

Discussion on the Immunologic Mechanism of Zhuang Medicine External Treatment of Allergic Rhinitis Based on the Theory of “Disease Caused by Toxin-Deficiency”

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Abstract: Allergic rhinitis (AR) is an IgE-mediated Th2-type inflammatory disease of the nasal mucosa. It has a high prevalence worldwide and significantly affects patients' quality of life. Currently, Western medicine treatment can control symptoms, however, it still faces issues such as recurrence and long-term medication. Zhuang medicine, based on the theory of “disease caused by toxin-deficiency”, emphasizes the interaction and mutual influence of “toxin” and “deficiency” in causing the disease. This article holds that the occurrence and development of AR reflect the pathological dynamics and evolution of “toxin” and “deficiency”, which are reciprocally mutually causal. Based on the theory, Zhuang medicine external treatment, guided by the principles of “detoxifying and tonifying deficiency, unblocking pathways and regulating Qi”, demonstrate unique advantages in the clinical management of AR. This article aims to clarify the intrinsic connection between the “theory of disease caused by toxin-deficiency” and modern pathogenesis of AR, and systematically elucidate the mechanism and clinical application of the Zhuang medicine external treatment, hoping to provide innovative theoretical perspective and practical evidence based on the ethnic medical theory for the prevention and treatment of AR through integrated Chinese and Western medicine.

Keywords: Allergic rhinitis; Zhuang medicine; Theory of disease caused by toxin-deficiency; External treatment; Immunologic mechanism

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1. Introduction

Allergic rhinitis (AR) is a chronic non-infectious disease mediated by specific IgE and characterized by Th2-type nasal mucosal inflammation. Its typical symptoms include nasal itching, sneezing, runny nose, and nasal obstruction, and may be complicated by other conditions such as nasal polyp, conjunctivitis, otitis media, and asthma^[1,2]. AR is one of the most common allergic diseases worldwide, affecting nearly one-third of the population worldwide, and its prevalence in China

has also been increasing annually^[3,4]. Currently, mainstream clinical treatments include allergen avoidance, antihistamines, and leukotriene receptor antagonists, etc., which can effectively alleviate patient's symptoms, but may cause side effects such as epistaxis, headache, and gastrointestinal discomfort^[5]. Therefore, exploring alternative therapies with stable efficacy and fewer side effects is of significant importance.

The theory of “disease caused by toxin-deficiency” of Zhuang Medicine offers a unique perspective. The theory holds that, “toxin” and “deficiency” are the core factors in the occurrence and development of the disease, as the two are mutually causal, leading to dysfunction in the body's “three passages and two channels”^[6]. This aligns closely with the pathogenesis of AR: the invasion of exogenous allergens corresponds to “toxin”, while the immune dysfunction and weakened defensive Qi correspond to “deficiency”. The intertwining of “toxin” and “deficiency” leads to disharmony of Qi and blood in the nose, manifesting as various symptoms.

Therefore, this article aims to systematically explore the intrinsic connection between the “theory of disease caused by toxin-deficiency” of Zhuang Medicine and the modern pathogenesis of AR, and to summarize the application and research progress of external treatment AR based on this theory, thereby promoting integration between ethnic medicine and modern medicine.

2. Relevance of the theory of “disease caused by toxin-deficiency” of Zhuang medicine to pathogenesis of AR

2.1. Disease caused by “toxin” and the external trigger of AR

In the Zhuang medicine theory, “toxin” is regarded as a broad category of pathogenic factors, including external pathogens from the natural environment, such as wind, dampness, heat, and miasma, as well as tangible toxins from plants and animals^[7]. This theory further classifies toxins into tangible and intangible forms, and distinguishes them into exogenous and endogenous categories based on the pathway of onset. “Toxin” exhibits a dual attribute of cause and effect, serving both as the initial factor that triggers diseases and as a product of the pathological process.

“Exogenous toxins” are crucial in triggering the pathological reactions of AR. Among these, the pathogenic characteristics of the “wind toxin” and “dampness toxins” align particularly well with the pathogenesis patterns of AR. “Wind-toxin”, with the nature of fluidity and mutability, resembles the wind-borne dissemination of spring pollen. When such seasonal allergens invade the nose, they can trigger typical symptoms of AR such as nasal obstruction and sneezing. This corresponds to the pathogenesis of wind-toxin attacking the nose, obstructing the Qi movement, and leading to airway blockage in Zhuang medicine. “Dampness-toxin”, viscous and heavy in nature, resembles perennial allergens like dust mites and mold. These allergens thrive in humid environments, and their metabolic products adhere to the nasal mucosa, leading to overactivation of local immunological reaction, manifesting as nasal obstruction, thick nasal discharge, and a sensation of heaviness in the head. This aligns with the pathogenesis of “dampness-toxin affecting the spleen, leading to stagnation in the nose” in Zhuang medicine. Modern epidemiological studies show that pollen particles not only act as allergens but also contain active substances like protease, which can directly damage the epithelial barrier of the nasal mucosa, increase permeability, and promote antigen presentation and inflammatory cell infiltration^[8]. This process shares similarities with the pathogenesis of “wind-toxin transforming into fire” in Zhuang Medicine, which causes nasal swelling and redness. Modern medicine shows that house dust mites can disrupt the tight junctions between airway epithelial cells, penetrate the mucosal layer, and interact with local immune cells, triggering a series of immune responses and inducing Type I hypersensitivity reactions^[9]. This process resembles the invasion of “dampness-toxin” obstructing the “Longlu”, leading to stagnation of Qi and blood, and accumulation of dampness, manifested as mucosal edema and increased discharge. Research has found that mite is in parallel with seasonal humidity fluctuations^[10]. Dampness-toxin-dispelling medicinal herbs such as Tufuling (*Rhizoma Smilacis Glabrae*), Didancao (*Herba Elephantopus*), and Guizhencao (*Herba Bidentis Bipinnatae*) in Zhuang medicine, can achieve clinical efficacy of suppressing inflammatory responses by unblocking the “Longlu” and “Huolu”, expelling wind-toxin, and removing dampness-toxin^[11-13].

2.2. Disease caused by “Deficiency” as the intrinsic etiological basis of AR

In Zhuang medicine, “deficiency” is considered the intrinsic foundation for disease onset, referring to the weakness or disharmony of the body’s healthy Qi. Deficiency can result from innate constitutional insufficiency, improper postnatal nourishment, overexertion, or prolonged illness^[14]. When the healthy Qi is deficient, the ability to defend against external pathogens declines, or internal metabolic disorders arise, generating endogenous toxins, leading to diseases. In the pathogenesis of AR, “deficiency” primarily manifests as insufficiency in the functions of the Zang-Fu organs such as the lung, spleen, and kidney, resulting in systemic immune dysregulation, namely “asynchrony of the three Qi”.

2.2.1. Lung deficiency and dysfunction of the nasal mucosal barrier

According to Zhuang medicine theory, “the lung governs celestial Qi and controls breathing”. When the lung Qi is sufficient, the nose remains unobstructed, and the exterior defense is consolidated. When the lung Qi is deficient, it leads to the insecurity of the airway, followed by impaired functions of the physical and immune barriers of the nasal mucosa. The onset of AR is closely associated with the lung dysfunction. The nasal mucosal epithelium serves as the first line of defense against external pathogens, with its barrier integrity crucial for preventing allergen penetration. Modern medicine confirms that patients with AR exhibit dysfunction of the nasal epithelial barrier and abnormal expression of claudin^[15]. In addition, AHBD-2, widely distributed in the nasal mucosa, is a key effector in maintaining local immune function. It constitutes the nasal chemical defense system by mediating the innate immune response^[16]. Clinical studies have shown that serum HBD-2 levels in children with AR are significantly lower compared to healthy children. This reduction in defensin expression directly weakens the local antimicrobial defense capacity of the nasal cavity, substantially increasing the risk of airway infections and serving as a significant trigger for acute AR^[17]. From the perspective of Zhuang medicine theory, the dysfunction of the lung and the disruption of the defense mechanism of the airway are mutually causative, collectively leading to an enhanced ability of allergens and other “toxins” to penetrate the barrier, forming a vicious pathological cycle of toxin invasion and deficiency of healthy Qi.

2.2.2. Spleen deficiency and AR

According to Zhuang medicine theory, the spleen governs the transportation and transformation of the “Gudao”, serving as the foundation for the generation of Qi and blood. When the spleen is deficient, it can lead to stagnation of “Gudao”, triggering a pathological state of “asynchrony of three Qi (heaven, earth, and human)”. This traditional understanding of pathogenesis closely aligns with modern medical mechanism of immune dysregulation in triggering AR. Modern research shows that the immune factor IL-2, primarily secreted by activated T lymphocytes, plays a crucial role in inhibiting the development of Th2 cells and promoting the differentiation of Th1 cell, which is essential for maintaining immune balance^[18]. Research has found that spleen deficiency syndrome is closely associated with immune imbalance. Fu Wenyang established a rat model of AR with spleen deficiency, and the results showed significantly reduced IL-2 expression in the rats^[19]. Research has found that the mouse model of spleen deficiency showed decreased IFN- γ and elevated inflammatory factor TNF- α , suggesting impaired immune regulation and exacerbated inflammation^[20]. These alterations in immune indicators align with the theory of “spleen deficiency with internal generation of dampness-toxin” in Zhuang medicine. Spleen deficiency results in dysfunction of transportation and transformation, leading to the internal generation of dampness, turbidity, and toxins, thus disrupting the coordination of the “three Qi”, and resulting in the accumulation of inflammatory factors and the disruption of immune homeostasis. This multi-level mechanism reveals the key pathological role of spleen deficiency in the onset of AR.

2.3. The relationship between the theory of “disease caused by toxin-deficiency” of Zhuang medicine and AR

2.3.1. The dynamic evolution of “toxin” and “deficiency”

From the perspective of Zhuang medicine, “toxin” and “deficiency” are not static or isolated in the course of AR, but

rather exist in a process of dynamic transformation and mutual influence. This dynamic relationship corresponds to the whole pathological process of AR, from acute onset to chronic persistence. During the early stage of the disease or at the peak of seasonal onset, it is often manifested as “toxin accumulation”. Patients are exposed to intense pathogenic factors such as “wind-toxin” and “dampness-toxin”, while their healthy Qi is not yet severely deficient. These pathogens suddenly obstruct the “Longlu” and “Huolu” in the nose, leading to stagnation of Qi movement and discharge of fluids. Clinically, this is often manifested as sudden and intense nasal itching, sneezing, and watery nasal discharge. If the disease persists, it progresses to the stage of “intertwined toxin and deficiency”. At this stage, the lingering toxin continuously depletes the body’s healthy Qi, particularly affecting the lung and spleen Qi. Concurrently, the insufficient healthy Qi struggles to expel the pathogens, allowing toxins to linger. Clinically, it manifested as recurrent nasal symptoms accompanied by signs of deficiency such as fatigue, poor appetite, susceptibility to illness. Over time, it transforms into a chronic pattern of “combined deficiency and toxin”. At this stage, the Qi, Yin and Yang of the lung, spleen, and kidney are all impaired, and the metabolism of Qi, blood and fluids are severely disrupted. The body not only fails to resist pathogens, but also becomes prone to generating pathological products such as phlegm-turbidity and blood stasis. This internal “turbidity toxin” combines with external pathogens, becoming difficult to resolve. Clinically, this manifests as persistent nasal obstruction, sticky nasal discharge, hyposmia, and may even be complicated by asthma or nasal polyps. In summary, the pathological nature of AR is a dynamic process in which “toxin” and “deficiency” continuously contend and transform throughout the disease course. This understanding provides a core theoretical basis for stage-based syndrome differentiation and dynamic intervention.

3. Application of Zhuang medicine external treatment of AR based on the theory of “disease due to toxin-deficiency”

As an important component of China’s treasure of traditional ethnic medicine, a distinctive feature and strength of Zhuang medicine lies in its expertise in utilizing external treatment, which aim to unblock “Longlu” and “Huolu”, regulate the synchronization of the “three Qi”, thereby achieving “external treatment with internal efficacy”. The treatment of AR follows the principle of combining ‘detoxification’ with “tonifying deficiency”. Common methods include medicinal thread moxibustion, lotus needle cupping, and acupoint pricking.

3.1. Zhuang medicine medicated thread moxibustion therapy

Based on Zhuang medicine theory, the protracted nature of AR is closely linked to the “insufficiency of celestial Qi”, which facilitates toxin invasion, and the imbalance of the “three Qi”. The pathology of AR involves chronic inflammation, barrier damage, and immune dysfunction. Zhuang medicine proposes the therapeutic principle of “regulating Qi and unblocking pathways to repel toxins”. Medicated thread moxibustion is the preferred method for regulating Qi and unblock pathways. In this therapy, a ramie thread is first immersed in a Zhuang herbal liquid, then ignited and used to directly apply moxibustion to acupoints on the body surface. By stimulating the “Longlu” and “Huolu” with heat, it allows the medicinal efficacy to reach the affected area directly, thereby regulating Qi and blood and exerting a dual regulatory effect of both expelling toxin and tonifying deficiency. Lu Jingjing et al. found that medicinal thread moxibustion combined with electroacupuncture for treating AR demonstrated significantly improvement in symptoms compared to electroacupuncture alone ^[21]. Wang Xilin et al. administered medicated thread moxibustion combined with acupoint application during Sanfu days, achieving a total effective rate of 94.9% ^[22]. Additionally, research has found that this therapy combined with Qidi Buxu Formula can reduce inflammatory indicators such as serum IL-4 and IL-22 in patients ^[23]. Zhang Ying et al. also suggested it has the effects of enhancing immunity and suppressing inflammation ^[24]. In summary, Zhuang medicine medicated thread moxibustion can intervene in the progression of AR through multiple dimensions, including immune regulation and inflammation inhibition. This not only validates the theoretical foundation of “regulating Qi and unblocking passages, eliminating toxins and tonifying deficiency”, but also provides a reference basis for comprehensive clinical

treatment.

3.2. Zhuang medicine lotus needle back cupping method for unblocking the “Longlu” and “Huolu”

In Zhuang medicine theory, the “Longlu” and “Huolu” are the core pathways that maintain human functions. The “Longlu” governs Qi and blood circulation, nourishing the entire body, while the “Huolu” is responsible for information transmission, with its regulatory center located in “Qiaowu”^[25,26]. When both are unobstructed, the “three Qi” can synchronize. Conversely, if they become obstructed, external toxins can easily invade and internal pathogens may proliferate. Symptoms of AR, such as nasal obstruction and runny nose, are the external manifestations of dysregulation of “Qiaowu” and immune dysfunction due to wind-toxin and cold-dampness obstructing “Longlu” and “Huolu”. Therefore, unblocking these pathways is crucial for treatment. This therapy involves pricking the back region with the lotus needle, followed by cupping, aiming to unblock stagnation, expel toxins, and restore “synchronization of the three Qi”. Modern clinical research provides support for the effectiveness of this method.

Clinical studies have shown that Zhuang medicine lotus needle back pricking and cupping method has definitive effects in improving AR symptoms and regulating immune indicators. A controlled study by Gui Xiongbin et al. showed that lotus needle cupping method for removing stasis achieved significantly superior efficacy in total effective rate and cure rate compared with oral desloratadine, with fewer complications^[27]. At the immunological level, this therapy can significantly suppress sIgE levels in AR patients and reduce the release of allergic mediators^[28]. Further research suggests that the mechanism of action is associated with the regulation of Th1/Th2 balance. For instance, Wang Lina et al. observed elevated IFN- γ levels, decreased IL-4 levels, and normalized Th1/Th2 ratios after treatment^[29]. In summary, Zhuang medicine lotus needle back pricking and cupping method, by unblocking the two pathways and eliminating toxins and stasis, not only improves AR symptoms and restores balance of Qi movement, but also provides modern scientific evidence for the theory of “eliminating toxins and expelling stasis” from the perspective of immune regulation.

3.3. Zhuang medicine acupoint pricking therapy for detoxification

Zhuang medicine acupoint pricking therapy is based on the theories of “three pathways and two channels”, “synchronization of the three Qi”, and “disease caused by toxin-deficiency”. With the therapeutic principles of “regulating Qi, detoxifying, and tonifying deficiency”, it uses pricking and bloodletting to directly eliminates “toxic pathogens” and “blood stasis” in the nasal passages, thereby rapidly unblocking the Longlu and harmonizing Qi and blood.

Research has shown that acupoint pricking can significantly elevate the stimulation threshold of the nasal mucosa for histamine, and its mechanism is associated with the inhibition of mast cell degranulation and histamine release^[30,31]. Clinical observation has shown that this therapy achieves a short-term total effective rate of 83.87–90.63% for seasonal AR, with a long-term efficacy maintenance rate of 56–61%^[32]. Both outcomes are significantly superior to those of oral antihistamines. Its mechanism is closely associated with the regulation of immune response. Studies have shown that that acupoint pricking therapy can reduce serum IgE levels in AR patients and downregulates peripheral blood IL-4 levels in experimental models, suggesting it can inhibit Th2-type immune responses and IgE synthesis^[33,34].

From the perspective of Zhuang medicine theory, this method involves selecting acupoints such as Yingxiang (LI20) and Hegu (LI4) to directly eliminate “toxin stasis”, aiming to restore synchronization of the “three Qi”. Modern research shows that it can reduce nasal mucosal hyperreactivity by regulating key indicators such as IgE and IL-4. The mutual validation between the two not only provides a modern interpretation of the “toxin-deficiency” pathogenesis in AR but also offers a scientific basis for the clinical application of this therapy.

4. Reflections and outlook

This article systematically elucidates how the theory of “disease caused by toxin-deficiency” of Zhuang medicine explains the mechanism of AR as the “intertwining of toxin and deficiency with immune imbalance”. It also verifies that Zhuang

medicine external treatment exerts therapeutic effects by regulating immune pathways such as the Th1/Th2 balance. In the modern context, this theory can be understood as an abnormal immune response triggered by exogenous allergens (toxin) under conditions of insufficient immune regulatory function (deficiency).

However, current research has limitations in modern definitions of core concepts, standardization of external treatment protocols, the strength of evidence for long-term efficacy, and the exploration of underlying mechanisms. Future efforts should focus on establishing an objective evaluation system for Zhuang medicine syndromes, conducting standardized multi-center clinical studies, and utilizing systems biology techniques to elucidate its mechanisms, thereby advancing the modernization of Zhuang medicine diagnostic and therapeutic system in the field of allergic diseases.

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