

A Review of Recent Progress in the Mechanisms and Effectiveness of Acupuncture for Treating Allergic Rhinitis

Fan Bu , Zhengchi Lou

The Third Affiliated Hospital of Xinxiang Medical University, Henan, 453000, People's Republic of China

Correspondence: Zhengchi Lou, Email louzhc1977@163.com

Abstract: This review aims to summarize and evaluate the latest clinical evidence and mechanistic studies regarding acupuncture for the treatment of allergic rhinitis AR. Compared with traditional medical treatment, acupuncture treatment of allergic rhinitis has fewer side effects and drug dependence, especially for those patients who do not respond well to medical treatment, acupuncture treatment has become a new hope. By analyzing results from RCTs, systematic reviews, and meta-analyses, the significant effectiveness of acupuncture in improving AR symptoms is clarified. We explore the mechanisms of acupuncture in immune regulation, neural modulation, inflammation modulation, and microbiota modulation, and assess its clinical efficacy and safety. The results indicate that acupuncture significantly alleviates AR symptoms through multiple biological regulatory mechanisms. Future research should further standardize acupuncture treatment protocols and deepen mechanistic studies to optimize its clinical application.

Keywords: acupuncture, allergic rhinitis, mechanisms, efficacy

Introduction

Allergic rhinitis (AR) is a chronic inflammatory disease of the nasal mucosa caused by an overreaction of the immune system to environmental allergens such as pollen, dust mites, mold, and animal dander. The main symptoms of AR include nasal congestion, rhinorrhea, sneezing, and nasal itching, often accompanied by ocular symptoms such as tearing and itching, significantly impacting patients' daily lives and imposing a substantial burden on public health systems.¹

Current treatments for AR primarily include antihistamines, intranasal corticosteroids, leukotriene receptor antagonists, and immunotherapy. Antihistamines effectively relieve symptoms such as sneezing and rhinorrhea but have limited efficacy for nasal congestion and often cause side effects like drowsiness.² Intranasal corticosteroids are the first-line treatment for AR, significantly reducing nasal inflammation and improving all symptoms, but long-term use may lead to local immunosuppression and nasal mucosal atrophy.³ Leukotriene receptor antagonists are effective in some patients but generally offer limited overall efficacy.⁴ Immunotherapy, which involves gradually increasing the dose of allergens to induce tolerance, aims for long-term symptom relief but requires a long treatment period and must be conducted under professional supervision.⁵ Additionally, these conventional treatments often have side effects and poor patient compliance.

Acupuncture, an integral part of traditional Chinese medicine, has been used for thousands of years.⁶ By stimulating specific acupoints, acupuncture regulates the balance of qi and blood in the body and has been widely applied to treat various diseases. Recent studies have increasingly shown that acupuncture also has significant effects in alleviating AR symptoms. Due to its notable efficacy, minimal side effects, and high patient compliance, acupuncture has garnered attention in the medical community.

This review not only consolidates recent findings on the mechanisms of acupuncture in treating AR—including immune regulation, neural modulation, inflammation modulation, and microbiota modulation—but also highlights its potential to bridge traditional and modern therapeutic approaches. The key innovation of this work lies in providing

a comprehensive and multidisciplinary perspective on acupuncture's role in AR management, an aspect that has been underexplored in previous reviews. Targeted primarily at clinicians, researchers, and policymakers, this paper seeks to support the integration of acupuncture into evidence-based AR treatment protocols while offering valuable insights for advancing research in this field.

This review aims to summarize recent advances in acupuncture treatment for AR, focusing on its mechanisms in immune regulation, neural modulation, inflammation modulation, and microbiota modulation. By systematically reviewing relevant literature, we hope to provide scientific evidence for the application of acupuncture in AR treatment and offer references for future research directions.

Epidemiology

AR is a non-infectious chronic inflammatory disease caused by an overreaction of the immune system to inhaled allergens such as pollen, dust mites, mold, and animal dander. In recent years, the global prevalence of AR has been increasing, particularly in highly urbanized and industrialized regions. According to recent studies, the global prevalence of AR varies widely, ranging from 1.0% to 54.5%, with significant increases in low- and middle-income countries.¹

The prevalence of AR varies significantly across different age groups. For instance, the prevalence among children under the age of 3 is approximately 5%, increasing to 8.5% among children aged 6 to 7, and reaching 14.6% among adolescents aged 13 to 14. Among adults aged 20 to 44, the prevalence ranges from 11.8% to 46%.⁷ Additionally, there is a noticeable gender difference in AR prevalence. Prepubescent males have a higher prevalence than females, but this trend reverses after puberty, with females showing higher prevalence rates than males.⁸

The occurrence of AR is closely associated with various risk factors, including the use of antibiotics, air pollution, and parental smoking. Smoking causes changes in cytokine levels in the body. These cytokines play critical roles in regulating immune responses, including antiviral responses. When cytokine levels are imbalanced, the normal function of the immune system may be compromised, rendering the body less resistant to the virus and promoting recurrent infections.⁹ This may reflect both AR severity and susceptibility.¹⁰ A recent large-scale genome-wide association study identified 41 gene loci associated with AR in European populations, involving both innate and adaptive immune pathways, thus bridging the link between environmental exposure and cellular responses.¹¹ Additionally, epidemiological studies have proposed the “sibling effect” and “farm effect”, supporting the “hygiene hypothesis” and “biodiversity hypothesis”, respectively, emphasizing the role of environmental exposure in AR.¹²

Clinical Manifestations

Nasal congestion is one of the most common symptoms of AR, typically resulting from hyperemia and swelling of the nasal mucosa. Patients often experience difficulty breathing through the nose, and in severe cases, may resort to mouth breathing. The severity of nasal congestion can fluctuate based on environmental changes and the level of allergen exposure.¹³

Rhinorrhea, another hallmark symptom of AR, involves the secretion of a large amount of watery nasal discharge. This symptom typically appears rapidly following allergen exposure and can persist for several hours to days. The primary cause of rhinorrhea is the overactivity of the nasal mucosal glands.¹⁴

Sneezing is an acute symptom of AR, often occurring in bouts. Upon exposure to allergens, patients may experience a series of consecutive sneezes. This reaction is due to the hypersensitivity of nerve endings in the nasal cavity.¹⁵

Nasal itching, a defining symptom of AR, often causes patients to frequently rub their noses. This itching is linked to the release of inflammatory mediators like histamine, which stimulate nerve endings in the nasal cavity.¹⁶

Asthma is an airway hyperresponsive disease associated with AR.¹⁷ Asthma itself does not directly lead to recurrent infections, but as a chronic disease, its symptoms and management modalities may be associated with an increased risk of infection.¹⁸ Patients' airways are highly sensitive to a variety of irritants (eg, allergens, cold air, exercise, etc). This airway inflammation may make the airways more susceptible to bacterial or viral infection, thereby triggering asthma attacks.¹⁹

The severity and duration of these symptoms vary among individuals and are influenced by the type of allergens, the amount of exposure, and environmental factors. Although AR symptoms are not life-threatening, they significantly impact the quality of life and daily functioning of patients.

Clinical Evidence of Acupuncture for AR Overview of Randomized Controlled Trials (RCTs)

In recent years, several RCTs have evaluated the clinical efficacy of acupuncture for AR. The study by Bao Jiaying²⁰ observed the effects of modified acupuncture at the pterygopalatine ganglion on AR. In this study, 80 patients with AR were randomly divided into an observation group and a control group, with 40 patients in each group. The observation group received modified acupuncture at the pterygopalatine ganglion for 30 minutes each session, twice a week, with intervals of 3 to 4 days, for 4 consecutive weeks. The control group used budesonide nasal spray, twice daily, one spray per nostril, for 4 consecutive weeks. The results showed that after the first treatment, at the end of the treatment, and 4 weeks post-treatment, the total nasal symptom score (TNSS) and nasal congestion and itching scores of the observation group were significantly lower than those of the control group ($P < 0.01$). The recurrence rate in the observation group was 13.5%, significantly lower than the 44.8% in the control group ($P < 0.01$). Overall, the total effective rate in the observation group was 92.5%, higher than the 72.5% in the control group ($P < 0.05$). Furthermore, the study noted that the observation group showed better improvements in Visual Analog Scale (VAS) scores and Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ) scores compared to the control group ($P < 0.01$). Specifically, at the end of the treatment and 4 weeks post-treatment, the VAS and RQLQ scores of the observation group were significantly lower than those of the control group, indicating that acupuncture not only effectively alleviates nasal symptoms but also significantly improves the quality of life for patients.

Findings from Systematic Reviews and Meta-Analyses

Systematic reviews and meta-analyses provide more comprehensive and reliable evidence by integrating the results of multiple studies. Min He⁶ conducted a systematic review and meta-analysis to evaluate the efficacy and safety of acupuncture for AR. Following Cochrane methodological standards, this study included 30 RCTs with a total of 4413 participants. These studies compared the efficacy of acupuncture with other treatments for AR, including no intervention, sham acupuncture, and conventional drug treatments. The results indicated that acupuncture significantly improved nasal symptoms and quality of life in adult AR patients compared to no intervention. Specifically, the acupuncture group showed significant improvements in TNSS and RQLQ scores. Additionally, the acupuncture group demonstrated greater reductions in nasal symptoms and improvements in quality of life compared to the sham acupuncture group. However, there was no significant difference in efficacy between acupuncture and commonly used antihistamines (such as cetirizine or loratadine). Nevertheless, acupuncture showed a certain advantage in reducing serum IgE levels, suggesting that it may alleviate AR symptoms by modulating the immune response. It is important to note that while these results indicate some advantages of acupuncture, trial sequential analysis did not confirm the robustness of these findings, indicating the need for more high-quality studies to further validate these results. Additionally, the study highlighted that most included trials had a high risk of performance bias and attrition bias, which could affect the quality and reliability of the evidence.

Clinical Efficacy of Acupuncture in Improving AR Symptoms

In recent years, studies have gradually revealed the clinical efficacy of acupuncture in improving symptoms of AR patients. Guo Yuhao²¹ conducted a prospective, randomized, single-blind trial to evaluate the early intervention effects of sphenopalatine ganglion (Xinwu acupoint) stimulation on patients with seasonal AR (SAR). This study included 41 SAR volunteers, randomly divided into a sphenopalatine ganglion acupuncture group (SPG group) and a sham acupuncture group (SA group). The results showed that after early intervention starting 4 weeks before the allergy season, the SPG group had significantly lower scores for sneezing, nasal congestion, and nasal itching compared to the SA group. The RQLQ scores also indicated that the SPG group experienced significantly better symptom improvement than the SA

group, demonstrating the effectiveness of sphenopalatine ganglion stimulation in improving SAR symptoms and quality of life.

Liu²² conducted another RCT to evaluate the efficacy of intranasal acupuncture for the treatment of persistent AR (PAR). This study randomly assigned 120 PAR patients to an intranasal acupuncture group and a conventional drug treatment group. The results showed that on the first day after treatment, the intranasal acupuncture group had significantly better scores on the VAS and RQLQ compared to the conventional drug treatment group, particularly in terms of improving nasal congestion, olfactory function, and sleep quality.

Mechanisms of Acupuncture in the Treatment of AR

Immune Regulation Mechanism

Acupuncture plays a significant role in treating AR through various immune regulation mechanisms. Firstly, acupuncture can modulate the balance of T cell subsets, enhancing Th1 cell activity and inhibiting Th2 cell function, thereby reducing the secretion of pro-inflammatory cytokines such as IL-4, IL-5, and IL-13. These cytokines play a crucial role in the inflammatory response of AR. By restoring the Th1/Th2 balance, acupuncture effectively reduces the extent of the inflammatory response.²³

Additionally, acupuncture can increase the number and function of regulatory T cells (Tregs), which play a vital role in maintaining immune tolerance and suppressing excessive immune responses.²⁴ Studies have shown that acupuncture treatment can promote Treg cells to secrete anti-inflammatory cytokines such as IL-10 and TGF- β , thereby inhibiting the occurrence of inflammatory and allergic reactions.²⁵

In IgE-mediated immune responses, acupuncture can have an inhibitory effect. IgE plays a key role in the pathogenesis of AR by binding to high-affinity receptors and triggering allergic reactions.²⁶ Acupuncture treatment can significantly reduce the levels of total and specific IgE in the serum, thereby reducing IgE-mediated allergic reactions. This mechanism has been validated in clinical studies, demonstrating the effectiveness of acupuncture in reducing allergic symptoms.²⁷ Ma et al randomly assigned 80 patients with AR into a drug group and an acupuncture-moxibustion group, with 40 patients in each group. The drug group received loratadine tablets once daily for 10 days per course, for a total of three courses. The acupuncture-moxibustion group selected bilateral LI20, EX-HN3, LI4, and BL23 as the main acupoints for acupuncture and moxibustion, once daily, 30 minutes per session, for 10 sessions per course, for a total of three courses. Symptom and sign scores, quality of life scale (R-QOL) scores, and eosinophil (EOS) distribution scores were assessed before and after treatment. Serum levels of IgE, ROR γ t, Foxp3, IL-17, IL-27, and IL-33 were detected using ELISA. Results showed that post-treatment, both groups had significantly reduced symptom and sign scores, R-QOL scores, EOS distribution scores, and serum levels of IgE, ROR γ t, IL-17, and IL-33, and significantly increased serum levels of Foxp3 and IL-27. The acupuncture-moxibustion group showed significantly better improvements in symptom and sign scores, R-QOL scores, and serum levels of IgE, ROR γ t, and IL-33 compared to the drug group, and higher serum levels of Foxp3 and IL-27.²⁸

Moreover, acupuncture enhances nasal mucosal barrier function, reducing allergen invasion, and thus lowering the occurrence of allergic reactions. Specific mechanisms include strengthening the tight junctions of nasal epithelial cells, reducing the release of inflammatory mediators, and improving the immune environment of the nasal cavity.²⁹ This not only helps alleviate acute symptoms of AR but also prevents recurrence of the disease.

Neural Regulation Mechanism

The autonomic nervous system, including the sympathetic and parasympathetic nervous systems, plays a crucial role in the pathological process of allergic diseases such as AR.³⁰ Overactivity of the sympathetic nervous system can lead to nasal vasoconstriction and increased mucosal permeability, exacerbating AR symptoms.³¹ Acupuncture can modulate autonomic nervous system activity by stimulating specific acupoints, reducing sympathetic excitability, and enhancing parasympathetic activity. This regulatory effect can alleviate nasal vasoconstriction and inflammation, thereby relieving AR symptoms.³²

Acupuncture can also activate certain areas of the brain, such as the hypothalamus and brainstem, to balance autonomic nervous system regulation. By influencing the central nervous system, acupuncture can reduce the nervous excitability induced by allergic reactions, alleviating AR symptoms.³³ Additionally, acupuncture increases the release of endogenous opioids, reducing pain and inflammatory responses.³⁴ Acupuncture can also regulate neurotransmitter levels such as 5-HT, serotonin, and dopamine, improving the emotional and psychological state of AR patients.³⁵ These neurotransmitter modulations help alleviate AR symptoms and improve the quality of life for patients.

A study aimed to elucidate the role of 5-HT in regulating Treg activity.³⁶ Researchers collected blood samples from AR patients and isolated Treg cells using magnetic cell sorting. Serum levels of 5-HT and other cytokines were measured by ELISA. Results showed that serum 5-HT levels were higher in AR patients compared to healthy controls. Data analysis revealed a positive correlation between serum 5-HT concentrations and AR-related cytokine concentrations, and a negative correlation with peripheral Treg frequency. Exposure to 5-HT enhanced the expression of IL-6 and IL-21 in dendritic cells (DCs). Co-culture of 5-HT-treated DCs with Tregs led to the conversion of Th17 cells. Blocking STAT3 effectively abolished the 5-HT-induced conversion of Tregs to Th17 cells. In summary, AR patients exhibit higher serum 5-HT levels, and 5-HT-treated DCs can convert Tregs to Th17 cells.

Inflammation Modulation Mechanism

Acupuncture alleviates AR inflammation through multiple anti-inflammatory mechanisms.³⁷ Firstly, acupuncture can increase the secretion of anti-inflammatory cytokines such as IL-10 and TGF- β , which inhibit the production and release of pro-inflammatory cytokines, modulate immune responses, and reduce inflammatory damage.²⁵ Secondly, acupuncture can inhibit the degranulation of mast cells and EOS, reducing the release of histamine and other inflammatory mediators, thereby alleviating allergic symptoms.³⁸ Additionally, acupuncture improves nasal mucosal barrier function, enhancing mucosal defense, reducing allergen invasion, and mitigating inflammatory responses.²⁹

NF- κ B is a key transcription factor. In AR patients, the NF- κ B pathway is typically highly activated in the nasal mucosa, leading to the production of large amounts of pro-inflammatory cytokines such as TNF- α , IL-1 β , and IL-6, which exacerbate inflammation and allergic symptoms.³⁹ Acupuncture treatment can reduce the expression of these pro-inflammatory cytokines by inhibiting NF- κ B pathway activity. I κ B α , a member of the I κ B protein family, can bind to the NF- κ B complex, preventing its entry into the nucleus and thereby blocking NF- κ B-mediated gene transcription, playing a crucial role in the NF- κ B signaling pathway.⁴⁰ Acupuncture can inhibit the phosphorylation and degradation of I κ B α , preventing NF- κ B from entering the nucleus, thus inhibiting its transcriptional activity and reducing inflammatory responses.⁴¹

In AR, overactivation of the TLR4/MyD88/NF- κ B signaling pathway exacerbates inflammation and worsens symptoms. Studies have shown that the expression of TLR4 is significantly increased in the nasal mucosa of AR patients, suggesting TLR4's important role in recognizing and responding to allergens.⁴² Activation of TLR4 leads to MyD88-mediated NF- κ B activation, resulting in the release of large amounts of pro-inflammatory cytokines, which further trigger and maintain chronic inflammation in the nasal cavity.⁴³

Specific studies have found that inhibiting TLR4 or MyD88 can significantly reduce NF- κ B activity, decrease the expression of pro-inflammatory cytokines, and thereby alleviate AR inflammation and symptoms. For example, certain natural medicines⁴⁴ and acupuncture therapy have shown significant efficacy against AR by modulating the TLR4/MyD88/NF- κ B pathway. In an experiment by Tian MH, an AR model was established by ovalbumin induction. The acupuncture group received acupuncture at the "Die E acupoint", while the sham acupuncture group received superficial acupuncture, for 6 days. The results showed that behavioral scores, serum IgE, OVA-sIgE, IL-4, IL-17 levels, and protein expression of GATA-3, TLR4, MyD88, and NF- κ B p65 in the nasal mucosa were significantly higher in the model group compared to the blank group, while serum IFN- γ , IL-10 levels, and T-bet protein expression in the nasal mucosa were lower. Compared to the model group, the acupuncture group showed significantly reduced behavioral scores, serum IgE, OVA-sIgE, IL-4, IL-17 levels, and nasal mucosa expression of GATA-3, TLR4, MyD88, and NF- κ B p65 proteins, while serum IFN- γ , IL-10 levels, and T-bet protein expression in the nasal mucosa increased. No significant changes were observed in the sham acupuncture group. The inflammatory response in the nasal mucosa was milder in the acupuncture group compared to the model and sham acupuncture groups.⁴⁵

Microbiota Regulation Mechanism

Acupuncture not only treats AR through immune and neural regulation mechanisms but also plays a role in balancing the nasal microbiota. Studies have shown that the microbiota of AR patients significantly differs from that of healthy individuals, particularly in the nasal cavity.⁴⁶ Research has found that the composition of the gut microbiota in infancy significantly influences the development of allergic diseases. Specifically, the relative abundance of bifidobacteria and *Escherichia/Shigella* in the gut microbiota is closely related to the occurrence of AR. Infants with decreased bifidobacteria and increased *Escherichia/Shigella* are more likely to develop AR.⁴⁷ This finding suggests that early imbalance in the gut microbiota may increase the risk of allergic diseases in childhood. Furthermore, studies have shown that early use of specific probiotics can modulate the gut microbiota and reduce the risk of allergic diseases. For instance, in a study of children at high risk for allergies, interventions with a mixture of specific probiotics (such as lactobacilli and bifidobacteria) and galactooligosaccharides administered to mothers and infants significantly reduced the incidence of eczema in infancy, and in some cases, this protective effect persisted into childhood.¹⁷²⁰⁸⁶⁰¹

In AR patients, the nasal cavity harbors significantly increased levels of harmful bacteria such as *Staphylococcus*⁴⁸ and *Streptococcus*,⁴⁹ while beneficial bacteria such as lactobacilli and bifidobacteria are significantly reduced.⁵⁰ This imbalance in the microbiota can lead to hyperactive immune responses in the nasal mucosa, further exacerbating inflammation and allergic symptoms.⁵¹ Acupuncture can promote the growth of beneficial bacteria such as lactobacilli and bifidobacteria in the nasal cavity. These beneficial bacteria can inhibit the proliferation of harmful bacteria, enhance the barrier function of the nasal mucosa, and reduce inflammatory responses.⁵² For example, studies have found that after acupuncture treatment, the number of lactobacilli in patients significantly increased, while the number of *Staphylococcus* significantly decreased, indicating that acupuncture has a positive effect on restoring microbiota balance.⁵³

Acupuncture has shown significant effects in regulating local and systemic immune responses, thereby enhancing the immune barrier function of the nasal mucosa, increasing the secretion of antimicrobial peptides, and inhibiting the colonization and proliferation of harmful bacteria. In a specific study,⁵⁴ researchers randomly divided New Zealand rabbits into normal control, AR model, non-acupoint acupuncture, and intranasal acupuncture groups. The results indicated that compared to the model group, intranasal acupuncture significantly reduced symptom scores, levels of SP and VIP in the nasal mucosa, and serum levels of IgE and IL-4 in AR rabbits, while significantly increasing the expression of NPY and serum IFN- γ levels. Specifically, after acupuncture treatment, the sneezing frequency, nasal secretion amount, and nasal itching scores in AR rabbits significantly decreased, the expression of SP and VIP in the nasal mucosa significantly declined, serum levels of IgE and IL-4 significantly dropped, while the expression of NPY and serum levels of IFN- γ significantly increased. These findings suggest that acupuncture significantly inhibits the colonization and proliferation of harmful bacteria by regulating the levels of neuropeptides (such as SP, VIP, and NPY) and inflammatory factors (such as IgE, IL-4, and IFN- γ), reduces allergen invasion of the nasal mucosa, and lowers inflammatory responses. This mechanism explains the effectiveness of acupuncture in treating AR and provides a biological basis for its role in enhancing immune barrier function.

Clinical Application of Acupuncture in the Treatment of AR

Acupuncture has demonstrated significant efficacy in treating AR. To ensure scientific and consistent clinical application, the establishment of standardized treatment protocols is crucial. The following are standardized protocols for acupuncture treatment of AR, including acupoint selection, needling techniques, and adjunctive therapies.

Acupoint Selection

Commonly used acupoints include Yingxiang (LI20), Yintang (EX-HN3), Hegu (LI4), Zusanli (ST36), Quchi (LI11), and Dazhui (GV14).^{55,56} Yingxiang, located 0.5 cun lateral to the midpoint of the outer edge of the nostril, helps to open the nasal passages and disperse wind-heat. Yintang, located at the midpoint between the eyebrows, has calming and nasal-opening effects. Hegu, located between the first and second metacarpal bones on the dorsum of the hand, helps to release the exterior and regulate qi and blood. Zusanli, located 3 cun below the patella and 1 cun lateral to the anterior crest of the tibia, strengthens the spleen and stomach and tonifies qi. Quchi, located at the lateral end of the elbow crease, clears

heat and regulates qi and blood. Dazhui, located in the depression below the spinous process of the seventh cervical vertebra, disperses wind and clears heat.

Needling Techniques⁵⁷

For acupuncture treatment, needles with a diameter of 0.25–0.30 mm and a length of 25–40 mm are generally used.⁵⁷ The needling technique involves rotational reinforcement and reduction methods. When needling acupoints such as Yingxiang, Yintang, Hegu, and Zusanli, the needle is inserted to an appropriate depth (approximately 0.5–1.5 cun), with a retention time of 20–30 minutes per session. Rotational stimulation is performed every 5 minutes to enhance the needling sensation. The treatment frequency is 2–3 times per week, with each session lasting 20–30 minutes. Typically, 10 sessions constitute one course of treatment, with 1–3 courses recommended based on the patient's condition.

Adjunctive Therapies

In addition to acupuncture, moxibustion can be used, especially for patients with cold-deficiency AR.^{58,59} Common moxibustion acupoints include Zusanli, Dazhui, and Mingmen. Moxibustion can be performed after acupuncture, with each session lasting 20–30 minutes, 2–3 times per week. Dietary adjustments are also recommended, advising patients to avoid spicy and irritating foods, maintain a light diet, and consume foods rich in vitamins and minerals, such as fresh vegetables and fruits. Lifestyle modifications include maintaining a regular routine, engaging in appropriate exercise, and avoiding excessive fatigue and stress.

Safety and Side Effects of Acupuncture

Acupuncture is widely used in clinical practice and is generally considered safe.^{60–62} As a non-pharmacological therapy, acupuncture does not involve systemic drug effects, making it less likely to cause systemic adverse reactions. This makes acupuncture particularly suitable for patients who are allergic to drugs or have drug contraindications. Although rare cases of severe complications such as pneumothorax and infections have been reported,⁶³ these are extremely rare and usually associated with improper techniques or the use of unsterile needles. By strictly adhering to aseptic techniques and proper procedures, most of these risks can be avoided.

Despite its overall safety, acupuncture may still cause minor side effects. These may include slight pain, bruising, and bleeding at the needling sites.⁶⁴ In most cases, these symptoms are temporary and resolve on their own within a few days. A few patients may experience needle shock reactions, such as dizziness, nausea, sweating, or fainting during acupuncture. This is usually due to nervousness, fasting, or fatigue. By helping patients relax, ensuring proper nutrition, and allowing adequate rest, needle shock reactions can be effectively prevented.⁶⁵ Although the risk of infection is extremely low, improper needle use or technique may still cause local infections. Strict aseptic procedures and the use of disposable needles are crucial measures to prevent infections.⁶⁶

Conclusion

This paper reviews the mechanisms and efficacy of acupuncture in the treatment of AR, exploring clinical evidence and mechanisms from multiple perspectives. Acupuncture demonstrates potential and unique advantages in treating AR by regulating the immune system, nervous system, inflammatory response, and microbiota balance. Although existing research has provided substantial scientific evidence for acupuncture therapy, further in-depth mechanism studies are still needed.

Abbreviations

AR, allergic rhinitis; RCTs, Randomized Controlled Trials; TNSS, total nasal symptom score; RQLQ, Quality of Life Questionnaire; VAS, Visual Analog Scale; SAR, seasonal allergic rhinitis; SPG group, sphenopalatine ganglion acupuncture group; PAR, persistent allergic rhinitis; SA group, sham acupuncture group; EOS, eosinophil; DCs, dendritic cells; R-QOL, quality of life scale.

Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

This study was supported by Henan Province Traditional Chinese Medicine Culture and Management Research Project [No.TCM2024041]; National Traditional Chinese Medicine Innovation Backbone Talent Training Project [No.140-ZYYCX202115; No.084-ZYYCX202115]; and Xinxiang Soft Science Research Program Project [No.RKX2024021].

Disclosure

No conflicts of interest.

References

- Bousquet J, Anto JM, Bachert C, et al. Allergic rhinitis. *Nat Rev Dis Prim.* 2020;6(1):95. doi:10.1038/s41572-020-00227-0
- Zhang Y, Lan F, Zhang L. Update on pathomechanisms and treatments in allergic rhinitis. *Allergy.* 2022;77(11):3309–3319. doi:10.1111/all.15454
- Zhang M, Ni J-Z, Cheng L. Safety of intranasal corticosteroids for allergic rhinitis in children. *Expert Opin Drug Saf.* 2022;21(7):931–938. doi:10.1080/14740338.2022.2046731
- Wise SK, Damask C, Roland LT, et al. International consensus statement on allergy and rhinology: allergic rhinitis–2023. *Wiley Online Lib.* 2023;2023:293–859.
- Drazdauskaitė G, Layhadi JA, Shamji MH. Mechanisms of allergen immunotherapy in allergic rhinitis. *Curr Allergy Asthma Rep.* 2021;21:1–17. doi:10.1007/s11882-020-00977-7
- He M, Qin W, Qin Z, Zhao C. Acupuncture for allergic rhinitis: a systematic review and meta-analysis. *Eur J Med Res.* 2022;27(1):58. doi:10.1186/s40001-022-00682-3
- Ciofalo A, Pasquariello B, Iannella G, et al. The role of nasal cytology in the diagnosis of allergic and non-allergic rhinitis in adult and children. *Eur Rev Med Pharmacol Sci.* 2019;23(12). doi:10.26355/eurrev_201906_18170
- Mariona P, Theresa K, Andreas R, et al. Sex-related allergic rhinitis prevalence switch from childhood to adulthood: a systematic review and meta-analysis. *Int Arch Allergy Immunol.* 2017;172(4):1. doi:10.1159/000464324
- Gian Luigi M, Maria antonietta A, Silvia C, et al. Passive exposure to smoke results in defective interferon-gamma production by adenoids in children with recurrent respiratory infections. *J Interferon Cytokine Res.* 2009;29(8):1. doi:10.1089/jir.2008.0108
- Kamil J, Agnieszka K, Andrzej E, Cemal C. Perspectives for the use of bacterial lysates for the treatment of allergic rhinitis: a systematic review. *J Asthma Allergy.* 2022;15:1. doi:10.2147/jaa.S360828
- Johannes W, Marie S, John AC, et al. Genome-wide association and HLA fine-mapping studies identify risk loci and genetic pathways underlying allergic rhinitis. *Nat Genet.* 2018;50(8). doi:10.1038/s41588-018-0157-1
- Jon G, Marie S. Epidemiology of allergy: natural course and risk factors of allergic diseases. *Handb Exp Pharmacol.* 2021;268:1. doi:10.1007/164_2021_507
- Noriko O, Naoaki S, Takahisa M. The role of bioactive lipid mediators in nasal congestion of allergic rhinitis. *Nihon Yakurigaku Zasshi.* 2024;159(3). doi:10.1254/fpj.24004
- Weini H, Tianhong Z, Yinghong Z, et al. A multi-center observation of the therapeutic efficacy of Bencycloquidum bromide in the treatment of seasonal allergic rhinitis with predominant symptoms of rhinorrhea. *Lin Chuang Er Bi Yan Hou Tou Jing Wai Ke Za Zhi.* 2023;37(7). doi:10.13201/j.issn.2096-7993.2023.07.008
- Gwanghui R, Jun-Sang B, Ji Hye K, Eun Hee K, Young-Jun C, Ji-Hun M. Sneezing and rubbing counts in allergic rhinitis mouse models are a reliable indicator of type 2 immune response. *Clin Exp Otorhinolaryngol.* 2020;13(3). doi:10.21053/ceo.2019.02005
- Yuhang C, Jie W, Liqun W, Ye Z, Hong C, Ziwei Z. Efficacy of Chinese herbal medicine on nasal itching in children with allergic rhinitis: a systematic review and meta-analysis. *Front Pharmacol.* 2023;14. doi:10.3389/fphar.2023.1240917
- Michael PP, Christopher DB, Jacob K, John HK. What role does allergy play in chronic ear disease and laryngitis? *Curr Allergy Asthma Rep.* 2016;16(10). doi:10.1007/s11882-016-0653-2
- Dimitri P, Ilaria B, Amelia L, Gian Luigi M. Pediatric rhinosinusitis and asthma. *Respir Med.* 2018;141. doi:10.1016/j.rmed.2018.06.016
- Jussi L, Hille S, Hanna J, Irmeli L. Long-term clinical follow-up of irritant-induced occupational asthma. *Occup Environ Med.* 2024. doi:10.1136/oemed-2024-109540
- Jia-Ying B, Xin-Wei L, Wei-Bo Z, Jia D. Modified acupuncture at sphenopalatine ganglion for allergic rhinitis: a randomized controlled trial. *Zhongguo Zhen Jiu.* 2023;43(5):1.

21. Guo Y, Huang L, Zhang L, et al. Early intervention improves clinical responses to seasonal allergic rhinitis by stimulation in sphenopalatine ganglion (Xinwu acupoint). *J Tradit Chin Med.* 2023;43(4):5. doi:10.19852/j.cnki.jtcm.20230524.001
22. Li-Li L, Zheng G, Lei T, Zhan-Feng Y. A novel and alternative therapy for persistent allergic rhinitis via intranasal acupuncture: a randomized controlled trial. *Eur Arch Otorhinolaryngol.* 2023;280(6):1. doi:10.1007/s00405-022-07793-x
23. Donata G, Florian P, Miriam O, Sylvia B, Benno B, Moritz G. Acupuncture and its effect on cytokine and chemokine profiles in seasonal allergic rhinitis: a preliminary three-armed, randomized, controlled trial. *Eur Arch Otorhinolaryngol.* 2022;279(10):1. doi:10.1007/s00405-022-07335-5
24. Liu Q, Pan P, Ling Z, Zhang X, Zhang X, Li S. Corrigendum to "Acupuncture regulates the Th17/Treg balance and improves cognitive deficits in a rat model of vascular dementia. *Heliyon.* 2023;9(4):1. [Heliyon 9 (2) (February 2023) Article e13346. doi:10.1016/j.heliyon.2023.e14577
25. Yuan-Yuan Q, Chu-Wen F, Zhong-Ren S, et al. Effect of electroacupuncture on behavior and hippocampal inflammatory factors in rats with chronic fatigue syndrome. *Zhen Ci Yan Jiu.* 2024;49(3). doi:10.13702/j.1000-0607.20230441
26. Clarissa B, Ines Z, Tatiana I, et al. Trimeric Bet v 1-specific nanobodies cause strong suppression of IgE binding. *Front Immunol.* 2024;15. doi:10.3389/fimmu.2024.1343024
27. Zhongxia W, Zhiyong W, Yan J, Jinhua L, Xiaoyan W, Jianxin W. Effect of acupuncture at Xinwu acupoint combined with loratadine and fluticasone propionate on symptom alleviation, nasal function, and serum histamine level in patients with allergic rhinitis. *Am J Transl Res.* 2023;15(2):5.
28. Wei M, Chun-Tao Z, Hui-Mei S, Xiao-Shan X, Tong Z, Yue-Feng T. Clinical efficacy and safety evaluation of acupuncture combined with moxibustion in treatment of allergic rhinitis. *Zhen Ci Yan Jiu.* 2022;47(4). doi:10.13702/j.1000-0607.20210315
29. Xin Z, Hui L, Tian-Min Z, Lu L, Shou-Liang H. Acupuncture combined with smokeless or smoky moxibustion for regulating immune function of experimental chronic rhinosinusitis mice. *Zhen Ci Yan Jiu.* 2021;46(9). doi:10.13702/j.1000-0607.201021
30. Gary James C. Asthma, classical conditioning, and the autonomic nervous system - a hypothesis for why children wheeze. *Arch Dis Child.* 2023;109(6). doi:10.1136/archdischild-2023-325441
31. Huang YR, Lou HF, Zhang L. The influence of cold dry air on nasal mucosa. *Lin Chuang Er Bi Yan Hou Tou Jing Wai Ke Za Zhi.* 2018;32(1):1. doi:10.13201/j.issn.1001-1781.2018.01.015
32. Kazufumi T, Kenji I. Association between 2-Hz electroacupuncture stimulation near the cervical sympathetic trunk and nasal skin temperature: a randomized crossover study. *Med Acupunct.* 2021;33(4). doi:10.1089/acu.2020.1517
33. Sheng C, Shu-Han Q, Yi Z, et al. Impact of acupuncture for allergic rhinitis on the activity of the hypothalamus-pituitary-adrenal axis: study protocol for a randomized controlled trial. *Trials.* 2019;20(1). doi:10.1186/s13063-019-3424-2
34. Qian W, Zhonghao L, Dengyun N, et al. Low-frequency electroacupuncture exerts antinociceptive effects through activation of POMC neural circuit induced endorphinergic input to the periaqueductal gray from the arcuate nucleus. *Mol Pain.* 2024;20. doi:10.1177/17448069241252401
35. Nai-Qi M, Jia-Li Y, Jun-Jing S, et al. Effect of electroacupuncture at "Neiguan" (PC6) on pain and brain orexin 1 receptor in mice with inflammatory pain. *Zhen Ci Yan Jiu.* 2024;49(5). doi:10.13702/j.1000-0607.20230128
36. Gui Y, Gaohui W, Wenkai Y, et al. 5-HT is associated with the dysfunction of regulating T cells in patients with allergic rhinitis. *Clin Immunol.* 2022;243. doi:10.1016/j.clim.2022.109101
37. Horng-Sheng S, Yun-Shien L, Chi-Neu T, Yu-Mei H, Joen-Rong S, Hen-Hong C. DNA microarray analysis of the effect on inflammation in patients treated with acupuncture for allergic rhinitis. *J Altern Complement Med.* 2008;14(6). doi:10.1089/acm.2007.0669
38. Wen-Yan Y, Liang-Xiao M, Yuan T, et al. Acupuncture alleviates menstrual pain in rat model via suppressing eotaxin/CCR3 axis to weak EOS-MC activation. *Evid Based Complement Alternat Med.* 2022;2022. doi:10.1155/2022/4571981
39. Zhen Nan Y, Yan Jing F, Thi Van N, et al. Undaria pinnatifida ameliorates nasal inflammation by inhibiting eosinophil and mast cell activation and modulating the NF- κ B/MAPKs signaling pathway. *Immun Inflamm Dis.* 2024;12(3). doi:10.1002/iid3.1215
40. Praveen Krishna V, Bruce AJ, Fridrik JK, Jennifer LD. Quantifying NF- κ B activation by flow cytometry of I κ B α degradation. *Curr Protoc.* 2024;4(5). doi:10.1002/cpz1.1026
41. Feng P, Feng Z, Yanbei C, et al. Warm acupuncture reduces pain and inflammation in rats with lumbar disc herniation induced by autologous nucleus pulposus transplantation via regulating p38MAPK/NF- κ B pathway. *J Acupunct Meridian Stud.* 2024;17(1). doi:10.51507/j.jams.2024.17.1.28
42. Yong X, Zhiqiang S, Ronghua L, Ronghua W, Rong W, Jiyuan L. H3K27 acetylation promotes lncRNA OIP5-AS1 transcription and induces apoptosis of nasal epithelial cells in allergic rhinitis through up-regulation of TLR4. *Xi Bao Yu Fen Zi Mian Yi Xue Za Zhi.* 2024;40(5):1.
43. Jing Z, Lu G, Dongdong Y, Yulan S, Yan Z, Yan F. Three artemisia pollens trigger the onset of allergic rhinitis via TLR4/MyD88 signaling pathway. *Mol Biol Rep.* 2024;51(1). doi:10.1007/s11033-024-09350-7
44. Huajing L, Hongmei Z, Hua Z. Apigenin attenuates inflammatory response in allergic rhinitis mice by inhibiting the TLR4/MyD88/NF- κ B signaling pathway. *Environ Toxicol Int J.* 2022;38(2). doi:10.1002/tox.23699
45. Mei-Hui T, Ya-Nan Z, Wei-Fang S, Huan L, Yong T. Acupuncture at "Die E acupoint" alleviates inflammatory reaction via inhibiting TLR4/MyD88/NF- κ B signaling in rats with allergic rhinitis. *Zhen Ci Yan Jiu.* 2024;49(5). doi:10.13702/j.1000-0607.20230724
46. Sampo K, Ching J, Katri K, et al. Early-life gut microbiota associates with allergic rhinitis during 13-year follow-up in a Finnish probiotic intervention cohort. *Microbiol Spectr.* 2024. doi:10.1128/spectrum.04135-23
47. Sjögren YM, Jenmalm MC, Böttcher MF, Björkstén B, Sverremark-Ekström E. Altered early infant gut microbiota in children developing allergy up to 5 years of age. *Clin Exp Allergy.* 2009;39(4). doi:10.1111/j.1365-2222.2008.03156.x
48. Xiaofei S, Zhipan T, Qi L, Zhenkun Y. Analysis of nasal flora composition in children with perennial allergic rhinitis. *Lin Chuang Er Bi Yan Hou Tou Jing Wai Ke Za Zhi.* 2024;38(2). doi:10.13201/j.issn.2096-7993.2024.02.009
49. Z AC, Yasmin H, S AL, et al. Elexacaftor-tezacaftor-ivacaftor decreases pseudomonas abundance in the sinonasal microbiome in cystic fibrosis. *Int Forum Allergy Rhinol.* 2023;14(5). doi:10.1002/alr.23288
50. Min-Gyu K, Seung-Won H, Hye-Ryun K, Seok-Jin H, Dong-Hyun K, Jeong-Hee C. Probiotic NVP-1703 alleviates allergic rhinitis by inducing IL-10 expression: a four-week clinical trial. *Nutrients.* 2020;12(5). doi:10.3390/nu12051427
51. Roberta DG, Lorenzo D, Alessandro B, Marta B, Matteo G, Elena DV. Putative microbial population shifts attributable to nasal administration of *Streptococcus salivarius* 24SMBc and *Streptococcus oralis* 89a. *Probiotics Antimicrob Proteins.* 2018;11(4). doi:10.1007/s12602-018-9488-6

52. Caterina A, Vincenza Patrizia DM, Francesca O, et al. Treatment with a probiotic mixture containing bifidobacterium animalis subsp. Lactis BB12 and Enterococcus faecium L3 for the prevention of allergic rhinitis symptoms in children: a randomized controlled trial. *Nutrients*. 2021;13(4). doi:10.3390/nu13041315
53. Xiaoke Q, Zheng L, Shengtao H, et al. Electroacupuncture improves depression-like behavior by regulating the abundance of lactobacillus and staphylococci in mice. *J Integr Neurosci*. 2023;22(2). doi:10.31083/j.jin2202028
54. Zheng G, Zhan-Feng Y, Qiao-Ping L, et al. Effect of intranasal acupuncture on neurogenic inflammation in allergic rhinitis rabbits. *Zhen Ci Yan Jiu*. 2021;46(2). doi:10.13702/j.1000-0607.200250
55. Mengxia SH, Shang W, Jiangxia WU, et al. Efficacy and safety of acupoint application for allergic rhinitis: a systematic review and meta-analysis of randomized controlled trials. *J Tradit Chin Med*. 2022;42(6). doi:10.19852/j.cnki.jtcm.2022.06.003
56. Jin-Xian L, Quan-Mei S, Xue-Cheng Z, et al. Analysis of acupoints selection rules and efficacy evaluation of acupuncture and moxibustion for allergic rhinitis. *Zhen Ci Yan Jiu*. 2023;48(1). doi:10.13702/j.1000-0607.20221110
57. Sheng C, Sheng-Nan G, Federico M, et al. Clinical practice guideline for allergic rhinitis treatment with acupuncture. *Chin J Integr Med*. 2020;27(2). doi:10.1007/s11655-020-3161-0
58. Fei-Hu W, Bi-Xiang Z, Ting-Ting Z, Zhuo-Hong C, Hong Z, Gang L. Observation of the long-term clinical efficacy of “Fuyang Guben” acupuncture-moxibustion therapy on perennial allergic rhinitis and its effects on the total IgE and IL-4 in the serum. *Zhen Ci Yan Jiu*. 2023;48(6). doi:10.13702/j.1000-0607.20221293
59. Shi-Hao D, Wei G, Chao Y, et al. Filiform needle acupuncture for allergic rhinitis: a systematic review and meta-analysis. *J Integr Med*. 2022;20(6). doi:10.1016/j.joim.2022.08.004
60. XingYu L, Xi C, XueMei L, et al. Efficacy and safety of therapies related to acupuncture for acute herpes zoster: a PRISMA systematic review and network meta-analysis. *Medicine*. 2024;103(20). doi:10.1097/md.00000000000038006
61. Jae-Hong K, Jeong-Cheol S, Ae-Ran K, et al. Safety and efficacy of acupuncture for mild cognitive impairment: a study protocol for clinical study. *Front Neurol*. 2024;15. doi:10.3389/fneur.2024.1346858
62. Yao H, Qian Y, Xianjin H. The efficacy and safety of acupuncture and moxibustion for the management of nausea and vomiting in pregnant women: a systematic review and meta-analysis. *Heliyon*. 2024;10(2). doi:10.1016/j.heliyon.2024.e24439
63. Brittany S, Sungyub L, Prabhjot M. Traumatic Pneumothorax in a 58-year-old man: a case report of a rare post-acupuncture adverse event. *Am J Case Rep*. 2021;22. doi:10.12659/ajcr.928094
64. Jiyeon W, Jun-Hwan L, Heejung B, Hyangsook L. Safety of acupuncture by Korean medicine doctors: a prospective, practice-based survey of 37,490 consultations. *BMC Complement Med Ther*. 2022;22(1). doi:10.1186/s12906-022-03782-z
65. Fengya Z, Shao Y, Tingting M, et al. An overview of systematic reviews of acupuncture for neurodegenerative disease. *Asian J Psychiatr*. 2023;91. doi:10.1016/j.ajp.2023.103882
66. Youn-Jung K, Sung-Han K, Hak Jin L, Won Young K. Infectious adverse events following acupuncture: clinical progress and microbiological etiology. *J Korean Med Sci*. 2018;33(24). doi:10.3346/jkms.2018.33.e164

International Journal of General Medicine

Publish your work in this journal

The International Journal of General Medicine is an international, peer-reviewed open-access journal that focuses on general and internal medicine, pathogenesis, epidemiology, diagnosis, monitoring and treatment protocols. The journal is characterized by the rapid reporting of reviews, original research and clinical studies across all disease areas. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/international-journal-of-general-medicine-journal>

Dovepress
Taylor & Francis Group