

Session Report

Highlights from the Stem Cell Session of the 11th Yazd International Congress and Student Award in Reproductive Medicine, Shahid Sadoughi University of Medical Sciences

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Received:

2025-11-30

Accepted:

2025-12-03

Volume:1

Issue no.4

Editor-in-Chief:

Behrouz Aflatoonian Ph.D.



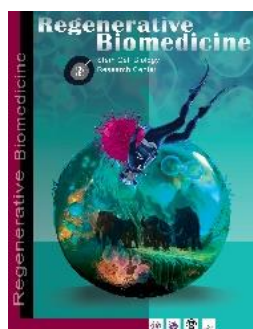
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Abstract

This paper summarizes the proceedings of the Stem Cell Session of the “11th Yazd International Congress and Student Award on Reproductive Medicine” held at Shahid Sadoughi University of Medical Sciences, Yazd, Iran, on May 15, 2025. The session brought together distinguished national and international experts to present and discuss advances and their studies in stem cell biology, tissue engineering, and reproductive medicine. Topics covered included in vitro gametogenesis and metabolite profiling, tissue-engineered therapeutic strategies for infertility, the role of extracellular vesicles in spermatogenesis, innovative tissue engineering approaches for azoospermia, and the therapeutic potential of exosome-based treatments for polycystic ovary syndrome. Additionally, emerging research on human pluripotent stem cell-derived cardiovascular cells for disease modeling and regenerative repair, as well as the molecular epidemiology of reproductive infectious diseases and cancers, was discussed. Collectively, the presentations highlighted the translational potential of stem cell and tissue engineering research in addressing infertility and advancing reproductive health.

Keywords: Conditioned Media, Cumulus Cells, Extracellular Vesicles, Infertility, Testicular Cells, Tissue Engineering



How to cite this article:

Hajizadeh, F. Highlights from the Stem Cell Session of the 11th Yazd International Congress and Student Award in Reproductive Medicine, Shahid Sadoughi University of Medical Sciences, 2025; 1(4): 335-339.

<https://doi.org/10.22034/jrb.2025.12.V1I4A6>

Introduction

The integration of stem cell science and reproductive medicine has opened new frontiers in the diagnosis and treatment of infertility. The Stem Cell Session at the 11th Yazd International Congress and Student Award on Reproductive Medicine provided a unique platform for researchers to present novel findings and discuss translational strategies for regenerative applications in reproductive health. The session featured a series of insightful presentations from leading Iranian and international scientists, focusing on stem cell differentiation, tissue engineering, extracellular vesicles, and regenerative therapies targeting infertility and reproductive diseases. The talks reflected the growing global interest in applying cellular and molecular advances to overcome the challenges of infertility and reproductive tissue dysfunction.

Session Highlights

Dr. Behrouz Aflatoonian opened the session with his talk entitled “Metabolites and *In Vitro* Gametogenesis”. He highlighted that the metabolic co-dependence between oocytes and cumulus cells is essential for determining oocyte developmental competence. Research across various species has shown that secreted factors from reproductive nursing cells such as testicular, cumulus, and granulosa cells, can significantly support oocyte *in vitro* maturation (IVM) and *in vitro* gametogenesis (IVG) (1). Dr. Aflatoonian summarized recent findings from his group demonstrating that conditioned media from testicular and cumulus cells enhance IVM in mice (2, 3) and support human *in vitro* gametogenesis (1, 4). These results confirm earlier studies using

different cell types and species. Additionally, his team examined metabolite shifts during the differentiation of human embryonic stem cells (hESCs) into germ cells, revealing dynamic metabolic changes that influence gamete development (Aflatoonian et al, unpublished). These discoveries offer new insights into the metabolic regulation of gametogenesis and may contribute to future advancements in infertility treatment (1).

Dr. Ebrahimi’s presentation titled “Tissue Engineering and Stem Cell-Based Therapeutic Strategies for Infertility Diseases”, bridged fundamental biology with clinical innovation by exploring tissue engineering and stem cell-based strategies for infertility treatment. Dr. Ebrahimi reviewed recent advances in the application of embryonic, induced pluripotent, and adult stem cells for the regeneration of reproductive tissues such as the ovary and endometrium. She emphasized the potential of biomaterial scaffolds to recreate the natural reproductive microenvironment, supporting cell growth and differentiation. The presentation also addressed the ethical and translational challenges of clinical implementation, underscoring the need for standardized differentiation protocols, immune compatibility assessments, and Good Manufacturing Practice (GMP) compliance. Her talk demonstrated how tissue engineering can move beyond concept to clinical utility, offering regenerative solutions for patients suffering from infertility-related diseases (5).

The emerging role of exosomes and extracellular vesicles (EVs) in male fertility and spermatogenesis was explored in Dr. Korouji’s talk, “The Role of Extracellular

Vesicles in Spermatogenesis”. He outlined how these nanoscale vesicles, secreted by Sertoli, Leydig, and germ cells, serve as key mediators of cell-to-cell communication within the testicular microenvironment. Exosomes facilitate the transport of proteins, lipids, and RNAs essential for spermatid development, influencing gene expression, immune modulation, and oxidative stress protection (6, 7).

Dr. Korouji emphasized the therapeutic and diagnostic potential of exosomal cargo as biomarkers for male fertility disorders. His presentation positioned exosomes as both functional regulators and clinical tools for understanding and managing male infertility (8-10).

Compelling data on oocyte progenitor stem cells and their potential role in female fertility restoration were presented by Dr. Fathi from the Royan Institute. In his presentation entitled “Redesigning life: Ovarian Germ Cells are the Intelligent Sleepers”, he described pioneering research that demonstrated the existence and proliferative capacity of these cells in ovarian tissue. Using an artificial ovary model, his team successfully induced the differentiation of progenitor stem cells into oocytes and primordial follicles after transplantation. This breakthrough suggests that modifying the extracellular niche can awaken dormant progenitor cells, potentially restoring fertility in women with premature ovarian failure or post-cancer treatment infertility. The findings represent a remarkable advancement in reproductive tissue engineering and underscore the regenerative potential of ovarian stem cells (11).

Dr. Movahedin from Tarbiat Modarres University, delivered an overview on recent advances in tissue-engineered with the title “How Tissue Engineering Can Help Azospermia Patients; In Vitro and In Vivo Studies”. The talk highlighted progress in in vitro spermatogenesis, including the use of biomimetic scaffolds, organoid cultures, bioreactors, and decellularized testicular matrices that replicate the native testicular environment (11-13).

Exosome-enhanced dynamic culture systems and 3D-printed ECM scaffolds enriched with bioactive molecules were noted for their success in promoting SSC proliferation and achieving haploid spermatid formation in animal models (8). The review also covered in vivo approaches, such as testicular tissue grafting and SSC transplantation, which have enabled functional sperm generation in murine hosts. The role of mesenchymal stem cell-derived exosomes in restoring spermatogenesis in azoospermic models was emphasized as a promising regenerative therapy (12).

The following presentation by Mahdieh Karimi highlighted the therapeutic promise of exosome-based interventions for polycystic ovary syndrome (PCOS). Using an animal model, her study examined the effects of exosomes derived from human embryonic stem cell-derived mesenchymal stromal cells (Yazd2/MSCs) on PCOS-induced rats. The results showed that intra-ovarian injection of exosomes significantly reduced ovarian size, normalized testosterone levels, and improved ovarian morphology in a dose-dependent manner. The findings emphasized the regenerative and endocrine-modulatory novel, cell-free therapeutic strategy for effects of exosome therapy, introducing a managing

PCOS a major cause of female infertility (9, 14).

A comprehensive overview of the applications of human pluripotent stem cells (hPSCs) in disease modeling and regenerative therapy was presented by Dr. Jie Na from Tsinghua University, China. His group has successfully developed protocols to derive cardiomyocytes, endothelial cells, and macrophages from hPSCs under defined conditions, enabling the construction of 3D mini-cardiac organoids. These organoids, when transplanted into rat models of myocardial infarction, significantly improved cardiac function and reduced fibrosis. Additionally, hPSC-derived endothelial cells were shown to restore choroidal vasculature and visual function in ocular disease models. Dr. Na also introduced hPSC-derived macrophages as valuable models for studying host–pathogen interactions in infections such as hepatitis C and SARS-CoV-2. His presentation showcased the remarkable versatility of hPSC technologies across regenerative and immunological domains (15).

Dr. Farashahi concluded the session with a presentation entitled “Infectious Diseases and Reproductive Cancers on human papillomavirus (HPV) genotyping and its implications in reproductive cancers”. A major focus of the talk was on Human Papillomavirus (HPV) and Chlamydia trachomatis, two of the most significant infectious contributors to reproductive malignancies worldwide. High-risk HPV serotypes, particularly HPV-16 and HPV-18, were emphasized for their causal role in cervical cancer, jointly responsible for

roughly 70% of global cases. The presenter also underscored the importance of persistent HPV infection, noting that host genetic factors such as polymorphisms in immune-related genes (e.g., HLA-DQ, TLR9) may impair viral clearance and increase susceptibility to malignant transformation.(16-18).

Conclusion

The Stem Cell Session at the 11th Yazd International Congress and Student Award on Reproductive Medicine demonstrated the dynamic interplay between basic stem cell research, tissue engineering, and translational reproductive medicine. From in vitro gametogenesis and artificial ovary engineering to exosome-based fertility treatments and hPSC-derived regenerative models, the session highlighted both scientific innovation and clinical relevance. The integration of molecular insights, bioengineering tools, and regenerative strategies showcased the future of infertility treatment and reproductive health restoration. Collectively, the discussions reflected a shared vision: translating stem cell research from the laboratory to clinical application to improve reproductive outcomes and human well-being.

Conflict of Interest

The authors declare that they have no competing interests.

References

1. Tahajjodi SS, Yazd EF, Agharahimi A, Akyash F, Hajizadeh-Tafti F, Golzadeh J, et al. Cumulus cells conditioned medium facilitates germ cell differentiation from human embryonic stem cells: An experimental study. *International Journal of Reproductive Biomedicine*. 2025;23(1):33.

2. Adib M, Seifati SM, Ashkezari MD, Akyash F, Khoradmehr A, Aflatoonian B. Effect of human testicular cells conditioned medium on in vitro maturation and morphology of mouse oocytes. *International Journal of Fertility & Sterility*. 2020;14(3):176.
3. Adib M, Seifati SM, Ashkezari MD, Khoradmehr A, Rezaee-Ranjbar-Sardari R, Tahajjodi SS, et al. The effect of the human cumulus cells-conditioned medium on in vitro maturation of mouse oocyte: An experimental study. *International Journal of Reproductive BioMedicine*. 2020;18(12):1019.
4. Akyash F, Aflatoonian R, Farashahi-Yazd E, Hajizadeh-Tafti F, Golzadeh J, Tahajjodi SS, et al. Testicular cells derived conditioned medium supports germ cell differentiation of human embryonic stem cells. *Cell Journal (Yakhteh)*. 2024;26(6):370–9.
5. Kuchakzadeh F, Ai J, Ebrahimi-Barough S. Tissue engineering and stem cell-based therapeutic strategies for premature ovarian insufficiency. *Regenerative therapy*. 2024;25:10–23.
6. Shahlai M, Afkhami H, Ahmadih-Yazdi A, Mirmazloumi SH, Sahraei SS, Akbari M, et al. Exosomes in Alzheimer's disease: From pathogenesis to therapeutics—A comprehensive review of diagnostic and drug delivery applications. *Biomedicine & Pharmacotherapy*. 2025;192:118548.
7. Mokhtari K, Sheykhasan M, Shahnazari M, Ahmadih-Yazdi A, Shokrollah N, Samadi P, et al. Extracellular vesicles in reproductive medicines. *Extracellular Vesicles for Therapeutic and Diagnostic Applications: Elsevier*; 2025. p. 243–81.
8. Afkhami E, Movahedin M, Anvari M, Farashahi Yazd E, Aflatoonian B. Exosomes, a promising future for endometriosis. *Regenerative Biomedicine*. 2024;1(1):32–5.
9. Karimi M, Anvari M, Mohammadi M, Hajizadeh-Tafti F, Aflatoonian B. Exosomes Extracted from Human Embryonic Stem Cells-Derived Mesenchymal Stem/Stromal Cells Support Treatment of Polycystic Ovary Syndrome in Animal Model. *Regenerative Biomedicine*. 2025;1(2):127–34.
10. Shokrollah N, Aflatoonian B, Ahmadih-Yazdi A. Therapeutic Potential of Exosomes in Wound Healing with A Focus on Fibroblast-Derived Exosomes: A Mini Review. *Regenerative Biomedicine*. 2024;1(1):23–31.
11. Hamzeh M, Movahedin M. Appropriate Biomaterials for Scaffold Fabrication to Induce In Vitro Spermatogenesis. *Regenerative Biomedicine*. 2025;1(2):78–84.
12. Moradian SA, Amirkhani Z, Movahedin M, Gharib SN, Varghaiyan Y, Niknafs B, et al. Platelet-rich plasma (PRP) and the future of male fertility: a path forward for personalized and regenerative therapies. *Stem Cell Research & Therapy*. 2025;16(1):486.
13. Anvari A, Movahedin M. Releasing Scaffold Can Improve Spermatogenesis. *Regenerative Biomedicine*. 2025;1(2):73–7.
14. Karimi M, Izadi M, Akyash F, Aflatoonian B. Mesenchymal Stem/Stromal Cells Derived Exosomes-based Therapy and Polycystic Ovary Syndrome. *Regenerative Biomedicine*. 2025;1(2):135–8.
15. Li M, Wang P, Huo ST, Qiu H, Li C, Lin S, et al. Human Pluripotent Stem Cells Derived Endothelial Cells Repair Choroidal Ischemia (Adv. Sci. 9/2024). *Advanced Science*. 2024;11(9):2470053.
16. Luu XQ, Jun JK, Suh M, Oh J-K, Yu S-Y, Choi KS. Cervical Cancer Screening, HPV Vaccination, and Cervical Cancer Elimination. *JAMA Network Open*. 2025;8(8):e2526683–e.
17. Izadi M, Dehghan Marvast L, Rezvani ME, Zohrabi M, Aliabadi A, Mousavi SA, et al. Mesenchymal stem-cell derived exosome therapy as a potential future approach for treatment of male infertility caused by Chlamydia infection. *Frontiers in microbiology*. 2022;12:785622.
18. Zohrabi M, Dehghan Marvast L, Izadi M, Mousavi SA, Aflatoonian B. Potential of mesenchymal stem cell-derived exosomes as a novel treatment for female infertility caused by bacterial infections. *Frontiers in Microbiology*. 2022;12:785649.