REVIEW
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Acupuncture for the reproductive and hormonal system

I Made Mahadinata Putra MN[1*], Putu Dania Saras Wahyuda[2], Luh Nyoman Dewanty Nirwikara[2], Anak Agung Mas Maharani[2], Maria de Chelsa Poto Pesa[2], Nadia Meilani Putri Rahayu[2]

[1]Medical Doctor Profession Program, Faculty of Medicine, Universitas Mahasaraswati Denpasar
[2]Bachelor of Medicine Program, Faculty of Medicine, Universitas Mahasaraswati Denpasar

*Correspondence:
I Made Mahadinata Putra MN; Medical Doctor Profession Program, Faculty of Medicine, Universitas Mahasaraswati Denpasar;
mahadinata@unmas.ac.id

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ABSTRACT

Reproductive health represents a fundamental pillar of systemic human wellness. However, the rising prevalence of hormonal disorders and infertility highlights significant gaps in conventional medical management. While pharmacological interventions and assisted reproductive technologies remain essential, patients often encounter adverse side effects and substantial psychological distress, fostering an increased demand for integrative approaches such as acupuncture. This narrative review synthesizes current evidence to clarify the neurophysiological, endocrine, and immune mechanisms by which acupuncture influences reproductive homeostasis. Research indicates that acupuncture functions as a neuromodulatory intervention, activating afferent nerve fibers to regulate the hypothalamic-pituitary-gonadal (HPG) axis and normalize cortisol levels. These pathways facilitate the release of key neurotransmitters, such as endorphins and serotonin, which modulate the secretion of follicle-stimulating hormone (FSH) and luteinizing hormone (LH). Clinically, acupuncture demonstrates efficacy in improving ovulation rates in patients with polycystic ovary syndrome (PCOS), increasing clinical pregnancy success in IVF protocols, and enhancing male sperm parameters by reducing oxidative stress and improving testicular microcirculation. Furthermore, it effectively manages primary dysmenorrhea and reproductive-related anxiety. Ultimately, acupuncture serves as a potent complementary modality that supports systemic functional balance. However, to facilitate broader integration into modern medical practice, the scientific community must prioritize more rigorous longitudinal research and the development of standardized clinical protocols. Implementation should be restricted to supervised settings under competent healthcare professionals to ensure safe, evidence-based utilization.

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INTRODUCTION

Reproductive health is a fundamental pillar of systemic human wellness, encompassing not only reproductive capacity but also hormonal balance, overall quality of life, and psychological stability.[1] The endocrine and reproductive systems maintain homeostasis through intricate neuroendocrine communication; therefore, any disruption to this delicate balance can precipitate a spectrum of clinical complications, ranging from menstrual irregularities to chronic infertility.[1]

Over recent decades, the prevalence of reproductive and hormonal disorders has risen significantly, with polycystic ovary syndrome (PCOS), ovulatory dysfunction, and irregular menstrual cycles becoming increasingly common in clinical practice.[2] These imbalances are often driven by multifactorial triggers, including chronic stress, sedentary lifestyles, and psychosocial stressors, which collectively dysregulate the hypothalamus–pituitary–gonadal (HPG) axis, which governs ovulation and reproductive hormone secretion.[2]

While conventional medical interventions, including pharmacological agents, exogenous hormones, and assisted reproductive technologies, are essential, many patients do not achieve significant clinical improvement or must contend with adverse side effects and substantial psychological distress.[3] This therapeutic gap has fueled a growing demand for holistic and integrative approaches, leading to increased academic and clinical interest in acupuncture as a prominent complementary modality.[4]

Within a biomedical framework, acupuncture is understood to stimulate specific anatomical points that modulate the nervous and neuroendocrine systems, potentially restoring hormonal balance by enhancing pelvic blood circulation and activating neurotransmitters.[4] Preliminary evidence, including case reports by Nuralita et al. and pilot studies by Strisanti, suggests that acupuncture can improve menstrual quality and reduce anxiety in patients with weight-loss-related amenorrhea.[5,6] Furthermore, research indicates its efficacy in alleviating dysmenorrhea symptoms linked to hormonal instability.[7] Despite these promising signals, the current body of literature remains largely confined to small-scale case studies and pilot designs, which limits the ability to draw definitive clinical conclusions.

The purpose of this narrative review is to synthesize the existing literature on

the impact of acupuncture on hormonal and reproductive health, clarify its physiological mechanisms, and assess its therapeutic efficacy. By evaluating current evidence-based outcomes, this review aims to provide a comprehensive overview that helps clinicians understand how acupuncture may serve as a viable adjunct to conventional care. Ultimately, this work aims to highlight the need for more rigorous, large-scale longitudinal research to facilitate the systematic integration of acupuncture into standardized reproductive healthcare protocols.

RESULTS

The Fundamentals of Acupuncture

The historical foundations of acupuncture originate from Traditional Chinese Medicine (TCM), which views the human body as a holistic system regulated by the balance of a vital energy called Qi.[8] This energy flows through specific pathways known as meridians that connect internal organs with peripheral tissues. In this framework, illness results from disrupted Qi flow, and therapy aims to restore equilibrium by stimulating specific acupuncture points.[8] Diagnosis and treatment selection are guided by the conceptual principles of Yin and Yang, which characterize traditional acupuncture as an inherently individualized and holistic approach.

In the context of modern medicine, there is no anatomical or physiological evidence for Qi or meridians. Consequently, research from the last five years has prioritized neurophysiological and biomedical explanations for acupuncture's efficacy. Studies indicate that stimulating acupuncture points activates afferent nerve fibers, specifically Aδ and C fibers, which then trigger spinal and supraspinal responses. This activation modulates descending pain pathways and induces the release of measurable neurochemical mediators such as endorphins, serotonin, and norepinephrine.[9,10] Therefore, contemporary science frames acupuncture as a neuromodulatory intervention rather than metaphysical energy manipulation.

A significant divergence exists between acupuncture and modern medicine regarding their theoretical bases and diagnostic methodologies. Modern therapy focuses on specific pathophysiological triggers, such as inflammation, structural defects, or molecular abnormalities, using objective data from clinical exams, laboratories, and imaging. Conversely, traditional acupuncture prioritizes systemic functional balance through pattern-based diagnoses that often differ from Western nosological categories.[8,11]

Despite these conceptual differences, systematic reviews and clinical guidelines published within the last five years highlight acupuncture as an effective complementary therapy for chronic pain and functional disorders.[12] Its integration into modern healthcare adheres to evidence-based medicine principles, with efficacy and safety established through clinical trials and meta-analyses. Thus, modern medicine utilizes acupuncture as a supplementary modality that functions through scientifically grounded neurophysiological and neuroendocrine mechanisms rather than as an alternative to conventional care.[10-12]

The Physiological Mechanisms of Acupuncture for the Reproductive System

The physiological mechanisms of acupuncture within the reproductive system involve an integrated interaction between the nervous, endocrine, immune, and vascular systems to maintain reproductive homeostasis.

Neurophysiological Mechanisms

Stimulating acupuncture points triggers a complex integration between the somatic and autonomic nervous systems rather than merely activating peripheral nerve receptors. The activation of afferent pathways toward the spinal cord and hypothalamus modulates the limbic system, which governs emotional regulation and stress responses.[14,16] This modulation is clinically significant because chronic stress disrupts reproductive function by elevating cortisol, which, in turn, suppresses the release of Gonadotropin-Releasing Hormone (GnRH). Consequently, acupuncture acts as an intervention that normalizes the Hypothalamic–Pituitary–Adrenal (HPA) axis, thereby indirectly stabilizing the Hypothalamic–Pituitary–Gonadal (HPG) axis.

Furthermore, the release of neurotransmitters such as endorphins and serotonin provides both analgesia and hormonal modulation.[15] Endorphins, for instance, can enhance hypothalamic GnRH release, which stimulates the secretion of Luteinizing Hormone (LH) and Follicle-Stimulating Hormone (FSH) from the anterior pituitary. These hormones are essential for the menstrual cycle, ovulation, and spermatogenesis. Additionally, serotonin and norepinephrine contribute to mood regulation and neuroendocrine balance, ultimately improving the quality of life for patients with reproductive disorders.[16] Thus, the neurophysiological mechanism of acupuncture provides a systemic regulatory mechanism that integrates neurological, endocrine, and psychological components.

Endocrine and Hormonal Mechanisms

Acupuncture influences the endocrine system through intricate neurohormonal modulation. Stimulating specific acupuncture points enhances hypothalamic and anterior pituitary activity, thereby influencing the secretion of reproductive hormones, including FSH, LH, estradiol, progesterone, and Anti-Müllerian Hormone (AMH).[17] Research involving women with Diminished Ovarian Reserve (DOR) indicates that acupuncture can reduce FSH levels, which typically rise as a compensatory response to declining ovarian function.[18] This reduction in FSH is often accompanied by an increase in AMH levels and Antral Follicle Count (AFC), both of which serve as critical indicators of ovarian reserve and fertility potential.[15]

Moreover, acupuncture effectively lowers cortisol, a stress hormone known to impair HPG axis function.[16] High cortisol levels inhibit hypothalamic GnRH release, leading to decreased LH and FSH secretion and, in turn, disruptions in ovulation and the menstrual cycle. By reducing cortisol levels, acupuncture helps restore hormonal balance and increases the likelihood of spontaneous ovulation. These effects position acupuncture as a promising complementary therapy for managing reproductive disorders linked to stress and hormonal dysfunction.

Immune and Microcirculatory Mechanisms

Acupuncture improves blood perfusion to reproductive organs, particularly the uterus and ovaries, via vasodilation mediated by decreased sympathetic nervous system activity. This vasodilation enhances local blood flow, which is vital for improving endometrial receptivity and oocyte quality.[19] Increased blood flow to the endometrium optimizes its thickness and vascularization, thereby supporting embryo implantation. In the ovaries, enhanced microcirculation ensures an adequate supply of oxygen and nutrients for follicular development, directly impacting oocyte maturation.

In addition to microcirculatory benefits, acupuncture exerts significant immunomodulatory effects. Evidence suggests it can lower levels of proinflammatory cytokines such as Tumor Necrosis Factor-alpha (TNF-α) and Interleukin-6 (IL-6), which contribute to the pathogenesis of endometriosis and PCOS 19 For patients with endometriosis, acupuncture reduces local inflammation and pain while improving the peritoneal environment for fertilization. In cases of PCOS, it helps decrease insulin resistance and systemic inflammation, thereby refining hormonal profiles and promoting ovulation. Consequently, these immune and microcirculatory mechanisms provide both local and systemic support for multifactorial reproductive disorders.[19]

Acupuncture Mechanisms in the Female Reproductive System

Acupuncture primarily modulates the Hypothalamic–Pituitary–Ovarian (HPO) axis, the central pathway for female reproductive regulation.[17,19] Stimulating specific points can increase hypothalamic GnRH secretion, which prompts the anterior pituitary to release LH and FSH. These hormones are fundamental to folliculogenesis, ovulation, and the production of estradiol and progesterone.[17,19] Therefore, acupuncture influences not only the menstrual cycle but also follicular quality and the hormonal balance necessary for fertility. This finding suggests that acupuncture interacts directly with the underlying biological mechanisms of reproduction rather than merely offering symptomatic relief.

Furthermore, acupuncture provides measurable benefits for women with Diminished Ovarian Reserve (DOR).[18] Improvements in AMH levels and AFC following therapy reflect enhanced ovarian reserve, which is a critical fertility indicator.[20] This mechanism is likely linked to increased uterine and ovarian perfusion, which optimizes oxygenation and nutrient delivery while improving endometrial receptivity. Enhanced receptivity increases the probability of successful embryo implantation, reaffirming acupuncture's potential as a complementary modality in fertility programs, particularly for patients with hormonal imbalances or decreased ovarian reserve.[19]

Acupuncture Mechanisms in the Male Reproductive System

Acupuncture influences male reproductive health through several interconnected pathways. First, it regulates testosterone, the primary hormone driving spermatogenesis. Increased testosterone levels support sperm maturation in the seminiferous tubules, thereby improving semen concentration and quality. Additionally, acupuncture mitigates oxidative stress by enhancing the activity of antioxidant enzymes, including Superoxide Dismutase (SOD) and Glutathione Peroxidase. Reducing oxidative stress is vital, as free radicals can damage sperm membranes and DNA, leading to impaired motility and morphology.[16]

Beyond hormonal and oxidative factors, acupuncture improves testicular circulation.[13] Vasodilation induced by sympathetic nervous system modulation increases blood flow to the testes, ensuring the oxygen and nutrient supply required for spermatogenesis. This enhancement can improve semen parameters, including concentration, motility, and morphology. Furthermore, acupuncture provides anti-inflammatory effects that reduce inflammatory mediators in the male genital system, creating a more conducive environment for high-quality sperm production. Thus, acupuncture serves as a comprehensive complementary therapy for male reproductive health by integrating hormonal, oxidative, circulatory, and immunological mechanisms.[13]

The Effects of Acupuncture on Reproductive Function

Acupuncture exerts a multifaceted influence on reproductive function in both men and women, as evidenced by clinical evaluations focusing on infertility, assisted reproductive technology (ART), menstrual disorders, and reproductive-related psychological well-being.

Clinical Applications in Female Infertility and PCOS

In the management of female infertility, acupuncture serves as a primary complementary intervention for ovulatory dysfunction, diminished ovarian reserve (DOR), and idiopathic infertility. Clinical data indicate that acupuncture improves hormonal parameters and ovarian function while increasing clinical pregnancy rates more effectively than control groups or sham acupuncture.[21] Specifically, for patients with PCOS, acupuncture promotes spontaneous ovulation. It regulates the menstrual cycle by modulating the hypothalamus–pituitary–ovarian (HPO) axis.[22]

Integration with Assisted Reproductive Technology (ART)

Acupuncture is increasingly utilized as an adjunct to assisted reproductive technology (ART), particularly in vitro fertilization (IVF). Studies report that incorporating acupuncture into IVF protocols is associated with significantly higher clinical pregnancy and live birth rates compared to standard care alone.[21] Furthermore, evidence from network meta-analyses suggests that the intervention's efficacy depends heavily on timing and frequency; specifically, treatments administered before and after embryo transfer appear to be critical for optimizing implantation rates and pregnancy success.[23]

Impact on Male Reproductive Parameters

Regarding male factor infertility, acupuncture contributes to improved sperm parameters, including concentration, motility, and morphology. By enhancing testicular microcirculation and mitigating oxidative stress, acupuncture elevates overall semen quality compared to traditional control therapies.[24]

These physiological improvements suggest that acupuncture supports the biological environment necessary for healthy spermatogenesis and improved paternal fertility potential.

Management of Menstrual Disorders and Psychological Distress

Acupuncture is an effective modality for managing menstrual disorders, specifically primary dysmenorrhea. By modulating prostaglandin levels and the autonomic nervous system, it significantly reduces the intensity of menstrual pain compared to placebo or standard pharmacological analgesics.[25] Beyond physical symptom management, acupuncture addresses the psychological stressors often inherent in infertility. By reducing anxiety and stress in women undergoing fertility treatments, acupuncture modulates neuroendocrine pathways. It lowers cortisol levels, which may ultimately enhance the probability of successful conception.[22]

Acupuncture Treatment Protocols

Acupuncture techniques and protocols are critical determinants of clinical efficacy, particularly in reproductive and hormonal disorders. In modern clinical practice, the application of acupuncture is not arbitrary; rather, it relies on standardized point selection, precise stimulation methods, and tailored treatment frequencies adapted to the patient's physiological status. This structured approach is essential because acupuncture operates through integrated neuro-endocrine-immune pathways that modulate systemic biological responses, including regional blood flow, autonomic nervous system activity, and hormonal regulation.[26]

Fundamental Acupuncture Techniques

The primary technique involves inserting sterile, single-use needles into specific acupoints at varying depths and angles, depending on the anatomical site and therapeutic objective. Following insertion, practitioners may apply manual stimulation, such as rotation, lifting, or light thrusting, to elicit *deqi*, a characteristic sensation of heaviness, warmth, or tingling. This *deqi* response signals the activation of afferent nerve fibers, triggering neurophysiological cascades at the spinal and central levels, including activation of the autonomic nervous system and the release of neurochemical mediators that influence systemic function.[27]

Beyond manual methods, clinicians frequently use electroacupuncture (EA), which involves applying low-intensity electrical currents to the needles inserted into the body. EA provides a more consistent, measurable, and potent stimulus than manual techniques alone. In managing hormonal and reproductive dysfunction, EA is often the preferred modality due to its robust capacity to influence neural pathways and neuroendocrine interactions, specifically those governing the hypothalamic–pituitary–ovarian (HPO) and hypothalamic–pituitary–gonadal (HPG) axes.[26]

Strategic Point Selection for Reproductive and Hormonal Regulation

Point selection for reproductive and hormonal therapy focuses on anatomical sites involved in the regulation of the hypothalamus, pituitary gland, and reproductive organs. Frequently utilized points include CV4 (*Guanyuan*), CV6 (*Qihai*), SP6 (*Sanyinjiao*), ST29 (*Guilai*), LR3 (*Taichong*), and KI3 (*Taixi*). These points are selected based on both traditional principles and empirical evidence demonstrating that their stimulation enhances reproductive blood flow, modulates autonomic responses, and supports hormonal equilibrium via afferent neural pathways connected to neuroendocrine centers.[28]

Modern scientific evidence indicates that stimulating these points alters sensory nerve activity, providing a biological basis for how acupuncture influences the brain's neuroendocrine centers. Neuromodulation research confirms that peripheral nerve pathways originating from these acupoints affect the release of gonadotropin-releasing hormone (GnRH) and regulate the secretion of luteinizing hormone (LH) and follicle-stimulating hormone (FSH), which are central to reproductive health.[26]

Therapeutic Protocols and Standardization

Acupuncture protocols for reproductive disorders are individualized based on clinical diagnosis, physiological status, and specific therapeutic goals. Clinical reviews and trials typically recommend a frequency of 1 to 3 sessions per week, with each session lasting 20 to 30 minutes. The total duration of therapy may span several weeks or multiple hormonal cycles, depending on clinical response and objectives, such as inducing ovulation in PCOS or improving fertility outcomes.[29]

In complex cases such as infertility or PCOS, protocols often integrate low-frequency electroacupuncture to amplify neuroendocrine modulation. This approach aims to dampen excessive sympathetic nerve activity, stimulate β-endorphin release, and normalize reproductive hormone secretion patterns to restore cyclical balance.[29] Recent dose-response studies further emphasize that parameters such as the number of stimulated points, session frequency, and total duration significantly influence clinical outcomes. These findings underscore the importance of protocol standardization to optimize the efficacy of acupuncture as a complementary medical modality.[29]

Safety and Clinical Principles

Clinical safety remains a cornerstone of professional acupuncture practice, necessitating strict adherence to aseptic techniques, the use of sterile single-use needles, and comprehensive medical evaluations prior to the initiation of therapy. When administered by trained healthcare professionals who meet recognized competency standards, acupuncture is generally considered a safe intervention.[28] Reported adverse effects, such as localized pain, minor bruising, or transient weakness at the insertion site, are typically mild, infrequent, and resolve spontaneously without further intervention.[28]

Furthermore, core clinical principles dictate that treatment parameters must be tailored to the patient's specific physiological needs. Routine monitoring is essential for evaluating therapeutic responses and identifying potential side

effects, enabling clinicians to modify protocols dynamically. This adaptive approach ensures that clinical benefits are maximized while minimizing any associated risks to the patient.

Ultimately, contemporary acupuncture techniques and protocols are designed to deliver controlled, sustained neurosensory stimulation that triggers physiological responses capable of restoring reproductive and hormonal equilibrium. The transition toward a systematic, evidence-based framework continues to solidify acupuncture's position as a valuable complementary modality in modern medical practice.[28]

CONCLUSION

Evidence indicates that acupuncture regulates menstrual cycles, enhances ovulation, improves ovarian reserve, and optimizes outcomes in assisted reproductive technologies such as IVF among women, while concurrently enhancing male sperm quality by improving testicular circulation and mitigating oxidative stress. Furthermore, the modality offers essential psychological support by reducing the stress and anxiety known to impair reproductive function. While acupuncture demonstrates significant potential as a supportive therapy for hormonal and reproductive health, it must be positioned as a complementary adjunct rather than a replacement for conventional medical interventions. To facilitate its broader integration into modern clinical practice, the medical community must prioritize the development of standardized protocols and further rigorous research. Clinical implementation should be restricted to supervised settings under competent healthcare professionals, accompanied by comprehensive patient education to ensure safe and evidence-based utilization.

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All authors contributed equally in the writing process of this article.

REFERENCES

1. Anang Kurniawan A, Setiawan Wisnu Aji SW, Dhionisius David Mario DDM, Liss Dyah Dewi Arini LDDA. Peran sistem endokrin dalam regulasi fisiologis tubuh dan implikasinya terhadap kesehatan. Jurnal Mahasiswa Ilmu Kesehatan. 2025;3(1):47–54. doi:10.59841/jumkes.v3i1.2184
2. Peng X, Wu B, Zhou S, Xu Y, Ogihara A, Nishimura S, Jin Q, Litscher G. Integrating acupuncture and herbal medicine into assisted reproductive technology: A systematic review and meta-analysis of East Asian traditional medicine. Healthcare. 2025;13(11):1326.
3. Sarip NS, Pratiwi AR, Sianturi ASB, Hafifa F, Sari VJ, Pratiwi N. Kajian literatur: Gangguan sistem reproduksi pada perempuan dan laki-laki di era modern. Al Qodiri: Jurnal Pendidikan, Sosial dan Keagamaan. 2025;23(3):575–86. doi:10.53515/qodiri.2025.23.3.575-585
4. Ko JH, Kim S-N. A literature review of women's sex hormone changes by acupuncture treatment: Analysis of human and animal studies. Evid Based Complement Alternat Med. 2018.
5. Zulli Nuralita, Kurniawan LC, Wulandari M. Penatalaksanaan infertilitas melalui akupunktur dalam perspektif Chinese Medicine: Studi kasus. Jurnal Kesehatan (UNAR). 2025.
6. Strisanti IAS. Akupunktur terapi untuk menurunkan level ansietas pada wanita dengan weight loss related amenorrhea: A pilot study. Jurnal Riset Kesehatan Nasional. 2020;4(1):60–4.
7. Dewi HL, Wulandari M, Mahadini C. Asuhan akupunktur pada pasien nyeri menstruasi karena stagnasi Qi hati di Griya Sehat Purple Acupuncture Cirebon. Jurnal Sehat Indonesia (JUSINDO). 2025;7(2):1195–213.
8. Zhang S, Li J. An introduction to traditional Chinese medicine, including acupuncture. Anat Rec. 2021;304:2359–64.
9. Zhang R, Lao L, Ren K, Berman BM. Mechanisms of acupuncture–electroacupuncture on persistent pain. Anesthesiology. 2014;120(2):482–503.
10. Li N, et al. The mechanisms of acupuncture in the treatment of chronic pain: a review. Front Neurosci. 2022;16:834179.
11. Vickers AJ, Vertosick EA, Lewith G, et al. Acupuncture for chronic pain: update of an individual patient data meta-analysis. J Pain. 2018;19(5):455–74.
12. Zhang S, Wu W, Zhang J, et al. Clinical practice guidelines for acupuncture: evidence-based recommendations. BMJ. 2023;380:e072064.
13. Kim JH, Lee S, Park HJ, et al. Auricular acupuncture for anxiety and sleep disorders. Complement Ther Med. 2023;69:102857.
14. Zheng Y, Wang X, Zhao H, Jiang Y, Zhu Y, Chen J, et al. The "Black Straight- Line Sign" in the Putamen in diffusion-weighted imaging: a potential diagnostic MRI marker for multiple system atrophy. Front Neurol. 2022.
15. Logan AD, Yama NS, Fu KMC. Selective active resonance tuning for multi-mode nonlinear photonic cavities. Opt Express. 2024;32(8):13396–407. doi:10.1364/OE.512048.
16. Mongrain K, Simmons A, Shore I, Prinja X, Reaume M. Side-by-side: a one-on- one peer support program for medical students. Acad Med. 2022;97(8):1170–4. doi:10.1097/ACM.0000000000004704.
17. Inouye BM, Sexton SJ, Boysen WR, Kowalik U, Truong T, Kuchibhatla M, Peterson AC. Increasing comorbidity and frailty is not associated with early postoperative complications among men undergoing artificial urinary sphincter or sling implantation: a real-world application of NSQIP® data to reconstructive urology. Urol Pract. 2021;8(2):264–9. doi:10.1097/UPJ.0000000000000199.
18. Lin, G., Liu, X., Cong, C., Chen, S., & Xu, L. (2023). Clinical efficacy of acupuncture for diminished ovarian reserve: a systematic review and meta-analysis of randomized controlled trials. Frontiers in Endocrinology, 14.
19. Xiang WL, Xiong J, Wang HY, Cai T, Shi P, Zhao QH, et al. The Bro-Xre toxin- antitoxin modules in Weissella cibaria: inducing persister cells to escape tetracycline stress by disrupting metabolism. 2024.
20. Zhang Z, Zhu X, Hou H, Tang L, Xiao J, Zhong Q. Corrigendum to "Regeneration and utilization of graphite from the spent lithium-ion batteries by modified low- temperature sulfuric acid roasting". 2022.
21. Adugna SA, Kitessa JD. Open castration in dromedary camel through two scrotal incisions: a case report. Clin Case Rep. 2023;11:e6931. doi:10.1002/ccr3.6931.
22. Meena VK, Kumar V, Karalia S, Dangi RS, Sundd M. Structural and mechanistic insights into modulation of α-Synuclein fibril formation by aloin and emodin. Biochim Biophys Acta Gen Subj. 2022;1866(7):130151. doi:10.1016/j.bbagen.2022.130151.
23. Tagami T, Okamura M, Ogawa K, Ozeki T. Fabrication of mucoadhesive films containing pharmaceutical ionic liquid and Eudragit polymer using pressure-assisted microsyringe-type 3D printer for treating oral mucositis. Biochim Biophys Acta Gen Subj. 2022.
24. Er A, Ay IE, Ceran TH. Evaluating Turkish readability and quality of strabismus- related websites. 2024.
25. Rogowski P, Trapp C, von Bestenbostel R, Konnerth D, Marschner S, Schmidt H, et al. Radiotherapy in oligometastatic prostate cancer, a pattern of care survey among members of the German Society for Radiation Oncology (DEGRO). 2022.

26. Ye Y, Zhou C-C, Hu H-Q, Fukuzawa I, Zhang H-L. Underlying mechanisms of acupuncture therapy on polycystic ovary syndrome: Evidences from animal and clinical studies. Front Endocrinol. 2022;13:1035929.
27. Zhu H, Nan S, Suo C, Zhang Q, Hu M, Chen R, Wan J, Li M, Chen J, Ding M. Electroacupuncture affects the activity of the hypothalamic-pituitary-ovary axis in female rats. Front Physiol. 2019;10:466.
28. Bu Y, Yan J, Zhang Z, Xue S, Chi F, Zheng Y, Xia Y, Chen Y. Acupuncture and the HPO axis: A review of neuroendocrine mechanisms with implications for ovarian function. J Integr Neurosci. 2025;24(10):39451.
29. Wei J, Shen Z, Zhao C, Bai H, Yin J, Wang J. Dose-response of acupuncture on ovulation rates in polycystic ovary syndrome: A meta-analysis and exploratory dose- response analysis. Front Endocrinol. 2025;16:1610338.