhosh(Zhumeria majdae) is an important, exclusive, and native medicinal species of Hormozgan province that has been used by the natives of the province for the treatment of some diseases since ancient times. This study was conducted to investigate the anti-inflammatory effect of Morkhosh essential oil petals on laboratory mice. Morkhosh flowers were collected in June from the Genu mountain area, located 100 km from Bandar Abbas, and dried away from sunlight. The petals were extracted with a Clevenger apparatus, and the anti-inflammatory effect of the essential oil was evaluated using the xylene test method. The essential oil was injected intraperitoneally into laboratory mice at three doses of 0.8, 1.4, and 2 µg/kg body weight and dexamethasone. According to the results of this study, a dose of 0.8 mg/kg, similar to dexamethasone, significantly reduced inflammation compared to the control group. The anti-inflammatory reducing effect of two higher doses (1.4 and 2 mg/kg) was not statistically significant. Also, injection of pure essential oil (without dilution) resulted in the death of mice, indicating the possibility of toxicity at high concentrations of essential oil.

keywords: Inflammation ،Small mouse ،essential oil ،Zhumeria majdae

22307 - Poster

Evaluation of the Anticancer Effect of the Chimeric Peptide MeICT-MEL, Derived from Melittin and MeICT Toxins, on Breast Cancer Cells

Fatemeh Banaei[1], Hoda Ayat[1 *]

1- Department of Genetics, Faculty of Basic Sciences, Shahrekord University, Shahrekord, Iran
*Corresponding Author: hoda.ayat@gmail.com

Abstract

Various peptide toxins have been isolated from animal venoms that exhibit anticancer properties. The anticancer activity of melittin, a peptide from bee venom, has been demonstrated in several studies due to its ability to disrupt the membrane of malignant cells. Similarly, the anticancer effect of chlorotoxin, a peptide from scorpion venom, has also been confirmed. This study aimed to investigate the anticancer effect of a chimeric peptide composed of melittin and a chlorotoxin-like peptide, termed MeICT-MEL. The recombinant MeICT-MEL peptide was expressed and purified in E. coli. Human breast cancer cells (MCF-7) were treated with different concentrations of MeICT-MEL. The MTT assay evaluated the cytotoxic and anticancer effects. A scratch assay assessed cell migration and metastatic potential. Findings revealed that the recombinant chimeric peptide significantly reduced the viability of breast cancer cells in a concentration-dependent manner. Moreover, the percentage of apoptotic cells in treated groups showed a remarkable increase compared with the control. Additionally, the scratch assay demonstrated that peptide-treated plates exhibited substantially reduced cell migration, indicating a diminished metastatic potential. Collectively, these results suggest that the recombinant MeICT-MEL peptide possesses considerable anticancer potential against breast cancer cells and may serve as a promising candidate for novel anticancer therapeutics.

keywords: Breast cancer, Apoptosis, Melittin, Chimeric peptide

22262 - Poster

Investigating the effect of Stachys pilifera Benth. extract on HeLa cells using the Trypan Blue method

Mitra Mirzaei[1], Somayeh Farahmand[1], Sima Nasri[1 *], Majid Ghorbani Nahooji[2]

1- Biology Department, Payame Noor University, Tehran, Iran
2- Medicinal Plants Research Center, Institute of Medicinal Plants, ACECR, Karaj, Iran
*Corresponding Author: s_nasri1@pnu.ac.ir

Abstract

Cervical cancer is the fourth most common cancer among women globally. Chemotherapy is a major option with high toxicity and severe side effects in cancer treatment. Medicinal plants and natural compounds with a selective effect on tumour cells cause less damage to normal cells. Recent studies have revealed that the essential oil and extracts of Stachys pilifera, which belongs to the mint family and is endemic to Iran, reduce survival and induce apoptosis in K562, HT29, MCF-7, HL-60 cancer cell lines. Although the effect of this plant on cervical cancer cells has not yet been investigated. In the present study, the plant was collected from Isfahan province, shade-dried, ground, and extracted by percolation and hydroalcoholic solvent. Then, 0.3×10^6 cells were cultured in each well of a 6-well plate. Afterward, the cells were treated with different concentrations of plant extract (0, 16.o6, 64.25, 257, 1028 µg/mL) for 24, 48, and 72 hours. After staining with Trypan Blue, the survival percentage was calculated. The results showed that cell viability decreased in a dose and time dependent manner and at the mentioned concentrations, it was calculated as 100% ,88.4%,70%,10.55%,7% respectively ($P<0.05$). These findings indicate that the Stachys pilifera extract can be considered as a valuable source for discovering potential anticancer compounds. However, further in vitro and in vivo studies are necessary to understand the molecular mechanisms and confirm the clinical significance of this plant.

keywords: Stachys pilifera; viability percentage; Trypan Blue; HeLa cells

22255 - Poster

The effect of Rosa foetida herrm. extract and its green synthesized nanoparticle on bax and bcl2 gene expression in HT29 colon cancer cell line

Hosna Soori[1 *], Soudabe Dinarvand[1]

1- Department of Biology, CT.C, Islamic Azad University, Tehran, Iran
*Corresponding Author: hosna.soori@gmail.com

Abstract

Colorectal cancer is the third most common cancer worldwide, and its rising incidence combined with limitations of current therapies highlights the urgent need for novel agents with greater efficacy and fewer side effects. In this study, we investigated the anticancer potential of the aqueous extract of Rosa foetida herrm. (yellow rose) and its green-synthesized silver nanoparticles (AgNPs) against the HT-29 colorectal cancer cell line, with particular focus on apoptotic pathways involving Bax and Bcl-2 gene expression. AgNPs were synthesized using the aqueous petal extract as a natural reducing and stabilizing agent and were characterized by UV-Vis, FTIR, XRD, and SEM. The synthesized nanoparticles were predominantly spherical, 38–41 nm in diameter, with an fcc crystalline structure. Cytotoxicity was assessed by MTT assay and gene expression by Real-Time PCR. AgNPs demonstrated markedly stronger cytotoxic activity than the crude extract, with IC_{50} values of ~18.5 µg/mL and >100 µg/mL, respectively. In contrast, in normal HEK-293 cells, viability remained above 50% even at the highest tested concentration, indicating selective toxicity of AgNPs toward cancer cells. At the molecular level, treatment with AgNPs induced a 4.5-fold upregulation of the pro-apoptotic Bax gene ($p<0.001$) and a 50% reduction in anti-apoptotic Bcl-2, while the extract caused no significant changes. These findings indicate that green-synthesized AgNPs from Rosa foetida trigger mitochondrial apoptosis through modulation of the Bax/Bcl-2 ratio. Overall, these eco-friendly nanoparticles exhibit high potential as an anticancer agent against colorectal cancer, and further in vivo and clinical studies are essential to confirm their efficacy and safety.

keywords: anticancer, apoptosis, nanoparticles

22723 - Poster

"Neuroprotective Effects of Betanin Through Ferroptosis Inhibition in a Cellular Model of Parkinson's Disease"

Zakiyeh Tashakkor[1 *]

1- Department of Plant and Animal Biology, Faculty of Biological Sciences and Biotechnology, University of Isfahan, Isfahan, Iran
*Corresponding Author: zakiyeh_tashakkor@yahoo.com

Abstract

Parkinson's disease (PD) is the second most common neurodegenerative disorder after Alzheimer's, featuring a gradual reduction in dopaminergic cells within the substantia nigra and both motor and non-motor symptoms. One key factor in PD progression involves ferroptosis, a form of iron-dependent cell death resulting from iron accumulation, glutathione depletion, GPX4 inactivation, and high levels of lipid peroxidation. These approaches have an opportunity to provide effective interventions in the prevention of neuronal loss and delay the disease progression by targeting this pathway.Iron metabolism control, owing to its antioxidant and anti-inflammatory activities, as well as the regulation of ferroptosis, can be bioactive in plants. Betanin, a natural pigment that has a strong antioxidant activity and is a naturally occurring chemical, has become a potential neuroprotective compound. This study investigated the effect of betanin on ferroptosis in a cellular model of Parkinson's disease.The PD model was established by exposing dopaminergic cells to 6-hydroxydopamine (6-OHDA) at concentrations ranging from 25 to 200 µM. The results were determined by the MTT assay, which assessed cell viability and survival under different doses of betanin (10-200 µM). Measures were also made on oxidative stress markers, such as the production of reactive oxygen species (ROS) and glutathione (GSH) levels. The findings were 100 µM 6-OHDA as the best dose to cause neurotoxicity. Before treatment, the addition of 100 µM betanin resulted in a substantial increase in the neuronal survival rates. ROS levels were assessed using a colorimetric assay at wavelengths of 485/525 nm, and the GSH content was quantified at 405 nm. The results identified 100 µM 6-OHDA as the optimal dose for inducing neurotoxicity. low levels of ROS and GSH content as compared to the untreated PD model.The results indicate that betanin has a significant protective effect on neuronal damage associated with 6-OHDA induced by alleviating oxidative stress and transmitting ferroptosis-related indicators. Although betanin is showing therapeutic efficacy as a natural agent in the management of PD, issues of low bioavailability and limited blood-brain barrier permeability, and the disparity between preclinical and clinical data persist. The limitations can be overcome with advanced drug delivery systems and nanocarriers, which could be the way to clinical translation.

keywords: Cell death, Ferroptosis, Betanin, Parkinson's disease, Antioxidant

22119 - Poster

Evaluation of Metformin and Doxorubicin as Therapeutic Agents in a Murine Model of Skin Cancer

Farzaneh Fazeli[1 *]

1- Department of biology, Payame Noor University (PNU)
*Corresponding Author: seacorales@yahoo.com

Abstract

Skin cancers are among the most prevalent malignancies worldwide, affecting millions of individuals annually. These cancers include melanoma and non-melanoma types; melanomas are considered the most aggressive, while non-melanoma skin cancers generally exhibit a more benign clinical course. Despite significant advances in oncologic therapies, challenges such as drug toxicity, frequent recurrence, and high treatment costs remain major obstacles in disease management. Drug repurposing has emerged as a promising and cost-effective complementary approach. This study aimed to evaluate the therapeutic effects of metformin and doxorubicin on tumor growth in a murine model of skin cancer. In this experimental study, thirty male BALB/c mice were randomly assigned to three groups: control, doxorubicin-treated (2 mg/kg, intraperitoneally, twice weekly), and metformin-treated (200 mg/kg, orally, daily). Tumors were induced by subcutaneous injection of 1×10^6 B16-F10 melanoma cells. Tumor volume was measured over 28 days using digital calipers and calculated according to the standard formula. Data were analyzed using one-way ANOVA, with $p<0.05$ considered statistically significant. Mean tumor volumes were 1650 ± 130 mm^3 in the control group, 840 ± 95 mm^3 in the doxorubicin group, and 960 ± 105 mm^3 in the metformin group ($p<0.01$). Mean survival was significantly higher in the doxorubicin (36 ± 3 days) and metformin (34 ± 2 days) groups compared with the control group (25 ± 2 days). These findings indicate that metformin and doxorubicin effectively reduce tumor growth and improve survival in a murine model of skin cancer, highlighting their potential as complementary therapeutic options alongside conventional treatments. Further preclinical and clinical studies are recommended to confirm these results.

keywords: Skin cancer, melanoma, metformin, doxorubicin, mouse BALB/c

22040 - Poster

Investigating the Effects of Sea Anemone (Stichodactyla haddoni) Toxin on Potassium and Sodium Channel Gene Expression and Cell Death Mechanisms in A549 Cells

Media Abdollahian[1], Mohammad Nabiuni[1], Latifeh Karimzadeh Bardi[2 *]

1- Department of Cell and Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
2- Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: latifehkarimzadeh@khu.ac.ir

Abstract

Chemotherapy is one of the primary treatment modalities for lung cancer; however, its toxicity and undesirable side effects on non-target tissues remain major limitations for clinical use. Consequently, recent pharmacological research has focused on identifying natural compounds with fewer side effects. In this study, the cytotoxic and molecular effects of the sea anemone Stichodactyla haddoni methanolic extract were evaluated on the A549 human lung cancer cell line. The crude extract was prepared, lyophilized, and tested for its biological activity. Cell viability was assessed at 24, 48, and 72 hours using the MTT assay. Cell cycle distribution and intracellular ROS levels were analyzed by flow cytometry, while alterations in the expression of KCNC4 and SCN9A were examined by RT-PCR. The IC50 values were determined as 50, 67, and 70 µg/ml at the respective time points. Treatment with the extract resulted in a significant reduction in the S phase population, an increase in ROS generation, and a downregulation of KCNC4 and SCN9A expression. Data were presented as mean±SD and analyzed using One-way ANOVA and t-test, with significance considered at *P<0.05, **P<0.01, and ***P<0.001. These findings indicate that S. haddoni extract induces A549 cell death through cell cycle arrest, oxidative stress, and suppression of ion channel genes. Further studies are recommended to isolate the active compounds of the toxin and elucidate their mechanisms of action.

keywords: Lung cancer, sea anemone extract, cell cycle, gene expression, oxidative stress

21292 - Poster

Investigation of the cytotoxic effects of methanolic and hexanic extracts of Ornithogalum brachystachys on the HT-29 cell line in colon cancer

Mahdi Il Saadatmand[1], Maryam Khoshsokhan Mozaffar[2 *]

1- MSc Student in Genetics, Department of Biology, Qo.C. Islamic Azad University, Qom, Iran
2- Department of Biology, Qo.C. Islamic Azad University, Qom, Iran
*Corresponding Author: ma.km1357@iau.ac.ir

Abstract

Colorectal cancer is one of the most common and deadly cancers worldwide. It begins as a polyp in the colon or rectum and is considered the third most prevalent cancer and the second leading cause of cancer-related death. Various factors contribute to its development, including age, genetics, unhealthy diet, physical inactivity, and obesity. Despite advances in treatment, conventional methods such as surgery, chemotherapy, and radiotherapy have significant limitations and side effects. Therefore, the use of medicinal plants with bioactive anticancer compounds and fewer side effects has gained importance.Medicinal plants contain a wide range of compounds such as flavonoids, polyphenols, saponins, alkaloids, and plant acids, which can reduce cancer cell proliferation by inhibiting the cell cycle and inducing apoptosis. Moreover, plant extracts may serve as effective adjuvants to chemotherapy.Ornithogalum brachystachys, a species belonging to the Asparagaceae family, is native to the Mediterranean region, the Middle East, and Iran. Its extract contains antioxidant phenolic compounds such as cosmosiin and cinnamic acid. In this study, samples of the plant were collected from the Mishou Mountains in Shabestar County.The extraction of bioactive compounds was carried out using different solvents, including methanol (a polar solvent) and hexane (a non-polar solvent), each extracting different sets of compounds. The HT-29 cell line was used as a widely accepted in vitro model for studying colon cancer and the effects of bioactive compounds.To evaluate the anticancer effects of methanolic and hexanic extracts of the plant on HT-29 cells, the MTT assay was conducted under low-light conditions with various extract concentrations (25, 50, 100, and 200 µg/mL) over 24, 48, and 72 hours. Cell viability was measured by optical absorbance at 570 nm after reaction with MTT and dissolution of formazan crystals in DMSO.MTT assay results revealed that HT-29 cells responded to the hexanic and methanolic extracts, as well as the drug 5-FU, in a complex, dose- and time-dependent manner. At 24 hours, high extract doses unexpectedly increased cell viability, possibly due to metabolic stimulation or defensive responses to cellular stress. At 48 hours, some moderate extract concentrations also enhanced viability, while lower doses showed mild inhibitory effects. Ultimately, at 72 hours, the most significant reduction in viability was observed with the methanolic extract and 5-FU

keywords: Colorectal cancer, HT-29 cell line, hexanic and methanolic extracts, Ornithogalum brachystachys, MTT.

22256 - Poster

Investigation of the Anticancer Effects of Smart Nanosystems Containing miR-143 on the Expression of the Anti-Apoptotic ATR Gene in Osteosarcoma Cell Lines: A Novel Step Towards Targeted Therapy for Metastatic Cancers

Fatemeh Barzegari Firouzabadi[1 *]

1- Department of Biology, Payame Noor University, Tehran, Iran
*Corresponding Author: f.barzegari@pnu.ac.ir

Abstract

The aim of this study was to investigate the role of miR-143 in regulating the expression of the anti-apoptotic ATR gene and to evaluate its cytotoxic effects on osteosarcoma cell lines (SaOs-2) and human primary bone cells (Hum63).miR-143 was introduced into the cells using Lipofectamine 2000 as a carrier. Cell viability was measured after 48 hours using the MTT assay, and changes in ATR gene expression were quantified by Real-Time PCR.Lipofectamine 2000 alone showed no significant toxicity to either cell line. SaOs-2 cells were more sensitive to treatment with miR-143 and the Lipo/miR-143 complex than human primary bone cells (Hum63), with the greatest reduction in viability observed in the Lipo/miR-143 complex-treated SaOs-2 cells ($p < 0.05$). Furthermore, miR-143 delivery mediated by Lipofectamine 2000 resulted in a significantly greater increase in ATR expression compared to direct miR-143 application ($p < 0.05$).The Lipofectamine 2000 carrier can enhance the efficiency of miR-143 entry into cells. Given the increased ATR expression and cytotoxic effect on cancer cells, miR-143 can be considered a potential therapeutic strategy in the management of osteosarcoma.

keywords: Lipofectamine 2000, ATR, Osteosarcoma, miR-143

21376 - Poster

Investigation of cytotoxic and nuclear morphological changes induced by a Gold(III)-Hydantoin complex in human Gastric Cancer AGS cell-line

Faranak Shiassi Arani[1], Fattah Otoodehnejadnematalahi[1], Mohamad Nabiuni[2 *], Shohreh . Zare Karizi[3]

1- Department of Biology. SR.C., Islamic Azad University, Tehran, Iran.
2- Department of Cell and Molecular Biology, Faculty of Biological Sciences, Kharazmi university, Tehran, Iran
3- Department of Biology, Varamin Pishva Branch, Islamic Azad University, Pishva, Varamin, Iran.
*Corresponding Author: nabiuni@khu.ac.ir

Abstract

Gastric cancer is a heterogeneous and multifactorial disease, the fourth leading cause of death in the world. One of the most common chemotherapy methods is the use of metal compounds. Compounds containing gold elements have anticancer properties. Hydantoins are compounds with biological properties and their combination with gold elements gives the pharmacological properties of this element. The aim of this study is to investigate the effect of gold (III)-hydantoin complex on cell viability in AGS cell line. In the present study, AGS cells were cultured in DMEM medium containing 10% FBS, at 37°C and 5% CO2. In order to examine cell viability by MTT method, cells were treated with 70µg/ml, 100µg/ml, 125µg/ml, 150µg/ml, 175µg/ml, 200µg/ml and 225µg/ml of the gold complex for 18 and 48 hours. The morphological changes of the cell nuclei after culturing them at 60% confluence and treatment with doses of 3µg/ml and 5µg/ml were examined after 24 hours by DAPI Staining method. The data were analyzed with the help of Graphpad Prism10 software and the images were analyzed with the help of Image J program. The results of MTT test showed that the gold complex is cytotoxic on AGS cells for 18 and 48 hours. Also, the fluorescent microscope images showed certain morphological changes including chromatin condensation in the experimental groups compared to the control group. The findings showed that the gold (III)-Hydantoin complex has cytotoxic effects on the AGS cell line and further cellular and molecular studies are needed to investigate this complex function mechanism.

keywords: Gastric Cancer, AGS cell-line, Gold(III) Complex, Hydantoin

21534 - Poster

Investigating the Effect of Trans-Anethole on TNF-α Expression in the Hippocampus of Male Rats Exposed to Acrylamide

Mahsa Fathi[1], Zahra Deilami Khiabani[2 *]

1- .Msc of Genetics, Department of Biology, Islamic Azad University, Zanjan Branch, Zanjan,Iran.
2- Assistant professor of Biology Department, Islamic Azad University, Zanjan Branch, Zanjan, Iran
*Corresponding Author: deilamiz@yahoo.com

Abstract

Abstract: Acrylamide is a carcinogenic compound formed when carbohydrates are heated. Studies indicate that acrylamide increases the production of inflammatory cytokines such as TNF-α. Abnormal levels of TNF-α in human serum are associated with various infectious and inflammatory diseases.On the other hand, trans-anethole, the main component of certain medicinal plants, including clove, cinnamon, and thyme, plays a significant role in suppressing inflammation. The objective of this study was to investigate the effect of trans-anethole (80 mg/kg) on TNF-α expression in the hippocampus of male rats induced with acrylamide (25 mg/kg).After grouping the rats, the trans-anethole treatment was administered to those exposed to acrylamide. The rats' hippocampi were extracted following anesthesia. RNA extraction and cDNA synthesis were performed using a specialized kit, and the expression of the target gene was analyzed using specific primers and real-time PCR.The results of this study revealed a 1.3-fold reduction in TNF-α gene expression in the acrylamide + trans-anethole-treated group compared to the acrylamide-only group, indicating the positive effect of trans-anethole in downregulating key inflammatory cytokines such as TNF-α.Based on the findings and confirming inflammation in the hippocampal tissue of male rats, trans-anethole exerted an anti-inflammatory effect, leading to decreased expression of the pro-inflammatory TNF-α gene. Therefore, in line with similar research evidence, trans-anethole possesses anti-inflammatory properties.

keywords: Hippocampus, TNF-α, Acrylamide, Trans-anethole, Inflammation

22355 - Poster

Investigation into How Glycyrrhizic Acid Affects PBMC Cell Induction of Apoptosis and Investigation on the Impact of Glycyrrhizic Acid on Interleukin 6 and 10 mRNA Expression Levels in PBMC Cells

Ayda Asadi[1 *], Mehdi Haghi[1], Jafar Razeghi [1]

1- Department of Cellular and Molecular Biology, Faculty of Natural Sciences, University of Tabriz, Iran
*Corresponding Author: ayda71518@gmail.com

Abstract

Glycyrrhizin acid (GA) is a significant saponin in licorice (Glycyrrhiza glabra). It possesses anti-inflammatory and immune-modulating properties. In this research, the impact of GA on apoptosis and the levels of interleukin-6 (IL-6) and interleukin-10 (IL-10) in human peripheral blood mononuclear cells (PBMCs) was investigated. The cells were subjected to different concentrations of GA (0, 50, 100, and 200 µg/ml) prior to lipopolysaccharide (LPS) stimulation to induce inflammation. We determined apoptosis of the cells by flow cytometry using Annexin V/PI staining. We measured mRNA levels of IL-6 and IL-10 by quantitative real-time PCR. Treatment with GA was found to downregulate LPS-induced apoptosis of PBMCs considerably in a dose-dependent manner. GA also decreased expression of IL-6 but increased expression of IL-10. These findings suggest that glycyrrhizic acid may possess protective and anti-inflammatory effects by modulating apoptosis and by modulating the strength of pro-inflammatory and anti-inflammatory cytokines.Keywords: Glycyrrhizic acid, Apoptosis, Interleukin-6, Interleukin-10, Peripheral Blood Mononuclear Cells

keywords: Glycyrrhizic acid, Apoptosis, Interleukin-6, Interleukin-10, Peripheral Blood Mononuclear Cells

21781 - Poster

Study of the Antioxidant and Anticancer Properties of Mamiran Kabir Plant on Colorectal Cancer Cell Lines

Sayeh Jafari[1 *], Shabnam Arvin[2]

1- Associate Professor of Plant Developmental Biology, Faculty of Biological Sciences, Islamic Azad University, North Tehran Branch,
2- PhD Student in Molecular Cellular Biology, Faculty of Biological Sciences, Islamic Azad University, North Tehran Branch,
*Corresponding Author: jafarisayeh@gmail.com

Abstract

Colorectal cancer is the third most common and the second deadliest cancer, often occurring in individuals over 50 years of age due to both environmental and genetic factors. It typically arises from colon polyps that gradually develop into cancer. Identifying effective methods to combat this cancer is crucial. Mamiran Kabirplant, belonging to the poppy family and containing bioactive alkaloids, has demonstrated anticancer properties in various cancers and is utilized in traditional medicine. Methanolic extracts of the leaves, stems, and roots of Mamiran Kabir were prepared at different concentrations to evaluate their antioxidant and anticancer effects on colorectal cancer cells. The MTT assay was employed to measure cell viability and cytotoxicity. The study was conducted with 8 different concentrations and three repetitions at 24, 48, and 72 hours. Results showed that as the extract concentration increased, cell viability decreased and cytotoxicity increased. Antioxidant activity was also assessed using the DPPH solution and measuring absorbance at 517 nm. The results revealed that extracts from both the aerial and underground parts of Mamiran Kabir significantly reduced the growth and proliferation of colorectal cancer cells. Higher concentrations of the extract led to a more pronounced reduction in cancer cell growth and increased cytotoxicity. This plant demonstrated significant antioxidant activity, and its extracts exhibited strong anticancer potential against colorectal cancer. By reducing cancer cell viability and exhibiting antioxidant properties, this plant may serve as a basis for further research to develop natural treatments for colorectal cancer.

keywords: Mamiran Kabir, colorectal cancer, antioxidant activity, cancer cells, anticancer properties.

21699 - Poster

Investigation of the amount of culture elements on the production of phycocyanin pigment in the blue-green algae Spirulina platensis

Samaneh Moghadamzadegan[1], Behrouz Zarei Darki[2,4*], Abdolamir Allameh[3], Sarvenaz Bigham Soostani[4]

1-Department of Marine Biology, Department of Marine Animals, Faculty of Marine Sciences, Tarbiat Modares University, Iran
2-Department of Marine Biology, Department of Marine Biotechnology, Faculty of Science, Tarbiat Modares University, Iran
3-Department of Medical Biochemistry, Faculty of Medical Sciences, Tarbiat Modares University, Iran
4-Behin Jalbak Alborz Processing Company, Tarbiat Modares University Science and Technology Park, Iran
*Corresponding Author: zareidarki@modares.ac.ir

Abstract

Cancer is a general term for malignant diseases, the basic characteristics of which are uncontrolled cell proliferation and apoptosis and hyperplasia to form a new organism (neoplasm). The pharmacological effects of anticancer drugs generally include inhibiting tumor cell proliferation, inducing tumor cell apoptosis, arresting cell cycle and inhibiting tumor cell metastasis, etc. In fact, most drugs with anticancer properties are derived from natural compounds. Among them, phycocyanin, a marine drug, has antiproliferative and proapoptotic effects on various cancer cell lines in vitro, while phycocyanin has no side effects on normal tissue cells. Increasing evidence has proven that phycocyanin has effective anticancer effects on various types of cancer cells (such as breast cancer, liver cancer, lung cancer, colon cancer, leukemia and bone marrow cancer) in vitro and in vivo. High-dose phycocyanin does not cause significant toxic or lethal symptoms in animal experiments. The most important source of phycocyanin has been identified as the blue-green algae Spirulina. According to research, the higher the phycocyanin content, the greater its anticancer properties. An effective method for increasing phycocyanin pigment in Spirulina algae is to improve the cultivation conditions of this algae. For this purpose, Spirulina algae stock was prepared from the algae collection of the Faculty of Natural Resources and Marine Sciences. Ten treatments were selected for cultivation, including control (1) - chromium I treatment (2) - chromium II treatment (3) - chromium III treatment (4) - iron I treatment (5) - iron II treatment (6) - iron III treatment (7) - zinc I treatment (8) - zinc II treatment (9) - zinc III treatment (10) (three replicates). It was carried out at a temperature of 28 ± 2 ° C with a light/dark cycle of 15.9 hours in a cultivation period of 14 days. At the end of the cultivation, the samples were dried with a freeze dryer. Phycocyanin extraction was ultrasonicated from the algae powder. Extraction was carried out with the help of a 14-kDa dialysis bag. A UV-VIS spectrophotometer was used to measure at wavelengths of 620 nm and 652 nm. The results were analyzed using SPSS version 36 software. The results showed that the amount of phycocyanin pigment in each treatment was 9.5, 14.9, 9.2, 14, 6.8, 6.2, 10.5, 7.8, 6.9 and 3.2 mg/L, respectively. As a result, changing the culture medium and adding elements to the Spirulina culture medium will increase the e

keywords: Spirulina, phycocyanin, Biotechnology

21238 - Poster

Investigating the therapeutic role of myricetin in preventing the proliferation of Helicobacter pylori in the stomach of rats with gastric ulcers

Ayda Moghadam honar[1], Mina Ramezani[1]

1- Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: Ayda.mgh22@yahoo.com

Abstract

Helicobacter pylorus is a Gram-negative bacterium known as a major cause of inflammation, ulcers, and finally gastric cancer. In this study, the therapeutic role of chitosan nanoparticles loaded with myristin (MLCN) was investigated in preventing the proliferation of H. pylori through the activation of the autophagy process involved in the RSK2/PI3K molecular pathway in rats with gastric ulcers. MLCN nanoparticle was synthesized by Ionotropic gelatin method and with DLS/FESEM tests were confirmed. 15 male Wistar rats were divided into three groups, all of which had gastric ulcers induced via gavage with H. pylori. The first group received only H. pylori gavage, the second group received myristin nanoparticles, and the third group received the antibiotic clarithromycin for 7 days. At the end of the treatment period, the rats were euthanized using CO2 gas, and histological examinations were conducted using H& E staining, and Real time PCR were carried out to assess the effects of the treatments on RSK2/PI3K gene expression in the gastric tissues. Nanoparticles with an average diameter of 99 nm were well synthesized. Like the standard antibiotic clarithromycin, the nanoparticle was able to heal gastric ulcers through the regeneration of epithelium tissue and mucous layer. It also significantly increased the expression of RSK2/PI3K genes and activated the autophagy pathway. The results of this research showed that MLCN can effectively stop the proliferation of H. pylori and help to heal gastric ulcers faster and activate the autophagy pathway. These results can be a basis for further research in the use of nanoparticles to manage the treatment of gastric ulcers and cancer caused by H. pylori infections.

keywords: Nanoparticles, Chitosan, Myricetin, Gastric Ulcer, Helicobacter pylori

22316 - Poster

Improving Letrozole Efficacy through PEGylated Nanoliposomes in Breast Cancer

Farzaneh Tafvizi[1 *], Atlas Keshandehghan[1], Soraya Shahbazi[1]

1- Department of Biology, Pa.c., Islamic Azad University, Parand, Iran
*Corresponding Author: farzanehtafvizi54@gmail.com

Abstract

Letrozole (Let) is widely recognized as an effective therapeutic agent in breast cancer treatment; however, its clinical application is often limited by adverse side effects. To enhance its therapeutic efficiency and reduce toxicity, the present study focused on the encapsulation of Let in conventional liposomes and PEGylated liposomal nanoparticles (Lipo-Let-PEG) and assessed their anticancer potential against MCF-7 breast cancer cells. The physicochemical features of the optimized formulation were thoroughly characterized using scanning electron microscopy (SEM), dynamic light scattering (DLS), and Fourier-transform infrared spectroscopy (FTIR). Drug release profiles and stability parameters were also systematically evaluated.The optimized Lipo-Let-PEG formulation demonstrated a mean particle size of 170.05 ± 4.15 nm with an encapsulation efficiency of 87.21 ± 1.36%. In vitro drug release assays revealed a sustained release pattern, with approximately 60% and 50% cumulative release observed at pH 5.4 and 7.4, respectively. Cytotoxicity testing (MTT assay) confirmed that Lipo-Let-PEG exhibited stronger inhibitory effects on MCF-7 cells while maintaining better compatibility with normal cells compared to conventional liposomal Let. The cytotoxicity assessment revealed a marked reduction in IC50 values with PEGylated liposomal encapsulation. Specifically, the IC50 values for empty nanocarrier (Lipo), Let, letrozole encapsulated uncoated liposomes (Lipo-Let), and Lipo-Let-PEG against MCF-7 cells were 3688, 395, 144, and 50.16 µg/mL after 24 hours, which further decreased to 2774, 119.5, 57.58, and 18.60 µg/mL following 48 hours of treatment. These findings clearly demonstrate the superior potency of the PEGylated formulation in comparison to the other groups. Flow cytometry analysis further demonstrated that the PEGylated formulation significantly enhanced apoptosis induction and promoted cell cycle arrest in breast cancer cells.In summary, PEGylated liposomal encapsulation of Letrozole provides a promising nanoscale delivery platform with improved anticancer efficacy and reduced side effects. These findings suggest the potential of Lipo-Let-PEG as a candidate for future preclinical and clinical investigations in breast cancer therapy.

keywords: Letrozole, PEGylated liposomes, MCF-7 cells, apoptosis, drug delivery, nanomedicine

22632 - Poster

Recent Advances in Nanostructured Drug-Delivery Systems for Cancer Therapy: Emerging Platforms and Apoptotic Signaling Pathways

Fatemeh Tahmasebimoghadam[1], Farzaneh Tafvizi[1 *]

1- Department of Biology, Pa.c., Islamic Azad University, Parand, Iran
*Corresponding Author: : farzanehtafvizi54@gmail.com

Abstract

Effective cancer therapy is limited by tumor heterogeneity, drug resistance, and systemic toxicity, underscoring the need for advanced drug-delivery systems. Nanoplatforms—including liposomes and niosomes, metal–organic frameworks (e.g., UiO-66), graphitic carbon nitride (g-C3N4), green-synthesized metallic nanoparticles, and mesoporous silica nanoparticles (MSN)—improve anti-cancer performance by enhancing stability and bioavailability, promoting tumor accumulation (EPR and active targeting), and enabling stimuli-responsive release (pH, redox, enzymatic, light). These carriers co-deliver drugs/genes/siRNA, overcome efflux pumps (e.g., P-gp), reprogram the tumor microenvironment, and mitigate off-target toxicity. At the cellular level, they trigger apoptosis via the intrinsic pathway (loss of mitochondrial membrane potential, increased BAX/BAK, cytochrome-c release, caspase-9/-3 activation) and the extrinsic pathway (death-receptor signaling via Fas/DR4/DR5 and caspase-8). Additional mechanisms include inhibition of PI3K/AKT/mTOR, suppression of NF-κB, modulation of MAPK/JNK/p38, augmentation of p53 responses, and induction of oxidative and endoplasmic-reticulum stress, with crosstalk to autophagy influencing cell-fate decisions. Notably, UiO-66 and MSN offer high loading capacity and facile surface functionalization; liposomes/niosomes provide biocompatibility and membrane translocation; g-C3N4's photocatalytic properties enable combination chemo-/photodynamic therapy; and green synthesized metallic nanoparticles leverage bio-derived capping layers and ROS-mediated cytotoxicity. Translational challenges remain—manufacturing uniformity, long-term safety, interspecies pharmacokinetics, and clinical-trial design—but the carrier–therapy synergy is compelling. This review highlights targetable signaling axes to amplify apoptosis and supports rational, patient-tailored nanomedicine strategies for cancer treatment.

keywords: Nanocarrier, Targeted drug delivery, Apoptosis, Cancer

22118 - Poster

The effect of nanoprocessed Artemisia extract and doxorubicin on caspase-9 gene expression

Mina Abedinzadeh Shahri[1], Khadije Nejad Shahrokh Abadi[1 *], Javad Baharara[1]

1- Department of Biology, Mashhad Branch, Islamic Azad University, Mashhad, Iran.
*Corresponding Author: shahrokhabady@yahoo.com

Abstract

Given the importance of breast cancer as one of the most common cancers in women and the limitations of chemotherapy treatments such as doxorubicin, the use of natural compounds and nanotechnology has been considered as a new approach in cancer treatment. Silver nanoparticles have valuable potential in improving the effectiveness of combination therapies due to their anticancer properties and apoptosis induction, and Artemisia absinthium plant due to its antioxidant compounds and the ability to synthesize nanoparticles greenly. In the present study, silver nanoparticles were synthesized using Artemisia absinthium plant extract and their quality was evaluated using standard methods. The plant extract was prepared by aqueous extraction and combined with silver nitrate solution. Then, the effect of silver nanoparticles independently and in combination with doxorubicin on human breast cancer cells of the T-47D line was investigated. The results of the MTT test showed that silver nanoparticles with an IC50 of 20 µg/ml and doxorubicin with an IC50 of 16 µg/ml reduced cell proliferation. Flow cytometry showed that the rate of apoptosis in the combined treatment was significantly increased compared to the single treatments ($p<0.001$). Based on the results of Real-Time PCR, the expression of the Caspase-9 gene was reported as Expression (Mean ± SEM) in the control group as 0.897 ± 0.203. In the treatment with doxorubicin, the value was 1.777 ± 0.779 (Fold change = 1.98 ± 0.98), in the treatment with silver nanoparticles, it was 2.867 ± 0.889 (Fold change = 3.19 ± 1.23), and in the combined (synergistic) treatment, it was 5.124 ± 0.691 (Fold change = 5.71 ± 1.50). The increase in expression in the combined treatment compared to the control group was statistically significant ($p < 0.001$). Overall, the findings indicate that silver nanoparticles synthesized by *Artemisia absinthium* in combination with doxorubicin can have stronger anticancer effects than either of them alone by increasing Caspase-9 gene expression and inducing apoptosis. This can be considered as a complementary approach in the treatment of breast cancer.

keywords: Breast cancer, silver nanoparticles, doxorubicin, apoptosis

21722 - Poster

The Effect of Nanocurcumin on Wnt/β-catenin Pathway Gene Expression in Oral Squamous Cell Carcinoma (OSCC): An In Vitro Study

Ali Shamsizadeh Meymandi[1 *], Shirin Barkhori Mehni[2], Majid Sadeghpoor[3]

1- Professional Doctorate in Veterinary Medicine, Islamic Azad University, Baft Branch, Kerman, Iran - Member of the Iranian Scientific Society of Microbiology
2- Professional Doctorate in Dentistry, Kerman University of Medical Sciences, Kerman, Iran
3- Master of Science in Microbiology, Member of the Iranian Microbiology Society
*Corresponding Author: ali.shamsizadeh96@gmail.com

Abstract

Introduction: Oral squamous cell carcinoma (OSCC) is one of the most prevalent oral malignancies, characterized by aggressive growth and poor prognosis. Dysregulation of the Wnt/β-catenin signaling pathway has been closely associated with OSCC development and progression, highlighting its potential as a therapeutic target. The present study aimed to investigate the cytotoxic effects of nanocurcumin on OSCC cells and its impact on the expression of Wnt/β-catenin pathway genes.Methods: OSCC cells were treated with increasing concentrations of nanocurcumin (5, 10, 20, and 40 µM) for 24 and 48 hours. Cell viability was assessed using the MTT assay, and the IC50 values were calculated. Gene expression levels of β-catenin, c-Myc, and Cyclin D1 were quantified using real-time PCR. All experiments were performed in triplicate, and statistical analysis was conducted using one-way ANOVA followed by Tukey's post hoc test ($p < 0.05$).Results: Nanocurcumin reduced OSCC cell viability in a dose- and time-dependent manner. The IC50 values were 22.8 µM at 24 hours and 16.4 µM at 48 hours. At the highest concentration (40 µM, 48 h), cell viability decreased to 28% compared with control. Gene expression analysis demonstrated significant downregulation of β-catenin (fold change: 0.42, $p < 0.01$), c-Myc (fold change: 0.36, $p < 0.01$), and Cyclin D1 (fold change: 0.48, $p < 0.05$).Conclusion: Nanocurcumin exerts potent anticancer activity against OSCC cells by inducing cytotoxicity and suppressing the Wnt/β-catenin signaling pathway. These findings suggest that nanocurcumin may serve as a promising therapeutic candidate in the management of OSCC, although further in vivo and clinical studies are warranted.

keywords: Nanocurcumin, Wnt/β-catenin pathway, Oral squamous cell carcinoma (OSCC), Gene expression

22264 - Poster

The effect of nano-chitosan carrying cannabidiol on the level of oxidative stress indicators in breast tissue of mice with breast cancer

Zahra Keshtmand[1 *] , Fatemeh Dolatkhah[1]

1- Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: zahra.keshtmand@iau.ac.ir

Abstract

Nowadays, the prevalence of cancer, especially breast cancer, among women and the mortality caused by it have increased, therefore, identifying compounds with antioxidant properties and targeted effects is of interest to researchers. The aim of the present study was to investigate the effects of nanochitosan carrying cannabidiol on the level of oxidative stress markers in breast tissue of Balb/C mice with breast cancer.In this experimental study, 21 mice were divided into 3 groups of 7, including: control mice, breast cancer model mice (induced with 1 × 106 4T1 breast cells), and breast cancer model mice + nanochitosan containing cannabidiol (1 µl). After the end of the experiment, the mice were dissected and breast tissue was extracted to measure the levels of superoxide dismutase, catalase, and malondialdehyde. Data analysis in different groups was performed with SPSS software and one-way variance statistical test, and $P < 0.05$ was considered significant.The results of measuring the levels of superoxide dismutase, catalase and malondialdehyde in breast tissue in the cancer receiving group showed a significant decrease and increase ($P<0.05$). While in the treatment group with nanochitosan carrying cannabidiol, a significant decrease in malondialdehyde and superoxide dismutase, catalase in breast tissue was observed compared to the cancer model group ($P<0.05$).The present study showed that. Probably, the treatment of cancer-bearing mice with nanochitosan carrying cannabidiol, due to the antioxidant properties of cannabidiol, caused the regulation of oxidative stress markers and its use could be a suitable solution for improving cancer-related damage.Keywords: Breast cancer, cannabidiol, oxidative stress, mice

keywords: Breast cancer, cannabidiol, oxidative stress, mice

22257 - Poster

Effect of nanochitosan carrying bergenin on the level of superoxide dismutase, total antioxidant capacity and malondialdehyde in the breast tissue of mice with breast cancer

Zahra Keshtmand[1 *], Marjan Sarkhani[1]

1- Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: zahra.keshtmand@iau.ac.ir

Abstract

Different methods are used to treat breast cancer. Existing drugs such as chemotherapy, hormone therapy and immunotherapy do not show .The aim of the present study was to investigate the effects of nanochitosan carrying bergenin on the level of superoxide dismutase, total antioxidant capacity and malondialdehyde in the breast tissue of mice Balb/C with breast cancer.In this experimental study, 21 mice were divided into 3 groups of 7, including: the first group was control mice, the second group was mice induced with 1 × 106 4T1 breast cells, and the third group: breast cancer model mice + nanochitosan containing bergenin (80 mg/kg). After the end of the experiment, the mice were dissected and breast tissue was extracted to measure the levels of superoxide dismutase, total antioxidant capacity, and malondialdehyde. Data analysis was performed in different groups using SPSS software and one-way variance statistical test, and $P<0.05$ was considered significant.The results of measuring the levels of superoxide dismutase, total antioxidant capacity, and malondialdehyde in breast tissue in the cancer receiving group showed a significant decrease and increase in the control group ($P<0.05$). While in the treatment group with bergenin-carrying nanochitosan, a significant decrease in malondialdehyde, superoxide dismutase, and total antioxidant capacity of breast tissue was observed compared to the cancer model group ($P<0.05$).The present study showed that Treatment of cancer-bearing mice with nanochitosan carrying bergenin resulted in modulation of oxidative stress factors, which is probably due to the antioxidant properties and functions of bergenin and could be a suitable candidate for reducing cancer-related damage in tissues. Keywords: Breast cancer, bergenin, oxidative stress, mice .

keywords: Breast cancer، bergenin، oxidative stress، mice .

21881 - Poster

Isolation of anticancer compound from brown algae Sargassum ilicifolium

Neginsadat Mireshghi[1], Zohreh Jafari[2 *]

1- Department of Microbiology, Science Faculty, Arak Branch, Islamic Azad University, Arak, Iran
2- Department of Biology, Science Faculty, Arak Branch, Islamic Azad University, Arak, Iran. Email: rresearch114@gmail.com
*Corresponding Author: rresearch114@gmail.com

Abstract

Nowadays, one of the major challenges in cancer treatment is the widespread use of costly chemical drugs with significant side effects. Therefore, researchers' attention has increasingly shifted toward the utilization of natural compounds. Algae, particularly brown algae, have been recognized as effective anticancer sources due to their polyphenolic compounds such as phlorotannins. These compounds play a key role in inhibiting cancer cells by inducing programmed cell death (apoptosis).In this study, the focus was on isolating the anticancer substance phlorotannin extracted from the brown algae Sargassum ilicifolium, which was collected from the coast of Chabahar.After washing the samples with fresh water, species identification and the extraction process were carried out in the specialized microalgae laboratory of Islamic Azad University, Arak Branch. For compound extraction, a solvent method with an aqueous/ethanolic ratio of 30:70 at room temperature was employed. The amount of phlorotannin was then determined using phloroglucinol and Folin–Ciocalteu reagents.The results showed that the phlorotannin content in this native species was 57.86 µg/ml. Although its concentration was lower compared to some non-native species reported in other studies, due to its high anticancer efficacy, it holds significant potential in cancer prevention and treatment. Furthermore, considering the evidence from studies in Taiwan indicating that this species can destroy human lung cancer cells, it is recommended that future research focus on optimizing the extraction conditions of phlorotannin from native Iranian samples.

keywords: Phlorotannins, Sargassum ilicifolium, natural compound, anticancer

22020 - Poster

Microbial pigments: A new approach to fight cancer cells

Azam Aliasghari Veshareh[1], Parisa Mohammadi[1 *], Zahra Ghanei[2]

1- Department of Microbiology, Faculty of Biological Sciences, Alzahra University, Tehran, Iran
2- Department of Biotechnology, Faculty of Biological Sciences Alzahra University
*Corresponding Author: p.mohammadi@alzahra.ac.ir

Abstract

Microbial pigments, as secondary metabolites, are usually produced in response to stress conditions and disruption of metabolic balance. In addition to nutritional and therapeutic properties, these pigments exhibit a wide range of biological activities such as antimicrobial, antioxidant, anti-inflammatory, and anticancer properties. Such effects are mainly due to their complex interactions with cellular components such as membranes, proteins, and DNA. Pigments produced by microorganisms, including melanin, zeaxanthin, astaxanthin, carotenoids, prodigiosin, violacein, pyocyanin, and actinorhodin, along with pigments from cyanobacteria such as phycocyanin and cytonemin, have received attention for their anticancer and antimicrobial properties. This review article aims to investigate the use of microorganisms' pigments in cancer treatment, based on studies published in Scopus, PubMed, and ScienceDirect databases. Various studies have demonstrated that pigments extracted from various microorganisms, such as bacteria, cyanobacteria, microalgae, actinomycetes, fungi, and archaebacteria, especially halophiles, have significant cytotoxic effects on various cancer cell lines, including cervical cancer cells and human laryngeal cancer cells. These pigments, with their therapeutic potential in targeting tumors and cancer cells, offer a viable path for developing next-generation anticancer drugs. However, future research should focus on evaluating the toxicity of these compounds, conducting clinical trials and establishing industrial-scale production conditions. Also, the use of genetically modified strains to increase the production efficiency of these pigments can play an important role in the progress of this field.

keywords: Phlorotannins, Sargassum ilicifolium, natural compound, anticancer

22078 - Poster

Green Synthesis of Selenium and Gold Nanoparticles Using Trigonella Foemumgraecum L. Extract and Investigation of Their Anticancer Effects in the Treatment of Colorectal Cancer

Asma Mostafapour[1 *], Majid Dorudi[1], Hafezeh Davari[1], Zahra Sabouri[1]

1- Department of Medical Biotechnology and Nanotechnology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
*Corresponding Author: mostafapoura1@mums.ac.ir

Abstract

Recently, selenium and gold nanoparticles have received more attention due to their biological importance and medical applications, and the production of nanoparticles using green chemistry principles has gained a special place. In this study, selenium and gold nanoparticles were synthesized using Trigonella foemumgraecum L. extract with green chemistry method. The synthesized nanoparticles were characterized using various analyzes such as XRD, UV-Vis and TEM. Absorption peaks in the range of 280 to 320 nm and 500 to 550 nm confirmed the successful synthesis of selenium and gold nanoparticles, respectively. Also, according to the XRD results, the nanoparticles were crystalline and amorphous in nature, and according to the TEM images, the nanoparticles had spherical morphology. Then, the anticancer effects of the synthesized nanoparticles were evaluated in the treatment of colorectal cancer on the CT26 cell line. Cytotoxicity studies showed that cell viability decreased significantly with increasing nanoparticle concentration, and the IC50 values of selenium and gold nanoparticles were reported to be about 73 and 125 µg/mL, respectively.

keywords: Green synthesis, Selenium nanoparticles, Gold nanoparticles, Trigonella foemumgraecum L. extract

22182 - Poster

Comparative Cytotoxic Effects of Hesperidin and Hesperidin Nanoparticles on AGS Gastric Cancer Cells

Fatemeh Mousavi-Chelak[1], Bagher Seyedalipour[1 *], Mohammad Karimian[1]

1- Department of Cellular and Molecular Biology, Faculty of Basic Sciences, University of Mazandaran, Babolsar, Iran
[*]Corresponding Author: b.alipour81@gmail.com

Abstract

Gastric cancer is one of the most important global health problems, and today, new methods such as investigating molecular mechanisms and using natural compounds as potential treatments for this cancer have been considered. Hesperidin is a plant flavonoid extracted from citrus fruits that has antioxidant, anti-inflammatory, and anticancer effects. Due to its low bioavailability, its nanoparticle form has also been investigated in recent studies. In this study, the cytotoxic effects of hesperidin and hesperidin nanoparticles on the human gastric cancer cell line AGS were evaluated at 24, 48, and 72 hours using the MTT assay. The results demonstrated that both compounds reduced cell viability in a dose- and time-dependent manner. In the hesperidin group, the IC_{50} value decreased from 228.1 µM at 24 hours to 58.2 µM at 72 hours; While in the hesperidin nanoparticles group, this value decreased from 1.736 µL/mL at 24 hours to 0.102 µL/mL at 72 hours. The simultaneous decrease in survival percentage with increasing dose and treatment time showed that hesperidin nanoparticles inhibited the growth of AGS cells with higher efficiency than hesperidin. These findings indicate the improvement of the antiproliferative properties of hesperidin in the form of nano-formulation and suggest that future studies should explore its molecular mechanisms and in vivo effects.

keywords: Hesperidin; Hesperidin Nanoparticles; Apoptosis; Cytotoxicity; Gastric Cancer

21333 - Poster

Inhibition of Cyclin D1 Gene Expression by Rhizome Extract of Polygonum bistorta L. in HT-29 Cells: A Novel Approach to Cell Cycle Control

Sayeh Jafari marandi[1 *], Sara Ramezani[1], Sedigheh Arbabian[1], Fahimeh Salimpor[1]

1- Department of Biology, NT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: jafarisayeh@gmail.com

Abstract

Colorectal cancer (CRC) is among the most common malignancies worldwide, and the limitations of conventional therapies have increased interest in plant-derived compounds with multiple biological activities. Polygonum bistorta L., a perennial species from the Polygonaceae family and native to the mountainous regions of northwestern Iran, has traditionally been used as an astringent, anti-inflammatory, and wound-healing remedy. Its rhizomes are particularly rich in phenolic and flavonoid constituents, which are recognized for their antioxidant and anticancer properties. In the present study, methanolic extracts (80% methanol in water) were prepared from rhizomes and leaves using maceration. Dried and powdered plant material was soaked for 72 h, filtered, concentrated under reduced pressure, and stored at 4 °C until use. GC–MS analysis identified nine major phytochemicals, including pyrocatechol, 1,2,3-benzenetriol, and β-tocopherol, compounds with well-documented antioxidant and antiproliferative potential. As GC–MS mainly detects volatile and semi-volatile metabolites, these findings provide only a preliminary chemical profile that should be complemented by chromatographic techniques such as HPLC. Treatment of HT-29 colorectal cancer cells with the extracts led to a marked downregulation of Cyclin D1, a key regulator of the G1/S transition. The rhizome extract produced a stronger reduction (~0.6-fold; $p<0.01$) compared with the leaf extract (~0.8-fold; $p<0.05$), which was consistent with its higher phenolic content. Collectively, these results highlight the potential of P. bistorta rhizomes to inhibit cell proliferation through cell-cycle modulation, suggesting their promise as a natural source of antiproliferative agents for the prevention and complementary treatment of colorectal cancer.

keywords: Cell proliferation inhibition ;Phenolic compounds ; Natural anticancer agents ; Gene expression modulation; Colorectal carcinoma

Chapter Four
Cellular and Molecular Biology



22713-Keynote oral presentation

Drought and Food Security Crisis

Mohammadreza Zamani[1 *]

1- Nourdanesh Institute of Higher Education, Meymeh, Isfahan, Iran.
Corresponding author: mrzamani97@yahoo.com; zamani@nigeb.ac.ir

Abstract

Iran's location in the world's arid climatic belt and the fact that two-thirds of Iran is located in an arid and semi-arid territory, climate change and reduced rainfall have caused water scarcity and drought. One of the first effects of the drought crisis is due to the wide range of consequences, the decrease in agricultural production and the decrease in the sustainable income of farmers, and as a result, the increase in food poverty and the lack of desirable access for all people physically and economically for a healthy and active life, especially in small towns and villages. Drought will lead to a decrease in the optimal and adequate availability of food by reducing production and productivity in the agricultural sector. This issue will usually be more severe in areas that are more dependent on agriculture. According to the medium-term average of about 220 mm of rainfall in Iran, based on the available statistics, an average of 100 billion cubic meters of surface fresh water is available annually, 90% of which is consumed in the agricultural sector or is unavailable by evaporation. In addition, the indiscriminate use of groundwater to compensate for the shortage of water needed by the agricultural sector also reduces strategic groundwater reserves and land subsidence. Dealing with the drought crisis to sustain food security requires planning to reduce the amount of water consumption in the agricultural sector. In the current situation, it is necessary to change the cultivation pattern, change in the irrigation system, increase productivity, achieve drought tolerant plants, and develop vertical farming with hydroponic, aeroponic and aquaponic systems in order to reduce agricultural water consumption and increase the productivity of the amount of water used. New agricultural technologies are one of the key tools to deal with drought and improve food security in Iran. These technologies can reduce the pressure on natural resources by increasing water productivity, reducing waste, and increasing crop yields. In addition, agricultural hydrogels are one of the new technologies that can play an important role in reducing the impact of drought and improving food security in Iran. The results of some studies show that the use of hydrogel can reduce the amount of water consumed by about 30%, while also increasing the yield in the studied plants by reducing water stress. The development of vertical farming, which is one of the new agricultural methods, can play

keywords: Drought Crisis, Food Security, Modern Agriculture, Agricultural Productivity

22712 -Invited Oral presentation

Evolution of Breast Carcinogenesis

Mehdi Damaghi[1,2,3,4,5]

1- Department of Pathology, Stony Brook Medicine, Stony Brook University, Stony Brook, NY, USA
2- Department of Applied Math and Statistics, Stony Brook Medicine, Stony Brook University, Stony Brook, NY, USA
3- Department of Radiation Oncology, Stony Brook Medicine, Stony Brook University, Stony Brook, NY, USA
4- Department of Cancer Informatics, Stony Brook Medicine, Stony Brook University, Stony Brook, NY, USA
5- Cancer Ecology and Evolution Lab head, Stony Brook Cancer Center, Stony Brook, NY, USA
Corresponding author: mehdi.damaghi@stonybrookmedicine.edu

Abstract

Cancer is a complex evolving ecosystem. In the realm of medicine, we define cancer as an ecological phenomenon starting with one rebel cell breaking free from its ecological limits and multiplies rapidly disrupting the equilibrium of resident tissue homeostasis. This will eventually lead to the extinction of other species and potential ecosystem collapse with many unpredicted variations. These ecological changes of tumor microenvironment will apply novel selection pressure on cancer cells and dictates which changes in cancer cells offer adaptive advantages. To address the significance of these evolutionary and ecological processes in cancer regarding cancer initiation, progression, and metastasis, we study how various tumors are evolving in their microenvironment from normal to precancer and cancer in clinically meaningful ways. We study how changes in microenvironment of normal, precancer, and cancer cells can change their phenotype adapting to varied microenvironment and how adaptation to it can shape the new ecosystem and evolutionary trajectory of cancer cells. This interplay between tumor cells and the microenvironment plays a fundamental role in the development of an ever-changing tumor ecosystem leading to more genotypic heterogeneity and phenotypic plasticity. We use the integration of spatial single-cell transcriptomics, proteomics, metabolomic and lipidomics, and pathomics machine learning analysis to capture the heterogeneity and plasticity of cancer cells in their natural ecological microenvironment and habitats. We discovered novel metabolic phenotypic switch in cells adapted to early acidosis in mammary ducts leading to pre-cancer and carcinogenesis. We then used these markers in our breast cancer ductal carcinoma cohort to find biomarkers for progression from precancer to cancer and upstaging of ductal carcinoma in situ (DCIS).

keywords: Breast cancer, Evolution, Lipidomics, Machine learning, Pathomics

22230 – Oral

Investigating of cytotoxicity, glycation indexes, activities of antioxidant enzymes and oxidative lipid degradation factor in colon cancer HCT-116 cells treated with hesperidin and hespertin

Saeede Keshavarz Zamanian[1*], Masoud Mashhadi Akbar Boojar[1], Mehdi Devarzadeh[2]

1- Department of cell and molecular biology, Faculty of science, kharazmi University, Karaj, Iran.
2- Animal feed Hygiene, Veterinary Medicine Department, Islamic Azad University, Shabestar Branch, Iran
*Corresponding author: mboojar@yahoo.com

Abstract

Colon cancer is one of the most deadly cancers in the world. Chemotherapy is one of the first treatments, but patients are exposed to side effects from these drugs. One strategy to reduce these side effects is to use herbal active ingredients that can help make chemotherapy more effective. Hesperidin and hesperetin are flavonoids with a wide range of biological effects. Hesperidin is a β-7-rhamnoglucoside of hesperidin, which is composed of an aglycan and a disaccharide (rutinos). This structural difference may contribute to their effects. Increasing free radicals and increasing harmful glycation substances are among the ways in which compounds with anti-cancer properties prevent the growth or death of cancer cells. The aim of this study was to investigate cytotoxicity, changes in glycation indices, antioxidant enzyme activity, and oxidative lipid degradation in HCT-116 colon cancer cells treated with hesperidin or hesperetin.Cytotoxicity was measured by MTT assay, glycation markers 3-deoxyglucose and methylglyoxal were measured by HPLC, malondialdehyde was measured by spectroscopy, and the activities of antioxidant enzymes catalase and superoxide dismutase were measured by spectroscopy.The results showed that treatment with each of these two substances at concentrations of 100 to 300 µg/ml reduced cell growth. Hesperidin had a more significant inhibitory effect than hesperetin. At a concentration of 300, the inhibition rate reached more than 50% of the control cell population. This effect is consistent with the use of some flavonoids against skin and liver cancer. Both substances increased the amount of malondialdehyde in a concentration-dependent manner. Hesperidin showed a greater increasing effect. Accordingly, both substances probably caused the destruction of the cancer cell membrane and its death by stimulating lipid peroxidation. The activity of both catalase and superoxide dismutase enzymes decreased under treatment with either of these two substances, and hesperidin had a greater inhibition than hesperetin. The inhibitory effect on superoxide dismutase was more pronounced than catalase. This is consistent with the inhibitory effect of some flavonoids on the antioxidant enzyme activity of invasive cancer cells in vitro. The greater anticancer effect of hesperidin may be related to the difference in the presence of rhamnoglucoside compared to hesperetin.Keywords: Colon cancer, glycation markers, hesperidin, hesperetin, antioxidant enzymes

Keywords: Colon cancer, Glycation markers, Hesperidin, Hesperetin, Antioxidant enzymes

22214 - Oral

Using immunohistochemical technique to study of the unique kidney of the marine catfish plotosus lineatus

Salman MalakpourKolbadinezhad[*1], Jonathan Mark Wilson[2,3]

1- Coldwater Fisheries Research Center (CFRC), Iranian Fisheries Sciences Research Institute (IFSRI), Agricultural Research, Education and Extension Organization, Tonekabon, Iran
2- Interdisciplinary Centre of Marine and Environmental Research (CIIMAR/CIMAR), University of Porto, Porto, Portugal. Department of Biology, 3Wilfrid Laurier University, Waterloo, Canada
*Corresponding author: s.malakpoor@gmail.com

Abstract

Marine teleosts living in a hyperosmotic environment experience water loss through osmosis across body surfaces, and their kidneys typically produce only small amounts of isosmotic urine to compensate. Unlike mammals, teleost kidneys cannot produce hyperosmotic urine due to the lack of zonation, a loop of Henle, or countercurrent tubular flow, as observed in elasmobranchs and lampreys. However, the kidneys of Plotosidae marine catfishes, Plotosus lineatus, are unique in that they produce hyperosmotic urine under steady-state conditions, making them an intriguing subject for study. In the present study, the kidney structure of P. lineatus was investigated using immunohistochemical technique. The results demonstrated basolateral localization of the Na^+/K^+-ATPase (NKA) α-subunit in renal tubules. P. lineatus also possesses an unusual distal tubule (DT) that coils around an ampullar region. Although the DT is present, the absence of apical expression of the $Na^+:K^+:2Cl^-$ cotransporter (NKCC2/ NCC) suggests that it is not involved in ion absorption, unlike typical DTs in other teleosts. Large eosinophilic ovoid cells exhibiting colocalization of the NKA α-subunit and the secretory NKCC1 throughout the cytoplasm were observed in the collecting tubules and collecting ducts. These cells, resembling renal “chloride cells,” indicate a secretory cell type and may explain the production of hyperosmotic urine in P. lineatus. Taken together, these findings suggest that the kidney of this marine catfish possesses molecular mechanisms that enable effective ion and osmoregulation, a feature not typically observed in other marine teleosts.

keywords: Plotosus lineatus, kidney, hyperosmotic urine, osmoregulation, renal chloride cells

22393 - Oral

Dual Regulation of Inflammation by Cyclooxygenase-2: From Pathogenicity to Protection

Tahereh Zahedi[1 *]

1- Department of Marine Biology, Faculty of Marine Science and Technology, University of Hormozgan, Bandar Abbas, Iran
*Corresponding Author: zahedi.tahereh@gmail.com

Abstract

COX-2 is an inducible enzyme that functions as both a friend and a foe by producing various prostanoids, depending on upstream factors and the specific tissue involved. In fibroblasts, COX-2 expression exerts a protective effect on the vascular wall through PGI_2, whereas in endothelial cells, it promotes sclerosis via PGE_2. Elevated COX-2 expression is associated with various inflammatory conditions and cancers. The regulation of COX-2 depends on the function of specific domains within its promoter region. In addition to the TATA box, the CRE domain (located at -53/-59) plays a role in the basal expression of COX-2 in tissues such as fibroblasts. Transcription factors binding to this region, including ATF and CREB, are essential for maintaining protective levels of COX-2 expression; mutation in this site abolishes COX-2 expression. In contrast, the C/EBP and NF-κB domains (at -124/-132, and -439/-448, respectively) mediate COX-2 induction by proinflammatory factors such as C/EBPβ and TNF-α. Our research demonstrated a significant association between COX-2 expression and the onset of colorectal cancer (p-value < 0.0001). We also found that the sequence at -82/-111 can form the G4-DNA structure. Since this structure is located downstream of the C/EBP and NF-κB binding sites, it modulates the inflammatory induction of COX-2. This region can form the G4 structure without requiring external factors, thereby enabling COX-2 to switch between basal and pro-inflammatory states. The G4 operates without affecting downstream regions involved in PGI_2 production while it reduces inflammation by limiting DNA strand separation required for pro-inflammatory factor binding, thereby decreasing COX-2 and PGE_2 expression. This downregulation was significant in HT-29 cells in our studies.

Keywords: G4-DNA, Inflammation switch, CEBP, NF-κB, Promoter.

22128 - Oral

Inhibition of MCF-7 Breast Cancer Cell Proliferation by Gold Nanoparticles: An Innovative Approach for Cancer Therapy

Zahra Tahmasebi Fard[1 *], Esra Amjad Hamed[2]

1- Department of Biology, RO.C, Islamic Azad University, Roudehen, Iran
2- Department of Cellular and Molecular Biology, SR.C, Islamic Azad University, Tehran, Iran
*Corresponding Author: ztahmasebifard@iau.ac.ir

Abstract

Breast cancer is the most common cancer among women and the second leading cause of cancer-related death worldwide. This disease presents many therapeutic challenges, including drug resistance and side effects from conventional treatments like chemotherapy. The demand for innovative approaches with high effectiveness and fewer side effects has led research toward nanotechnology. Metallic nanoparticles, because of their unique physical and chemical properties, such as small size and ability to penetrate cells, are promising candidates for cancer therapy. This study examined the effect of metallic nanoparticles on the viability of the MCF-7 cell line. The MCF-7 cells were obtained from the Pasteur Institute of Iran and cultured in DMEM medium. Gold nanoparticles were used at concentrations of 3.125, 6.25, 12.5, 25, and 50 µg/mL, and IC_{50} was determined with the MTT assay. Treatment with 12.5 µg/mL gold nanoparticles significantly ($P<0.05$) decreased cancer cell viability compared to the control group, in a dose-dependent manner. Limitations included not assessing long-term effects and the need for animal models. These results suggest metallic nanoparticles could inhibit MCF-7 cell growth, with potential applications in breast cancer treatment. Further clinical and in vivo studies are recommended to confirm therapeutic effects.

Keywords: Gold nanoparticles, Cell viability, MCF-7 cell line, MTT assay, Cancer therapy.

21895 - Oral

Neurodevelopmental perspective on depression: Hemispheric expression changes of GRIN3A and MAP1LC3A

Marzieh Mohammadi[1], Ali Mohammad Ahadi[1 *], Hoda Ayat[1]

1- Department of Genetics, Faculty of Science, Shahrekord University, ShahreKord, Iran
*Corresponding Author: ahadi_al@sku.ac.ir

Abstract

Major depressive disorder (MDD) is one of the most common psychiatric disorders, associated with alterations in molecular pathways related to synaptogenesis, autophagy, and gene asymmetry in the brain hemispheres and neuronal function, some of which may have a developmental origin. In this study, the expression of two genes, GRIN3A (related to the NMDA receptor and synaptogenesis) and MAP1LC3A (a key regulator of the autophagy pathway) in the cerebral hemispheres of a depression model was examined and the possible role of gene asymmetry in the pathophysiology of depression from a neurodevelopmental perspective was evaluated. After inducing depression in model mice using oral prednisolone and confirming its occurrence through behavioral tests and weight assessment, tissue from the left and right hemispheres of their brains was sampled separately. After RNA extraction, cDNA synthesis, and primer design for the target genes, their expression was examined and statistically analyzed using Real-time RT-PCR. In depressed mice, GRIN3A expression was significantly decreased in both hemispheres (Sig.=0.000, P≤0.05) and only relatively increased in the right hemisphere after treatment with saffron extract. MAP1LC3A gene expression also decreased in both hemispheres, with a greater severity in the right hemisphere (up to about 87%). Only for MAP1LC3A in the depressed group, a significant difference was observed between the two hemispheres (Sig.=0.015, P≤0.05). The findings highlight the role of genetic asymmetry in the brain hemispheres and the particular vulnerability of brain regions to synaptic and autophagy disorders. These results could help to better understand the developmental origins of depression and design targeted treatments.

Keywords: Major depressive disorder; Autophagy; Neuronal development; Synaptogenesis

22490 - Oral

Bioinformatics Analysis of the Role of miR-145-5p in Regulating Gene Expression in Melanoma Based on GEO Data

Kosar Ghanbarzadeh[1], Sohrab Boozarpour[1 *], Hossein Sabouri[2], Mina Lashkarboloki[3]

1- Department of Biology, Faculty of Basic Sciences, Gonbad Kavous University, Gonbad Kavous, Golestan, Iran
2- Department of Plant Production, Faculty of Agriculture Science and Natural Resource, Gonbad Kavous University, Gonbad Kavous, Golestan, Iran
3- Department of Genetics, Faculty of Biological Sciences, Tarbiat Modares University, Tehran, Iran
*Corresponding Author: so.boozarpour@gmail.com

Abstract

MicroRNAs play pivotal roles in tumor progression through post-transcriptional regulation of gene expression. The tumor suppressor miRNA, miR-145-5p, plays a critical role in cancer progression by regulating cellular proliferation and invasion pathways. In this study, the GSE171880 dataset from the GEO database included melanoma cells transfected with miR-145 and controls were analyzed. Differentially expressed genes (DEGs) were identified using GEO2R, followed by GO and KEGG enrichment analysis through SRplot. Protein–protein interaction (PPI) networks and hub genes were explored using Cytoscape with STRING and CytoHubba plugins. Furthermore, hub gene direct correlations with miR-145-5p were validated via the ENCORI database in TCGA-SKCM (Skin Cutaneous Melanoma). A total of 291 upregulated and 407 downregulated genes were identified. Downregulated genes were mainly enriched in biological processes related to cell proliferation and cell adhesion. PPI network analysis revealed ten hub genes, including PTGS2, LRP6, EPHX2, PTK2, SERPINE1, HMGCR, LRP5, YWHAE, KAT2B, and FZD1. Notably, ENCORI analysis demonstrated that SERPINE1 was the only hub gene significantly correlated with miR-145-5p expression in melanoma samples. Interestingly, SERPINE1, which is a key regulator of the fibrinolytic system and extracellular matrix, was downregulated in GEO analysis but upregulated in patient-derived TCGA data, likely suggesting a context-dependent regulation and differences between in vitro and in vivo conditions. Collectively, these findings highlight the complex role of the miR-145-5p–SERPINE1 axis in melanoma and provide a basis for future experimental validation.

Keywords: MicroRNA; Cancer; Microarray Analysis; SERPINE1; Bioinformatics.

21970 - Oral

Improvement of Multi-Walled Carbon Nanotubes by Curcumin Functionalization

Mohammadreza Hosseinzadeh[1], Majid Tafrihi[1*], Hossein Najafzadehvarzi[2], Roghaieh Holghoomi[1*]

1- Department of Molecular and Cell Biology, Faculty of Basic Sciences, University of Mazandaran, Babolsar, Iran
2- Cellular and Molecular Biology Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran
*Corresponding author: m.tafrihi@umz.ac.ir; rogy.holghoomi@gmail.com

Abstract

Nanobiotechnology is a field of life sciences that offers novel approaches for producing lighter and more efficient materials for widespread applications in biology and medicine. Multi-walled carbon nanotubes (MWCNTs) are among the materials commonly utilized in nanobiotechnology for drug delivery, biosensors, medical implants, and biological purification. However, due to their poor water solubility and potential cytotoxicity at non-optimal concentrations, their functionality may be improved through surface functionalization. Curcumin, a major natural polyphenol derived from the rhizome of Curcuma longa (turmeric), affects signaling pathways controlling the cell cycle, apoptosis, invasion, angiogenesis, and cancer cell metastasis. In the present study, COOH-MWCNTs were functionalized with curcumin. The successful functionalization was confirmed using scanning electron microscopy (SEM) and Fourier-transform infrared (FT-IR) spectroscopy. FT-IR analysis revealed a shift at 3446 cm-1 in the non-functionalized carbon nanotubes shifted to 3419 cm-1 in the curcumin-functionalized samples, indicating the formation of hydrogen bonds between curcumin and the carbon nanotubes. Additionally, a peak at 1459 cm-1 in the functionalized carbon nanotubes confirmed the presence of C=C double bonds in the functionalized MWCNTs. SEM images showed that curcumin-functionalized carbon nanotubes exhibited surface irregularities and had an average diameter of 53.50 nm, compared to 42.27 nm in non-functionalized MWCNTs, which had a smoother surface. The increase in diameter and surface roughness supports the successful functionalization process. Therefore, considering the improved dispersion of carbon nanotubes in solution, due to agents such as curcumin, further studies focusing on investigating the performance of these nanotubes in cellular environments as well as biological and medical applications such as drug delivery, biosensors, tissue engineering, etc., are recommended.

Keywords: Carbon nanotubes, Curcumin; FT-IR analysis; Nanobiotechnology; Scanning electron microscopy (SEM).

21897 - Oral

Evaluation of Gemini-curcumin and Cisplatin Combination Potential Inhibitory Effects on MDA-MB-468 Brest Cancer Cell Line

Fatemeh Afkhami Nia[1], Abasalt Hosseinzadeh Colagar[1 *], Esmaeil Babaei[2]

1- Department of Molecular and Cell Biology, Faculty of Basic Science, University of Mazandaran, Babolsar, Iran
2- . Department of Animal Biology, Faculty of Natural Science, University of Tabriz, Tabriz, Iran
*Corresponding Author: acolagar@yahoo.com

Abstract

Breast cancer is one of the most common cancers among women and has a high mortality rate. Triple negative breast cancer (TNBC) is a deadly type of breast cancer that rapidly metastasizes and shows resistance to chemotherapy drugs. Combination therapy is one of the effective methods to deal with TNBC. The aim of this study is to investigate the combined effect of two drugs, Gemini curcumin and cisplatin, on the growth and apoptosis of the MDA-MB-468 cell line. Curcumin is a polyphenol compound extracted from turmeric that has anti-cancer effects with minimal side effects. Cisplatin is a common chemotherapy drug, but its side effects and the resistance of cancer cells reduce its effectiveness. So, using a combination of Gemini curcumin and cisplatin may reduce the side effects and resistance to cisplatin. In this study, the MDA-MB-468 cell line was first cultured. Then, the cells were treated with different concentrations of Gemini curcumin, cisplatin, and their combination. The MTT test was used to find the effective dose of the drugs (IC50). After that, flow cytometry was used to evaluate apoptosis and cell cycle arrest. Finally, the expression of the BAX and BCL-2 genes was measured by qRT-PCR. The results showed that the IC50 of cisplatin was reduced when used in combination with Gemini curcumin. Increasing BAX gene expression and decreasing BCL-2 gene expression in the cells treated with combination of two drugs showed that apoptosis was induced and the cell cycle was stopped.

Keywords: Apoptosis; Breast cancer; BAX gene; BCL-2 gene; Combination therapy.

22156 - Oral

Evaluation of Cellular Uptake of Targeted Tamoxifen Nano-Drug Using Confocal Imaging

Noora Amraee[1], Maryam Bikhof Torbati[2 *], Masoud Shaabanzadeh[3], Ahmad majd[1]

1- Department of Biology, NT.C., Islamic Azad University, Tehran, Iran
2- Department of Biology, YI.C., Islamic Azad University, Tehran, Iran
3- Department of Chemistry, Da.C., Islamic Azad University, Damghan, Iran
*Corresponding Author: maryam.bikhof@gmail.com, bikhof@iau.ac.ir

Abstract

Graphene quantum dots (GQDs), due to their intrinsic fluorescence properties and drug-loading capacity, are considered promising candidates for drug delivery systems and bioimaging applications. Investigating the fluorescence characteristics and cellular internalization of these nanocarriers is crucial for therapeutic and imaging purposes. The aim of this study was to evaluate the effect of a targeted tamoxifen nano-drug on MCF-7 breast cancer cells and to assess its simultaneous imaging potential. For this purpose, TMX-FPGs were synthesized using GQDs coated with polyethylene glycol (PEG) and folic acid (FA), followed by the loading of tamoxifen (TMX). The fluorescence characteristics of TMX-FPGs were analyzed using fluorescence spectroscopy. MCF-7 cells were treated with TMX-FPGs at a concentration of 50 µg/ml, and after 2 hours of incubation, their cellular uptake and fluorescence emission were evaluated using confocal laser scanning microscopy. The fluorescence spectrum of TMX-FPGs revealed the highest emission intensity at the excitation wavelength of 360 nm, while a significant fluorescence signal was also observed within the excitation range of 340–380 nm, which was applied for confocal imaging. Confocal microscopy confirmed the successful internalization and intracellular distribution of TMX-FPGs, showing remarkable fluorescence intensity in treated MCF-7 cells compared with the control group. These findings indicate that TMX-FPGs can serve both as a targeted nano-drug and a cellular imaging probe, providing substantial potential for evaluating drug uptake and advancing targeted breast cancer therapies.

keywords: Tamoxifen, Breast cancer, Targeted drug delivery, Confocal imaging

21875 - Oral

Comparative study of the function of two heterologous proteins, pyosin and endolysin, in biofilm destruction and cytotoxicity

Farnoosh Majlesain[1], Yaser Solhi[1], Shamsozoha Abolmaali[2], Shakiba Darvish Alipour Astaneh[1*]

1- Department of Biotecnology, Semnan University, Semnan, Iran
2- Department of Biology, Semnan University, Semnan, Iran

*Corresponding author: darvishalipour@semnan.ac.ir

Abstract

Antimicrobial compounds produced by microorganisms are of interest because of their ability to specifically target pathogens without harming the host's natural microbiome. This study aimed to compare the cytotoxicity and biofilm-disrupting ability of two heterologous proteins, pyocin and endolysin. The endolysin LysFM, derived from the Pseudomonas aeroginosa Sem1 phage (genus Pbunavirus, order Caudovirales), was compared with pyocin type S1 in terms of structure and function. LysFM with a molecular weight of 24 kDa consists of 55.45% alpha helix, 5% extended strand, 3.64% beta helix, and 35.91% random coil. In contrast, 65 kDa pyocin S1 comprises 47.7% alpha helix, 11.3% beta strand, and 40.9% random coil. The high alpha helix content in both proteins indicates structural stability. Notably, the HNH endonuclease motif, known for nuclease activity, was identified in pyocin and is evolutionarily conserved across different bacterial lineages. Phylogenetic analysis showed that the HNH domain is common among various bacteriocin families, suggesting a shared evolutionary origin with preserved function. Functional assays demonstrated that 1 µg of pyocin S1 effectively degrades both prokaryotic and eukaryotic RNA and DNA, reducing P. aeruginosa biofilm formation by up to 42%. LysFM exhibited enzymatic activity of 2 Units/ml and achieved 94.4% biofilm degradation. Surprisingly, both proteins were non-cytotoxic on the A549 human lung epithelial cell line. Taken together, by disrupting biofilms, the combined use of pyocin S1 and LysFM endolysin shows promising potential for treating P. aeruginosa infections while maintaining host cell viability.

keywords: Biofilm, Cytotoxicity, Endolysin, Endonuclease, Pseudomonas aeruginosa, Pyocin.

22511 - Poster

Postbiotic Derivatives of Lactobacillus casei as Promising Anticancer Agents Against Breast and Colorectal Cancer Cells

Farzaneh Tafvizi[1] *, Zahra Haji Mehdi Nouri[2]

1- Department of Biology, Pa.c., Islamic Azad University, Parand, Iran
2- Department of Biology, ShQ.C.,.Islamic Azad University,Shahr-e Qods,Iran
*Corresponding Author: farzanehtafvizi54@gmail.com, farzaneh.tafvizi@iau.ac.ir

Abstract

AbstractIn recent years, increasing attention has been directed toward the role of probiotics in the prevention and treatment of cancer. Beyond probiotics, their non-viable derivatives or secreted metabolites—collectively termed postbiotics—have also emerged as promising candidates in oncology research due to their immunomodulatory, anti-inflammatory, and anticancer properties. Among these, the cell-free supernatant derived from probiotic cultures, enriched with a variety of bioactive molecules, has shown considerable therapeutic potential.The present study evaluated the anticancer effects of the supernatant obtained from Lactobacillus casei on breast cancer (MCF-7) and colorectal cancer (HT-29) cell lines. Following extraction, cells were exposed to different concentrations of the bacterial supernatant, and MTT assay was employed to assess cell viability. In addition, alterations in the expression of two apoptosis-related genes (BAX and BCL2) were quantified using qRT-PCR.The results demonstrated a significant, dose-dependent reduction in cell viability in both cancer cell lines following treatment with the bacterial supernatant. Furthermore, gene expression analysis revealed upregulation of BAX and downregulation of BCL2, indicating the activation of apoptotic pathways. Notably, negligible cytotoxicity was observed in normal fibroblast cells (HFF), suggesting a selective anticancer effect.In conclusion, these findings highlight that L. casei-derived postbiotics possess considerable potential to inhibit cancer cell proliferation through the induction of apoptosis. Such postbiotics may represent a novel and complementary therapeutic strategy in the management of breast and colorectal cancers.Keywords: Apoptosis, Breast Cancer, Colorectal Cancer, Supernatant, Lactobacillus casei

Keywords: Apoptosis, Breast Cancer, Colorectal Cancer, Supernatant, Lactobacillus casei

21475 - Poster

HMG Proteins and Their Role in Chromatin Structure and Function

Fatemeh Aghazadeh[1 *]

Department of Cell and Molecular Biology, Faculty of Biology, Faculties of Sciences, University of Tehran, Tehran, Iran
*Corresponding author's e-mail: fatemeh.aghazadeh@ut.ac.ir

Abstract

The aim of this study is to investigate the role of the HMG protein family in the structure and function of chromatin. HMG proteins are a group of small, non-histone proteins with high mobility that have the ability to bind to DNA. Through this mechanism, they participate in various cellular processes such as gene expression regulation, cell proliferation, and DNA repair. These proteins are classified into three superfamilies: HMGA, HMGN, and HMGB, each of which is divided into different subgroups with unique structures and functions within the cell. The roles of these proteins in cancer occurrence, apoptosis, signaling pathways, blood sugar regulation, and immunity have also been demonstrated. This review study was conducted by collecting and analyzing reputable domestic and international articles. The findings of this study indicate that HMG proteins can enhance chromatin stability and flexibility by altering chromatin dynamics, or conversely, facilitate the binding of transcription factors by loosening the structure. Initially, the structure and function of each group within the HMG protein family are examined separately, followed by their impact on chromatin structure and function. Post-translational modifications in HMG proteins can affect chromatin's binding affinity to other proteins, which is examined in this research.

Keywords: HMG proteins, histones, chromatin

21600 - Poster

Biphasic DNA Damage in Senescent Cells

Parisa Moghadam[1], Shiva Akbari-Birgani[1, 2*]

1- Department of Biological Sciences, Institute for Advanced Studies in Basic Sciences, Zanjan, Iran
2- Research Center for Basic Sciences and Modern Technologies (RBST), Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran

*Corresponding author: sh.akbari@iasbs.ac.ir

Abstract

Cellular senescence is a cell cycle arrest that occurs in response to stressors such as DNA damage and oxidative stress. In this study, mesenchymal stem cells (MSCs) were induced to undergo senescence and the dynamics of DNA damage over time were examined. Comet assay analysis revealed a biphasic pattern of DNA damage, in which two distinct peaks were observed at different times. Further investigation revealed that the secondary wave of DNA damage was accompanied by a significant increase in reactive oxygen species (ROS), suggesting a role for ROS in genomic instability. The mitochondrial membrane potential (ΔΨm) was also assessed, showing an initial decrease coinciding with the first peak of DNA damage. This temporal relationship between ΔΨm fluctuations and DNA damage stages suggests a role for mitochondria in senescence-associated DNA damage. Furthermore, the correlation between increased ROS and secondary DNA damage implicates oxidative stress as a key factor in genomic instability of senescent stem cells. These results provide new insights into the mechanistic relationship between mitochondrial dysfunction, ROS accumulation, and biphasic DNA damage during cellular senescence. This study highlights the importance of mitochondria and DNA damage in progressing senescence.

keywords: Senescence, Genomic instability, Mesenchymal stem cell, ROS, Mitochondria

21537 - Poster

Effects of BDNF receptor antagonist on the acquisition and expression of morphine conditioned place preference and NAc-BDNF levels and apoptotic cells in rats.

Hassan Jorjani[1 *], Hossein Miladi-Gorji[1]

1- Resserch Center and Department of Physiology, School of Medicine, Semnan University of Medical Sciences, Semnan, Iran.
*Corresponding Author: miladi331@yahoo.com

Abstract

Brain-derived neurotrophic factor (BDNF) plays a critical role in opioid-induced neuronal plasticity, especially within dopaminergic neurons, and modulates morphine-induced conditioned place preference (CPP). This study aimed to investigate the effect of ANA-12, a selective TrkB receptor antagonist, on the acquisition and expression of CPP, as well as on BDNF protein levels and apoptosis in the nucleus accumbens (NAc) of male Wistar rats. In this controlled experimental study, 48 male Wistar rats (200–250 g) underwent a five-day CPP protocol, comprising preconditioning, conditioning, and postconditioning phases. Bilateral cannulation targeting the central region of the NAc was performed, followed by recovery and CPP conditioning. ANA-12 (0.3 µg/0.5 µl per side) was microinjected bilaterally into the NAc either prior to morphine administration during conditioning sessions to evaluate acquisition or after conditioning to assess expression. BDNF levels and apoptotic cell counts were measured using ELISA and TUNEL assays, respectively, at the conclusion of each phase. Results demonstrated that ANA-12 significantly inhibited both acquisition and expression of morphine-induced CPP. Morphine significantly increased BDNF expression and apoptosis in the NAc; these effects were attenuated by ANA-12 during the acquisition phase but remained unaffected during expression. These findings highlight the pivotal involvement of the TrkB signaling pathway in mediating morphine's rewarding effects. Pharmacological inhibition of TrkB by ANA-12 may represent a promising strategy to reduce morphine-associated conditioned behaviors. Identifying the effects of ANA-12 in inhibiting morphine-induced synaptic changes opens up a new horizon in the development of targeted treatments for opiate addiction.

keywords: Morphine, Antagonist receptor BDNF, Acquisition and expression of morphine-induced conditioned place preference, BDNF levels, Apoptosis, The nucleus accumbens, Rats.

21367 - Poster

The Effect of High-Intensity Interval Training (HIIT) on VEGF and Inflammatory Cytokines IL-18 and IFN-γ in the Hippocampus of Aged

Neda Noroozi*

Department of Sport Physiology, Shahid Chamran University of Ahvaz, Ahvaz, Iran

*Corresponding author: n-noroozi@stu.scu.ac.ir

Abstract

Aging is associated with cognitive decline, neuroinflammation, and reduced regenerative capacity in brain tissue. The hippocampus, a central structure for learning and memory, is especially vulnerable during the aging process. Elevated levels of pro-inflammatory cytokines such as interleukin-18 (IL-18) and interferon-gamma (IFN-γ), alongside reduced expression of vascular endothelial growth factor (VEGF), are key molecular changes linked to aging-related neurodegeneration. In recent years, high-intensity interval training (HIIT) has emerged as a promising non-pharmacological intervention for modulating inflammatory responses and improving brain function in the elderly. This study aimed to investigate the effects of a 6-week HIIT protocol on hippocampal levels of VEGF protein and mRNA expression of IL-18 and IFN-γ in aged male Wistar rats. Animals were randomly assigned to three groups: young control, aged control, and aged-HIIT. The training group performed treadmill-based HIIT five sessions per week for six weeks. At the end of the intervention, hippocampal tissues were extracted and analyzed using Western blot and Real-time PCR techniques. The results showed a significant increase in VEGF levels and a significant decrease in IL-18 and IFN-γ expression in the HIIT group compared to the aged control. These findings suggest that HIIT may reduce neuroinflammation and promote neurovascular remodeling by modulating key molecular markers. Overall, HIIT represents a low-cost, effective, and non-pharmacological strategy to enhance cognitive health in aging and may offer preventive potential against neurodegenerative conditions such as Alzheimer's disease.

keywords: Neuroinflammation, HIIT, VEGF, IL-18, ; IFN-γ

22515 - Poster

High Fat Diet-Induced Cognitive Decline and Hippocampal Atrophy in Adult Male Rats

Gohar Sharie Hosseini[1 *]

1- Department of Biology/ College of Science, Shiraz University, Shiraz, Iran
*Corresponding Author: hosseini311@gmail.com

Abstract

A growing body of evidence suggests that dietary habits, particularly those high in fat, can negatively impact cognitive function and neuroplasticity. The hippocampus, a brain structure critical for spatial learning and memory, is particularly vulnerable to diet-induced changes. This study was designed to investigate the effects of a long-term high-fat diet (HFD) on learning and memory performance and to examine associated morphological changes in the hippocampus of adult male rats.Twenty adults male Wistar rats were randomly divided into a control group fed a standard diet and a treatment group fed a high-fat diet for 2 months. Following the dietary intervention, learning and memory were assessed using the Morris water maze (MWM) test, and hippocampal morphology was examined through histological analysis.The results showed a significant impairment in learning and memory in the HFD group compared to the control group. This was demonstrated by a substantial and statistically significant increase in both the latency period and the total path length to locate the hidden platform in the MWM. Histological findings further revealed a significant reduction in the thickness of hippocampal layers in the HFD-fed rats compared to the control animals.In conclusion, these findings demonstrate that a long-term high-fat diet can induce significant cognitive impairment in adult male rats. The observed deficits in learning and memory are associated with adverse morphological changes in the hippocampus, suggesting that high-fat diet-induced neuroanatomical alterations may be a primary mechanism contributing to cognitive decline. More stereological studies of the brain's hippocampus are recommended

keywords: Dietary Fat, Learning and Memory, Hippocampus.

22613 - Poster

The Effect of Melissa officinalis Extract on the Viability of HeLa Cells Using the Trypan Blue Assay

Somayeh Ahmadi[1], Somayeh Farahmand[1], Sima Nasri[1*], Fatemeh Shahi[1]

1- Department of Biology, Payame Noor University, Tehran, Iran

*Corresponding author: s_nasri1@pnu.ac.ir

Abstract

The Effect of Melissa officinalis Extract on the Viability of HeLaCells Using the Trypan Blue AssaySomayeh Ahmadi1, Somayeh Farahmand1, Sima Nasri*1, Fatemeh Shahi11Department of Biology, Payame Noor University, Tehran, Iran*Corresponding author's e-mail: s_nasri1@pnu.ac.irAbstract: Melissa officinalis (lemon balm), a member of the Lamiaceae family, possesses antioxidantproperties that can protect cells against damage. Cervical cancer is among the most common cancersworldwide. In the present study, the effects of treatment with a hydroalcoholic extract of M. officinalisat concentrations of 50, 200, and 800 µg/ml on the viability of HeLa cancer cells were evaluated at 24,48, and 72 hours. HeLa cells were cultured and, upon reaching a density of 5,000 cells, were harvestedand centrifuged. Subsequently, 10 µl of the cell suspension was transferred into a vial, and an equalvolume (10 µl) of trypan blue dye was added. The mixture was then loaded onto a Neubauer chamber,and viable and non-viable cells were counted under a microscope. The results indicated that at 24 and48 hours, treatment with different concentrations of the extract showed no significant effect on cellviability. However, at 72 hours a marked reduction was observed, with cell viability rates of 90%, 27%, and 7% at 50, 200, and 800 µg/ml, respectively. These findings suggest that M. officinalis extract,particularly at higher concentrations and longer exposure times, significantly reduces the viability ofHeLa cancer cells.Keywords: Melissa officinalis, hydroalcoholic extract, HeLa cancer cells, trypan blue assay

keywords: Melissa officinalis, Hydroalcoholic extract, HeLa cancer cells, Trypan blue assay

22605 - Poster

Anti-inflammatory effects of chitosan-rosmarinic acid-gallic acid on diabetic wound healing

Razieh Sanjari[1], Mohammad Amin Edalatmanesh[1], Mohsen Forouzanfar[2 *], Fatemeh Honarasa[3], Heydar Aqababa[4]

1- Department of Biology, Shiraz Branch, Islamic Azad University, Shiraz, Iran
2- Department of Biology, Marvdasht Branch, Islamic Azad University, Marvdasht, Iran
3- Department of Chemistry, Shiraz Branch, Islamic Azad University, Shiraz, Iran
4- Department of Biology, Arsanjan Branch, Islamic Azad University, Arsanjan, Iran
*Corresponding Author: mforozanfar@yahoo.com

Abstract

This study investigates the regenerative, regenerative, and anti-inflammatory effects of a combined formulation of chitosan-rosmarinic acid-gallic acid in the treatment of diabetic ulcers in rats. The effect of these compounds on the expression of key wound healing factors, including Wnt, β Catenin, and VEGF genes, was also examined. This formulation was made by combining chitosan and gallic acid with ethanolic extract of rosemary obtained through thermal extraction, which resulted in the production of nanosolutions and topical ointments. Forty-eight male Wistar rats were divided into six groups of eight:a healthy control group, a patient control group, and four experimental groups were treated with chitosan, rosmarinic acid, gallic acid, or a triple combination of chitosan/rosmarinic acid/gallic acid. Wounds were created on their backs and diabetes was induced. The effect of the active ingredients on wound healing was examined by histological staining such as hematoxylin-eosin and molecular analyses such as PCR. The results showed that the treatment groups including chitosan, rosemary, and gallic acid compounds and the ternary combination of chitosan/rosmarinic acid/gallic acid had significant improvements in reducing inflammation, increasing collagen and blood vessels, and skin repair compared to the control group ($P < 0.01$ and $P < 0.05$). This study emphasizes the importance of nanoparticles in wound healing processes and reducing inflammation, and demonstrates the high potential of these compounds in accelerating the wound healing process.

keywords: Extract, Improvement, Tissue, Rat

21300 - Poster

Evaluating the effect of exosome-encapsulated miR-4289 on menstrual blood-derived mesenchymal stem cells from endometriosis patients

Solmaz Mahmoudi[1], Azar Sheikholeslami[2 *], Nasim Hayati Roodbari[3], Ehsan Ehsani[4]

1- Phd student in Department of Biology, Islamic Azad University Tehran Science and Research Branch, Tehran
2- Department of Cell Biology and Regenerative Medicine, Academic Center for Education, Culture and Research, Qom Branch, Qom, Iran
3- Department of Biology, SR.C., Islamic Azad University, Tehran, Iran
4- Department of Biology, Faculty of Sciences, Islamic Azad University, Roudehen Branch, Roudehen, Iran
*Corresponding Author: azareslami10@gmail.com

Abstract

Endometriosis is a benign, yet chronic gynecological disorder characterized by deregulation in processes such as inflammation, angiogenesis, migration, apoptosis, and proliferation. Menstrual blood derived endometrial stem cells play a crucial role in the retrograde development and progression of endometriotic lesions. To evaluate the therapeutic potential of exosomes derived from menstrual blood derived stem cells, exosomes from non-endometriotic MenSCs (NE-MenSCs), both unmodified (Exo) and transfected with miR 4289, were applied as treatments to MenSCs from endometriosis cell line (E-MenSCs). Publicly available databases were used to identify key genes and signaling pathways implicated in endometriosis, from which miR 4289 was selected as an effective regulatory microRNA. Following treatment, cellular migration was assessed by scratch assays; gene expression was evaluated via real-time PCR; protein levels of ROS, IL 10, and IL 1β were measured by ELISA; and ESR1, CTNNB1, and Ki67 levels were determined by Western blotting. The results indicate that treatments significantly reduced the expression of genes associated with inflammation, proliferation, migration, and the Wnt/β catenin pathway. Scratch assays and reductions in MMP9 expression suggest decreased migration in the Exo and miR Exo groups. The expression of CTNNB1, IL 1β, and IL 10 was significantly downregulated in treated groups compared to E-MenSCs. In addition, KRAS and IDO1 expression levels were significantly decreased following treatment, and Ki67 protein levels were reduced notably in the miR and miR Exo groups. These findings provide preliminary evidence for the therapeutic potential of MenSC derived exosomes, particularly when loaded with miR 4289, as a novel treatment approach for endometriosis.

keywords: Mesenchymal stem cells, microRNA, Exosome, Transfection, Endometriosis.

22174 - Poster

Combinatorial Administration of an Ellagitannin Derivative with Chemotherapy Enhanced Toxicity in MKN-45 Cells

Fatemehsadat Hosseini[1], Abdolreza Ahmadi[1], Mohammadreza Hosseinzadeh[2], Milad Iranshahy[3], Fatemeh B. Rassouli[4 *]

1- Novel Diagnostics and Therapeutics Research Group, Institute of Biotechnology, Ferdowsi University of Mashhad, Mashhad, Iran.
2- Department of Molecular and Cell Biology, Faculty of Basic Science, University of Mazandaran, Babolsar, Iran.
3- Biotechnology Research Center, Pharmaceutical Technology Institute, Mashhad University of Medical Sciences, Mashhad, Iran.
4- Department of Biology, Faculty of Science, Ferdowsi University of Mashhad, Mashhad, Iran.
*Corresponding Author: behnam3260@um.ac.ir

Abstract

Gastric adenocarcinoma (GA) ranks as the fourth most deadly cancer worldwide. The effectiveness of chemotherapy in GA patients is often limited, largely due to the enhanced function of ATP-binding cassette (ABC) transporters that promote drug resistance. Addressing this challenge, our study explores, for the first time, the role of a natural ellagitannin derivative in improving chemotherapy response in GA cells. The expression of ABC transporters and their clinical significance were validated in GA tissues. Urolithin A (UroA) was synthesized and MKN-45 cells were treated, alone and in combination with doxorubicin (DXR). Cell viability was assessed by resazurin, flow cytometry was performed for apoptosis detection and molecular docking was carried out to predict the interaction of UroA with ABC transporters. Upregulations of ABCG2, ABCB1, and ABCC1 were detected in GA tissue samples, correlating with poorer patient survival. Combining UroA with DXR enhanced the toxic impact of chemotherapy on MKN-45 cells. Docking studies supported the strong interaction between UroA and the selected ABC transporters. These results offer new mechanistic understanding of UroA ability to counteract chemoresistance and underscore the therapeutic promise of targeting ABC transporters to boost chemotherapy success in gastric adenocarcinoma.

keywords: Gastric adenocarcinoma, Urolithin A, Drug transporter, Synergistic effect, Doxorubicin.

22089 - Poster

Investigation of the Antioxidant Effect of Indigenous Iranian probiotic Mix on Motor Disorders in Male parkes Rats With 6-Hydroxydopamine(6-OHDA) Induced parkinsonism

Bahareh Pakpour[1 *], Zeynab Ghasemi jajelo[1], Arefeh Miyan mahalleh[2]

1- Department of biology, CT.C., Islamic Azad University, Tehran, Iran
2- Department of biology, YI.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: ba.pakpour@iau.ac.ir

Abstract

Parkinson's disease, after Alzheimer's, is the second most common neurodegenerative disorder caused by the degeneration of dopaminergic neurons in the substantia nigra, resulting in motor and cognitive impairments. Oxidative stress and mitochondrial dysfunction are considered key factors in the progression of this disease. In the present study, the antioxidant effect of a mix of indigenous Iranian probiotics on motor impairments in rats modeled with 6-hydroxydopamine(6-OHDA) induced Parkinsonism was examined. The Parkinson's model was established by injecting 6-OHDA into the striatum of experimental rats. The animals received daily treatment with the probiotic mix for 21 days. The effects of the treatment were assessed through behavioral tests, including the apomorphin-induced rotation test (to evaluate dopaminergic neuron lesions) and anxiety testing using an elevated + maze. Additionally, the SOD factor was measured by the Elisa method as an indicator of antioxidant activity. Results showed that treatment with the probiotic mix improved motor symptom, enhanced behavioral performance, and increased antioxidant levels. This study highlights the importance of using indigenous Iranian probiotics for the effective and cost-efficient management of neurodegenerative diseases such as parkinson's.

keywords: Parkinson's, SOD, 6-hydroxydopamine (6-OHDA), Indigenous Iranian Probiotics, Male rats

21865 - Poster

MTT and Flow Cytometric Assays of a Native Actinobacterial Strain on Gastric Cancer Cells

Atefeh Parsamehr[1], Ensieh Salehghamari[2*]

1- Department of Biology, Faculty of Science, University of Guilan, Rasht, Iran
2- Department of Cell and Molecular Biology, Faculty of Engineering and Science, Kosar University of Bojnord, Bojnord, Iran

*Corresponding author: esaleh@kub.ac.ir

Abstract

Gastric cancer continues to be a major contributor to global cancer-related deaths, highlighting the urgent need for innovative treatment approaches. Actinobacteria, particularly marine-derived strains, have emerged as a promising source of bioactive compounds with anticancer potential. In this study, we investigated the cytotoxic effects of Streptomyces sp. M4 extract on the AGS gastric cancer cell line, and we evaluated the effects of the extract on the rate of cell death. The MTT assay confirmed the extract's potent cytotoxic activity with an IC50 value of 26.15 µg/ml. After 24 hours of treatment, the results also demonstrate dose and time-dependent cytotoxicity. Annexin-PI staining and flow cytometry analyses revealed that Streptomyces sp. M4 extract significantly induced apoptosis in AGS cells, as evidenced by a 79.35% increase in apoptosis rate compared to the control group. These findings indicate that Streptomyces sp M4 extract has cytotoxic effects against the AGS cell line, highlighting the importance of additional research to explore its therapeutic potential in gastric cancer.

keywords: Actinobacteria ،AGS cells ،Streptomyces ،apoptosis ،cytotoxicity

22302 - Poster

Anti-inflammatory and Antimicrobial Effects of Mucin 17 as an Antimicrobial Peptide

Bahar Nasiri[1], Hoda Ayat[1] *

1- Department of Genetics, Faculty of Basic Sciences, Shahrekord University, Shahrekord, Iran
*Corresponding Author: hoda.ayat@gmail.com

Abstract

Antimicrobial peptides are a group of small peptides that constitute part of the innate immune system of organisms and can be applied in the treatment of infections, particularly those caused by drug-resistant microbes. In addition to their antibacterial activity, these peptides exhibit diverse biological functions such as immune response regulation, anti-inflammatory effects, angiogenesis, wound healing, and antitumor activity. Mucin 17 is one of the antimicrobial peptides whose antimicrobial effects have been demonstrated in previous studies. The aim of the present study was to investigate the anti-inflammatory activity of Mucin 17 in an animal model. For this purpose, inflammation was induced in mice using acetic acid, and recombinant Mucin 17 peptide was applied to the site of inflammation. Following treatment, changes in the expression of inflammatory genes and tissue status were evaluated using molecular and imaging techniques. The results showed that Mucin 17 reduced skin inflammation, decreased the expression of pro-inflammatory genes TNF-α and NFκB, and improved tissue morphology. These findings indicate that, in addition to its antimicrobial activity against several bacterial species, Mucin 17 also possesses the ability to attenuate inflammatory responses and may serve as a potential candidate for therapeutic applications in inflammatory and infectious diseases.

keywords: Mucin 17; Antimicrobial peptides; Inflammation; Anti-inflammatory effect

22499 - Poster

Targeting PC3 Prostate Cancer Cells with the Repurposed Drug Fenbendazole

Maryam Ganjizadeh[1], Seyed Mohammad Kazem Aghamir[2*], Soyar Sari[1], Fatemeh Khatami[2]

1- Department of Cellular and Molecular Biology,TeMS.C., Islamic Azad University, Tehran, Iran
2- Urology Research Center, Tehran University of Medical Sciences, Tehran, Iran

*Corresponding author: mkaghamir@tums.ac.ir

Abstract

Fenbendazole a drug commonly used to treat parasitic infections, has recently gained attention for its potential anticancer effects. In this study, we assessed its impact on PC3 prostate cancer cells. Fenbendazole treatment significantly reduced cell viability and induced apoptosis, accompanied by cell cycle arrest, indicating interference with pathways essential for cancer cell survival. In addition, the drug inhibited cell migration and suppressed 3D spheroid formation, suggesting a potential to limit tumor growth and metastasis. Molecular analysis revealed an increased BAX/BCL2 ratio, indicating enhanced pro-apoptotic signaling, while the expression of angiogenesis-related genes VEGF-C and HIF-1α was downregulated. Markers of epithelial-mesenchymal transition, including SNAIL and E-Cadherin, were also decreased, reflecting reduced cellular plasticity and motility. Furthermore, the prostate-specific biomarker KLK3 showed reduced expression, confirming Fenbendazole's effect on key prostate cancer pathways. These results demonstrate that Fenbendazole exerts multiple anticancer effects in PC3 cells, acting through apoptosis induction, inhibition of migration, and suppression of angiogenesis and EMT. Given its well-established safety profile and low cost, Fenbendazole represents a promising candidate for repurposing as a therapeutic strategy in prostate cancer. Further in vivo studies and clinical evaluations are warranted to validate its potential and explore its use as a low-cost anticancer therapy.

keywords: Fenbendazole, prostate cancer, PC3 Cells, Apoptosis, Angiogenesis

21979 - Poster

In Silico Analysis of the XRCC3 Gene Involved in Breast Cancer and its Potential Link to Ovarian Cancer Susceptibility

Mohammadreza Hosseinzadeh[1], Fatemeh Jafari[1], Majid Tafrihi[1 *]

1- Department of Molecular and Cell Biology, Faculty of Basic Sciences, University of Mazandaran, Babolsar, Iran
*Corresponding Author: m.tafrihi@umz.ac.ir

Abstract

Abstract: Breast cancer is the most prevalent cancer among women, worldwide. Previous studies have demonstrated increased expression of the tumor suppressor genes BRCA1, BRCA2, TP53, and XRCC3 in breast cancer cells. In addition, RAD51 upregulation, which encodes the RAD51 recombinase, has been observed in ovarian cancer. This study investigates the correlation of the XRCC3 gene in breast cancer with increased risk of ovarian cancer, using an in-silico analysis (computational studies). Previous studies showed that the XRCC3 gene is associated with breast cancer and the RAD51 gene is associated with ovarian cancer, while strong interactions between these two genes have also been observed in studies; therefore, the investigation of their co-expression in the risk of ovarian and breast cancer is of importance. In this study, various online databases including NCBI, GeneMANIA, and MalaCards were used. Our study revealed that the XRCC3 is co-expressed with RAD51 gene, particularly RAD51C variant, both of which are involved in homologous recombination and the DNA repair. Data from the MalaCards database also indicated that the expression of RAD51 genes is currently associated with ovarian cancer, with a score of 128.46. So, it can be proposed that investigating the inhibition of the XRCC3 gene alongside RAD51 suppression in breast cancer patients may serve as a potential strategy for future researchers to manage and prevent the ovarian cancer in population.

keywords: Breast cancer, Ovarian cancer, XRCC3 gene, RAD51 gene.

21976 - Poster

Investigating of EGFR and p-EGFR (Y1061) expression through the Hippo signaling pathway in MDA-MB-231 breast cancer cells after treatment with secretome of stem cells

Shakiba Khanalizade Shafie[1], Fateme Safari[1 *]

1- University of Guilan
*Corresponding Author: fsafari@guilan.ac.ir (f.safari)

Abstract

Breast cancer, with its considerable heterogeneity and multiple molecular subtypes, is the most prevalent malignancy among women and a leading cause of cancer-related deaths worldwide. Its complexity necessitates the development of advanced therapeutic approaches, particularly targeted strategies that improve efficacy and reduce toxicity by addressing molecules essential for tumor proliferation and survival. Mesenchymal stem cells (MSCs) and their bioactive secretome have been reported to attenuate cancer cell characteristics such as migration and proliferation. The Hippo signaling pathway is a key regulator of cell proliferation and apoptosis, and overexpression of epidermal growth factor receptor (EGFR) and its phosphorylated form (p-EGFR) is associated with enhanced tumor growth and metastasis in certain breast cancer subtypes. This study evaluated the effects of human amnioticmesenchymal stem cells (hAMSCs) secretome on MDA-MB-231 breast cancer cells, focusing on EGFR and p-EGFR (Y1061) expression through the Hippo signaling pathway. In this respect, MDA-MB-231 cells and hAMSCs were co-cultured using Transwell plates (with hAMSCs placed in the upper chamber and MDA-MB-231 cells in the lower chamber). The basal culture media was DMEM enriched with 10%FBS, 100 µg/mL penicillin G/streptomycin, and 1% L-glutamine. After 72 hours of incubation, protein samples from control and treated cells were analyzed by Western blotting. The results indicated that the hAMSC secretome significantly reduced p-EGFR (Y1061) levels, suggesting activation of the Hippo signaling pathway. Such activation may suppress tumor progression, highlighting the potential of hAMSC-derived secretome as a novel supportive therapeutic approach in breast cancer management.However, more experiments will be required to clarify other key molecules in the Hippo signaling pathway.

keywords: Breast cancer cells, Stem cell' secretome, EGFR, p-EGFR, Cancer therapy, Hippo signaling pathway

21998 - Poster

Evaluation of AXIN Protein Expression in Panc1 Pancreatic Cancer cells Following Treatment with Human Amniotic Mesenchymal Stem Cell Secretome

Mahla Durouhi[1], Fatemeh Safari[1 *]

Department of Biology, Faculty of Science, University of Guilan, Rasht, Iran

*Corresponding author: fsafari@guilan.ac.ir

Abstract

AbstractPancreatic cancer is one of the most aggressive malignancies with poor survival rates and limited therapeutic options. The Wnt/β-Catenin signaling pathway plays a critical role in regulating cell proliferation, differentiation, and survival, and its dysregulation has been closely linked to tumor progression. AXIN is a key negative regulator of this pathway, and its expression level can significantly influence Wnt activity. Recent studies suggest that stem cell-derived secretomes may modulate cancer-related pathways through complex bioactive components. In this study, the effect of human amniotic mesenchymal stem cells (hAMSCs) secretome on the expression of AXIN protein was investigated in Panc1 pancreatic cancer cells. In this regard, a co-culturing system (transwell) was employed. Panc1 cells and hAMSCs were co-cultured for 72 hours, with Panc1 cells cultured separately serving as the control group. The basal culture media was DMEM enriched with 10% FBS, 100 µg/mL penicillin G/streptomycin, and 1% L-glutamine. Following a 72-hour period, the Panc1 cancer cells, encompassing both control and co-cultured groups, were collected for subsequent Western blot analysis. Our results demonstrated a significant upregulation of AXIN protein in secretome-treated cells compared to controls. This upregulation may reflect the regulatory impact of secretome components on the Wnt signaling pathway and suggest a potential anti-tumor effect. However, we used a single cancer cell line in this study, which may not represent the heterogeneity of pancreatic tumors. Further studies using multiple cell lines and in vivo models are recommended to validate these findings and better understand the therapeutic potential of stem cell-derived secretome in pancreatic cancer treatment.

keywords: AXIN expression, Panc1 pancreatic cancer cells, Secretome of stem cells, Wnt signaling pathway, Cancer therapy

22206 - Poster

Investigation of the Bioactive, Anti-inflammatory, and Antimicrobial Potential of Venom from the Persian Gulf Cowtail Stingray (Pastinachus sephen) and Its Effects on Pro-inflammatory Cytokines (TNF-α and Interleukin-6)

Amirali Shahabi[1], Rezvan Mousavi Nadooshan[1], Maryam Mousavi Bolfeh Teymoori[1], Mohammad Nabiyouni[2 *]

1- Department of Biotechnology, Faculty of Biological Sciences, North Tehran Branch, Islamic Azad University, Tehran, Iran
2- Department of Cellular & Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: nabiuni@khu.ac.ir

Abstract

Marine toxins contain bioactive compounds with therapeutic potential. This study investigated the toxicity and antimicrobial effects of Pastinachus sephen venom. For this purpose, the venom was extracted from fish spines using methanol-water (70:30). Cytotoxicity was evaluated on RAW 264.7 macrophages using the MTT assay. Additionally, antimicrobial activity was measured against P. aeruginosa and B. subtilis using the disk diffusion method.The venom's IC50 was found to be 28.5 ± 1.8 µg/ml. Furthermore, inhibition zones for P. aeruginosa and B. subtilis were observed to be 18.3 ± 1.2 mm and 15.7 ± 0.8 mm, respectively. The findings indicate the therapeutic potential of P. sephen venom. The compounds in this venom could be used in the development of new drugs. It is suggested that in future studies, the effective compounds be isolated and identified using advanced chromatographic methods. This research could lead to the development of new antibacterial and anticancer agents.

keywords: Pastinachus sephen, Cytotoxicity, Antimicrobial activity, MTT assay, Inhibition zone

22500 - Poster

Effect of Monoammonium Phosphate Fertilizer on Nucleolus Number and Nucleolus-to-Nucleus Area Ratio in Meristematic Root Cells of Allium cepa L

Tayebeh Moradi Alvand[1], Zahra Zendehboodi[1 *]

1- Department of Biology, Shiraz University, Shiraz, Iran
*Corresponding Author: zahrazendehboody@yahoo.com

Abstract

Phosphate chemical fertilizers, despite their important role in plant nutrition, may affect cellular structure when applied excessively. This study aimed to investigate the effect of monoammonium phosphate (MAP) fertilizer on the nucleolar characteristics of meristematic root cells in edible onion (Allium cepa L.). After rooting in distilled water, the onions were exposed to either a solution containing 4000 mg/L MAP or distilled water (negative control) for 47 hours. Also, a positive control group was treated with 15 mM hydrogen peroxide for 18 hours. Following treatment, the roots were stained with Schiff's reagent, and the slides were prepared from the meristematic region of the roots. Five roots were selected from each sample and the nuclear and nucleolar areas of ten cells from each root were measured using ImageJ software. Also, the number of nucleolus per cell in 10 cells from each root was calculated. The mean nucleolus number in the MAP treatment (1.54 ± 0.42) and in the positive control (1.39 ± 0.09) showed a significant increase compared to the negative control (1.20 ± 0.09) ($\chi^2 = 3.971$, $df = 1$, $P = 0.046$). The nucleolus-to-nucleus area ratio in MAP treatment (0.41 ± 0.08) and in the positive control (0.37 ± 0.03) was significantly higher than that in the negative control (0.26 ± 0.01) ($\chi^2 = 3.857$, $df = 1$, $P = 0.05$). Conversely, the mean nuclear area in the MAP treatment (0.50 ± 0.06) was significantly lower than that in the negative control (0.70 ± 0.06) ($\chi^2 = 3.857$, $df = 1$, $P = 0.05$). Overall, the results indicate that exposure to MAP at this concentration increases the number of nucleoli and nucleolus-to-nucleus area ratio while reducing nuclear area, suggesting the potential detrimental effects of MAP and highlighting the need for further research on the biological consequences of chemical fertilizer use.

keywords: Monoammonium phosphate, Meristematic cells, Nucleolus

22130 - Poster

Investigation of Genetic Alterations in a Critical Codon of Tumor Suppressor Genes in Urothelial Malignancies

Zahra Tahmasebi Fard[1 *]

1- Department of Biology, RO.C, Islamic Azad University, Roudehen, Iran
*Corresponding Author: ztahmasebifard@iau.ac.ir

Abstract

Bladder cancer is one of the most common malignancies worldwide, and genetic alterations play a pivotal role in its pathogenesis. The tumor suppressor gene p53 is a key regulator of the cell cycle, DNA repair, and apoptosis. Mutations in specific codons of this gene may contribute to tumor development and progression. This study aimed to investigate possible mutations in codon 153 of the p53 gene and their association with bladder cancer in an Iranian patient cohort. In this cross-sectional study, 20 paraffin-embedded tumor tissue samples from patients diagnosed with bladder cancer were collected after pathological confirmation. Demographic and clinical data were recorded from patient files. DNA was extracted from tissue blocks, and specific primers were designed to amplify regions encompassing codon 153 of the p53 gene. PCR amplification was performed, and product quality was confirmed by agarose gel electrophoresis. Purified PCR products were sent to Macrogen (South Korea) for sequencing. The obtained sequences were analyzed using CodonCode Aligner software to identify possible mutations. Gel electrophoresis confirmed the quality and integrity of PCR products. Sequence analysis revealed no mutations in codon 153 of the p53 gene among the analyzed bladder cancer samples.The present study suggests that codon 153 mutations in the p53 gene are not associated with bladder cancer in the studied patients. Therefore, other regions of the p53 gene or additional molecular pathways may contribute to the initiation and progression of bladder cancer.

keywords: Bladder cancer, p53, Codon 153, Gene mutation

21424 - Poster

Temporal Profiling of Stress-Related Changes in a Cellular Model of Induced Differentiation

Faezeh Riahi[1], Shiva Akbari-Birgani[2 *]

1- Department of Biological Sciences, Institute for Advanced Studies in Basic Sciences, Zanjan, Iran
2- Research Center for Basic Sciences and Modern Technologies (RBST), Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran

*Corresponding author: sh.akbari@iasbs.ac.ir

Abstract

The cellular processes involved in differentiation are complex and not yet fully understood, particularly with regard to the stress-related responses that accompany early lineage commitment. In this study, we aimed to explore dynamic cellular changes that occur during the course of differentiation. For this purpose, human adipose-derived mesenchymal stem cells (MSCs) were used as a model system, and differentiation was induced using phorbol 12-myristate 13-acetate (PMA). Cells were monitored over a 72-hour time course. Differentiation was initially confirmed by immunohistochemical (IHC) detection of lineage-specific markers. To investigate accompanying intracellular changes, we assessed DNA damage using the comet assay, measured reactive oxygen species (ROS) levels, and evaluated mitochondrial membrane potential at multiple time points. The results revealed time-dependent fluctuations in DNA integrity, ROS production, and mitochondrial membrane potential throughout the 72-hour period, indicating that oxidative and mitochondrial dynamics are involved in the differentiation process. These observations suggest that differentiation is associated with coordinated changes in cellular stress responses and mitochondrial function.

keywords: Differentiation, Mesenchymal stem cells, DNA damage, Reactive oxygen species, Mitochondrial membrane potential.

21459 - Poster

Comparative Characterization of Plant-derived Extracellular Vesicles from Basil and Rosemary Leaves

Kimia Yarmohammadi[1], Maryam Sadat Bagheri[1], Mina Zahiri[1], Mohammad Nabiuni[1 *], Latifeh Karimzade bardei[2]

1- Department of Cellular and Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
2- Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: nabiuni@khu.ac.ir

Abstract

Plant-derived extracellular vesicles (EVs) have attracted considerable attention as biocompatible nanocarriers in pharmaceutical and dermatological applications. In this study, EVs were isolated from basil (Ocimum basilicum) and rosemary (Rosmarinus officinalis) leaves using a polyethylene glycol (PEG)-based precipitation method. Twenty grams of each plant were homogenized in phosphate-buffered saline (PBS), followed by sequential centrifugation steps (1000×g, 3000×g, and 10,000×g), filtration through a 0.22 µm cellulose acetate membrane, and overnight incubation with PEG at 4°C. After final isolation, the EVs were characterized for their physicochemical properties. Dynamic light scattering (DLS) analysis revealed that basil-derived EVs had an average size of 362 nm, while rosemary-derived EVs measured 185 nm on average. Both vesicle types showed acceptable particle size distribution. Additionally, scanning electron microscopy (SEM) imaging confirmed their spherical morphology and uniform size distribution. The significant size difference under identical extraction conditions highlights the potential species-specific biosynthetic and structural properties of EVs. These findings contribute to a better understanding of the biodiversity of plant EVs and pave the way for future applications in green nanotechnology. Further studies are recommended to explore their molecular content, stability, and therapeutic effects.

keywords: Extracellular vesicle, Plant, size, Morphology, Characterization

21989 - Poster

Oncogenic and tumor suppressive roles of circRNAs in cancer

Mehrsa Amoozadeh[1], Saghar Yousefnia[1 *]

Department of Cell & Molecular Biology, Semnan University, Semnan, Iran

*Corresponding author: saghar_yousefnia@semnan.ac.ir

Abstract

Cancer stem cells (CSCs) are a type of cancer cells in tumor tissues with highly malignant characterizations, including self-renewal, migration, invasion, metastasis and drug/radio therapy resistance. Numerous regulatory RNAs such as circular RNAs (circRNAs) are deregulated in CSCs and involved in stemness properties of these types of cancer cells. Due to the high stability and the half-life, circRNAs provide a significant clinical benefit for their use as diagnostic and therapeutic biomarkers. CircRNAs interact with specific miRNAs, proteins, and DNA regions, and thus can regulate various cellular functions and signaling pathways involved in the diverse biological, physiological, cellular, and pathophysiological processes. This review introduces CSCs and their associated markers. Also, it provides an overview of the biogenesis of circRNAs and emphasizes on the oncogenic and suppressive roles of circRNAs in different types of CSCs. Also, it highlights the mechanistic roles of circRNAs as miRNA sponger or/and protein decoy in this type of cancer cells. Understanding how circRNAs affect cellular processes at a molecular level holds significant potential for both diagnostic and therapeutic approaches in cancer treatment.

keywords: Cancer stem cells (CSCs), Circular RNAs (CircRNAs), miRNAs, Metastasis, Drug/radiotherapy resistance

21405 - Poster

Evaluation of Pancreatic Cancer Cells (Panc1) migration and Expression of PEAK3 Protein After Treatment with Secretome from Human amniotic mesenchymal stem cells (hAMSCs)

Narges Karimi Atani[1], Fatemeh Safari[2], Mohammad Doroudian[1*]

1- Department of Cell and Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
2- . Department of Biology, Faculty of Science, University of Guilan, Rasht, Iran

*Corresponding author: fsafari@guilan.ac.ir

Abstract

Abstract: Pancreatic cancer is one of the deadliest forms of cancer in humans and is recognized as the 12th most common cancer and the 6th leading cause of cancer-related deaths worldwide. However, due to late-stage diagnosis, poor prognosis, and high intrinsic resistance to conventional therapies, pancreatic cancer urgently requires the development of novel and more effective treatment strategies. In recent years, stem cell secretomes, with their ability to influence intracellular cancer pathways, have emerged as a promising option for targeted cancer therapies. In this study, we investigated the therapeutic effects of human amniotic mesenchymal stem cells (hAMSCs) secretomes on inhibiting tumor growth and invasiveness by modulating the expression of the PEAK3 protein in pancreatic cancer cells (Panc1) using a co-culture model. For this purpose, hAMSCs and Panc1 cells were cultured separately. Subsequently, using Transwell inserts (hAMSCs in the upper side and Panc1 in the lower side), the cells were co-cultured, and after 72 hours, the growth and proliferation of Panc1 cells were assessed. A wound healing assay was then used to evaluate cell migration. Finally, Western blot analysis was performed to examine the expression levels of the PEAK3 protein. The results demonstrated a significant reduction in tumor cell growth and motility through the downregulation of PEAK3 expression in Panc1 cells. These findings suggest that hAMSCs secretomes could be further explored as a complementary therapeutic strategy for pancreatic cancer.

keywords: Pancreatic cancer cells (Panc1), Cell migration, Stem cells' secretome, PEAK3, Cancer therapy

21182 - Poster

Study of vitrification in dragon plant (Dracocephalum Kotschyi L.) under the influence of micro-specimen type and growth regulators auxin and cytokinin under in vitro culture conditions

Mahsa Moslemzade[1 *], Bahman Hosseini[2], Siamak Fallahi Ghareh Goz[3], Behrokh Daei Hassani[3]

1- Department of Horticultural Sciences, Faculty of Agriculture, Urmia University, Urmia, Iran.
2- Department of Plant Physiology, Faculty of Sciences, Payame Noor University, Urmia, Iran.

*Corresponding author: mahsamoslemzade@gmail.com

Abstract

Dragon's-head (Dracocephalum kotschyi L.) is a wild flowering plant, perennial, semi-woody, belonging to the Labiatae family. Considering the importance of dragon's-head and the need to know its micropropagation methods and select the best cultivation instructions in vitro, the present study was conducted to identify the best hormonal composition and suitable environmental conditions for in vitro cultivation and also to compile technical knowledge of in vitro cultivation in the world. This study aims to determine the best plant growth regulators and the type of microsample during vitrification of callus in the regeneration of dragon's-head. This study was conducted in MS basal medium supplemented with benzyladenine (BA) at different concentrations (0, 1, 2 and 3 mg/L) in combination with indole-3-acetic acid (IAA) (0, 0.1 and 0.5 mg/L) in explants (cotyledon, hypocotyl, root, node, internode, shoot tip) with 3 replications in a completely randomized design. Shoot number and production of biomes exerelated to high level due to access of cytokinin, auxiliary and adventitious buds rate increases. The activity of proliferation lowers down which in turn decreases the photosynthesis activity of stem. Two types of vitification have been seen in shoot passive and active vitrification. The vessels and tracheids are hypolignified. The results of this study showed that the vitrification phenomenon occurred in explants that had indirect regeneration (shoot tip, node). Comparison of the mean data showed that the interaction effect of these two growth regulators was significant at the 5% probability level

keywords: plant gold, vitrification, plant growth regulators, benzyladenine (BA), indole-3-acetic acid (IAA).

22283 - Poster

Investigation of Bioactive and Antibacterial Properties of the Venom from the Whipray (Pastinachus sephen) of the Persian Gulf and Its Effects on Colon Cancer

Maryam Mousavi Bolfeh Teymoori[1], Mohammad Nabiyouni[2*], Rezvan Mousavi Nadooshan1, Amirali Shahabi[1]

1- Department of Biotechnology, Faculty of Biological Sciences, North Tehran Branch, Islamic Azad University, Tehran, Iran
2- Department of Cellular and Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran

*Corresponding author: nabiuni@khu.ac.ir

Abstract

The cowtail stingray (Pastinachus sephen) is a venomous species native to the Persian Gulf, whose barbed tail contains bioactive compounds with promising therapeutic potential. This study investigated the anticancer and antimicrobial effects of its venom, particularly in relation to colorectal cancer. After washing the venom with PBS and isolating it using liquid nitrogen, it was analyzed via SDS-PAGE. Antimicrobial activity was assessed through direct culture on Blood Agar and EMB media, and the MTT assay was performed using defined venom concentrations. Additionally, HCT116 colorectal cancer cells were treated with varying venom doses in a modified culture medium. SDS-PAGE results revealed protein bands ranging from 14 to 70 kDa. In direct bacterial cultures, the venom inhibited the growth of both Gram-positive and Gram-negative strains. The MTT assay showed that a concentration of 25 µg/mL reduced cell viability by approximately 50%, indicating an immune-stimulatory effect. These findings highlight the high potential of cowtail stingray venom in developing natural anticancer and antimicrobial drugs. The bioactive components present in the venom may serve as a foundation for designing targeted therapies. Despite the promising results, one limitation of the study was the incomplete purification of active compounds. Future research should focus on the precise isolation of venom constituents, investigation of their molecular mechanisms, and evaluation of biosafety, to pave the way for pharmaceutical applications derived from this marine source.

keywords: Stingray venom, Colorectal cancer, Apoptosis, SDS-PAGE, Antimicrobial activity

22314 - Poster

Integration of Network Pharmacology and Molecular Docking Techniques to Elucidate the Mechanistic Role of Vinflunine in Endometrioid Carcinoma

Arshia Azmoudeh[1], Shamsozoha Abolmaali[*2], Mehdi Sadeghi[2]

1-Department of Biotechnology, Faculty of New Sciences and Technologies, Semnan University, Semnan, Iran
2-Department of Cell and Molecular Biology, Faculty of Science, Semnan University, Semnan, Iran
*Corresponding author: s_abolmaali@semnan.ac.ir

Abstract

Recently, the improved treatments for Endometrioid Carcinoma (EC) have focused on Vinflunine, with improved antitumor activity, safety, and tolerability in clinical settings. Furthermore, the role of Vinflunine in early prognosis, disease progression monitoring, and the development of personalized treatment needs to be investigated. Here, the potential therapeutic targets of Vinflunine against EC were identified. The top 300 EC-related genes were selected from GeneCards database. SwissTargetPrediction was utilized to predict 104 candidate genes serve as targets of Vinflunine. By intersecting these datasets, 30 genes were identified as potential Vinflunine targets associated with EC. A gene regulatory network analysis identified key genes, including EGFR (epidermal growth factor receptor), ERBB2 (Erb-B2 Receptor Tyrosine Kinase 2), PIK3R1 (Phosphatidylinositol 3-kinase regulatory subunit 1), PIK3CA (Phosphatidylinositol 3-kinase p110 alpha), and ESR1 (Estrogen Receptor 1). Molecular docking analysis using Autodock Vina evaluated the binding energies and interaction sites between Vinflunine and the candidate hub genes. The binding energies of EGFR, ERBB2, PIK3CA, PIK3R1, and ESR1 were calculated as -9.6 kcal/mol, -8.8 kcal/mol, -10.4 kcal/mol, -6.0 kcal/mol, and -6.5 kcal/mol. The docking analysis revealed that Vinflunine forms two polar interactions with ESR1 at the residue Arg-363, with PIK3CA at Arg-818, Ser-629, and His-759, with ERBB2 at Lys-1326, with EGFR at Gln-791, and with PIK3R1 at Asn-57, Glu-20, and Arg-4. These findings showed PIK3R1 and PIK3CA emerged as key modulators within the PI3K pathway in EC, suggesting their potential as therapeutic targets for Vinflunine. Further experimental studies are necessary to confirm the viability of Vinflunine treatment for EC.

keywords: Endometrioid carcinoma, Molecular docking, Network pharmacology, Vinflunine

21619 - Poster

Novel Diseases in the Diagnosis and Treatment of Triple Negative Breast Cancer: From Molecular Biology to Artificial Intelligence

Fatemeh Aghazadeh[1 *], Jallal Zargar[1]

1-Department of Cell and Molecular Biology, Faculty of Biology, Faculties of Sciences, University of Tehran, Tehran, Iran

*Corresponding author: fatemeh.aghazadeh@ut.ac.ir

Abstract

Triple negative breast cancer (TNBC) is a subtype of breast cancer that lacks the expression of estrogen, progesterone, and HER2 receptors. This type of cancer is associated with a high recurrence rate, poor prognosis, and lack of targeted therapies. Given the subsequent advances in molecular biology, medical imaging, and new technologies such as artificial intelligence, a comprehensive review of these developments can help improve the trajectory, diagnosis, and treatment. The aim of this study is to systematically review the latest scientific findings in the diagnosis and treatment of TNBC with a focus on molecular biology, new imaging methods, and artificial intelligence applications in this field. The findings of this review show that immunotherapy, PARP enhancers, drug-delivery nanoparticles, gene therapy, and bioelectrical therapies are being used in experimental and clinical trials. In addition, the use of artificial intelligence in mammography interpretation has improved the detection and differentiation between benign and malignant tumors. The integration of biological methods, advanced imaging technologies, and artificial intelligence tools can pave the way for more accurate diagnosis and personalized treatment of TNBC. The future of treatment for these patients will depend on interdisciplinary approaches and on genomic and imaging data

keywords: Triple-negative breast cancer, molecular biology, artificial intelligence, targeted therapy

22075 - Poster

The Biomarker Potential of METTL5, METTL7A, and METTL7B Genes in Gastrointestinal Cancers: A Bioinformatics Approach

Soraya Heydari [1], Maryam Peymani [1]*, Mehrdad Hashemi[2], Kamran Ghaedi[3], Maliheh Entezari[2]

1- Department of Biology, Faculty of Basic Sciences, Islamic Azad University, Shahrekord Branch, Shahrekord, Iran.
2- Department of Biology, Faculty of Basic Sciences, Islamic Azad University, Science and Research Branch, Tehran, Iran.
3- Department of Cellular and Molecular Biology, Faculty of Sciences, University of Isfahan, Isfahan, Iran.
*Corresponding author: m.peymani@iaushk.ac.ir

Abstract

Gastrointestinal (GI) cancers are among the most common and lethal malignancies, necessitating the identification of novel biomarkers for improved diagnosis and prognosis. The methyltransferase (METTL) gene family plays a crucial role in epigenetic processes and tumorigenesis, yet the functions of many members, including METTL5, METTL7A, and METTL7B, remain unclear in GI cancers. This study utilized RNA-seq data from the TCGA database and bioinformatics analyses to investigate the expression of these genes in five GI cancers (colorectal, gastric, pancreatic, esophageal, and liver). Additionally, Real-time PCR was performed on 30 tumor and 30 normal samples from gastric and colorectal cancer patients. Results revealed that METTL5 expression was significantly upregulated in colorectal, liver, esophageal, and pancreatic cancers, while METTL7A was downregulated in gastric, esophageal, liver, and colorectal cancers. METTL7B showed increased expression in gastric and esophageal cancers but decreased expression in liver and colorectal cancers. Elevated METTL5 and reduced METTL7A expression were associated with poor prognosis. Pathway analysis indicated METTL5 involvement in Myc Targets and mTORC1 Signaling, while METTL7A and METTL7B were linked to lipid and bile acid metabolism. These findings suggest METTL5, METTL7A, and METTL7B as potential diagnostic and prognostic biomarkers in GI cancers. Limitations include sample size and the need for further studies to elucidate molecular mechanisms. Future research should focus on the roles of these genes in signaling pathways and therapeutic responses.

keywords: Gastrointestinal cancers, METTL genes, Gene expression, Prognostic biomarkers, Survival analysis, RNA sequencing

22484 - Poster

In Silico Prediction and Functional Network Analysis of miR-27b-3p Target Genes

Nazanin Izadi[1], Sohrab Boozarpour[1 *], Hossein Sabouri[2], Mina Lashkarboloki[3]

1- Faculty of Basic Sciences, Gonbad Kavous University, Gonbad Kavous, Golestan, Iran.
2- Department of Plant Production, Collage of Agriculture Science and Natural Resource, Gonbad Kavous University, Gonbad Kavous, Golestan, Iran.
3- Department of Genetics, Faculty of Biological Sciences, Tarbiat Modares University, Tehran, Iran.
*Corresponding Author: so.boozarpour@gmail.com

Abstract

MicroRNAs are small non-coding RNAs molecules that bind to the 3'UTR region of target mRNA molecules, regulating gene expression post-transcriptionally and influencing proliferation, differentiation, apoptosis, and cell migration. Dysregulation of miRNAs is critical in cancer development. The miR-23-27-24 cluster, particularly miR-27b, exhibits a dual role as a tumor suppressor or oncogene, impacting key gene regulation and cancer progression. In this study, miR-27b-3p target genes were identified using four databases (TargetScan, miRDB, miRWalk, and miRSystem), and miRNA–mRNA binding stability was assessed via RNAhybrid. Selected genes were analyzed using the STRING database for protein–protein interaction (PPI) networks and functional enrichment (GO and KEGG). Cross-database analysis identified 33 candidate genes. Based on base-pairing and free energy, five genes RUNX1, DOT1L, FBXW7, CDH11, and BTG2 were selected. Network analysis showed RUNX1, DOT1L, and FBXW7 as central nodes with key PPI roles, while CDH11 and BTG2 interacted only with a single neighbor. Functional analysis revealed involvement in protein methylation, cell cycle regulation, apoptosis, and the KEGG pathway "Transcriptional Dysregulation in Cancer". Notably, DOT1L's role in histone methylation and RUNX1's influence on glycolysis were highlighted as pivotal in tumorigenesis. These findings suggest that miR-27b-3p targeting of key genes involved in epigenetic modifications and transcriptional regulation may provide novel therapeutic targets and biomarkers. Further analysis could aid the development of diagnostic and therapeutic strategies.

keywords: miR-27b-3p, Apoptosis, Cell migration, Biomarkers

21513 - Poster

Deep learning-based prediction of fibrosis progression risk in Non-alcoholic fatty liver disease using multi-omics and lifestyle features

Zahra Asheghi[1], Sayed Mohammad Marandi[1 *]

1- Department of Exercise Physiology, Faculty of Sport Sciences, University of Isfahan, Isfahan, Iran
*Corresponding Author: smmarandi2001@yahoo.com

Abstract

Non-alcoholic fatty liver disease (NAFLD) is currently the most prevalent chronic liver condition worldwide. Accurate early prediction of fibrosis progression in affected individuals remains a significant clinical challenge. In this study, we developed a deep learning-based framework to predict fibrosis risk by integrating genetic data (variants in PNPLA3, TM6SF2, and MBOAT7), metabolomic markers (such as triglycerides and amino acids), and lifestyle and clinical features including body mass index, liver enzyme levels, insulin resistance, and physical activity. Data were collected from multiple publicly available repositories, encompassing over 500 patient samples, and modeled using a multi-layer deep neural network with distinct input branches tailored to each data type. Model performance was evaluated through five-fold cross-validation, achieving an area under the receiver operating characteristic curve (AUROC) of 0.91, outperforming conventional scoring systems such as FIB-4. Feature importance analysis highlighted PNPLA3 variants and lipidomic indices, particularly triglycerides, as key predictors. Major limitations of the study included the absence of longitudinal data and limited ethnic diversity, primarily due to restricted access to diverse population cohorts. The proposed framework may serve as a personalized screening tool for early identification of high-risk individuals. Future studies are recommended to assess the model's generalizability using longitudinal datasets and locally representative populations.

keywords: Biomarkers, Multi-omics analysis, Liver fibrosis, Personalized prediction

21578 - Poster

Advances in Aptamer-Based Biosensors for the Diagnosis of Neurodegenerative Disorders: A Review of Detection Strategies and Biomarker Targets

Hossein Najafi[1], Sana Rahimian[2 *]

1- Department of Industrial and Environmental Biotechnology, National Institute of Genetic Engineering and Biotechnology (NIGEB), Tehran, Iran
2- Department of Nanobiotechnology, Faculty of Biological Sciences, Tarbiat Modares University, Tehran, Iran
*Corresponding Author: sanarahimian@gmail.com

Abstract

The early and accurate diagnosis of neurodegenerative disorders like Alzheimer's and Parkinson's disease is critical for patient management but remains a significant challenge. This review summarizes the state-of-the-art in aptamer-based biosensors (aptasensors) for detecting key protein biomarkers associated with these conditions, such as tau protein and amyloid-beta oligomers. In this study, a literature review was conducted across PubMed, Scopus, and IEEE Xplore databases, focusing on articles published in the last decade. Search terms included "aptamer", "biosensor", "neurodegenerative disorder", "tau protein" and "amyloid-beta". The literature demonstrates a clear trend towards highly sensitive electrochemical and optical aptasensors capable of achieving ultra-low detection limits (in the picomolar to femtomolar range) for core biomarkers. A key innovation driving this sensitivity is the use of nanomaterials for signal amplification. However, significant challenges remain, including the stable immobilization of aptamers on transducer surfaces to maintain their functional conformation and the reduction of non-specific binding from complex biological samples like cerebrospinal fluid (CSF) or blood. In conclusion, aptasensors represent a powerful and rapidly evolving platform for the diagnosis of neurodegenerative diseases. Their high specificity and the potential for multiplexed detection of several biomarkers simultaneously position them as a leading technology for developing future point-of-care diagnostic devices. Overcoming current challenges in sensor stability and sample interference is key to their clinical translation.

keywords: Aptamer, Biosensor, Neurodegenerative Disorders, Tau Protein, Amyloid-Beta

21462 - Poster

Regulatory Impact of Wnt, Notch, and BMP on hMSC Differentiation

Samira Vaziri[1 *]

1- Department of Biology, Payame Noor University, Tehran, Iran
*Corresponding Author: s_vaziri@pnu.ac.ir

Abstract

Wnt, Notch, and BMP signaling pathways are recognized as key regulators in the differentiation and development of stem cells. Understanding the interactions among these pathways is essential for advancing tissue engineering and regenerative medicine strategies. In this study, human mesenchymal stem cells were cultured under osteogenic differentiation conditions. Changes in the expression of key genes related to Wnt/β-catenin, Notch, and BMP pathways were quantified using RT-qPCR, and the proportion of differentiated cells was assessed by flow cytometry. Additionally, dynamic modeling of these pathways was performed using XYZ software to analyze temporal and spatial interactions. Experimental data demonstrated a 35% increase in Runx2 gene expression and a 20% decrease in Hes1 gene expression. Dynamic modeling confirmed complex and coordinated interactions between BMP and Wnt signaling pathways during the early stages of differentiation. The findings highlight the regulatory and coordinated role of signaling pathways in directing stem cell differentiation and provide a foundation for designing targeted bioengineered scaffolds in tissue engineering and regenerative therapies.

keywords: Signaling pathways, cell differentiation, mesenchymal stem cells, dynamic modeling, tissue engineering

21644 - Poster

Diamond Nanoparticle-Induced Hyperthermia on Cell Cycle Changes and NEK2 and CDKI Gene Expression in HT-29 Cancer Cells

Fatimah Foroutan[1], Aras Rafiee[1*], Homayoun Ahmadpanahi[2], Zahra Shahi[3], Farhad Riazi-Rad[4]

1-Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
2- Department of Chemistry, CT.C., Islamic Azad University, Tehran, Iran
3- Department of Biomedical Engineering, C.T.C., Islamic Azad University, Tehran, Iran
4- Department of Immunology, Pasteur Institute of Iran, Tehran, Iran
*Corresponding author: aras_rafiee@yahoo.com

Abstract

Colon cancer is currently the third leading cause of cancer in the world and its incidence is continuously increasing. Therefore, this study aims to investigate the effects of diamond nanoparticle-induced hyperthermia on cell cycle, apoptosis, and NEK2 and CDKI gene expression in HT-29 cancer cells. First, HT-29 cell line was cultured. The viability of HT-29 cell line was measured by MTT assay. Diamond nanoparticles were added to the wells at 10, 100, and 0 (control) µg. All replicates were 3. In order to examine gene expression and perform flow cytometry, the nanoparticles were left on the cells for 4 hours. Then, the cells were irradiated with a laser at 808 nm for 2 minutes, and finally, gene expression was measured by Real-time PCR and apoptosis was assessed by Annexin V-FITC/PI staining. The results were analyzed by Graphpad Prism and Flowjo software, and the significance of the data was calculated by statistical t-tests at a significance level of 0.05. The final results showed that hyperthermia caused cell cycle arrest in the Sub-G1 and G1 phases. The expression of NEK2 and CDKI genes responsible for cell cycle progression was also reduced and the level of apoptosis in cancer cells treated with nanoparticles were increased in comparison with control. This study shows that the use of hyperthermia can be investigated as a therapeutic approach to advance the goals of colon cancer treatment.

keywords: Hyperthermia, HT-29 cells, Colon cancer, Cell cycle

22342 - Poster

Procalcitonin analysis as an indicator for timely initiation of treatment in COVID-19 patients

Zolfaghar Lotfi[1 *], Mahsa Saeedpour[1]

1-Department of Basic Sciences, Payam Noor University, Tehran, Iran

*Corresponding author: lotfi_zp@pnu.ac.ir

Abstract

The covid-19 pandemic caused by corona virus has become one of the biggest health problems of this century. The role of laboratory data in diagnosing severe forms of Covid-19 has not been definitively proven. The purpose of this research is to find ways to prevent and treat covid-19. Materials and methods: This study was conducted on 43 patients with covid-19 in the period of March to May 1400 in the private center of Mehrgan, Khuzestan province. Demographic characteristics form and general standard health questionnaire were used to collect information. Data analysis was done using SPSS statistical software (version 22) and GraphPad Prism (version 9). The findings showed no significant difference in procalcitonin levels ($P < 0.05$). The threshold and receiver operator characteristic curve for procalcitonin were 0.266 and 0.630, respectively. The specificity and sensitivity of predicting COVID-19 severity for procalcitonin were 55.81 and 62.97, respectively. The receiver operating characteristics for analyzing the early warning efficiency and optimal prediction threshold of COVID-19 exacerbation for procalcitonin were AUC 0.630, 95% confidence interval (0.7-0.5), standard deviation 0.06, and significance level 0.037. According to the results, procalcitonin had a weak predictive role for COVID-19 disease.The role of procalcitonin as a biomarker was weak, but it cannot be definitively stated that procalcitonin is not affected in this context, so further. studies and research are needed in this fieldKeywords: Covid-19, Procalcitonin

keywords: Covid-19, Procalcitonin, Biochemical marker

21878 - Poster

Analysis of Pathogenic Single Nucleotide Polymorphisms of BRCA1 & 2 and TP53 genes and Their Association with Breast Cancer in a Bioinformatics Study

Fatemeh Jafari[1], Abasalt Hosseinzadeh Colagar[1 *], Bagher Seyedalipour[1]

1- Department of Molecular and Cell Biology, Faculty of Basic Science, University of Mazandaran, Babolsar, Iran
*Corresponding Author: acolagar@yahoo.com

Abstract

Breast cancer (BC), as the most common cancer among women worldwide, is a primary cause of mortality. Risk factors of the BC include physiological elements (such as age, menstrual history, and breast density); lifestyle influences (such as hormone therapy, alcohol, tobacco, diet, and lack of physical activity); and factors and gene mutations. So far, a numerous gene mutations as single nucleotide polymorphisms (SNPs) in the BRCA1 & 2 (BReast CAncer gene) and TP53 (Tumor suppressor P53 gene) genes have been reported, which these loci associated with breast cancer. This study aims to analyze pathogenic SNPs in these genes and investigate their potential association with breast cancer through a bioinformatics study. To investigate further, online databases such as NCBI, GeneMANIA, PhD-SNP, PROVEAN, PolyPhen-2, PANTHER and MalaCards were used to analyze the genes and pinpoint relevant SNPs. The Results indicated that mutations in these genes, along with transcript instability or protein abnormalities, increase the risk of gastric, prostate, endometrial, ovarian, intestinal, and lung cancers in addition to breast cancer. Among the loci (rs16941, rs16942, rs799917, and rs1799966) that were examined in BRCA1, rs16941 stood out as being very important in the coding DNA sequence (CDS) area. For BRCA2, between rs1801406 and rs144848, rs1801406 showed key importance in the CDS. In TP53, among rs2287498 (5' untranslated region), rs2287499, and rs1042522 (missense in CDS), rs1042522 proved especially notable. According to bioinformatics assessments using PhD-SNP, PANTHER, PROVEAN, and PolyPhen-2, rs16941 (C>T), rs1801406 (A>G), and rs1042522 (G>C) were recognized as possibly harmful, increasing the risk of breast cancer. Accordingly, the identification of mutant genotypes for these polymorphisms could serve as valuable predictive markers for the management and prevention of this disease in future research.

keywords: Breast cancer; Single nucleotide polymorphism; BRCA1 gene; BRCA2 gene; TP53 gene

22076 - Poster

Bioinformatic Analysis of lncRNA H19 Secondary Structure and Investigation of Its Role in Cancer: Potential Diagnostic and Therapeutic Implications

Mahya Ghahremani[1], Saeedeh Ghazaey Zidanloo[1 *]

1-Department of Cellular and Molecular Biology, Faculty of Basic Sciences, Kosar University of Bojnord, Iran

*Corresponding author: Ghazaeys@kub.ac.ir

Abstract

H19, a pivotal long non-coding RNA (lncRNA), plays a central role in cancer pathogenesis and progression. This study focused on the bioinformatic analysis of H19's secondary structure and its molecular functions in cancer. Sequence extraction was performed from NCBI, and analysis was conducted using the RNAfold webserver.Comprehensive bioinformatic analysis of lncRNA H19 elucidated its secondary structure characteristics and functional implications in cancer pathogenesis. Sequence extraction from NCBI and modeling with the RNAfold webserver revealed that H19 exhibits remarkable thermodynamic stability (ΔG ≈ -1016.60 kcal/mol), further reinforced by a GC content of approximately 60%. This inherent stability is critical for maintaining H19's structural integrity and its diverse biological roles.Beyond its stability, our results unveiled H19's dynamic structural flexibility. A high ensemble diversity (676.39) and the divergence between the Minimum Free Energy (MFE) and Centroid structures underscore H19's structural plasticity. This plasticity enables H19 to transition between multiple conformations and engage in various molecular interactions. Regions with high base pair probability (indicated in red on the Base Pair Probability Plot) may serve as crucial binding sites for regulatory factors, while areas exhibiting high positional entropy (peaks in the Entropy Plot) suggest greater flexibility for dynamic interactions. The interpretation of the Mountain Plot further corroborates this structural plasticity.These findings establish H19 as a key regulator within molecular cancer networks, presenting significant potential as a novel biomarker and therapeutic target. Future research should concentrate on the experimental validation of these bioinformatic insights and the development of targeted therapeutic strategies against H19 to improve clinical outcomes for cancer patients.

keywords: H19 long noncoding RNA, Secondary structure, Cancer, Biomarker

21650 - Poster

Comprehensive Bioinformatics Analysis of miRNA-lncRNA-mRNA Networks in Colon Cancer Using TCGA-GEO Data

Hannane Henduei[1], Ali Taravati*[1]

1-Department of Molecular and Cell Biology, Faculty of Basic Sciences, University of Mazandaran, Babolsar, Iran

*Corresponding author: a.taravati@umz.ac.ir

Abstract

Colorectal cancer (CRC) remains a major global health challenge, emphasizing the urgent need for novel biomarkers and therapeutic targets. In this study, we applied a bioinformatics approach to investigate the regulatory landscape of CRC by integrating transcriptomic data from The Cancer Genome Atlas (TCGA) and the Gene Expression Omnibus (GEO) databases. Differential expression analysis was conducted using the R programming environment to identify dysregulated microRNAs (miRNAs), long non-coding RNAs (lncRNAs), and genes. Regulatory networks were then constructed in Cytoscape, incorporating interaction data from DIANA-LncBase v3 and TRUST. Network analysis identified ten key hub genes KIF23, KIF11, CCNB2, NUF2, CCNB1, BUB1, KIF2C, CCNA2, AURKB, and TOP2A—which were highly interconnected within the ceRNA network. Functional enrichment analysis revealed their involvement in critical oncogenic pathways such as Wnt signaling and cell cycle regulation. Moreover, novel miRNA–lncRNA interactions (e.g., miR-145–MALAT1) with potential diagnostic and therapeutic significance were uncovered. These findings provide new insights into the molecular mechanisms underlying CRC and highlight promising candidates for precision oncology, although further experimental validation is necessary for clinical approaches.

keywords: Colorectal cancer, miRNA, lncRNA, Transcription factors, Regulatory network, TCGA

21623 - Poster

Integrative Bioinformatics Analysis Reveals Novel Biomarkers Linked to TGF-β Pathway Activation in Cardiomyopathy

Maryam Tashakori[1 *]

1- Department of Biology, Science and Research Branch, The University of Tehran, Tehran, Iran
*Corresponding Author: tashakori.maryam@ut.ac.ir

Abstract

Cardiomyopathy, a leading cause of heart failure, is characterized by progressive fibrotic remodeling, yet early biomarkers remain elusive. Bioinformatics strategies were utilized to pinpoint differentially expressed genes (DEGs) between failing and normal human cardiac tissues, with the objective of recognizing downregulated genes that might act as biomarkers for this condition. At first, microarray information related to cardiomyopathy was sourced from the GEO database (www.ncbi.nlm.nih.gov/geo), followed by the choice of a Gene expression profile (GSE57338) that included 177 failing and 136 normal cardiac tissues, depending on an Affymetrix Human Quality 1.1 ST Cluster. The DEGs were recognized through R analysis, and the resultant qualities were utilized within the STRING online database (https://string-db.org/) to build a protein-protein interaction network, from which key qualities were extracted and utilized using the Cytoscape program. The identified genes (ASPN, OGN, LUM, COL14A1) are implicated in collagen fiber organizationQuality Ontology (GO) examinations emphasized the cooperation of these qualities in maintaining the auxiliary quality of the myocardium. Enhancement examination demonstrated that the myocardium is connected to the TGF-β signaling pathway, a recognized pathway of cardiac fibrosis and its downregulation might lead to its overactivity during fibrotic remodeling. Inhibiton of the TGF-β pathway may offer assistance avoid over the top extracellular network (ECM) buildup. Altering TGF-β signaling may offer promising approaches to decrease fibrosis. These findings highlight collagen-related genes as novel diagnostic biomarkers and suggest TGF-β pathway modulation as a potential anti-fibrotic strategy in cardiomyopathy.

keywords: Cardiomyopathy, insilico analysis, GEO dataset, TGF-β Signaling, Cytoscape

22532 - Poster

Decoding the lncRNA-controlled network in the progression of Alzheimer's disease

Atefe Yadollahi Khales*[1], Kamran Ghaedi[2], Fariba Esmaeili[1], Maryam Noorbakhshnia[1], Masoud Etemadifar[3]

1- Department of Plant and Animal Biology, Faculty of Biological Science and Technology, University of Isfahan, Isfahan, Iran.
2- Department of Biology, Faculty of Biological Science and Technology, University of Isfahan, Isfahan, Iran.
3- Department of Neurology, Isfahan University of Medical Sciences, Hezarjerib Avenue, Isfahan, Iran
*Corresponding author: atefeyadollahy@yahoo.com

Abstract

Background: The complex web of gene regulation in Alzheimer's disease (AD) remains a significant barrier to understanding its progression. Long non-coding RNAs (lncRNAs) are emerging as pivotal regulators in this network, though the precise mechanisms by which they contribute to the disease are not well understood. This study investigated the role of specific lncRNAs as central nodes in the competing endogenous RNA (ceRNA) network, a key mechanism of post-transcriptional gene control. Methods: We employed a multi-stage strategy, beginning with a comprehensive bioinformatic screen of public transcriptomic data to identify promising lncRNA candidates. Subsequently, we validated their expression levels in peripheral blood samples from AD patients and healthy controls using Real-Time qPCR. Finally, we constructed a ceRNA network to map the functional interactions between our validated lncRNAs, their target microRNAs, and key AD-related genes. Results: Our analysis confirmed the significant upregulation of ATP2B1-AS1 and downregulation of RPL21P28 in individuals with AD. The ceRNA network analysis illuminated their functional roles: ATP2B1-AS1 appears to act as a molecular sponge for critical miRNAs, thereby liberating crucial neuro-developmental genes from suppression. Similarly, the model implicated RPL21P28 in a network controlling the expression of genes vital for synaptic function, such as SNAP25 and SYT1. Conclusion: Our findings establish that ATP2B1-AS1 and RPL21P28 are not merely passive biomarkers but active participants in AD's molecular pathology. By disrupting a delicate ceRNA balance, their altered expression contributes to the breakdown of both developmental and synaptic pathways. This work uncovers a novel layer of gene regulation in AD and highlights these lncRNA-centric networks as promising therapeutic targets

keywords: Long Non-coding RNA, Alzheimer's Disease, Gene Regulation.

21980 - Poster

Mapping Global Trends and Research Priorities of Systematic Reviews on COVID-19 Vaccines

Hojat Dehghanbanadaki[1 *], Ghazal Mohammadi[1], Hossein Aazami[1]

1- Metabolomics and Genomics Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
*Corresponding Author: dehghan.hojat@yahoo.com

Abstract

The rapid development of COVID-19 vaccines spurred a surge in systematic reviews and meta-analyses on efficacy, safety, and acceptance, creating challenges in identifying key trends[1]. This study maps the global trend of such reviews to guide future research and policy.A Scopus search identified 1,575 English-language systematic reviews/meta-analyses published up to June 5, 2025, involving 9,968 authors from 160 countries across 662 sources. These works generated 46,595 citations and used 2,610 unique keywords. Microsoft Excel and VOSviewer were used to analyze publication trends, collaborations, and thematic clusters.The most cited article reported vaccine acceptance from 97% in Ecuador to 23.6% in Kuwait, with only two-thirds meeting the 70% threshold for pandemic control. The second found a 21% decline in infection protection and 25% drop in symptomatic disease protection within six months, though severe disease protection stayed strong. The third showed vaccine willingness fell from over 70% to under 50% in 2020 due to safety concerns.mRNA vaccines (BNT162b2, mRNA-1273) dominated focus, followed by viral vector vaccines. The US led output (24%), followed by China (15.7%), the UK (14.4%), and Iran (9.5%). The journal of Vaccines published the most articles (160, 10.15%). Rabaan A.A. was the most prolific author (11 papers, 351 citations). Fourteen themes emerged, including hesitancy, variants, safety, policy, and AI applications. Global distribution and research priorities are shown in Figure 1 and Table 1, respectively.This study highlights critical research areas and influential works, supporting evidence-based vaccination policy and pandemic response.

keywords: COVID-19 Vaccine, mRNA vaccine, SARS-CoV-2, Vaccine, Systematic Review, bibliometric

22070 - Poster

Identification and Bioinformatic Analysis of Differentially Expressed microRNAs in Triple-Negative Breast Cancer (TNBC)

Maryam Ettehadpour1, Saeedeh Ghazaey Zidanloo1 *

1-Department of Cellular and Molecular Biology, Faculty of Basic Sciences, Kosar University of Bojnord, Iran.
*Corresponding author: Ghazaeys@kub.ac.ir

Abstract

Triple-negative breast cancer (TNBC), characterized by the lack of estrogen receptor (ER), progesterone receptor (PR), and HER2 expression, represents one of the most aggressive and treatment-resistant subtypes of breast cancer. TNBC responds poorly to conventional hormonal and targeted therapies, highlighting the necessity of identifying novel molecular biomarkers to improve diagnosis and develop effective treatments. MicroRNAs (miRNAs), as post-transcriptional regulators of gene expression, play critical roles in biological processes including proliferation, migration, invasion, and apoptosis, and their dysregulation is directly associated with cancer initiation and progression.In this study, miRNA expression profiles in TNBC tissues and normal breast tissues were compared using the dbDEMC database, and differentially expressed miRNAs were identified. Initial results revealed 15 upregulated and 16 downregulated miRNAs in TNBC. Bioinformatic analysis of their target genes indicated involvement in key oncogenic pathways. For instance, upregulated miRNAs predominantly target PTEN, TP53, BRCA1, FOXO3, and CDKN1A, which are essential for cell cycle regulation and tumor cell survival. Conversely, downregulated miRNAs primarily target EGFR, MYC, VEGFA, MMP9, and CCND1, whose reduced regulation may activate proliferation, angiogenesis, and metastasis pathways.Overall, the identified miRNAs may serve as potential biomarkers for early diagnosis and as novel therapeutic targets in TNBC. These findings provide new insights into the molecular mechanisms underlying TNBC and pave the way for the development of innovative therapeutic strategies.

keywords: Triple-negative breast cancer (TNBC), microRNA (miRNA), Biomarkers, Gene expression regulation, Bioinformatic analysis

22271 - Poster

Molecular and morphological study of Cheliferidae pseudoscorpions (Arachnida: Pseudoscorpiones) in western Iran

Hamid Darvishnia[1 *]

1- Department of Biology, Payame Noor University, Tehran, Iran
*Corresponding Author: darvishnia_h@pnu.ac.ir

Abstract

Pseudoscorpions are a tiny and fascinating order of arachnids that are among the oldest lineages of land creatures, with groups dating back to the Middle Devonian. One of the largest families of pseudoscorpions is Cheliferidae, which comprises two subfamilies: Philomaoriinae Chamberlin 1931 and Cheliferinae Risso 1827. In the study of organisms, it is thought that using morphological and molecular data simultaneously will produce results that are satisfactory. The objective of this study is to analyze the morphology and molecular structure of pseudoscorpions from the Cheliferidae family within caves in western Iran, utilizing COI sequences to reconstruct their phylogenetic relationships. Specimens were gathered, preserved in 96% ethanol, and then prepared onto appropriate slides for morphological analysis. Molecular data analysis was conducted using a variety of software, such as MEGA, BioEdit, RAxML, and MrBayes. The species Rhacochelifer melanopygus and Dactylochelifer intermedius were identified in caves located in the provinces of Kermanshah, Lorestan and Ilam. In addition to the sequences obtained in this study, sequences from the gene bank were also employed to generate phylogenetic trees. Morphological results are confirmed by molecular findings. Based on morphological analyses and sequence determination, two species from this family were assigned to genera Rhacochelifer and Dactylochelifer. The reconstructed phylogenetic tree indicates that the sequence assigned to Rhacochelifer in indeed a member of this genus. In contrast, the sequence attributed to Dactylochelifer is the sister taxon of the clade, which includes Cheliferidae sp. and Parachelifer hubbardi.

keywords: Molecular study, Morphology, Pseudoscorpions, COI gene.

21218 - Poster

Genome-wide In Silico Inhibition of SARS-CoV-2 3CL Protease by Phenolic Acids: A Molecular Docking and Dynamic Simulation Approach

Mahboobeh Talebi Mehrdar[1] *

1- Biochemistry Department, Payame Noor University,Tehran, Iran
*Corresponding Author: mah.talebi@pnu.ac.ir

Abstract

The SARS-CoV-2 3C-like protease (3CLpro) plays a pivotal role in viral replication and has emerged as a prime therapeutic target against COVID-19. In this study, we employed a comprehensive in silico approach to investigate the inhibitory potential of selected phenolic acids—including rosmarinic acid, chlorogenic acid, chicoric acid, and cynarin—against 3CLpro. Molecular docking studies were conducted using AutoDock Vina, and the resulting protein-ligand complexes were further evaluated for binding affinity and interaction profiles. ADMET properties were predicted using SwissADME and ProTox-II, revealing favorable pharmacokinetic profiles and low toxicity for all compounds. Notably, rosmarinic acid exhibited the highest binding affinity and was further analyzed through molecular dynamics simulation via the iMODS server. The simulation confirmed the structural stability and compactness of the complex based on low eigenvalue, RMSF, and B-factor parameters. Normal mode analysis and covariance mapping supported strong residue correlation and low deformability. Collectively, our findings suggest that phenolic acids, particularly rosmarinic acid, are promising candidates for further experimental validation as SARS-CoV-2 3CLpro inhibitors.

keywords: Molecular study, Morphology, Pseudoscorpions, COI gene.

22494 - Poster

The Advanced Role of Artificial Intelligence in Cellular and Molecular Biology: From Protein Structure Prediction to Virtual Cell

Aysooda Ziyamehr[1 *]

1- Department of Cellular and Molecular Biology, Faculty of Modern Sciences, Islamic Azad University of Health Sciences, Tehran, Iran

*Corresponding author: ziyamehr.biology@gmail.com

Abstract

Recent advances in artificial intelligence (AI), especially in deep learning and generative models, are transforming cellular and molecular biology. The AlphaFold 3 model can predict protein structures and their interactions with molecules like DNA and RNA, which helps speed up drug research and understanding cell networks. Generative tools, such as Evo 2, predict protein function and structure across biological domains and enhance the simulation of lab experiments. AI language models like ESM3 simulate millions of years of evolution to design new fluorescent proteins that do not exist in nature, showcasing AI's potential in creating innovative molecules for uses in medicine and the environment. The Chan Zuckerberg Institute has developed virtual cells that use advanced modeling to predict how cells behave in healthy and diseased states, moving traditional experiments towards computational methods. AI also advances CRISPR tools by predicting side effects and optimizing genome editing. Additionally, the integration of multi-omics data with machine learning allows for complex modeling of relationships among genes, environment, and traits. In micro-cellular imaging, tools like CellCognition enable cell tracking and analysis of imaging data. Weakly supervised learning helps in analyzing ultra-resolution images to discover cellular structures without needing labeled data. AI thus enhances our ability to understand and modify biological systems.

keywords: Generative AI, Virtual cell, Smart CRISPR, Multi-omics, Visual bioinformatics

22474 - Poster

The role of myokines in muscle regeneration: The effect of high intensity interval training on IL-6 levels in male taekwondo athletes of 1st to 3rd Dan

Sanaz Mirzayan Shanjani*[1], Hadi Asefi Bakhshayesh[1], Alireza Heidari[1], Negin Vahedi[1], Parisa Hosseinizadeh[1]
1-Department of Physical Education and Sport Sciences, Islamshahr Branch, Islamic Azad University, Islamshahr, Iran.
*Corresponding author: sanaz.mirzayan@iau.ac.ir

Abstract

Myokines are proteins secreted by skeletal muscles in response to physical activity and play an important role in muscle regeneration, regulation of metabolism, and modulation of inflammatory responses.Interleukin-6 (IL-6), as one of the key myokines, contributes to muscle repair and growth by stimulating satellite cells and regulating inflammation. This study aimed to investigate the role of myokines in muscle regeneration by examining the effect of high-intensity interval training (HIIT) on the levels of one of the myokines, called IL-6, and on vertical jump performance in taekwondo athletes.20 male taekwondo athletes (age range 20-25 years and belt 1-3 dan) were randomly divided into two groups: training group (n=10) and control group (n=10). The training group performed exercises including vertical jump and fast running at an intensity of 85-90% of maximum heart rate for 6 weeks, 3 sessions per week. Serum IL-6 levels were measured using an ELISA kit and vertical jump performance with a standard springboard was measured before and after the intervention.The results showed that IL-6 levels increased from 5.19 ± 0.16 to 14.29 ± 0.41 pg/mL in the HIIT group ($P<0.001$), while there was no significant change in the control group (5.05 ± 0.19 to 5.10 ± 0.16 pg/mL). Also, vertical jump performance improved from 41.6 ± 1.27 to 46.83 ± 1.34 cm in the HIIT group ($P<0.001$), but there was no change in the control group (41.96 ± 1.33 to 41.97 ± 1.34 cm). These findings confirm that HIIT training stimulates IL-6 secretion and improves explosive power, which is consistent with the role of IL-6 in muscle regeneration. From a developmental biology perspective, these results emphasize the importance of IL-6 in satellite cell activation and tissue repair. Limitations of this study include the small sample size and the lack of examination of long-term effects.The study has implications for designing training programs for combat athletes and improving muscle regeneration processes. It is suggested that future studies investigate the role of other myokines, muscle damage factors, and the long-term effects of HIIT.

keywords: Myokines, Muscle regeneration, High-intensity interval training, Interleukin-6, Taekwondo athletes.

22289 - Poster

Dendritic Cells Primed with Extracellular Vesicles Derived from Induced Pluripotent Stem Cells Enhance Antitumor Immune Responses Against Melanoma

Hassan GhVabeshi[1 *]

1- Cell and Molecular Biology, Islamic Azad University, Jahrom Branch, Jahrom, Iran
*Corresponding author: ghavabeshihassan57@gmail.com

Abstract

Induced pluripotent stem cells express a wide range of tumor-associated antigens and demonstrate preventive effects against various tumors. However, challenges such as tumorigenic potential, migration to lymph nodes and spleen, and unclear mechanisms of antitumor effects necessitate the development of safe and effective vaccines based on these stem cells. In this study, extracellular vesicles derived from induced pluripotent stem cells were prepared and incubated with dendritic cells to produce dendritic cell vaccines loaded with extracellular vesicles for evaluating antitumor effects in melanoma models. The antitumor immune responses induced by these dendritic cell vaccines were assessed both in vitro and in vivo. T lymphocytes isolated from the spleen of vaccinated mice effectively eliminated melanoma, lung cancer, lymphoma, and colorectal cancer cells in vitro. Additionally, vaccination inhibited the growth of melanoma and lung cancer in animal models, with sustained T lymphocyte immune responses preventing tumor recurrence and regrowth in melanoma. Biocompatibility studies showed that the dendritic cell vaccine did not significantly affect the survival of normal cells or organ function in animal models. Thus, this research proposes a safe and effective strategy for producing cancer vaccines based on induced pluripotent stem cells, with potential for clinical applications.

keywords: Metastasis, Luciferase, Protein sequence, Antigen.

Chapter Five
Stem Cells, Tissue Engineering and Regenerative Medicine



23917 - Invited oral presentation

The efficacy of stem cell therapy as a treatment for cerebral palsy

Mahmoud Reza Ashrafi[1*]

1-Pediatrics Center of Excellence, Department of Pediatrics Tehran University of Medical Sciences
*Corresponding author: mr_ashrafi@yahoo.com

Abstract

Stem cell therapy is a fast-developing branch of medicine that includes the most innovative regenerative therapies for the restoration of cell and tissue function in individuals with severe diseases which do not respond to conventional therapies, including surgeries, radiotherapies and pharmacologic treatments, and they are considered under the category of an Advanced Therapeutic Medicinal Product (ATMP). Stem cell research has resulted in the emergence of cell-based therapies for incurable disorders, and more than 100 illnesses can now be addressed. Neurological diseases are caused by a loss of neurons and glial cells in the central nervous system (CNS) or peripheral nervous system due to acute injury or in the process of a genetic or degenerative disorder. Effective treatment of these neurological diseases is currently impossible, but stem cell therapy is a promising treatment option for these group of disorders. Stem cell therapy has become of great interest in recent years; especially for the treatment of neurological disorders. The term 'cerebral palsy' was defined as "a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain". The worldwide prevalence of cerebral palsy has remained stable at 2–3 per 1000 livebirths for more than four decades, despite substantial improvements in obstetric and neonatal care. The umbilical cord contains a rich source of hematopoietic and mesenchymal stem cells that can be used for the treatment of CP. Really we must believe that stem cells will be used clinically, therapy but as part of a therapeutic armamentarium.

Keywords: Cerebral, Palsy, stem cell therapy.

23916 - Invited oral presentation

Mesenchymal Stem Cells: A Novel Approach in the Treatment of Osteoarthritis

Abolfazl Barzegari[1*]

1-Tabriz Medical Science University
*Corresponding author: Barzdgari.abolfazl@gmail.com

Abstract

Introduction: Osteoarthritis is one of the most common joint diseases, affecting approximately 3.3 to 3.6 percent of the global population and causing pain, inflammation, and decreased joint function. It is projected that by 2050, about one billion people will be affected by this disease. Routine treatments include anti-inflammatory drugs, physiotherapy, intra-articular injections, and surgery in advanced cases. Novel approaches such as cell therapy using mesenchymal stem cells (MSCs) aim to repair and regenerate damaged cartilage and reduce inflammation, especially in the early stages of the disease. Additionally, therapy with exosomes, as active molecular carriers, promotes the repair process and reduces inflammation in joints. These methods are rapidly expanding as minimally invasive and effective treatments. This study aimed to evaluate the safety and efficacy of intra-articular injections of repeated doses (two injections) of allogeneic umbilical cord-derived mesenchymal stem cells (UC-MSCs), UC-MSC-derived exosomes, and their secretome compared to intra-articular hyaluronic acid (HA) in patients with knee osteoarthritis. Materials and Methods: The study was conducted in two phases: the first phase was production and technology development, and the second was a clinical trial. In the first phase, umbilical cord Wharton's jelly MSCs were prepared under standard conditions and characterized. The secretome and exosomes were isolated and quality tested. After product preparation, phase two was an accessible clinical trial approved by the ethics committee and registered in the Iranian Registry of Clinical Trials. The trial included eligible men and women aged 50-80 years with knee osteoarthritis diagnosed according to the American College of Rheumatology criteria. The population consisted of patients with mild to moderate knee osteoarthritis visiting outpatient physical medicine clinics. Personal data, including age, sex, affected knee side, supplement use, and specific diet, were recorded. The Visual Analog Scale (VAS), a common subjective method, was used to assess changes in pain. Functional changes were evaluated using the Western Ontario and McMaster Universities Arthritis Index (WOMAC), assessing pain, stiffness, and function, and the Lequesne index, a questionnaire assessing pain and functional disability. The SF-36 questionnaire was used to assess quality of life changes. Ninety-six participants were randomly assigned in a 1:1:1:1 ratio by block randomization (blocks of 4 and 8) using RAS software to one of four groups: intra-articular HA at baseline and six months (control group, n=24), UC-MSCs at baseline and six months (n=24), UC-MSC secretome at baseline and six months (n=24), or UC-MSC-derived exosomes at baseline and six months (n=24). MSC injections contained 30 × 10^6 UC-MSCs in 3 mL saline with 5% AB plasma; exosomes and secretome contained EVs 8 × 10^10.5 in 3 mL saline with 5% AB plasma; HA injections contained 3 mL Durolane. Results: Data were presented as mean (standard deviation) and frequency (percentage) for quantitative and qualitative variables, respectively. Data analysis was performed using SPSS version 23. Normality was assessed by the Kolmogorov-Smirnov test. To compare baseline pain, function, and quality of life indices, independent t-tests were used, and post-intervention group comparisons were performed using ANCOVA, controlling for baseline values and potential confounders. Parametric tests were used for data with normal distribution, and non-parametric tests for non-normal distributions. Results showed that intra-articular injection of mesenchymal stem cells did not significantly improve disease symptoms. Exosome injections had a highly significant effect on disease improvement ($p < 0.05$). The secretome showed an even better therapeutic effect compared to exosomes ($p < 0.001$).

Keywords: Mesenchymal stem cells, exosomes, secretome, osteoarthritis.

23919 - Invited oral presentation

Organoid

Seyed Iman Seihoon[1*]

1-Tehran Medical Science University
*Corresponding author: i.seihoon@gmail.com

Abstract

Organoids are simple tissue-engineered cell-based in vitro models that recapitulate many aspects of the complex structure and function of the corresponding in vivo tissue. They can be dissected and interrogated for fundamental mechanistic studies on development, regeneration and repair in human tissues, and can also be used in diagnostics, disease modelling, drug discovery and personalized medicine. Organoids are derived from either pluripotent or tissue-resident stem (embryonic or adult) or progenitor or differentiated cells from healthy or diseased tissues, such as tumours. To date, numerous organoid engineering strategies that support organoid culture and growth, proliferation, differentiation and maturation have been reported.

Keywords: cell transfer, cancer, organoids.

23913 - Invited oral presentation

Novel Stem Cell Therapies in Male Infertility

Hossein Eini[1*]

1-Clinical Embryologist/PhD in Reproductive Biology/Iran University of Medical Sciences
*Corresponding Author: h.eyni1990@gmail.com

Abstract

In modern life, several factors such as genetics, exposure to toxins, and aging have resulted in significant levels of male infertility, estimated to be approximately 18% worldwide. In response, substantial progress has been made to improve in vitro fertilization treatments (e.g. microsurgical testicular sperm extraction (m-TESE), intra-cytoplasmic sperm injection (ICSI), and round spermatid injection (ROSI)). Mimicking the structure of testicular natural extracellular matrices (ECM) outside of the body is one clear route toward complete in vitro spermatogenesis and male fertility preservation. Here, a new wave of technological innovations is underway applying regenerative medicine strategies to cell-tissue culture on natural or synthetic scaffolds supplemented with bioactive factors. The emergence of advanced bioengineered systems suggests new hope for male fertility preservation through development of functional male germ cells. To date, few studies aimed at in vitro spermatogenesis have resulted in relevant numbers of mature gametes. However, a substantial body of knowledge on conditions that are required to maintain and mature male germ cells in vitro is now in place. This presentation explains about fertility preservation and infertility treatment in male using tissue engineering and regenerative medicine techniques.

Keywords: stem cell, male, infertillity.

23914 - Invited oral presentation

mRNA-PROTAC synergy for personalized cancer vaccines

Hosein Ghasemi Moghadam[1*]

1-Associate Professor of Internal Medicine & Hematology- Oncology,Department of Medical Biotechnology, Faculty of Medical Sciences and Technologies, Tabriz University of Medical Sciences
*Corresponding author: dr.ghasemi621@gmail.com

Abstract

Recent advances in gene therapy and immuno-oncology have reshaped the landscape of cancer treatment. Personalized cancer vaccines based on mRNA platforms enable patient-specific immune activation tailored to individual tumor genomic profiles. Meanwhile, PROTAC technology has emerged as a powerful strategy to selectively degrade oncogenic proteins, offering novel therapeutic avenues. This talk explores the synergistic integration of mRNA and PROTAC technologies in next-generation cancer vaccine design, aiming to redefine the scope of precision oncology and open new frontiers in personalized **cancer** immunotherapy.

Keywords: Oncology, synergy, mRNA.

23936 - Invited oral presentation

Cervical wound healing using alginate-derived hydrogel and PRP

Masoumeh Majidi zolbin[1*]

1-Tehran Medical Science University
*Corresponding Author: Masoumeh.Majidizolbin@gmail.com

Abstract

This study proposes a controlled-release drug delivery system that combines platelet-rich plasma (PRP) with alginate hydrogel, a natural polymer, to enhance cervical healing. We evaluated the effectiveness of this innovative hydrogel approach (Alg-PRP) in improving cervical healing in a rat model of cervical injury. Forty female Wistar rats were randomly divided into ٤groups (n = ١٠): Alg-PRP, PRP, PBS, and healthy control. Descriptive and validation experiments were performed to assess the properties of the Alg-PRP hydrogel. Cervical trauma was induced under anesthesia using an ١٨-gauge needle. The Alg-PRP and PRP groups received their respective treatments, while the PBS group received no treatment and the control group was left uninjured. Cervical tissue regeneration was evaluated using quantitative real-time reverse transcription PCR (qRT-PCR) and histopathological assessments. Immunohistochemical (IHC) staining was also performed to assess cervical fibrosis and healing parameters. Functional outcomes, including pregnancy rate and litter size, were also analyzed. The Alg-PRP hydrogel exhibited a uniform porous structure and minimal toxicity to cells, could gradually release growth factors, and could be safely degraded in the animal body without causing damage. According to qRT-PCR results, vascular endothelial growth factor (VEGF) expression in the Alg-PRP group was significantly higher compared to the PBS group ($p < ٠,٠٠١$). The Alg-PRP group also showed lower expression of matrix metalloproteinase- ٩(MMP٩) and transforming growth factor-β (TGF-β) genes compared to the PBS and control groups ($p < ٠,٠٠٠١$and $p < ٠,٠٠١$, respectively), indicating reduced fibrosis and inflammation. Collagen I and III expression was decreased in the Alg-PRP group compared to the PBS and control groups ($p < ٠,٠٠١$and $p < ٠,٠٥$, respectively). Fibrosis scores determined by Masson's trichrome staining were lowest in the Alg-PRP group ($p < ٠,٠١$). IHC showed increased epithelial and cellular proliferation ($p < ٠,٠٠١$, $p < ٠,٠٠٠١$), decreased alpha-smooth muscle actin levels ($p < ٠,٠٠٠١$), and increased angiogenesis ($p < ٠,٠١$) in the Alg-PRP group. Functional results demonstrated the highest pregnancy rate (٪١٠٠) and larger litter sizes in the Alg-PRP group compared with the other groups. The findings indicate that the Alg-PRP hydrogel significantly improves cervical repair and reproductive outcomes in a rat model of cervical injury.

Keywords: Cervical ulcer, alginate, PRP.

23915 - Invited oral presentation

The role of microRNAs at the DLK1-DIO3 locus in regulating pluripotent stem cells

Sharif Moradi[1*]

1-Department of Stem Cells and Developmental Biology, Cell Science Research Center, Royan Institute for Stem Cell Biology and Technology, ACECR, Tehran, Iran
*Corresponding Author: sharif.moradi@gmail.com

Abstract

The imprinted Dlk1-Dio3 locus, which harbors the largest microRNA (miRNA) cluster in the mammalian genome, is a critical regulator of naïve pluripotency. Our research demonstrates that miRNAs from this locus are significantly upregulated in mouse embryonic stem cells (ESCs) cultured under ground-state (2i and R2i) conditions, which are associated with locus hypomethylation. We identify a distinct signature of maternally expressed miRNAs, specifically miR-541-5p, miR-410-3p, and miR-381-3p, that is pivotal for the efficient derivation of ESCs from the inner cell mass (ICM). Functional analyses reveal that these miRNAs are not merely 2i/R2i-associated biomarkers but active drivers of ground-state pluripotency: their overexpression robustly enhances the efficiency of ESC generation and augments pluripotency, while their inhibition compromises it. Mechanistically, they promote self-renewal and stabilize the ground state by repressing pro-differentiation pathways. Our findings establish Dlk1-Dio3 locus-embedded miRNAs as essential drivers of both the establishment and maintenance of naïve pluripotency, providing fundamental insights into the post-transcriptional.

Keywords: microRNA, DIJ1-Dio3, locus.

23918 - Invited oral presentation

Evaluation of the effectiveness of amniotic membrane in the treatment of extravasation in neonates.

Kayvan Mirnia[1*]

1-Associate Professor of neonatology pediatric department children's medical center tehran university of medical science
*Corresponding Author: Kayvanmirnia@yahoo.com

Abstract

Objective: Extravasation, the leakage of substances from a peripheral intravenous (IV) access into the surrounding tissues, can lead to tissue damage ranging from local irritation to necrosis and scarring. Neonates are at increased risk of extravasation due to their small and fragile veins, and the need for prolonged IV therapies. In this report, we investigated the effectiveness of using amniotic membrane (AM) as a biological dressing for treating extravasation injuries in neonates.
Methods: This case series included six neonates who presented with extravasation injuries between February ۲۰۲۰and April ۲۰۲۲. Neonates of any gestational age who developed wounds secondary to extravasation were included in the study. Neonates with skin disorders or grade ۱and ۲wounds were excluded from the study. Wounds that were free of infection and necrosis were covered with amniotic membrane and assessed after ٤٨hours. Five days after AM placement, the dressing was removed and replaced; this process was continued every ٥to ٧days until healing.
Results: The mean gestational age of the neonates was ٣٣,٦weeks. The mean healing time was ١٢,٥ days (range ٢٠-١٠days), and no adverse reactions were observed. All neonates healed completely without scarring.
Conclusion: This preliminary report suggests that the use of amniotic membrane is safe and effective in the treatment of extravasation in neonates. However, controlled studies with larger sample sizes are necessary for a more accurate evaluation and to determine clinical implications.

Keywords: Extravasation, neonatal, amniotic.

23937 – Invited oral presentation

Cell therapy in neurodegenerative diseases

Nasim Vosughi[1,*]

1-Department of Applied Cell Sciences, School of Advanced Medical Technologies, Tehran University of Medical Sciences
*Corresponding Author: Dr.n.vosoughi@gmail.com

Abstract

Neurodegenerative diseases such as Alzheimer's, Parkinson's, multiple sclerosis (MS), Huntington's, and other disorders that degenerate the central nervous system, are major challenges in contemporary medicine, characterized by progressive degeneration of nerve cells, functional disability, and reduced quality of life for patients. Current treatments are mainly symptomatic and unable to halt or reverse the disease process. In this context, cell therapy has emerged as a novel and promising approach that, by utilizing mesenchymal stem cells, neural stem cells, and other cellular sources, offers the possibility of repairing nerve tissue, modulating immune responses, and restoring impaired functions. This presentation will introduce and review the latest achievements and scientific evidence in the field of cell therapy applications for neurodegenerative diseases. In particular, studies related to the role of stem cells in improving cognitive deficits in Alzheimer's, restoring motor function in Parkinson's, modulating inflammatory processes in MS, and cellular interventions in Huntington's disease will be discussed. Furthermore, existing challenges, including the limitations of clinical trials, safety issues, and the need for standardization of treatment protocols, will be examined.
Overall, cell therapy offers a promising perspective for developing effective treatments for a wide range of neurodegenerative diseases, although the path forward requires more extensive basic and clinical research to ensure the efficacy and safety of this approach.

Keywords: Alzheimer, Cell therapy, neurodegenerative.

21910 - Oral

Phase I Clinical Evaluation of Fetal Membrane Constructs Seeded with Fibroblasts and Keratinocytes for Enhanced Diabetic Wound Healing"

Atefeh Shahbazi[1] *, Masoud Habibi[1], Mehrangiz Tootoonchi[1] , Gholamreza Esmaeeli Djavid[1]

1-Department of Regenerative Medicine and Biotechnology in Wound Healing, Medical laser research center, Yara institute, academic center for education culture and research (ACECR), Tehran, Iran
*Corresponding Author: shahbazi_2082@yahoo.com

Abstract

Fetal membranes have demonstrated considerable efficacy in treating chronic wounds, particularly diabetic foot ulcers (DFUs), by promoting re-epithelialization, accelerating wound closure, and exerting strong anti-inflammatory and anti-scarring effects through the elimination of inflammatory cells while preserving a cytokine-rich extracellular matrix. When combined with skin-derived stem cells, fetal membranes create a favorable microenvironment for the ex vivo expansion of fibroblasts and keratinocytes while maintaining their normal phenotypes; these cells contribute to tissue regeneration via secretion of key growth factors and signaling molecules. This study evaluated the therapeutic efficacy of fetal membranes seeded with dermal (fibroblasts) and epidermal (keratinocytes) cells versus conventional sterile gauze dressings in 30 DFU patients randomized into two groups: Group A (n = 15) received fetal membrane dressings seeded with fibroblasts and keratinocytes, and Group B (n = 15) received sterile gauze alone. Fetal membranes were washed with PBS, sectioned, and decellularized using three freeze–thaw cycles (−80 °C/37 °C) followed by overnight incubation in trypsin–EDTA at 4 °C, effectively removing cellular components while preserving extracellular matrix structure; trypsin was neutralized with DMEM, and membranes were washed and stored at −80 °C for up to three months. Primary fibroblasts and melanocytes were isolated from human foreskin, with epidermis and dermis separated using Dispase II, keratinocytes obtained via trypsin–EDTA digestion, and fibroblasts extracted from the dermis; all cells were cultured in specialized media under sterile cleanroom conditions. In Group A, cell identity was confirmed using Vimentin (fibroblast marker) and keratinocyte-specific antibody CK14, and the scaffold was sterilized via the plasma method, packaged into 5 × 5 cm units, and applied to wounds. Clinical assessments every three weeks showed progressive wound closure, reduced exudate, absence of pus or necrotic debris, and no swelling, infection, or inflammation. All Group A patients exhibited significant improvement, with several achieving complete or near-complete epithelialization; the scaffold remained sterile, well-tolerated, and free from adverse immunological reactions, demonstrating safety, biocompatibility, and promising efficacy for chronic wound healing.

keywords: Fetal Membranes, Fibroblasts, Keratinocytes, Diabetic Foot Ulcer, Wound Healing.

22171 - Oral

Intraperitoneal Melatonin Administration Mitigates Testicular Damages in Mouse Model of Non-Obstructive Azoospermia Mouse Model of Non-Obstructive Azoospermia

Mohammadmehdi Barfar[1], Zahra Saffarian[1], Fereshteh Azedi[2], Hannaneh Golshahi[1*]

1- Nanobiotechnology Research Center, Avicenna Research Institute, ACECR, Tehran, Iran
2- Cellular and Molecular Research Center, Iran University of Medical Sciences, Tehran, Iran; Department of Neuroscience, Faculty of Advanced Technologies in Medicine, Iran University of Medical Sciences, Tehran, Iran.
*Corresponding Author: h.golshahi@avicenna.ac.ir

Abstract

Non-obstructive azoospermia (NOA) is a severe form of male infertility characterized by impaired spermatogenesis in the testes, often lacking effective therapeutic options (1). It is frequently associated with reduced antioxidant levels and oxidative stress, which further contribute to testicular damage (2). This study aims to investigate the therapeutic potential of intraperitoneal melatonin administration in modulating histopathological alterations of testicular tissue in a non-obstructive azoospermia model. A total of eighteen adult mice were randomly assigned into three experimental groups: (1) Sham, (2) untreated (NOA model), and (3) melatonin-treated. Melatonin was administered intraperitoneally at a dose of 8 mg/kg once weekly over eight consecutive weeks. Upon completion of the treatment regimen, all animals were euthanized, and testicular tissues were harvested for subsequent histological and biochemical analyses. Melatonin treatment partially reduced tissue damage compared to the untreated group, although degenerative changes and vacuolization persisted in several seminiferous tubules. The present study suggested that intraperitoneal administration of melatonin into busulfan-induced azoospermia in mice improved testicular failure and may ameliorate testicular tissue damage.

keywords: Non-obstructive azoospermia (NOA), Melatonin, intraperitoneal administration, Testicular histopathology, Seminiferous tubules.

22268 - Oral

Effect of the Interaction Between Direct Current Electric Field and Iranian Honeybee Venom on Neural Differentiation of Bone Marrow-Derived Mesenchymal Stem Cells

Mohammad Hossein Fakourzadeh[1], Rasoul Amirfattahi[1], Mohammad Nabiuni[2 *], Latifeh Karimzadeh Bardeei[3]

1- Department of Biomedical Engineering, Faculty of Electrical and Computer Engineering, Isfahan University of Technology, Isfahan, Iran
2- Department of Cell and Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran.
3- Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: nabiuni@khu.ac.ir

Abstract

The use of stem cells is one of the most promising therapeutic approaches for neurological disorders. Electrical stimulation, as a biophysical method, along with natural compounds such as honeybee venom, has shown potential in inducing efficient neural differentiation of stem cells both in vitro and in vivo. This study aimed to investigate the effects of direct current electric fields and Iranian honeybee venom on the neural differentiation potential of mesenchymal stem cells. Mesenchymal stem cells were isolated from the bone marrow of adult Wistar rats (4–5 weeks old) and cultured in DMEM/F12 medium supplemented with 10% fetal bovine serum and 1% antibiotics. The cells were maintained in an incubator at 37°C with 5% CO_2. The mesenchymal nature of the cells was confirmed using flow cytometry and the expression of CD34, CD45, CD44, and CD73 markers. The MTT assay was used to assess the cytotoxicity of honeybee venom and cell viability under direct current electrical stimulation. To evaluate the extent of neural differentiation of mesenchymal stem cells under the influence of electrical stimulation and honeybee venom treatment, cresyl fast violet staining was performed after ten days. The results revealed that the IC50 concentration of honeybee venom was determined to be 9.69 µg/mL. In groups treated with honeybee venom, electrical stimulation, or their combination, morphometric parameters, including neurite length and number, were significantly increased compared to the control group. However, the combination of honeybee venom and electrical stimulation resulted in less differentiation compared to individual treatments. Electrical stimulation, as a biophysical factor, and honeybee venom, as a bioactive agent, demonstrated the ability to induce neural differentiation.

keywords: stem cell, electric stimulation, neural differentiation, honey-bee venom.

22226 - Oral

Protective Effects of Menstrual Blood Stem Cell-Derived Secretome by modulation of Antioxidant Status in Busulfan-Induced Azoospermic Mice

Mohammadmehdi Barfar[1], Zahra Saffarian[1], Fereshteh Azedi[2], Hannaneh Golshahi[1*]

1- Nanobiotechnology Research Center, Avicenna Research Institute, ACECR, Tehran, Iran
2- Cellular and Molecular Research Center, Iran University of Medical Sciences, Tehran, Iran; Department of Neuroscience, Faculty of Advanced Technologies in Medicine, Iran University of Medical Sciences, Tehran, Iran
*Corresponding Author: h.golshahi@avicenna.ac.ir

Abstract

Non-obstructive azoospermia is one of the most common causes of male infertility. Stem cell research represents a new hope for developing novel therapies with higher safety and lower cost. This study aimed to investigate the effect of the secretome derived from allogeneic human menstrual blood stem cells (MenSCs-CM) on changes in the oxidative stress/antioxidant status of busulfan-induced azoospermic mice. Eighteen adult mice were divided into three experimental groups: (1) Sham, (2) no treated group (NOA model), and (3) NOA+secretome administration. Secretome was obtained from MenSCs. Ten microliters of secretome were first injected into the rat testis space in mice with NOA. Then, they received 500 microliters once a week for eight consecutive weeks intraperitoneally. Afterward, the animals were euthanized, and blood samples were collected for further evaluations. Secretome administration significantly increased CAT, SOD, and GSH levels compared to the untreated NOA group. These markers also showed a higher trend relative to the sham controls. Secretome administration effectively enhanced the antioxidant defense system in busulfan-induced azoospermic mice, as evidenced by significant increases in CAT, SOD, and GSH levels. These results suggest that secretome treatment can restore redox balance and stimulate adaptive antioxidant responses, highlighting its potential therapeutic role in mitigating oxidative stress associated with azoospermia.

keywords: Azoospermia, Busulfan, Menstrual blood stem cell, Secretome, Antioxidant defense.

22378 - Oral

Recellularization of testis using decellularized testicular scaffold of rat

Alireza Yousefi[1], Mohammad Hajian[1*], Malihezaman Monsefi[1]

1- Developmental Biology Research Lab., Department of Biology, University of Shiraz, Shiraz, Iran
*Corresponding Author: hajian.m72@gmail.com

Abstract

Abstract: Given the importance of testicles in reproduction, testicular tissue engineering was addressed by implanting natural scaffolds and migrating host somatic cells. Adult rat testis were divided into two parts and decellularized using SDS (Sodium dodecylsulfate) and Triton X-100 solutions at concentrations of 0.1, 0.3, and 0.6% for 48 and 24 hours. The degree of decellularization and scaffold integrity of testicular sections were examined after hematoxylin-eosin and Hoechst staining. Evaluation of the scaffolds was performed using scanning electron microscopy (SEM) and Raman microscopy spectroscopy. Decellularized scaffolds were implanted into the abdominal cavity of normal rats, under the liver lobes and along the mesentery. The scaffolds were removed from the host body after 10, 20, and 30 days, and the cells were replaced into the scaffolds using the aforementioned techniques. The use of SDS and Triton X-100 preserved the structure of the extracellular matrix and completely decellularized the testicular tissue. Tissue sections of the cell-enriched scaffolds showed cell penetration and nesting in the structure of seminiferous tubules, blood vessels, and tunica albuginea. Implantation of a natural testicular scaffold is non-toxic for the migration, growth, and survival of host mesenchymal cells, enabling their different cells of germinal epithelum. This method is a suitable option for testicular tissue engineering without causing an immune reaction. It is recommended to investigate the success of testicular tissue engineering over a long period of time, transplant the engineered testicle into the mouse body, and examine sperm formation over a long period of time.Keywords: Re-cellularization, Testis natural scaffolds, SDS, Triton X-100

keywords: Re-cellularization, Testis natural scaffolds, SDS, Triton X-100.

21493 - Oral

Study of synergize of the chitosan hydrogel containing α-tocopherol antioxidant on differentiation of Mesenchymal stem cells for skin tissue engineering

Shiva Hajimousaei[1], Shiva Irani[1], Fereshteh Sharifi[2*]

1-Department of Biology, SR.C., Islamic Azad University, Tehran, Iran
2-Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: fer.sharifi.368@iau.ac.ir

Abstract

Nowadays, hydrogel scaffolds are used as supporting structures to control cell growth in the repair of damaged tissues or organs. The aim of this study investigate the biocompatibility and expression of COLLAGEN protein of Mesenchymal stem cells (MSC) differentiated into fibroblasts in the Chitosan hydrogel (CTS) and the antioxidant α-tocopherol (α-toco). At first CTS hydrogel containing α-toco was synthesized and characterized with Scanning Electron Microscopy (SEM). Then, MTT assay was used to assess the biocompatibility of the MSC in 72 hours. At the end, the expression of COLLAGEN protein was evaluated using Immunocytochemistry (ICC) over 14 days for confirming the fibroblast differentiation.In the results of SEM images of the hydrogel showed that the hydrogel had an acceptable morphology with a porous structure. The MTT assays proved that the biocompatibility of MSCs increased in 72 hours. Also, the results of the ICC test revealed COLLAGEN expression (49.80%).From these results, it can be concluded that α-toco natural antioxidant, combined with CTS hydrogel, can improve the growth and differentiation of MSCs cells to fibroblasts and can be considered as a candidate for use in skin tissue engineering.Finally, considering the limitations of this study, some suggestions can be made in this regard such as changing the source of mesenchymal cells and changing the protein under study in inducing differentiation.

keywords: Chitosan, Hydrogel, α-tocopherol, Mesenchymal stem cells , fibroblast differentiation.

21466 - Oral

Study of the viability of fibroblast cells cultured on sodium alginate-carrageenan scaffolds incorporated with cerium oxide nanoparticles.

Samin Bisheh[1], Vahid Nejati[1*], Ali Akbari[2], Jafar Rezaie[2]

1- Department of Biology, Faculty of Sciences, Urmia University, Urmia, Iran
2- Solid Tumor Research Center, Cellular and Molecular Medicine Research Institute, Urmia University of Medical Sciences, Urmia, Iran
*Corresponding Author: v.nejati@urmia.ac.ir

Abstract

Application of tissue engineering involves the development of biological substitutes for the repair, replacement, preservation, or enhancement of tissue and organ function. This study was designed and conducted to evaluate of mouse fibroblast cells(3T3) cultured on sodium alginate-carrageenan based scaffolds incorporated with cerium oxide nanoparticles. To prepare the nanocomposite scaffolds, cerium oxide nanoparticles were loaded onto sodium alginate-carrageenan scaffolds. Following freeze-drying, characterization tests were performed on the scaffolds, and the MTT assay was used to assess cell viability. The cells were divided into five treatment groups: F0, F3, F5, F7 and control. The results demonstrated that the addition of cerium oxide nanoparticles to the sodium alginate-carrageenan scaffolds resulted in the relative improvement in fibroblast cells viability over 24 hours. The group without nanoparticles showed a significant decrease in cell survival compared to the control group ($p < 0.05$). Whereas the other groups, F3 (3% nanoparticles), F5 (5% nanoparticles), F7 (7% nanoparticles), exhibited viability levels close to the control group with no significant differences observed. These findings indicate the protective role of cerium oxide nanoparticles in enhancing the biocompatibility of the scaffolds.

keywords: tissue engineering, scaffold, nanocomposite, fibroblast cells.

22422 - Oral

Therapeutic potential of exosomes derived from human endometrial mesenchymal stem cells for heart tissue regeneration after myocardial infarction

Masoumeh Sepehri [1], Shahram Rabbani [2], Jafar Ai [1], Naghmeh Bahrami [1,3], Somayeh Ebrahimi-Barough [1*]

1- Department of Tissue Engineering, School of Advanced Technologies in Medicine, Tehran University of Medical Sciences, Tehran, Iran
2- Research Center for Advanced Technologies in Cardiovascular Medicine, Cardiovascular Diseases Research Institute, Tehran University of Medical Sciences, Tehran, Iran
3- Craniomaxillofacial Research Center, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding Author: somaye.ebrahimi@gmail.com, massisepehri@yahoo.com

Abstract

Myocardial infarction (MI) is the most common cardiovascular disease (CVD) and the leading cause of mortality worldwide. Recent advancements have identified human endometrial mesenchymal stem cells (hEnMSCs) as a promising candidate for heart regeneration; however, challenges associated with cell-based therapies have shifted focus toward cell-free treatments (CFTs), such as exosome therapy, which shows considerable promise for myocardial tissue regeneration.MI was induced in male Wistar rats by occluding the left anterior descending (LAD) coronary artery. The hEnMSCs-derived exosomes (hEnMSCs-EXOs) were encapsulated in an injectable fibrin gel inside the cardiac tissue. The encapsulated hEnMSC-EXOs were administered, and their effects on myocardial regeneration, angiogenesis, and heart function were monitored for 30 days post-MI. The treatments were evaluated through histological analysis, echocardiographic parameters of left ventricular internal dimension at end-diastole (LVIDD) and end-systole (LVIDS), left ventricular end-diastole volume (LVEDV), left ventricular end-systole volume (LVESV), left ventricular ejection fraction (LVEF), and molecular studies. Histological findings demonstrated significant fibrosis and left ventricular remodeling following MI. Treatment with fibrin gelencapsulated hEnMSCs-EXOs substantially reduced fibrosis, enhanced angiogenesis, and prevented heart remodeling, leading to improved cardiac function. Notably, 30 days after encapsulated hEnMSCs-EXOs were delivered, a less inflammatory microenvironment was observed, supporting cardiomyocyte retention in ischemic tissue. This study highlights the potential of encapsulated hEnMSCs-EXOs in fibrin gel as a novel therapeutic strategy for ischemic myocardium repair post-MI. The findings underscore the importance of biomaterials in advancing stem cell-based therapies and lay a foundation for clinical applications to mitigate heart injury following MI.

keywords: Human endometrium mesenchymal stem cells, Myocardial infarction, Heart regeneration, Exosomes, Angiogenesis.

21667 - Oral

Autologous Mesenchymal Stem Cell Transplantation in Genetically Complex Cerebellar Ataxia: A Case Report

Amirreza Boroumand[1*] , Jalil Tavakol-Afshari[2], Hamid Reza Rahimi[3], Majid Mojarrad[4], Yalda Mohtaj Khorassani[5], Delaram Hassani[6]

1- International Center for Personalized Medicine (P7Medicine), 40235 Dusseldorf, Germany
2- Immunology Research Center, Department of Immunology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
3- Department of Medical Genetics and Molecular Medicine, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
4- Khorasan Razavi Genetics Foundation, Mashhad, Iran
5- Rayan Research Center for Neuroscience & Behavior, Department of Biology, Faculty of Science, Ferdowsi University of Mashhad, Mashhad, Iran
6- Applied Biotechnology Research Center, TeMS.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: arboroumand.ab@gmail.com

Abstract

Abstract:Introduction: Cerebellar ataxias are progressive neurodegenerative disorders with genetic causes and limited treatment options. Variants in genes such as SYNE1 and MINPP1 have been linked to distinct hereditary ataxias. We report two siblings with cerebellar ataxia and different pathogenic variant combinations: the brother was homozygous for both SYNE1 and MINPP1, while the sister was heterozygous for SYNE1 and homozygous for MINPP1. This is the first reported case of heterozygous SYNE1 and MINPP1 variants co-occurring in ataxia.Materials and Methods: Each patient underwent eight sessions of autologous mesenchymal stem cell transplantation (MSCT) using bone marrow-derived MSCs (1×10^6 cells/kg), delivered via intravenous and intrathecal routes at 1-, 3-, and 6-month intervals. Dual-route delivery may enhance CNS engagement. Safety screenings were conducted before each session. Supportive care included physiotherapy, antioxidants, and a high-protein diet. Clinical progress was tracked using the Scale for the Assessment and Rating of Ataxia (SARA).Results: The 22-year-old sister showed sustained improvement, with SARA scores reducing from 5 to 0 over 24 months, including gains in balance, coordination, and speech. Only transient side effects (fever, headache, nausea) occurred. The 15-year-old brother showed early improvements, but his SARA scores fluctuated (2–8), possibly due to disease progression or genotype-related resistance. The sister's benefits persisted through a 12-month follow-up, suggesting durable effects.Discussion and Conclusions: MSCT may provide functional benefits in genetically complex ataxia, potentially through paracrine effects. The sister's response may relate to her preserved SYNE1 allele, which supports MSC function. Genotype-specific responsiveness should guide future trials, incorporating genetic stratification and biomarker profiling to refine treatment and predict therapeutic outcomes.

keywords: : Mesenchymal Stem Cell Therapy, Cerebellar Ataxia, Neurodegenerative Disease, SYNE1 Mutation, SARA score.

22576 - Oral

Microfluidic chips to synthesize microcarriers for in vivo application of neural stem cells

Ahmadreza Maftoonazad[1], Zahra Azarmgin[2], Farzad Moradikhah[3], Ehsan Seyedjafari[3], Bahman Zeynali[2], Azita Parvaneh Tafreshi[1,2*]

1-Developmental Biology Laboratory, School of Biology, College of Science, University of Tehran, Tehran, Iran
2-Department of Molecular Medicine, Faculty of Medical Biotechnology, National Institute of Genetic Engineering and Biotechnology, Tehran, Iran
3 -Department of Medical Biotechnology, School of Biotechnology, College of Science, University of Tehran, Iran
*Corresponding Author: tafreshi@nigeb.ac.ir

Abstract

Injectable microcarriers provide a defined three-dimensional niche to guide neural lineage commitment while enabling minimally invasive delivery. We fabricated alginate–gelatin microcarriers reinforced with graphene oxide using microfluidic chips. Microcarriers were synthesized by using injectable pumps which generated water-in-oil droplets followed by ionic, chemical crosslinking, physicochemical and biological characterization. This yielded monodisperse spheres ≈200 µm in diameter. Fourier-transform infrared spectroscopy confirmed alginate, gelatin, and graphene oxide containing carriers. Scanning electron microscopy revealed a porous, roughened surface of graphene-oxide carriers versus smoother in those of the alginate–gelatin. Graphene oxide reduced equilibrium swelling ratio and increased apparent stiffness compared to alginate–gelatin controls, which led to preservation of their shape for at least 45 days in culture. Biocompatibility was confirmed by live/dead and MTT assays of human adipose-derived mesenchymal stem cells cultured on carriers, demonstrating >90% viability and sustained proliferation. Using basic fibroblast growth facto (bFGF), epidermal growth factor(EGF) and platelet-derived growth factor(PDGF) in cultured mesenchymal stem cells, we showed neural induction of the stem cells (nestin+, SOX2+) by immunocytochemistry and real-time PCR. Our microfluidic approach established a scalable, uniform, mechanically reinforcable and culture-compatible microcarriers that support attachment, survival, and early neural priming.

keywords: Microfluidic chips, microcarriers, neural stem cells.

22611 - Oral

Novel Sulfated Alginate/Cerium-Doped Bioactive Glass Scaffolds: A Promising Strategy for Cardiac Regeneration

Fatemeh Shams[1], Nafiseh Baheiraei[2 *], Fatemeh Forouzandeh[2]

1- Department of Basic sciences, Biology and health, Faculty of Interdisciplinary Sciences and Technologies, Tarbiat Modares University, Tehran, Iran
2- Tissue Engineering and Applied Cell Sciences Division, Department of Anatomical Sciences, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran
*Corresponding Author: n.baheiraei@modares.ac.ir

Abstract

Cardiovascular diseases remain a leading cause of mortality worldwide, underscoring the urgent for regenerative therapies. In this study, porous composite scaffolds composed of sulfated alginate (S-Alg) integrated with 5% cerium-doped 45S5 bioactive glass (Ce-BG) were fabricated using a freeze-drying technique for cardiac applications. Scanning electron microscopy revealed an interconnected porous network with an average pore diameter of 150 ± 50 µm. The scaffold demonstrated cytocompatibility by supporting the adhesion and proliferation of human umbilical vein endothelial cells (HUVECs) over seven days. Functional assays showed up to a 2.5-fold increase in VEGFR2 gene expression on S-Alg/Ce-BG scaffold compared to control, and DPPH radical scavenging activity reached 65% after 24 hours, highlighting pronounced antioxidant potential. Sustained release of calcium, silicon, and cerium ions was observed over seven days, contributing to a favorable microenvironment for cardiac tissue regeneration. Collectively, the S-Alg/Ce-BG scaffolds combine structural integrity, pro-angiogenic signaling, and antioxidant activity, positioning them as promising candidates for cardiac patch applications. Future studies, including cardiomyocyte evaluations and in vivo models, are recommended to further assess their translational potential.

keywords: Cardiac tissue engineering, Cerium-doped bioactive glass, Sulfated alginate, Angiogenesis, Antioxidant activity.

21955 - Oral

Tissue Engineering Approaches for Diabetes Treatment: Reviewing Cell Encapsulation Strategies

Nasrin Salehi[1], Zahra Azizi[2,3], Mozaffar Mahmoodi[4*]

1- Department of Bioscience Engineering, Faculty of Advanced Sciences and Technologies, University of Tehran, Tehran, Iran
2- Department of Applied Cellular Sciences, Faculty of Advanced Medical Technologies, Tehran University of Medical Sciences, Tehran, Iran
3- Department of Molecular Medicine, Faculty of Advanced Medical Technologies, Tehran University of Medical Sciences, Tehran, Iran
4Department of Molecular Medicine and Medical Biotechnology, Faculty of Medicine, Kurdistan University of Medical Sciences, Sanandaj, Iran
*Corresponding Author: m.mahmoodi@muk.ac.ir

Abstract

Diabetes mellitus is a metabolic disease affecting more than 500 million individuals globally, which is caused by a defect or deficiency of insulin leading to severe complications if not properly managed. The conventional methods of treatment including insulin therapy, oral hypoglycemic agents, and lifestyle changes, though successful up to a point, are confronted by serious challenges. Tissue engineering, as a more modern approach, offers a promising solution by enclosing pancreatic islets or insulin-producing cells in biomaterials to restore natural insulin production and regulate blood sugar levels. Many encapsulation techniques employ natural and synthetic biomaterials with different sources of insulin-producing cells to offer maximum biocompatibility, mechanical strength, and metabolic function. Tissue engineering addresses critical issues such as immune protection, cell viability, and proper insulin secretion versus the limitations of bioartificial pancreas. Recent advances and future directions are emphasized in this review highlighting the potential of tissue engineering to revolutionize diabetes therapy by rendering long-term immunoprotection and adaptive physiological treatment.

keywords: Diabetes, Microencapsulation, Nanoencapsulation, Islet cells, Bioartificial pancreas.

21548 - Oral

Next-Gen Stem Cell Engineering: From CRISPR-Enhanced Therapeutics to Exosome Paradigms in Regenerative Medicine

Farnaz Mozayani[1], Mohammadbagher Kargar[2 *]

1- Student Research Committee, School of Medicine, Birjand University of Medical Sciences, Birjand, Iran
2- Department of Cell and Molecular Biology, Faculty of Life Sciences and Biotechnology, Shahid Beheshti University, Tehran, Iran
*Corresponding Author: m_kargarmalekroodi@sbu.ac.ir

Abstract

Stem cell engineering, focused on mesenchymal stem cells (MSCs) and induced pluripotent stem cells (iPSCs), has established a new paradigm in regenerative medicine by manipulating self-renewal, multi-lineage differentiation, and paracrine signaling. This review critically analyzed recent preclinical and clinical evidence. Key findings revealed that engineering the cellular microenvironment with smart biomaterials (responsive hydrogels, 3D scaffolds) and targeted nanoparticles enhances cell survival and integration by up to 40%. CRISPR/Cas9-mediated genome editing improved therapeutic efficacy in models of diseases like Duchenne muscular dystrophy; however, editing efficiency in human MSCs remained low (1%), with persistent tumorigenicity and off-target effects, especially in iPSCs. In clinical trials, intra-articular MSC injections for knee osteoarthritis reduced pain by 50% (WOMAC score), and allogeneic MSC administration for steroid-refractory acute graft-versus-host disease (GvHD) achieved a 68.5% 180-day survival rate. Nevertheless, inherent cell heterogeneity, short-term persistence of transplanted cells in cardiac applications, and high cGMP production costs (up to 2,000L scale) posed major limitations. The conclusions highlight a paradigm shift toward cell-free exosome-based therapies, potentially reducing immune risks by 90%. Practical applications include developing automated bioreactors for mass production and safer CRISPRa/i platforms. Future studies should prioritize standardizing cell potency assays, engineering exosomes for tissue-specific targeting, and designing adaptive clinical trials aligned with harmonized FDA/EMA requirements.

keywords: Regenerative medicine, Stem cell engineering, Tissue repair, Mesenchymal stem cells (MSCs), Induced pluripotent stem cells (iPSCs).

22404 - Oral

Wharton's jelly exosome-decorated injectable microspheres made using microfluidics: a novel combinatorial approach for osteoarthritis regeneration

Soumayeh Amirsaadat[1], Abolfazl Barzegari[2 *]

1-Stem Cell and Regenerative Medicine Institute, Tabriz University of Medical Sciences, Tabriz, Iran
2- Université Sorbonne Paris Nord, INSERM UMR-S 1148, Laboratory for Vascular Translational Science, Nanotechnologies for Vascular Medicine and Imaging, France
*Corresponding Author: barzegaria@tbzmed.ac.ir

Abstract

Osteoarthritis (OA) is a debilitating joint disorder characterized by chronic inflammation and inadequate cartilage repair, necessitating advanced therapeutic strategies that extend beyond symptomatic relief. This study presents the design, development, and in vitro evaluation of a novel combinatorial drug delivery system for the sustained and synergistic treatment of OA. We developed injectable monodisperse microspheres using a microfluidic device, encapsulating Metformin (Met)-loaded hollow mesoporous silica nanoparticles (HMSNs) within PLGA matrix (PLGA-HMSN@Met). To enhance regenerative potential, Wharton's jelly-derived exosomes (WJ-Exos) were conjugated to the microsphere surface, creating a final PLGA-HMSN-Met@Exo composite.Structural analysis confirmed nanoscale HMSNs uniform PLGA microspheres (~75 μm). FTIR analysis verified successful Metformin loading. The PLGA-HMSN@Met system demonstrated superior release kinetics compared to HMSNs alone, eliminating the initial burst release and providing a uniform, linear, and sustained release of Met over 40 days, fitting the Higuchi model. The composite system was biocompatible, with loaded Met being safer than free drug and carriers safe for chondrocytes up to 100 μM.In an LPS-induced inflammatory model using C28/I2 chondrocytes, the PLGA-HMSN-Met@Exo system exhibited potent anti-inflammatory effects, significantly reducing pro-inflammatory markers (TNF-α, IL-6, iNOS) while elevating anti-inflammatory markers (Arg-1, TGF-β1). It also provided significant chondroprotection by inhibiting key cartilage-degrading enzymes (ADAMTS5, MMP 3, -13) and enhanced cell migration in a scratch assay.In conclusion, the microfluidic-synthesized PLGA-HMSN-Met@Exo system successfully integrates sustained drug release with exosome-mediated immunomodulation and repair. This combinatorial approach effectively addresses inflammation, inhibits cartilage degradation, and promotes regeneration, presenting a highly promising and intelligent strategy for advanced OA treatment.

keywords: Droplet-Microfluidic, PLGA microspheres, Exosomes, Sustained drug release, Anti-inflammatory, Osteoarthritis

22054 - Oral

Hydrogel nanocomposites based on sodium alginate dialdehyde/gelatin loaded by modified halloysite nanotubes: synthesis, identification and interaction with fibroblast cells

Sima Taghizadeh[1], Vahid Nejati[1 *], Ali Akbari[2], Jafar Rezaie[2]

1- Department of Biology, Faculty of Basic Sciences, Urmia University, Urmia, Iran
2- Solid Tumor Research Center, Cellular and Molecular Research Institute, Urmia University of Medical Sciences, Urmia, Iran
*Corresponding Author: v.nejati@urmia.ac.ir

Abstract

Regenerative medicine is an emerging field of research focused on the repair, replacement, or regeneration of cells, tissues, or organs to restore their function. This study aimed to synthesize and characterize nanocomposite hydrogels based on oxidized sodium alginate and gelatin, containing modified halloysite nanotubes, and to investigate their interactions with mouse fibroblast cells (3T3). Halloysite nanotubes were functionalized with 3-aminopropyl triethoxysilane (APTES) and incorporated into the hydrogels. N-hydroxysuccinimide (NHS) and 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide (EDC) were used as crosslinking agents during the fabrication process. After freeze-drying, characterization tests were performed on the hydrogels, and an indirect MTT assay was employed to evaluate cell viability and hydrogel-cell interactions. Cells were treated with varying percentages of halloysite nanotubes and divided into six groups: T0 (0%), T1 (1%), T3 (3%), T5 (5%), T7 (7%), and control. The results demonstrated that at 24 hours, increasing the percentage of halloysite nanotubes induced a statistically significant difference in cell viability and proliferation compared to the halloysite-free sample. Furthermore, at both 24 and 48 hours, the addition of modified halloysite nanotubes significantly enhanced cell viability and growth. These findings highlight the effective role of modified halloysite nanotubes in improving the biocompatibility of the hydrogels.

keywords: regenerative medicine, hydrogel,halloysite, fibroblast cell.

21495 - Poster

Combination Effect of Conditioned Medium and Chitosan-Based Hydrogel on Osteogenic differentiation of Mesenchymal Stem Cells

Rozhin Rajabi[1], Fereshteh Sharifi[2], Shiva Irani[1 *,]

1- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2- Department of Biology, Central Tehran Branch, Islamic Azad University, Tehran, Iran
*Corresponding Author: s.irani@srbiau.ac.ir

Abstract

The development of acellular strategies in tissue engineering, particularly in bone regeneration, has increasingly focused on cell secretions. The conditioned medium (CM) derived from adipose-derived mesenchymal stem cells (ADMSCs) is known as a rich source of bioactive paracrine factors capable of promoting osteogenic differentiation. In this study, ADMSCs were encapsulated in a chitosan/carboxymethyl chitosan (CTS/CMC) hydrogel scaffold and treated with 90% CM. Scaffold structure was examined by scanning electron microscopy (SEM) after 72 hours. Cell viability was assessed using MTT assay at 24 and 72 hours. Osteogenic differentiation was evaluated by Alizarin Red Staining (ARS), calcium content, and alkaline phosphatase (ALP) activity on days 7 and 14. SEM images confirmed the porous and interconnected structure of CTS/CMC hydrogel suitable for cell adhesion. MTT results showed significantly higher metabolic activity in the CM-treated group compared to control ($P<0.05$). ARS staining demonstrated enhanced calcium nodule formation in the CM group at both time points, indicating active matrix mineralization. Calcium content was significantly increased in CM-treated scaffolds, especially on day 14 ($P<0.01$), supporting late-stage mineralization. ALP activity also rose markedly in the CM group, particularly on day 14 ($P<0.05$), reflecting early osteogenic commitment. These findings suggest that CM alone, without exogenous differentiation factors, can effectively promote osteogenesis in stem cells. This approach represents a promising and expandable acellular strategy in bone tissue engineering. Future studies are recommended to include gene expression analysis and in vivo functional assessments to validate the efficacy of this method in bone regeneration.

keywords: Conditioned medium; Osteogenic; Hydrogel; Calcium deposition.

22471 - Poster

Preclinical evaluation of the effect of systemic administration of stem cells derived from Wharton's jelly and secretome extracted from it on renal tissue injury following heart failure

Negin Taslimi[1], Mahmood Manshoori[2], Jafar Hashemian[3,4], Razieh Shams[3,4], Niloofar Khalili[2], Mohammad Mehdi Barfar[2], Hannaneh Golshahi[2*]

1- Faculty of Veterinary Specialized Sciences, Department of Pathology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2- Nanobiotechnology Research Center, Avicenna Research Institute, University Jahad, Tehran, Iran
3- Regenerative Medicine and Cell Therapy Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
4- Diabetes Research Center, Institute of Clinical Endocrinology and Metabolism, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding Author: h.golshhi@avicenna.ac.ir

Abstract

Myocardial infarction induces oxidative stress and inflammation, impairing cardiac performance and causing injury to the distant organs like kidney. Mesenchymal stem cells derived from Wharton's jelly and their secretome, through release of paracrine factors, represent a promising approach to mitigate renal injuries.

keywords: Heart failure, Myocardial infarction, Cell therapy, Wharton's jelly mesenchymal stem cells.

22294 - Poster

Evaluation of the Compatibility of Electrospun Collagen/PVA Scaffolds Crosslinked with Citric Acid

Tahereh Mehrvarz[1], Hamid Mahdavi[2], Abbas Parham[1,3*]

1- Division of Physiology, Department of Basic Sciences, Faculty of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran.
2- Department of Novel Drug Delivery Systems, Faculty of Science, Iran Polymer and Petrochemical Institute, Tehran, Iran
3- Stem Cell Biology and Regenerative Medicine Research Group, Research Institute of Biotechnology, Ferdowsi University of Mashhad, Mashhad, Iran
*Corresponding Author: parham@um.ac.ir

Abstract

Abstract: In this study, the effect of citric acid crosslinking below the denaturation temperature on electrospun mats composed of PVA and collagen was investigated. PVA, due to its inherent solubility, exhibits limited stability, while collagen is a key biopolymer in the extracellular matrix. Collagen was solubilized in 0.5 M mild acid, and 10% w/v PVA was blended with varying concentrations of citric acid relative to PVA. Electrospinning parameters were kept constant for all solutions. The resulting mats were first heat-treated in an oven at 40 °C and subsequently exposed to citric acid vapor for 24 hours. Characterization was performed using FTIR, SEM, contact angle measurements, and HDF cell viability assays. FTIR spectra of all mats exhibited a peak at 1730 cm^{-1}, confirming ester bond formation and crosslinking of citric acid with PVA functional groups. In samples treated with intermediate citric acid concentrations, additional amide peaks were observed below 1500 and at ~3200. Contact angle analysis showed a slight increase after heat treatment, with higher hydrophobicity observed in samples exposed to citric acid vapor. SEM images revealed uniform fibers across all groups. Moreover, HDF cell viability was enhanced in mats treated with citric acid compared to the control, and the presence of collagen further promoted cell adhesion and proliferation. Overall, the findings demonstrate that intermediate concentrations of citric acid provide the most favorable balance for HDF fibroblast survival and growth in electrospun PVA/collagen scaffolds, highlighting the importance of optimizing citric acid content to enhance biocompatibility and support tissue regeneration.

keywords: Electroporation, polyvinyl alcohol, collagen, citric acid, HDF.

22175 - Poster

From Nature to Therapy: Bioactive Hydrogel with Effective Compounds from Yarrow and Turmeric Plants with Antioxidant Properties for Rapid Wound Healing and Skin Regeneration

Adeleh Tashtar[1 *], Fatemeh Barzegari Firouzabadi[1], Seyedeh Sara Hashemi[2]

1- Department of Biology, Payame Noor University, Tehran, Iran
2- Burn and Wound Healing Research Center, Shiraz University of Medical Sciences
*Corresponding Author: adelehtashtar1@gmail.com

Abstract

As the body's largest organ, the skin serves a critical role in protecting against external threats and maintaining physiological homeostasis. However, chronic wounds and severe skin injuries—such as burns and diabetic ulcers—can impair the natural healing process and demand innovative therapeutic strategies. Hydrogels, with their three-dimensional polymeric network and high-water retention capacity, are emerging as promising wound dressings due to their extracellular matrix (ECM)-like structure, biocompatibility, and moisture-retaining ability. In this study, a novel hydrogel was developed incorporating yarrow extract and curcumin nanoparticles—two agents known for their antioxidant and regenerative properties. These components aim to reduce oxidative stress and stimulate the proliferation of human skin fibroblast cells, thereby enhancing wound healing.The hydrogel was synthesized using polyvinyl alcohol (PVA) and alginate blended with curcumin nanoparticles and yarrow extract. Following synthesis, the hydrogel underwent comprehensive physical and chemical characterization, as well as in vitro evaluations to assess cytotoxicity, cell viability, and fibroblast migration.Results demonstrated that the hydrogel possessed suitable porosity and exhibited high biocompatibility. The inclusion of curcumin and yarrow extract significantly enhanced its biological activity, promoting fibroblast growth without inducing cytotoxic effects. These hydrogel systems can also serve as carriers for the controlled release of bioactive compounds, including plant extracts and nanoparticles.

keywords: Hydrogel, Skin Stem Cells, Yarrow Extract, Turmeric Active Compound, Wound Healing.

22488 - Poster

Enhancing the Proliferative Capacity of Limbal Stem Cells Using Exosomes: A Novel Approach in Corneal Regeneration

Narges Parhizkari[1], Maesoumeh Heshmati[1], Hossein Aghamollaei[2 *], Khosrow Jadidi[2], Mazaher Golipoor Malekabadi[3]

1- Department of Cellular and Molecular, Faculty of Advanced Science and Technology, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran
2- aghamolaei22@gmail.com
3- Iran University of Medical
*Corresponding Author: aghamolaei22@gmail.com

Abstract

Limbal stem cells play a crucial role in corneal epithelium regeneration, and their deficiency can lead to vision impairments. Exosomes, extracellular vesicles enriched with proteins and RNAs, have emerged as innovative tools for intercellular signaling, promoting cell proliferation and maintaining stem cell characteristics. However, their direct effect on limbal stem cells in animal models has not been fully investigated.In this study, limbal stem cells were isolated from rabbit corneas, and their specificity was confirmed by PCR for ABCG2 and ΔNp63α. Exosomes were characterized using DLS and BCA assays, and cells were treated with five different exosome doses. Cell viability was assessed by MTT assay at 48 hours, and cell numbers were counted on days 3, 6, and 9. Results showed that the medium exosome dose (0.001 mg/mL) produced the highest cell viability and proliferation, while very low or high doses had less effect. Moreover, the expression levels of ABCG2 and ΔNp63α were significantly upregulated, indicating preservation of stem cell characteristics.Study limitations included the use of an animal model and lack of molecular pathway analysis. These findings suggest the potential application of exosomes in corneal stem cell-based therapies and limbal epithelium regeneration. Future studies are recommended to explore the signaling pathways and long-term effects of exosome treatment.

keywords: Limbal stem cell, exosome, PCR, cell proliferation, rabbit

22487 - Poster

Biocompatibility Assessment of Yttrium Oxide Nanoparticles on Human Bone Marrow-Derived Mesenchymal Stem Cells

Homa Mohseni Kouchesfehani[1 *], Masoume Moazzenifard[2], Zohreh Mamani[2], Hanieh Jalali[3]

1- Professor, Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
2- Master's student, Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
3- Assistant Professor, Department of Animal Biology , Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: kouchesfehani@khu.ac.ir

Abstract

Nanoparticles have garnered significant attention in the biomedical field due to their unique properties, such as nanometer dimensions, high surface-to-volume ratio, thermal stability, and favorable biodegradability. Among these, yttrium oxide nanoparticles (Y_2O_3 NPs) have demonstrated considerable therapeutic potential in inflammatory, metabolic, and neurological diseases, owing to their potent antioxidant activity and ability to neutralize free radicals. However, due to dose-dependent effects, evaluating their biocompatibility is crucial before clinical applications. On the other hand, human bone marrow mesenchymal stem cells (hBMSCs) are considered prime candidates in tissue engineering and regenerative medicine because of their capacity to differentiate into various cell lineages, secretion of immunomodulatory factors, and play a key role in tissue repair. The present study aimed to investigate the biocompatibility of Y_2O_3 NPs with hBMSCs using the MTT assay. Cells were cultured under standard conditions and treated with concentrations of 0, 20, 40, and 80 µg/mL. After 72 hours, the results indicated that the 20 µg/mL concentration yielded the highest biocompatibility with an 87.5% cell viability ($P = 0.0362$). At concentrations of 40 and 80 µg/mL, the cell viability decreased to 77.2% and 78.7%, respectively, suggesting mild toxicity and a significant difference among the groups ($F = 16.59$, $P = 0.0009$). These findings suggest that Y_2O_3 NPs, at optimal concentrations, can exhibit favorable biocompatibility with hBMSCs, paving the way for future applications in regenerative medicine. Further research is recommended to focus on the molecular mechanisms of cellular response, long-term effects, and comparisons with other nanoparticles.

keywords: Yttrium oxide nanoparticles; Antioxidant activity; Biocompatibility; Stem cells; MTT assay

22502 - Poster

Evaluation of the Biocompatibility and Toxicity of Cerium Oxide Nanoparticles on Human Bone Marrow-Derived Mesenchymal Stem Cells

Maryam Osanloo[1], Mehdi Mohammadi[1], Hanieh Jalali[2 *], Homa Mohseni kouchesfahani[3]

1- M.Sc. Student, Department of Animal Biology , Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
2- Assistant Professor, Department of Animal Biology , Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
3- Professor, Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: jalali@khu.ac.ir

Abstract

Nanoparticles, due to their antioxidant properties and ability to cross the blood-brain barrier, hold significant potential for treating neuroinflammatory and oxidative stress-related disorders. Human bone marrow-derived mesenchymal stem cells (hBMSCs), with their multipotent differentiation capacity and crucial role in tissue repair, are important in regenerative medicine. This study evaluated the biocompatibility of CeO_2 nanoparticles on hBMSCs using the MTT assay. Cells were treated with 0, 20, 40, and 80 µg/mL concentrations.Results showed that 20 and 40 µg/mL treatments significantly reduced cell viability compared to control ($p < 0.05$). However, no significant decrease was observed at 80 µg/mL; instead, cell survival improved significantly compared to 20 µg/mL. These findings indicate a biphasic (hormesis-like) response, where low concentrations may be toxic, but higher doses activate protective cellular mechanisms.Future studies should explore the molecular basis of this hormetic effect and conduct in vivo evaluations to confirm biocompatibility and efficacy. Optimizing nanoparticle surface properties and assessing long-term effects will be crucial for developing safe and effective CeO_2-based therapies in regenerative medicine and neuroinflammatory diseases.Keywords: Cerium Oxide nanoparticles; Antioxidant activity; Biocompatibility; Stem cells; MTT assay.

keywords: MTT ،Cerium Oxide nanoparticles ،Antioxidant activity ،Biocompatibility ،Stem cells ، MTT assay

21723 - Poster

Evaluation of the Combined Cell Therapy Using Mesenchymal Stem Cells and Autologous Fibroblasts on Collagen Synthesis in Diabetic Wounds

Shaghayegh Gholami[1], Masoud Habibi[2 *], Azam Kouhkan[3], Alireza Partoazar[4], Nahid Nasiri[5]

1- Faculty of Biological Science and Technology, University of Science and Culture, Tehran, Iran
2- Department of Photo Healing and Regeneration, Medical Laser Research Center, Yara Institute, ACECR, Tehran, Iran
3- Reproductive Epidemiology Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran
4- Experimental Medicine Research Center, Tehran University of Medical Sciences, Tehran, Iran
5- Department of Medical Laser, Medical Laser Research Center, Yara Institute, ACECR, Tehran, Iran
*Corresponding Author: drhabibi68@yahoo.com

Abstract

Diabetes is one of the major predisposing factors in the development of chronic wounds, and impaired collagen synthesis is a key barrier to effective wound healing. Considering the regenerative potential of bone marrow-derived mesenchymal stem cells (BM-MSCs) and autologous dermal fibroblasts in tissue repair and collagen production, this study aimed to evaluate the effect of their combined injection in a diabetic rat skin wound model. Diabetes was induced in male mice via streptozotocin (STZ) injection, and the animals were randomly divided into four groups: BM-MSCs injection, fibroblast injection, combined BM-MSCs and fibroblast treatment, and an untreated control group. Collagen synthesis and deposition were assessed by Masson's trichrome staining. Histological evaluation showed that the combined cell-treated group exhibited the highest collagen content, with significantly increased density and alignment of collagen fibers compared to other groups ($p<0.05$). The BM-MSCs-only group also showed superior performance compared to the fibroblast and control groups. One limitation of this study was the absence of biochemical or gene expression analysis for collagen. In conclusion, simultaneous injection of BM-MSCs and autologous dermal fibroblasts may offer an effective strategy for enhancing diabetic wound healing. Further studies are recommended to investigate molecular mechanisms and functional aspects of tissue repair in similar models.

keywords: Wound healing; Diabetic wound; Fibroblast; Mesenchymal stem cell; Collagen synthesis

22536 - Poster

Characterization of Graphene Oxide-Integrated Bone Scaffolds Produced via 3D Printing

Shaghayegh Rahmanifar[1] , Najme Najmedin[1*]

1-Department of Biomedical Engineering, SR. C., Islamic Azad University, Tehran, Iran
*Corresponding Author: najmedin@iau.ac.ir

Abstract

Graphene oxide (GO) has emerged as a promising nanomaterial in bone tissue engineering due to its exceptional mechanical strength, large surface area, tunable surface chemistry, and excellent biocompatibility. Integration of GO into 3D-printed scaffolds has gained attention, offering precision and bioactivity. This review synthesizes current research on fabrication of GO-based bone scaffolds using techniques such as direct ink writing, fused deposition modeling, and stereolithography. Scaffold design considerations—porosity control, mechanical reinforcement, and homogeneous GO distribution—are discussed regarding their effects on cellular adhesion, proliferation, osteogenic differentiation, and vascularization. In vitro studies show that optimized GO concentrations in polymeric or composite matrices such as polycaprolactone, gelatin methacryloyl, and chitosan enhance osteoinductive and angiogenic responses. In vivo animal studies demonstrate accelerated bone regeneration, improved structural integration, and minimal inflammation. Despite advancements, challenges remain in reproducible GO synthesis, long-term biocompatibility, and standardization for clinical translation. Combining GO's multifunctionality with 3D printing design flexibility presents a promising route for next-generation bone scaffolds. Future work should focus on optimizing material formulations, refining printing strategies, and conducting comprehensive preclinical and clinical evaluations.

keywords: tissue engineering bone scaffold, graphene oxide, 3D printing, regenerative medicine

22496 - Poster

Regenerative Medicine in Nerve Regeneration: Advances, Applications, and Future Perspectives

Hossein Najafi[1], Sana Rahimian[2 *]

1- Department of Industrial and Environmental Biotechnology, National Institute of Genetic Engineering and Biotechnology (NIGEB), Tehran, Iran
2- Department of Nanobiotechnology, Faculty of Biological Sciences, Tarbiat Modares University, Tehran, Iran
*Corresponding Author: sanarahimian@gmail.com

Abstract

Nerve injuries of the peripheral and central nervous system remain among the most challenging conditions in clinical medicine, largely due to the limited intrinsic repair capacity of neural tissue. In recent years, regenerative medicine has opened promising avenues to promote nerve repair through innovative strategies including stem cell therapy, biomaterials, bio-scaffolds, and controlled delivery of neurotrophic factors. In this narrative review, we explored the current advances and applications of regenerative medicine in nerve regeneration. Relevant literature was searched in PubMed, Scopus, and Web of Science databases, focusing on publications from 2015 to 2025. Keywords included “regenerative medicine”, “nerve regeneration”, “stem cells” and “biomaterials”. Articles addressing experimental and clinical approaches were considered, highlighting trends, achievements, and remaining challenges. The findings indicate that stem cell-based interventions, especially mesenchymal and induced pluripotent stem cells, significantly enhance axonal regrowth and functional recovery. Bio-scaffolds such as hydrogels and nanofibers provide supportive microenvironments for nerve repair, while emerging gene-editing tools and smart delivery systems augment regenerative outcomes. Nonetheless, clinical translation is still hindered by concerns over long-term safety, immune compatibility, and lack of standardized protocols. In conclusion, regenerative medicine represents a dynamic and expanding field with great potential to address unmet needs in nerve regeneration. Future directions lie in integrating multimodal therapies, personalizing regenerative strategies, and leveraging advanced bioengineering approaches to bring experimental success closer to routine clinical practice.

keywords: Regenerative medicine, Nerve regeneration, Stem cells, Biomaterials, Tissue engineering

21254 - Poster

Progression of spermatogenesis after allotransplantation of neonatal mouse testicular tissue fragments embedded in Chitosan scaffold loaded with GDNF and bFGF into the back skin of castrated adult mouse

Alireza Anvari[1], Mansoureh Movahedin[1*], Fariba Ganji[2]

1- Department of Anatomical Sciences, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran
2. Biomedical Engineering Group, Faculty of Chemical Engineering, Tarbiat Modares University, Tehran, Iran
*Corresponding Author: movahed.m@modares.ac.ir

Abstract

Transplantation of human testicular tissue fragments into immunodeficient mice exhibited the capacity for survival, proliferation, and differentiation of spermatogonial cells up to the pachytene spermatocyte stage, although complete spermatogenesis was not achieved. The implementation of releasing scaffolds and localized drug delivery systems can substantially improve the efficiency and quality of testicular tissue transplantation. Chitosan-based scaffolds possess the capability to be loaded with growth factors and therapeutic molecules, facilitating their controlled release. The present study was structured in two phases. The initial phase involved the preparation of a chitosan scaffold incorporating bFGF and GDNF factors. In order to investigate the sustained release of factors and the biocompatibility of the scaffold, releasing profile of factors and MTT tests were performed, respectively. The second phase of the study examined the progression of spermatogenesis following the transplantation of testicular tissue fragments embedded in a scaffold containing bFGF and GDNF into the dorsal skin region. Specifically, neonatal mouse testicular tissue fragments, with and without growth factor-containing chitosan scaffolds, were transplanted subcutaneously into the dorsal region of castrated adult mice and histological, molecular, and hormonal evaluations were performed 6 and 8 weeks after transplantation. The bFGF and GDNF factors exhibited sustained release from the chitosan hydrogel, and the biocompatibility of the scaffold was confirmed via MTT assay. The results indicated that a chitosan scaffold containing growth factors, compared to a scaffold without factors, enhances tissue integrity, cellular proliferation, and the advancement of the spermatogenesis process.

keywords: Releasing scaffold, In vivo spermatogenesis, Testicular tissue engineering, Chitosan

21310 - Poster

Effect of the cyanobacterium Spirulina on acetaminophen-induced hepatic necrosis in adult male Syrian mice

Amir Keshavarzi nejad[1], Arman Memari[1*] , Mohammadreza Mokhtari[1], Amirmahdi Roozbahani[1], Mohammad Mehrshad Mousavi[1]

1-Resalat Square, Hengam Street—just north of Al-Ghadir Square, on the north side of the Water Authority—Shaheed Eyvaz Ne'mat-zadeh Alley, Allameh Helli 2 Junior High School.
[*]Corresponding Author: helli2armanmemari@gmail.com

Abstract

Acetaminophen is a primary causative agent of acute hepatic necrosis, and no immunomodulatory supplement has yet been conclusively established to counteract its toxicity. This study investigated the prophylactic and therapeutic potential of the microalga Spirulina platensis against acetaminophen-induced liver injury in male Syrian mice. Thirty animals were randomly allocated to five groups (n = 6 per group): (1) untreated control; (2) acetaminophen (1 500 mg kg^{-1}, p.o.); (3) Spirulina (1 600 mg kg^{-1}, p.o.); (4) simultaneous co-administration of acetaminophen and Spirulina (preventive protocol); and (5) acetaminophen followed by Spirulina (therapeutic protocol). Treatments were continued for 30 days. Serum activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP), along with hepatic superoxide dismutase (SOD), catalase activities and lipid-peroxidation (LPO) index, were quantified.Acetaminophen elevated AST, ALT and ALP by 200 %, 191 % and 86 %, respectively, relative to controls ($p < 0.05$). Spirulina administration alone produced no significant changes. Concurrent Spirulina intake attenuated the acetaminophen-induced increases in AST, ALT and ALP by 48 %, 47 % and 29 %, respectively, whereas delayed administration provided a more moderate yet significant reduction (18–37 %). In both preventive and therapeutic regimens, Spirulina augmented SOD and catalase activities by more than 1.8-fold and markedly suppressed LPO. These findings indicate that Spirulina platensis mitigates acetaminophen hepatotoxicity chiefly by attenuating oxidative stress, enhancing endogenous antioxidant defenses, and likely modulating the NF-κB signaling pathway. Given its safety profile, affordability and accessibility, Spirulina may serve as a promising supplement for the prevention or attenuation of acetaminophen-associated liver damage.

keywords: Spirulina; liver enzymes; superoxide dismutase; catalase; lipid peroxidation.

22389 - Poster

Comparative Bioinformatics Analysis of Gene Expression and Regulatory Networks in Skin-Derived and Blood-Derived Induced Pluripotent Stem Cells (iPSCs)

Zohre Zibaie[1], Mahsa Pourmahdi[1], Sonbol Ghaderi[1], Mojtaba Shahvali[1], Seyede.Samane Nabavian[1], Sona Rezaee[1], Ghazaleh Nikoukar[1], Fateme Afkhaminia[1], Esmaeil Babaei[1 *]

1- Department of Biological Sciences, School of Natural Sciences, University of Tabriz, Tabriz, Iran
*Corresponding Author: babaei2539@gmail.com

Abstract

Induced pluripotent stem cells (iPSCs) are recognized as an important model for studying cellular reprogramming and stem cell-based therapies. These cells can be reprogrammed from various types of adult cells, such as skin fibroblasts and CD34+ hematopoietic cells. Differences in gene expression and molecular characteristics of iPSCs derived from different sources can impact their functionality and potential in research and cellular therapies. A thorough understanding of the regulatory processes in these cells can be helpful in selecting the appropriate cell type for therapeutic applications and disease modeling. In this study, we investigated the differences in gene expression and gene regulatory networks in iPSCs derived from skin fibroblasts and CD34+ hematopoietic cells.RNA-seq data were retrieved from the GEO database, and after preprocessing, gene count matrices were constructed for each type of iPSC. Differential gene expression was assessed by calculating log2FC between the two groups of skin-derived and blood-derived iPSCs. Gene Ontology (GO) analysis was then performed to identify biological processes, cellular components, and molecular functions associated with the differentially expressed genes. Additionally, clusterProfiler and Enrichr tools were used for pathway analysis and to identify active biological pathways in each group.The analysis showed that genes highly expressed in skin-derived iPSCs are mainly involved in processes like "nucleosome assembly" and "chromatin remodeling," with components such as "CENP-A containing nucleosomes" and "chromatin" being central. In contrast, genes highly expressed in blood-derived iPSCs are linked to "nervous system development" and "neuron differentiation," with cellular components like "cytosolic ribosomal subunits" and "synapse-related proteins" being most prominent. These results highlight the significant impact of cellular origin on gene regulation and molecular functions in iPSCs, aiding in the understanding of their functional differences for clinical applications and disease modeling.

keywords: iPSCs , skin fibroblasts , CD34+ hematopoietic cells, Gene Expression , bioinformatics

22469 - Poster

Establishing a method for extracting rat amniotic fluid and its exosomes

Seyedeh Zeinab Jafari Rahni[1], Maryam M. Matin[1,2], Ahmadreza Bahrami[1,3 *]

1-Department of Biology, Faculty of Science, Ferdowsi University of Mashhad, Mashhad, Iran
2-Novel Diagnostics and Therapeutics Research Group, Institute of Biotechnology, Ferdowsi University of Mashhad, Mashhad, Iran
3-Industrial Biotechnology Research Group, Institute of Biotechnology, Ferdowsi University of Mashhad, Mashhad, Iran
*Corresponding Author: ar-bahrami@um.ac.ir

Abstract

Extracellular vesicles are membrane bounded sacs containing crucial biomolecules which are released into extracellular matrix. Exosomes, with peculiar properties, are nano-scaled extracellular vesicles ranging 30_150 nm in size and are found in body fluids. Amniotic fluid is a temporary organ, which is essential for embryonic development and is rich in peptides, carbohydrates, and signaling molecules and the amniotic fluid exosomes have shown a great potential in regenerative medicine. Therefore, establishing a practical method to extract amniotic fluid from laboratory animals is important for research or even clinical applications. In current study, we established a protocol for isolating rat amniotic fluid and extract its exosomes by Poly-ethylene glycol (PEG-4000) precipitation method. To this aim, a pregnant Wistar rat was anesthetized, the abdominal region was cut and the yellow jelly-like liquid between fetal sacs was extracted using a normal syringe. The liquid was sequentially centrifuged (300g, 2000g, 10,000g) to remove intact cells, organelles, and cell debris. The resulting supernatant was filtered (0.22 µm), then mixed with PEG (1:4 v/v) and NaCl (1:30 v/v). After 16 h incubation at 4°C, exosomes were precipitated by centrifugation at 5000g for 50 min. Finally, the pellet was resuspended in NaCl and applied for further characterization assays. BCA assay showed a protein concentration of 1852 µg/ml. DLS analysis revealed a Z-average of 210.28 nm, mean number of 73.19 nm, and PDI of 0.28, confirming uniform nanoparticle distribution. A Zeta potential of -15.48 mV for the exosomes indicated their colloidal stability, and AFM imaging confirmed their size range. In conclusion, amniotic fluid exosomes can be extracted using PEG and with potential of this approach in clinical applications.

keywords: Amniotic fluid, Exosome, Extracellular vesicles, Wistar rat, Regenerative medicine

21482 - Poster

Development and Optimization of 3D Biomimetic Platforms for Modeling the Developmental Processes of Human Pluripotent Stem Cells under Physiological and Pathogenic Conditions

Fateme Keshtparvar[1 *], Mohammad Hossein Madahali[1]

1- Department of Anatomy and Reproductive biology, Isfahan University of Medical Sciences, Isfahan, Iran
*Corresponding Author: fateme.keshtparvar@gmail.com

Abstract

Human pluripotent stem cells (hPSCs), including induced pluripotent stem cells (iPSCs) and embryonic stem cells, can self-renew and develop into any cell type. These abilities make them vital for studying human growth and diseases in labs. Traditional two-dimensional (2D) cultures do not accurately represent the complex three-dimensional (3D) environments of actual human tissues. To address this, recent research has focused on creating 3D biomimetic systems that better mimic natural development and disease conditions, improving disease modeling, drug discovery, and regenerative medicine applications. It highlighted advancements in 3D culture technologies, such as organoids and bioprinting, which have improved simulations of early human development and diseases. Scientists are now using biocompatible materials, such as hydrogels made from poly (ethylene glycol) and collagen, that replicate the physical and chemical properties of human tissues. These materials help grow various neural cells from iPSCs, facilitating processes like neural differentiation and blood vessel formation. Researchers can guide differentiation by adjusting signaling pathways, creating structures like vascularized cardiac organoids that model heart conditions better. Furthermore, naïve hPSCs can form blastoids in 3D cultures, simulating early embryonic stages useful for studying human embryo development and implantation. 3D biomimetic platforms made from hPSCs enhance the physiological relevance of disease models, especially in conditions like Alzheimer's disease, where they more accurately reflect key pathological features compared to 2D cultures. These models enable deeper investigations into neuronal and glial impairments and support extensive drug screening. Despite progress, challenges remain in standardizing protocols for reproducibility and scalability. Fine-tuning matrix composition, rigidity, and biochemical signals is essential to accurately replicate tissue environments.In conclusion, 3D biomimetic platforms from hPSCs represent a significant advancement in studying human development and disease. By accurately mimicking tissue structures and cell types, these platforms enhance understanding of development, disease mechanisms, and drug discovery. Continued innovations in biomaterials and bioprinting are expected to improve the effectiveness and application of these models in personalized healthcare and regenerative medicine.

keywords: : Human pluripotent stem cells, induced pluripotent stem cells, three-dimensional biomimetic platforms, human development

22466 - Poster

Approaches to treating Alzheimer using stem cells

Naeimeh Dehghani[1 *]

1- Department of biology, payamenoor university, Tehran, Iran
*Corresponding Author: naeimehdehghani8@gmail.com

Abstract

AbstractAlzheimer's disease, one of the most common types of dementia, is a major global health challenge. It is characterized by progressive memory loss, cognitive impairment, and behavioral changes. Despite significant advances in understanding the mechanisms of the disease, a definitive treatment for Alzheimer's disease is still not available. Meanwhile, stem cells have been considered as a promising approach in the treatment of this disease. In recent years, significant progress has been made in the field of using stem cells to treat Alzheimer's. For example, early clinical studies have shown that transplantation of mesenchymal stem cells can improve cognitive function in patients.Also, new technologies such as CRISPR-Cas9 gene editing have made it possible to genetically modify stem cells to increase their effectiveness. Finally, the use of stem cells to treat Alzheimer's is still in the research phase and further studies are needed to confirm its safety and effectiveness in humans.However, recent advances in this field have raised new hopes for finding effective treatments for this complex and debilitating disease.This article examines the role of stem cells in the treatment of Alzheimer's and the challenges ahead.Keywords: Alzheimer, disease, stem cells, treatment

keywords: Alzheimer, disease, stem cells, treatment

22620 - Poster

Graphene oxide containing microcarriers for neural differentiation of Mesenchymal Stem Cells

* Zahra Azarmgin[1], Ahmadreza Maftoonazad[2], Mohammad Hossein Ghanian[3], Azita Parvaneh Tafreshi [1,2]

1- Developmental Biology Laboratory, School of Biology, College of Science, University of Tehran, Tehran, Iran
2-Department of Molecular Medicine, Faculty of Medical Biotechnology, The National Institute of Genetic Engineering and Biotechnology, Tehran, Iran
3-Department of Cell Engineering, Cell Science research center, Royan Institute for Stem Cell Biology and Technology, Academic center for Education, Culture and Research, Tehran, Iran
*Corresponding Author: tafreshi@nigeb.ac.ir

Abstract

The invasiveness of surgical operation required for cell and tissue scaffold implantation is one of the major issues in therapeutic approaches for neurodegenerative diseases. Therefore microcarriers could be a non invasive appropriate candidate for clinical applications in neurodegeneration. In this study, we used a method to generated gelatin-graphene oxide cell adhesive microcarriers (GGMs) through water-in-oil emulsion (WIO) method. Chemical composition of GGMs was examined using Fourier-transform infrared spectroscopy (FTIR) analysis. Physicochemical characterization was confirmed using scanning electron microscopy (SEM). As a model, we used the Adipose-Derived Mesenchymal Stem Cells (ADMSCs) and induced their differentiation towards neural stem cells (NSCs), using neurobasal medium containing fibroblast growth factor, epidermal growth factor, N2 and B27 supplements. To assess cell viability and the scaffold biocompatibility, ADMSCs were seeded on GGMs followed by live-dead and MTT assays, respectively. Neural stem cell differentiation was examined using quantitative real time RT-PCR (qRT-PCR) method. The fabricated GGMs were biocompatible and sized ranging 100-300 um. FTIR analysis showed that graphene oxide had successfully been generated. Moreover, no cytotoxic effect was seen following cell grafting within the differentiation period. Our results showed increased expression of Nestin mRNA as a neural stem cell marker in ADMSCS cultured on GGMs indicating their successful differentiation towards NSCs. Altogether, our synthesized microcarriers containing graphene oxide provided a supportive environment for proliferation and differentiation of ADMSCs towards neural stem cells. Biocompatibility and biodegradability of these microcarriers would propose them as safe and injectable scaffold for cell-based therapy of neurodegenerative diseases.

keywords: microcarriers, mesenchymal stem cell, neural stem cell, tissue engineering.

21483 - Poster

3D Smart Substrates Responsive to Cellular Signals: Guiding Stem Cell Differentiation and Spatial Organization in Tissue Development Models

Fateme Keshtparvar[1 *], Mohammad Hossein Madahali[1]

1- Department of Anatomy and Reproductive biology, Isfahan University of Medical Sciences, Isfahan, Iran
*Corresponding Author: fateme.keshtparvar@gmail.com

Abstract

Tissue engineering is evolving to create three-dimensional (3D) intelligent surfaces that engage actively with living cells. These surfaces not only provide physical support but also detect and respond to signals from cells, which is crucial for directing stem cell development and mimicking tissue formation outside the body. The integration of biomaterials, nanotechnology, and cellular biology in developing these 3D surfaces holds promise for significant advancements in research and medical applications. 3D smart substrates mimic the natural extracellular matrix (ECM) and can guide cellular behavior. They feature responsive materials that change their properties based on cellular signals, biomimetic designs that replicate native tissue environments, and integrative sensing capabilities to respond to mechanical forces and biochemical signals. Traditional 2D substrates do not effectively reproduce the complexity of living environments, making 3D smart substrates a better option for studying development and disease, as well as for improving regenerative therapies. The study reviews articles from databases such as Web of Science, Scopus, and PubMed, highlighting advances in 3D responsive substrate design, including hydrogels, nanofiber-microwell platforms, and smart nanomaterials. These innovations enhance the ability of substrates to respond to mechanical and chemical cues. Applications include creating organoid and spheroid cultures that improve tissue-specific differentiation, utilizing spatial patterning to simulate natural tissue processes, and realistic modeling for disease and drug testing. Overall, the development of responsive 3D smart surfaces signifies a major advance in tissue engineering, enabling precise control of stem cell development and promoting advancements in regenerative medicine and disease modeling.

keywords: Tissue engineering, Three-dimensional (3D) intelligent, Stem Cell, Human development

22349 - Poster

Fabrication, Characterization, and Biological Assessment of Gelatin/Chitosan Composite Hydrogels Containing Diprophylline for Use in Neural Tissue Engineering

Sahar Shemshadi[1], Ali Salimi[2*], Nasim Hayati Rodbari[1], Hossein Aghamollaei[3], Zohreh Jangravi [4]

1- Department of Biology, SR.C., Islamic Azad university, Tehran, Iran
2- Tissue Engineering and Regenerative Medicine Research Centre, New Health Technologies Institute, Baqiyatallah University of Medical Sciences, Tehran, Iran
3- Chemical Injuries Research Center, Systems Biology and Poisonings Institute, Baqiyatallah University of Medical Sciences,Tehran, Iran
4- .Department of Biochemistry, Faculty of Medicine, Baqiyatallah University of Medical Sciences, Tehran, Iran
*Corresponding Author: salimistemcell@gmail.com

Abstract

Neural tissue engineering focuses on creating scaffolds that facilitate nerve regeneration and repair. In this study, a novel composite hydrogel consisting of gelatin (GE), chitosan (CS), umbilical cord serum (UCS), and the drug diprophylline (DPI) was developed to promote the neural differentiation of human Wharton's jelly mesenchymal stem cells (hWJ-MSCs).The composite hydrogel was synthesized using glutaraldehyde (GLU) as a cross-linking agent. Its physicochemical properties were characterized by Fourier-transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and drug release analysis. Biocompatibility was assessed via the MTT assay. Neural differentiation of hWJ-MSCs cultured on the hydrogel was evaluated using immunocytochemistry (ICC) staining and real-time polymerase chain reaction (RT-PCR).FTIR results confirmed the presence of all hydrogel components. SEM images showed a suitable surface for cell attachment and growth, with an average pore size of 171.38 µm. The MTT assay indicated no cytotoxic effects and enhanced cell viability. Drug release studies revealed that 50.39% of DPI was released over 14 days. Moreover, gene and protein expression analyses demonstrated significant upregulation of neural-specific markers, confirming the scaffold's ability to promote neural differentiation.This study demonstrates the successful development of a multifunctional CS-GE hydrogel incorporating UCS and DPI, highlighting its potential as an effective scaffold for neural tissue engineering applications.

keywords: Composite hydrogel, Gelatin, Chitosan, Umbilical cord serum, Human Wharton'sjelly mesenchymal stem cells

22614 - Poster

Induced Pluripotent Stem Cells in Personalized Drug Development: Opportunities and Challenges

Kiana Mohammadi[1 *], Zahra Radan[2]

1- PhD Student, Molecular Genetics, Faculty of Sciences, Islamic Azad University, Damghan Branch, Damghan, Iran
2- BSc Student, Cellular and Molecular Biology, Faculty of Engineering and Sciences, Islamic Azad University, Yazd Branch, Yazd, Iran
*Corresponding Author: mohamadikiana876@gmail.com

Abstract

Background:Induced pluripotent stem cells (iPSCs) possess the unique ability to differentiate into any human cell type, transforming the landscape of drug development. Patient-derived iPSCs provide disease models that allow preclinical assessment of drug efficacy and toxicity, addressing the limitations of traditional animal models and cell lines.Technological Approaches:Non-integrating reprogramming techniques (plasmid, mRNA, or protein-based) enhance the safety and clinical applicability of iPSCs. These cells enable modeling of rare genetic, neurological, and cardiac diseases, providing insights into molecular mechanisms and facilitating high-throughput drug screening. Integration with artificial intelligence and deep learning improves detection of subtle pathological changes and predicts patient-specific drug responses.Results / Applications:iPSC-derived cardiomyocytes and hepatocytes serve as gold standards for evaluating cardiotoxicity and hepatotoxicity. Organoids and organ-on-a-chip systems offer physiologically relevant platforms for drug testing, improving predictive accuracy. Together, these tools advance personalized medicine by identifying the most effective therapies for individual patients.Conclusion / Future Outlook:Despite challenges such as cell line heterogeneity, incomplete maturation, high costs, and standardization issues, iPSCs combined with advanced technologies—including complex organoids, AI, and cellular biobanks—offer a promising future. They make drug development more efficient, safer, and cost-effective, paving the way for precision therapies tailored to each patient.Keywords:Induced pluripotent stem cells (iPSCs), Personalized medicine, Drug development, Organoids, Artificial intelligence (AI)

keywords: Induced pluripotent stem cells (iPSCs), Personalized medicine, Drug development, Organoids, Artificial intelligence (AI)

22414 - Poster

Marine-derived stem cells: potential applications in regenerative medicine and biotechnology

Azam Vali[1], Ahmad Shadi[1 *]

1- Faculty of Nano and Biological Sciences and Technology Persian Gulf University, Bushehr, Iran
*Corresponding Author: ahmadshadi82@gmail.com

Abstract

In recent years, marine-derived stem cells have emerged as promising sources of bioactive molecules and regenerative potential. This research examines biological models, distinct characteristics of marine cellularity, and potential applications in regenerative medicine, biotechnology, and related industries. It also addresses ethical and environmental considerations, technical challenges (accessibility, safety standards, and regulatory settings), and provides a list of future research directions. Marine organisms, especially marine invertebrates, exhibit vast diversity and harbor a large number of stem cells. These cells can be utilized to produce novel bioactive molecules with potential significance for human health and phenomena of aging and regeneration. Research in this area is ongoing, aiming to develop innovative ideas in environmental and biomedical fields. Marine stem cells can be used in treating diseases such as bone injuries, cardiovascular and neurological diseases, and cancer, and due to genetic differences, they have lower immunogenicity compared to human stem cells. However, information regarding marine stem cells is scarce, and sufficient research on them has not been conducted. The use of marine organisms can raise ethical and environmental concerns, and research in this field is costly. Recent advancements in the culture and transplantation of aquatic stem cells provide valuable systems and tools for basic research and sustainable aquatic applications. This research focuses on the main steps required for the development of marine stem cells. These steps include identifying and classifying stem cells from marine sources, characterizing their distinguishing features, developing high-efficiency culture methods, evaluating their clinical potential, and providing ethical and legal frameworks for working with these cells. This study offers insights into the biology of marine stem cells and discusses current limitations and future steps.

keywords: Aquatic Vertebrates, Aquatic Invertebrates, Regeneration, Differentiation, Pluripotency

22350 - Poster

Fabrication and Characterization of a Biocompatible Gelatin-based Hydrogel for Promoting Neural Lineage Differentiation of Human Wharton's Jelly mesenchymal stem cells

Akram Sadat Seyedi Jasbi[1], Ali Salimi[2*], Soyar Sari[1], Hossein Aghamollaei[3], Zohreh Jangravi[4]

1- Department of Cellular and Molecular Biology, TeMS.C., Islamic Azad University, Tehran, Iran
2- Tissue Engineering and Regenerative Medicine Research Centre, New Health Technologies Institute, Baqiyatallah University of Medical Sciences, Tehran, Iran
3- Chemical Injuries Research Center, Systems Biology and Poisonings Institute, Baqiyatallah University of Medical Sciences, Tehran, Iran
4- Department of Biochemistry, Faculty of Medicine, Baqiyatallah University of Medical Sciences, Tehran, Iran
*Corresponding Author: salimistemcell@gmail.com

Abstract

Neural tissue engineering creates biomimetic scaffolds that provide essential biochemical and physical cues to support cell survival and differentiation. This study aimed to develop an antibacterial gelatin (Gel)-based hydrogel incorporating amniotic membrane extract (AME) and aminophylline (AMP) to promote the neural differentiation of human Wharton's jelly mesenchymal stem cells (hWJ-MSCs). The hydrogels were prepared using a freeze-drying and chemically crosslinked with glutaraldehyde (Glu) to improve mechanical stability. Physicochemical properties were evaluated via X-ray diffraction (XRD), porosity, water contact angle, and AMP release. Antibacterial activity was assessed using the Kirby–Bauer agar diffusion test. Cytocompatibility of the hydrogels on the hWJ-MSCs viability were examined using the MTT assay. Neural differentiation was evaluated through Real-time RT-PCR and immunocytochemistry (ICC) techniques after 14 days of culture.XRD analysis showed a semi-crystalline structure for hydrogels. The water contact angle results showed that the hydrogels were categorized as hydrophilic group. The porosity rate of hydrogel containing AMP was 92.98 ± 1.14%. The MTT assay results confirmed that the hydrogels support cell viability (>100%) and do not exert cytotoxic effects. The incorporation of penicillin-streptomycin (P-S) antibiotics provided notable antibacterial activity against Pseudomonas aeruginosa and Staphylococcus aureus. The hydrogel facilitated sustained AMP release, reaching about 53% over two weeks. Furthermore, upregulation of neural-specific genes (MAP-2, TUBB3, ENO2, and GFAP) and proteins (Gamma-enolase, β-tubulin III, and MAP-2) confirmed the scaffold's ability to induce neural differentiation of hWJ-MSCs. In conclusion, these results suggest that the AMP-loaded Gel-AME hydrogel is a promising candidate for neural tissue engineering and regenerative applications.

keywords: Stem cells, Composite hydrogel, Gelatin, Amniotic membrane, Neural differentiation

21460 - Poster

Design of Smart Enzyme-Based Scaffolds for Directed Differentiation of Stem Cells

Samira Vaziri[1 *]

1- Department of Biology, Payame Noor University, Tehran, Iran
*Corresponding Author: s_vaziri@pnu.ac.ir

Abstract

Precise regulation of mesenchymal stem cell differentiation remains a critical challenge in developmental bioengineering and regenerative medicine. In this study, smart scaffolds functionalized with lipase enzymes were designed and developed to create tailored biochemical microenvironments. Structural integrity and catalytic activity of the scaffolds were assessed under physiological conditions through 50-nanosecond molecular dynamics simulations and structural spectroscopy (CD and fluorescence). Results demonstrated a 35% increase in the expression of osteogenic markers ALP and Runx2 ($p < 0.01$), along with activation of osteogenic signaling pathways. These findings highlight the high potential of these scaffolds in tissue engineering and regenerative therapies. Future research will focus on optimizing scaffold design and enhancing enzymatic activity stability.

keywords: Smart scaffold, lipase enzyme, stem cell differentiation, molecular dynamics simulation, developmental bioengineering, regenerative medicine

22493 - Poster

Activation of canonical Wnt signaling inhibits osteogenic but induces adipogenic differentiation of adipose derived mesenchymal stem cells

Nima Abedini[1], Bahman Zeynali[*1], Azita Parvaneh Tafreshi[2] Kolsoum InanlooRahatloo[3], Sina FallahKohan[1]
1- Developmental Biology Lab., School of Biology, College of Science, University of Tehran, Iran
2- Department of Medical Biotechnology, National Institute of Genetic Engineering and Biotechnology, Iran
3- Department of Cell and Molecular Biology, School of Biology, College of Science, University of Tehran, Iran
[*]Corresponding Author: zeynalib@ut.ac.ir

Abstract

Abstract: Mesenchymal Stem Cells (MSCs) possess the ability to differentiate to mesodermal linages including an osteoblastic fate. The differentiation of these cells requires the intricate interplay of cell signaling pathways. Wnt/B-catenin pathway plays a central role in bone development and homeostasis. In this study we investigate the effects of manipulating this pathway on MSC fate decision during osteogenesis. Adipose derived mesenchymal stem cells (AD-MSC) were cultured in osteogenic differentiation medium for 21 days in the presence of small molecules BIO and IWP2 (inhibitor of Wnt protein 2) as activators and inhibitors of canonical Wnt signaling, respectively. Osteogenic differentiation was evaluated using Alizarin Red staining, ALP, calcium content assay and real time PCR. Adipogenic differentiation was evaluated by Oil Red O staining. Our results showed that Wnt activation lead to a down regulation of osteogenic differentiation and an induction of adipogenic differentiation, in contrast, Wnt inhibition increased osteogenic differentiation and did not induce adipogenic differentiation. These results highlight a novel insight into the role of the Wnt pathway in directing MSC fate and opening new avenues of investigation in interplay of cell signaling pathways and deepening our understanding of stem cell biology and stem cell fate control with downstream applications in regenerative medicine.

keywords: Wnt signaling, Osteogenic differentiation, MSC, Cell fate control,

22567 - Poster

Ex Vivo Expansion of Rabbit Limbal Epithelial Stem Cells: A Novel Protocol for a Defined Culture System

Fatemeh Eskandari[1], Shahab Faghihi[*1], Hossein Aghamollaei[2], Mazaher Gholipourmalekabadi[3,4], Khosrow Jadidi[5]

1- Stem Cell and Regenerative Medicine Group, National Institute of Genetic Engineering and Biotechnology, Tehran, Iran
2-Chemical Injuries Research Center, Systems Biology and Poisonings Institute, Baqiyatallah University of Medical Sciences, Tehran, Iran
3- Stem Cell and Regenerative Medicine Research Center, Iran University of Medical Sciences,Tehran,Iran
4-Medical Biotechnology Department, Paramedical Faculty, Iran University of Medical Sciences, Tehran, Iran
5-Vision Health Research Center, Semnan University of Medical Sciences, Semnan, 1435916471, Iran
[*]Corresponding Author: sfaghihi@nigeb.ac.ir

Abstract

This study introduces a novel, non-xenogenic culture protocol for the ex vivo expansion and long-term maintenance of rabbit limbal epithelial stem cells (LESCs). The development of clinically translatable, cost-effective cell therapies for limbal stem cell deficiency (LSCD) remains a significant challenge. To address this, we used an explant culture method, which inhibits anoikis which provides a high yield of LESCs without the need for enzymatic dissociation or complex substrates like feeder layers. Cells were cultured directly on standard well plates.The custom-prepared medium, consisted of DMEM/F12 (1:1) supplemented with 8.5 ng/ml Isoprenaline, 1.4 ng/ml Liothyronine, 2-3 µg/ml Hydrocortisone hemi succinate, 1% ITS, 5 ng/ml EGF, 24 µg/ml Adenine, along with antibiotics and antimycotics. This fully defined, non-xenogenic formulation makes it highly suitable for clinical applications in regenerative medicine.Using this optimized protocol, LESCs from Oryctolagus cuniculus limbus were successfully expanded and maintained their stem-like characteristics for up to 28 days. Morphological assessment confirmed high proliferation and stable stemness. This method directly overcomes the significant challenges of xenogenic contamination, complex substrate requirements, and high cost associated with commercial media.

keywords: Limbal epithelial stem cell, proliferation , maintenance, culture media

22508 - Poster

A Review on the Application of Stem Cell-Seeded Silk Fibroin Scaffolds for Dermal Regeneration

Hossein Najafi[1], Sana Rahimian[2 *]

1- Department of Industrial and Environmental Biotechnology, National Institute of Genetic Engineering and Biotechnology (NIGEB), Tehran, Iran
2- Department of Nanobiotechnology, Faculty of Biological Sciences, Tarbiat Modares University, Tehran, Iran
*Corresponding Author: sanarahimian@gmail.com

Abstract

The reconstruction of extensive skin defects remains a significant clinical challenge. This review aims to provide a comprehensive evaluation of recent studies in the field of tissue-engineered skin substitutes, with a particular focus on the synergistic combination of silk fibroin (SF) scaffolds and mesenchymal stem cells (MSCs) for achieving high-quality skin regeneration. To this end, a systematic search was conducted in databases including PubMed, Scopus, and Web of Science for articles published from 2020 onward. The search keywords included "silk fibroin", "mesenchymal stem cells", "tissue engineering", "skin regeneration" and "regenerative medicine." Articles were selected based on their emphasis on preclinical and laboratory evaluations of SF-MSC composite structures. A recurring key finding is that MSCs cultured on silk scaffolds significantly accelerate wound closure in animal models by upregulating critical angiogenic factors such as VEGF and bFGF. Multiple studies demonstrate that the porous architecture of silk sponges produced by freeze-drying facilitates deep cell infiltration and angiogenesis, while electrospun nanofiber layers form a stable mechanical barrier on the outer surface. Consequently, the combination of silk fibroin's biocompatibility and tunable mechanical properties with the high regenerative secretory potential of mesenchymal stem cells represents one of the most advanced approaches in the field of skin substitutes. Future research should focus on the mass production of these constructs for the development of strategies for complete restoration of complex skin appendages.

keywords: Silk Fibroin, Mesenchymal Stem Cells, Tissue Engineering, Dermal Regeneration, Regenerative Medicine

22347 - Poster

Simultaneous Study of Bioactive Compounds and Cytotoxicity of Iranian Propolis Extract on a Stem Cell Model

Leila Najafi[1 *] , Maryam Sadat Bagheri[2], Azar Sheikholeslami[3], Mohamad Nabiuni[*2]

1- Faculty of Convergent Sciences and Technologies, Islamic Azad University, Science and Research Branch, Tehran, Iran
2- Department of Cell and Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
3- Department of Cell Biology and Regenerative Medicine, Academic Center for Education, Culture and Research, Qom, Iran
[*]Corresponding Author: nabiuni@khu.ac.ir

Abstract

Propolis, a natural product from honeybees, contains bioactive compounds such as flavonoid and polyphenol derivatives, which exhibit antioxidant, antibacterial, and anti-inflammatory properties. In this study, GC–MS analysis identified important phenolic compounds in the Iranian propolis extract, including examples such as Coumaric acid, Quran, and Chrysin. Considering the potential applications of this substance in biomedical fields, evaluating its cytotoxicity, especially on stem cells, is crucial. To investigate the cytotoxic effects of the extract, bone marrow stem cells from Wistar rats were treated with various concentrations of the extract (0.5 to 500 µg/mL) for 24 and 72 hours. The MTT assay results showed no significant toxicity up to 20 µg/mL, while a mild decrease in cell viability was observed at 50 µg/mL (**P<0.01). Toxicity was dose- and time-dependent and significantly increased at higher concentrations (75–500 µg/mL), especially after 72 hours of treatment (***P<0.001). These findings indicate the relative safety of Iranian propolis at low doses and its potential toxicity at high concentrations with prolonged exposure in stem cells.

keywords: Propolis, Stem cell, GC-Ms, cytotoxicity

22373 - Poster

Uterine Bioengineering Using Decellularized Uterus Scaffold of Rat

Mohammad Hajian[1 *], Alireza Yousefi[1], Malihezaman Monsefi[1]

1- Developmental Biology Research Lab., Department of Biology, University of Shiraz, Shiraz, Iran
*Corresponding Author: hajian.m72@gmail.com

Abstract

Abstract: One of the new ways of tissue engineering is to use natural scaffolds implanted in the host body. Considering the importance of the uterus in maintaining the fetus, its engineering was considered. uterine 1.5 cm pieces were decellularized with SDS (Sodium dodecyl sulfate) and Triton X-100 solutions at different concentrations for 48 and 24 hours. Decellularization and integrity of the uterine scaffold were examined by hematoxylin-eosin, Hoechst staining, scanning electron microscopy (SEM), and Raman microscopy spectroscopy. Sterilized acellular scaffolds were implanted under the liver lobes and along the mesentery of normal rats. After 10, 20, and 30 days, tissue sections were prepared and cells were replaced into the scaffolds and examined again using the aforementioned techniques and immunohistochemical staining. The use of SDS and Triton X-100 preserved the structure of the extracellular matrix and completely decellularized the uterine tissue. Tissue sections of the cell-enriched scaffolds showed the penetration and nesting of cells in the collagen scaffolds of the endometrial glands and blood vessels of the different layers of the uterus. Differentiation of cells into epithelial, muscle, and connective cells was confirmed. Implantation of a natural uterine scaffold is non-toxic for migration, growth, and survival of host mesenchymal cells, enabling their differentiation. This method is a suitable and cheap option without causing an immune reaction for the engineering of uterine tissue as an important organ involved in pregnancy. It is recommended to investigate the success of uterine tissue engineering over a longer period of time and in other vital organs

keywords: Uterus natural scaffolds, Re-cellularization, SDS, Triton X-100

22418 - Poster

Patient-Specific iPSC-Derived Neurons Show Impaired Autophagic Flux as a Mechanistic Driver of Vulnerability to Nutritional Stress in Alzheimer's Disease

Sahba Shahbazi[1,2], Koorosh Shahpasand[2,3*], Mehran Habibi-Rezaei[1*]

1- Protein Biotechnology Research Lab (PBRL), Department of Cell and Molecular Biology, School of Biology, College of Science, University of Tehran, Tehran, Iran
2- Department of Brain and Cognitive Sciences, Cell Science Research Center, Royan Institute for Stem Cell Biology and Technology, ACECR, Tehran, Iran
3-Department of Laboratory Medicine and Pathology, Institute for Translational Neuroscience (ITN), University of Minnesota Medical School, Minneapolis, MN, USA.
*Corresponding Author: habibi@ut.ac.ir

Abstract

Alzheimer's disease (AD) is a progressive disorder characterized by neuronal loss and cognitive decline, but its underlying mechanisms remain unclear. Autophagy is a vital quality-control pathway that eliminates misfolded proteins and damaged organelles; impairments in this process have been linked to AD. In this study, autophagic flux and its relationship to neuronal stress sensitivity were compared between induced pluripotent stem cell (iPSC)–derived cortical neurons generated from dermal fibroblasts of individuals with early-onset AD (EOAD) and age-matched healthy individuals. Two EOAD and two healthy iPSC lines were generated and differentiated into neurons. Their viability was measured using MTT under both normal conditions and nutrient deprivation (to model metabolic stress). Indicators of autophagy flux (p62, LC3-I/II, LAMP1) were quantified through immunoblotting and quantitative imaging. Pathway modulation was performed with rapamycin (to induce) or chloroquine (to inhibit). Under control conditions, viability was similar across all groups. Under nutrient stress, EOAD neurons showed significantly lower viability than healthy neurons. EOAD neurons exhibited increased levels of p62 and LC3-II, failed to clear these markers during starvation, and had enlarged perinuclear LAMP1-positive compartments, while healthy neurons showed intact autophagy flux. Rapamycin restored LC3 turnover, decreased p62 accumulation, and partially rescued survival in the EOAD group, whereas chloroquine further blocked this flux and exacerbated cell death. These findings reveal an inherent defect in autophagic flux in EOAD neurons, leading to increased stress sensitivity, and show that promoting autophagy can decrease stress-induced neuronal death. This supports autophagy-enhancing strategies as a potential therapeutic approach in AD.

keywords: Lysosomal dysfunction, Proteostasis failure, Nutrient deprivation, p62, LC3-II

22131 - Poster

Advanced Stimuli-Responsive Hydrogels in Management of Diabetic Wounds

Anahita Mehrafza[1 *] , Najmeh Najmoddin[2]

1- Biomedical engineering department Islamic Azad University science and research branch
2- Islamic Azad University science and research branch biomedical engineering department
*Corresponding Author: a.mehrafza@iau.ir

Abstract

Chronic wounds, particularly diabetic ulcers, pose a major clinical challenge due to poor angiogenesis, persistent inflammation, high oxidative stress, and microbial infection, which disrupt the normal wound healing process. In this vein, hydrogels have emerged as promising wound dressing. Hydrogel is an ideal type of wound dressing because of biocompatibility, hydrophilicity and its ability to naturally degrade. The intricate three-dimensional polymer dressing can be loaded with drugs and growth factors. Stimuli-responsive hydrogels also known as 'smart hydrogels' provide a response to the specific diabetic wound microenvironment, such as high glucose, high ROS, and low pH. In this study we review the smart hydrogel classification and mechanism of their function. Such hydrogels could manage diabetic wounds due to their capability of self-healing and having antibacterial or antioxidant properties. Although studies are conducted only in vitro and in vivo and have not reached the clinical stage yet, but they offer advantages for future clinical applications.

keywords: Chronic wounds , Diabetic ulcers, Wound healing, Smart hydrogels

21456 - Poster

The Application of Natural Cellular Proteins for Elevating the Biocompatibility of Synthetic Polyvinyl Alcohol Scaffolds

Navid Dehnavi[1 *]

1- Department of Biology Education, Farhangian University, P.O. Box 14665-889Tehran, Iran
*Corresponding Author: n.dehnavi@cfu.ac.ir

Abstract

Polyvinyl alcohol (PVA) is a synthetic polymer derived from polyvinyl acetate through hydrolysis, known for its crystalline structure and biodegradability. Since its introduction in the early 20th century, PVA has been used in various fields, including industry, medicine, and food packaging, mainly because of its environmentally friendly qualities that make it a good alternative to natural polymers, especially in paper and textile coatings. As a non-toxic thermoplastic, PVA is compatible with living tissues and needs a high temperature (100 °C) for complete dissolution, making it suitable for biological uses. The growth of hydrogels in the biomedical field over the past 50 years, especially in contact lenses and absorbable sutures, has increased the demand for new polymer materials in medical devices. PVA's hydrophilicity and processing abilities, combined with natural extracellular matrix components like collagen, have improved cell adhesion and function. This study investigates PVA/collagen scaffolds to further improve biocompatibility.Using electrospinning, two types of conduits—PVA and PVA/collagen—were created. Rat bone marrow mesenchymal stem cells were cultured on these scaffolds for three days, and cellular attachment was assessed through scanning electron microscopy (SEM). Results indicated successful cell attachment, with fiber diameters measuring 200-400 nm for PVA and 100-300 nm for PVA/collagen. The MTT assay revealed significantly higher cell viability in PVA/collagen scaffolds compared to PVA alone. DAPI staining demonstrated improved stem cell proliferation on the composite scaffold, confirming that collagen incorporation significantly enhances PVA's biocompatibility for tissue engineering applications.

keywords: Conduit, Stem cell, Polyvinyl Alcohol.

22476 - Poster

Establishment a simple method for exosome isolation from wistar rat

Azar.M.Bazzaz[1], Maryam M Matin[2], Ahmadreza Bahrami[*3]

1- Department of Biology, Faculty of Science, Ferdowsi University of Mashhad, Mashhad, Iran
2- Novel Diagnostics and Therapeutics Research Group, Institute of Biotechnology, Ferdowsi University of Mashhad, Mashhad, Iran
3- Industrial Biotechnology Research Group, Institute of Biotechnology, Ferdowsi University of Mashhad, Mashhad, Iran
*corresponding author: ar-bahrami@um.ac.ir

Abstract

Exosomes are nanoscale extracellular vesicles, ranging from 40 to 160 nm, secreted by nearly all cell types. They contain a variety of molecular components, including nucleic acids (notably RNAs), proteins, lipids, and metabolites, which can reflect the characteristics of their originating cells. However, the utilization of undifferentiated embryonic or fetal cells poses a tumorigenic risk. In therapeutic programs, exosome-based approaches seek to take advantage of their regeneration capabilities, while minimizing associated risks of cell therapy. To this aim, we established a new method to isolate exosomes from fetal tissues with potential application in regenerative medicine. A 2-week pregnant WISTAR rat was euthanized under the approved animal application protocol of Ferdowsi University of Mashhad, and related fetuses were extracted from the uterine tubes. The combined fetal tissue was first mechanically homogenized and then underwent sequential centrifugations to remove cells and debris. The precleared supernatant was subsequently combined with a 16% polyethylene glycol (PEG 4000) solution and incubated overnight at 4 °C to precipitate exosomes. The isolated particles were analyzed by dynamic light scattering (DLS), zeta potential assessment, and field-emission scanning electron microscopy (FE-SEM). DLS data revealed a vesicle population concentration peak at approximately 50-150 nm, whereas zeta-potential analysis demonstrated a negative surface charge (peak at -25mV), compatible with lipid bilayer vesicles. FE-SEM imaging confirmed a uniform population of small, approximately spherical nanovesicles. These results align with established exosome features, including a size of around 100 nm and a cup-shaped morphology.

Keywords: Fetus" Exosome" Polyethylene Glycol

23897 - Poster

Limited efficacy of L-carnitine in rescuing chemotherapy-induced ovarian injury: the role of epigenetic modifications to transcription factors

Sara Ahmadpour[1], Ghazaleh Moshkdanian[2*], Zahra Rezvani[3], Majid Almasi [2]

1- Biotechnology Department, Faculty of Chemistry, University of Kashan, Kashan, Iran
2- Gametogenesis Sciences Research Center, Institute for Basic Sciences, Kashan University of Medical Science, Kashan, Iran
3- Department of Cell and Molecular Biology, Faculty of Chemistry, University of Kashan, Iran
*Corresponding author: ghazalmoshk@gmail.com

Abstract

Cyclophosphamide (CP), a common anticancer therapy, reduces ovarian follicle reserves and can induce premature ovarian failure (POF), potentially impairing fertility. This study evaluated CP's impact on oocyte-regulatory genes and the protective role of L-carnitine (LC) as an antioxidant. Six- to eight-week-old NMRI female mice were assigned to: control, CP, and CP+LC groups. Treatments were administered intraperitoneally for 21 days. Twenty-four hours after the final dose, ovaries were harvested. Real-time PCR quantified expression of Sohlh1 and Lhx8, key regulators of oogenesis, and MS-HRM analyzed Lhx8 promoter methylation. CP markedly reduced Sohlh1 and Lhx8 expression and altered Lhx8 promoter methylation, indicating epigenetic disruption of folliculogenesis. LC showed antioxidant effects but did not restore the CP-induced changes in gene expression or promoter methylation. These findings suggest CP disrupts folliculogenesis through epigenetic mechanisms affecting transcription factors, contributing to POF, and that LC fails to mitigate these epigenetic effects under the study conditions.

Keywords: Epigenetic regulation; Sohlh1; Lhx8; L-carnitine; DNA methylation

22195 - Oral

Stem Cell-Based Therapies as a Promising Approach for Type 1 Diabetes Mellitus: A Review of Current evidence

Mona Afifi[1*], Kazem Alirezaei[2]

1- Endocrinology Department, Hazrat Ali Asghar Children's Hospital, Iran University of Medical Sciences, Tehran, Iran
2-Dentist, graduate of Shahid Beheshti University, Tehran, Iran
*Corresponding Author: drmonaafifi1@gmail.com

Abstract

AbstractType 1 diabetes mellitus (T1DM) is an autoimmune disease characterized by the destruction of insulin-producing beta cells in the pancreas. While insulin therapy remains the mainstay of management, it does not restore endogenous insulin production or prevent long-term complications. Stem cell therapy has emerged as a promising strategy to regenerate functional beta cells and potentially reverse T1DM. This review summarizes findings from over 50 preclinical and clinical studies exploring the efficacy and safety of various stem cell types, including mesenchymal stem cells (MSCs), hematopoietic stem cells (HSCs), embryonic stem cells (ESCs), and induced pluripotent stem cells (iPSCs). Evidence from recent meta-analyses shows that autologous CD34+ HSCs and umbilical cord-derived MSCs have led to insulin independence in a significant proportion of patients, particularly in early-stage T1DM. Clinical case reports further support these findings, including complete remission observed in patients treated with reprogrammed autologous stem cells. However, challenges such as immune rejection, variability in differentiation efficiency, and lack of long-term safety data remain. Overall, stem cell therapy holds substantial promise as a disease-modifying approach in T1DM, but further controlled trials are essential to confirm its long-term efficacy and safety.

keywords: Type 1 diabetes, stem cell therapy, beta cell regeneration, mesenchymal stem cells, insulin independence.

21764 - Oral

Fabrication and characterization of polycaprolactone nanofibers with antioxidant properties for use in bone tissue engineering

Nasrin Fazeli[1*], Mahdi Arab[1], Alireza Molae[1]

1- Faculty of Biotechnology, Shahab Danesh University, Qom, Iran
[*]Corresponding Author: fazeli@shdu.ac.ir

Abstract

Electrospun fibers or electrospun nanofibers are a type of advanced materials produced through the electrospinning process. This process involves using a polymer solution or other materials that are affected by a strong electric field. The result of this process is the production of very thin fibers with a diameter of nanometers. Electrospun fibers can be used as drug carriers that release drugs in a controlled manner in the damaged bone area. This improves the treatment process and reduces the side effects of drugs. One of the latest developments in this field is the loading of drugs for bone differentiation and antioxidants into the fibers. In this study, the drug alendronate and gallic acid were loaded into electrospun fibers made of polycaprolactone so that the scaffold has two osteogenic and antioxidant capabilities, respectively. In recent studies, the antioxidant effect of gallic acid on improving osteogenic differentiation and the osteogenic differentiation effect of alendronate in mesenchymal stem cells have been proven. For this purpose, first the morphology of the fibers was optimized with different percentages of alendronate. The optimal amount of gallic acid was considered in terms of the appropriate morphology of the fibers in previous studies. Then, the optimal scaffold was investigated in terms of water absorption, porosity, antioxidant effect, and release of alendronate and gallic acid with PCL scaffold as the control group. The results of electron microscope images and experiments on water absorption, porosity, antioxidant properties of the scaffold, and drug release capacity showed that the polycaprolactone/alendronate/gallic acid scaffold can be recommended for bone tissue engineering.

keywords: Bone tissue engineering, Polycaprolactone, Alendronate, Gallic acid.

Chapter Six

Animal Developmental Cell



23772 - Keynote oral presentation

Cerebrospinal fluid is the metabolic powerhouse for the cerebral cortex, essential of both development and functional health of the cerebral cortex.

Jaleel Ahmad Myian[1*], Dhruti Doddaballapur[1]

1- Division of Neuroscience, School of Biological Sciences, Faculty of Biology, Medicine & Health, The University of Manchester, 3.540 Stopford Building, Oxford Road, Manchester M13 0PT, UK.
*Corresponding Author: j.miyan@manchester.ac.uk

Abstract

The central nervous system develops around fluid filled compartments that are linked together. Beginning with a sealed neural tube filled with embryonic cerebrospinal fluid (eCSF, more accurately called neural tube fluid), that expands the developing CNS through hydrostatic pressure that forms vesicles around which different parts of the brain and spinal cord develop. The cerebral vesicles are also formed at this stage but the cerebral cortex does not begin development until the production and drainage of a high volume cerebrospinal fluid, formed by the choroid plexus, secretory epithelium located in the ventricles of the brain. This high volume CSF exits the ventricular system and enters the subarachnoid space around the outside of the cortex and rest of the brain and spinal cord. This high volume system remains for the rest of the life of the animal/human. Here we describe the essential role of CSF in the development of the cerebral cortex and for its functional health throughout life. Specifically we will present evidence that it is the metabolic powerhouse for the cerebral cortex, not only supplying it with everything it needs to function but also forming a buffer against oxidative stress. We also discuss what happens in different cerebral conditions and how addressing the CSF issues could be harnessed to treat cerebral conditions.

keywords: metabolism, folate, glucose, neurotransmitters, nitric oxide

23812 - Keynote oral presentation

Cellular senescence and senolytics: a promise for maximizing the health span

Johannes Grillari[1*]

1- Institute of Molecular Biotechnology, BOKU University, Vienna, Austria; Ludwig Boltzmann Institute of Traumatology, The Research Center in Cooperation with AUVA, Vienna, Austria
*Corresponding Author: johannes.grillari@lbg.ac.at

Abstract

With age, senescent cells accumulate in various tissues, which is linked to low-grade chronic inflammation, aging and age-related diseases. As a possible therapy for age-related diseases, the ablation of senescent cells using senolytics mainly targeting senescent cell anti-apoptotic pathways (SCAPs) was proven efficient in numerous preclinical disease models and first clinical pilot studies are ongoing. Recently, we discovered an alternative target pathway for the development of novel senolytic compounds that is based on an altered lipid metabolism in senescent cells. We found that the enzymatic phospholipase A2 activity as well as the resulting metabolite arachidonic acid are significantly upregulated intracellularly in senescent cells. Since high levels of arachidonic acid can induce apoptosis, we tested, if inhibition of enzymes that use arachidonic acid as a substrate would increase its levels further to cytotoxic dosis specifically in senescent cells. Indeed, a range of various cell types were selectively eliminated in vitro when senescent. In vivo, the treatment of 26 months old C57BL6 mice resulted in decreased mRNA levels of p21 and SAbetaGal staining in various tissues as well as markedly improved neuromuscular functionality, frailty index score, as well as an around 40% increase in life span starting from treatment at the age of 27 months. In addition, we identified circulating miRNAs in plasma of mice that correlate with tissue levels of senescence marker genes in order to establish a companion diagnostic to monitor the senescent cell load. In summary, we here provide a promising novel strategy to assess the senescent cell load based on circulating miRNAs and then to eliminate senescent cells for counteracting functional decline and diseases associated with aging targeting the arachidonic acid metabolism.

keywords: health span, senolytics, Cellular senescence

23783 - Invited oral presentation

Spatial learning and memory dysfunction and hippocampal histopathology in diabetic rats: protective effects of N-Acetylcysteine

Parsa Amiri[1], Siamak Yari[1*], Mazaher Ahmadi[2]

1- Department of Biology, Faculty of Science, Bu-Ali Sina University, Hamedan, Iran
2- Department of Analytical Chemistry, Faculty of Chemistry and Petroleum Sciences, Bu-Ali Sina University, Hamedan, Iran
*Corresponding Author: s.yari@basu.ac.ir

Abstract

Diabetes mellitus, a prevalent metabolic disorder, is associated with cognitive decline and neurophysiological alterations, primarily due to oxidative stress and inflammation. This study investigated the potential neuroprotective effects of N-acetylcysteine (NAC), an antioxidant, on memory impairment in streptozotocin (STZ)-induced diabetic Wistar rats. Rats were divided into control, STZ-induced diabetic, and NAC-treated diabetic groups. Behavioral assessments using the Barnes Maze were conducted to evaluate spatial learning and memory. Histological analysis of viable cells in the CA1 region of the hippocampus was performed using cresyl violet staining Results indicated that STZ-induced diabetes led to significant body weight loss, increased water consumption, and impaired cognitive function, as evidenced by reduced spatial memory deficits. NAC treatment mitigated these effects, restoring body weight, reducing water intake, and improving spatial learning and memory performance compared to the diabetic group. Viable cell count was higher in the CA1 region of the NAC treated group. These findings suggest that NAC's antioxidant properties may ameliorate diabetes-induced cognitive deficits by reducing oxidative stress and inflammation, offering a potential therapeutic strategy for diabetic encephalopathy.

keywords: Memory impairment ،Streptozotocin ،Cresyl violet ،rat

23766 - Invited oral presentation

Organoids: The Intersection of Embryonic Development and Regenerative Medicine — A Review of the Importance of Laboratory Micro-Organs in Understanding the Mechanisms of Development and Regenerative Medicine

Hanieh Jalali[1 *]

1- Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: jalali@khu.ac.ir

Abstract

Organoids are small three-dimensional structures derived from stem cells that self-organize and differentiate to closely mimic the structure, cellular composition, and functions of real human organs. These complex, multicellular models capture key features of their living counterparts in laboratory conditions, including gene expression patterns and functional phenotypes, providing a highly biologically relevant platform for research. Organoids can be generated from tissue-derived cells, induced pluripotent stem cells (iPSCs), or cancer cells, enabling the creation of various organ systems such as brain, liver, kidney, and more. In developmental biology, organoids are valuable tools for studying early morphogenetic processes, cell differentiation, and organogenesis. By replicating critical stages of tissue and organ formation within a controlled three-dimensional environment, they overcome the ethical and technical limitations of human embryonic studies and traditional animal models. These models allow detailed investigation of developmental signaling pathways, stem cell biology, and disease mechanisms in human tissues. In regenerative medicine, organoids show promise as models for tissue engineering, disease modeling, and potential treatments. They enable studies of tissue regeneration and serve as a bridge toward developing clinical applications like organoid-based transplantation and personalized regenerative therapies. Overall, organoids represent a revolutionary advance that integrates basic biological research with clinical applications in biology, drug screening, and regenerative medicine. Their ability to recreate the complexity of human organs in laboratory settings has transformed the way diseases are studied and treated.

keywords: Stem cell ،Organoid ،Organogenesis ،Regeneration

23773 – Invited oral presentation

Cardiac Organoids as Patient-Specific Models: Advances in Tissue Engineering Approaches

Somayeh Ebrahimi-Barough[1 *]

1- Department of Biomedical Engineering, University of Minnesota, Minnesota, USA; Department of Tissue Engineering, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding Author: sebrahim@umn.edu

Abstract

Cardiac organoids are three-dimensional, stem cell–derived constructs that replicate key structural, cellular, and functional properties of the human heart. Recent advances in bioengineering have enabled organoids to exhibit spontaneous contraction, multicellular organization, and electrophysiological activity, providing a physiologically relevant platform for cardiovascular research. In here, we explore the use of cardiac organoids as a novel model for hypertrophic cardiomyopathy (HCM), a common genetic cardiac disorder characterized by pathological myocardial thickening and impaired diastolic function. Our findings highlight cardiac organoids as an advanced, scalable, and translationally relevant system for modeling HCM and accelerating the development of targeted therapies.

keywords: HCM, 3D cell culture, Cardiac organoids, iPSCs

23811 - Invited oral presentation

From human pluripotent stem cells to cardiac organoids: functional assessments in 3D.

Marisa E Jaconi[1 *], Michel Puceat[2]

1- Department of Basic Neurosciences, University of Geneva, Geneva, Switzerland.
2- INSERM Cardiovascular and Nutrition Research Center, Aix-Marseille University, School of Pharmacy La Timone, Marseille, France
*Corresponding Author: marisa.jaconi@unige.ch

Abstract

Up to 20 years ago, we have provided the first general picture of integrative physiology of human cardiomyocytes derived from human embryonic stem cells, demonstrating their developmental maturation toward an electrophysiological adult phenotype through cardio-specific ion channel patterns [PMID: 17255522].To date, the generation of 3D cardiac microtissues in vitro from human pluripotent stem cells has increasingly become a critical procedure for modelling not only the development of healthy human heart tissue but also heart pathological conditions relevant for disease modelling, drug screening as well as novel regenerative solutions. In particular, Hofbauer et al. recently reported the generation a mesodermal cell-self organizing cardioid [PMID: 34019794]. By challenging hESC with controlled concentrations of Wnt activator and activin in the absence of ECM proteins, they could produce cardioids presenting with a chamber-like cavity and presenting either left or right atrial or ventricular identity, as well as of outflow tract or atrio-ventricular origin. Those can be further fused into multi-chamber cardioids [PMID: 38029745]. We will present how we exploited and adapted those recently published protocols to successfully generate ventricular cardioids. Their functional characterization in vitro is critical to achieve sign of maturation and thereby correctly model ventricular tissue and associated pathologies, for instance using microelectrode arrays.

keywords: human pluripotent stem cells, cardiogenesis, cardioids, electrophysiological recordings

23767 - Invited oral presentation

Investigating the relationship between male infertility and methylation patterns and semen parameters

Nasim Naeemi[1 *], Homa Mohseni Kouchesfahani[2]

1- Assistant Professor ,Department of Biology, Faculty of Science, University of Sistan and Baluchestan, Zahedan ,Iran ,
2- Professor, Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: naeimi@science.usb.ac.ir

Abstract

Infertility is a heterogeneous condition that, in addition to genetic causes, is affected by epigenetic factors such as methylation. The CHD5 gene regulates the replacement of histones with protamine during chromatin condensation. The aim of this study was to evaluate the changes in CHD5 gene promoter methylation with semen parameters in infertile and control groups. This study was conducted on 103 (46%) infertile men with non-obstructive azoospermia and severe oligozoospermia (patients) and 121 (54%) fertile men (controls). Semen parameters were evaluated based on World Health Organization standards and the methylation status of CHD5 gene in peripheral blood was evaluated using MS-PCR. Data were evaluated with SPSS statistical software and ($p<0.05$) was considered significant. Ejaculation volume, sperm count, A+B progressive motility, morphology, and total sperm motility showed significant differences between the two groups, with the averages in the patient group being significantly lower than the control group ($p<0.001$). The frequency of MM status was significantly associated with an increased risk of infertility and the risk of infertility in them was (OR=4.047, CI=1.56-10.48), 95% confidence interval was ($p<0.05$). The comparison of the mean sperm concentration in MM, MU and UU methylation patterns was (62.73±6.51) 106, (61.58±3.48) 106, (65.59±4.71106) in the control group and in the infertile men group was (2.90±0.60) 106, (3.18±0.70) 106, (3.04±0.81) 106 respectively ($p<0.001$). Peripheral blood CHD5 gene hypermethylation in the patient group was associated with an increased risk of infertility and changes in semen parameters. Considering the importance of childbearing and recent advances in the field of infertility, standard semen analysis does not provide accurate information about sperm characteristics, and testicular biopsy and surgery cause secondary effects by damaging the tissue. Therefore, examining gene methylation in peripheral blood as a non-invasive biomarker, understanding molecular mechanisms, and studying in other populations are important for early awareness, early diagnosis, and confirmation of infertility outcomes. This is a challenging and promising issue that requires further research.

keywords: Male infertility ،Semen parameters ،CHD5 gene methylation ،Peripheral blood

23765 - Invited oral presentation

Application of cold atmospheric plasma technology in skin wound healing

Elaheh Amini[1 *]

1-Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
[*]Corresponding Author: elaheh.amini@khu.ac.ir

Abstract

Plasma medicine is a research field that utilizes the fundamentals of plasma physics in biomedicine. Cold Atmospheric Plasma (CAP) can produce via the ionization of atoms, commonly via exposure to robust electric fields, and composed of ions, free radicals, and molecules at varying energy states. It has been clarified that CAP is capable of exerting effects on biological systems in both direct and indirect ways. One of the most imperative advantages of CAP is its selective effect on cells, causing minimal damage to healthy cells and tissues. Therefore, CAP has been used in medicine due to its safety and effectiveness, and its anticancer and antimicrobial effects have been elucidated. In addition, the positive effects of CAP have also been proven in the field of dermatology. Studies have shown that CAP plays a critical role in wound healing directly by stimulating the proliferation and migration of skin cells. Recent literature, suggests that CAP can accelerate the wound healing process by affecting integrin receptors on the cell surface or promoting angiogenesis. On the other hand, studies showed that biological solutions activated by cold plasma at atmospheric pressure (PAM) via inhibition of bacterial proliferation and stimulation of both angiogenesis and cell migration are a promising therapy for the treatment of wounds. In terms of mechanism of action, CAP could accomplish wound healing through short-lived and long-lived ROS and RNS, promoting the formation of blood vessels, increment the CTGF and VEGF, activating YAP pathway, and upregulation the expression of Cx43.

keywords: atmospheric plasma pressure ،biological effects ،anticancer ،wound healing ،angiogenesis

23813 - Invited oral presentation

Bidirectional interaction between Periodontal Disease and Polycistic Ovarian syndrome: a systematic review

Sara Bernardi[1 *]

1- Department of Life Health and Environmental Sciences, University of L'Aquila, Italy
*Corresponding Author: bernardi@univaq.it

Abstract

Polycystic ovarian syndrome (PCOS) is a systemic endocrine disorder mainly characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology. Due to the inflammatory nature of the disease, PCOS could be particularly associated with the severity of periodontal inflammation via involving various inflammatory mediators such as interleukin-6 (IL-6), IL-17 and matrix metal-loproteinase-8 (MMP-8) in serum and saliva samples.In addition, the modified content of saliva, due to the low-inflammatory state, can affect the oral microbial balance. This systematic review aims to evaluate the type, presence and differences of salivary biomarkers of inflammation in patients suffering by PCOS and the risk of periodontal disease according to emerging scientific evidence. Selected databases were PubMed, Scopus, Google scholar and Web of science. The search strategy included the following terms: “oral inflammatory biomarkers” “salivary mediators”, “metabolic indicators”, “periodontal diseases”, “periodontitis”, “polycystic ovary syndrome”, “PCOS”, “ovulatory dysfunction”. Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines were used. The review revealed that there are various possible salivary inflammatory biomarkers in women with PCOS, such as cytokines, C-reactive Protein (CRP), Reactive oxygen species (ROS), MMPs, and microbiological diversity. Furthermore, these articles suggest an association between Periodontal Disease (PD) and PCOS, as periodontal parameters were more commonly altered in PCOS patients compared to healthy young women. This altered periodontal response in PCOS has been linked to an inflammatory state that appears to increase the susceptibility to PD. The salivary biomarkers of inflammation in patients affected by PCOS can be considered as a diagnostic method to assess the increased risk of periodontal disease. Further new studies are needed, with stricter protocols, to investigate the best potential of inflammatory biomarkers as a diagnostic salivary index forPCOS patients and to evaluate the true inductive properties of the biomarker in early periodontal disease screening.

keywords: Bidirectional interaction, Polycistic, Ovarian

23780 - Invited oral presentation

Hair Follicle Stem Cells in Neurological Regeneration and Repair

Sareh Pandamooz[1 *], Mohammad Saeed Salehi[2]

1- Stem Cells Technology Research Center, Shiraz University of Medical Sciences, Shiraz, Iran
2- Department of Animal Sciences, Shiraz University, Shiraz, Iran
*Corresponding Author: sareh_pandamooz@sums.ac.ir

Abstract

Hair follicle stem cells (HFSCs) are emerging as a promising and accessible source of multipotent stem cells with significant potential in regenerative medicine. Originating from the neural crest, HFSCs possess inherent plasticity and the capacity to differentiate into various neural lineages. This unique origin positions them as highly suitable candidates for neurological applications, where both structural and functional regeneration are required.Our research group has focused on exploring the therapeutic potential of HFSCs in neurological conditions, including spinal cord injury and stroke. In these contexts, HFSCs have demonstrated the ability to promote axonal regeneration, modulate inflammation, and support neuronal survival and remyelination. Their integration into host tissue and their paracrine signaling capabilities contribute to both regeneration and repair, making them effective agents for functional recovery. In spinal cord injury models, HFSC transplantation has resulted in improved locomotor function and reduced glial scarring. Similarly, in ischemic stroke models, HFSCs have shown potential to reduce infarct size and enhance neurogenesis. Importantly, their low immunogenicity and ease of harvesting from autologous sources offer significant advantages over other stem cell types. Through a multidisciplinary approach combining in vivo models, cellular tracking, and molecular profiling, our group continues to characterize the mechanisms underlying HFSC-mediated repair. These findings support the growing consensus that HFSCs represent a viable, translationally relevant tool for treating a wide spectrum of neurological disorders.

keywords: Hair follicle stem cell, Neuroregeneration, Spinal cord injury, Stroke, Regenerative medicine

23814 - Invited oral presentation

Engineering iPSC-Derived CAR-NK Cells for Targeted GD2 Immunotherapy in Glioblastoma: A Step Towards Clinical Translation

Nasim Xiaojie Xian[1], ShuhWen Aung[1], Lars Andresen[2], Astrid Lund Feilberg[2], Lucas Lange[3], Kristina Dauven[3], Axel Schambach[3] , Søren Skov[2], Niels-Bjarne Woods[1], Nasim Mayeli Fereidani[1 *]

1- Division of Molecular Medicine & Gene Therapy, Lund University, Sweden.
2-Preclinical Disease Biology, Department of Veterinary and Animal Sciences, University of Copenhagen.
3-Institute of Experimental Haematology, Hannover Medical School.
*Corresponding Author: nasim.mayeli@med.lu.se

Abstract

Natural Killer (NK) cells are recognized as the first line of immunosurveillance in our immune system, employing lytic machinery to eliminate abnormal cells without the need for pre-stimulation. Their unique innate characteristics, lack of human leukocyte antigen (HLA) matching requirements, and shorter lifespan make them ideal for 'off-the-shelf' immunotherapy. Advances in gene editing have revolutionized our ability to generate NK cells from human induced pluripotent stem (iPS) cells, which are armed with chimeric antigen receptors (CARs) capable of recognizing and lysing targeted cells. This progress addresses the need for off-the-shelf allogeneic cell-based immunotherapy, offering potential benefits for cancer patients, including reduced therapeutic costs. In this study, we established a simplified iPS cell differentiation system for the efficient and reproducible production of NK cells. The system is fully defined, xeno-free, feeder cell-free, and does not rely on embryoid body differentiation, reducing key sources of stochastic variability in in vitro-derived preparations while significantly simplifying scalability. Furthermore, we demonstrate the cytotoxic killing activity of IPS-NK cells is improved over NK cells derived from human peripheral blood. Additionally, incorporation of the CAR against GD2 improved cytotoxic ability of the iPS derived NK cells against Glioblastoma derived patient samples. Our data towards developing a highly translational iPS-derived NK cell differentiation system is a promising important step towards advancing NK based immunotherapies.

keywords: iPSC-Derived, Immunotherapy, Glioblastoma

23781 - Invited oral presentation

Application of exosomes extracted from insulin-producing precursor cells for controlling diabetes in a rat model

Elham Hoveizi[1 *]

1- Department of Biology, Faculty of Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran
*Corresponding Author: elham.hoveizi@gmail.com

Abstract

Diabetes, emerging as an epidemic, has attracted the attention of researchers. This study aims to evaluate a novel approach, exosome therapy, in a rat model to assess the potential therapeutic effects of this technology in diabetes. To establish a diabetic model, 12 male Wistar rats weighing approximately 250 g were rendered diabetic by intraperitoneal injection of streptozotocin at a concentration of 60 mg/kg. Endometrial stem cells were differentiated into insulin-producing precursors, and exosomes were isolated from these cells. The morphological characteristics, size, and related biological markers of the exosomes were assessed using SEM, NTA, and Western blot. The exosomes were administered intravenously to the diabetic rats in three consecutive doses of 100 µl at a concentration of 150 µg/mL. Results showed that exosomes with an average size of about 30 nm and positive expression of markers CD9, CD61, and CD80 were effectively isolated from the differentiated cells. Based on the obtained data, the use of these extracted exosomes produced significant positive effects in lowering blood glucose levels, preserving body weight, and managing diabetes stability over a relatively short period of eight weeks. Specifically, the average blood glucose level in the exosome-treated group at its best was reduced to 157 mg/dL. In the early weeks, blood glucose levels in the exosome-treated rats decreased significantly; however, from week four to the end of week eight, they increased somewhat. Nonetheless, they remained significantly lower than in the diabetic group. Weight change in the exosome-treated group did not show a statistically significant difference compared with the diabetic group; final week eight weights were 195 g and 172 g, respectively. The ongoing research and development of exosome therapy hold substantial potential to provide an innovative and effective approach for the treatment and control of diabetes and may contribute to improved health outcomes and quality of life for individuals living with this chronic disease. However, further research is warranted to more comprehensively assess safety, efficacy, and optimization of the therapeutic regimen.

keywords: Exosome therapy, Insulin-producing precursor cells, Diabetes mellitus, Endometrial stem cells

23768 - Invited oral presentation

Application of Tissue Engineering in Medicine: From the Laboratory to the Clinic

Maryam Moghaddam Matin[1,2 *]

1- Department of Biology, Faculty of Science, Ferdowsi University of Mashhad, Mashhad, Iran
2- Novel Diagnostics and Therapeutics Research Group, Institute of Biotechnology, Ferdowsi University of Mashhad, Mashhad, Iran
*Corresponding Author: matin@um.ac.ir

Abstract

With the increasing challenges associated with some incurable diseases, the science of tissue engineering has emerged as a new strategy in regenerative medicine. Using appropriate scaffolds, a good cell source, and specific growth factors can lead to the production of desired tissues or organs to treat certain diseases or replace damaged tissues in the body. Finding the best protocol for producing scaffolds in order to preserve the extracellular matrix, the integrity and mechanical strength of the original tissue, while at the same time removing all cells and antigens that can elicit an immune response in the recipient organism, is very important. Additionally, adding certain nanoparticles or extracellular vesicles from various sources can improve the properties of such scaffolds for different applications. Over the past several years, we have focused on constructing natural scaffolds from various tissues and organs including skin, kidney, pericardium, fascia, and others, in animal and human models; we have examined their properties, biocompatibility, and suitability for cell growth, and have tested some of them in animal models. Here, some results related to the protocols used to produce the scaffolds, the assessment of their structural and mechanical properties before and after cell culture, and the pathway forward for translating these products to the clinic are reviewed and discussed. Given the need for such products in various surgeries, mass production of these scaffolds could be an appropriate solution for treating certain diseases in the clinic and could facilitate the pathway from laboratory to bedside.

keywords: Tissue engineering, natural scaffold, nanoparticles, pericardium

22003 - Oral

Modulatory Effects of Neural Stem Cell-Derived Exosomes on the Differentiation of Mesenchymal Cells into Neural-like Phenotypes

Seyede Yosra Helalat[1], Elham Hoveizi[1*], Maryam Naderi Soorki[1]

1- Shahid Chamran University of Ahvaz
*Corresponding Author: elham.hoveizi@gmail.com

Abstract

Introduction and Objective Exosomes, as extracellular nanovesicles, play a significant role in intercellular information transfer and can act as regulatory factors, especially in cellular differentiation environments. This study aimed to investigate the modulatory effects of exosomes derived from neural stem cells (NSC-EX) on the differentiation of adipose-derived mesenchymal stem cells (AdMSCs) into neuro-like phenotypes. Methods Exosomes were isolated from neural stem cell culture medium using the Anacell kit and were characterized by nanoparticle tracking analysis (NTA), transmission electron microscopy (TEM), and Western blot. Subsequently, AdMSCs were exposed to these exosomes, and neuro-like differentiation was evaluated using neuronal molecular markers such as Tuj-1, MAP2, Nestin, and NF through immunocytochemistry and RT-qPCR. Results Findings showed that exposure of AdMSCs to NSC-EX led to upregulation of neural marker genes and proteins and induced morphological changes consistent with a neuro-like phenotype. Additionally, analysis of the exosome molecular content revealed the presence of lncRNAs associated with neural differentiation, including H19 and MEG3. Conclusion The results of this study indicate that NSC-EX can act as effective modifiers of AdMSC differentiation toward neuro-like cells. These findings may provide a foundation for the development of novel therapeutic strategies in neural tissue engineering and neurodegenerative diseases.

keywords: Exosome, Neural stem cells, Mesenchymal stem cells, Neural differentiation, lncRNA

22539 - Oral

The effect of coenzyme Q10 on mitochondrial biogenesis in mouse ovarian follicles during in vitro culture

Roya Harsini[1 *], Saeed Zavareh[1], Maysam Nasiri[1]

1- Department of Cellular and Molecular Biology, School of Biology, Damghan University, Damghan, Iran
[*]Corresponding Author: roya041har@gmail.com

Abstract

Abstract: The aim of this study was to investigate the effect of coenzyme Q10 on mitochondrial transcription factor (TFAM) gene expression and mtDNA copy number in mouse preantral follicles (PFs) during in vitro culture. For this experimental study, PFs were isolated from 14-day-old mice of the National Institute of Medical Research and cultured in the presence of 50 µM CoQ10 for 12 days. On the 12th day, human chorionic gonadotropin was added to stimulate ovulation. Basic parameters including preantral follicle growth rate and oocyte maturation were investigated. In addition, TFAM gene expression and mtDNA copy number of granulosa cells and oocytes were assessed using real-time polymerase chain reaction. The results showed that CoQ10 significantly increased the diameter of PFs, survival rate, antrum formation and metaphase II (MII) oocytes ($P < 0.50$). In addition, in the CoQ10-treated groups, TFAM gene expression in granulosa cells and oocytes was significantly increased compared to the control group. The mtDNA copy number of granulosa cells and oocytes cultured in the presence of CoQ10 was significantly higher compared to the control groups ($P < 0.50$). Adding CoQ10 to the culture medium enhances the developmental competence of PFs during in vitro culture by upregulating TFAM gene expression and increasing mtDNA copy number in oocytes and granulosa cells

keywords: Preantral follicles, mitochondrial transcription factor A, mtDNA copy number, oocyte, granulosa cells

21861 - Oral

Growth patterns of caudal skeletal structures in Aphaniops hormuzensis: A comparative study between immature and adult stages

Mina Motamedi[1], Zahra Hajizade[1 *]

1-Department of Biology, Faculty of Science, Shahid Bahonar University of Kerman, Iran
*Corresponding Author: zahraa.hajii77@gmail.com

Abstract

: Given the crucial role of the caudal fin in the early developmental stages of fish, the skeletal structure of the caudal region and its ontogenetic changes are of particular importance. The Hormuz tooth-carp (Aphaniops hormuzensis) is an endemic Iranian fish species with unique potential for studies on vertebrate developmental biology, particularly tissue regeneration. This study describes and analyzes the growth of caudal skeletal bones in A. hormuzensis at two key developmental stages (immature: size class I and adult: size class II) in the Khurgu warm-water habitat in Hormozgan Province. For this purpose, specialized bone/cartilage staining techniques (Alizarin Red/Alcian Blue) and radiology were employed. The caudal skeleton in both stages consisted of hypural, parhypural, and epural bones. A key finding was the consistent fusion and uniformity of the hypural bone across all examined stages. The growth of these bones in terms of length and thickness was gradual and proportional to the longitudinal growth of the body. Results indicated that the size and growth rate of specific caudal skeletal elements—such as the neural and haemal spines of preural vertebrae—were significantly correlated with body size (comparing immature size class I (15-25 mm) with adult size class II (36-45mm); $p < 0.01$). These structures were larger and more developed in adult specimens. While the basic pattern of caudal bones (type and arrangement) remained unchanged between immature and adult stages, allometric growth of these elements was evident.

keywords: Teleost ،development ،cartilage and bone differentiation ،regeneration

22287 - Oral

Phased Cerebellar Regeneration in Adult Zebrafish: Coordinated Inflammation Resolution, Metabolic Reprogramming, and Metronidazole-Enhanced IL-10 Response

Javid Rezaei Lord[1], Tooba Mirzapour[2] *

1- Department of Biological Sciences, Kharazmi University, Tehran, Iran
2- Department of Animal Sciences, University of Guilan, Rasht, Iran
*Corresponding Author: dr.tooba72@gmail.com

Abstract

Neural regeneration in adult zebrafish following a precise cerebellar lesion reveals a phased interplay of anti-inflammatory signaling, metabolic reprogramming, and immune/differentiation cues. We quantified the expression dynamics of IL-10 and TNF-α at 6 and 12 hours post-injury, and of aldoca and pax5 at days 1 and 7, under both control and metronidazole-treated conditions, using qRT-PCR. Without treatment, IL-10 rose by ~35% at 6 h and ~78% at 12 h ($p < 0.05$); metronidazole significantly amplified this response to ~43% and ~130%, respectively (12-h $p < 0.001$). In contrast, TNF-α plummeted to ~7% at 6 h ($p < 0.001$) and partially rebounded to ~39% by 12 h ($p < 0.01$), indicating prompt but regulated inflammation resolution. Metabolic gene aldoca surged dramatically, approximately 15-fold on day 1 and 17-fold by day 7 ($p < 0.001$), demonstrating robust energy reprogramming. Pax5 expression exhibited a slight nonsignificant increase on day 1, followed by a marked 43% elevation at day 7 ($p < 0.01$), signaling delayed activation of differentiation or immune-related processes. Together, these data delineate a structured regenerative sequence in zebrafish: initial suppression of inflammation and IL-10–mediated resolution, succeeded by a metabolic shift and, later, immune/differentiation signaling—further enhanced in the early phase by metronidazole-boosted IL-10 induction. This orchestrated response underscores the therapeutic promise of modulating inflammation and metabolism in central nervous system regeneration.

keywords: zebrafish; cerebellar injury; IL-10; metabolic reprogramming; metronidazole.

22265 - Oral

The Synergistic Effect of Mouse Mesenchymal Stem Cell-Derived Exosomes and a Low-Frequency Electromagnetic Field on Chondrogenic Differentiation

Maryam Lotfi[1], Khadije Nejad Shahrokhabadi[1], Javad Baharara[2 *], Pejman Khorshid[3]

1- Department of Biology, Mashhad Branch, Islamic Azad University, Mashhad, Iran
2- Department of Biology & Research Center for Animal Development Applied Biology, Mashhad Branch, Islamic Azad University, Mashhad, Iran
3- Department of Physics, Mashhad Branch, Islamic Azad University, Mashhad, Iran
*Corresponding Author: baharara@iau.ac.ir

Abstract

Background: Cartilage has a limited intrinsic capacity for healing, making the regeneration of cartilage damage a persistent challenge. Recent studies suggest that the secreted products of mesenchymal stem cells offer a promising new therapeutic strategy for such injuries. Furthermore, low-frequency electromagnetic fields have been observed to play a key role in various biological processes.Objective: The aim of this research was to investigate the potential synergistic effect between mesenchymal stem cell-derived exosomes and a low-frequency electromagnetic field in promoting the chondrogenic differentiation of mesenchymal stem cells. Methods: This in vitro study characterized mesenchymal stem cell-derived exosomes via AFM, SEM, TEM, and DLS. Cells in chondrogenic medium were treated with exosomes, a low-frequency electromagnetic field, or their combination. Cell survival was examined with MTT and Annexin assays, while cartilage differentiation was confirmed by Alcian blue staining. The expression of Sox-9, Acan, Col2a1, and Col10a1 genes was evaluated by real-time PCR on day14.Results: The results confirmed the presence of exosomes with a size of approximately less than 100 nm. Analysis via Alcian blue staining indicated a greater expression of glycosaminoglycans in the synergistic treatment group relative to all other groups. Real-time PCR analysis demonstrated that the synergistic treatment significantly upregulated the expression of Sox-9, Acan, and Col2a1 genes, while significantly downregulating the expression of Col10a1, compared to the other experimental groups.Conclusion: This study indicates that the synergistic effect of exosomes and a low-frequency electromagnetic field enhances chondrogenic differentiation, a finding that should be further explored in future clinical studies.

keywords: Chondrogenic differentiation, exosomes, low frequency electromagnetic field, mesenchymal stem cells, Chondrogenic gens, cartilage

21419 - Oral

Evaluation of the role of indigenous Iranian probiotics in improving memory and suppressing tau protein in a rat model of Alzheimer's disease

Zohreh Shadmehr[1] * Majid Navaian[2], Bahareh Pakpuor[3], Maryam Taj Abadi Ebrahimi[4]

1- PhD student in Microbiology, Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran.
2-Assistant Professor, Department of Biology, Yadegar-e-Imam Khomeini (RAH) Shahre Rey Branch, Islamic Azad University, Tehran, Iran.
3-Assistant Professor, Department of biology, Central Tehran Branch, Islamic Azad University, Tehran, Iran.
4- Associate Professor, Department of Biology, Central Tehran Branch, Islamic Azad University, Tehran, Iran.
*Corresponding Author: zshadmehr7@gmail.com

Abstract

Background and Objective: Alzheimer's disease (AD) is a progressive and prevalent neurodegenerative disorder in the elderly, characterized by cognitive impairment, the accumulation of abnormal proteins such as beta-amyloid (Aβ) and Tau, and the activation of inflammatory pathways. Recent evidence suggests that probiotics, owing to their anti-inflammatory and antioxidant properties, may modulate these pathological processes. This study aimed to investigate the effect of an indigenous Iranian probiotic combination on Tau protein expression and learning and memory performance in an animal model of Alzheimer's disease.Methods: In this experimental study, 21 male Wistar rats were randomly assigned to three groups: control, Alzheimer's, and treatment. AD was induced in the Alzheimer's and treatment groups by intra-hippocampal injection of Aβ1-42 into the CA1 region of the brain. The treatment group received a daily oral gavage of 1 mL of a probiotic mixture containing Lactobacillus acidophilus, L. paracasei, L. reuteri, and Bifidobacterium longum for three weeks. Cognitive and memory function were assessed using the shuttle box test, and Tau protein expression in hippocampal tissue was evaluated using the western blot technique.Results: Injection of Aβ significantly increased Tau protein expression and impaired memory performance in the Alzheimer's group compared to the control group ($P<0.001$). Probiotic administration significantly improved cognitive performance and reduced Tau expression in the treatment group ($P<0.01$).Conclusion: The indigenous Iranian probiotic combination exhibited notable neuroprotective effects by improving memory and suppressing Tau protein expression in an animal model of Alzheimer's disease. These findings support the potential use of probiotics as an adjunctive therapeutic strategy in the management of AD.

keywords: Alzheimer's disease, probiotics, Tau protein, western blot, memory.

22480 - Oral

Anatomical and Histochemical Fingerprint of Gastrointestinal Tract in Bony Fishes from Different Trophic Levels

Parsa Jomehpour[1], Seyyed Mohammad Hadi Alavi[1 *], Mona Dabagh[1], Mohammad Hossein Omidi[1]

1- Department of Animal Biology, School of Biology, College of Science, University of Tehran, Tehran
[*]Corresponding Author: hadi.alavi@ut.ac.ir

Abstract

Anatomy, morphology and histology of gastrointestinal tract (GIT) show ontogeny and phylogeny variations that are an evolutionary adaption to feeding habit. The GIT includes the headgut (mouth and pharynx), foregut (esophagus, stomach and pyloric ceca), midgut (intestine), and hindgut (rectum) in fish. It has extensive endocrine functions, and plays important roles in food uptake and digestion, and nutrient uptake. In the present study, we aimed at anatomical and histochemical fingerprint of GIT in fish from different trophic levels. The GIT from omnivorous (tench, Tinca tinca and common bream, Abramis brama) and carnivorous (donkey croaker, Pennahia anea) fishes were fixed in 5% formalin. The GIT was sectioned and embedded in paraffin after dehydration. Serial sections of 7 µm thickness were stained with H&E or PAS. The histological slides were observed under a light microscopy, and images were captured for histochemical characterization and GIT morphometry. Unlike of T. tinca, stomach was present in A. brama and P. anea. Pyloric ceca were not observed in any species. For all species, GIT was composed of mucosa, submucosa, muscularis and serosa layers. Morphometry of mucosal folds and cellular component varied along GIT, and showed species variations. Gastric glands and goblet cells were common components of the stomach and postgastric region, respectively; higher numbers were observed at anterior stomach and posterior intestine. Histochemical traits were tightly aligned with feeding behavior. This study quantifies histological features of GIT, illustrates spatial distribution of cellular component along GIT, provides a framework for understanding trophic specialization, and expands insight into evolution of digestive system.

keywords: Gastric cells, Goblet cells, intestine, mucosal folds, stomach

22291 - Poster

Selenium nanoparticles attenuate silver nanoparticles toxicity in mice Sertoli cells via modulation of SOD and Kindlin-2

Setayesh Safaei [1], Mahnaz Azarnia [1*], Elaheh Amini [1], Mohammad Nabiuni [2], Media Abdollahian[2]

1-Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran.
2- Department of Cell and Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran.
Corresponding author's e-mail: azarnia@khu.ac.ir

Abstract

Male infertility has been increasing in recent years, raising concerns about the reproductive risks of nanoparticles. Silver nanoparticles (AgNPs) are known to induce oxidative stress and impair male fertility, whereas selenium nanoparticles (SeNPs) have demonstrated antioxidant properties at specific concentrations. The present study aimed to evaluate the protective role of SeNPs against AgNPs-induced toxicity in mouse Sertoli cells. Sertoli cells were surgically isolated from NMRI mice and characterized by flow cytometry. The cells were divided into experimental groups: control, AgNPs (10 µg/ml), and combined treatments of AgNPs (10 µg/ml) with SeNPs at concentrations of 24–64 µg/ml for 10 hours. Cytotoxicity was assessed by MTT assay, oxidative stress was measured through reactive oxygen species (ROS) and malondialdehyde (MDA) levels, and the expression of antioxidant-related genes (SOD and Kindlin-2) was quantified using real-time PCR. Exposure to AgNPs significantly reduced cell viability, elevated ROS and MDA production, and downregulated SOD and Kindlin-2 expression (***$p \leq 0.001$). In contrast, co-treatment with SeNPs markedly improved Sertoli cell survival in a dose-dependent manner. At higher doses of SeNPs (64 µg/ml), ROS and MDA levels decreased significantly, while the expression of SOD and Kindlin-2 was upregulated compared to the AgNP-only group (***$p \leq 0.001$). These findings indicate that SeNPs can effectively counteract AgNPs-induced cytotoxicity in Sertoli cells by enhancing antioxidant defense mechanisms and reducing oxidative damage. Thus, SeNPs may serve as potential therapeutic agents to mitigate nanoparticle-associated reproductive toxicity.Keywords: male infertility, nanoparticles, Sertoli cells, selenium, oxidative stress

keywords: male infertility, nanoparticles, Sertoli cells, selenium, oxidative stress

22305 - Poster

Muscle functional anatomy in two crustacean models: Copepoda and Cirripedia

Zeinab Zinatbakhsh[1 *], Alireza Sari[1]

1- Centre of Excellence in Phylogeny and School of Biology, College of Science, University of Tehran, Tehran, Iran
*Corresponding Author: zinatbakhsh@ut.ac.ir

Abstract

This study aimed to investigate the functional anatomy of muscles in two groups of crustaceans, Copepoda and Cirripedia, with a focus on muscular homology and evolutionary relationships. The species Tigriopus californicus (Copepoda) and Balanus glandula (Cirripedia) were selected as model organisms. Copepods are small crustaceans that play a crucial role in marine ecosystems as primary consumers, whereas cirripede larvae, in addition to playing a similar role, permanently attach themselves to hard substrates at the end of their larval stage. Despite their different lifestyles, these two groups share a common ancestry and display remarkable similarities.To achieve detailed comparisons, serial histological sections were prepared. The sections were stained with hematoxylin–eosin and analyzed to identify muscle structures in each group. Subsequently, the observed muscles in both species were compared to determine structural and functional similarities and differences. This comparative approach not only facilitated the recognition of muscular homologies and functional adaptations linked to lifestyle and habitat but also provided insights into the evolutionary relationships between these groups.Additionally, the findings were compared with previous studies to validate the results and to place them within an evolutionary framework. The outcomes of this research revealed group-specific muscular features, offered new perspectives on the evolutionary history of crustaceans, and highlighted the potential for future studies in the field of functional muscle biology in invertebrates.

keywords: muscle homology; functional adaptation; functional anatomy; inter-class comparison; muscle histology

22530 - Poster

Immunohistochemical Analysis of Testicular Tissue in Male Rats Following PM2.5 Inhalation Exposure

Elnaz Noshadirad[1 *], Kazem Parivar[1], Saeed Motesaddi Zarandi[2], Pejman Mortazavi[3], Batool Ghorbani Yekta[4]

1- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2- Department of Environmental Health Engineering, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran
3- Department of Pathobiology, Science and Research Branch, Islamic Azad University, Tehran, Iran
4- Department of Physiology, Faculty of Medicine, Tehran Medical Sciences, Islamic Azad University of Medical Sciences, Shariati St, Tehran, Iran.
*Corresponding Author: elnaznoshadirad@gmail.com

Abstract

Air pollution, especially PM2.5 particulate matter, is recognized as one of the major threats to human health and its association with reproductive problems has been confirmed. However, the precise molecular mechanisms under the influence of these particles still require further investigation. In this study, the effect of exposure to PM2.5 and gaseous pollutants on the levels of oxidants, oxidative enzymes, oxidative damage, and aquaporin 9 protein expression in testicular tissue of male rats was investigated. Thirty-six male Wistar rats were divided into three groups: control (clean air), gas (gaseous pollutants), and gas + PM2.5. Exposure was performed for three months, four hours per day, with real PM2.5 concentrations (from urban air). Testicular tissue was extracted and analyzed after exposure to assess malondialdehyde (MDA) levels as a marker of oxidative damage, and immunohistochemical expression of aquaporin 9. The results showed that exposure to PM2.5 significantly increased MDA levels and decreased aquaporin 9 expression in testicular tissue compared to the control group ($P<0.05$). These changes were associated with impaired sex hormone signaling and reduced spermatogenesis quality. The findings suggest that PM2.5 leads to infertility by inducing oxidative stress, DNA damage, and impaired water and ion transport in Sertoli cells. Limitations of the study included the lack of long-term effects and the focus on an animal model, but its practical applications could be useful in health policies to reduce air pollution. It is suggested that additional studies be conducted on human models and the role of antioxidants.

keywords: Oxidative damage, aquaporin 9, oxidative stress, sex hormones, spermatogenesis

22310 - Poster

Protective effect of apigenin on Nrf2 protein expression in the liver of cadmium-treated mice

Mahsa Norouzi[1], Fereshteh Mir Mohammadrezaei[1 *], Mohammad Karimian[2]

1- Department of Biology, Faculty of Basic Sciences, University of Mazandaran, Babolsar, Iran
2-Department of Cell and Molecular Biology, Faculty of Basic Sciences, University of Mazandaran, Babolsar, Iran
*Corresponding Author: fereshteh.mmrezaei@gmail.com

Abstract

Cadmium (Cd) is a major environmental pollutant that accumulates in the liver and induces oxidative stress, inflammation, and metabolic disturbances. The use of plant-derived compounds with antioxidant properties is considered an effective approach to mitigating such damage. Apigenin, a natural flavonoid, exerts protective effects against cadmium toxicity by activating the Nrf2/Ho-1 signaling pathway. The aim of this study was to investigate the effects of apigenin on histological alterations and Nrf2 protein expression in the liver of cadmium-treated mice. In this study, mice were divided into different groups receiving cadmium, apigenin, or a combination of both. Liver samples were collected after intervention and fixed in 10% formalin. Four-micron sections were prepared after paraffin embedding and subjected to immunohistochemical staining using an anti-Nrf2 antibody. The findings showed that Nrf2 expression was highest in the Sham group, whereas cadmium administration significantly reduced its level ($p<0.05$). Treatment with apigenin at both doses (AP5 and AP50) restored Nrf2 expression to the level of the Sham group. The combination of cadmium and apigenin also led to partial improvement of Nrf2 expression, although it remained lower than that of the Sham group. These results indicate that cadmium induces liver injury through suppression of the Nrf2 pathway, while apigenin, as an antioxidant compound, can substantially attenuate these effects. Therefore, apigenin may represent a potential candidate for preventing heavy metal-induced hepatotoxicity.Keywords: Liver, Cadmium, Apigenin, Nrf2, Oxidative Stress

keywords: Liver, Cadmium, Apigenin, Nrf2, Oxidative Stress

22522 - Poster

Effects of Inhaled PM2.5 on Hormonal Levels, Histopathology, Oxidative Stress, and Hormone Receptors in the Uterus of Female Rats

Pejman Mortazavi[1 *], Nazli Yazdani Karganrood[2], Akram Eidi[2], Saeed Motesaddi Zarandi[3]

1- Department of Pathobiology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2- Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
3- Department of Environmental Health Engineering, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran
*Corresponding Author: sp.mortazavi@gmail.com

Abstract

Air pollution, especially fine particulate matter (PM2.5) and its associated polycyclic aromatic hydrocarbons (PAHs), threatens women's reproductive health, and fewer studies have been conducted than in the male system. In this study, the effects of PM2.5 on ovarian and uterine quality were investigated using 24 female Wistar rats in control (standard air), exposure to gaseous pollutants, and exposure to gaseous pollutants plus PM2.5 groups for three months in an urban simulation environment. PM2.5 particles from Tehran were collected with small volume samplers, analyzed for metals (ICP-MS) and PAHs (GC-MS), and applied to exposure chambers. Serum assays showed increased FSH and LH along with decreased progesterone and estrogen in the PM2.5 groups, confirming hormonal imbalance. Oxidative stress markers revealed decreased SOD, GPx, CAT and increased MDA with greater severity in the PM2.5 group. Histopathology showed ovarian follicular atresia, thinning of granulosa layers and stromal fibrosis, while uterine analysis confirmed epithelial atrophy, reduced endometrial thickness and low expression of ER/PR receptors by immunohistochemistry. PAHs likely act as endocrine disruptors and alter receptor signaling, follicular growth and uterine integrity, which increases the risk of infertility. These findings emphasize the need to control urban emissions; future research should explore molecular mechanisms and antioxidant therapies in human cohorts for strategies to prevent PM2.5-induced reproductive toxicity.

keywords: reproductive hormones, histopathology, oxidative stress, PAHs, PM2.5

22231 - Poster

Anti-fibrotic Effects of Daucus carota Seed Essential Oil on Cholestasis-Induced Hepatic Injury

Alaa K. Alshujairi[1, 2*], Mohammad Nabiuni [3], Talal Anwer Abdulkareem [4], Latifeh Karimzadeh Bardeei [1], Elmira Beirami [1]

1- Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran.
2- Department of Animal Production, College of Agriculture, University of AL-Qasim Green, Babil, Iraq.
3- Department of Cellular and Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran.
4- Department of Animal Production, College of Agricultural Engineering Sciences, University of Bagdad, Iraq.

*Corresponding Author: alla82@agre.uoqasim.edu.iq

Abstract

Cholestasis is a liver condition caused by impaired bile synthesis, secretion, or flow, linked to liver fibrosis and cirrhosis. Carrot seeds, a customary medicinal plant, are rich in anti-inflammatory carotenoids. This study assessed the hepatoprotective potential of carrot seed essential oil using an in vivo model of cholestasis, aiming to disrupt the cholestatic-fibrotic feedback loop and reinstate hepatobiliary homeostasis. Twenty-four adults male Wistar rats, weighing approximately 250 ± 20 g, were randomly assigned to four groups: (1) control, (2) sham-operated, (3) bile duct ligation (BDL)-induced cholestasis, and (4) cholestasis treated with carrot seed oil at a dose of 2 g/kg/day for 21 consecutive days. Blood and liver samples were collected for serological and immunohistochemical analyses. Histomorphometry examination of liver tissue was conducted by sectioning and staining tissue sections with hematoxylin and eosin and Trichrome Masson. Statistical analysis showed that cholestasis increased Kupffer cells AND collagen fibers ($p<0.001$). Carrot seed oil restored reduced Kupffer cells and collagen density. Serum biomarkers were elevated in cholestasis but decreased with oil treatment. Additionally, immunohistochemical analysis confirmed elevated TGF-β and α-SMA protein levels in cholestatic livers, which were significantly reduced upon treatment. In conclusion, these findings indicate that carrot seed essential oil possesses strong hepatoprotective properties, primarily by modulating inflammatory responses and inhibiting the TGF-β/α-SMA signaling pathway. This highlights its potential as a natural therapeutic agent for managing cholestatic liver injury.

keywords: carrot seed, inflammation, liver, α-SMA

22179 - Poster

The association between aluminum chloride exposure and granulosa cell tumors' occurrence

Farima Rahimi Mansour[1 *], Mohammad Nabiuni[2], Raoufeh Koochaki[2], Elaheh Amini[3]

1- Gnecology Research Unit, Institute of Experimental and Clinical Research, Universite Catholique de Louvain, Brussels, Belgium
2- Department of Cell & Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
3- Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: farima.rahimi@uclouvain.be

Abstract

Aluminum chloride (AlCl3) is used for water purification and antiperspirant manufacture, affecting different tissues such as the brain, liver, uterus, and ovary through the induction of oxidative stress, inflammation, and cell death. For the in vitro section, we collected ovarian tissue from immature female NMRI mice, isolated granulosa cells (GCs), cultured GCs with Alpha-MEM medium, 1% antibiotic, and 15% FBS, and treated them with 1, 4, and 10 mM of AlCl3. The cell proliferation evaluated with MTT assay, apoptosis assigned by AO/PI staining, and the expression of Cyp19a1, Pcna, Puma, and Map1lc3b genes measured using qRT-PCR. For the in vivo section, the 20 immature NMRI female mice were randomly divided into four groups: a control group receiving distilled water, and three experimental groupsinjected intraperitoneally with 1.2, 4.8 and 12.1 mg/kg of AlCl3 solution. After two weeks, the mice's ovaries were then removed. Then, the histopathological changes of the ovaries and the expression of the same genes were assessed. A decrease occurred in the number of treated GCs following the increment of AlCl3 concentrations, as well as a rise in apoptosis rate. The expression of Puma was suppressed or slightly increased in treated GCs, the expression of the Map1lc3b gene was decreased, the expression of Cyp19a1 and Pcna genes increased. The injection of various concentrations of AlCl3 changed the ovarian structure and inhibited follicular growth. The Cyp19a1 and Pcna genes had increased expression, while the Puma and Map1lc3b genes exhibited variable expression. AlCl3 had toxic effects on ovarian tissue and granulosa cells, including disrupted folliculogenesis, the presence of Call-Exner bodies, and impaired gene expression, directing us to the granulosa cell tumors for the first time.

keywords: Aluminum chloride, Granulosa cell, Apoptosis, Ovarian tissue

22024 - Poster

Evaluation of the effect of phycocyanin on the changes in expression of the apoptotic gene BAX in human pancreatic cancer cells (AsPC1 line)

Maryam Nezami[1], Khadijeh Nejad Shahrokhabadi[1], Javad Baharara[2 *]

1- Department of Biology, Ma.C., Islamic Azad University, Mashhad, Iran
2- Research Center for Animal Development Applied Biology, Mashhad Branch, Islamic Azad University, Mashhad, Iran
*Corresponding Author: baharara@iau.ac.ir

Abstract

Pancreatic cancer, due to its aggressive nature, late diagnosis, and resistance to conventional treatments, is considered one of the most lethal cancers, and the search for novel therapeutic approaches in this field is essential. Phycocyanin is a bioactive compound derived from the microalga Spirulina, widely used in the food, cosmetic, and pharmaceutical industries because of its antioxidant, anti-inflammatory, and anticancer properties. The aim of this experimental–laboratory study was to investigate the effect of phycocyanin on cell proliferation and the induction of apoptotic cell death in the AsPC1 pancreatic cancer cell line. In this study, AsPC1 cells were treated with phycocyanin at concentrations of 100, 200, 300, and 400 µg/ml for 24 hours. Cell viability was assessed using the MTT assay. Changes in BAX gene expression were evaluated using Real-time PCR. The MTT assay results showed that phycocyanin reduced the proliferation of pancreatic cancer cells in a dose-dependent manner ($p<0.05$). A concentration of 300 µg/ml was determined as the inhibitory concentration (IC50). Real-time PCR results indicated an increase in the expression of the apoptotic gene BAX in cells treated with 300 µg/ml phycocyanin compared to the control group. These findings suggest that phycocyanin may activate apoptosis, possibly through upregulation of BAX gene expression in pancreatic cancer cells. With further investigation, phycocyanin could potentially serve as an adjuvant in pancreatic cancer treatment.

keywords: Pancreatic cancer; Cell proliferation; Spirulina microalgae; Phycocyanin; Apoptosis

22013 - Poster

Evaluation of cell viability and changes in BAX gene expression in DU-145 cancer cells (human prostate cancer) treated with phycocyanin

Saba Hosseini[1], Khadijeh Nejad Shahrokhabadi[1], Javad Baharara[2 *]

1- Department of Biology, Ma.C., Islamic Azad University, Mashhad, Iran
2- Research Center for Animal Development Applied Biology, Mashhad Branch, Islamic Azad University, Mashhad, Iran
*Corresponding Author: baharara@iau.ac.ir

Abstract

Phycocyanin is a natural pigment extracted from cyanobacteria, due to its prominent biological properties, has attracted attention in the treatment of many diseases such as cancer. Prostate cancer is one of the most common cancers in men, and due to drug resistance and the side effects of common treatments, there is a need to provide novel, natural, and safe therapeutic approaches. In this experimental–laboratory research, the antiproliferative effects of phycocyanin and the changes in the expression level of the apoptotic gene BAX in the DU-145 cell line were investigated. Initially, prostate cancer cells were treated with concentrations of 100 to 400 µg/ml of phycocyanin for 24 hours, and then the MTT assay was performed to evaluate cell viability. Changes in BAX gene expression were examined using the Real-Time PCR technique. The results showed that phycocyanin, in a concentration-dependent manner, caused a significant decrease in the viability of DU-145 cancer cells ($p<0.05$). The concentration of 300 µg/ml of phycocyanin was determined as the IC_{50}. To investigate the effect of phycocyanin on cell death pathways, changes in BAX gene expression were measured as one of the key genes promoting intrinsic apoptosis. The results indicated a significant increase in BAX gene expression in the group treated with a concentration of 300 µg/ml compared to the control group ($p<0.05$). Based on the findings of this study, phycocyanin can, by reducing cell viability and increasing BAX gene expression, be proposed as an effective compound for complementary treatment of prostate cancer.

keywords: Phycocyanin; Apoptosis; Prostate cancer; Cyanobacteria

22512 - Poster

Empagliflozin ameliorates Doxorubicin-induced hepatotoxicity by antioxidant and anti-inflammatory effects in male mice

Nafiseh Asgari[1], Zahra Kalhori[1 *]

1- Department of Biology, Razi University, Kermanshah, Iran
*Corresponding Author: zahrakalhori1@yahoo.com

Abstract

Doxorubicin (DOX) is a chemotherapeutic drug that causes hepatotoxicity associated with oxidative stress and inflammation. Empagliflozin (EMPA) is a medication with antioxidant and anti-inflammatory properties that is used to treat type 2 diabetes mellitus. The present study investigated the protective effect of empagliflozin on dox-induced hepatotoxicity. Twenty-eight adult male NMRI mice (8-12 weeks old) were randomly divided into four groups (n = 7 per group): the DOX group received 2 mg/kg intraperitoneally on days 1, 7, 14, 21, and 28. DOX+EMPA group, in addition to receiving a 2 mg/kg intraperitoneally on days 1, 7, 14, 21 and 28 of doxorubicin, at the same time received 10mg/kg/day empagliflozin for 28 days, the EMPA group received 10mg/kg/day empagliflozin for 28 days, and the control group did not receive any medications. Finally, Livers were studied histomorphologically, Serum levels of IL-6 and TNF-α, Malondialdehyde, and the antioxidant capacity were measured relatively using an ELISA kit, the thiobarbituric acid (TBA) assay, and the ferric reducing antioxidant power (FRAP) assay. Data were analyzed using one-way ANOVA and Tukey's test, and the means were considered significantly different at $p<0.05$. The Serum levels of IL-6, TNF-α, and MDA significantly increased in the DOX group compared to the control, while these parameters significantly reduced to the control level in the DOX +EMPA group. The antioxidant capacity was significantly reduced in the DOX group compared to the control, while it was significantly increased in the DOX+EMPA group. Empagliflozin ameliorates Doxorubicin-induced hepatotoxicity by antioxidant and anti-inflammatory effects in male mice.

keywords: Doxorubicin; Empagliflozin; Liver; Inflammation; Antioxidant capacity

22521 - Poster

Empagliflozin mitigate doxorubicin-induced hepatotoxicity by reducing Apoptosis in male mice

Nafiseh Asgari[1], Zahra Kalhori[1 *]

1- Department of Biology, Faculty of Science, Razi University, Kermanshah, Iran
*Corresponding Author: zahrakalhori1@yahoo.com

Abstract

Doxorubicin (DOX) is a commonly used chemotherapy drug for various types of cancer, but its use is limited due to various organ toxicities. Empagliflozin (EMPA) is a medication with anti-apoptotic properties that is used to treat type 2 diabetes mellitus. The present study investigated the protective effect of empagliflozin on dox-induced hepatotoxicity. Twenty-eight adult male NMRI (8-12 weeks old) mice were randomly divided into four groups (n = 7 per group): the DOX group received 2 mg/kg intraperitoneally on days 1, 7, 14, 21, and 28. DOX+EMPA group, in addition to receiving a 2 mg/kg intraperitoneally (i.p) on days 1, 7, 14, 21 and 28 of doxorubicin, at the same time received 10mg/kg/day i empagliflozin for 28 days, the EMPA group received 10mg/kg/day empagliflozin for 28 days, and the control group did not receive any medications. At the end of treatment, Livers were studied, and the apoptosis rate in the hepatocytes was evaluated by TUNEL staining. Data were analyzed using one-way ANOVA and Tukey's test, and the means were considered significantly different at $p<0.05$. The percentage of apoptotic cells increased significantly in the DOX group compared with the Control and empagliflozin groups ($P < 0.001$). Compared with the DOX group, there was a significant decrease in the mean percentage of apoptotic cells in the DOX+empagliflozin group ($P < 0.01$). Empagliflozin can mitigate doxorubicin-induced hepatotoxicity by reducing Apoptosis.

keywords: Doxorubicin, empagliflozin, liver

22540 - Poster

Empagliflozin can improve liver enzymes in mice with doxorubicin-induced hepatotoxicity

Nafiseh Asgari[1], Zahra Kalhoi[1 *]

1- Department of Biology, Faculty of Science, Razi University, Kermanshah, Iran
*Corresponding Author: zahrakalhori1@yahoo.come

Abstract

Hepatotoxicity is a significant side effect of doxorubicin (DOX), while empagliflozin (EMPA) has the anti-liver injury biological functions. The study aimed to evaluate liver enzymes in mice with doxorubicin-induced hepatotoxicity. Twenty-eight adult male NMRI (8-12 weeks old) mice were randomly divided into four groups (n = 7 per group): the DOX group received 2 mg/kg intraperitoneally on days 1, 7, 14, 21, and 28. DOX+EMPA group, in addition to receiving a 2 mg/kg intraperitoneally on days 1, 7, 14, 21 and 28 of doxorubicin, at the same time received 10mg/kg/day i empagliflozin for 28 days, the EMPA group received 10mg/kg/day empagliflozin for 28 days, and the control group did not receive any medications. At the end of treatment serum concentrations of ALT, AST, ALP, GGt, total bilirubin, were determined using ELISA kits. Data were analyzed using one-way ANOVA and Tukey's test and the means were considered significantly different at $p<0.05$. Serum concentrations of ALT, AST, ALP, GGt and total bilirubin were significantly higher in the DOX group than in the control and empagliflozin groups ($P<0.001$), However, in the DOX+ empagliflozin group, serum concentrations of ALT, AST, ALP, GGt and total bilirubin were significantly lower than in the DOX group ($P<0.001$). Empagliflozin can mitigate doxorubicin-induced hepatotoxicity by improving liver enzymes.

keywords: Doxorubicin, empagliflozin, liver enzymes, mouse

21922 - Poster

Thermal developmental plasticity in Tenebrio molitor larvae: optimizing rearing parameters for sustainable insect production

Negin ShahMoradi[1], Somayeh Esmaeili-Rineh[1 *]

1- Department of Biology, Faculty of Science, Razi University, Kermanshah, Iran
*Corresponding Author: sesmaeili@razi.ac.ir

Abstract

With global population growth projected to reach 10 billion by 2050, the demand for alternative and sustainable protein sources is increasing. Insects such as the yellow mealworm (Tenebrio molitor) offer a promising solution due to their efficient feed conversion, low environmental impact, and high nutritional value. Temperature is a key abiotic factor that directly influences insect growth, survival, and metamorphosis. This study aimed to determine the effect of temperature on larval survival and metamorphosis in T. molitor. Larvae were reared under four constant temperatures: 24°C, 26°C, 28°C, and 30°C. Each treatment included three replicates of 50 uniform larvae, fed wheat bran and carrots, with relative humidity maintained at 60 ± 5%. Data were analyzed using one-way ANOVA. Results revealed a significant effect of temperature on both larval survival and metamorphosis rates ($p < 0.001$). The highest rates (100%) occurred at 24°C and 26°C. These values declined slightly at 28°C and reached their lowest levels at 30°C (94.7% survival, 91.5% metamorphosis). These findings indicate an optimal thermal range for development below 28°C. Temperature plays a fundamental role in shaping metabolic rates, enzyme activity, and energy allocation in insects. Moderate temperatures appear to support balanced metabolism, leading to improved survival and developmental outcomes. While elevated temperatures can accelerate development, they may simultaneously increase physiological stress, resulting in reduced survival or incomplete metamorphosis. In conclusion, maintaining temperatures between 24°C and 26°C, combined with adequate humidity, can significantly improve rearing outcomes in T. molitor. These insights are valuable for optimizing insect farming systems aimed at food and feed production, aligning with broader goals in sustainable agriculture and developmental biology.

keywords: Tenebrio molitor, developmental biology, metamorphosis, larval survival, sustainable protein

21779 - Poster

Developmental plasticity in Tenebrio molitor: influence of fruit-sourced moisture on embryonic duration and hatchability

Raziye Rashidi Ilzoleh[1], Vahid Akmali[1 *], Ehsan Sadeghi[2]

1- Department of Biology, Faculty of Science, Razi University, Kermanshah, Iran
2- Department of Nutritional Science, School of Nutritional Science and Food Technology, Kermanshah University of Medical Sciences, Kermanshah, Iran
*Corresponding Author: v_akmali@razi.ac.ir

Abstract

Mealworms (Tenebrio molitor) are increasingly recognized as a sustainable alternative protein source due to their high nutritional value and low ecological footprint. This study aimed to investigate the effect of fruit-derived dietary moisture on the embryonic development and hatching success of T. molitor under controlled conditions. Two dietary treatments were applied: one group received only wheat bran (dry diet), while the second group received wheat bran supplemented with fresh fruit. Larvae were reared at 28 ± 1°C in complete darkness. Each treatment consisted of 10 replicates, and data on the embryonic period and hatching rate were collected daily for three weeks. The mean embryonic duration was significantly longer in the fruit-supplemented group (8.08 ± 0.31 days) than in the control group (7.63 ± 0.74 days; $p < 0.001$). Likewise, hatching success was significantly higher in the fruit group (74.87%) compared to the control (65.03%; $p < 0.001$). These results suggest that dietary moisture not only influences developmental timing but also enhances embryo viability. From a developmental biology standpoint, the extended embryonic period may reflect a more stable and hydrated microenvironment, reducing osmotic and thermal stress during key morphogenetic stages such as germ band elongation and cuticle deposition. Adequate hydration likely improves cell integrity, metabolic balance, and timing of segmentation, contributing to more synchronized hatching. Moreover, dietary moisture may affect endocrine or gene regulatory mechanisms involved in tissue differentiation and stress responses. This highlights the regulatory potential of nutritional moisture in insect embryogenesis and supports its inclusion as a key factor in developmental biology research and insect farming strategies

keywords: Tenebrio molitor, embryogenesis; hatching success, moisture availability, developmental regulation.

22002 - Poster

Investigation of the cytotoxic and apoptotic effect of menthol on CT26 colon cancer cells

Somayeh Khezri[1*], Javad Baharara[1,2], Elaheh Amini[3]

1- Department of Biology, Ma.C., Islamic Azad University, Mashhad, Iran
2- Research Center for Animal Development Applied Biology, Mashhad Branch, Islamic Azad University, Mashhad, Iran
3- Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: khezrism64@gmail.com

Abstract

Colon cancer is a common gastrointestinal cancer in the world. In recent years, the use of natural medicinal products has increased significantly. Menthol is the active ingredient of the peppermint plant; studies have shown that menthol has anti-proliferative properties against cancer cells. In this experimental-laboratory study, the cytotoxic effect of menthol against CT26 colon cancer cells was measured by MTT test (with concentrations of 2 to 8 mM menthol and for 24 and 48 hours) and morphological characteristics related to apoptosis were examined by Acridine orange-Propidium iodide staining. The findings from the MTT test showed that menthol caused the proliferation of CT26 cell line to stop in a concentration- and time-dependent manner ($p<0.05$). The results obtained from Acridine orange-Propidium iodide staining showed apoptosis induction in cells treated with 4 mM menthol for 24 hours. The results of this study indicate that menthol induces apoptosis in colon cancer cells due to its cytotoxic and apoptotic properties. In the future, with further research and studies, menthol can be considered as an anticancer herbal compound in studies related to the treatment of colon cancer.

keywords: Colon cancer; Herbal product; Menthol; Acridine orange-Propidium iodide

22011 - Poster

The effect of phycocyanin on proliferation and migration of human ovarian cancer cells (A2780)

Inaz Soltani[1 *], Khadijeh Nejad Shahrokhabadi[1], Javad Baharara[2]

1- Department of Biology, Ma.C., Islamic Azad University, Mashhad, Iran
2- Research Center for Animal Development Applied Biology, Mashhad Branch, Islamic Azad University, Mashhad, Iran
*Corresponding Author: soltansoltani271@gmail.com

Abstract

Ovarian cancer is a lethal malignancy in women, characterized by high mortality, rapid progression, and poor response to conventional therapies. In recent years, natural compounds have become important in cancer therapies. Phycocyanin, a natural pigment from marine algae with antioxidant, antiproliferative, and anticancer properties, has a special place in different researches. This study evaluated the effects of phycocyanin on the viability and migration of human ovarian cancer cells (A2780) using MTT and scratch assays. Therefore, first, cells were cultured and then were treated with various concentrations of phycocyanin (100–500 µg/ml); after 24 hours, cytotoxicity was assessed via the MTT assay. The result of this test showed a concentration-dependent reduction. The IC50 concentration was determined to be 350 µg/ml ($p<0.05$). The scratch assay demonstrated that treatment with 350 µg/ml phycocyanin significantly reduced cell migration compared to the control after 24 hours. The findings of this experimental-laboratory study showed that phycocyanin effectively suppresses proliferation and migration of A2780 ovarian cancer cells. Phycocyanin as a natural product, holds potential as an adjuvant in ovarian cancer therapy, warranting further investigation.

keywords: Viability; Natural products; Metastasis; Phycocyanin; Ovarian cancer

22059 - Poster

Investigating the protective effect of crocin on acetaminophen-induced liver damage in rats

Aref Delkhosh[1], Mojtaba Ziaeei[2], Mahdi Ahmadi[3], Masoud Delashoub[4 *]

1- Department of Pathobiology, Faculty of Veterinary Medicine, Division of Pathology, Urmia University, Urmia, Iran.
2- Medicinal Plants research Center, Maragheh University of Medical Sciences, Maragheh, Iran.
3- Faculty of Medicine,Sarab,Iran.
4- Department of Basic Science, Faculty of Veterinary Medicine, TaMS.C, Islamic Azad University, Tabriz, Iran.
*Corresponding Author: masouddelashoub1976@iau.ac.ir

Abstract

Acetaminophen is an analgesic, anti-inflammatory and antipyretic drug that is not a corticosteroid (corticosteroid). It is one of the most common and important non-steroidal anti-inflammatory drugs, whose analgesic and antipyretic (fever-reducing) effects are greater than its anti-inflammatory effects, and outside the United States, it is better known as "paracetamol". One of the important side effects of acetaminophen is hepatotoxicity. Saffron is considered one of the important medicinal plants in traditional medicine. The main extract of saffron is called crocin, which has antioxidant, anti-inflammatory and hepatoprotective properties. The purpose of this experiment was to investigate the protective effects of crocin on liver tissue damage caused by acetaminophen in rats. To conduct this study, 32 male Wistar rats were divided into 4 groups of 8, including the control group (daily intraperitoneal saline), acetaminophen group with a dose of 750 mg/kg body weight intraperitoneally, acetaminophen group (similar to the acetaminophen group) + crocin 50 mg/kg body weight gavage for 15 days, and the crocin group with similar amounts to the third group. At the end of the experimental period, all animals were euthanized with ketamine-xylazine injection and liver tissue was extracted for histopathological examination with hematoxylin-eosin staining. The results showed that acetaminophen consumption induced inflammation around the portal area and hepatitis as well as hepatocyte necrosis, and saffron extract consumption caused partial repair of liver tissue and brought it closer to a healthy state. It can be concluded that crocin can protect liver tissue against damage caused by acetaminophen consumption due to its antioxidant and anti-inflammatory properties. Therefore, it is recommended to use crocin as a hepatoprotective drug in treatment protocols for liver diseases.

keywords: Acetaminophen, crocin, liver, rat

22431 - Poster

The synergistic effects of exercise training and probiotic supplementation on liver tissue parameters of male Wistar cholestatic rats

Mitra Modirrousta[1], Khadijeh Irandoust[1 *], Mohammad Nabiuni[2], Naheed Mojgani[3], Latifeh Karimzadeh Bardeei[4]

1- Department of Sport Science, Faculty of Social Science, Imam Khomeini International University, Qazvin, Iran
2- Department of Cell and Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
3- Razi Vaccine and Serum Research Institute, Alborz, Iran
4- Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: irandoust@soc.ikiu.ac.ir

Abstract

Cholestasis is a chronic liver disease that causes inflammation and fibrosis of the liver.Probiotics are bacteria that help maintain the balance of microbiota in the gut and have been suggested to prevent chronic liver damage. Exercise has profound effects on the gut microbiome in addition to body weight and liver fat. This study aimed to investigate the combined protective effects of exercise training and probiotic supplementation on liver tissue in cholestasis.30 male Wistar rats (200-250 g) were randomly assigned to five groups: control, bile duct obstruction cholestasis model, cholestasis with exercise training on a treadmill(3times/week), cholestasis with probiotic treatment (108 CFU/ml administered via gavage), and cholestasis subjected to both exercise training and probiotic treatment for a duration of three weeks. Histomorphometric examination of liver tissue was conducted by sectioning and staining tissue sections with Hematoxylin and Eosin and serum bilirubin. Statistical analysis was performed using one-way analysis of variance and Tukey's post hoc test, with a significance level set at $P<0.05$.The cholestasis group exhibited a significant decrease in the number of hepatocytes, along with a significant increase in the number of Kupffer cells, blood bilirubin level.Exercise training and probiotic consumption alone or in combination, compensated for liver tissue damage, including increasing the continuity of hepatic cords, reducing the number of Kupffer cells around the hepatic ducts, and compensating for bilirubin levels in the treatment groups.The findings suggest that exercise in conjunction with probiotic consumption may serve as a potential treatment protocol for cholestasis patients, as it can help reduce the progression of liver tissue damage.

keywords: cholestasis; histology; bilirubin

22105 - Poster

Investigating the effects of Hypericum perforatum extract on wound healing in rats

Fatemeh Alizadeh[1], Hamid Darvishnia[1 *], Mitra Arman[1]

1- Department of Biology, Payame Noor University, Tehran, Iran
*Corresponding Author: darvishnia_h@pnu.ac.ir

Abstract

A burn injury is a form of trauma that is caused by a variety of factors, including heat, which damages the protective outer layer of the body. Hypericum perforatum is a medicinal plant historically used to treat anxiety and depression, as well as various skin injuries like wounds, burns, and sunburn. The present study investigates the healing effects of a H. perforatum extract on second-degree burn wounds in rats. Burns were induced on the dorsal surface of 20 anesthetized rats. The animals were assigned to four groups: a control group, two experimental groups (receiving 15% and 25% plant extract, respectively), and a group treated with silver sulfadiazine ointment. Wound area, healing percentage, and tissue changes in the damaged skin layers were assessed on days 1, 5, 10, 15, and 20 after wound formation. The macroscopic results showed an acceleration of wound healing starting on day five, with the ointment-treated group and the 25% extract group exhibiting significant differences compared with the other treatments. Histological results indicated that, in the treated groups, tissues became progressively more granular and cellular over time, with the improvement being more pronounced in the ointment group than in the other treatments. The 25% plant extract group showed a higher level of granulation and cellularization than both the control and the 15% extract group. These findings suggest that, beyond its known antioxidant potential, this plant contains compounds that promote burn wound healing.

keywords: Histology, Medicinal Plant, Second Degree Burn, Hypericum perforatum.

22022 - Poster

Investigation the effect of phycocyanin on the apoptosis rate of A2058 cancer cells (human melanoma)

Kimiya Ervin[1], Khadijeh Nejad Shahrokhabadi[1], Javad Baharara[2 *]

1- Department of Biology, Ma.C., Islamic Azad University, Mashhad, Iran
2- Research Center for Animal Development Applied Biology, Mashhad Branch, Islamic Azad University, Mashhad, Iran
*Corresponding Author: baharara@iau.ac.ir

Abstract

Skin cancer includes melanoma and non-melanoma skin cancers. Melanoma is the most dangerous type of skin cancer. Phycocyanin is a blue pigment found in algae and cyanobacteria. This pigment has diverse biological activities and various applications in the food, cosmetic, and pharmaceutical industries. Phycocyanin possesses anti-inflammatory and anti-cancer properties and can inhibit the proliferation of cancer cells. The aim of this study was to investigate the effect of phycocyanin on the proliferation and induction of apoptosis in the A2058 cell line. To achieve this, the MTT assay and flow cytometry analysis were used to evaluate cytotoxicity and the type of induced cell death, respectively. First, A2058 cells were cultured and then treated with phycocyanin at concentrations of 100 to 500 µg/ml for 24 hours. The results of the MTT assay showed that phycocyanin inhibited the proliferation of A2058 cells in a concentration-dependent manner ($p<0.05$). The use of a 350 µg/ml concentration of phycocyanin resulted in the inhibition of proliferation in approximately 50% of the cancer cells. The results of the flow cytometry technique indicated that in the group treated with 350 µg/ml of phycocyanin, about 40% of the cells underwent apoptosis. The findings of this experimental-laboratory research suggest that phycocyanin, by reducing the proliferative capacity of A2058 cancer cells and increasing the percentage of apoptotic cells, could be considered a natural and effective product, with potentially fewer side effects, for the treatment of melanoma, pending further research.

keywords: Skin cancer; Melanoma; Cytotoxicity; Phycocyanin; Flow cytometry

21508 - Poster

Evaluation of FOXO3 Gene Expression Changes in the Ovarian Tissue of Mice with Polycystic Ovary Syndrome (PCOS)

Fatemeh Khorram[1], Elaheh Amini[1 *], Mahnaz Azarnia[1], Azadeh Niknejad[2]

1- Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
2- Department of Cell & Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran

[*]Corresponding Author: elaheh.amini@khu.ac.ir

Abstract

Polycystic ovary syndrome (PCOS) is one of the most significant endocrine disorders in women of reproductive age, characterized by disrupted folliculogenesis, apoptosis, and oxidative stress. FOXO3 is a key transcription factor involved in the regulation of programmed cell death. This study aimed to investigate the expression of the FOXO3 gene in the ovarian tissue of PCOS-induced mice.In this experimental study, sixteen adult female NMRI mice were randomly divided into two groups: control and PCOS. PCOS was induced by a subcutaneous injection of 200 µL of estradiol valerate solution (10 mg/mL) per mouse, corresponding to 2 mg of the drug per mouse. Initial confirmation of PCOS induction was performed via vaginal smear analysis, and after 54 days, the presence of PCOS was further validated using histological and hormonal assessments. After euthanasia, ovarian tissues were extracted, and FOXO3 gene expression was measured using quantitative real-time PCR (qRT-PCR).The results showed that FOXO3 expression was significantly upregulated in the PCOS group compared to the control group ($p < 0.05$). This increase in gene expression may contribute to enhanced apoptotic activity and ovarian dysfunction in the PCOS condition.

keywords: Apoptosis, Estradiol Valerate, Estrous cycle, Ovarian cyst, qRT-PCR.

22358 - Poster

study of the viability rate of fibroblast cells cultured on sodium alginate- gelatin-based scaffolds loaded with halloysite nanotubes.

Saeme Shamsi[1 *], Vahid Nejati[1], Jafar Rezaie[1], Ali Akbari[1]

1- Faculty of Science, Urmia Cellular and Molecular Medicine Research Institute, Urmia University
*Corresponding Author: saeme.shamsi1975@gmail.com

Abstract

Bleeding and wound infection are among the most important causes of patient mortality. Tissue engineering, as one of the new approaches in regenerating damaged tissues, emphasizes the use of 3D biocompatible scaffolds to guide cell growth and restore normal tissue function. In this study, a composite hydrogel based on sodium alginate and gelatin was designed, and halloysite nanotubes (HNTs) were added to its formulation to improve its biological and mechanical properties. Sodium alginate and gelatin played the role of the base matrix, and halloysite nanotubes played the role of nanofiller. After the preparation and sterilization of the scaffolds, the extract from the scaffolds was prepared and added to the fibroblast cell culture medium. Following 24 and 48 hours, the MTT test was performed to measure cell viability. The results showed that the designed scaffolds had high biocompatibility and, in particular, the samples containing halloysite nanotubes showed higher cell viability than the samples without it. These findings indicate that halloysite-reinforced alginate-gelatin hydrogels can be used as efficient substrates in tissue engineering and wound healing applications.

keywords: sodium alginate, halloysite, hydrogel, tissue engineering, cell attachment

22010 - Poster

Investigation of the level of antioxidant factor MDA in rat models of Alzheimer's treated with pycnogenol

Masoumeh Hashemi[1], Majid Navaian[2 *], Bahare Pakpour[3]

1-MSc in Pathogenic Microbiology from the Department of Biology, Yadegar-e-Imam Khomeini (Rah) Shahr Rey, Islamic Azad University, Tehran, Iran.
2-Assistant Professor in the Department of Biology at Yadegar-e-Imam Khomeini (Rah) Shahr Rey Branch, Islamic Azad University, Tehran, Iran.
3- Assistant Professor in the Department of Biology at Central Tehran Branch,
*Corresponding Author: majid_navaian@yahoo.com

Abstract

Alzheimer's disease is a progressive neurological disorder characterized by the abnormal accumulation of amyloid-beta plaques in the brain tissue, accompanied by oxidative stress, leading to the destruction of nerve cells and a gradual decline in cognitive function. The present research was designed to investigate the effect of pycnogenol and antioxidant index in an animal model of Alzheimer's disease. In this experimental study, 28 Wistar laboratory rats were randomly divided into four groups: normal, positive control, Alzheimer's, and Alzheimer's groups receiving pycnogenol. The Alzheimer's model was induced by bilateral beta-amyloid injection into the CA1 region of the hippocampus using stereotaxic surgery. Behavioral assessment was performed using the shuttle box test. Furthermore, the activity of the antioxidant enzyme malondialdehyde (MDA) was assessed using Western blot and ELISA reader. The results showed that pycnogenol consumption, compared to other compounds, produces a more significant and meaningful improvement effect on the memory of the Alzheimer's model rat. On the other hand, after daily consumption of pycnogenol, the level of MDA, as a marker of oxidative stress, decreased. The current study demonstrated that the combined consumption of plant extract containing polyphenol compounds such as pycnogenol can create a significant difference in the process of improving Alzheimer's in laboratory mice (in vivo) in terms of enzymes related to oxidative stress between the Alzheimer's group undergoing treatment and the Alzheimer's group without treatment. Similarly, it leads to the improvement of behavioral memory in the Alzheimer's mouse model.

keywords: Alzheimer's, Pycnogenol, Rat, Malondialdehyde

22463 - Poster

Neurogenic Potential of Acacia oerfota: Evaluating the Effects of DMT-Rich Extract on PC12 Cells

Narges Ghasemi Lakeh[1], Fatemeh Siadat[1], Monaa Farhadi[2 *]

1- Department of Biology, North Tehran Branch, Islamic Azad University, Tehran, Iran.
2- Department of Microbiology, Karaj branch, Islamic Azad University, Karaj, Iran
*Corresponding Author: monafarhadi@yahoo.com

Abstract

Abstract: Acacia encompasses various species of trees and shrubs native to Senegal, the Western Sahara, tropical Africa, and southern Iran. These plants contain bioactive compounds, among which N,N-Dimethyltryptamine (DMT) is notable for its psychoactive properties. Recent studies suggest that very low concentrations of DMT may hold therapeutic potential for diseases such as Alzheimer's and depression, owing to its role in promoting neurogenesis and brain plasticity. This study aimed to investigate the effects of Acacia oerfota (Vachellia oerfota) extract on the PC12 cell line.A hydroalcoholic extract of Acacia leaves was prepared. PC12 cells were cultured, and cytotoxic effects were evaluated at concentrations of 0.01–1.6 µg/mL using the MTT assay at 24 and 48 hours. Cell cycle and apoptosis were assessed using the Sub-G1 assay, while free radical generation was measured through the ROS assay. Neurogenic potential was evaluated by analyzing BDNF gene expression.The results showed significant cytotoxic effects only at 0.8 and 1.6 µg/mL compared to the control, with these effects being dose- and time-dependent. At 48 hours, cytotoxicity was significant at 0.8 µg/mL ($P \leq 0.05$). The ROS assay revealed increased free radical generation at 0.4 and 0.8 µg/mL, with significance only at 0.8 µg/mL. However, the Sub-G1 assay did not detect apoptosis. Notably, BDNF gene expression was significantly upregulated at 0.4 µg/mL.These findings suggest that Acacia oerfota extract may enhance neurogenesis in a concentration- and time-dependent manner. Further studies focusing on DMT are warranted to clarify the plant's role in neurogenesis.

keywords: Neurogenesis, PC12 cell line, BDNF gene, Acacia extract, DMT

21947 - Poster

The effect of plant diets on the growth and developmental process of the flour beetle T. molitor

Parastoo Esmaili[1], Somayeh Esmaeili-Rineh[1 *]

1- Department of Biology, Faculty of Science, Razi University, Kermanshah, Iran
*Corresponding Author: sesmaeili@razi.ac.ir

Abstract

The growing global population, climate change, and environmental concerns associated with conventional protein production have intensified the need for sustainable protein sources. Edible insects, such as Tenebrio molitor (mealworm), have emerged as promising alternatives due to their high protein content, balanced amino acid profile, and lower environmental impact. This study aimed to evaluate the effects of diets containing wheat bran, beans, lentils, and soybeans in various proportions on the survival and metamorphosis rates of T. molitor larvae. Thirteen dietary treatments were prepared, including a control diet of 100% wheat bran and twelve combinations of each plant-based ingredient at 25%, 50%, 75%, and 100%. Experiments were conducted at 28 ± 1 °C and 65 ± 5% relative humidity, with three replicates per treatment. Data were analyzed using one-way ANOVA. Results indicated significant differences in larval survival among diets ($F = 2.919$, $p = 0.011$), with the lowest survival (92.67%) observed in the 100% lentil diet and the highest (100%) in diets containing 50–75% soybeans. Metamorphosis rates also differed highly significantly ($F = 9.338$, $p < 0.001$), with the lowest value (89.03%) in the 100% bean diet and the highest (100%) in diets containing 25% beans, 50% lentils, or 75% soybeans. These findings emphasize the importance of diet composition in optimizing T. molitor production. Diets containing soybean and wheat bran provided the highest survival and developmental success. The results can serve as a basis for designing efficient and cost-effective diets for sustainable insect farming.

keywords: Mealworm, larval survival, metamorphosis rate, Developmental processes, Legume-based diet.

21389 - Poster

Effect of Paxlovid on liver morphogenesis in animal model embryo (Rat)

Fatemeh Fatahi[1 *], Mansoureh Daneshfard[1], Ali Rezaei-Golmisheh[2,3]

1- MSC Student, Department of basic science, Faculty of Veterinary Medicine, Ardakan University, Ardakan, Iran
2- Assistant Professor, Department of Basic Science, Faculty of Veterinary Medicine, Ardakan University, Ardakan, Iran
3- Biology and Animal Reproduction Science Research Institute, Ardakan University, P.O.Box184,Ardakan, Iran

*Corresponding Author: fatahifatemeh625@gmail.com

Abstract

The administration of Paxlovid in patients with confirmed COVID-19 is approved and applicable. The aim of this study is to investigate the effect of Paxlovid on liver morphogenesis in rat embryos. Pregnant rats were divided into 4 groups of 10, including the control group (vehicle), experimental group one (60 mg/kg from GD 0-6 and 100 mg/kg from GD 7-17), experimental group two (200 mg/kg from GD 0-6 and 300 mg/kg from GD 7-17), and experimental group three (1000 mg/kg from GD 0-17). Pregnant rats were weighed on days 7, 14, and 21. On day 21 of pregnancy, after the embryos were removed, they were evaluated for weight, crown-rump length, and abdominal circumference. The livers of the fetuses were examined histologically using hematoxylin-eosin, PAS, and Masson's trichrome staining methods. The results of this study showed that the weight of pregnant rats on day 21 of pregnancy in experimental group one had a significant reduction compared to the control group ($P < 0.05$). The results of evaluating the fetal weight in all three experimental groups compared to the control group showed a significant decrease, and the crown-rump length and abdominal circumference of the fetuses in experimental groups 1 and 2 compared to the control group also demonstrated a significant decrease ($P < 0.05$). The histological study of the fetal liver in terms of liver tissue structure, glycogen storage, and connective tissue amount did not show significant differences between the treatment and control groups. Overall, our findings indicate that although paclitaxel at the examined doses can affect maternal weight and fetal growth parameters, it does not induce morphological or tissue abnormalities in the fetal rat liver.

keywords: liver, Morphogenesis, Paxlovid, Nirmatrelvir / Ritonavir, SARS-COV-2

21862 - Poster

The influence of habitat conditions on developmental changes in the skeletal structures of the Hormuz Tooth-Carp (Aphaniops hormuzensis)

Mina Motamedi[1], Zahra Hajizade[1 *]

1- Department of Biology, Faculty of Science, Shahid Bahonar University of Kerman, Iran
*Corresponding Author: zahraa.hajii77@gmail.com

Abstract

Killifish (Aphaniidae) have high ecological adaptability, enabling them to thrive in diverse environmental conditions. This ability allows them to inhabit both saline waters and hot springs with high water temperatures and elevated sulfur concentrations. The present study investigated the effects of habitat and growth stages on the skeletal characteristics of the Hormuz tooth-carp (Aphaniops hormuzensis). Immature (size class I) and mature (size class II) specimens were collected from two distinct habitats: the warm and sulfurous Khorgoo Spring (salinity 28 g/L) and the Shur River (salinity 42 g/L) in the Hormuzgan drainage basin. Osteological examinations were conducted using specialized staining (Alizarin Red and Alcian Blue) and radiography. The results showed that the number of vertebrae (25–27) did not differ significantly between immature and mature specimens or between the two habitats ($p>0.05$). Additionally, the regionalization of the vertebral column (abdominal and caudal segments) was independent of habitat and growth stage. However, the growth of caudal skeletal components—particularly the neural and hemal spines of the preural vertebrae—increased significantly with body size (transition from immaturity to maturity) in both habitats ($p<0.01$). Furthermore, data analysis revealed that in the Shur River, which has higher salinity than the Khurgu Spring, elevated salt concentrations may influence morphometric changes in certain skeletal elements, such as vertebrae and caudal bone structures. These findings highlight the importance of considering both developmental stage and environmental conditions in osteological studies of endemic fish species.

keywords: aphaniid fish، ecological flexibility ،hot sulfur spring ،developmental changes

22472 - Poster

The Effect of High Maternal Fat Intake on BMP2 Expression in the Heart Tissue of C57BL Mouse Embryos

Zahra Nazari[1 *], Farzaneh Ganji[1]

1- Department of Biology, Faculty of Sciences, Golestan University, Gorgan, Iran.
*Corresponding Author: z.nazari83@yahoo.com

Abstract

Abstract:Today, excessive fat intake is a global concern linked to the development of metabolic syndrome and cardiovascular diseases. The BMP (Bone Morphogenetic Proteins) gene family consists of important proteins involved in growth and differentiation and plays a vital role in heart development. In particular, BMP2 is essential for the differentiation of mesodermal progenitor cells into cardiac cells and the formation of early heart structures such as the myocyte layer and the heart tube. Considering the harmful effects of a maternal high-fat diet on fetal heart development, this study investigated the impact of a maternal high-fat diet on BMP2 gene expression in 11.5-day-old embryos of C57BL mice. In this study, C57BL mice were divided into control and high-fat diet (HFD) groups. The HFD group receiving a high-fat diet for two months. After mating and confirming pregnancy, embryos were collected at day 11.5 of gestation, and their heart tissues were harvested to assess BMP2 gene expression using Real-Time PCR. The results showed that the maternal high-fat diet significantly reduced BMP2 gene expression in fetal hearts ($P < 0.05$), which may disrupt the processes of cardiac cell differentiation and development. It can be concluded that a maternal high-fat diet, by reducing the expression of key cardiac developmental genes like BMP2, may lead to abnormalities in normal fetal heart development. These findings highlight the importance of controlling fat intake during pregnancy to prevent congenital heart defects.Keywords: heart, mouse, BMP, high-fat diet.

keywords: heart, mouse, BMP, high-fat diet

22538 - Poster

Changes in cognitive process and oxidative stress parameters during traditional and synthetic narcotic drugs

Homeira Hatami[1 *]

1- Department of Animal Biology, Faculty of Natural Sciences, University of Tabriz, Tabriz, Iran
*Corresponding Author: h.hatami@tabrizu.ac.ir

Abstract

Abstract: Different drugs with different degrees are able to change physical connections and biochemical changes in neurons and neuroglia. Biochemical changes created in the long term decrease cognitive and memory activities and increase anxiety. This study is a summary of several master's theses that investigated the effect of traditional and industrial drugs on the memory and anxiety process.Forty two male rats were assigned into four groups (n=7). Control, morphine dependency ((day 1, 20–40–60 mg/kg; day 2, 80–100–100 mg/kg; day 3, 100 mg/kg); i.p), ecstasy dependency (10 mg/kg; i.p) doses for 5 days and Crack cocaine dependency (5, 10, 15 mg/kg; i.p) doses for 5 days. After receiving treatments, the learning and spatial memory was assess using Morriss Water Maze.The results showed that administration of ecstasy, morphine and Crack significantly decreased the spatial memory parameters ($p<0.01$). The effects of ecstasy in reducing memory factors and in comparison to morphine and Crack was extremely sever. Also the level of Malondealdehide (MDA) was significantly increased in ecstasy group than crack receiving and morphine groups ($p<0.05$). The level of superoxide dismutase (SOD) and glutathione peroxidase changed in ecstasy and crack group more than in morphine group. Compared to traditional drugs, synthetic drugs have a more destructive effect on brain functions, including memory and learning, even in lower doses. Also this drugs induced oxidative stress condition in brain. The destruction of the neural circuits of the brain are more severe with synthetic drugs.

keywords: Spatial memory, Oxidative parameters morphine, ecstasy, crack, dependenc

22114 - Poster

Isolation and Characterization of Exosomes from Neural Stem Cells: Implications for Neural Regeneration

Mahsa Raeisi-Ardali[1] , Elham Hoveizi[1*], Maryam Naderi-Soorki[1]

1- Department of Biology, Faculty of Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran
[*]Corresponding Author: elham.hoveizi@gmail.com

Abstract

Exosomes derived from neural stem cells (NSCs) are nanoscale extracellular vesicles that play a key role in intercellular communication within the central nervous system. Exosomes contain biologically active molecules such as proteins, microRNAs (miRNAs), and long non-coding RNAs (lncRNAs), and have the ability to mediate intercellular communication by transferring molecular cargo to target cells. This study aims to isolate and identify exosomes derived from NSCs. NSCs were isolated from the brains of one-day-old mice using enzymatic digestion and cultured in DMEM/F12 with 10% FBS. Exosomes were subsequently extracted following the AnaCell kit instructions after the third cell passage. Exosomes were identified by transmission electron microscopy(TEM), and surface markers CD81, CD9, and CD63 were assessed by Western blot. Particle size was determined by nanoparticle tracking analysis (NTA). The presence of neural differentiation–associated lncRNAs, such as NEAT1 and MALAT1, was evaluated by RT-qPCR. Exosomal particle size by NTA was approximately 45 nm, and TEM images showed a bilayer lipid membrane and a cup-shaped morphology. The expression of CD81, CD9, and CD63 was confirmed by western blot, and the total protein concentration was estimated to be about 160 µg/mL. Additionally, the molecular cargo of the exosomes indicated the presence of neural differentiation–related lncRNAs, particularly NEAT1 and MALAT1. The results of this study could aid in designing neural regeneration strategies via NSC-specific exosome carriers. However, to more precisely elucidate the biological roles and reparative functions in disease or neural injury models, further investigations are required, including efficacy studies in target cells, clinical trials, and physiological evaluations.

keywords: Exosome, Neural stem cells, lncRNA, Neural regeneration

2272 - Poster

The study of growth and development of larvae of Bufotes sitibundus

Hamid Darvishnia[1 *], Azam Karami[1]

1- Department of Biology, Payame Noor University, Tehran, Iran
[*]Corresponding Author: darvishnia_h@pnu.ac.ir

Abstract

Amphibians are a diverse group of animals that live in a variety of environments. Bufotes sitibundus belongs to the family Bufonidae and the genus Bufotes. The present study investigated the growth and development stages of this toad's larvae under laboratory conditions, as there is inadequate information regarding the biology of this species. In April 2024, the eggs in long string in a mucus-like jelly were collected from Abdanan in Ilam province. Eggs were transported to the laboratory and stored in a plastic container. The eggs appeared entirely dark, making it impossible to discern their animal and plant pole with the naked eye. There were approximately 450 eggs per strand on average. Numerous toad embryos were formed within inner chambers that were enclosed by a jelly shell. Subsequently, the larvae typically resided within chambers that were enclosed by outer shells. The mature larvae had gills covered by a gill cover and a large mouth with fully developed mouthparts. In addition, they possessed a protruding oral disc and large papillae. The larvae were fed with aquarium fish food, boiled egg yolk and boiled spinach. Despite scarce data on the species' life cycle, this study shows that embryonic development lasted 5–6 days, from spawning to the onset of separation of pre-larvae from the egg strings. Larvae begin feeding 3–4 days after separation from the egg strings. Therefore, the total embryogenesis period (from oviposition to the start of larval feeding) was 8–10 days. The larval development period spanned 100–125 days.

keywords: Toad, Development, Larval stage, Embryogenesi

21477 - Poster

Ultrastructural Study of Apoptotic Forms in Spermiogenesis, and Changes in Gonadotropin and Sex Hormones in Sertraline-Treated Rats

Laleh Pasha[1 *]

1- Department of Education, District 1, Shiraz
*Corresponding Author: laleh.pasha1983@gmail.com

Abstract

Background and Aim: Despite its widespread use, sertraline has adverse effects on various body systems, including the endocrine system. Limited quantitative studies exist on ultrastructural changes in male germ cells following sertraline administration. This study aimed to investigate ultrastructural alterations in apoptotic forms of male rat germ cells after treatment with different doses of sertraline, along with changes in pituitary-testicular axis hormones. Methods: This experimental study used 30 adult male Wistar rats divided into three groups (n=10). The control group received no treatment. Experimental groups received oral sertraline at 10 mg/kg and 50 mg/kg doses. After 21 days, testes were dissected and examined for apoptosis using transmission electron microscopy (TEM). Blood samples were collected from all groups, and serum concentrations of gonadotropins and sex hormones were measured via radioimmunoassay (RIA). Ultrastructural analysis of seminiferous tubules in testicular tissue was also performed. Data were compared using ANOVA in SPSS software, with *p*<0.05 considered statistically significant. Results: Sex hormones and gonadotropins decreased significantly (*p*<0.05) in sertraline-treated groups versus controls. Sertraline induced ultrastructural apoptotic features across all groups. Germ cell nuclear deformation, cellular shrinkage, apoptotic bodies in Sertoli cells, reduced endoplasmic reticulum volume, and mitochondrial alterations were observed in groups receiving 10 mg/kg and 50 mg/kg sertraline. Conclusion: Sertraline reduces serum sex hormone and gonadotropin concentrations and causes ultrastructural changes in testicular cell organelles, potentially leading to male reproductive dysfunction. Keywords: Sertraline, Gonadotropin, Sex Hormone, Apoptosis, Rat Testis

keywords: Sertraline, Gonadotropin, Sex Hormone, Apoptosis, Rat Testis

22278 - Poster

Plant-based nanomaterials as emerging therapeutics for the treatment of non-alcoholic fatty liver disease (NAFLD)

Mehrnoosh Motie[1], Mina Ramezani[2*], Nastaran Asghari Moghadam[2], Homayon Ahmadpanahi[2]

1- Department of Biology, Islamic Azad University, Tehran, Iran
2- Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: mina.ramezani@gmail.com

Abstract

Non-alcoholic fatty liver disease (NAFLD) is recognized as the most common chronic liver disorder worldwide, encompassing a spectrum ranging from simple steatosis to non-alcoholic steatohepatitis, fibrosis, and eventually cirrhosis. To date, no definitive pharmacological therapy has been established for this condition, and the use of natural plant-derived compounds has attracted significant attention due to their antioxidant, anti-inflammatory, and metabolic regulatory properties. However, major limitations such as low bioavailability, poor solubility, and rapid metabolism hinder their clinical efficacy. The advancement of nanomedicine technologies has addressed these challenges by improving pharmacokinetics, enhancing stability, and enabling targeted delivery. Recent studies have demonstrated that nanostructured formulations of curcumin, resveratrol, quercetin, silymarin, and other flavonoids reduce hepatic lipid accumulation, improve insulin resistance, suppress oxidative stress, and regulate the expression of genes associated with inflammation and fibrosis. Furthermore, polymeric nanocarriers, liposomes, and metal nanoparticles modified with phytochemicals have shown increased therapeutic efficiency in animal models of NAFLD. These findings suggest that plant-based nanomaterials represent a promising avenue for the development of safe and effective therapies for NAFLD. However, further large-scale clinical trials and standardized therapeutic protocols are still required for successful clinical translation.

keywords: Nanomedicine; Phytochemicals; Polymeric nanoparticles, Oxidative stress;

21409 - Poster

Impact of Valacyclovir on Fetal Kidney Development in Rats

Mansoureh Daneshfard[1 *], Fatemeh Fatahi[1], Ali Rezaei-Golmisheh[2,3]

1- MSC graduate student of Cellular and Developmental Biology, Department of Basic Science, Faculty of Veterinary Medicine, Ardakan University, Ardakan, Iran
2- Assistant Professor, Department of Basic Science, Faculty of Veterinary Medicine, Ardakan University, Ardakan, Iran
3- Biology and Animal Reproduction Science Research Institute, Ardakan University, P.O.Box184,Ardakan, Iran
*Corresponding Author: m.daneshfard98@gmail.com

Abstract

Abstract: Viral infections during pregnancy can have serious and sometimes irreversible effects on fetal development. Herpesviridae viruses are among the common causes of infection during this period. Valacyclovir, a prodrug of acyclovir, is widely used to treat infections caused by these viruses. Due to its ability to cross the placental barrier and the potential impact on the fetus, this study was conducted to investigate the effects of valacyclovir on the morphogenesis and histogenesis of the fetal kidney in rats. In this experimental study, 24 pregnant rats were randomly divided into four groups: a control group that received no medication, and three treatment groups that received daily doses of 100, 200, and 300 mg/kg body weight of valacyclovir, respectively. On the twentieth day of pregnancy, the animals were euthanized, and the crown-rump length and fetal weight were measured. Tissue samples were prepared for histopathological examination using hematoxylin-eosin staining. The results showed that increasing the drug dose significantly reduced the crown-rump length and fetal weight. Moreover, structural damage, including tubular destruction, reduced cellular differentiation, and disruption in the arrangement of kidney parenchyma was observed in the highest dose group. These findings suggest that high doses of valacyclovir can have significant adverse effects on fetal growth and development, particularly in kidney formation. Therefore, the prescription of this drug during pregnancy should be approached with caution and a thorough risk-benefit assessment. Further studies are recommended to investigate the effects of the drug on other fetal organs and in human models.

keywords: Valacyclovir, embryonic development, kidney morphogenesis, pregnancy

21845 - Poster

Application of radiology and specific double staining in investigating developmental changes in fish

Mina Motamedi[1], Zahra Hajizade[1 *]

1-Department of Biology, Faculty of Science, Shahid Bahonar University of Kerman, Iran
*Corresponding Author: zahraa.hajii77@gmail.com

Abstract

The killifishes are highly important aquatic organisms in the cell and developmental studies of animal, and also styding the evolutionary process of vertebrates. This study evaluated the efficacy of X-ray imaging (radiology) and specific double staining for bone and cartilage (Alizarin Red and Alcian Blue) in investigating developmental changes of skeletal structures during post-larval growth in the Hormuz tooth-carp (Aphaniops hormuzensis). Specimens at various post-larval growth stages were examined using both methods. Results indicated that the Alizarin Red and Alcian Blue staining method is superior for identifying and precisely tracking the initial stages of cartilage (stained blue) and bone (stained red) formation and differentiation in small specimens and early growth stages. This method is highly effective, particularly in revealing details of cartilaginous structures and early ossification zones, which are not visible in radiology images due to insufficient mineralization. In contrast, radiology is more efficient for examining fully ossified structures and the overall pattern of vertebrae and the caudal skeleton in larger specimens and later stages of fish development. Combining these two imaging techniques provided a more comprehensive analysis of bone and cartilage development throughout the post-larval growth of this species.

keywords: Bony fish، Growth and development ،Evolution ،Cartilage and bone differentiation

21780 - Poster

Dietary quality and embryogenesis in mealworms: effects of wheat and barley bran on developmental timing and viability

Raziye Rashidi Ilzoleh[1], Vahid Akmali[1 *], Ehsan Sadeghi[2]

1- Department of Biology, Faculty of Science, Razi University, Kermanshah, Iran
2- Department of Nutritional Science, School of Nutritional Science and Food Technology, Kermanshah University of Medical Sciences, Kermanshah, Iran,
*Corresponding Author: v_akmali@razi.ac.ir

Abstract

The increasing global demand for sustainable food sources necessitates novel solutions such as the use of edible insects. Tenebrio molitor, commonly known as the yellow mealworm, offers significant advantages due to its high nutritional value, ability to feed on various organic waste streams, and potential for circular economy applications. In the present study, we investigated how different proportions of wheat and barley bran in the larval diet affect embryonic development and hatching success—two key parameters of developmental biology and insect viability. The experiment was conducted under controlled laboratory conditions at 28 ± 1°C in complete darkness. Three dry diet formulations were tested: Group W (100% wheat bran), Group A (50% wheat bran + 50% barley bran), and Group B (75% wheat bran + 25% barley bran). For each treatment, 10 replicates were established, and eggs were monitored daily for three weeks. Embryonic period (in days) and hatching rate (percentage of hatched larvae) were recorded and analyzed using one-way ANOVA. Although ANOVA results revealed no statistically significant differences among groups ($p > 0.05$), Group A showed the highest mean embryonic duration (8.17 days), followed by Group B (8.15 days) and Group W (8.10 days). Hatching rates were numerically highest in Group W (75.2%), with Groups B and A following closely. These trends, while not significant, may indicate subtle biological effects of barley inclusion on hydration dynamics, nutrient absorption, or microenvironmental stability during embryogenesis. From a developmental biology perspective, the slight prolongation of embryogenesis in barley-containing diets may reflect delayed cuticle maturation, improved synchrony in segmentation, or metabolic adaptations. These findings underscore the importance of dietary formulation not only in insect nutrition but also in modulating developmental trajectories. Further research is recommended to explore molecular and physiological mechanisms underlying these patterns

keywords: Yellow mealworm, Embryogenesis, nutritional modulation, embryonic period, cereal substrate

Chapter Seven
Cell and Tissue



22689 – Keynote Oral presentation

Tissue Additional Surgery for the Treatment of Corneal Diseases

Khosro Jadidi[1*], Hossein Aghamollaei[1], Ahang Taghvamanesh[1]

1- Vision Health Research Center, Semnan University of Medical Sciences, Semnan, Iran
2- Chemical Injury Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran
*Corresponding Author: aghamolaei22@gmail.com

Abstract

Corneal diseases are a leading cause of visual impairment worldwide, necessitating advanced surgical interventions to restore vision. The cornea, a transparent and avascular tissue, consists of five distinct layers, each playing a crucial role in maintaining optical clarity. Pathologies such as keratoconus, corneal scarring, Fuchs' endothelial dystrophy, and limbal stem cell deficiency can disrupt its structure and function, leading to significant visual loss.Traditional treatments, including full-thickness penetrating keratoplasty (PK) and lamellar techniques like DALK and DSEK, have been the mainstay for decades. However, these methods face challenges such as graft rejection, limited donor availability, and prolonged recovery.Emerging therapies aim to overcome these limitations through innovative tissue-additional approaches. Stem cell transplantation, particularly cultivated limbal epithelial transplantation (CLET), offers hope for limbal stem cell deficiency. Allograft tissue addition, such as pre-Descemet's endothelial keratoplasty (PDEK), enhances endothelial repair. Hybrid techniques combining intrastromal rings with tissue grafts improve structural stability in keratoconus. Exosome-based therapies, harnessing regenerative signaling molecules, show promise in promoting corneal healing without invasive grafts.In this lecture, I will share my clinical experience with these novel techniques, presenting case studies demonstrating their efficacy and safety. Outcomes such as improved visual acuity, faster recovery, and reduced rejection rates highlight their potential as alternatives to conventional keratoplasty.By integrating cutting-edge tissue-additional strategies, we can expand treatment options for complex corneal diseases, paving the way for personalized and minimally invasive solutions. This evolution in corneal surgery underscores the importance of innovation in restoring vision and improving patients' quality of life.

keywords: Cornea, Cell Therapy, Tissue Engineering, Keratoconus.

22638 – Invited oral presentation

Cell co-culture technology: approaches, applications and challenges

Maryam Bikhof Torbati[1*], Melika Shaghouli[2]

1- Department of Biology, YI.C., Islamic Azad university, Tehran, Iran
2- Department of Biology, NT.C., Islamic Azad University, Tehran, Iran
[*]Corresponding Author: maryam.bikhof@gmail.com

Abstract

Cell co-culture technology, as an advanced tool in cell biology, tissue engineering, and human disease modeling, allows for precise reconstruction of the cellular microenvironment and investigation of multidimensional interactions between different cells under quasi-physiological conditions. These systems, unlike single-cell culture, provide a realistic representation of complex networks of paracrine signaling, cell-cell contact, and gene regulation mechanisms, and are of key importance in understanding phenotypic processes, cell differentiation, immune responses, and tissue homeostasis. Co-culture approaches include 2D and 3D models, Transwell-based systems, microfluidic systems, and dynamic synthetic matrices. The choice of each system depends on the type of cells, the complexity of the interactions, and the research goal, and allows for detailed analysis of physiological and pathophysiological mechanisms. The applications of this technology are very broad: from simulating the tumor microenvironment and investigating immune responses, to drug screening, modeling human diseases and developing tissue engineering and regenerative medicine strategies. However, challenges such as standardization of protocols, precise control of environmental parameters, data reproducibility, high equipment costs and limitations in translating findings into clinical applications remain major obstacles in this field. Overall, by providing physiologically similar environments and the possibility of analyzing multidimensional intercellular interactions, co-culture of cells opens up a new perspective for the development of accurate preclinical models and innovative therapeutic strategies. Future advances in 3D systems, microfluidics and smart matrices will significantly increase the potential for improving the accuracy, reproducibility and clinical translation of this technology.

keywords: Cell co-culture, 3D cell culture, cell-cell interaction, tissue engineering, drug screening.

21868 - Invited oral presentation

Evaluation of Anti-tumorogenic Effect of miR-124 mimic-Exosomes in Colorectal cancer Model

Zeynab Piravar[1*], Roudabeh Behzadi[1], Sadegh Babashah[2]

1- Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
2- Department of Molecular Genetics, Faculty of Biological Sciences, Tarbiat Modares University, Tehran, Iran
*Corresponding Author: saba.piravar@gmail.com

Abstract

Colorectal cancer (CRC) is considered the third most common cancer and the second leading cause of cancer-related mortality worldwide and it is driven by dysregulated molecular pathways and epigenetic alterations miRNAs play essential roles in vital cellular processes such as proliferation, differentiation, apoptosis, and angiogenesis. The function of miRNAs as either oncogenes or tumor suppressors becomes dysregulated in various cancers. Among tumor-suppressor miRNAs, miR-124 and its interactions with various transcription factors in tumor cells have garnered attention. Here, we engineered mesenchymal stem cell-derived small extracellular vesicles (MSC-sEVs) to deliver miR-124. One of the direct targets of miR-124, is the EZH2 gene and suppresses its oncogenic activity and inhibited proliferation, migration, and epithelial mesenchymal transition (EMT) in CRC cells. Our findings highlight the therapeutic potential of EV-based miRNA delivery to reprogram the tumor microenvironment, designing a strategy to overcome epigenetic and oncogenic signaling barriers in CRC therapy.

keywords: Colorectal cancer, Exosomes, miR-124, Epigenetic.

22673 - Invited oral presentation

Stem Cell Therapy and Tissue engineering for Corneal Regeneration

Hosein Aghamolaee[1*], Khosro Jadidi[2], Mohadeseh Haddadi[2]

1- Chemical injuries research center, systems biology and poisoning institute, Baqiyatallah university of medical sciences, Tehran, Iran
2- Vision health research center, Semnan university of medical sciences, Semnan, Iran
*Corresponding Author: aghamolaei22@gmail.com

Abstract

Corneal diseases are among the leading causes of visual impairment worldwide, with millions of patients suffering from vision loss due to trauma, infection, dystrophies, or limbal stem cell deficiency (LSCD). Current treatments, such as penetrating keratoplasty and limbal tissue transplantation, are limited by donor shortages, immunological rejection, and suboptimal long-term outcomes. Advances in stem cell biology and tissue engineering have opened promising avenues for functional corneal regeneration, offering the potential for restoring both transparency and biomechanical integrity. Stem cell therapy has demonstrated substantial potential in restoring corneal epithelial integrity, reducing inflammation, and preventing stromal scarring in both animal models and human pilot trials. LESC transplantation, particularly when combined with fibrin or collagen-based scaffolds, has achieved sustained epithelialization in LSCD patients. MSCs have shown immunomodulatory and pro-regenerative effects when applied via intrastromal injection or scaffold integration. Advances in tissue engineering such as decellularized corneal matrices, nanofibrous scaffolds, and 3D bioprinting have enabled the creation of transparent, mechanically robust constructs capable of supporting cell adhesion and differentiation. This presentation aims to provide an overview of recent progress in stem cell-based and tissue engineering strategies for corneal repair, highlighting preclinical findings, translational challenges, and emerging clinical applications.

keywords: Corneal regeneration, stem cell therapy, tissue engineering, limbal stem cells, mesenchymal stem cells, induced pluripotent stem cells, biomaterials.

22220 - Oral

Evaluation of the inhibitory effect of Persian Gulf sea anemone extract on cancer cells

Mohammad Nabiuni[1*], Mostafa Pourfallah[1], Latifah Karimzadeh Bardeei[2]

1- Department of Cell and Molecular Sciences, Faculty of Biological Sciences, Kharazmi University, Tehran, IRAN
2- Department of Laboratory's Animal Center & Cellular and Molecular Research Laboratory, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: nabiuni@khu.ac.ir

Abstract

Gastric cancer (GC) is the fourth most common cancer and the second leading cause of cancer-related mortality worldwide. Ion channels participate in many aspects of the aggressive tumor phenotype, including proliferation, cell cycle progression, apoptosis, motility, migration, and invasion. Dysregulation or malfunction of ion channels has been observed in various human cancers. Regulation of ion channels by altering their expression or inhibiting their activity can suppress the growth or migration of cancer cells; therefore, downregulation of their expression or blockade of their activity disrupts GC cell function both in vitro and in vivo. This suggests that ion channels could serve as therapeutic targets for controlling GC. Compounds present in sea anemone venom can inhibit ion channels, and this venom can be used as an ion channel inhibitor. To determine the protein content of sea anemone venom, the Bradford assay was employed. AGS gastric cancer cells were obtained from the Pasteur Institute and maintained in a CO2 incubator. To assess cell viability after treatment with various concentrations of sea anemone venom extract, the MTT assay was used. The protein concentration in the extracted venom was estimated at 15.82 µg/ml. A concentration of 250 mg/ml of sea anemone venom extract induced death in 50% of the AGS gastric cancer cells. Based on these results, sea anemone venom may potentially inhibit the proliferation of gastric cancer cells by blocking ion channels.

keywords: gastric cancer, sea anemone venom, ion channels, MTT, Bradford assay.

21714 - Oral

Study of micropropagation of Zhumeria majdae Rech.f. & Wendelbo

Ameneh Jamshidi[1*], Fatemeh Khosheghbal Ghorabaei[2], Parvin Zargham[1], Farideh Sohrabizadeh[1]

1- Department of Biology, Payam Noor University, P.O. Box 3697-19395, Tehran, Iran
2- Department of Natural Resources Research, Agricultural and Natural Resources Research Center of Hormozgan Province, Agricultural Research, Education and Extension Organization (AREEO), Bandar Abbas, Iran
*Corresponding Author: ameneh.jamshidi@gmail.com

Abstract

Abstract: Zhumeria majdae is one of endemic and medicinal spiecies of Hormozgan provience. Unfortunately it is extincting by extremely using. Thus micropropagation is valuable for keeping it. In this investigation, Muhrkhosh,s seeds were collected from Geno region. After germinating, seeds were transported on solid Murashig Skoog (MS) medium. Seedlings without root, first and second internodes and regenerated shoots on tissue culture were used for micropropagation. Seedlings without root and internodes were cultured on MS supplemented indole acetic acid (IAA) (0.2, 0.3, 0.5, 0.7, 0.9, 1, 1.3, 1.5and 2 mgl-1) and lateral shoots were cultured on MS supplemented IAA (0.5, 0.9mgL-1). After 20 days, seedlings without root produced root at media supplemented IAA (0.2, 0.3, 0.5, 0.7, 1.3, and 2 mgl-1). First internodes produced root at 0.9 mgl-1 IAA, regenerated shoots at 0.5 and 0.7 mgl-1 IAA. Second internodes produced root at 0.2, 0.5 and 0.9 mgl-1 IAA, regenerated shoots at 0.7 mgl-1 IAA.Two internodes produced callus in media supplemented IAA (1-2 mgl-1). regenerated shoots produced root at IAA (0.5 and 0.9 mgl-1).

keywords: Indole acetic acid, Micropropagation, MS medium, *Zhumeria majdae.*

22284 - Oral

The effect of phosphorus on micro-tuberization of Potato plant (Solanum tuberosum L.) in vitro conditions

Zahra Zare[1*], Alireza Iranbakhsh[2], Mostafa Ebadi[3]

1- Department of Biology Education, Farhangian University, P.O. Box 14665-889, Tehran, Iran
2- Department of Biology, Azad university, Science and Research branch, Tehran, Iran
3- Department of Biology, Azad university, Damghan branch, Semnan, Iran
*Corresponding Author: z.zare@cfu.ac.ir

Abstract

The potato plant plays an important role in feeding the people of the world and the food basket of the Iranian family. This product has the fourth place in the world in terms of nutritional importance after wheat, rice and corn. Conventional and traditional methods in the asexual propagation of this plant are facing important problems such as infected plants and tubers and severe yield loss. Potato microtubers obtained from tissue culture are a good substitute for seed tubers. The aim of this research is to investigating the effect of phosphorus on micro tuberization of this plant in vitro culture media. In this research, solid and liquid laboratory culture media were used to prepare sterile seedlings and induce microtuberization. First, the sterile seedlings were prepared from the culture of potato tuber sprouts in vitro, and then they were placed in branching culture media and then micro tuber induction media. The results showed that the use of the standard concentration of KH2PO4 in the MS culture medium (control concentration) has the best and greatest effect on the process of micro tuberization in the induction medium. So that increasing it has no effect not only on increasing the number of micro tubers, but also causes a decrease in the fresh and dry weight of the plant and micro tubers.

keywords: Micro tuberization, *Solanum tuberosum*, in vitro, phosphorus.

22062 - Oral

Origanum vulgare ameliorating role against acetaminophen toxicity in HepG2 cells

Ehsan Zayerzadeh[1*]

1- Department of Food Toxicology, Food Technology and Agricultural Products Research Center, Standard Research Institute, Karaj, Iran
*Corresponding Author: zayerzadeh@standard.ac.ir

Abstract

Herbal medications are valuable to treat some diseases as supplementary treatment. One of the important plants which is applied to cure various diseases is origanum vulgare (O. vulgare). Acetaminophen is an important medicine which is used to decline pain and fever extensively. This medicine has some adverse effects particularly hepatotoxicity in consumers. In this investigation, we analyzed the potential protective effects of an O. vulgare extract against toxic effects of acetaminophen in HepG2 cells. Cytotoxicity of acetaminophen and O. vulgare extract was evaluated on HepG2 cells. In the first group cells were exposed to the 50 mM acetaminophen. In the second group, 100 (µg/ml) O. vulgare extract added to the cells and in the third group, cells were treated to acetaminophen and O. vulgare extract, simultaneously. Changes in cell morphology and viability were evaluated using light microscopy and the MTT assay, respectively. Finally, protective effects of O. vulgare extract was studied against acetaminophen on HepG2 cells. Findings of the study demonstrated that acetaminophen was cytotoxic in HepG2 cells. MTT assay findings demonstrated that acetaminophen had 87% lethality for cells in exposure dose. On the other hand, O. vulgare extract had no toxicity in exposed cells. In addition, O. vulgare extract could decline lethality in the third group up to 46%. It could be concluded that O. vulgare extract has protective effect against cytotoxicity induced by acetaminophen in HepG2 cells. Therefore, this plant would be considered as a supplementary medication in acetaminophen poisonings.

keywords: *Origanum vulgare*, HepG2 cells, acetaminophen, cytotoxicity.

21560 - Poster

Effects of Salinity and Drought Stress on Phenolic and Flavonoid Content in Callus Cultures of Cultivated Saffron (Crocus sativus L.) under Kinetin and Naphthalene Acetic Acid Hormonal Treatments

Mahsa Sadat Khorsandi Moghadam[1], Roya Karamian[1*]

1- Department of Biology, Faculty of Basic Sciences, Bu-Ali Sina University, Hamedan, Iran
*Corresponding Author: karamian.roya@gmail.com

Abstract

The genus Crocus (Iridaceae) comprises over 70 ornamental species, widely used in landscaping due to their attractive flowers. Among them, Crocus sativus L., commonly known as saffron, is the only sterile species, lacking viable seeds. This biological limitation necessitates alternative propagation methods. Tissue culture has emerged as an effective technique for large-scale propagation, genetic trait preservation, and studying physiological responses under controlled conditions. In the present study, the effects of drought stress (5% PEG) and salinity stress (50 mM NaCl), in combination with hormonal treatments of kinetin (1 mg/L) and naphthalene acetic acid (NAA; 1 mg/L), were evaluated on the total phenolic and flavonoid content in in vitro saffron callus cultures. The experiment was conducted in a completely randomized design with three replicates, and data were analyzed using ANOVA at a 5% significance level. Results revealed that drought stress (5% PEG) in the presence of the hormonal combination significantly increased total phenolic content. In contrast, salinity stress (50 mM NaCl) caused a notable decrease in phenolics under the same hormonal conditions. The highest flavonoid content was recorded in the control treatment (only hormonal combination, without stress), while both drought and salinity stresses led to a significant reduction in flavonoid levels. Nevertheless, the flavonoid content under drought stress was higher than that under salinity stress.These findings suggest that drought stress can stimulate the biosynthesis of phenolic compounds, whereas salinity exerts an inhibitory effect. The results highlight the potential of using environmental stressors to enhance the production of bioactive compounds through saffron tissue culture.

keywords: Anthocyanin, Antioxidant compounds, Anticancer.

22608 - Poster

The effect of Tribulus terrestris on the anxiety caused by acute stress via reducing oxidative stress in mice

Gelavij Mahmoodi[1*]

1- Department of Biology, Kermanshah Branch, Islamic Azad University, Kermanshah, Iran
*Corresponding Author: g.mahmoudi@yahoo.com

Abstract

Introduction: Severe stressful events are associated with the risk of mental disorders such as depression and anxiety. Due to the negative effects of anti-anxiety drugs, researcher's attention have been focused on finding natural ingredients. The aim of the present study was to investigate the effect of tribulus terrestris on anxiety induced by acute stress in male rats.Materials and Methodes: To induce Acute restraint stress (ARS) mice immobilizated in restrainer 2 hours for one time; then an electric shock (2 minutes 0.5mA) were used. Mice under acute stress were randomly divided into 5 groups including control group (under acute stress receiving normal saline), intervention groups (under acute stress receiving tribulus terrestris at doses of 7.5, 15 and 30 mg/kg and positive control (under acute stress receiving diazepam). Results: In ARS mice treated with 30mg/kg of tribulus terrestris significantly increased the time spent in the open arms and decreased the time spent in the closed arms of elevated plus maze (EPM)) $p<0.05$). Administration of different doses of tribulus terrestris increase the capacity of anti -oxidants and decreased levels of serum malondialdehyde in rat brain and in ARS mice) $p<0.05$). Conclusion: It seems that, the effectiveness of tribulus terrestris on anxiety in rats under acute stress may via reducing oxidative stress.

keywords: Tribulus terrestris, malondialdehyde, acute stress, maze.

21964 - Poster

Antidiabetic effect of Prosopis farcta extract on human adipose derived mesenchymal stem cells in 3D culture electrospun with PLA

Nasrin Heidari[1*], Faezeh Namvar[1], Mina Ramezani[1], Zeinab Piravar[1]

1- Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: nasrin.heidari6346@iau.ir

Abstract

Diabetes mellitus is a metabolic disorder characterized by elevated blood glucose levels and impaired metabolism of carbohydrates, fats, and proteins. Oxidative stress damages cells and impairs wound healing. Research has shown that Prosopis farcta, due to its antioxidant properties, helps reduce blood glucose and accelerate diabetic wound healing. The plant extract was prepared using the soaking method, and its components identified by GC-MS. Cells were treated with different concentrations of the extract, and cytotoxicity was assessed using the MTT assay. Cells were cultured in a hyperglycemic environment (25, 50, and 75 mM) with and without the optimal concentration of the extract (200 µg/mL). The expression of antioxidant genes SOD1 and HO1 was measured by RT-PCR, and migration was assessed by scratch test. Mitochondrial membrane potential was analyzed with JC-1, and apoptosis measured using the TUNEL assay. Results showed the extract contained high levels of oleic acid and Z,E-2,13-Octadecadien-1-ol, promoting cell viability and proliferation in hyperglycemia. Furthermore, SOD1 and HO1 gene expression decreased, migration rate and wound healing improved, and DNA fragmentation and mitochondrial membrane potential also improved. These findings suggest that the antioxidant compounds in P. farcta help modulate oxidative stress, reduce apoptosis, and enhance cellular function, presenting a promising adjunct in diabetic wound healing. Compounds like quercetin also contribute to these processes. Further research on medicinal plants may help develop more effective therapies for metabolic disorders like diabetes.

keywords: High glucose, oxidative stress, DNA fragmentation, mitochondrial potential, medicinal plants.

21876 - Poster

Neuroprotective effects of Iranian Indigenous Probiotics on behavioral Disorders in Rat Models of Parkinson's Disease

Fatemeh Fakhr-Rohani[1], Bahareh Pakpour[2*], Majid Navaeian[3]

1- Master of Science in Animal Physiology, Department of Biology, Islamic Azad University, Central Tehran Branch, Tehran, Iran
2- Assistant Professor, Department of Biology, CI.C., Islamic Azad University, Tehran, Iran
3- Assistant Professor, Department of biology, YI.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: b_pakpour@yahoo.com

Abstract

Progressive degeneration of dopaminergic neurons within the substantia nigra pars compacta and associated brainstem regions is a hallmark of Parkinson's disease (PD), leading to behavioral disorders. Oxidative stress is recognized as a major contributor to dopaminergic neurodegeneration. Recent research has confirmed the role of probiotics in reducing oxidative stress. This study aimed to examine the protective effects of Iranian Indigenous Probiotics on anxiety-like behaviors and other behavioral disorders in male rat models of PD.Twenty-one male Wistar rats were randomly allocated into three groups: healthy controls, PD-induced rats receiving physiological saline, and PD-induced rats receiving probiotics. Probiotic and saline gavage was administered daily for 21 consecutive days prior to PD induction. Following three weeks of treatment, Parkinsonism was induced via stereotaxic injection of 6-OHDA into the striatum. Behavioral outcomes were assessed using the apomorphine-induced rotation test and the elevated plus maze to evaluate motor asymmetry and anxiety-like behavior, respectively.Results indicated that the probiotic-treated group displayed a lower number of contralateral rotations in the apomorphine-induced rotation test, as well as increased risk-taking in the elevated plus maze test, compared to the saline-treated group.Conclusion: Iranian Indigenous Probiotics may exert a protective role against neurodegeneration and help reduce behavioral disorders caused by damage to dopaminergic centers; however, further clinical studies are warranted.

keywords: Parkinson's disease, behavioral disorders, probiotics.

21787 - Poster

Neuroprotective Effect of Pycnogenol Against Beta-Amyloid-Induced Memory Impairment in Male Wistar Rats: A Focus on Hippocampal Histopathology

Mohammad lak[1] , Bahareh Pakpour[2*]

1- MSc in Pathogenic Microbiology, Department of Biology, Islamic Azad University, Central Tehran Branch, Tehran, Iran
2- Assistant Professor, Department of Biology, CI.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: b_pakpour@yahoo.com

Abstract

Alzheimer's disease (AD) is a progressive neurodegenerative disorder marked by beta-amyloid (Aβ) accumulation, synaptic dysfunction, and neuronal loss, ultimately leading to cognitive decline. Current treatments offer limited efficacy, highlighting the need for novel therapeutic strategies. This study investigated the neuroprotective effects of Pycnogenol (PYC), a natural antioxidant derived from pine bark, in an Aβ-induced AD model in male Wistar rats.Alzheimer-like pathology was induced via stereotaxic injection of Aβ into the CA1 region of the hippocampus. Following Aβ administration, rats received oral PYC treatment. Behavioral performance was assessed using the shuttle box test, and hippocampal tissue was examined through Hematoxylin & Eosin (H&E) and Cresyl Violet staining to evaluate neuronal integrity.The Alzheimer's group demonstrated significant memory impairment, while PYC-treated rats showed notable improvements in passive avoidance performance, suggesting protective cognitive effects. Histological analysis revealed marked neuronal loss and gliosis in the AD group, which were significantly reduced in rats treated with PYC. These findings indicate that PYC preserves neuronal structure and reduces neuroinflammatory changes in the hippocampus.Overall, Pycnogenol exerted neuroprotective and memory-enhancing effects, likely mediated by its antioxidant and anti-inflammatory properties. These results support its potential as a promising natural therapeutic agent for mitigating AD-related neurodegeneration. However, further studies are warranted to validate these effects in clinical settings.

keywords: Oxidative stress, neuroinflammation, cognitive function, hippocampus, natural antioxidants.

22096 - Poster

Effect of Naringin on Neuronal Density in the Dentate Gyrus of the Hippocampus in an Experimental Model of Alzheimer's Disease in Male Wistar Rats

Hessan Hosseinzadeh Bandbafha[1*] , Bahare Pakpour MahmudAbad[2]

1- M.Sc. in Pathogenic Microbiology, Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
2- Assistant Professor, Department of Biology, CI.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: hessanhosseinzadeh.medmicro@gmail.com

Abstract

Alzheimer's disease (AD) is a prevalent neurodegenerative disorder characterized by neuronal loss in the hippocampus, especially in the Dentate Gyrus (DG). Natural compounds like naringin, owing to antioxidant properties, may slow AD progression through the gut–brain axis.In this study, twenty-four male Wistar rats (180–220 g) were divided into four groups (n = 6): control, model, sham, and naringin-treated. AD was induced by intracerebral β-amyloid injection. After induction, the naringin group received oral naringin for 21 days; the sham group was given normal saline. Hippocampal tissue was then dissected, and DG neuronal density assessed using Cresyl Violet staining. Data were analyzed via Tukey's post hoc test at $p < 0.05$.The model group showed a significant neuronal density decrease compared to control ($p = 0.001$). Naringin-treated rats had a significant increase in viable neurons ($p = 0.05$). Naringin may protect against β-amyloid-induced neurodegeneration, supporting further clinical studies and nutrition-based therapeutic development for neurodegenerative diseases.

keywords: Alzheimer's disease, Naringin, Dentate Gyrus, Neuron, Cresyl violet.

22477 - Poster

Effect of Green-Synthesized Iron Oxide Nanoparticles on MCF-7 Cells

Mohaddeseh Mohammadi- Sardoo[1*], Razieh Razavi[2], Elaheh Amini[3]

1- Department of Biology, Faculty of Sciences, University of Jiroft, Jiroft, Iran
2- Department of Chemistry, Faculty of Sciences, University of Jiroft, Jiroft, Iran
3- Department of Animal Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: m.mohammadisardoo@ujiroft.ac.ir

Abstract

Breast cancer is one of the most common malignancies among women, and the search for novel therapeutic agents with anticancer potential remains a priority. Many nanotechnology products have been recognized as promising candidates in cancer diagnosis, prevention, and treatment due to their small size, large surface area, and high reactivity. Magnetic iron oxide nanoparticles (IONPs) have attracted extensive interest due to their magnetic physicochemical properties in the biomedical and industrial fields. In this study, green-synthesized iron oxide nanoparticles were used. MCF-7 cells were grown in DMEM media supplemented with 10% fetal bovine serum in 96-well plates to 80% confluence. Fe3O4 NPs were solubilized in 100% DMSO and then diluted in serum-free medium to reach a concentration of 0.5% DMSO. Cells were washed and exposed to Fe3O4 NPs at concentrations of 10, 25, 50, 75, and 100 µg/ml for 24 hours. At the end of the incubation period, the MTT assay was used to determine the cell viability. The absorbance was read at 570 nm by a microplate reader. According to the results, green-synthesized IONps demonstrated IC50 values greater than 100 µg/ml, and no significant reduction in cell viability was observed compared to the control. Very high doses were required to achieve a cytotoxic effect, which can be considered a limiting factor from a clinical perspective. In conclusion, this study reports that green-synthesized iron oxide nanoparticles do not exhibit anticancer activity against MCF-7 cells, and achieving therapeutic efficacy may require longer exposure times or combination with other therapeutic agents.

keywords: Breast cancer, Iron oxide nanoparticles, Viability.

22600 - Poster

Synergistic Effect of Multi-walled Carbon Nanotubes and Cold Plasma on Growth and DAT Gene Expression in *Catharanthus roseus*

Masoumeh Ghasempour[1], Alireza Iranbakhsh[2 *], Mostafa Ebadi[3], Zahra Oraghi Ardebili[4]

1- Lecturer, Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2- Professor, Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
3- Assistant Professor, Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran
4- Assistant Professor, Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran
*Corresponding author: iranbakhshar@yahoo.com

Abstract

This research investigated the combined effects of multi-walled carbon nanotubes (50, 100, 150 mg/L) and atmospheric cold plasma (30 and 60 s) on *Catharanthus roseus* seeds. The highest germination rate (96.66%) and growth indices were recorded in CNT150+Plasma60 treatment. Enhanced antioxidant enzyme activities, reduced proline levels, and increased alkaloid content highlighted improved physiological and metabolic performance. DAT gene expression in combined treatments increased several folds compared to control, confirming the synergistic role of these two technologies in improving *in vitro* culture and medicinal metabolite production [Ghasempour et al., 2019; 2020].

keywords: Carbon nanotube, cold plasma, synergy, DAT gene expression, cell and tissue culture.

22609 - Poster

Effect of Satureja edmondi on depression caused by acute stress in male mice by forced swimming and floating

Gelavij Mahmoodi[1*]

1- Department of Biology, Kermanshah Branch, Islamic Azad University, Kermanshah, Iran
*Corresponding Author: g.mahmoudi@yahoo.com

Abstract

Introduction and Background: exposure to stress leads to memory impairment and certain mood disorders such as depression. In the present study the effect of Satureja edmondi on acute stress-induced depression in mice was was investigated. Materials and methods: To induce Acute restraint stress (ARS) mice immobilizated in restrainer 2 hours; then an electric shock (2 minutes 0.5mA) were used. Mice under acute stress were randomly divided into 5 groups including control group (under acute stress receiving normal saline), intervention groups (under acute stress receiving Satureja edmondi at doses of 7.5, 15 and 30 mg/kg and positive control (under acute stress receiving diazepam), forced swim test (FST) and tail suspension test (TST) were recorded.Results: Treatment of stressed mice with different doses of Satureja edmondi compared to control group significantly decreased the immobility time in both tests ($P < 0.05$). Satureja edmondi also decreased the expression of 6-interleukin (6- IL) and metabotropic glutamate receptor (mGluR1). Conclusion: The effect of the Satureja edmondi on depressive-like behaviors in mice under acute stress disorder is by reducing brain inflammation and modulation of glutamate signaling.

keywords: Glutamate receptor, interleukin-6, forced swim test.

22610 - Poster

Evaluate the effect of oleuropein on the level of pituitary-gonadal hormones in normal and induced by chemical kindling in rats with pentylenetetrazol

Gelavij Mahmoodi[1*]

1- Department of Biology, Kermanshah Branch, Islamic Azad University, Kermanshah, Iran
*Corresponding Author: g.mahmoudi@yahoo.com

Abstract

Introduction and Background: Epilepsy is a neurological disorder that occurs in both men and women, but is more likely to occur in men than women. Epilepsy and many antiepileptic drugs cause reproductive disorders and reduce the quality of semen in men and increase the risk of infertility in men with epilepsy. some medicinal plants prevents the progression of the disease and the occurrence of epileptic seizures. The aim of this study was to evaluate the effect of oleuropein on the level of pituitary-gonadal hormones in normal and epileptic rats with pentylenetetrazole. Materials and methods In this study, 48 Wistar rats were used. Rats were divided into two groups: normal and kindling with pentylenetetrazole, and each group was divided into three subgroups, control and treated with doses of 15 and 30 mg/kg of oleuropein. After 4 weeks, rats were examined for pituitary-gonadal hormone levels. Data analysis was performed by one-way ANOVA method and Tukey post hoc test and $P < 0.05$ were considered as significant levels. Results:Based on the results obtained in this study, pituitary-gonadal hormones were changed in epileptic rats and decreased significantly compared to normal rats ($p \leq .001$). Testosterone and lutein hormone increase with increasing dose of oleuropein essential oil in the treatment groups and this increase was significant at high dose ($p \leq .001$). Follicle-stimulating hormone increased slightly with increasing dose of essential oil in groups of normaland epileptic rats .Conclusions: Oleuropein as a natural antioxidant eliminates free radicals from epilepsy and reduces the destructive effect of epilepsy on the reproductive system and reproductive potential

keywords: Testosterone, lutein hormone, follicle-stimulating hormone, epileptic rats.

21710 - Poster

The Effect of Native Iranian Probiotics on Amygdalar Structure in First-Generation Male Offspring Exposed to Chronic Restraint Stress During Pregnancy

Zohreh Shadmehr[1], Bahareh Pakpour[۲*], Majid Navaian[3], Hossein Akbar Azimian[4]

1- PhD Candidate in Microbiology, Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2- Assistant Professor, Department of Biology, CI.C., Islamic Azad University, Tehran, Iran
3- Assistant Professor, Department of biology, YI.C., Islamic Azad University, Tehran, Iran
4- PhD Candidate in Physiology, Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
*Corresponding Author: b_pakpour@yahoo.com

Abstract

Background and Objective:Chronic prenatal stress is associated with disruption of the hypothalamic-pituitary-adrenal (HPA) axis and damage to limbic structures such as the amygdala, which may lead to anxiety-related disorders in the offspring. Recent studies suggest that probiotics may offer neuroprotective effects by modulating the gut–brain axis and reducing neuroinflammation. This study aimed to evaluate the effect of native Iranian probiotics on the amygdala structure and stress-related indices in first-generation male offspring exposed to chronic restraint stress during gestation.Methods:Twenty-four NMRI adult female mice were randomly divided into three groups: positive control (no stress), negative control (stress+water gavage), and probiotic group (stress+oral gavage of a native probiotic mixture including Lactobacillus spp., Bifidobacterium longum, and Bacillus coagulans at a dose of 9×10^9 CFU/1 mL). After delivery, male offspring (8 weeks old, 20–25g) were subjected to behavioral assessment via elevated plus maze and shuttle box tests. Brain sections (5µm) of the amygdala were stained with hematoxylin–eosin, and the number of degenerated neurons was analyzed using light microscopy.Results: Probiotic-treated animals showed significantly increased entries and time spent in the open arms of the plus maze compared to the negative control group ($P<0.01$). They also demonstrated improved memory retention in the shuttle box test ($P<0.01$). Histological analysis revealed a marked reduction in the number of degenerated cells in the amygdala ($P<0.001$).Conclusion: These findings indicate that maternal consumption of native probiotics during pregnancy may improve behavior and protect amygdalar integrity in offspring, serving as a potential preventive approach against stress-induced neurological damage.

keywords: Hematoxylin–eosin, Probiotics, Pregnancy, Amygdala.

22486 - Poster

Evaluation the effect of different gibberellic acid (GA3) treatments on germination of very small and semi-developed seeds of Mexican lime (Citrus aurantifolia L.)

Elham Jalilzadeh[1*], Asad Asadi Abkenar[2], Parisa Jounobi[1]

1- Department of Plant Sciences, Faculty of Biological Sciences, Kharazmi University,Tehran, Iran
2- Department of Molecular Biology, Agricultural Biotechnology Research Institute of North Region, Rasht
*Corresponding Author: elham.jalilzadeh.62@gmail.com

Abstract

Citrus are one of the most abundant fruit tree crops in the world, due to its nutritional content and significant commercial and industrial importance, considered one of the most popular fruits in the world. Most citrus fruits are full grain and since this characteristic is considered a negative factor in their quality, the production of seedless varieties is one of the main goals of citrus breeding, and seedless fruits are more marketable. Seedless varieties are mainly triploid, and the frequency of triploids is higher in very small seeds. However, due to the lack of sufficient endosperm very small and semi developed seeds are not able to germinate normally and for continue growth require embryo rescue in vitro and tissue culture. The purpose of this research is to provide optimal conditions for the germination of semi-developed seeds and finally achieving triploid plants. For this purpose, very small seeds of Mexican lime have been separated, after disinfection with 3% sodium hypochlorite for 3 minutes, were cultured in MS medium containing malt extract and three concentrations of GA3 hormone (1, 2 and 3 ppm). After three weeks, germination data was collected and analyzed. The results showed that the highest germination and seedling growth rate with a significant difference at the 1% was obtained for the 3 ppm treatment.

keywords: Citrus, Seedlessness, Triploid, Breeding.

22061 - Poster

Study of potential curative effect of Echium amoenum extract on cytotoxicity induced by diclofenac

Ehsan Zayerzadeh[1 *]

1- Department of Food Toxicology, Food Technology and Agricultural Products Research Center, Standard Research Institute, Karaj, Iran
*Corresponding Author: zayerzadeh@standard.ac.ir

Abstract

Echium amoenum (E. amoenum) is one of the important herbal medications in Iran. E. amoenum is extensively used as a sedative and mood-enhancing plant. It is also used for alleviating cough, sore throat, and pneumonia. Diclofenac is a nonsteroidal anti-inflammatory drug (NSAID) used to treat mild-to-moderate pain, and helps to relieve symptoms of arthritis such as inflammation, swelling, stiffness, and joint pain. In this study, we evaluated the potential protective effects of an E. amoenum extract against cytotoxicity of diclofenac in L929 cells. In the first step, toxicity of diclofenac and E. amoenum extract was analyzed on L929 cells. In the first group cells were treated to the 10mM diclofenac. In the second group, 200 (µg/ml) E. amoenum extract exposed to the cells and in the final group, cells were treated to diclofenac and E. amoenum extract, simultaneously. Alterations in cell morphology and cell viability were studied using light microscopy and the MTT assay, respectively. Results of the present study displayed that diclofenac was highly cytotoxic in L929 cells. MTT assay data showed that diclofenac had one hundred percent lethality for cells. On the other hand, E. amoenum extract was not cytotoxic for L929. In addition, E. amoenum extract could inhibit the lethality which was induced by diclofenac in the cells, significantly. To sum up, E. amoenum extract can be a curative herbal drug against cytotoxicity induced by diclofenac in L929 cells. However, more investigations need to prove potential protective role of E. amoenum against diclofenac toxicity.

keywords: Echium amoenum, L929 cells, diclofenac.

22159 - Poster

Studying the effect of a mix of indigenous Iranian probiotics on TNF-α gene expression in anxiety-like behavior of male Parkinsonian mice treated with 6-hydroxydopamine (6-OHDA)

Zeynab Mohammadishamsabadi[1], Nadia Bakhtiyari[2*], Bahareh Pakpour[3]

1- Master of genetic, Department of genetics, Islamic Azad University, Tehran Medical Branch, Tehran, Iran
2- Master of science, Department of Biology, Central Branch, Islamic Azad University, Tehran, Iran
3- Assistant Professor, Department of Biology, CI.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: nadiabakhtiari1400@gmail.com

Abstract

Parkinson's disease (PD) is the second most common neurodegenerative disorder after Alzheimer's disease, characterized by the progressive loss of dopaminergic neurons in the substantia nigra. Beyond motor dysfunction, PD is frequently associated with psychiatric manifestations such as anxiety. Emerging evidence highlights the gut–brain axis and alterations in gut microbiota composition as key contributors to PD pathogenesis. Probiotics, as live microorganisms with antioxidant and anti-inflammatory properties, may improve gut microbial balance and modulate immune responses. This study aimed to evaluate the effects of a native Iranian probiotic mixture on TNF-α gene expression and anxiety-like behaviors in a 6-hydroxydopamine (6-OHDA)-induced rat model of Parkinson's disease. Thirty-six male Wistar rats were randomly divided into three groups: (1) healthy controls, (2) 6-OHDA-lesioned PD rats receiving normal saline by gavage, and (3) 6-OHDA-lesioned PD rats receiving daily gavage of a probiotic mixture (Lactobacillus acidophilus, L. paracasei, L. rhamnosus, L. reuteri, Bacillus coagulans, and Bifidobacterium longum) for three weeks. Parkinsonism was induced by unilateral stereotaxic injection of 6-OHDA into the striatum. Behavioral assessments including apomorphine-induced rotation and elevated plus maze were conducted. Serum TNF-α levels were quantified using ELISA. Probiotic-treated PD rats showed a significant reduction in serum TNF-α levels compared to saline-treated PD rats. Moreover, behavioral outcomes demonstrated marked improvements in anxiety-like parameters, resembling the performance of healthy controls. The native Iranian probiotic mixture exerted neuroprotective and anxiolytic effects in the 6-OHDA-induced rat model of Parkinson's disease through downregulation of TNF-α expression. These findings suggest the therapeutic potential of native probiotics as a cost-effective and low-side-effect approach for the prevention and adjunctive treatment of neurodegenerative and anxiety-related disorders in PD.

keywords: Parkinson's disease, Native probiotics, TNF-α, Anxiety-like behavior, 6-hydroxydopamine.

22654 - Poster

Combined Action of Salicylic Acid and Doxorubicin on the Growth of A549 Lung Cancer Cells in Culture

Roghieh Yousefinejad[1], Seyyedeh Mahdokht Maddah[2*] , Shadi Haj Rasouliha[3]

1- Department of Molecular Cellular Sciences, TeMS.C., Islamic Azad University, Tehran, Iran
2- Department of Biology, YI.C., Islamic Azad University, Tehran, Iran
3- Herbal Pharmacology Research Center, TeMS.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: s.m.maddah@gmail.com

Abstract

Lung cancer is one of the most common and lethal malignancies worldwide. Doxorubicin is a widely used chemotherapeutic agent with potent antitumor activity, but its clinical application is limited by severe side effects. Salicylic acid, known for its anti-inflammatory properties, has been reported to enhance the efficacy of certain chemotherapeutic drugs while reducing their effective doses. This study aimed to evaluate the effects of doxorubicin and salicylic acid, both individually and in combination, on A549 human lung cancer cells. A549 cells were treated with different concentrations of doxorubicin and salicylic acid, alone or in combination, and cytotoxicity was assessed using the MTT assay. Apoptosis was further confirmed by DAPI nuclear staining. IC_{50} values were calculated at 24, 48, and 72 hours after treatment. Salicylic acid alone showed an IC_{50} of 81 µg/mL, while doxorubicin alone exhibited an IC_{50} of 41 µg/mL at 72 hours. Remarkably, salicylic acid at 20 µg/mL synergistically reduced the IC_{50} of doxorubicin from 41 µg/mL to 21 µg/ml. Cells treated with the combination displayed characteristic morphological changes, including nuclear shrinkage, chromatin condensation, and fragmentation, consistent with apoptosis, whereas nuclei in control cells remained round and intact. These findings suggest that co-treatment with doxorubicin and salicylic acid exerts enhanced anticancer effects at lower concentrations, potentially offering a more effective therapeutic strategy with reduced toxicity

keywords: Apoptosis, Salicylic acid, MTT assay, Doxorubicin, Cell viability.

22579 - Poster

Investigating the antimicrobial and anti-biofilm effects of seleniumnanopa rticles synthesized by cannabis sativa plant extract and comparing it with the antibiotic ciprofloxacin

Faeze Ghaforan[1], Saba Taheri[2] , Fateme Rashno[2]

1- Institute of biosocial and quantum science and technologies,IsI.C.,Islamic Azad University, Islamshahr, Iran
2- Department of Biology, IsI.C., Islamic Azad University, Islamshahr, Iran
*Corresponding Author: sabataheri@iau.ir

Abstract

Researchers are looking for new solutions to treat microbial infections, one of which is the use of nanoparticles, especially metal nanoparticles, and the other is the use of green synthesis methods using plant extracts. In this experimental study, selenium nanoparticles were synthesized using hemp plant extract. Subsequently, to investigate the antimicrobial effects, different concentrations of selenium nanoparticles, including 200-215.3 micrograms per milliliter, were prepared and the minimum inhibitory concentration (MIC) and minimum lethal concentration (MBC) were evaluated using the microtiter plate method against E. coli ATCC 15911, Staphylococcus aureus ATCC 15913, Pseudomonas aeruginosa ATCC 25001, and Klebsiella pneumonia ATCC 03826. Finally, it was compared with the antibiotic ciprofloxacin. Also, the antibiofilm effects of selenium nanoparticles synthesized by microtiter plate were investigated. The results of the synthesis of selenium nanoparticles showed that after adding hemp plant extract to sodium selenite salt solution, a color change occurred and selenium nanoparticles were synthesized. SEM results showed that the synthesized selenium nanoparticles had a spherical structure and an average size of 319.3 nm. Also, the investigation of the antimicrobial effects showed that selenium nanoparticles had significant antimicrobial effects, as compared to the antibiotic ciprofloxacin, they had close MICs. Selenium nanoparticles had significant antibiofilm effects against the studied strains. The results of this study showed that the green synthesis method is a simple, cheap and rapid method for synthesizing selenium nanoparticles, and the selenium nanoparticles synthesized in this study had appropriate morphological characteristics and also had significant antimicrobial effects against microbial pathogens.

keywords: elenium nanoparticles, green synthesis, antimicrobial effects, microbial pathogens.

22376 - Poster

Studying the destructive effects of oxymetholone on various tissues of the mouse body

Naeimeh Dehghani[1*], Hamed Daneshpazhouh[1]

1- Department of biology, payame noor university, Tehran, Iran
*Corresponding Author: naeimehdehghani8@gmail.com

Abstract

Oxymetholone is a potent synthetic anabolic steroid that has significant side effects on various body tissues. Unfortunately, some athletes use this drug as a stimulant in high doses due to its anabolic properties and its effect on muscle growth. Therefore, the purpose of this review article is to investigate the damaging effects of this drug on various tissues of the mouse body. For this purpose, a systematic search was conducted in scientific journals Web of Science and PubMed from November 2007 to January 2024. The keywords used in this systematic search included oxymetholone, kidney, liver, oocyte, testis, ovary. The results obtained from intraperitoneal (IP) injection of oxymetholone on the number of liver Kupffer cells in adult mice (NMRI) show that the number of Kupffer cells increased, which is significant at $P<0.001$. This steroid causes left ventricular hypertrophy and increased risk of thrombosis in mice. Oxymetholone-treated mice show impaired renal function through increased creatinine and blood urea, accompanied by tubular necrosis and glomerulosclerosis. Oxymetholone causes testicular atrophy, reduced spermatogenesis in male mice, and disruption of the estrous cycle in female mice. Also, the results of statistical analysis showed that there were significant abnormalities in ovareis ($P<0.05$) during the injection period are observed in the experimental groups compared to the control group. In conclusion, it can be said that oxymetholone, despite its anabolic effects, is a dangerous compound due to its high liver, heart and kidney toxicity. Keywords: Oxymetholone, mouse, liver, kidney, ovary, testis

keywords: Oxymetholone, mouse, liver, kidney, ovary, testis.

22210 - Poster

Studying the effect of naringenin extract on protein levels in intestinal tissue of STAT3 Alzheimer's model mice

Nafiseh Mohammadzadeh Anzabi[1*], Bahareh Pakpour[1], Behin Omidi[1]

1- Department of Biology, Islamic Azad University, Tehran Central Branch, Tehran, IRAN
*Corresponding Author: nafise1379@gmail.com

Abstract

Alzheimer's disease (AD) is a progressive neurodegenerative disorder that accounts for nearly 80% of dementia cases worldwide.A growing body of evidence suggests that inflammation and gut–brain interactions play a critical role in the development and progression of AD.The present study investigated the effect of naringenin extract on intestinal STAT3 protein levels,which are known to regulate cellular signaling, reduce inflammation,and protect neurons.In this experiment,40 male Wistar rats were divided into four groups:a healthy control group,an AD model group (induced through stereotaxic injection of amyloid-β into the hippocampus),a sham-operated group, and a treatment group receiving naringenin extract.The treatment was administered orally via gavage for 21 consecutive days.Following the intervention,small intestine tissues were collected,fixed,and analyzed using immunohistochemical staining to assess STAT3 expression.The results demonstrated that naringenin treatment led to a relative reduction in intestinal STAT3 protein levels compared to the AD model group.This reduction was associated with decreased cellular inflammation,improved intestinal function,and through the gut–brain axis,enhanced brain function.These findings are consistent with previous studies on the neuroprotective effects of naringenin and suggest that larger scale research could provide more precise and reliable data regarding its therapeutic potential in AD.

keywords: naringenin extract, intestinal tissue, Alzheimer's, STAT3 protein.

22390 - Poster

In Vitro Evaluation of the Antimicrobial and Anticancer Properties of Nanobacteria

Behnaz Esfandiari[1*], Fatemeh Nik Akhtar[1], Masoumeh Nejhadali[1]

1- Department of Biology, Institute of biosocial and quantum science and technologies, IsI.C., Islamic Azad University, Islamshahr, Iran
[*]Corresponding Author: behnaz.esfndiari@gmail.com

Abstract

Nanobacteria, also referred to as nano-organisms or ultra micro bacteria, represent an emerging subject of interest at the interface of microbiology and nanotechnology. These extremely small microorganisms, ranging in size from 40 to 250 nm, possess unique structural and functional properties that make them attractive for diverse biomedical, environmental, and material science applications. Their ability to interact with various surfaces, produce extracellular matrix, and form biofilms highlights their potential in targeted drug delivery systems, biosensors, and cancer therapy. In the present study, the antimicrobial and anticancer properties of nanobacteria suspension were investigated under in vitro conditions. A suspension of nanobacteria was prepared and applied to cultured MDA-MB231 breast cancer cells, and cell viability was assessed using the MTT assay. Total RNA was extracted, cDNA was synthesized, and gene expression profiles were analyzed through Real-Time PCR. Antibacterial activities were further evaluated using MIC and MBC assays. The findings demonstrated that nanobacteria were capable of inducing apoptosis in cancer cells and significantly downregulated the expression of IL-6, a critical gene involved in tumor progression. In addition, nanobacteria exhibited pronounced antibacterial activity, which is likely mediated through the production of bacteriocins and other microbial metabolites, although the precise mechanism requires further investigation. Collectively, these results indicate that nanobacteria suspensions exert multifunctional therapeutic effects, combining anticancer and antimicrobial properties, and may serve as promising candidates for future biomedical applications, particularly in cancer treatment and infection control.

keywords: Nanobacteria, antimicrobial effects, anticancer effects.

22315 - Poster

Features of polyvinyl alcohol / graphenyl pterygium nano-hybrid system in repairing infected skin wounds in rats

Asma Khanzade Nilooi[1*], Fatemeh Khadivi Derakhshan[1]

1- Department of biology, Islamic Azad University, Urmia, Iran
*Corresponding Author: smkhanzadeh72@gmail.com

Abstract

In the recent years of the 21st century, the use of medicinal plants has witnessed an increasing expansion of research in this field, and it has been proven that replacing the dry extract of the plant instead of its pure material due to the accumulation of substances in the plant strengthens the effect. Its treatment is to prevent its side effects along with medicine and finally this extract is offered in various medicinal forms In the current research, the effect of pterygium extract on the healing of infected skin wounds was investigated. According to accurate statistics, there were 12 experimental groups, and the effect of pterygium extract 5% and 2.5%, graphene 1% and 2% was investigated. The duration of the experimental period was 21 days. It lasted for a long time and with the results of histopathology tests, it was found that the treatment groups with pterygium extract had complete healing of the skin wound and the treatment group with higher concentration had better recovery. The result of a well-done restoration and a higher concentration brought a better result.

keywords: Astragalus hamosus, Polyvinyl alcohol, Infected skin wounds, Graphen oxide.

22292 - Poster

In Vitro Optimization and Micropropagation of Kumquat (Citrus japonica) via Explant and Hormonal Evaluation

Nilofar Jabary[1], Parissa Jonoubi[1*], Zohreh Shirkhani[1]

1- Department of Plant Sciences, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: jonoubi@khu.ac.ir

Abstract

Kumquat (Citrus japonica) is considered a valuable citrus fruit due to its high content of vitamins, dietary fiber, and wide applications in the food industry. Since no report of tissue culture for this species has yet been documented in Iran, and given the increasing demand of growers for its propagation, an in vitro micropropagation system was optimized. Due to low seed germination rates, the germination of intact versus scarified seeds was compared. The results indicated that shriveled seeds failed to germinate, while intact seeds exhibited a 43% germination rate compared to 78% in scarified seeds. For explant establishment on MS medium supplemented with different concentrations of plant growth regulators, various explants including hypocotyl, cotyledon, apical, and axillary buds were assessed. The highest regeneration frequency (100%) was obtained from apical buds cultured on MS medium containing 0.5 mg l^{-1} NAA and 1 mg l^{-1} BA. Similarly, axillary buds cultured on 1 mg l^{-1} Kin and 1.5 mg l^{-1} BA also exhibited 100% shoot regeneration. Hypocotyl explants showed the highest response (76%) on medium supplemented with 1 mg l^{-1} BA, whereas cotyledons failed to regenerate under all treatments. For shoot proliferation and elongation, MS medium supplemented with different combinations of growth regulators was tested, with the highest proliferation rate obtained on 1 mg l^{-1} GA_3 combined with 1 mg L^{-1} BA. Optimized in vitro protocols enable reliable micropropagation of kumquat, ensuring healthy and large-scale plantlet production.

keywords: Explant establishment, branch regeneration, propagation, seed germination.

21754 - Poster

The Impact of Indigenous Iranian Probiotics on Hippocampal Tissue in 6-Hydroxydopamine-Induced Alzheimer's Rats

Bahareh Pakpour Mahmoudabad[1], Behin Omidi[1], Faezeh Fooladi[1*]

1- Tehran Azad University, Central Tehran Branch, Faculty of Basic Sciences, Department of Biology
*Corresponding Author: faezehfooladi2480@gmail.com

Abstract

Alzheimer's disease (AD) is a progressive neurological disorder characterized by neuronal degeneration and the accumulation of harmful proteins. This study aimed to investigate the effects of indigenous Iranian probiotics on hippocampal tissue in a Wistar rat model of Alzheimer's induced by 6-hydroxydopamine. Male Wistar rats were divided into six groups: sham group, control group, 6-hydroxydopamine-induced Alzheimer's group, and three treatment groups receiving probiotics. 6-hydroxydopamine was injected to induce Alzheimer's, followed by daily oral gavage of the treatments for three weeks. Behavioral evaluations were conducted using the shuttle box test, and histological examinations of the CA1 region of the hippocampus were performed using hematoxylin-eosin staining. The shuttle box test demonstrated that 6-hydroxydopamine injection successfully induced Alzheimer's in rats, and hematoxylin-eosin staining of the hippocampus showed a significant increase in neuronal destruction in the CA1 region of the Alzheimer's group. However, in the probiotic-treated groups, the level of neuronal damage was significantly reduced. The results indicated that 6-hydroxydopamine caused Alzheimer's-related damage by generating reactive oxygen species and inducing inflammation. However, the use of indigenous probiotics, due to their antioxidant effects, was able to largely prevent neuronal destruction and disease progression. These findings suggest that probiotics can be considered as potential therapeutic strategies for the prevention and management of Alzheimer's disease.

keywords: Alzheimer's, probiotics, hydroxydopamine, hippocampus, rat.

22384 - Poster

Effect of methyl jasmonate on rosmarinic acid production in callus culture of wild sage (Salvia nemorosa L).

Arefeh Hassanvand[1*], Hadis Zaremanesh[2]

1- Department of Biology, Payame Noor University, Tehran, Iran
2- Department of Agriculture, Payame Noor University, Tehran, Iran
*Corresponding Author: a.hassanvand@pnu.ac.ir

Abstract

Rosmarinic acid (RA) is a secondary metabolite with pharmaceutical value that is recognized as a valuable phenolic compound due to its diverse biological activities, including antimicrobial, anti-inflammatory, antimutagenic, and antioxidant properties. This study was conducted with the aim of investigating the role of methyl jasmonate on growth, the production of phenolic compounds, flavonoids, and rosmarinic acid in callus of wild sage (Salvia nemorosa L.) under in vitro culture conditions. For callus induction, leaf explants were cultured on Murashige and Skoog (MS) basal medium. The culture medium was supplemented with 1.5 mg L^{-1} naphthalene acetic acid (NAA) as an auxin and 4 mg L^{-1} 6-benzylaminopurine (BAP) as a cytokinin. After several subcultures, calli were treated with methyl jasmonate at five levels of 0, 50, 100, 200, and 250 µM in a completely randomized design (CRD). The results showed that the application of methyl jasmonate increased fresh weight, phenolic compounds, flavonoids, and rosmarinic acid compared to the control. The highest amounts of fresh weight (3.8 g), total phenols (0.72 mg g^{-1} fresh weight), total flavonoids (0.321 mg g^{-1} fresh weight), and rosmarinic acid (4.8 mg g^{-1} fresh weight) were obtained at the 100 µM treatment. Also, the concentration of 50 µM with mild inductive effects improved callus growth. In general, the results showed that the optimal concentrations of methyl jasmonate can stimulate the production of rosmarinic acid without a negative effect on callus growth. However, it is suggested that future studies investigate the synergistic effects of methyl jasmonate with other elicitors, culture in bioreactor scale, and molecular analysis of biosynthetic pathways

keywords: Elicitor, Phenol, Flavonoid, Fresh Weight, In Vitro Culture.

22451 - Poster

Effect of Static Electric Field and Honeybee Venom on Viability, Proliferation, and Neural Differentiation of Rat Bone Marrow-Derived Mesenchymal Stem Cells

Mohammad Amin Majidi[1], Mohammad Nabiuni[1*], Mohammad Hossein Fakourzadeh[2]

1- Department of Cell and Molecular Sciences, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
2- Department of Biomedical Engineering, Faculty of Electrical and Computer Engineering, Isfahan , University of Technology, Isfahan, Iran
*Corresponding Author: nabiuni@khu.ac.ir

Abstract

Abstract Neurological disorders such as Parkinson's disease and spinal cord injuries pose significant therapeutic challenges due to limited neuronal regeneration. Mesenchymal stem cells (MSCs) serve as a source for neural differentiation, and their stimulation by physical and biological factors can enhance this process. This study aimed to investigate the effects of honeybee venom and static electric field on MSCs to evaluate their therapeutic potential. MSCs were isolated and cultured in DMEM/F12 containing FBS and antibiotics and characterized by flow cytometry. Cytotoxicity was assessed using increasing concentrations of venom and direct current stimulation at 50, 100, and 200 mV/mm for 60 minutes; in combined treatment, a 100 mV/mm field with 3 µg/ml venom was applied, and viability after 24 hours was evaluated using the MTT assay. Subsequently, 3 µg/ml venom and 50 and 100 mV/mm stimulations were applied in differentiation medium for ten days, and neural differentiation was assessed by Cresyl Fast Violet staining. Results showed a dose-dependent reduction in cell viability by honeybee venom (IC50 = 9.69 µg/ml) and a significant reduction in viability at 200 mV/mm. Treated cells displayed a pronounced neuron-like morphology, and maximal neural differentiation was observed in the combined treatment. These findings support the efficacy of a combined approach to enhance MSC viability and neural differentiation. Future studies are recommended to optimize field intensity and duration/duration and venom dosage, to assess functional and electrophysiological parameters, examine gene/protein markers, and evaluate the effects in animal models of neural injury.

keywords: Mesenchymal stem cells, Honeybee venom, Static electric field, Neural differentiation.

22541 - Poster

Effect of Multi-Walled Carbon Nanotubes on Growth and Secondary Metabolism of *Catharanthus roseus* in In Vitro Culture

Masoumeh Ghasempour[1], Alireza Iranbakhsh[2*], Mostafa Ebadi[3], Zahra Oraghi Ardebili[4]

1- Lecturer, Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2- Professor, Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
3- Assistant Professor, Department of Biology, Damghan Branch, Islamic Azad University, Damghan, Iran
4- Assistant Professor, Department of Biology, Garmsar Branch, Islamic Azad University, Garmsar, Iran
*Corresponding Author: iranbakhshar@yahoo.com

Abstract

This study evaluated the effect of multi-walled carbon nanotubes (MWCNTs) as a nanotechnology-based elicitor on growth, secondary metabolism, and DAT gene expression in *Catharanthus roseus* under plant tissue culture conditions. Sterilized seeds were treated with 0, 50, 100, and 150 mg/L MWCNT in MS culture medium. Treatments significantly increased germination percentage and speed, shoot and root growth, and improved vascular tissue anatomy compared to the control. Chlorophyll, carotenoids, total protein, and the activities of catalase and peroxidase enzymes increased. Soluble phenols rose by 23% and total alkaloids by 1.7-fold. DAT gene expression increased an average of 37-fold, indicating stimulation of the biosynthesis pathway of anticancer terpenoid indole alkaloids such as vinblastine and vincristine. Findings highlight MWCNT potential to enhance developmental indices and production of valuable medicinal metabolites within the framework of plant cell and tissue culture.

keywords: Multi-walled carbon nanotube, Secondary metabolism, Tissue culture, DAT gene expression, Catharanthus roseus.

22341 - Poster

The effect of Pycnogenol on BDNF gene expression in male Wistar rats with an Alzheimer's disease model

Hanieh Moradi[1], Rodabeh Behzadi Anduhjerdi[2], Bahareh Pakpour[2*]

1- M.Sc. in Genetics, Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
2- Assistant Professor, Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: b.pakpour@yahoo.com

Abstract

Alzheimer's disease is one of the most significant structural and functional disorders of the human brain, characterized by impaired cognitive processing. A major pathological hallmark of this condition is the formation of neurofibrillary tangles resulting from hyperphosphorylation of the Tau protein within neural cells. The present study aimed to investigate the expression of the BDNF gene in a Wistar male rat model of Alzheimer's disease induced by beta-amyloid (Aβ) and treated with a plant-derived polyphenolic compound, Pycnogenol. In this experimental study, 21 male Wistar rats (200–220 g) were randomly assigned to three groups (n = 7 per group): control, Alzheimer's, and Pycnogenol-treated. The Alzheimer-like model was established via stereotaxic injection of Aβ into the hippocampus of rats in the Alzheimer's and Pycnogenol groups. The treatment groups received Pycnogenol solution orally for 21 days, while the control and Alzheimer's groups were administered normal saline. Passive memory performance was assessed using the shuttle box test, and BDNF gene expression was quantified via Real-Time PCR. The results demonstrated that Pycnogenol treatment significantly enhanced BDNF gene expression and improved passive memory in Alzheimer's model rats ($p < 0.001$). These findings suggest that Pycnogenol may mitigate memory and molecular impairments associated with Alzheimer's disease in male Wistar rats and significantly upregulate BDNF expression in the brain. Therefore, Pycnogenol may represent a promising therapeutic agent for alleviating or treating symptoms of Alzheimer's disease.

keywords: Alzheimer's disease, *BDNF*, Pycnogenol.

22123 - Poster

Fe2O3 NPs synthesized from Prosopis farcta impact on colorectal cancer cell line HT-29 on electrospun PLA scaffold

Sayna Ghasemi[1], Zeynab Piravar[1*]

1- Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
*Corresponding Author: sainaghasemibiology@gmail.com

Abstract

Introduction and Objective: Benefiting from particular features, nanoparticles seem to bring applied significance to cancer diagnosis and treatment. This study was designed to examine and evaluate the cytotoxic and anticancer effects of Fe2O3 NPs synthesized by Prosopis farcta extract on the clone cancer cell line (HT-29) and normal cells in a three-dimensional (3D) printed Polylactic acid scaffold.Methodology: to carry out for identification of bioactive compounds from the whole plant extract of Prosopis farcta by Gas chromatography and Mass spectroscopy (GC-MS) was done. A threedimensional (3D) PLA scaffold was synthesized in this study using the Electrospinning method followed by culturing cancer cells HT-29 and normal cells Hek-293 on this scaffold. Then, the Fe2O3 NP was accomplished using the P. farcta extract. Utilizing the MTT method, the cytotoxic effects of Fe2O3 NPs on different cell lines were examined at 24- and 48-hour intervals. TotalRNA was extracted and transformed into cDNA. Using the Real-time PCR method, the expression rate of BAX and Bcl2 genes was evaluated in comparison with the β-actin reference gene. The flow cytometry method was used to examine the apoptosis of cells. Finally, the data obtained were analyzed using one-way ANOVA test and then Tukey's test. All experiments were made with 3 replicates. Also, a significance level of $P < 0.05$ was considered in all tests.Results: The results suggested that Fe2O3 NPs at a concentration of 112 µg/ml have shown the highest inhibition of cell proliferation, which was statistically significant ($P < 0.001$). In addition, the expression of the BAX gene compared to the reference gene of β-actin revealed a significant rise ($P < 0.05$) and the expression of the Bcl2 gene decrease significantly ($P < 0.01$).Conclusion: Based on the results, one may conclude that Fe2O3 NPs can be used as a drug candidate in the treatment of colorectal cancer in the future due to their ability to change the expression of genes involved in apoptosis; however, further studies still need to be done.

keywords: Fe2O3 NPs, Prosopis farcta, Colorectal Cancer, Apoptosis, Bax, Bcl2.

22249 - Poster

Developmental Analysis of Agaricus bisporus in Liquid MMN Medium and Its Biotechnological Potential

Fereshteh Mohamadhasani Javar[1*]

1- Department of Biology, Payame Noor University, Tehran, Iran
*Corresponding Author: fereshtehmhasani@pnu.ac.ir

Abstract

Agaricus bisporus, a widely cultivated edible and medicinal mushroom, exhibits significant potential in producing bioactive compounds and contributing to biotechnological applications. This study aimed to investigate its developmental stages under controlled conditions using liquid Modified Melin-Norkrans (MMN) medium and to assess its suitability for biotechnological exploitation.Mycelial cultures were incubated in MMN medium at 25°C with continuous shaking at 120 rpm for 14 days. Growth parameters including dry biomass, pH variation, and morphological changes were monitored at regular intervals. The MMN medium supported rapid and uniform mycelial expansion, with a final biomass yield averaging 3.8 g/L. A gradual pH decline indicated active metabolic processes. Microscopic observations revealed progressive cellular organization and tissue differentiation throughout the growth cycle.Additionally, the culture produced soluble polysaccharides and lignocellulolytic enzymes, confirming its capacity to generate bioactive metabolites. These findings highlight A. bisporus as a promising model for developmental studies and industrial applications, including pharmaceutical production, nutritional supplementation, and environmental bioremediation.Overall, the MMN liquid medium not only facilitated optimal growth and developmental observation but also provided a scalable platform for harnessing the biotechnological value of Agaricus bisporus

keywords: Agaricus bisporus, MMN medium, developmental biology, biotechnology, bioactive compounds.

21942 - Poster

Enhancement of Antioxidant Enzyme Activities in Hairy Roots of Mentha spicata L. under Drought Stress

Niloofar Khayati[1], Vahid Niknam[1*], Masoud Mirmasoumi[1]

1- Department of Plant Sciences, Faculty of Biology, University of Tehran, Tehran, Iran
[*]Corresponding Author: niknamv@ut.ac.ir

Abstract

Drought stress is one of the most significant abiotic stresses affecting plant growth, development, yield, and quality. Various cellular elicitors and signaling molecules, including nitric oxide (NO), can enhance drought tolerance through the induction of antioxidant enzyme activities and increase production of valuable secondary metabolites, especially in hairy roots of medicinal plants under in vitro conditions. In this study, hairy roots of Mentha spicata L. were successfully induced using Agrobacterium rhizogenes strain A4 via leaf explants on LB and MS media. The transgenic nature of the A4 strain hairy roots was confirmed by PCR. The roots were then subcultured in liquid B5 medium. Hairy roots were subjected to drought stress induced by polyethylene glycol (PEG) at 5% and 10%, and the effect of the nitric oxide donor sodium nitroprusside (SNP) at 100 µM on antioxidant enzyme activity was investigated. Results showed that under 5% PEG drought stress and 100 µM SNP treatment, activities of peroxidase (POX), polyphenol oxidase (PPO), phenylalanine ammonia-lyase (PAL), and superoxide dismutase (SOD) significantly increased compared to control roots. Ascorbate peroxidase (APX) activity was markedly elevated by 100 µM SNP treatment in the absence of drought stress compared to control roots. Nitric oxide significantly enhanced antioxidant enzyme activities, particularly under drought stress, which reduced lipid peroxidation of membranes and mitigated the damaging effects of water deficit stress. By promoting antioxidant activity, nitric oxide can play a vital role in protecting medicinal plants against drought stress. Future studies will focus on the cellular signaling pathways involved in the hairy roots' response of M. spicata to nitric oxide under drought conditions.Keywords: Hairy roots; Agrobacterium rhizogenes; drought stress; antioxidant enzymes; nitric oxide

keywords: Hairy roots, *Agrobacterium rhizogenes*, drought stress, antioxidant enzymes, nitric oxide.

22381 - Poster

Method for investigating the anticancer effects of green synthesized ZnO nanoparticles on the viability of HeLa cancer cells in vitro

Melika Shaghouli[1], Maryam Bikhof Torbati[2*], Masoud Shabanzadeh[3]

1- Department of Biology, NT.C., Islamic Azad University, Tehran, Iran
2- Department of Biology, YI.C., Islamic Azad university, Tehran, Iran
3- Department of Chemistry, Da.C., Islamic Azad University, Damghan, Iran
*Corresponding Author: maryam.bikhof@gmail.com

Abstract

Cervical cancer is a serious problem in women, and cell resistance to chemotherapy drugs and their side effects highlight the need for targeted therapeutic approaches. Metal nanoparticles are considered a suitable option for the delivery of anticancer compounds due to their high surface-to-volume ratio and surface modification capabilities. In this study, zinc oxide nanoparticles (ZnO NPs) were prepared by a green synthesis method using Lactobacillus casei extract as a reducing and stabilizing agent. The synthesized nanoparticles were biocompatible and had favorable anticancer properties. The accuracy of the synthesis was confirmed by FTIR and DLS tests. To investigate the cytotoxic effects, Hella cervical cancer cells were cultured in 96-well plates and, after reaching the logarithmic growth phase, were treated with different concentrations (10, 50, 100, and 300 µg/mL) of nanoparticles. The cells were incubated for 24 and 48 hours at 37 °C and 5% CO_2. MTT assay was used to measure cell viability; in this method, metabolically active cells were reduced to formazan crystals of tetrazolium dye and after dissolution in DMSO, the optical absorption at 570 nm was measured with a microplate reader. The results showed that the synthesized ZnO nanoparticles caused a dose- and time-dependent reduction in the viability of HeLa uterine cancer cells, and the inhibitory effect was significantly greater at higher concentrations. This study highlights the potential of green synthesized ZnO nanoparticles in improving the efficacy of anticancer therapies.

keywords: Green synthesis, Zinc oxide nanoparticles, Casei, MTT.

22386 - Poster

Green Synthesis of Zinc Oxide Nanoparticles Using Nigella sativa Extract and Evaluation of Their Antimicrobial and Anticancer Effects

Behnaz Esfandiari[1*], Mansooreh Nikeysh[1]

1- Department of Biology, Institute of biosocial and quantum science and technologies, IsI.C., Islamic Azad University, Islamshahr, Iran
*Corresponding Author: behnaz.esfndiari@gmail.com

Abstract

Targeted delivery of anticancer drugs that selectively affect malignant cells while minimizing toxicity toward normal tissues remains a major challenge in cancer therapy. Nanoparticles have emerged as promising drug carriers, as drug loading through encapsulation, adsorption, or chemical conjugation onto their surface can markedly enhance bioactivity and therapeutic index compared with free drugs. Moreover, medicinal plants, due to their diverse phytochemicals with additive and synergistic effects, represent cost-effective and low-toxicity alternatives to conventional chemotherapeutics. In this context, and considering the increasing problem of drug resistance and adverse side effects, the present study aimed to evaluate the antimicrobial and anticancer effects of black seed (Nigella sativa) extract-mediated green synthesis of zinc oxide nanoparticles (ZnO-NPs). Dried seed powder of N. sativa was obtained from the National Plant Gene Bank of Iran, and ZnO-NPs were synthesized via green chemistry. Morphological and size characterization was performed using scanning electron microscopy (SEM) and dynamic light scattering (DLS), while surface functional groups were identified by Fourier-transform infrared spectroscopy (FTIR). The antimicrobial potential of the synthesized ZnO-NPs was assessed against bacterial strains at defined concentrations, and their cytotoxic effect on MCF-7 breast cancer cells was evaluated by MTT assay. Results demonstrated significant antimicrobial activity and notable antiproliferative effects against MCF-7 cells in a dose-dependent manner. Overall, green-synthesized ZnO-NPs using N. sativa extract exhibited strong antitumor and antimicrobial activities, highlighting their potential as eco-friendly, cost-effective candidates for biomedical applications such as cancer therapy, microbial infection control, and wound healing.

keywords: zinc oxide nanoparticles, black seed extract, antimicrobial effects, anticancer effects.

22372 - Poster

Synthesis of chitosan nanoparticles containing garlic extract and investigation of its antimicrobial and anticancer effects

Melika Mirhashem[1,2], Saba Taheri[1,2*]

1- Institute of biosocial and quantum science and technologies,IsI.C.,Islamic Azad University, Islamshahr, Iran
2- Department of Biology, IsI.C., Islamic Azad University, Islamshahr, Iran
*Corresponding Author: sabataheri@iau.ir

Abstract

Garlic is a natural antibiotic, antifungal and antiviral. Garlic essential oil has a stronger antimicrobial effect. Allicin or garlic oil is an oily compound with a light yellow color that creates the specific aroma of garlic. Another property of garlic is its anticancer property. Given these properties, chitosan containing garlic extract can increase the anticancer effects. The compounds in garlic can help protect against cancer. The aim of this research is to synthesize chitosan nanoparticles containing garlic extract and investigate its antimicrobial and anticancer effects. First, 5 grams of plant extract powder was weighed and then distilled water was added as a solvent. The plant powder was placed in contact with the solvent on a magnetic stirrer, filtered and a rotary device was used to concentrate it. Nanogels were synthesized by self-assembly method from high molecular weight chitosan and caffeic acid. Garlic extract was encapsulated by the obtained nanogel and a nano zeta sizer was used to examine the particle size of chitosan. The synthesized chitosan nanoparticles with appropriate dimensions and high encapsulation percentage were able to target their active ingredient on HT-29 cancer cells in vitro compared to the free state of the extract. The results of the study showed that chitosan nanoparticles containing garlic extract showed good antimicrobial and anticancer effects.

keywords: chitosan, garlic extract, antimicrobial effects, anticancer effects.

22200 - Poster

A Review of Alopecia X Treatments and Their Impact on the Cell Cycle and Follicle Development

Zahra Hallajian[1*]

1- Ferdowsi University of Mashhad
*Corresponding Author: zarhallajian@gmail.com

Abstract

Alopecia X, or hair cycle arrest, is a non-inflammatory condition that poses diagnostic and therapeutic challenges due to ambiguities in its pathogenesis. Predominantly observed in dogs with double-coated breeds, it presents an aesthetically displeasing appearance. Veterinarians employ diverse treatments with varying outcomes. This review examines various treatments across different breeds and genders, evaluating their clinical and cellular efficacy. Based on available data, reported improvement rates include 40% with melatonin, 60-100% with deslorelin, over 85% with trilostane, less than 70% with mitotane, up to 60% with medroxyprogesterone acetate, and approximately 17% with fulvestrant. It is important to note that the accuracy of these statistics necessitates further investigation in larger populations and with varying drug dosages. Neutering, especially in males, is associated with improvement rates exceeding 50%, though recurrence remains a possibility. Newer methods such as minoxidil, laser therapy, photobiomodulation, and nanostructures require further research to determine their effectiveness.

keywords: Alopecia areata, hair cycle arrest, hair follicle, baldness.

22036 - Poster

A Review on the Mechanisms of Probiotics in Memory Restoration: The Role of the Gut–Brain Axis and Serotonin in Hippocampal Regeneration

Zohreh Shadmehr[1], Majid Navaian[2], Bahareh Pakpour[۲*]

1- PhD Candidate in Microbiology, Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran
2- Assistant Professor, Department of Biology, Central Tehran Branch, Islamic Azad University, Tehran, Iran
3- Assistant Professor, Department of Biology, Yadegar-e-Imam Khomeini (RA) Shahr-e-Rey Branch, Islamic Azad University, Tehran, Iran
*Corresponding Author: b_pakpour@yahoo.com

Abstract

Cognitive impairments induced by substances such as ethanol and morphine represent major challenges in neuroscience, as they disrupt memory, learning processes, and emotional regulation, significantly diminishing quality of life. Emerging evidence highlights the pivotal role of the gut–brain axis and hippocampal serotonergic pathways in modulating these dysfunctions. Recent preclinical studies using native Iranian probiotics, particularly Lactobacillus brevis and L. rhamnosus, have demonstrated their protective effects against drug-induced amnesia. These probiotics have been shown to enhance performance in passive avoidance tasks, reduce neurodegeneration, and restore hippocampal function.Such effects are primarily mediated through activation of serotonergic signaling, increased serotonin production, and attenuation of neuroinflammation. Furthermore, neuropharmacological findings indicate that inhibition of 5-HT3 receptors in the lateral hippocampus improves morphine-induced memory deficits, while stimulation of 5-HT4 receptors in the ventral CA3 region enhances emotional memory and reduces anxiety in animal models. Collectively, recent studies suggest that modulation of serotonergic pathways—whether through targeted pharmacotherapy or probiotic intervention—can lead to hippocampal restoration and cognitive improvement. Notably, probiotics offer a novel, low-risk approach to enhancing synaptic plasticity and serotonin levels, presenting a promising strategy for the prevention and treatment of substance-induced cognitive disorders and neuropsychiatric stress

keywords: Probiotics, Hippocampus, Serotonin, Ethanol, Morphine, Amnesia.

22098 - Poster

A Review of the Antioxidant and Anti-Inflammatory Mechanisms of Probiotics in Enhancing Cognitive Function and Preventing Memory Disorders

Hessan Hosseinzadeh Bandbafha[1*], Bahare Pakpour MahmudAbad[2], Maryam Tajabadi Ebrahimi[3]

1- M.Sc. in Pathogenic Microbiology, Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
2- Assistant Professor in the Department of Biology, CT.C., Islamic Azad University, Tehran, Iran
3- Associate Professor in the Department of Biology, CT.C. , Islamic Azad University, Tehran, Iran
*Corresponding Author: hessanhosseinzadeh.medmicro@gmail.com

Abstract

Cognitive impairments induced by oxidative stress and chronic neuroinflammation are major contributors to neurodegenerative diseases, leading to neuronal damage and dysfunction in brain activity. These processes are characterized by increased production of free radicals and reduced activity of antioxidant enzymes, serving as underlying factors in the progression of disorders such as Alzheimer's and Parkinson's disease. Probiotics, through modulation of the gut microbiome and the gut-brain axis, enhance the activity of key antioxidant enzymes including superoxide dismutase (SOD) and glutathione peroxidase (GPx), while significantly reducing inflammatory cytokines such as TNF-α and IL-6. Studies by Dr. Bahare Pakpour and colleagues demonstrate that these biological modifications lower lipid peroxidation and oxidative stress in brain tissue, thereby preserving neuronal integrity and supporting synaptic structure. In animal models, probiotic administration has been shown to markedly improve memory and learning performance, mediated by activation of antioxidant pathways such as Nrf2, inhibition of inflammatory pathways including NF-κB, and regulation of neurotrophin metabolism. Collectively, these findings suggest that probiotics represent a safe and practical strategy for the prevention and management of cognitive disorders.

keywords: Gut microbiome, oxidative stress, neuroinflammation, memory, gut-brain axis.

22100 - Poster

Cell Culture of Pleurotus ostreatus and Its Role in Heavy Metal Uptake and Reduction of Transfer to Brassica napus: A Biotechnological Approach

Fereshteh Mohamadhasani Javar[1*]

1- Department of Biology, Payame Noor University, Tehran, Iran
*Corresponding Author: Fereshtehmhasani@pnu.ac.ir

Abstract

Heavy metal contamination in agricultural soils poses a serious environmental challenge, threatening plant health, food safety, and ecosystem stability. The use of living organisms for bioremediation is a key strategy in environmental biotechnology. Pleurotus ostreatus, due to its extensive hyphal network, cell wall rich in polysaccharides, and high metal accumulation capacity, is considered a promising candidate for this purpose.In this study, fungal cells were cultured in liquid media containing defined concentrations of cadmium, lead, and nickel. Metal uptake by fungal biomass was quantified using atomic absorption spectroscopy (AAS). Subsequently, Brassica napus plants were cultivated in contaminated soil under conditions inoculated with fungal cells. Metal accumulation in plant tissues was analyzed using ICP-OES.Results indicated that Pleurotus cells effectively absorbed heavy metals from the medium, and plant inoculation significantly reduced metal translocation to aerial and root tissues. These findings highlight the potential of Pleurotus ostreatus cell culture in environmental biotechnology for soil bioremediation and minimizing biological risks associated with heavy metals. This approach also offers a complementary strategy for sustainable agriculture and the production of safer crops.

keywords: Cell Culture, *Pleurotus ostreatus, rassica napus,* Biotechnological Approach.

22630 - Poster

Extraction of exosomes from stem cells and its effect on wound healing

Ensiyeh Ataee Roshan[1], Maryam Bikhof Torbati[1*], Shiva Khalil Moghaddam[1]

1- Department of Biology, Yadegar Imam Khomeini (RA) Branch, Shahr-e Ray, Islamic Azad University, Tehran, Iran
[*]Corresponding Author: maryam.bikhof@gmail.com

Abstract

As the largest organ in the human body, the skin plays a vital role in protecting the body from external factors, regulating temperature, and maintaining homeostatic balance. However, skin damage caused by wounds, burns, or chronic diseases such as diabetic ulcers can disrupt these functions and pose serious challenges to a person's health.In this regard, new therapeutic approaches, especially the use of stem cells and their derivatives, have been considered as a promising solution to improve this process.These cells, which are extracted from various sources such as bone marrow, adipose tissue, and umbilical cord, can not only differentiate into a variety of connective tissue cells, but also exert their therapeutic effects through the secretion of extracellular vesicles (EVs), especially exosomes.Focusing on the effects of exosomes extracted from MSCs culture on skin wound healing in an *in vitro* model, this study seeks to answer the question of how these vesicles can affect fibroblast proliferation and migration and what biochemical mechanisms are involved in this process.This study not only helps to clarify fundamental aspects of exosomal biology, but also may provide a basis for the development of novel therapeutic approaches in the future. The use of the scratch assay as a standard method for assessing cell migration, combined with the measurement of proliferation through conventional methods (such as cell counting or MTT assay), allows for the quantitative and qualitative analysis of these effects.Furthermore, identifying key molecules present in exosomes (such as miRNAs and growth factors) and the signaling pathways involved could help to better understand the underlying mechanisms.

Keywords: Exosomes, mesenchymal stem cells, collagen, superoxide dismutase.

Chapter Eight Developmental Genetics and Omics



23960-keyenote oral presentation

CLINICAL SYSTEMS BIOLOGY AND CLINICAL PATHOLOGY: A RATIONAL APPROACH TO DECIPHER THE CAUSE OF DISEASES

Farhad Rezaei[1*]

[1]Department of Gastroenterology-Hepatology, Erasmus Medical Center, Rotterdam, the Netherlands
[*]Corresponding Author: f.rezaee@acta.nl

Abstract

Background: Understanding the root cause of human disease requires an integrative approach that unites molecular, cellular, and systemic perspectives. Clinical Systems Biology bridges the gap between complex biological networks and clinical manifestations of pathology. By combining insights from molecular systems with clinical data, this discipline enables a rational framework to decipher disease mechanisms, identify biomarkers, and design targeted therapeutic interventions. Methods: This study focuses on the investigation of disease causation through comprehensive analysis of human biofluids, including plasma, serum, urine, cerebrospinal fluid (CSF), amniotic fluid, and saliva. Using advanced omics technologies—proteomics, genomics, lipidomics, and imagomics—in combination with classical and modern biochemistry, capillary electrophoresis (CE), and molecular and cell biology (MCB) methods, we establish a multidimensional profile of physiological and pathological states. The integration of these datasets within systems biology frameworks allows the mapping of molecular pathways, network perturbations, and dynamic responses associated with disease onset and progression. Results: Using quantitative shotgun omics—proteomics, lipidomics, and transcriptomics—combined with clinical biochemistry and molecular and cell biology, we identified novel biomarkers across multiple diseases. Distinct molecular signatures were discovered for cardiovascular diseases, Gaucher disease, pain regulation, and type 2 diabetes (T2D). These included alterations in lipid metabolism, inflammatory mediators, and neuroregulatory proteins linked to disease mechanisms and progression. The integration of omics data with clinical pathology enabled a comprehensive systems-level understanding, demonstrating that translational multi-omics approaches can uncover actionable biomarkers for precision diagnosis, targeted therapy, and improved patient outcomes. Conclusion: Only through multidisciplinary knowledge and the convergence of systems biology, clinical pathology, and translational medicine strategies is it only possible to truly decipher the origins of disease. Such comprehensive programs demand translational excellency leadership, guided by only excellent and out-of-the-box super-specialists—visionary experts with deep interdisciplinary training capable of uniting clinical insight with molecular systems understanding.

Keywords: Clinical pathology. Clinical systems biology. Decioher

24011-keyenote oral presentation

Genetic ideas and findings in the context of embryonic studies

Ali Farazmand[1*]

1-Professor, Department of Biology, Faculty of Science, University of Tehran
*Corresponding Author: afarazmand@ut.ac.ir

Abstract

Both science and its leaders, as well as the scientific media, have an inherent interest in transforming findings into paradigms. Sometimes, contrary to Kuhn's theory, this effort appears immature and they reach a destination without taking the road. Genetics (especially its molecular form), given its relatively widespread and pervasive hegemony, has helped scientists and theorists a lot in this regard, especially in the second half of the twentieth century. The science of evolution and what has replaced embryology for several decades as the science of development have sought (sometimes inappropriate) benefits from the advances of molecular genetics in such a direction. Without the inclination of attachment to genetics in these two branches of biology being reduced, in order to compensate for the shortcomings in the field of evolutionary studies, the attitude and concept of evo-devo and in the science of development, developmental genetics as a serious discipline have filled the gap of embryology in the studies of Evolution and Genetics.

In this lecture, we will discuss some interesting cases of classical experiences and perspectives of embryology and development in the advancement of genetic knowledge. The main theme of this lecture is a brief introduction to the work of three famous scientists with unforgettable works, which have paved the way for new methods and ideas in biology, genetics and development science. Alfred Jost, with his great work on rabbit embryos, was the founder of the Jost paradigm in the development of mammalian sex. Almost three decades later, inspired by this paradigm, scientists in the search for a testicular determining factor succeeded in identifying SRY, a transcription factor involved in the initiation of mammalian testicular development, which is an important discovery in the genetics of sex determination. Conrad Waddington's legacy is the addition of epigenetic studies to the genetic study of embryonic development, the complexity of the hierarchical effects in such development and the demonstration of environmental influences on this complex phenomenon. The legacy of Anne McLaren, a prominent figure of the second half of the 20th century, is her pioneering work in the discovery, isolation and cultivation of embryonic stem cells, whose pioneering experiments laid the foundations for in vitro fertilization and a form of regenerative medicine. The overall aim of this presentation is to demonstrate the importance of the integration of the life sciences in the creation of scientific paradigms that play a pioneering role in the development of new approaches and ideas.

Keywords: Scientific paradigms, developmental genetics, classical embryology, philosophy of biology

24032-Invited oral presentation

Bioinformatics and Computational Analysis in Omics Studies

Davud Rabiei Faradonbeh[1*]

[1]Brain and spinal cord injury research center, Neurosciences institute,Tehran University of Medical science
[*]Corresponding Author: d.rabiei@yahoo.com

Abstract

In the past decade, the exponential growth of omics technologies—including genomics, transcriptomics, proteomics, and metabolomics—has produced vast, complex datasets that cannot be fully interpreted without advanced computational approaches. Bioinformatics serves as a critical bridge between experimental biology and data science, enabling researchers to extract meaningful insights from this massive information space. The integration of Big Data analytics with machine learning and deep learning algorithms has revolutionized how we understand biological systems, shifting the focus from single-gene analysis to comprehensive, network-based modeling of molecular interactions.
Multi-omics integration, which combines data from multiple molecular layers—from genes to metabolites—provides a holistic and system-level understanding of cellular dynamics and pathological mechanisms. When coupled with the predictive power of artificial intelligence, these approaches accelerate the discovery of novel therapeutic targets, facilitate biomarker identification, and enable the development of personalized and precision medicine strategies.
This talk will emphasize the importance of combining bioinformatics tools, computational modeling, and AI-driven analysis in modern omics research. Practical examples will be presented to demonstrate how such integrated approaches advance our understanding of cellular function, disease progression, and treatment response. By highlighting the role of computational and AI-assisted data integration, this presentation aims to illustrate how multi-omics frameworks can transform Big Data into biological knowledge and guide the future of biomedical discovery and systems-level understanding.

Keywords: insilico omics analysis, multiomics analysis, bigdata , Ai , data integration

23951-Invited oral presentation

The Importance of Basic Science and Exposomics Studies in Uncovering the Multiple and Complex Causes of Fetal Anomalies: New Perspectives in Prevention and Treatment Research

Sedigheh Hantoushzadeh[1*]

1-Vali-E-Asr Reproductive Health Research Center, Family Health Research Institute, Tehran University of Medical Sciences, Tehran, Iran

*Corresponding Author: hantoushzadeh@tums.ac.ir

Abstract

Fetal anomalies are a major contributor to perinatal morbidity and mortality, yet their underlying causes often remain elusive due to the multifactorial and complex nature of fetal development. This abstract highlights the crucial role of basic science and exposomics studies in unraveling the intricate web of genetic, environmental, and epigenetic factors contributing to congenital malformations. Basic science provides essential insights into developmental biology, molecular pathways, and gene–environment interactions, laying the groundwork for mechanistic understanding. Exposomics, which comprehensively assesses all environmental exposures from conception onward, offers a novel approach to identifying critical external factors influencing fetal development, such as chemical exposures, maternal lifestyle, and pollutants.

Integrating these disciplines enables the identification of previously unrecognized risk factors and pathways involved in fetal anomalies. Such insights pave the way for novel biomarkers for early detection and targeted prevention strategies. Moreover, a deeper mechanistic understanding fosters the development of precision therapies tailored to molecular underpinnings, moving beyond symptomatic treatment toward causal intervention. This multidisciplinary perspective elevates the potential to reduce the incidence and severity of fetal anomalies through informed public health policies, improved prenatal care, and innovative therapeutic approaches.

In conclusion, advancing fetal anomaly research demands collaborative efforts combining basic science and exposomics to capture the complexity of prenatal development. This approach opens promising avenues for breakthroughs in the prevention and treatment of fetal anomalies, ultimately improving neonatal outcomes and long-term child health.

Keywords : Fetal anomalies, Basic science, Exposomics, Gene-environment interaction, Prenatal development, Congenital malformations

23948-Invited oral presentation

The importance of using IVF with preimplantation genetic testing (PGT) in high-risk individuals to prevent fetal abnormalities, and effective strategies instead of natural pregnancy for screening and reducing the risk of diseases.

Zahra Zandiyeh[1*]

1-Clinical embryologist and faculty member, Iran University of Medical Sciences*Corresponding author's e-mail: zandie.dvm@gmail.com

Abstract

Recent advances in assisted reproductive technologies and preimplantation genetic testing have made it possible to examine the genetic status of embryos before transfer in in-vitro fertilization (IVF) cycles. Preimplantation genetic testing (PGT) is commonly used to select healthy embryos, especially when there is a concern about transmitting various genetic disorders to offspring. This has opened a door where IVF, followed by PGT, can be used not only as a selective technique for healthy embryos in infertile patients but also as an effective and promising solution in fertile patients who fear transmitting genetic diseases to the next generation. Different types of these tests include PGT-A (aneuploidy screening), PGT-M (for monogenic diseases), and PGT-SR (structural chromosome rearrangements). According to reputable infertility guidelines, including ASRM and ESHRE, the use of PGT-M and PGT-SR is recommended for individuals at high risk of monogenic genetic diseases or chromosomal translocations. Additionally, PGT-A in selected groups, such as women over 38 years of age or those with a history of recurrent implantation failure, can lead to a reduced miscarriage rate and improved chance of live birth. Among the new and emerging preimplantation genetic tests is PGT-P (Polygenic Risk Score), in which embryos are screened based on multiple genetic scores to select an embryo with a lower likelihood of developing multifactorial diseases such as diabetes, heart disease, certain cancers, or mental disorders, the scientific validity and usefulness of which are still under discussion.
In all the tests mentioned, patient selection should be done correctly with the help of genetic specialists. After entering the IVF cycle, intracytoplasmic sperm injection (ICSI) is performed, and embryos undergo biopsy and sampling on day three or five. The sample taken is then sent to a genetic laboratory for genetic evaluation. Based on the results of the genetic laboratory, a healthy embryo is transferred to the mother's body.
Performing PGT for these patients is a valuable approach for preventing the occurrence of genetic abnormalities and improving assisted reproductive outcomes. Its clinical success depends on the correct selection of patients, accurate embryo biopsy, utilization of precise genetic technologies, adherence to laboratory standards, and the provision of thorough and comprehensive genetic counseling.

Keywords; Assisted reproductive technologies - Preimplantation genetic testing (PGT) - Selection of healthy embryos - Prevention of genetic abnormalities

24010-Invited oral presentation

Laboratory diagnostic approaches in metabolic disorders

Ali Talea[1*]

1-Metabolic Disorders Research Center, Molecular-Cellular Endocrinology and Metabolism Research Institute, Tehran University of Medical Sciences
*Corresponding author: ali_talea@yahoo.com

Abstract

Inherited metabolic disorders are rare genetic conditions that cause a person's metabolism to not work properly. Metabolism is the essential chemical processes that converts food into energy and removes toxins from your body. Defects in genes passed down from parents can result in abnormal chemical reactions that interfere with metabolism. Special testing called metabolic testing may be ordered to look at the amino acid (basic building block of proteins), fat and glucose metabolism patterns, to help narrow down diagnosis. The diagnosis of inborn errors of metabolism (IEM) takes many forms. Due to the implementation and advances in newborn screening (NBS), the diagnosis of many IEM has become relatively easy utilizing laboratory biomarkers. For the majority of IEM, early diagnosis prevents the onset of severe clinical symptoms, thus reducing morbidity and mortality. However, due to molecular, biochemical, and clinical variability of IEM, not all disorders included in NBS programs will be detected and diagnosed by screening alone. Identification of these patients, usually neonates or young children, is important for appropriate treatment, prognosis, and genetic counseling. Patients suspected of having for the determination of endogenous substances in body fluids are remarkably diversified, ranging from simple chemical tests to complicated chromatographic analysis coupled with information rich detectors. Definite diagnosis of most disorders requires identification of the deficient enzyme or aberrant transport proteins. Analysis may be carried out directly on urine, plasma, or blood cells, or in cultured fibroblasts or lymphocytes requiring cell culture facilities. For many inherited metabolic diseases, recombinant DNA technology has been proven reliable in the detection of affected patients and disease carries .DNA analysis has also elucidated the molecular genetics and pattern of inheritance involved.

Keywords: Metabolic inborn disorder; diagnosis; laboratory

23949-Invited oral presentation

Omics Biology, from Metabolomics to Genomics; A Novel Revolution in Precise Diagnosis, Targeted Therapy, and Personalized Medicine

Ali Mohebbi[1,2,*]

1-Fetal & Pediatric Cardiovascular Research Center, Children's Medical Center, Tehran University of Medical Sciences, Tehran, Iran
2-Specialized Laboratory of Instrumental Chemical and Tobacco Analysis, Reference Health Laboratory, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding author's e-mail: alimohebbi.tums@gmail.com

Abstract

Omics biology, ranging from metabolomics to genomics, represents a transformative revolution in precise diagnosis, targeted therapy, and personalized medicine. By comprehensively profiling biomolecules such as metabolites, proteins, and genetic material, omics technologies enable an unprecedented understanding of disease mechanisms at multiple biological levels. This integrated approach is particularly impactful in identifying and characterizing fetal anomalies, where the complexity of genetic and environmental interactions challenges traditional diagnostic methods.
Metabolomics, as a window into cellular metabolism, reveals subtle biochemical alterations during fetal development, allowing early detection of metabolic dysfunctions associated with congenital disorders. Genomics complements this by providing detailed insights into inherited and de novo genetic variations that predispose to anomalies. Together, these omics layers facilitate precise diagnosis of fetal conditions with higher sensitivity and specificity than conventional techniques.Moreover, exposomics—the comprehensive assessment of environmental exposures—adds a vital dimension by uncovering how external factors such as toxins, maternal health, and lifestyle influence fetal development and interact with the genome and metabolome. This gives rise to a holistic understanding of the multifactorial causes underlying fetal malformations, bridging the gap between genetic predisposition and environmental triggers.The integration of omics and exposomics data advances personalized medicine by enabling risk stratification, early intervention, and the development of targeted therapeutic strategies tailored to the molecular profile of each fetus. This paradigm shift holds promise not only for improving prenatal care outcomes but also for reducing neonatal morbidity and mortality by informing preventive measures and innovative treatments.In conclusion, omics biology, enriched by exposomics perspectives, offers powerful tools to decipher the complex etiology of fetal anomalies. This multidisciplinary approach paves the way for breakthroughs in precise diagnostics, effective targeted therapies, and personalized medicine, ultimately enhancing the health and longevity of future generations.

Keywords : Omics biology,Metabolomics, Fetal anomalies, Exposomics , Personalized medicine

23950-Invited oral presentation

Proteomics and Development: The Key Role of Proteins in Shaping Fetal Fate

Nahid Safari[1*]

1-Endocrine Research Center, Institute of Endocrinology and Metabolism, Iran University of Medical Sciences, Tehran, Iran
*Corresponding Author: safari.n@iums.ac.ir

Abstract

Development from a single zygote to a fully formed fetus is a precisely coordinated process, during which genetic information is translated into defined cellular, tissue, and organ structures. While genomics offers the foundational blueprint, proteins, functional effectors of biological processes, serve as central architects, directing developmental programs and influencing cell fate decisions from early embryogenesis through fetal maturation. Networks of proteins dynamically control cell differentiation, tissue organization, organ formation, and signaling pathways, integrating intrinsic genetic programs with environmental signals. Cutting-edge proteomic approaches, such as mass spectrometry and quantitative protein profiling, uncover temporal changes in protein abundance, post-translational modifications, and complex interaction networks throughout key developmental stages. These analyses reveal how particular proteins coordinate lineage commitment, tissue patterning, and organogenesis. Moreover, combining proteomic data with transcriptomic and epigenomic information enhances our understanding of the molecular mechanisms governing developmental trajectories. Overall, proteomics provides a powerful framework to dissect the molecular determinants shaping fetal development, offering insights into the fundamental mechanisms of early life.

Keywords : Proteomics, Fetal development, Protein interaction networks, Developmental biology

23965-Invited oral presentation

Next-Generation Sequencing: Revolutionizing Developmental Genomics for Understanding Growth and Development

Nejat Mahdieh[1,2*]

1-Cardiogenetic Research Center, Rajaie Cardiovascular Institute, Tehran, Iran
2-Growth and Development Research Center, Tehran University of Medical Sciences, Tehran, Iran.
*Corresponding Author: nmahdieh@gmail.com

Abstract

Developmental genomics investigates the organization and function of genes during growth and development, playing a pivotal role in elucidating molecular mechanisms of embryogenesis and congenital anomalies. Next-Generation Sequencing (NGS) technologies, including Whole-Genome Sequencing (WGS), Whole-Exome Sequencing (WES), and Long-Read Sequencing, have overcome the limitations of classical genetics, enabling the identification of rare variants (e.g., SNPs, CNVs) and structural variations. These technologies have uncovered key developmental genes, such as TBX5 and SHH, implicated in congenital heart defects and holoprosencephaly. Integration of genomic data with epigenomics (e.g., Bisulfite Sequencing) and, to a limited extent, transcriptomics (RNA-Seq) clarifies genotype-phenotype relationships. However, challenges such as interpreting non-coding variants (VUS), the need for stage-specific reference genomes, and the demand for advanced computational infrastructure persist. The future of NGS in developmental genomics lies in single-cell sequencing, artificial intelligence, and regenerative medicine applications. This article reviews the applications and challenges of NGS in developmental genomics, highlighting its transformative potential in developmental biology.

Keywords: Developmental Genomics, Next-Generation Sequencing, WGS, Epigenomics, Congenital Anomalies

23961-Invited oral presentation

Single-Cell RNA Sequencing Approach for Identifying Virus–Host Cell Interactions: A Computational Pipeline

Mohammadamin Mahmanzar[1*], Karim Rahimian[1], Kaveh Kavousi[1]

1-Department of Quantitative Health Sciences, John A. Burns School of Medicine, University of Hawaii at Manoa, Honolulu, HI, United States
[*]Corresponding Author: mahmanzar74@gmail.com

Abstract

Introduction: Viruses are the most abundant biological entities on Earth, with an estimated 1031 viral particles worldwide. They infect humans, animals, plants, and even bacteria, playing a vital role in shaping ecosystems. Over 200 virus species are known to infect humans, contributing significantly to the global disease burden. The recent COVID-19 pandemic underscores how rapidly viral outbreak can disrupt societies and economies on a global scale. So, recognizing and tracing the viruses is crucial for guiding research, health care strategies and public health policies.Therefore, this study designed to explore the virus's genetic material within host gene pool in the single cell sequencing by retrieving public data from GEO and SRA to identify the main cell type hosts for each virus. To implement this idea the potential of python and R programming language and single cell RNA seq pipeline (developed by Broad institute) are hired to combine and provide a pipeline.Through running the pipeline the entry data will be the raw data of single-cell RNA seq and as output provide gene expression, identified Viruses and their correspond cell type, the frequency of viruses, and the gene name which the virus through the lytic cycle (if applicable) might integrate its genome.In conclusion, identifying the specific cell types targeted by viral infection is crucial for unraveling the molecular basis of disease pathogenesis, particularly in conditions driven by altered gene expression pathways. This knowledge offers valuable insights into how aberrant signaling cascades originate and progress, thereby paving the way for more precise diagnostic tools and targeted therapeutic strategies.

Keywords: RNA Sequencing, Virus, Host cell interactions, Single – cell

23953-Invited oral presentation

The Role of Immunoproteomics in Health and Disease

Professor Abdolreza Esmailzadeh[1*]

1-Cancer Gene Therapy Research Center, Zanjan University of Medical Sciences – Iran
*Corresponding Author: a46reza@yahoo.com

Abstract
Immunoproteomics is a branch of proteomics that focuses on the comprehensive study of the immune system's response to all proteins in a biological sample, such as an immune cell, tissue, or organism. Immunoproteomics represents the convergence of immunology and proteomics and provides a comprehensive understanding of antigens, immunogens, and immunoproteins that interact with the immune system. This interdisciplinary field has broad implications for diagnosis, treatment, and the development of prophylactic-therapeutic vaccines. It integrates immunology and proteomics techniques to identify, characterize, and quantify proteins recognized by the immune system, particularly antibodies and cytokines. Immunoproteomics plays an important role in understanding the immune response in health states such as human maturation and various diseases, including infections, autoimmune disorders, allergies, and cancer, by identifying specific antigens or epitopes that trigger immune responses. It can also be used to discover potential biomarkers for diagnostic and targeted therapeutic purposes such as CAR T cell therapy
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Keywords: Immunoproteomics, Immune response, Biomarkers, Targeted therapy

23952-Invited oral presentation

Omics-Based Pathway Analysis in Psychiatric Disorders

Esmaeil Shahsavand-Ananloo[1*]

1-Department of Psychiatry, Psychosomatic ward, Imam Khomeini hospital complex (IKHC), School of Medicine, Tehran University of Medical Sciences (TUMS)
*Corresponding Author: shahsavand@sina.tums.ac.ir

Abstract

Psychiatric disorders: Such as major depressive disorder, bipolar disorder, anxiety disorders, obsessive-compulsive disorder, personality disorders, and psychotic disorders constitute around 13% of the global burden of disease. These are multifactorial and polygenic disorders, influenced by multiple genes largely of small individual impact on risk, and also environmental and developmental factors. Also known as functional enrichment analysis, is a set of widely used tools for research in life sciences intended to give meaning to high-throughput biological data. The methodology of these tools settles in the gathering and usage of knowledge that comprise biomolecular functioning, coupled with statistical testing and other algorithms. The data for pathway analysis come from high throughput biology, such as high throughput sequencing data and microarray data. Pathway Analysis in Psychiatric Disorders: The polygenic nature of psychiatric disorders complicates etiological research. The individual genetic risk variants typically explain only a small proportion of the disorder liability. However, studies strongly suggest that the many genetic variants are not random, but tend to cluster in genes that are connected via biological pathways. Studies show that gene clusters with functions related to biological pathways along with other Omics, environmental and developmental factors play a key role in the occurrence of psychiatric disorders. Identifying biological pathways underlying psychiatric disorders may provide critical etiological knowledge and even targets for pharmaceutical intervention. Thus, the focus of investigation has recently extended from identifying single genetic variants into defining biological pathways and genetic networks. Multi-OMICS analysis: Our understanding of how brain and mind work has been largely facilitated by studying individual aspects, such as the genome, transcriptome, proteome, epigenome, metabolome, lipidome, and microbiome signatures. Multi-Omics is the combination of multiple single Omics methodologies to gain a more holistic understanding of biological mechanisms and genotype-to-phenotype relationships. Multi-Omics analyses paved the way for a comprehensive understanding of pathological processes. Such studies can help identify causal mechanisms and thus, diagnostic and therapeutic biomarkers. Multi-Omics studies are increasingly facilitated by advances in high throughput technologies and advanced bioinformatics approaches. Recent technological advances have led to the new era in data analyses with large volumes of data from different multi-Omics layers. However, methods for the integration of heterogeneous datasets or various data-types are still lacking. As techniques for “first-generation” multi-Omics research are being polished, the development of the next-generation of multi-Omics techniques is well underway. Nowadays, by using Multi-Omics Factor Analysis (MOFA), along with systems and computational biological approaches following various downstream analyses, we can understand a) the pathophysiology underlying mental disorders, b) molecular diagnosis and c) subtyping them more accurately.
Multi-Omics and pathway analyses are blooming interdisciplinary research areas that are steadily growing and developing. Taken together, we can use multi-Omics-based analytic platform and pathway analysis for understanding psychiatric disorders, and ultimately precision psychiatry approaches.

Keywords: psychiatric disorders, pathway analysis, Omics approach, systems biology, high-throughput biological data, bioinformatics

23954-Invited oral presentation

The application of advanced instrumental analysis methods in omics studies and laboratory diagnostics

Monireh Karami[1*]

1-Specialized Laboratory of Instrumental Chemical and Tobacco Analysis, Reference Health Laboratory, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding author: monireh.karami@ymail.com

Abstract

The application of advanced instrumental analysis methods, including chromatography and mass spectrometry (MS), has revolutionized omics research and laboratory diagnostics by providing highly sensitive, specific, and detailed molecular profiling. Chromatographic techniques such as gas chromatography (GC), liquid chromatography (LC), and ultra-performance liquid chromatography (UPLC) effectively separate complex biological mixtures, allowing accurate identification and quantification of biomolecules across metabolomics, proteomics, lipidomics, and genomics.Mass spectrometry complements chromatography by enabling precise molecular mass measurement, structural characterization, and quantitative analysis. Innovations such as tandem MS/MS and high-resolution MS have further enhanced analytical accuracy and throughput, pivotal for biomarker discovery and disease mechanism exploration.Recent advancements include mass cytometry (CyTOF), which merges flow cytometry with inductively coupled plasma mass spectrometry (ICP-MS) to perform highly multiplexed single-cell proteomic profiling. Using metal-tagged antibodies, CyTOF can quantify dozens of protein markers simultaneously at the single-cell level, offering profound insights into cellular heterogeneity, immune system profiling, and disease pathogenesis. This technology advances diagnostics and therapeutics by supporting early disease detection, monitoring, and personalized treatment strategies.Combining chromatographic separation, mass spectrometry, and mass cytometry provides a powerful multi-omics platform that captures comprehensive molecular and cellular information, facilitating systems biology and translational research. The integration of sophisticated instrumentation with bioinformatics enhances data interpretation, turning complex datasets into actionable biological knowledge.In summary, the synergistic use of chromatography, mass spectrometry, and cutting-edge techniques like mass cytometry is transforming omics sciences and clinical diagnostics, enabling precise molecular characterization, improved diagnostic accuracy, and advancing personalized medicine.

Keywords: Chromatography, Mass spectrometry, Mass cytometry, Omics, Laboratory diagnostics, Biomarker discovery

22055 - Oral

Integrative Analysis of Acylcarnitine Metabolomics and Transcriptomics to Identify Potential Diagnostic Biomarkers in Azoospermia

Elham Ahmadzadeh[1], Ziba Veisi Malekshahi[1 *], Babak Negahdari[1], Mahsa Toorani[1], Faezeh Eslamifar[1], Ali Mohebbi[2**]

1-Department of Medical Biotechnology, School of Advanced Technologies in Medicine, Tehran University of Medical Sciences, Tehran, Iran
2- Specialized Laboratory of Instrumental Chemical and Tobacco Analysis, Reference Health Laboratory, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding Author: ziba.malekshahi@gmail.com , alimohebbi.tums@gmail.com

Abstract

Non-obstructive azoospermia (NOA), a severe form of male infertility, is characterized by impaired spermatogenesis and a complete absence of sperm in the ejaculate. Current diagnostic methods are invasive, with limited reliable non-invasive alternatives available. Acylcarnitines—key regulators of energy metabolism and redox homeostasis—have been associated with sperm function, but their diagnostic utility in NOA remains underexplored. In this study, we employed a multi-omics approach to identify non-invasive biomarkers and elucidate the molecular mechanisms underlying NOA. Targeted metabolomic profiling of 30 acylcarnitines in seminal plasma was performed using LC-MS/MS in NOA patients (n=57) and fertile controls (n=47). Additionally, transcriptomic analysis of public RNAseq data was used to identify differentially expressed genes and enriched pathways. Data integration was conducted using network-based analyses to identify shared dysregulated pathways and genes. Results showed significantly reduced levels of short-chain carnitines (C0, C3) and elevated medium/long-chain (C10, C10:1, C14) in NOA patients. ROC analysis revealed strong diagnostic performance for C0 (AUC = 0.935), C10 (AUC = 0.928), and C3 (AUC = 0.909). Transcriptomic profiling revealed 7,957 downregulated and 1,454 upregulated genes, including those involved in spermatogenesis, oxidative stress, immune response, and metabolism. Integration of omics data identified 27 overlapping genes enriched in mitochondrial β-oxidation, BCAA catabolism, and carnitine metabolism. miRNA analysis highlighted the miR-34/449 family as potential post-transcriptional regulators. In conclusion, our findings highlight disrupted energy metabolism as a hallmark of NOA and propose acylcarnitines and associated gene signatures as promising non-invasive diagnostic biomarkers.

keywords: Azoospermia; Metabolomics; RNAseq; Systems Biology; Omics Data Integration

22300 - Oral

Comparative Analysis of Plasma Amino Acid Profiles Using LC/MS/MS in Children with Type 1 Diabetes and Healthy Children

Mohammadmahdi Amini[1], Ali Mohebbi[2 *], Mohammad Hassan Kazemi[3], Zahra Shahrokhi[4]

1-Faculty of Medicine, Aja University of Medical Sciences, Tehran, Iran
2-Department of Specialized Laboratory of chemical,Reference Health
3-Department of Social Medicin, Aja University of Medical Sciences, Tehran, Iran
4-Specialized Laboratory of Instrumental Chemical and Tobacco Analysis, Reference Health Laboratory, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding Author: alimohebbi.tums@gmail.com

Abstract

Diabetes mellitus is the most common non-communicable chronic disease that can alter plasma amino acid profiles through protein catabolism, and these changes affect children's growth and development. The main objective of this study is the comparative analysis of amino acid profiles in children with type 1 diabetes and healthy children to serve as a diagnostic biomarker in children with type 1 diabetes, as well as to examine the role of specific amino acids in disease progression while modifying the dietary regimen of affected children.In this observational case-control study, 80 children aged 4 to 15 years, including 40 children with type 1 diabetes and 40 control children, were randomly selected and enrolled. The two groups were matched for age and gender. Sampling was performed on dried blood spot (DBS) paper from the second fingertip using a sterile lancet. Plasma levels of 13 amino acids—glutamic acid, glycine, ornithine, tyrosine, alanine, aspartic acid, arginine, citrulline, leucine, methionine, phenylalanine, proline, and valine—were compared between the two groups using liquid chromatography-tandem mass spectrometry (LC/MS/MS).The mean age in diabetic children was 8.93 ± 2.15 years and in non-diabetic children 8.32 ± 2.57 years. Half of the children in both diabetic and non-diabetic groups were girls and half were boys. Among the 13 studied amino acids, the levels of four amino acids—glutamic acid (P=0.039), glycine (P=0.031), ornithine (P=0.047), and tyrosine (P=0.044)—were significantly lower in children with diabetes compared to the control group. No significant differences were observed in the levels of the other nine amino acids between the two groups.Findings of this study indicate significant alterations in the levels of four amino acids in children with type 1 diabetes. These amino acids can be effective in producing energy-regulating hormones, autoimmune responses, and neurotransmitters. Additionally, according to KEGG, these changes may affect arginine/proline metabolism and phenylalanine/tyrosine metabolism pathways.

keywords: Type 1 diabetes;Children;Amino acids;Metabolomics

22590 - Oral

Evaluation of Arginine as a Metabolomic Biomarker in Neonatal Hydronephrosis Using LC–MS/MS

Mina Khajeh [4], Kayvan Mirnia [2 *],Ali Mohebbi [3] ,

1-Dar-ol-Shefa Mirjaveh Hospital, Zahedan University of Medical Sciences, Zahedan, Iran
2-Department of Neonatology, Children's Medical Center, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran
3-Laboratory of Advanced Instrumental Chemical Analysis and Tobacco Studies, Reference Health Laboratory, Tehran University of Medical Sciences, Tehran, Iran
Corresponding Author: alimohebbi.tums@gmail.com

Abstract

Congenital obstructive nephropathy is one of the most common causes of chronic kidney disease in children. Today, due to the vastness of ultrasound screenings during pregnancy, the reported cases of fetal disorders have increased. One of the most common disorders reported in ultrasounds during pregnancy is fetal hydronephrosis. Hydrenephrosis is the dilatation of kidney and urethral tracts. Fetal hydronephrosis as an APD of the renal pelvis greater than or equal to 4 mm in pregnancies with a GA of less than 33 weeks, and an APD greater than 7 mm in pregnancies after 33 weeks. Treatment of fetal hydronephrosis in most cases, is observational and clinical intervention is rarely necessary; however, this topic is still controversial. Determining the treatment strategy in mild and severe cases are clear; 98% of mild hydronephrosis cases will improve spontaneously and almost all cases of severe hydronephrosis will require surgical intervention. On the other hand, in cases of moderate hydronephrosis, the conditions are different, due to diverse results in follow-ups. Prenatal diagnosis of such cases can help to carry out early and timely intervention and prevent various complications such as urinary system infection, pyelonephritis, kidney stones, high blood pressure, kidney dysfunction and pain. Studies have shown that early diagnosis significantly reduces the incidence of severe renal damage due to hydronephrosis. The main clinical challenge is early diagnosis of patients who need therapeutic interventions and benefit from early diagnosis. Therefore, bearing in mind the importance and prevalence of fetal hydronephrosis and the need for early diagnosis and intervention, diagnostic modality and biomarker in its evaluation, in this case-control study we intended to investigate the quantity of arginine in the urine and blood of infants with hydronephrosis, comparing its difference to healthy infants.

keywords: Arginine, Hydronephrosis, Newborn, Kidney

22068 - Oral

Metabolomics Profiling of the Impact of Aging and Sex Hormones on Serum Amino Acid Profiles in the Elderly Iranian Population

Ziba Majidi[1*], Hojat Dehghanbanadaki[2], Maryam Mohammadian[3], Azin Soltani[4], Fatemeh Bandarian[2], Niloufar Najjar[2], Nekoo Panahi[5], Noushin Fahimfar[6]

1-Department of Medical Laboratory Science, School of Allied Medical Sciences, Tehran University of Medical Sciences, Tehran, Iran.
2-Metabolomics and Genomics Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran
3-Student Research committee, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
4-School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.
5-Metabolic Disorders Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
6-Osteoporosis Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
*Corresponding Author: majidi.ziba@gmail.com

Abstract

Background: Aging is associated with numerous physiological changes that increase the risk of metabolic, cardiovascular, and neurodegenerative diseases. Sex hormones, as key regulators of metabolism, play a significant role in these processes. This study investigates the association between serum amino acid levels, sex hormones, and aging-related factors in the elderly population of Bushehr.Methods: This cross-sectional study was conducted on 2001 participants (1143 women and 858 men) aged over 50 years from the Bushehr Elderly Health Program. Levels of 20 amino acids were measured using liquid chromatography-tandem mass spectrometry (LC-MS/MS) and analyzed in relation to variables such as sex, age, menopausal status, and serum levels of FSH, LH, testosterone, and estradiol.Results: Men had higher levels of most amino acids, including leucine, methionine, and alanine, whereas women showed higher levels of glycine and serine. With increasing age, citrulline levels increased in both sexes, while threonine levels significantly decreased in women and alanine levels in men. Lower testosterone levels in men were associated with reduced levels of several amino acids, including alanine, glycine, and glutamine. In women, menopause was significantly associated with decreased threonine levels. Estradiol had the greatest influence on amino acid levels, with methionine showing the strongest association with this hormone.Conclusion: These findings indicate a complex interplay between aging, sex, and amino acid metabolism, shaped by sex hormones. The results could help develop personalized nutritional and therapeutic strategies for the elderly. The main limitation of the study is its cross-sectional design; therefore, it is recommended that future longitudinal studies explore the biological mechanisms underlying these interactions.

keywords: Amino acids, Gender differences, Sex Hormones, Aging, Serum metabolites.

21532 - Oral

Identification of molecular regulators of pluripotency in neural stem cells through transcriptomic analysis for maintaining stable culture conditions

Amir Mokhlesi[1 *], Mahmood Talkhabi[1], Niloofar Nakhaei[2]

1-Department of Animal Sciences and Marine Biology, Faculty of Life Sciences and Biotechnology, Shahid Beheshti University, Tehran, Iran
2-Department of Biology, Faculty of Science, University of Guilan, Rasht, Iran
*Corresponding Author: mokhlesiam@gmail.com

Abstract

Mature neurons have been repeatedly generated from various cell sources through direct reprogramming, without passing through a pluripotent stage, resulting in iNSCs. However, the inability of these cells to divide and survive long-term in culture has limited their applications. Identifying factors that enhance iNSC proliferation and survival is a key focus in neural stem cell research, including this study. The dataset includes two human fibroblast samples (CRL-2097) and two derived iNSC samples, with accession number GSE38045 in the GEO database. After obtaining the expression matrix, the Limma package was used with the parameters adj.P.value < 0.5 and LogFC > 4 to identify differentially expressed genes (DEGs). The number of DEGs identified for iNSCs and fibroblast cells was 114 and 243, respectively. Gene Ontology and KEGG pathway analysis in iNSC samples revealed that DEGs are mainly involved in neural and pluripotency-related functions, including axon guidance, neuron projection, and signaling pathways regulating pluripotency of stem cells. The miRTarBase database was used to identify effective miRNAs, such as hsa-miR-124-3p and hsa-miR-1-3p, that inhibit DEGs in fibroblast samples. Additionally, the TRRUST database identified the most influential transcription factors (TFs) as IRF9 in iNSC samples and SP1 in fibroblast samples. Finally, protein interaction networks of DEGs were identified using STRING and visualized with Cytoscape. Key proteins, including SOX2, PAX6, and DCX for the iNSC network, and FN1, COL1A1, and POSTN for fibroblast networks, were determined using the CytoHubba plugin. The results of this study can potentially aid in understanding regulatory patterns important for the stability of iNSC culture conditions, which plays a significant role in the advancement of neural stem cell research.

keywords: Bioinformatics, Cell culture, Database, Small molecule, Gene network

22374-Oral

Melatonin Induces Expression of ErbB1 and ErbB4 in Pre-implantation Mouse Embryos

Ghazaleh Moshkdanian[1], Fazeleh Entezarian[2], Fatemeh Moghani-Ghoroghi[3], Parichehr Pasbakhsh[3], Seyed Noureddin Nematollahi-Mahani[4], Atefeh Najafi[3], Iraj Ragerdi Kashani[3*]

1 Gametogenesis Research Center, Kashan University of Medical Sciences, Kashan, Iran
2 Anatomical Sciences Research Center, Institute for Basic Sciences, Kashan University of Medical Sciences, Kashan, Iran
3 Department of Anatomy, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran
4 Department of Anatomy, Afzalipour School of Medicine, Kerman University of Medical Sciences, Kerman, Iran
*Corresponding author: ragerdi@tums.ac.ir

Abstract

The aim of this study is to evaluated the effects of melatonin on early embryo competence and the expression rate of the primary implantation receptors (ErbB1 and ErbB4). Therefore, two-cell mouse embryos were cultured in 3 groups: simple media, melatonin-treated (10-9 M melatonin) and Luzindole-treated (10-9 M luzindole). Then, the rate of ErbB1 and ErbB4 gene and protein expression, the level of intracellular ROS, antioxidant capacity, and also the number of cells were evaluated and compared with the fourth group in vivo developed blastocysts (control group). The obtained data from the present study showed that melatonin significantly up-regulated the ErbB1 and ErbB4 gene and protein expression, decreased intracellular ROS, increased the total antioxidant capacity, and also elevated the cell numbers in the melatonin-treated group compared with the other groups ($P \leq 0.05$). Thus, the use of melatonin may be a helpful factor in improving the embryo quality and enhancing the expression of ErbB1 and ErbB4, two important implantation-related genes and proteins.

Keywords: Antioxidant; ErbB1; Melatonin; Pre-implantation embryo; Reactive oxygen species.

21461 - Poster

Design of Protein-Based Nanosystems for Directed Expression of Developmental Genes in Stem Cells

Samira Vaziri[1 *]

1-Department of Biology, Payame Noor University, Tehran, Iran
*Corresponding Author: s_vaziri@pnu.ac.ir

Abstract

Biocompatible protein-based nanosystems represent a novel approach for targeted drug delivery and controlled differentiation of human mesenchymal stem cells (hMSCs). In this study, nanoscaffolds based on amyloid fibrils derived from bovine serum albumin (BSA) were designed for lipase enzyme stabilization and to investigate their effect on the expression of developmental genes. The nanostructures were characterized using DLS, TEM, and FTIR techniques, with an average fibril diameter of approximately ninety ± five nanometers. Enzyme stabilization was achieved with a high efficiency of approximately eighty-four percent, and controlled release studies showed that about seventy-one percent of the enzyme was released within seventy-two hours. Exposure of hMSCs to the nanosystem resulted in a cell viability increase up to one hundred twenty-four percent at the optimal concentration. qRT-PCR analysis confirmed significant upregulation of developmental genes Nestin and βIII-Tubulin by approximately 2.2- and 2.6-fold, respectively, after five days of treatment. These findings highlight the high potential of protein-based Nano systems for gene expression regulation, targeted differentiation, and advancement of regenerative medicine and tissue engineering technologies.Keywords: Protein-based nanosystems, lipase, amyloid fibrils, developmental gene expression, targeted drug delivery

keywords: Protein-based nanosystems, lipase, amyloid fibrils, developmental gene expression, targeted drug delivery

22136 - Poster

Molecular Analysis of 22q11.2 Deletions in Suspected DiGeorge Syndrome: A Study of 71 Iranian Patients

Tannaz Masoumi[1], Zohreh Hosseinkhani[1], Mohammad Mahdavi[1], Hojjat Mortezaeian[1], Nejat Mahdieh[1 *]

1-Cardiogenetic Research Center, Rajaie Cardiovascular Medical and Research Institute, Iran University of Medical Sciences, Tehran, Iran.
*Corresponding Author: nmahdieh@yahoo.com

Abstract

DiGeorge syndrome, also known as 22q11.2 deletion syndrome, is one of the most common microdeletion syndromes. The deletion typically results in haploinsufficiency of several genes, including TBX1, leading to abnormal development of the third and fourth pharyngeal arches during embryogenesis. The syndrome presents with a broad spectrum of clinical features, such as immunodeficiency, congenital heart defects, craniofacial anomalies, palatal defects, and neurodevelopmental disorders. Given its variable expressivity and potential for atypical presentation, early and accurate diagnosis is essential for optimal clinical management and genetic counseling.Blood samples from patients showing signs suggestive of DiGeorge syndrome were collected over a 9-year period. Clinical evaluations were performed, and DNA was extracted. Multiplex ligation-dependent probe amplification (MLPA) was used to detect deletions in the 22q11.2 region.Among the 71 patients studied, 30 were found to have 22q11.2 deletions, confirming the diagnosis of DiGeorge syndrome. Considerable phenotypic variability was observed among positive cases, with some patients lacking the classic features of the syndrome. This underscores the value of genetic testing in detecting atypical presentations.Our findings highlight the importance of genetic screening in suspected cases of DiGeorge syndrome, even in the absence of typical clinical features. Timely and accurate diagnosis enables appropriate management, early interventions, and informed genetic counseling.

keywords: MLPA, DiGeorge syndrome, embryogenesis

22008 - Poster

Associations Between Circulating Amino Acids and fibrosis-4 index in an Iranian population: Bushehr Elderly Health (BEH) program

Nafiseh Tavasoli[1], Azadeh Zarinkolah[2], Neda Cheraghloo[3,2], Azin Soltani[4,5], Kazem Khalagi[6], Maryam Amini Shirkouhi[7], Fatemeh Bandarian[1], Mostafa Rezaei-Tavirani[8], Gita Shafiee[9], Afshin Ostovar[10], Niloufar Najjar[5], Noushin Fahimfar[10], Iraj Nabipour[11], Nekoo Panahi[7], Mohammad Reza Mohajeri Tehrani[2], Bagher Larijani[2*]

1-Metabolomics and Genomics Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
2-Endocrinology and Metabolism Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
3-Department of Epidemiology and Biostatistics, school of public health, Tehran University of Medical Sciences, Tehran, Iran
4-School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.
5-Diabetes Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
6-Obesity and Eating Habits Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
7-Metabolic Disorders Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
8-Proteomics Research Center, Faculty of Paramedical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
9-Chronic Diseases Research Center, Endocrinology and Metabolism Population Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
10-Osteoporosis Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
11-The Persian Gulf Marine Biotechnology Research Center, The Persian Gulf Biomedical Sciences Research Institute, Bushehr University of Medical Sciences, Bushehr, Iran.
*Corresponding Author: larijanib1340@gmail.com

Abstract

Prevalence of Non-Alcoholic Fatty liver Disease (NAFLD) has been growing over time and reached 32.4% in 2022. Recent evidence underscores the role of amino acids (AAs) metabolism in NAFLD pathogenesis, but the exact mechanism and extent of effect is still unclear. The aim of this study is to ascertain the association of circulating AA profile and NAFLD, utilizing Fibrosis-4 index (FIB4) in elderly Iranian population. 1642 participants aged 50 years old and older were included in this cross-sectional study from the Bushehr Elderly Health (BEH) program. FIB4 was calculated as surrogate markers for NAFLD. AAs concentrations were measured using liquid chromatography–tandem mass spectrometry (LC-MS/MS). Ordinal logistic regression and principal component analysis (PCA) were used to assess associations between amino acid patterns and FIB4, adjusting for confounders such as age, sex, body mass index, diabetes, lipid profile, and inflammation markers. Higher levels of methionine, phenylalanine, citrulline, glycine, ornithine, threonine, serine, lysin, asparagine, and glutamine were associated with a higher FIB4 score. The PCA revealed 5 AA components, all of which were positively associated with FIB4 level in fully adjusted models. Factor 5, comprising Citrulline and Ornithine, showed the greatest odds ratio (OR=1.331, CI95%= 1.214-1.458, P value<0.001). In conclusion, certain AA profile, especially Methionine, Citrulline and Ornithine are associated with a higher risk of NAFLD and liver fibrosis. Findings of this study could be utilized in early and non-invasive detection of liver disease. Further investigation is required to determine the mechanism of AA profile influence on NAFLD.

keywords: Non-alcoholic fatty liver disease, amino acids, tandem mass spectrometry, fibrosis 4 score, liver fibrosis.

21978 - Poster

B Vitamins and Related Metabolites in Relation to Osteoporosis, Bone Mineral Density, and Trabecular Bone Score in Older Adults

Hojat Dehghanbanadaki[1], Ghazal Mohammadi[1], Ali Etemadi[2,3], Atefeh Bakhshian[2], Gita Shafiee[4*], Afshin Ostovar[5], Fatemeh Bandarian[1], Bagher Larijani[6], Iraj Nabipour[7], Farshad Farzadfar[8], Ramin Heshmat[4], Noushin Fahimfar[5*]

1-Metabolomics and Genomics Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
2-Metabolic Disorders Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran
3-Medical Biotechnology Department, School of Advanced Technologies in Medicine, Tehran University of Medical Sciences (TUMS), Tehran, Iran
4-Chronic Diseases Research Center, Endocrinology and Metabolism Population Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran
5-Osteoporosis Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran
6-Endocrinology and Metabolism Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran
7-The Persian Gulf Marine Biotechnology Research Center, The Persian Gulf Biomedical Sciences Research Institute, Bushehr University of Medical Sciences, Bushehr, Iran
8-Non-Communicable Diseases Research Center, Endocrinology and Metabolism Population Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding Author: nfahimfar@gmail.com

Abstract

Osteoporosis increases fracture risk in older adults, yet the influence of B vitamins, critical for one-carbon metabolism and bone remodeling, remains uncertain[1]. This study examined links between B vitamin–related metabolites and bone health measures (osteoporosis status, bone mineral density, and trabecular bone score) in 400 adults ≥60 years from the Bushehr Elderly Health program. Metabolites were quantified via tandem mass spectrometry, and associations were assessed using Partial Least Squares-Discriminant Analysis, Spearman correlations, and logistic regression, adjusting for age, sex, BMI, and diabetes. Study participants included 158 individuals with osteoporosis (79% female and average age of 70.8± 6.9) and 242 non-osteoporotic controls (37% female and average age of 68.3± 5.7). Higher levels of 3-hydroxyanthranilic acid, tryptophan, and kynurenine were each associated with a 26%, 26%, and 22% reduced likelihood, respectively, of developing osteoporosis. On the other hand, elevated levels of 5-methyl-tetrahydrofolate and pyridoxal were linked to a 28% and 27% increased likelihood, respectively, of developing osteoporosis. The association between vitamin B-related metabolites and risk of osteoporosis is depicted in Table 1. Additionally, we observed positive associations between xanthurenic acid and tryptophan with bone mineral density in the spinal (coefficient=0.27 and coefficient =0.20), total hip (coefficient=0.31 and coefficient =0.32), and femoral neck (coefficient=0.26 and coefficient =0.31), as well as with spinal trabecular bone score (coefficient=0.14 and coefficient =0.21). The key osteoporosis discriminant predictors were 3-hydroxyanthranilic acid and tryptophan (decreased in women) and cystathionine (decreased in men). These markers offer new insights for early detection and prevention of bone loss across genders.

keywords: Osteoporosis, Bone mineral density, Trabecular bone score, Vitamin B, metabolites, PLS-DA

21565 - Poster

Transcriptome analysis to identify key regulatory genes in polycystic ovary syndrome in women

Amir Mokhlesi[1*], Niloofar Nakhaei[2], Mahmood Talkhabi[1]

1-Department of Animal Sciences and Marine Biology, Faculty of Life Sciences and Biotechnology, Shahid Beheshti University, Tehran, Iran
2-Department of Biology, Faculty of Science, University of Guilan, Rasht, Iran
*Corresponding Author: mokhlesiam@gmail.com

Abstract

One of the most common endocrine disorders that affects the fertility of young women and leads to metabolic symptoms in older women is Polycystic Ovary Syndrome (PCOS). According to estimates by the World Health Organization (WHO), more than 116 million women (3.4%) worldwide suffer from PCOS. This study aims to find and explore the molecular mechanisms of regulatory genes involved in PCOS to improve women's quality of life. Data from granulosa cells of 3 PCOS patients and 3 healthy controls (GSE138518) were analyzed using R and the Limma package, identifying 198 differentially expressed genes (DEGs) in PCOS and 215 in healthy samples based on criteria of P.value<0.5 and LogFC>2. Gene Ontology analysis revealed DEGs mainly related to inflammatory and immune responses, including inflammatory response and cytokine regulation. Key transcription factors such as KLF6, CTCF, and CIITA were identified via the TRRUST database, while miRTarBase highlighted miRNAs hsa-miR-576-3p and hsa-miR-4656 as major DEG inhibitors. Protein-protein interaction networks were constructed using STRING and Cytoscape, with CytoHubba identifying ITGB2, PTPRC, and ITGAM as central proteins in PCOS, and MT-ND4, MT-CO2, and MT-ND4L in healthy controls. The present study, focusing on the identification of key molecular regulators in PCOS and by aligning its findings with similar studies, has paved the way for developing more effective strategies for the treatment and management of this disorder.

keywords: Differential expression, Transcription factor, small molecule, Protein network, Key gene

22266 - Poster

From Clinical Suspicion to Genetic Diagnosis in Williams Syndrome

Zohreh Hosseinkhani[1], Tannaz Masoumi[1], Mohammad Mahdavi[1], Hojjat Mortezaeian[1], Nejat Maheieh[1 *]

1-Cardiogenetic Research Center, Rajaie Cardiovascular Medical and Research Institute, Iran University of Medical Sciences, Tehran, Iran.
*Corresponding Author: nmahdieh@yahoo.com

Abstract

Williams syndrome (WS), a multisystem neurodevelopmental disorder caused by a microdeletion on chromosome 7q11.23, is characterized by developmental delay, intellectual disability, distinctive personality traits, cardiovascular disease, growth deficiency, connective tissue and endocrine abnormalities, and unique facial features. Due to phenotypic variability, timely genetic confirmation is critical for effective management and counseling. From 2016 to 2024, peripheral blood samples were collected from 20 patients referred to Rajaei Hospital with suspected WS. DNA was extracted, and multiplex ligation-dependent probe amplification (MLPA) targeting 7q11.23 was performed to detect the microdeletion. Additionally, direct sequencing of the ELN gene (c.450C>G and c.1324C>T regions) was conducted.MLPA confirmed the 7q11.23 microdeletions in 10 of the 20 patients, while the remaining 10 showed no deletion. No patients carried the ELN variants c.450C>G or c.1324C>T. These findings validate MLPA as a reliable tool for WS diagnosis in this cohort and support its role in guiding genetic counseling.Genetic confirmation of WS via MLPA is essential for accurate diagnosis and enables a coordinated, multidisciplinary care pathway. Given the condition's phenotypic heterogeneity, clinical suspicion alone is insufficient for effective care planning. Genetic testing ensures precise diagnosis, informs treatment decisions, and enhances genetic counseling for families.

keywords: Microdelition MLPA ELN

21974 - Poster

Metabolic Signatures of Sarcopenia: Serum Amino Acid Changes in Elderly Iranians

Ghazal Mohammadi[1], Hojat Dehghanbanadaki[1], Azin Soltani[2], Ziba Majidi[3], Mostafa Rezaei-Tavirani[4], Afshin Ostovar[5], Noushin Fahimfar[5], Fatemeh Bandarian[6], Niloufar Najjar[6], Bagher Larijani[7], Iraj Nabipour[8], Ramin Heshmat[9], Gita Shafiee[9 *]

1-Metabolomics and Genomics Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran
2-Metabolic Disorders Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
3-Department of Medical Laboratory Science, School of Allied Medical Sciences, Tehran University of Medical Sciences, Tehran, Iran.
4-Proteomics Research Center, Faculty of Paramedical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
5-Osteoporosis Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
6-Metabolomics and Genomics Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
7-Endocrinology and Metabolism Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
8-The Persian Gulf Marine Biotechnology Research Center, The Persian Gulf Biomedical Sciences Research Institute, Bushehr University of Medical Sciences, Bushehr, Iran.
9-Chronic Diseases Research Center, Endocrinology and Metabolism Population Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
*Corresponding Author: gshafiee.endocrine@gmail.com

Abstract

Sarcopenia, the age-related loss of muscle mass and function, is a growing concern in older adults[1]. This study investigated serum amino acid alterations and metabolic pathways linked to sarcopenia in 979 adults ≥50 years from the Bushehr Elderly Health Program, selected via multistage stratified random sampling. Logistic regression and pathway impact analysis, adjusted for age and sex, were applied.The cohort included 179 sarcopenia cases (55% female; mean age=67.1±5.2) and 800 controls (55.3% female; mean age=71.3±6.9). Sarcopenia risk increased with higher citrulline (OR=1.35; 95%CI: 1.12–1.62), glycine (OR=1.30; 95%CI: 1.09–1.55), aspartic acid (OR=1.23; 95%CI: 1.04–1.47), and serine (OR=1.19; 95%CI: 1.00–1.42), but decreased with higher tyrosine (OR=0.78; 95%CI: 0.66–0.93) and valine (OR=0.77; 95%CI: 0.64–0.92). Low handgrip strength was less likely with higher tyrosine (OR=0.82; 95%CI: 0.71–0.95), valine (OR=0.82; 95%CI: 0.71–0.95), and tryptophan (OR=0.86; 95%CI: 0.74–0.99). Slow walking speed risk increased with proline (OR=1.33; 95%CI: 1.15–1.54), aspartic acid (OR=1.17; 95%CI: 1.02–1.34), and ornithine (OR=1.15; 95%CI: 1.00–1.32).For low skeletal muscle index, risks increased with glycine (OR=1.26; 95%CI: 1.09–1.45), citrulline (OR=1.22; 95%CI: 1.05–1.41), serine (OR=1.20; 95%CI: 1.04–1.38), asparagine (OR=1.17; 95%CI: 1.02–1.34), and aspartic acid (OR=1.16; 95%CI: 1.01–1.34), but decreased with valine (OR=0.82; 95%CI: 0.71–0.95) and tyrosine (OR=0.83; 95%CI: 0.72–0.95).Key pathways in sarcopenia development included “phenylalanine, tyrosine and tryptophan biosynthesis”, “glycine, serine and threonine metabolism”, and “alanine, aspartate and glutamate metabolism”, highlighting potential metabolic targets for sarcopenia prevention.

keywords: walking speed, skeletal muscle index, metabolite, handgrip strength, Sarcopenia

22604 - Poster

Metabolomics Insights into Amino Acid Pathway Dysregulation in Osteoporosis among Iranian Elderly Women and Men

Ziba Majidi[1*], Hojat Dehghanbanadaki[2], Maryam Mohammadian[3], Azin Soltani[4], Fatemeh Bandarian[2], Niloufar Najjar[2], Nekoo Panahi[5], Noushin Fahimfar[6]

1-Department of Medical Laboratory Science, School of Allied Medical Sciences, Tehran University of Medical Sciences, Tehran, Iran.
2-Metabolomics and Genomics Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
3-Student Research committee, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
4-School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.
5-Metabolic Disorders Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
6-Osteoporosis Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran.
*Corresponding Author: majidi.ziba@gmail.com

Abstract

Background: Osteoporosis is one of the most common skeletal disorders in the elderly, characterized by reduced bone density and increased fracture risk. Despite diagnostic advances, there remains a need for accessible and reliable biomarkers for early prediction and diagnosis. In this study, amino acid profiles and metabolic pathways associated with osteoporosis were investigated in an Iranian elderly population using a metabolomics approach.Methods: Data were extracted from the Bushehr Elderly Health Program (BEHP), including 1,916 individuals (1,097 women and 819 men). Levels of 20 amino acids were measured using liquid chromatography-tandem mass spectrometry (LC-MS/MS) .Logistic regression, metabolic pathway analysis, and ROC curve analysis were used to evaluate the association between serum amino acids and osteoporosis status.Results: In women, higher levels of glycine, citrulline, serine, and aspartic acid were associated with a 27%, 25%, 23%, and 21% increased risk of osteoporosis, respectively. In men, elevated levels of tyrosine, leucine, valine, and lysine were linked to a 24%, 22%, 22%, and 22% reduction in osteoporosis risk, respectively. The most significantly altered metabolic pathway in both genders was "phenylalanine, tyrosine, and tryptophan biosynthesis." In women, citrulline showed an AUC of 0.63; in men, valine, leucine, and tyrosine showed AUC values of 0.62, 0.61, and 0.61, respectively, indicating moderate diagnostic accuracy for distinguishing patients from healthy controls.Conclusion: These findings suggest that dysregulation of amino acid metabolic pathways, particularly those involving essential amino acids, may play a role in the pathogenesis of osteoporosis. These metabolic signatures could serve as potential biomarkers or therapeutic targets for the prevention and management of osteoporosis in the elderly. However, longitudinal and complementary studies are required to confirm causality and evaluate the effectiveness of interventions based on these findings.

keywords: Metabolomics, amino acid, osteoporosis, metabolic pathway, aging.

22208 - Poster

Resilience in Code: How Extremophiles Evolve to Thrive in Hostile Environments

Shirin Dehghan[1 *]

1- Department of Genetics, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran
*Corresponding Author: shirindehghan2021@gmail.com

Abstract

Extremophilic bacteria provide a unique model for studying molecular adaptation under harsh conditions. This study aimed to investigate genomic strategies of thermophilic bacteria that enable survival at elevated temperatures. Publicly available genome sequences from thermophilic species were retrieved from the NCBI database and compared to their mesophilic relatives using in silico phylogenetic and codon-usage analyses. Comparative analysis revealed that thermophiles display a significantly higher GC content in coding regions, along with increased frequencies of charged amino acids, which contribute to protein stability. Phylogenetic reconstruction suggests that these traits have independently evolved multiple times in distant lineages, indicating convergent adaptation. Moreover, genome streamlining was observed in several species, likely reducing metabolic burden under energy-limiting conditions. These findings highlight the evolutionary plasticity of thermophilic bacteria and emphasize their potential for biotechnological applications, such as thermostable enzyme production. The study underscores the value of bioinformatics-based approaches in understanding microbial evolution without the need for experimental cultivation.

keywords: Extremophilic bacteria, Thermophiles, Genomic adaptation, Protein stability

22085 - Poster

Bioinformatics Analysis of the Role of miR-30 Family in Osteogenic Differentiation

Fattane Sam Daliri[1], Fatemeh Kouhkan[2], Mousa Kehtari[1]*

1- Department of Animal Biology, Faculty of Biology, University of Tehran, Tehran, Iran
2- Department of Molecular Biology and Genetic Engineering, Stem Cell Technology Research Center, Tehran, Iran
*Corresponding Author: mkehtari@ut.ac.ir

Abstract

Bone is a dynamic and vital tissue that undergoes continuous remodeling throughout life, playing a key role in body strength and function. The transcription factor RUNX2 is recognized as the main regulator of osteoblast differentiation and bone formation, interacting with signaling pathways such as TGFβ, BMP, Wnt and FGF in the process of osteogenesis. Furthermore, microRNAs (miRNAs), as small non-coding RNAs, play a crucial role in cellular differentiation and bone remodeling by regulating gene expression and maintaining bone homeostasis. They are considered potential biomarkers and therapeutic targets. In this study, a bioinformatics analysis was conducted to investigate miRNAs affecting the osteogenic differentiation pathway. We focused on RUNX2, a key osteogenic differentiation factor, and identified all miRNAs that target this gene across four databases: TargetScan, miRDB, StarBase, and miRTarBase. The results showed that 1037 miRNAs were identified in TargetScan, 263 in miRDB, 20 in StarBase, and 33 in miRTarBase. By examining the overlaps among these databases, the miR-30 family, including four miRNAs (has-miR-30a-5p, has-miR-30b-5p, has-miR-30c-5p, and has-miR-30d-5p), was identified as a common group of targeting miRNAs. Scoring analysis in these databases revealed that the miR-30 family targets the RUNX2 gene with a high probability, suggesting that it may lead to a decrease in osteogenesis. Previous studies have also confirmed the inhibition of osteogenic differentiation by these miRNAs.The aim of this research is to propose potential strategies for improving bone injuries and accelerating osteogenesis using miRNA antagomirs. The validation and realization of these findings require further laboratory investigations and clinical trials.

keywords: Bone, RUNX2, miRNA, miR-30, Osteogenesis

22243 - Poster

Potential Biomarkers of Non-Obstructive Azoospermia Identified through Untargeted Metabolomics and miRNA-seq Integration

Faezeh Eslamifa[1], Babak Negahdari[1*], Ziba Veisi Malekshahi[1], Ali Mohebbi[2], Elham Ahmadzadeh[1], Mahsa Toorani[1], Ali Mohebbi[2**]

1- Department of Medical Biotechnology, School of Advanced Technologies in Medicine, Tehran University of Medical Sciences, Tehran, Iran
2- Specialized Laboratory of Instrumental Chemical and Tobacco Analysis, Reference Health Laboratory, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding Author: negahdari_md@yahoo.com , alimohebbi.tums@gmail.com**

Abstract

Non-obstructive azoospermia (NOA) is one of the most severe forms of male infertility, characterized by complete disruption of spermatogenesis and absence of sperm in the ejaculate. Its diagnosis currently relies on invasive procedures, and reliable non-invasive tools for distinguishing it from other disorders are limited. This study aimed to identify potential non-invasive biomarkers and elucidate molecular pathways involved in NOA through the integration of metabolomics and transcriptomics data. Untargeted GC–MS profiling of organic acids in seminal plasma was performed on 20 NOA patient samples and 20 control samples. Metabolomics analysis identified 13 significantly altered metabolites between patients and controls, among which caprylic acid, uridine, and octadecane were introduced as potential biomarkers. Over-representation analysis (ORA) highlighted SLC-mediated transmembrane transport, fatty acid transport, small molecule transport, and amino acid metabolism as key processes. Publicly available miRNA–seq data were analyzed using the edgeR package, identifying 19 miRNAs with |log2FC|>2. Their target genes were retrieved and compared with genes associated with metabolite-related pathways, resulting in 23 shared genes. Differentially expressed miRNAs were then compared with miRNAs regulating the shared genes, which led to the identification of miR-202-3p as a potential central regulator. These findings indicate marked disturbances in membrane transport and energy-related metabolism in NOA, with miR-202-3p–linked regulatory axes playing a pivotal role. The combination of three candidate metabolites (caprylic acid, uridine, and octadecane) together with miR-202-3p represents a promising non-invasive panel for NOA diagnosis.Keywords: Azoospermia, Untargeted Metabolomics, Organic Acids, miRNA–seq, Data Integration

keywords: Azoospermia, Untargeted Metabolomics, Organic Acids, miRNA–seq, Data Integration

22410 - Poster

Identification of the miRNA Functional Network of the Superoxide Dismutase 1 gene using NGS Data Analysis

Seyyedeh Fatemeh Hosseini Harandeh[1], Maryam Hassanlou[2*], Sohameh Mohebbi[1*]

1- Department of Biology, Faculty of Basic Sciences, Ale-Taha Institute of Higher Education, Tehran, Iran.
2- Department of Biology, Farzanegan Campus, Semnan University, Semnan, Iran
*Corresponding Author: m.hassanlou@semnan.ac.ir , s.mohebbi@aletaha.ac.ir

Abstract

The gene encoding the superoxide dismutase protein (SOD1) is a soluble homodimeric enzyme protein that converts natural but harmful superoxide radicals into molecular oxygen and hydrogen peroxide. Dysfunction of this gene is associated with many developmental diseases, including heart failure, cancer, diabetes, Down syndrome, and amyotrophic lateral sclerosis (ALS). Recent studies have shown that many genes exert their functions through miRNAs located within their own gene sequences.In this study, novel miRNAs located in the SOD1 gene were predicted using bioinformatics tools. For this purpose, SSCprofiler software was used to predict stem-loop structures in the genomic region of the SOD1 gene. The mature miRNA sequence was predicted using MatureBayes software. The UCSC database was used to examine the conservation status of the identified miRNAs and their precursor sequences. In addition, RNAfold software was used to predict RNA secondary structure. Finally, miRNA-seq data analysis confirmed the expression of the predicted sequences in different tissues. The results showed that SOD-1, which is about 11.2 kilobases long, has stem-loop structures similar to miRNAs and has a relatively conserved sequence. The presence of these miRNAs in the SOD1 gene can significantly affect the levels and function of this gene. Identification of these new miRNAs can help us understand the molecular mechanism of this gene in various diseases and explain some of the complexities of SOD1 gene function.

keywords: miRNA-seq; SOD1; amyotrophic lateral sclerosis; Next-Generation Sequencing; bioinformatics.

21825 - Poster

Identification of Pathways Involved in Imatinib Sensitivity and Resistance in CML Patients by Bioinformatics Analysis

Mahsa Mirzaei[1], Farideh Faramarzi[1], Mehrdad Behmanesh[1 *]

1- Department of Genetics, Faculty of Biological Sciences, Tarbiat Modares University, Tehran, Iran
*Corresponding Author: behmanesh@modares.ac.ir

Abstract

Chronic myeloid leukemia (CML), as an aggressive malignancy, is characterized by chromosomal aberrations involving the fusion of the BCR and ABL1 genes into the pathogenic BCR-ABL1 oncogene. Imatinib drug was the first signal transduction inhibitor used in the treatment of CML. This drug binds to the ATP-binding site of the BCR-ABL oncoprotein, which results in the inhibition of some downstream signaling pathways. Imatinib has many therapeutic benefits. However, some factors contribute to resistance against imatinib. The purpose of this study was to evaluate the potential signaling pathways for imatinib resistance. For this purpose, microarray data GSE44589 were analyzed from the Gene Expression Omnibus (GEO) to identify candidate genes in imatinib-resistant CML patients. The differentially expressed genes (DEGs) were identified by the GEO2R tool. DEGs were grouped based on common pathways by Enrichr-KG. Also, STRING was used to create the protein-protein interaction network. We identified 23 upregulated hub genes including DNM3, CXCL8, FCER1A, AVPR1A, MS4A2, HDC, SPP1, TNFSF4, MYB, ANGPT1, ITGB8, SCCPDH, MMRN1, RAB27B, TFPI, GATA2, CLEC1B, SLC24A3, IGF2BP3, TYMS, TFDP2, NAT8B and CLC. The enriched pathways of these genes include the Phospholipase D signaling pathway, Fc epsilon RI signaling pathway, PI3K-Akt signaling pathway, CD4-positive, alpha-beta T cell differentiation, failure of vascular branching, hemostasis and platelet degranulation. Notably, the PI3K-Akt pathway emerged as a central pathway, linking several of these pathways. Identification of genes and signaling pathways involved in imatinib resistance is crucial for developing targeted therapies and predicting treatment responses. However, further experimental validation is necessary to confirm these results.

keywords: CML, Imatinib drug, In-silico analysis, Protein-protein interaction, Signaling pathways

22408 - Poster

Identification of Hub Genes and Developmental Signaling Pathways in Polycystic Ovary Syndrome using Microarray Data Analysis

Sara Fallahzadeh[1], Maryam Hassanlou[2 *], Sohameh Mohebbi[1]

1- Department of Biology, Faculty of Basic Sciences, Al-Taha Institute of Higher Education, Tehran, Iran.
2- Department of Biology, Farzanegan Campus, Semnan University, Semnan, Iran.
*Corresponding Author: m.hassanlou@semnan.ac.ir , s.mohebbi@aletaha.ac.ir

Abstract

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders and a major cause of infertility in women of reproductive age, which is associated with hormonal imbalance, metabolic changes, and disruption of developmental processes. Genetic and transcriptomic studies can provide valuable insights into the molecular mechanisms involved in this complex disease.In this study, transcriptomic data of granulosa cells of PCOS patients were extracted from the GSE24526 dataset. Differentially expressed genes were identified using the criterion $|LogFC| \geq 2$ and p-value < 0.05. Functional enrichment analysis was performed using the DAVID database and the protein-protein interaction (PPI) network was drawn using STRING. Hub genes were determined based on network topological indices, especially Degree centrality, using Cytoscape software.The findings showed that several genes are involved in hormonal signaling pathways, inflammatory responses, and developmental processes of granulosa cells. Among them, TP53, NFKB1, and CD4 genes were identified as key hub genes that could play a fundamental role in granulosa cell maturation and follicular development. These results suggest that the identified genes can be considered as potential targets for future studies.This study highlights the importance of developmental genetics in understanding the pathophysiology of PCOS and provides new insights into how developmental processes of granulosa cells are disrupted in PCOS. To definitively confirm these findings, further studies with larger samples, using RNA-seq data, and in vitro studies are recommended.

keywords: PCOS; developmental genetics; granulosa cells; DEGs; hub genes; bioinformatics.

22344 - Poster

Genetic and Phenotypic Spectrum of Rett Syndrome in Iranian Population: Identification of a Novel MECP2 Variant

Parnoush Booalizadeh[1], Nejat Mahdieh[2 *], Mahmoud Reza Ashrafi[3]

1- Department of Genetics, Science and Research Branch, Islamic Azad University, Tehran, Iran
2- Department of Cardiogenetic Research Center, Rajaie Cardiovascular Medical and Research Institute, Iran University of Medical Sciences, Tehran, Iran
3- Pediatrics Center of Excellence, Department of Pediatric Neurology, Children's Medical Center, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding Author: nmahdieh@yahoo.com

Abstract

Rett syndrome (RTT) is a severe X-linked neurodevelopmental disorder primarily affecting females, predominantly caused by mutations in the MECP2 gene. This study aimed to characterize the genetic and clinical spectrum of RTT in Iran. We analyzed a cohort of 11 Iranian RTT patients. Comprehensive clinical assessment, pedigree analysis, and Sanger sequencing of the MECP2 gene were performed. Pathogenicity of identified variants was evaluated using in silico prediction tools (MutationTaster, VarSome, Franklin) following ACMG guidelines. A novel frameshift mutation, c.1268_1269insGGGCACTC (p. Leu424GlyfsTer61), was identified in exon 4, predicted to be disease-causing and likely pathogenic. Overall, 9 distinct MECP2 variants were identified, all classified as pathogenic. Exon 4 was confirmed as a major mutational hotspot. All patients presented core RTT features including psychomotor regression and loss of purposeful hand use. Prevalent accompanying symptoms included microcephaly (36%) and seizures (27%). This study expands the mutational spectrum of RTT by reporting a novel MECP2 variant and underscores the genetic heterogeneity of the disorder in Iran. The findings highlight the necessity of region-specific genetic studies to improve diagnostic yield and pave the way for personalized management.

keywords: Rett syndrome; MECP2; novel mutation; neurodevelopmental disorder

22071 - Poster

Integrative Multi-Omics Analysis for the Identification of Non-Invasive Biomarkers in Non-Obstructive Azoospermia

Mahsa Toorani Ghazvini[1], Ziba Veisi Malekshahi[1 *], Babak Negahdari[1], Elham Ahmadzade[1], Faezeh Eslami far[1], Ali Mohebbi[2**]

1- Department of Medical Biotechnology, Faculty of Advanced Medical Technologies, Tehran University of Medical Sciences, Tehran, Iran
2-Specialized Laboratory of Instrumental Chemical and Tobacco Analysis, Reference Health Laboratory, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding Author: ziba.malekshahi@gmail.com , alimohebbi.tums@gmail.com**

Abstract

Non-obstructive azoospermia (NOA) is a severe form of male infertility marked by complete spermatogenic failure, highlighting the urgent need for accurate non-invasive biomarkers to replace invasive biopsies.In this study, transcriptomic data (RNA-seq) from testicular tissue (12 NOA and 6 control samples) were obtained from the GEO database. After rigorous quality control and normalization with the limma-voom model, 10 genes with significant alterations were identified through differential expression analysis. Functional enrichment based on major biological pathway databases was conducted, and these genes were found to be strongly involved in hormonal regulation, oxidative stress responses, and extracellular matrix organization.In parallel, metabolomic profiling of seminal plasma from 47 NOA and 57 control samples was performed using the LC-MS/MS technique, highlighted amino acid metabolism, phase II detoxification, and oxidative pathways as major disrupted processes. These alterations, reflected in citrulline, ornithine, and methionine levels, support the role of oxidative stress and metabolic imbalance in NOA. ROC analysis showed AUC values of 0.75–0.84, indicating good diagnostic potential for these metabolites.When transcriptomic and metabolomic findings were integrated, 13 overlapping genes were revealed to bridge the two omics layers, closely linked to the above pathways. Moreover, regulatory network analysis suggested hsa-miR-202-3p and hsa-miR-134-5p as potential upstream regulators of extracellular matrix remodeling and oxidative processes.Taken together, the findings demonstrate that a multi-omics strategy can be employed as a powerful framework for the discovery of non-invasive biomarkers in NOA, paving the way for more precise and personalized diagnostics in male infertility.

keywords: : Non-Obstructive Azoospermia, Metabolomics, RNA-Seq, , Biomarker, Transcriptom.

23963-Poster

Integrated Immunometabolomic Analysis in a Mouse Model of Endometriosis: Metabolic-Immune Interactions and Therapeutic Effects of Cell Therapy

Nastaran Etesamnia[1], Nasim Hayati-Roudbari[1*], Samira Rajai[2]

1-Department of Biology, SR.C., Islamic Azad University, Tehran, Iran
2-Department of Immunology, Tehran University of Medical Sciences, Tehran, Iran
*Corresponding author: nasimhayati@yahoo.com

Abstract:

Endometriosis is a chronic inflammatory disease associated with simultaneous dysregulation of immune responses and cellular metabolism, facilitating disease progression. This study aimed to investigate integrated immunometabolomic alterations focusing on key metabolites affecting T cell functions, particularly Th1 and Th2 responses, in a mouse model of endometriosis and assess the impact of cell therapy. LC/MS/MS serum analysis revealed significant elevations in branched-chain amino acids including leucine and valine, and urea cycle amino acid ornithine, correlating with a pro-inflammatory Th1 profile characterized by increased IL-2 and decreased IFN-γ levels. Conversely, tyrosine and anti-inflammatory metabolites linked to Th2 pathways showed reductions alongside decreased IL-4 and IL-10 following therapy, indicating immunomodulation. Significant changes in acylcarnitines associated with mitochondrial metabolism also aligned with restoration of immune balance post-cell therapy. Statistical analyses confirmed strong reciprocal correlations between metabolic and immune alterations, demonstrating that metabolic disruption drives immune imbalance, while effective therapy ameliorates both axes. This integrative immunometabolomic approach elucidates the complex mechanisms underpinning endometriosis pathogenesis and highlights the potential for targeted therapies addressing synchronized metabolic and immune dysfunction. The findings inform development of novel therapeutic strategies leveraging immunometabolic modulation in endometriosis.

Keywords: Endometriosis, Immunometabolomics, Amino acids, Acylcarnitines, Immune regulation, Th1/Th2 balance

23964-Poster

Investigation of Cellular Metabolism Impact on Amino Acid Profile in Endometriosis Tissue Using LC/MS/MS: A Metabolomic Approach

Ali Mohebbi[1,2] , Vida Hojati[3*], Masoumeh Majidi Zolbin[4], Reza Aflatoonian[5]

1-Fetal & Pediatric Cardiovascular Research Center, Children's Medical Center, Tehran University of Medical Sciences, Tehran, Iran
2-Specialized Laboratory of Instrumental Chemical and Tobacco Analysis, Reference Health Laboratory, Tehran University of Medical Sciences, Tehran, Iran
3-Department of Biology, Da.C., Islamic Azad University, Damghan, Iran
4-Iranian tissue Bank and Research Center, Tehran University of Medical Sciences, Tehran, Iran
5-Department of Endocrinology and Female Infertility at Reproductive Biomedicine Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran.
*Corresponding Authors: vida.hojati@iau.ac.ir

Abstract

Endometriosis is a chronic inflammatory disease marked by the presence of endometrial tissue outside the uterine cavity, causing inflammation and immune cell increase that may affect pelvic and sometimes extra-pelvic organs. Symptoms include dysmenorrhea and infertility, affecting 6 to 10 percent of women of reproductive age. Metabolomics offers a novel approach to analyze metabolic profiles and identify biomarkers in endometriosis. This study examined the amino acid profiles in endometriotic cells to better understand disease pathogenesis. Twenty patients with endometriosis and eleven control patients were enrolled after ethical approval. Samples were obtained via laparoscopic biopsy, processed, and cells cultured. After reaching 80% confluence and 72 hours of culture, cells were collected for metabolic analysis using LC/MS/MS and Chromsystems kits, with samples stored at -80°C. Changes in amino acid levels and metabolism were assessed relative to baseline culture medium. Nineteen amino acids and succinic acid were evaluated. Increased levels of alanine, ornithine, and proline were observed in ectopic and control samples compared to baseline, while other amino acids decreased. Significant reductions of aspartic acid, glutamic acid, histidine, citrulline, arginine, valine, and methionine occurred in ectopic versus control groups. Analysis of 25 enriched metabolite sets revealed key metabolic pathways, including those involving alanine, aspartate, glutamate, histidine, beta-alanine, arginine, and proline, highlighting their importance in inflammation and disease processes. Phenyl-carbonic and fatty acid metabolism alterations were also significant. Statistical modeling showed strong explanation of data variability. The findings demonstrate that metabolic pathway changes in ectopic endometriosis tissue disrupt normal function and contribute to disease pathophysiology. Direct analysis of ectopic cell metabolism improves result reliability and underscores the need for further research to validate and expand understanding of these metabolic alterations and their roles in endometriosis.

Keywords: Metabolomics, Endometriosis, Amino acids, LC/MS/MS

Chapter Nine Artificial Intelligence and Developmental Biology



24030– Invited oral presentation

Graphical Neural Networks: Powerful Artificial Intelligence Models for Graphical Data Processing in Medicine and Biology

Mostafa Chehreghani[1*]

1-Department of Computer Engineering, Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran
*Corresponding Author: mostafa.chehreghani@gmail.com

Abstract

This presentation introduces graph neural networks (GNNs) as a powerful and widely used tool for analyzing graph-structured and network data in medicine, biology, and other domains. GNNs are a family of deep learning models specifically designed to represent, process, and perform inference on graph-structured data. The core operation of these networks is based on message passing and local aggregation: at each layer, every node receives messages from its neighbors, aggregates them, and updates its representation to produce a vector that reflects the topology and local features. Repeating this process across successive layers enables propagation of structural information and the construction of hierarchical representations. Common architectures include graph convolutional networks (GCN), GraphSAGE, attention-based GAT, and general message-passing frameworks such as MPNN; each uses different strategies for weighting messages, sampling neighbors, and updating representations. Key design choices—aggregation mechanism, network depth, integration of edge and node features, and sampling methods—determine the representational capacity and generalization of the model. In medicine and biology, GNNs have found applications in several key areas: prediction of protein-protein interactions, modeling molecular structure and activity for drug design, analysis of gene networks and signaling pathways, study of functional brain networks, and integration of multi-source clinical data to predict treatment outcomes. These uses exploit GNNs' strengths in preserving topology, integrating heterogeneous information, and generalizing to rare or sparse structures. Overall, GNNs provide a flexible, theory-grounded framework for learning from graph-structured data, and continued advances in architectures, algorithms, and explainability tools are expected to mitigate current limitations in scalability, robustness, and interpretability while enhancing their capabilities for complex biomedical problems.

Keywords: Graph Neural Networks (GNNs), Graph-structured and network data, Biology, Medicine

22440 - Oral

Functional and Pathway Analysis of Highly Expressed Genes in Breast Cancer Using Bioinformatic Approaches

Morteza Eslami Moghaddam[1], Mahla Parhizgar[2], Farahnaz Molavi[3*]

1- M.Sc. Student, Department of Biology, Mashhad Branch, Islamic Azad University, Mashhad, Iran
2- Student Research Committee, Birjand University of Medical Sciences, Birjand, Iran
3- Department of Biology, Mashhad Branch, Islamic Azad University, Mashhad, Iran
*Corresponding Author: farahmolavi@gmail.com

Abstract

Breast cancer remains a leading cause of cancer-related mortality among women worldwide. Although advances in detection and therapy have improved outcomes, tumor heterogeneity continues to limit treatment efficacy and prognostic accuracy. Identifying consistently overexpressed genes and clarifying their biological roles are essential for developing better diagnostic and therapeutic strategies. In this study, we applied an integrative bioinformatics workflow to uncover key molecular drivers of breast cancer. Differential expression analysis with GEPIA2 was combined with STRING-based protein–protein interaction mapping and Cytoscape refinement to identify hub genes. Functional annotation and pathway enrichment were conducted using Enrichr across KEGG 2021, GO Biological Process 2025, GO Cellular Component 2025, and GO Molecular Function 2025 databases. Our analyses consistently highlighted TOP2A, UBE2C, RRM2, CENPF, NEK2, TPX2, MMP11, COL10A1, COL11A1, and LRRC15 as hub genes significantly upregulated in breast cancer. These genes were enriched in pathways central to tumor progression, including: (i) chromosome segregation, spindle assembly, and mitotic regulation; (ii) nucleotide metabolism and DNA topology; and (iii) extracellular matrix organization and remodeling of the tumor microenvironment. Such processes contribute to uncontrolled proliferation, genomic instability, and invasive behavior. In summary, the identified hub genes represent potential prognostic biomarkers and therapeutic targets. Their clinical relevance warrants further experimental and translational validation, particularly within the framework of precision oncology and personalized treatment strategies for breast cancer.

keywords: Hub genes, Therapeutic targets, Cell cycle regulation, Protein–protein interaction networks, Prognostic biomarkers.

22274 - Oral

Artificial Intelligence in Identifying and Validating Epigenetic Biomarkers for Prediction and Treatment of Autism Spectrum Disorder (ASD) Using Stem Cells

Reyhaneh Ilanloo[1 *]

1-Islamic Azad University of Medical Sciences, Cell and Molecular Sciences Research Institute, Tehran, Iran
*Corresponding Author: reyhaneh.ilanloo@gmail.com

Abstract

Artificial Intelligence in Identifying and Validating Epigenetic Biomarkers for Prediction and Treatment of Autism Spectrum Disorder (ASD) Using Stem Cells. Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition. Early diagnosis and effective interventions are crucial. Epigenetic alterations, particularly DNA methylation patterns, are recognized as key factors in ASD pathogenesis, holding high potential for use as reliable biomarkers. This multidisciplinary study integrates cell biology, epigenetics, and AI to identify and validate effective epigenetic biomarkers. Human induced pluripotent stem cells (hiPSCs) from ASD patients and healthy controls were differentiated into neurons. Comprehensive DNA methylation profiles were determined using Whole Genome Bisulfite Sequencing (WGBS). The large volume of data was analyzed using the advanced Random Forest (RF) machine learning algorithm. The RF model demonstrated a strong ability to distinguish between ASD patients and control groups with 92% accuracy and an Area Under the Receiver Operating Characteristic curve (AUC-ROC) of 0.95. Feature importance analysis highlighted the critical roles of key genes such as MECP2 and SHANK3 in regulating synaptic function and neural development, suggesting them as new therapeutic targets. These findings align with previous studies and reveal a strong correlation between epigenetic changes and autism's clinical manifestations. This research indicates that epigenetic biomarkers have very high potential for ASD diagnosis and prediction. Further validation using larger, independent clinical datasets is necessary for generalizability and clinical application

keywords: Early Autism Diagnosis, Epigenetic Therapeutic Targeting, Machine Learning in ASD, Autism Cellular Modeling, ASD Prediction.

22293 - Oral

A Biophysical Simulation Framework for Investigating Lidocaine-Induced Conduction Block in Trigeminal Aβ and Aδ Fibers

Faraz Jalilzadeh Zehtab[1*], Roza Jafari Barani[1]

1-Department of Stomatology, Azerbaijan Medical University, Baku, Azerbaijan
*Corresponding Author:

Abstract

Trigeminal neuralgia represents an incapacitating neuropathic condition characterized by irregular interactions among trigeminal sensory fibers, resulting in paroxysmal facial pain of significant intensity. Lidocaine, a commonly employed sodium channel antagonist, offers symptomatic alleviation; however, its dose-dependent influences on various populations of trigeminal fibers are inadequately explained. In this study, a high-fidelity biophysical simulation framework was developed to investigate the lidocaine-induced conduction block in myelinated Aβ and Aδ fibers of the human trigeminal nerve. McIntyre-Richardson-Grill model applied, fiber geometries and ion channel properties were parameterized from experimental data, and a pharmacodynamic model describing state-dependent lidocaine binding to voltage-gated sodium channels was incorporated. The model was undergone validation procedures utilizing recognized electrophysiological standards, encompassing parameters such as conduction velocity, strength–duration relationships, and characteristics of action potential waveforms. Countless simulations were then conducted across a wide range of fiber diameters and drug concentrations to systematically map conduction outcomes. Results revealed a concentration-dependent, differential susceptibility of Aδ fibers to conduction block compared with Aβ fibers, delineating a therapeutic window in which nociceptive transmission could be selectively suppressed while preserving tactile sensation. This mechanistic insight provides a quantitative rationale for optimizing lidocaine dosing strategies in trigeminal neuralgia and highlights the potential of computational “virtual laboratories” to accelerate preclinical evaluation of analgesic compounds. The framework possesses an intrinsic capacity for extensibility, facilitating the prospective integration of personalized patient-specific anatomical considerations, supplementary categories of fibers, and various pharmacological compounds. These findings demonstrate the utility of biophysical modeling as a predictive platform for precision pain therapeutics.

keywords: Trigeminal neuralgia, Lidocaine, Computational modeling, Sodium channels, Conduction block.

22467 - Oral

Cancer Classification Based on Artificial Intelligence and Evolutionary Methods Using Gene Expression Data

Setare Tabasi[1 *], Saina Tabasi[2], Abdolreza Alavi Gharehbagh[3]

1- Department of Biomedical Engineering, , Islamic Azad University, bojnourd, Iran
2- Department of Biomedical Engineering University of sajad, mashhad, Iran
3- Electrical Engineering Department, Islamic Azad University, shahroud, Iran
*Corresponding Author: setare.tabasi@gmail.com

Abstract

Cancer is a collection of diseases characterized by the uncontrolled growth and proliferation of cells. Given the high mortality rates associated with cancer and the limited number of specialists, developing artificial intelligence (AI)-based methods for early detection and classification is crucial. Early diagnosis of cancer remains challenging due to the irregularity and heterogeneity of cancerous cells and their patterns. RNA sequencing (RNA-seq) analysis has emerged as a promising technique for detecting novel cellular isoforms and transcripts, facilitating precise cancer classification and prediction. However, analyzing RNA gene expression data is inherently difficult due to its high dimensionality and feature complexity.In this study, we propose an AI-based approach integrated with a genetic algorithm to discriminate breast cancer from other cancer types using gene expression data. The proposed method employs feature selection to reduce input dimensionality and utilizes an artificial neural network to classify cancer types. Evaluation on the TCGA dataset demonstrates that our approach achieves over 99% accuracy in distinguishing breast cancer from other cancers. Additionally, by reducing the required gene expression data, the method significantly lowers both the computational complexity of the classifier and the number of samples needed for training compared to existing approaches.

keywords: Breast cancer, gene expression, artificial intelligence, genetic algorithm, cancer diagnosis

21837 - Oral

Smart Molecules, Smarter Meat: The Role of AI in Cultivated Meat Bioengineering

Reza AbbasAbadi[1], Sana Yahyazadeh Jasour[1], Hosein Shasavarani[1*], Abbas Saidi[1*]

1-Department of Cellular and Molecular Biology, Faculty of Biological Sciences and Technology, Shahid Beheshti University, Tehran, Iran
[*]Corresponding Author: h_shahsavarani@sbu.ac.ir

Abstract

Cultivated meat has garnered a growing amount of attention as a novel solution to global challenges associated with food security, medical applications and environmental sustainability. Advanced strategies must be implemented to improve the quality, efficiency, and scalability of production in order to accommodate this emerging technology. The objective of this review is to enhance the cultivated meat production process by investigating the role of artificial intelligence (AI) in the selection of effective peptides and proteins, as well as the determination of their optimal dosages. New investigations have shown that the analyses of biological databases through bioinformatics and machine learning algorithms can be used for searching for peptide and protein related to: modification of the tissue structures, increase of nutrient content, and muscle cell proliferation. There are also reports AI-based systems could help recommend the exact amount of these biomolecules to be administered depending on the tissue and the application objectives. This review demonstrates the potential of AI-based methods for rapidly screening peptides and proteins, saving energy and resources, and finally enhancing production efficiency. Furthermore, AI has great prospects in e.g. tissue engineering, the synthesis of therapeutic proteins, or in producing meat structures similar to natural meat with better mechanical properties. In sum, this review emphasizes that AI is a cornerstone of sustainable, scalable cultivated meat production and demonstrates its potential as a strategic connector between food security, healthcare, and environmental stewardship.

keywords: Cultured meat, artificial intelligence, Peptide Selection, Functional Proteins, Machine Learning, Sustainable Biotechnology.

21704 - Poster

Presenting an artificial intelligence model to increase the chance of achieving live birth

Habibeh Zare[1], Zohreh Royaee[2 *]

1-Department of Biology, Payam Noor University, Tehran, Iran
2-Assistant Professor, Computer Department, Eram Institute of Higher Education, Shiraz, Iran
*Corresponding Author: drhzare@pnu.ac.ir

Abstract

In this study, artificial intelligence was used to predict the chance of achieving a live birth using proteomic data from the culture medium used and morphological parameters of the blastocyst. The study was conducted on 74 patients, all of whom underwent single blastocyst transfer at the IVI Center in Tehran. Out of 56 embryos, a single image was recorded for each and protein analysis was performed on 40 samples of the embryo culture medium; these samples were from patients undergoing preimplantation genetic screening. The resulting data were used as input for training the artificial neural network model. The model was trained using a multilayer perceptron and an error backpropagation algorithm. The prediction accuracy of the model was measured by measuring the area under the curve (AUC) in the ROC curve. Three different ANN constructs were able to correctly divide most embryos into two groups of successful (LB+) and unsuccessful (LB-) embryos in terms of achieving live birth: ANN1 model (using appearance data and two protein markers) showed 100% accuracy, ANN2 model (with seven protein markers) showed 85.7% accuracy, and ANN3 model (with 25 protein markers) showed 83.3% accuracy. The proposed model was also able to predict live birth with an AUC of 1.0. The results showed that the proposed model can serve as an efficient tool in selecting embryos with a higher chance of live birth in a population of euploid embryos. This method, if further validated, could increase the success of infertility treatments by reducing the number of embryo transfers.

keywords: Machine learning, artificial intelligence, proteomics, blastocyst, live birth, fertility prediction.

22198 - Poster

Improving the efficiency of protein extraction from dry distillers' meal using artificial intelligence and alkali

Habibeh Zare[1], Zohreh Royaee[2 *]

1-Department of Biology, Payam Noor University, Tehran, Iran
2-Assistant Professor, Computer Department, Eram Institute of Higher Education, Shiraz, Iran
*Corresponding Author: drhzare@pnu.ac.ir

Abstract

In this study, the optimization of the protein extraction process from dry distillers' meal using alkaline method was investigated using artificial intelligence techniques. Dry distillers' meal is known as one of the main by-products of cereal fermentation, which despite its low cost, has a significant protein content and can be used as a valuable resource in various industries. In order to improve the efficiency of protein extraction, two artificial intelligence approaches were developed, including artificial neural network (ANN) and genetic algorithm (GA). In these models, three process variables were considered as inputs and the protein extraction rate as the output. The ANN model was able to obtain a correlation coefficient of 0.98664, indicating its high prediction accuracy. Then, the input parameters of the ANN model were optimized using GA. The results showed that the combined ANN-GA model was able to predict a maximum extraction of 0.424 g of protein from every 2 g of dry distillers meal, which is equivalent to a 15.46% increase in extraction efficiency compared to statistical optimization. Also, the data obtained from this model showed a good agreement with the results of real experiments under optimal conditions.

keywords: Artificial Intelligence, Protein, Dry Distillers Meal, Cereals.

22209 - Poster

Cancer mRNA Prediction in Different Tissues Using Artificial Intelligence

Habibeh Zare[1], Zohreh Royaee[2 *]

1-Department of Biology, Payam Noor University, Tehran, Iran
2-Assistant Professor, Computer Department, Eram Institute of Higher Education, Shiraz, Iran
*Corresponding Author: drhzare@pnu.ac.ir

Abstract

MRNA prediction is a novel approach to diagnose and predict diseases based on individual patient characteristics. In this regard, designing deep learning models to predict disease status using gene expression data becomes important. In this study, a self-encoding deep learning model was developed consisting of two separate parts – classifier and translator. The classifier was first trained to classify gene expression profiles (tumor or normal) and the corresponding tissues. Then, using the classifier as a discriminator, the translator was trained. The task of the translator is to convert the gene expression type from tumor to normal version and vice versa, without changing the original tissue. This translator simultaneously produces normal and tumor versions depending on the type of input sample. This model is able to predict the mRNA gene expression matrix of cancer samples from the corresponding normal samples and vice versa. The F1 score of this model, depending on the tissue type, was reported to be between 0.935 and 0.999 in the classifier and between 0.944 and 0.999 in the transferor. The accuracy of the proposed model in tissue classification was 0.986 and 0.992 in disease classification, indicating its significant superiority over conventional learning models such as SVM, logistic regression, and decision tree. These results demonstrate the high applicability and efficiency of this model in the field of disease diagnosis.

keywords: Artificial Intelligence, Protein, Dry Distillers Meal, Cereals.

22394 - Poster

Plant Development in the Age of Artificial Intelligence with a Focus on Gene Regulatory Network Reconstruction and Phenotypic Prediction

Arefeh Hassanvand[1*] , Hadis Zaremanesh[2]

1- Department of Biology, Payame Noor University, Tehran, Iran
2- Department of Agriculture, Payame Noor University, Tehran, Iran
*Corresponding Author: a.hassanvand@pnu.ac.ir

Abstract

Plant evolutionary developmental biology (evo-devo) aims to explain structural and phenotypic diversity by examining the interplay between growth processes and evolutionary mechanisms. With the rapid expansion of genomic, transcriptomic, and epigenomic datasets, classical statistical methods have become inadequate for analyzing nonlinear relationships and complex developmental networks. Despite the increasing importance of this field, few comprehensive reviews have addressed how artificial intelligence (AI) can overcome these challenges. This article reviews and analyzes recent studies, showing that machine learning and deep learning algorithms—including artificial neural networks, convolutional neural networks, support vector machines, and large language models (LLMs)—have reconstructed gene regulatory pathways, identified spatiotemporal patterns of gene expression, and accurately predicted developmental stages of organs such as leaves, meristems, and roots. In some reports, AI-based models achieved 30–50% higher predictive accuracy compared with classical approaches. Convolutional neural networks performed particularly well in modeling root development, although tissue heterogeneity limited their performance in leaves. LLMs outperformed correlation-based methods in uncovering hidden rules of gene–gene interactions. These findings suggest that integrating AI algorithms with graph-based frameworks and causal learning can improve both accuracy and interpretability. However, the lack of robust time-series and multicellular datasets, the demand for high computational resources, and limited model transparency remain significant barriers. The overall inference of this review is that developing scalable, comprehensive databases and employing reinforcement-based frameworks should be prioritized in future studies. Such efforts will not only enhance predictive power and theoretical understanding but also redefine the boundaries of plant evo-devo and accelerate the transition toward AI-driven evolutionary research.

keywords: Meristem, Tissue heterogeneity, Artificial neural networks, Leaf architecture, Gene expression.

21867 - Poster

Intelligent Phage Display: Applications of Deep Learning and Bioinformatics

Melika Bashiri Khoshraftar[1], Saeedeh Ghiasvand[2 *]

1- Master's student in Biotechnology, Department of Biotechnology, Faculty of Interdisciplinary Science and Technology, Malayer University
2- Associate Professor of Molecular Genetics, Department of Biotechnology, Faculty of Interdisciplinary Science and Technology, University of Malayer
*Corresponding Author: s.ghiasvand@malayeru.ac.ir

Abstract

The integration of deep learning and bioinformatics has fundamentally transformed biomolecule discovery and targeted ligand design via phage display. Tools such as AlphaFold and next-generation sequencing (NGS) analyses have enabled the rapid identification of protein variants with novel function. Advanced models like LSTM and Transformer architectures optimize binding site affinity and molecular stability, reducing time and cost in drug development. Even in libraries with limited diversity, these models can propose effective modifications to fine-tune binding sites and enhance ligand stability .Despite challenges such as phage display replication bias and data complexity, modern statistical methods like Gaussian processes and more precise selection criteria (based on positive-to-negative selection ratios) have facilitated the construction of focused libraries. Future research directions include improving biopanning methods to better eliminate off-target variants, employing trinucleotide codons for more precise library design, implementing active learning with real-time laboratory feedback, extending these technologies to applications such as IgG antibody and TCR design, integrating multi-omics data for a more comprehensive understanding, and ultimately conducting long-term, rigorous evaluations in animal models and clinical studies to conclusively confirm efficacy and safety.

keywords: phase display, active learning, Bioinformatics.

22253 - Poster

Convergence of Artificial Intelligence and Biology: From Computational Modeling to Advances in Diagnosis and Therapy

Kosar Maleki[1*]

1- Graduate of Shahed Zeinabiyeh High School, Zanjan, Iran.
*Corresponding Author: k.m.15061385@gmail.com

Abstract

The rapid growth of biological data and the increasing complexity of biological systems highlight the urgent need for advanced analytical tools. A key challenge in modern biology is the vast volume of genomic, proteomic, and metabolomic data, which traditional methods cannot efficiently process. This study explores the transformative role of artificial intelligence (AI) in computational biology by examining applications of machine learning and deep neural networks in modeling biological processes. Adopting a meta-analytical and comparative approach, it synthesizes international studies on disease diagnosis, drug design, protein structure prediction, and genetic pattern discovery. Findings show that AI algorithms can reveal hidden relationships within biological datasets, improve accuracy in predicting complex diseases such as cancer and Alzheimer's by 20–30% compared to classical methods, shorten drug development time by up to 40%, and achieve over 90% accuracy in protein structure identification. Results further indicate that the convergence of AI and biology not only accelerates research and therapeutic processes but also enables personalized medicine and the redesign of biological systems. However, challenges remain, including limited interpretability of models, dependence on data quality and standardization, and ethical and legal issues in applying results. Future research should focus on developing more transparent algorithms, building reliable biological databases, and designing shared ethical and regulatory frameworks to ensure the safe and sustainable use of AI in biology.

keywords: Artificial Intelligence, Computational Biology, Personalized Medicine, Intelligent Biotechnology, Machine Learning.

21349 - Poster

Artificial Intelligence in Service of Developmental Biology: Reconstructing Growth and Differentiation Pathways in the Age of Smart Computation

Samar Sadeghi[1 *]

1- biology teacher, saraye danesh high school
*Corresponding Author: biology.sadeghi@gmail.com

Abstract

Recent advances in artificial intelligence, particularly in deep learning, have enabled novel approaches to analyzing complex developmental phenomena. In this study, advanced neural models were employed to reconstruct developmental trajectories of mouse embryonic stem cells. Initially, time-lapse microscopic images of early mouse embryogenesis were analyzed using convolutional neural networks (CNNs). Subsequently, reinforcement learning models were applied to predict cell fate based on the expression of key developmental genes. The results showed that the combined CNN-RL model could predict the ectoderm-to-neural differentiation pathway with 91% accuracy. Sensitivity analysis further revealed that the expression levels of Sox2 and Pax6 had the most significant impact on fate determination. Major challenges included the need for large datasets and the standardization of imaging protocols across laboratories. The findings suggest that artificial intelligence is not only applicable to developmental analysis but also has the potential to replace certain costly experimental methods. Given the model's ability to reconstruct growth dynamics, future studies are recommended to integrate AI with single-cell RNA sequencing data and to develop more interpretable models for understanding molecular interactions during development.

keywords: Artificial intelligence, convolutional neural networks, cell fate prediction, developmental biology, reinforcement learning

Chapter Ten

Livestock and Aquatic Animal Reproduction Technology



23921-keyenote oral presentation

Sturgeon Embryos as a Model for Germline Specification: Mitochondrial Contributions and Evolutionary Insights

Martin Pšenička[1*]

1-Faculty of Fisheries and Protection of Waters, University of South Bohemia in České Budějovice, South Bohemian Research Center of Aquaculture and Biodiversity of Hydrocenoses, Czech Republic
*Corresponding Author: psenicka@frov.jcu.cz

Abstract

Primordial germ cells (PGCs) in most fish are specified by maternally inherited germ plasm, yet sturgeons (Acipenseridae) exhibit a unique spatial and developmental separation of germline and somatic lineages. Their holoblastic cleavage pattern, more reminiscent of amphibians than teleosts, provides a powerful system for investigating germline specification, mitochondrial roles in development, and evolutionary transitions in cleavage modes.
We combined PGC visualization using FITC-dextran and GFP-nos3 3'UTR mRNA microinjections with targeted UV irradiation of the vegetal pole and mitochondrial transplantation across sturgeon species. Histological analyses and qPCR tomography were used to trace embryonic versus extra-embryonic contributions.
Our findings show that vegetal blastomeres primarily give rise to PGCs, while the majority form transcriptionally inactive yolk cells that function as extra-embryonic nutritional tissue. UV ablation of the vegetal pole eliminated PGCs without disturbing somatic development, demonstrating that early somatic patterning proceeds independently of germ plasm. Remarkably, mitochondrial transplantation restored PGC formation in germ plasm-depleted embryos, highlighting a key role for mitochondria in germline specification. Fate-mapping further confirmed that yolk cells do not integrate into embryonic tissues, supporting the view that sturgeons represent an evolutionary intermediate between holoblastic and meroblastic cleavage strategies.
Sturgeon embryos, with their natural separation of germ plasm and somatic territories, thus offer an exceptional in vivo model for uncovering the mechanisms of germline development and mitochondrial function. Beyond fundamental insights, this system has important implications for germline biotechnologies and conservation of endangered sturgeon species.

Keywords: Sturgeon, germline, mitochondrial

23876 - Invited oral presentation

Manipulating the Epigenome in Somatic Cell Nuclear Transfer: Recent Progress and Future Directions

Farnoosh Jafarpour[1 *]

1-Department of Animal Biotechnology, Reproductive Biomedicine Research Center, Royan Institute for Biotechnology, ACECR, PO Box 816513-1378, Isfahan, Iran
*Corresponding Author: jafarpour.farnoosh@gmail.com

Abstract

Somatic cell nuclear transfer (SCNT) provides a powerful system to reset differentiated nuclei to a totipotent state, with applications in agriculture, biomedicine, and basic research. Despite the successful cloning of numerous mammalian species, overall efficiency remains low, largely due to incomplete or aberrant epigenetic reprogramming. Donor nuclei often retain inappropriate DNA methylation and histone modification patterns, leading to abnormal gene expression, developmental arrest, and postnatal defects in cloned offspring. Recent advances have highlighted the importance of dynamic regulation of DNA methylation, histone acetylation, and histone methylation, as well as the roles of non-coding RNAs in guiding nuclear reprogramming. Experimental interventions, including the use of DNA methyltransferase inhibitors, histone deacetylase inhibitors, and metabolic modulators, have been employed to overcome epigenetic barriers with variable success. More targeted approaches, such as locus-specific epigenome editing and fine-tuned manipulation of chromatin states during critical windows of reprogramming, are emerging as promising strategies. In parallel, refinements in donor cell preparation, oocyte quality assessment, and embryo culture conditions further support improved developmental outcomes. Nevertheless, species-specific variability and unintended consequences, such as placental dysfunction or large offspring syndrome, underscore the complexity of epigenetic remodeling in SCNT embryos. Looking ahead, integrative approaches that combine genome editing and precise epigenome modulation hold potential to unravel the mechanisms underlying reprogramming resistance. Such insights may ultimately lead to more reliable and efficient cloning systems, advancing both fundamental developmental biology and practical applications in animal biotechnology and regenerative medicine.

keywords: somatic cell nuclear transfer, epigenetic reprogramming, DNA methylation, histone modification, cloning efficiency, epigenome manipulation

23877 - Invited oral presentation

The application of nanoparticles produced by the green method in enhancing the sperm quality of farm animals after cryopreservation.

Mahdi Hajian[1 *]

1-Department of Animal Biotechnology, Reproductive Biomedicine Research Center, Royan Institute for Biotechnology, ACECR, Isfahan, Iran
*Corresponding Author: mehdihajian2002@gmail.com

Abstract

Cryopreservation induces oxidative stress in spermatozoa, primarily through the overproduction of reactive oxygen species (ROS), which compromise motility, membrane integrity, DNA stability, and ultimately fertilizing ability. Antioxidants and nanotechnology-based delivery systems have emerged as promising strategies to mitigate cryodamage and enhance post-thaw sperm function. In this study, we investigated the effects of different natural antioxidant compounds, their nanoparticle formulations, and novel nano–delivery strategies on the quality and fertility potential of goat sperm following cryopreservation. Berberine, a potent alkaloid with strong antioxidant activity but limited bioavailability, was synthesized as nano-berberine using anti-solvent precipitation with a syringe pump (APSP) technique, and also loaded onto selenium nanoparticles (Se-NPs). Characterization of the nanoparticles was confirmed using EDX, UV-visible spectroscopy, FE-SEM, Zeta-potential, and FTIR. In parallel, ρ-coumaric acid (ρ-CA) was evaluated alone, as nanoparticles (PCNPs), in combination with zinc chloride ($ZnCl_2$), zinc oxide nanoparticles (ZnO-NPs), or loaded onto ZnO-NPs (ρ-CA-ZnONPs). Optimal concentrations for each treatment were determined through preliminary incubation trials. Post-thaw assessments included sperm motility, viability, plasma membrane and DNA integrity, ROS generation, lipid peroxidation, and in vitro fertilization ability, followed by embryo development. Across experiments, all nanoparticle-based treatments significantly improved sperm parameters compared to controls ($p<0.05$). Notably, berberine loaded on Se-NPs, as well as ρ-CA-ZnONPs and PCNPs + ZnO-NPs, showed the greatest protective effects, markedly enhancing motility, membrane integrity, and embryo developmental competence, while reducing oxidative stress, lipid peroxidation, and DNA fragmentation. Network and principal component analyses confirmed the superiority of combined antioxidant-nanoparticle formulations over single treatments. Collectively, these findings demonstrate that bioactive compounds such as berberine and ρ-CA, when delivered via advanced nanotechnology-based systems, substantially increase the cryotolerance, post-thaw resistance, and fertilizing capacity of goat sperm. Such approaches offer valuable potential for improving cryopreservation outcomes in livestock reproduction and may be translated to other mammalian species.

keywords: cryopreservation, nanoparticles , sperm

23875 - Invited oral presentation

Application of reproductive induction technologies in barnacles for mass propagation

Alireza Sari[1 *]

1-School of Biology, College of Science, University of Tehran
*Corresponding Author: sari@ut.ac.ir

Abstract

Barnacle have always been considered in the studies of marine arthropods as one of the evolutionary developmental models. Different reproductive methods and species-specific strategies have fascinated researchers since the 1950s, leading to the documentation of life history traits including reproduction, larval stages, and metamorphosis by biologists. Three types of reproductive strategies have been documented in barnacle: hermaphroditism, having a complementary male, and having a dwarf male. Regarding fertilization mechanisms and their embryology, studies are relatively complete. Given the importance of barnacles in the studies of bioadhesion (biofouling), many species have been examined from the perspective of reproduction and recruitment, providing a suitable sources for comparison with larger species that have significant food importance. The presence of both male and female reproductive organs in one individual and having an actual male or female at the appropriate time has led many barnacle species to follow the protandric reproductive strategy, allowing them to produce sperm at the first stage of maturity, which in some cases is less than a month. The actual female, with the presence of a perforated egg case, provides a very specialized process of fertilization in the animal mantle. Species members of Megabalanus and Pollicipes live in tropical and temperate regions, and considering the added value derived from this seafood as a luxury food in Europe, there has been a significant increase in interest to reproductive mechanisms and mass breeding. By employing the potential of feeding with suitable live food, optimal temperature, and creating suitable conditions in marine environments and aquaculture farms, a great opportunity has emerged to enhance human knowledge and understanding of the reproduction of this amazing organism. This will address the biological, historical, adaptive, and ultimately practical aspects of reproduction in barnacles. Addressing the role of environmental factors and the induction of reproduction with hormone-activating compounds and the control of juvenile hormone has been a recent success in the reproductive biology of crustaceans and the barnacles.

keywords: barnacles , mass propagation, induction technologies

23798 - Invited oral presentation

Challenges of reproductive technologies in camels

Amir Niasari naslaji[1 *]

1-Department of Theriogenology, Faculty of Veterinary Medicine, University of Tehran
*Corresponding Author: niasari@ut.ac.ir

Abstract

Breeding season, semen viscosity, and mating in the sitting position are limiting factors in the development of reproductive technologies in camels. As seasonal breeders, camels have a prolonged calving interval (approximately 2.5 years), which further restricts the applicability of these technologies. High semen viscosity poses significant challenges for semen handling, processing, and preservation, hindering the progress of artificial insemination (AI) in this species. The binding of sperm within viscous seminal plasma limits interaction with cryoprotectants, resulting in unsuccessful semen cryopreservation. Although some offspring have been produced via AI using fresh semen, there are no reports of successful births following insemination with frozen semen. Multiple Ovulation and Embryo Transfer (MOET) is a routine and successful embryo technology in camels, with pregnancy rates exceeding 50%. Other embryo production methods, such as cloning via somatic cell nuclear transfer (SCNT), remain costly and yield low pregnancy rates (around 6%). In conclusion, aside from MOET, other reproductive technologies in camels are still in the early stages of development.

keywords: Camel ،breeding season ،semen ،embryo ،reproductive technologies

22157 - Oral

Gonadal Development in the Oriental Medicinal Leech (Hirudo orientalis)

Behnam Youneszadeh[1], Masoumeh Malek[1 *], Atabak Roohi Aminjan[2], Robabeh Latif[3]

1-Department of Zoology, School of Biology, College of Science, University of Tehran, Tehran, Iran
2-Department of Biology, Faculty of Science, Bu-Ali Sina University, Hamedan, Iran
3-Farzanegan Campus, Semnan University, Semnan, Iran
*Corresponding Author: memalek@ut.ac.ir

Abstract

The timing of gonadal development is a critical factor in shaping the reproductive strategy of animals. Leeches are hermaphroditic animals, and in certain species the male gonads mature earlier than the female gonads, a condition referred to as protandry. In this study, we investigated the sequential stages of gonadal development in the oriental medicinal leech (Hirudo orientalis). Male and female gonads were examined histologically across seven weight groups ranging from 1 to 7 g. Tissue samples were fixed in 4% formalin and stained with hematoxylin–eosin for histological evaluation. The sexual condition of H. orientalis was characterized as asynchronous hermaphroditism. The male phase was initiated in the weight range of 3–4 g, marked by the presence of stage IV spermatogenic clusters and a pronounced increase in the number of all types of clusters compared with lighter weight groups, reaching its peak at 4–5 g. The female phase commenced at 5–6 g, indicated by the presence of free oocytes in the ovarian lumen and a concurrent decline in spermatogenic clusters. These findings suggest that in H. orientalis, sexual maturity begins with the predominance of male function, followed by the onset of female function, which subsequently becomes dominant.

keywords: Spermatogenic cluster, Oocyte, Gonad, Asynchronous hermaphroditism, Protandry

21203 - Oral

Comparison of embryo transfer from superovulation versus artificial insemination on reproductive performance in repeat breeder dairy cows

Mohammad Javad Karimi Sabet[1 *], Saleh Tabatabei Vakili[1], Farid Barati[2], Morteza Mamouei[1]

1-Department of Animal Science, Faculty of Animal Science, Agricultural Sciences and Natural Resources University of Khuzestan, Mollasani, Khuzestan, Iran
2-Department of Clinical Science, Faculty of Veterinary Medicine, Shahrekord University, Shahrekord, Iran
*Corresponding Author: jkarimi464@gmail.com

Abstract

Repeat breeding is an important factor affecting economic success in dairy management. The objective of this study was to investigate the effect of superovulation and embryo transfer compared to artificial insemination on the reproductive performance of multiparous cows.21 Holstein heifers were selected based on general health status and ovarian function. All heifers received two consecutive doses of prostaglandin F2α. 10 days after estrus, heifers were injected with 975 international units of decreasing doses of hrFSH every 12 hours (225, 225, 150, 150, 75, 75, 37.5 and 37.5 international units for 8 consecutive intramuscular injections). Two doses of PGF2α were administered at the same time as fifth and sixth FSH injections. After estrus detection, the heifers were inseminated twice at interval of 12 and 24 hours. On the seventh day after standing heat, the heifers were prepared to wash the uterus. The embryos were examined in a 10 cm Petri dish under a stereomicroscope and Grade A and B embryos were frozen. The recipients used in this study consisted of 96 multiparous Holstein dairy cows that had failed to conceive after 3 to 21 artificial inseminations. Based on reproductive and productive performance records such as number of calvings, history of abortion, and milk yield. 21 cows were selected and randomly assigned in a block design to receive embryos. The remaining 75 cows, with similar reproductive and productive histories, were assigned to the control group and subjected to routine artificial insemination protocols. In this study, 43% of the embryos were transferred fresh, while 57% were cryopreserved. Comparison of conception rates between the embryo transfer and artificial insemination groups was performed using the Chi-square procedure in SAS. The results showed that the The mean of artificial insemination in each conception and the conception rate in repeat breeder cows (n=75) were 5.2±0.06 and 28%, respectively. None of the recipient cows (21 cows) became pregnant 25 days after embryo transfer. Therefore, under the conditions of this study, embryo transfer was not an effective alternative to artificial insemination in repeat-breeder cows.

keywords: Embryo transfer, Wakel cows, artificial insemination, superovulation, pregnancy

21374 - Poster

Effect of the presence of foot-and-mouth disease virus serotype A on the in vitro maturation of bovine oocytes in culture medium

Farzam Ghahramani[1], Aidin Rahim Tayefeh[2], Rohollah Keshavarz[2], Majid Mohammad Sadegh[3], Mehran Farhoodi[4 *]

1-Faculty of Veterinary Medicine, Ka.C., Islamic Azad University, Karaj, Iran
2-Animal Biotechnology Department, National Institute of Genetic Engineering and Biotechnology, PO Box 14965-16, Tehran, Iran
3-Department of Clinical Sciences, Faculty of Veterinary Medicine, Ga.C., Islamic Azad University, Garmsar, Ira
4-Department of Clinical Sciences, Faculty of Veterinary Medicine, Ka.C., Islamic Azad University, Karaj, Iran
*Corresponding Author: farhoodimog@gmail.com

Abstract

: This study aimed to investigate the effect of serotypes A of FMDV on the maturation of bovine oocytes in laboratory culture. This study was conducted at the National Institute of Genetic Engineering and Biotechnology, and to obtain ovarian samples, two cases were referred from the slaughterhouse of Tehran province, and the samples were taken randomly and transferred to the National Institute of Genetic Engineering and Biotechnology under controlled temperature conditions (37 degrees Celsius). Then, after aspiration of the eggs, the eggs were divided into two groups of 80 and treated based on serotypes A of FMDV. One group was a negative control, and the other group was challenged by A serotype. The results of this study showed that FMD virus affected oocyte maturation in such a way that in the control group, the average percentage of oocyte maturation was 70.416%, and in the groups treated with serotypes A, it was 12.916%. According to the analysis, with a P value < 0.5, the control group had a significant difference from the other treated group. The group treated with serotype A had a significant difference only with the control group. The virus harmed the expansion of oocytes and the spacing of cumulus cells, and according to Hoechst staining, a very small number of oocytes reached the metaphase stage of meiosis II, and the cell culture of the egg contents was also negative by PCR test. According to the results of this study, foot-and-mouth disease viruses of serotypes A and their simultaneous involvement have a direct effect on egg maturation, and therefore, it shows the need for livestock management and veterinarians working in livestock farms to pay attention to the study of foot-and-mouth disease. Paying attention to this disease will increase the economic productivity and income of livestock farms by preventing a decrease in reproduction.

keywords: Foot-and-mouth disease, reproduction, oocyte maturation, serotype A.

22241 - Poster

Gonadal histology of the Bulatmai barbel broodstocks (Luciobarbus capito)

Mohaddeseh Ahmadnezhad[1*], Seyed Fakhreddin Mirhashemi Nasab[1], Danial Gorouhi[2], Adel Hosseinjani[1], Erfan Akbari Nargesi[3], Mohammad Sayad Bourani [1]

1- Inland Waters Aquaculture Research Center, Iranian Fisheries Sciences Research Institute, Agricultural Research, Education and Extension Organization (AREEO), Bandar Anzali, Iran
2- Shahid Ansari Teleost Fish Restocking and Genetic Conservation Center, Rasht, Iran
3- Coldwater Fisheries Research Center, Iranian Fisheries Sciences Research Institute, Agricultural Research, Education and Extension Organization (AREEO), Tonkabon, Iran
*Corresponding Author: m_ahmadnezhad@yahoo.com

Abstract

Bulatmai barbel (Luciobarbus capito), Zardeh par in Persian, is an endangered native and economically important species of the Caspian Sea. The objective of this study was to identify the characteristics of the gonad tissue of the brood stock and to investigate the stage of sexual maturation and final maturity of oocytes and sperms to obtain basic knowledge used in artificial propagation of this species. Gonadal tissue sampling of female and male brood stock kept in captivity during the breeding season was performed and the sampled tissues were fixed in Bouin solution. Tissue slides were prepared by classical histology with Hematoxylin & Eosin staining for study with a light microscope. The results of microscopic observations showed the presence of different stages of oocyte maturation in the ovarian tissue, which is a characteristic pattern of the ovary of batch spawner fish. In female brood stock, three stages of ovary maturation were found, including: developing, close to spawning, and regenerating phase. Gonadal tissue sections of male brood stock showed the spent stage. Spermiation was possible in male brood stock without hormone therapy and with gentle pressure on the abdominal area. Asynchronous final maturation was observed in female and male brood stock. For the successful injection of synthetic hormones in artificial propagation of this fish, it is necessary for one or more complete batches of ovarian eggs to have reached the final stage of sexual maturity.

keywords: Bulatmai barbel, Caspian Sea, Reproduction, Histology

21489 - Poster

Enhancing Male Monosex Production in Nile Tilapia (Oreochromis niloticus) Using Combined CRISPR-Cas9 Gene Editing and Hormonal Induction

Mohamad Fakhrian[1*], Fatemeh Abbassian[2], Ali Ghannadi[1], Marzieh Ansari[2]

1-Department of Natural Resources and Environment, Science and Research Branch, Islamic Azad University, Tehran, Iran, m.fakhrian110@gmail.com
2-Department of cellular and molecular biology, Faculity of Nano and Bio Science and Technology, University, Bushehr, Iran
*Corresponding Author: m.fakhrian110@gmail.com

Abstract

Monosex culture of Nile tilapia (Oreochromis niloticus) is widely practiced to enhance growth rates and control unwanted reproduction in aquaculture. Traditional hormonal sex reversal methods face environmental and regulatory concerns, necessitating alternative biotechnological approaches. This study evaluates the efficacy of CRISPR-Cas9 gene editing targeting the dmrt1 gene, combined with hormonal induction, to produce male-biased populations. A total of 700 fertilized Nile tilapia eggs were randomly assigned into four groups: (1) Control (no treatment, n=100), (2) CRISPR-Cas9 knockout of dmrt1 (n=200), (3) 17α-methyltestosterone (MT) feeding at 60 mg/kg for 21 days post-hatch (n=200), and (4) combined CRISPR-Cas9 + MT treatment (n=200). Gene editing efficiency was confirmed by PCR and sequencing. Fish were reared under controlled conditions for 90 days. Sex ratios were determined via gonadal histology. Growth performance (weight gain, feed conversion ratio) and survival rates were recorded. Statistical analysis used ANOVA with significance at $p < 0.05$. The CRISPR group achieved 71.0% ± 2.5 male ratio, MT group 88.5% ± 1.8, and combined group 96.7% ± 1.1, significantly higher than the control's 51.2% ± 3.0 ($p < 0.01$). Mean final weights were highest in the combined group (72.6 g ± 3.2), followed by MT (65.3 g ± 2.9), CRISPR (60.8 g ± 3.1), and control (52.1 g ± 4.1). Feed conversion ratio improved by 15% in the combined group. Survival rates showed no significant differences (average 89–92%). Histological examination confirmed normal testicular development in over 94% of males in the combined treatment. Integrating CRISPR-Cas9 gene editing with hormonal induction significantly enhances male monosex production in Nile tilapia without compromising growth or survival. This dual approach presents a sustainable and efficient alternative to conventional methods, with potential to reduce hormone usage and environmental impact in aquaculture.

keywords: Nile Tilapia, CRISPR-Cas9, Monosex Culture, Hormonal Induction, Aquaculture Biotechnology

22143 - Poster

Stages of cocoon production in the oriental medicinal leech (Hirudo orientalis)

Atabak Roohi Aminjan[1*], Masoumeh Malek[2], Robabeh Latif[3], Samira Sargolzaii[2]

1-Department of Biology, Faculty of Science, Bu-Ali Sina University, Hamedan, Iran
2-Department of Zoology, School of Biology, College of Science, University of Tehran, Tehran, Iran
3-Farzanegan Campus, Semnan University, Semnan, Iran
*Corresponding Author: a.roohiaminjan@basu.ac.ir

Abstract

The medicinal leech Hirudo orientalis, as one of the native and valuable species with extensive applications in medical, pharmaceutical, and research fields, has been threatened in recent years due to increased demand and overharvesting. In this study, the cocoon-laying process of this species was examined under laboratory conditions to obtain more detailed information regarding the different stages of cocoon formation. In this research, adult leeches, after an initial acclimation period in the breeding environment, were fed with sterile sheep blood with approximately 40°C using the “blood sausage” method. Subsequently, the leeches were transferred to group tanks for mating, and after the mating period, they were moved to containers with a moss substrate under suitable humidity and temperature conditions (around 28°C) for cocoon deposition. The cocoon-laying process was observed step by step. Observations indicated that the adult leeches first identify a suitable site for cocoon deposition in terms of substrate moisture and quality using chemoreceptors located in the prostomium region. After settling in the selected site, the leech cleans the clitellar area with its oral sucker and then secretes from the clitellar glands to form the initial cocoon structure as a transparent tubular shape. Following this, a foam-like substance full of bubbles surrounds the cocoon, which, upon drying, turns into a spongy structure. Initially, the cocoons are brown and gradually change to gray over the course of several days.

keywords: Oral sucker, Clitellum, Cocoon foam, Sponge of cocoon, Cocoon color

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