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Zhen Wu Tang: A Case Report Unveiling The Lung-Gut Axis In Asthma Management Through Chinese Herbal Medicine

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Abstract

Asthma is a prevalent chronic respiratory condition affecting adults and children worldwide. In 2019, the World Health Organization estimated that 262 million people were affected by the disease (World Health Organization [WHO], 2024). Its development arises from the complex interaction between the immune system and environmental triggers. Traditional Chinese medicine (TCM) offers a comprehensive framework for understanding and treating asthma, rooted in the principles of syndrome differentiation and treatment found in the earliest Chinese medicine text, the *Huang Di Nei Jing* (Yellow Emperor's Inner Classic), and later herbal texts. Zhen Wu Tang, a Chinese herbal formula, offers a comprehensive approach to asthma management, leveraging its diverse pharmacological actions. The synergistic interactions among Zhen Wu Tang's components not only amplify its therapeutic potential but also inspire new avenues for research and treatment development. Exploring its impact on the gut microbiome unveils novel opportunities for therapeutic exploration in the lung-gut connection within TCM, underscoring the relevance of TCM's diagnostic framework in modern clinical investigations. This case emphasizes the necessity for future clinical studies to encompass herbs, acupuncture, and TCM diagnostic criteria.

Keywords: asthma, Chinese herbal medicine, TCM, microbiome, Zhen Wu Tang

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Introduction

Asthma is a prevalent chronic respiratory condition affecting both adults and children worldwide. According to the World Health Organization, in 2019, the disease affected an estimated 262 million people (WHO, 2024). Its development arises from the complex interaction between the immune system and environmental triggers. When exposed to allergens, pollutants, or respiratory infections, the immune system triggers an inflammatory response, releasing various mediators such as histamine, leukotrienes, and cytokines, contributing to an inflammatory environment (Global Initiative for Asthma [GINA], 2021b). This environment leads to airway hyperresponsiveness, making the bronchioles unusually sensitive, resulting in significant bronchoconstriction and airflow limitation.

The progression of asthma is marked by several pathophysiological changes. Bronchoconstriction occurs as the smooth muscles around the airways tighten, narrowing the passages and hindering airflow. Simultaneously, inflammation induces the airway epithelium's goblet cells to produce excessive mucus, worsening the obstruction. Furthermore, inflammation increases vascular permeability, causing fluid to leak into the airway walls and inducing edema, further impairing respiratory function (Barnes, 2018).

T Cell Subset	Cytokines Produced	Role in Asthma
Th1	IL-2, IFN-γ	Counter-regulate Th2 responses, promote cytotoxic T cell activity
Th2	IL-4, IL-5, IL-13	Eosinophilic inflammation, AHR, mucus production
Th17	IL-17, IL-22	Neutrophilic inflammation, tissue remodeling
Tfh	IL-21	B cell activation, antibody production
Treg	IL-10, TGF-β	Immune suppression, tolerance
Th9	IL-9	Allergic responses

Table 1: Cytokines and T Cell Responses in Asthma

Current allopathic asthma treatment involves several medications with different mechanisms of action to manage symptoms and reduce the risk of exacerbations. Bronchodilators, such as short-acting beta-agonists like albuterol, are commonly used for quick relief of bronchoconstriction by relaxing the smooth muscle of the airways (National Heart, Lung, and Blood Institute [NHLBI], 2020). However, they can cause side effects such as tremors,

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palpitations, and increased heart rate (GINA, 2021a). Inhaled corticosteroids are central to asthma management as they reduce airway inflammation (NHLBI, 2020). However, they may lead to local side effects such as oral thrush and hoarseness and systemic side effects such as adrenal suppression and osteoporosis with long-term use (GINA, 2021a). For severe or resistant cases of asthma, additional treatments may be necessary. Leukotriene receptor antagonists inhibit leukotrienes, inflammatory mediators involved in asthma pathogenesis (NHLBI, 2020). These medications can cause side effects such as headache, nausea, and elevated liver enzymes (GINA, 2021a). Immunomodulatory agents like monoclonal antibodies, anti-IgE medications, and anti-IL-5 medications target specific inflammatory pathways in asthma (NHLBI, 2020). These treatments may have side effects such as allergic reactions and potentially severe systemic reactions (GINA, 2021a).

Due to the potential side effects of current standard care, holistic approaches such as traditional Chinese medicine (TCM) should not be overlooked. TCM offers a comprehensive perspective, considering the interconnectedness of body, mind, and environment. Practices like acupuncture, herbal medicine, and dietary therapy aim to tackle the root causes of asthma, striving to rebalance or create homeostasis within the body (Li, Du, & Li, 2019). Integrating holistic treatments with conventional therapies can provide a more encompassing approach to asthma management, addressing not only the symptoms but also the underlying imbalances and triggers and preventing the side effects of long-term, sometimes lifelong, medication use.

TCM Perspective

TCM offers a comprehensive framework for understanding and treating asthma, rooted in the principles of syndrome differentiation and treatment. The ancient text *Huang Di Nei Jing* (Yellow Emperor's Inner Classic) provides profound insights into respiratory health, shedding light on TCM's perspective on such ailments and their broader implications for overall well-being.

In TCM, the Lung organ system is revered for its respiratory functions and part in regulating the body's circulatory systems. Intricately linked to qi, the form and function of all physiological forces, the Lung is crucial in distributing and regulating qi throughout the body, emphasizing its pivotal role in maintaining holistic health and balance.

The *Huang Di Nei Jing*, specifically in the section "Five Observations Five Agents" (五阅五使, wǔ yuè wǔ shǐ), details respiratory symptoms, noting that such

diseases often manifest as shortness of breath and flaring nostrils. This underscores the critical role of the Lung organ system in respiratory health and breathing patterns. Additionally, in the section "The Main Organs" (本脏, běn zàng), the text discusses the concept of "elevated lungs," linking it to symptoms such as upper respiratory distress, shoulder discomfort, and coughing, highlighting the interconnectedness of respiratory health with other bodily functions.

Moreover, the section on "Five Pathogenic Factors" (五邪, wǔ xié) describes how external pathogenic factors can affect the Lung, leading to symptoms such as painful skin, temperature fluctuations, breathing difficulties, and discomfort in the shoulders and back. Finally, the section on "Painful Disorders" (举痛论, jǔ tòng lùn) addresses the impact of physical exertion, noting that activities causing panting and sweating can strain the lungs, emphasizing the importance of lifestyle choices on overall Lung channel health.

These insights underscore the complex nature of respiratory conditions in TCM, encompassing both external influences and internal imbalances. Understanding these factors is crucial for accurate diagnosis and effective treatment of respiratory ailments.

Case Description

Ms. M, a 38-year-old woman, an enthusiastic runner and hiker, had adhered to a vegan lifestyle for the past decade. Her decision to adopt veganism was influenced by a history of digestive discomfort, marked by recurrent urgent diarrhea following meals. This condition instilled considerable anxiety, particularly when dining out. Through a process of elimination, she pinpointed her symptoms to her body's reduced ability to process fats, especially from animal sources. Upon eliminating animal proteins from her diet, Ms. M experienced a significant improvement in her digestive issues.

Additionally, Ms. M had been using oral contraception for over 15 years to regulate her menstrual cycle and to alleviate menstrual pain that was once debilitating. In her early 30s, it was discovered that she had a 5.5 cm dermoid cyst in her left ovary and a 2 cm dermoid cyst in her right ovary. Dermoid cysts are a type of teratoma that contains elements such as hair, teeth, and skin. They are usually slow-growing and benign. Ms. M had decided against invasive surgery to remove them at the time of this report.

Ms. M led a busy professional life in the fast-paced finance industry while pursuing a master's degree, reflecting a lifestyle characterized by substantial time and energy commitments. Notably, she was of below-average weight.

Her medical journey took a significant turn three years prior during a four-day hike on the Inca Trail to Machu Picchu, where the combination of high elevation, cold, and wet conditions triggered her first asthma attack. Since then, this initial episode evolved into a pattern of frequent asthma attacks, mainly provoked by walking and running in cold weather. These attacks were characterized by difficulty inhaling, leading to shortness of breath and a sensation of mucus obstruction in her throat.

Over time, her condition worsened to the point where she often struggled to take a full breath while lying down at night. When expelled, the mucus appeared clear and foamy. Due to her aversion to pharmaceutical medication, Ms. M's current treatment regimen was limited to using a rescue inhaler, albuterol, which she increasingly relied on. She began using her albuterol multiple times daily and every single night before going to bed. In search of another solution, she explored alternative treatments.

Ms. M presented with a pale complexion. Her pulse was deep and thin, indicating deficiency and lack of strength in the body's qi. The tongue was observed to be quivering, pale, and wet—a presentation that aligned with significant imbalances within her body.

Diagnosis & Treatment Strategy

According to the *Collection of Treatments* (证治汇补, Zhèng zhì huì bǔ), shortness of breath, or "气短, qì duǎn," arises when there is insufficient qi to sustain continuous breathing, particularly in those who are deficient and exert themselves excessively. Furthermore, the *Guidelines for Clinical Practice* (临证指南医案, Lín zhèng zhǐ nán yī àn) suggest that asthma, when caused by excess, primarily involves the Lung organ system. In contrast, internal damage-related asthma implicates the Kidney.

In TCM, the Kidney organ system is the foundation for the body's yang energy, essential for promoting organ functions and warmth. Additionally, TCM views the menstrual cycle as a balance of Kidney yin and Kidney yang, with ovulation being the point at which yin transforms into yang (Lyttleton, 2013). Since birth control suppresses ovulation, it inhibits the natural ebb and flow of yang transformation, which, over time, contributes to the depletion of Kidney yang.

Ms. M's prolonged use of oral contraceptives, coupled with her active lifestyle, led to a depletion of her Kidney yang. When Kidney yang diminishes, it hampers the Spleen's ability to transform and transport properly, leading to her hypo-functioning digestion. This impairment also resulted in pathological water accumulation, which spilled into the Lung, mimicking mucus obstruction. Additionally, inadequate Kidney yang failed to grasp qi from the Lung, manifesting as inhalation difficulties and shortness of breath. Therefore, the diagnosis in this case was Kidney and Spleen yang deficiency, with water overflowing into the Lung.

The treatment strategy focused on addressing the root cause of her symptoms by warming and fortifying the Kidney and Spleen yang to facilitate proper movement and transformation of fluids throughout her body.

Herbal Formula

According to the *Three Character Classic of Medicine* (醫學三字經, Yī xué sān zì jīng, published in 1804), under section eleven, it states: "in diseases with edema, there is yin and yang [...] when there is wheezing, [use] Zhen Wu Tang" (水腫病 有陰陽 ...兼喘促 真武湯, huǐ zhǒng bìng, yǒu yīn yáng ... jiān chuǎn cù, zhēn wǔ tang). The formula strengthens the yang of the Spleen and Kidney to dispel pathogenic water accumulation. Zhen Wu Tang (ZWT) consists of five herbs: fu zi, fu ling, bai zhu, sheng jiang, and bai shao.

Ingredients	Nature	Taste	Organs	Primary Action	Dosage
Fu zi	Hot	Pungent, sweet	Heart, Kidney, ***Spleen***	Tonifies Kidney yang, transforms water	9g
Fu ling	Neutral	Sweet, bland	Heart, ***Spleen***, Kidney	Strengthens ***Spleen***, dries dampness	9g
Bai zhu	Warm	Bitter, sweet	***Spleen***, Stomach	Strengthens ***Spleen***, dries dampess	6g
Sheng jiang	Warm	Pungent, sweet	Lung, ***Spleen***, Stomach	Warms the ***middle jiao***, spreads Lung qi, dispels edema	9g
`Bai shao	Neutral	Bitter, sour	Liver, ***Spleen***	Nourishes Blood, harmonizes Liver and ***Spleen***	9g

Table 2: Ingredients of Zhen Wu Tang

ZWT is a classic formula from the *Shang Han Lun* (Treatise on Cold Damage Disorders), authored by Zhang Zhongjing in 219 CE. It is a seminal text in traditional Chinese medicine that systematically outlines the diagnosis and treatment of diseases caused by external cold pathogenic factors, emphasizing the dynamic interaction between these factors and the body's response. It employs a framework known as the "six levels" (六经, liù jīng), which represents stages of disease progression within the body from the most superficial to the most interior: tai yang, yang ming, shao yang, tai yin, shao yin, and jue yin.

Zhen Wu Tang (ZWT) is traditionally prescribed during the shao yin stage, marked by symptoms such as cough, uncontrolled urination, and diarrhea. This stage is a more severe progression from the tai yin stage and indicates deeper disease penetration affecting the Heart and Kidney. While ZWT addresses these advanced symptoms, Li Zhong Wan is commonly used for earlier-stage conditions, focusing on warming the Spleen and Stomach to prevent disease from affecting Kidney function, which is crucial for water transformation.

In traditional Chinese medicine (TCM), the concept of wu xing, or the five phases—wood, fire, earth, metal, and water—explains the body's internal dynamics and relationship with nature. Maintaining balance between these phases is essential for health, as described in two cycles: the generating cycle (nourishment) and the controlling cycle (restraint). In ZWT, all herbs target the Spleen and Stomach, linked to the earth phase. This formula utilizes the controlling cycle by employing the earth phase to manage the water phase, reflecting its action in absorbing excess fluids.

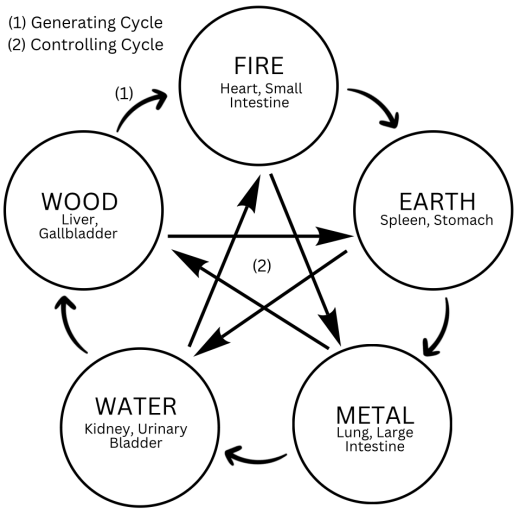

Figure 1: Diagram of Five Phase Cycle

Additionally, examining the properties of individual herbs highlights how their flavors contribute to ZWT's effects. Fu zi is pungent and hot, used to counteract cold, warm the channels, and dispel dampness, in accordance with the principle in *Nei Jing* that heat and pungency balance coldness. Fu ling is neutral and sweet, while bai zhu is warm and sweet, both working to strengthen the Spleen and regulate water metabolism. Bai shao is sour and slightly cold, and sheng jiang is pungent and warm. Together, they balance the body's dampness and restore harmony, aligning with the *Nei Jing*'s recommendation of sour and pungent flavors to counteract damp conditions.

Case Study Outcome

Ms. M was prescribed a granule form of ZWT, with a dosage of six grams twice daily. After one week, she experienced substantial improvements, particularly less mucus buildup and fewer breathing difficulties. This allowed her to reduce her albuterol inhaler usage from several times daily to once a week.

At her one-month follow-up, she reported further progress, with minimal reliance on her rescue inhaler except before strenuous exercise. Her pulse had strengthened, and her tongue no longer quivered, indicating overall improvement in health. Her dosage was reduced to two grams daily before bed, which she maintained successfully at her six-month follow-up. She was

also able to reintroduce high-quality animal proteins into her diet without digestive discomfort.

Discussion

Asthma is a global health problem characterized by chronic airway inflammation, mucus production, and bronchoconstriction. While conventional treatments are effective, their long-term side effects have prompted interest in alternative therapies like TCM. Research into ZWT's pharmacological components reveals a synergistic effect addressing asthma's pathophysiological mechanisms.

Fu ling (Poria cocos), like many mushrooms, reduces lung tissue inflammation and rebalances immune responses by modulating Th1/Th2 cytokine ratios, alleviating the allergic response seen in asthma (Chao et al., 2021). Bai shao (Paeonia lactiflora) has a range of anti-inflammatory and bronchodilatory effects, reducing airway inflammation, smooth muscle contraction, and allergic reactions (Wang et al., 2021). Bai zhu (Atractylodes macrocephala) possesses potent antioxidant properties that protect lung tissues from damage caused by oxidative stress (Li et al., 2012). Sheng jiang (Zingiber officinale) reduces lung inflammation and enhances immune regulation (Yocum et al., 2020). Fu zi (Aconitum carmichaelii) has been shown to suppress inflammation via the HMGB1-mediated NF-κB pathway, further supporting its use in asthma management (Liu et al., 2019).

While these findings support the potential use of ZWT in treating asthma, it is essential to recognize that much of the evidence comes from preclinical studies. Clinical trials are necessary to confirm these effects in humans. Nonetheless, ZWT's composition reflects a growing preference for naturally derived treatments with fewer side effects, offering a sustainable alternative to long-term conventional asthma medications.

Ingredient	Action	Mechanism
Fu Zi	Reduce asthma-related inflammation	Suppress the HMGB1-mediated NF-κB signaling pathway
Fu Ling	Immunomodulatory	Rebalance Th1/Th2 cytokine ratios, alleviate Th2-skewed allergic response
Bai Zhu	Protect lung tissues	Potent antioxidant effect, counteract oxidative stress
Sheng Jiang	Reduce lung inflammation	Inhibit proinflammatory pathways, enhance regulatory T cell activation
Bai Shao	Reduce airway inflammation, suppress cough, reduce bronchial smooth muscle contraction	Inhibit TNF-α and other inflammatory cytokines; regulate calcium ion concentration

Table 3: Zhen Wu Tang Pharmacological Actions

Future Research: The Lung-Gut Axis

In TCM, the Spleen plays a central role in digestion and metabolism, mirroring the gastrointestinal system in Western medicine. ZWT's action on the Spleen suggests that gastrointestinal health is vital in addressing asthma, as the Lung channel originates in the Stomach and Large Intestine before reaching the anatomical lungs. The Lung and Spleen also share an energetic connection in the tai yin channel, emphasizing their mutual role in nutrient digestion and distribution. Li Dong-Yuan, in *Pi Wei Lun* (Treatise of Spleen and Stomach), highlighted the Spleen's importance in asthma treatment, noting that disruptions in Spleen function can lead to asthma and phlegm accumulation.

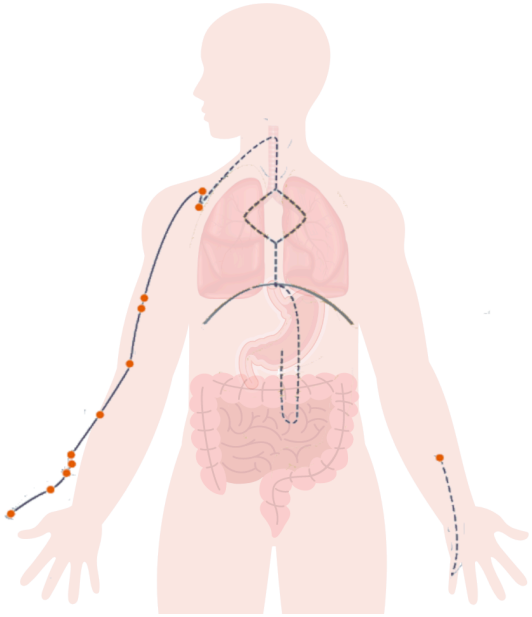

Figure 2: Lung Channel

Modern research has begun exploring ZWT's role in modulating the gut microbiome and its impact on the lung-gut axis. One study found that ZWT restored microbial balance and influenced over 1,400 serum metabolites, pointing to potential new mechanisms for asthma management through gut health (Li et al., 2021).

Patient's Perspective

Ms. M's asthma was triggered by environmental factors, including cold weather, limiting her ability to enjoy activities like running. Conventional medications had undesirable side effects, leading her to explore TCM as an alternative. Her experience underscores the importance of patient-centered care that addresses both the physical and emotional aspects of managing chronic conditions.

Conclusion

ZWT presents a multifaceted approach to asthma management through its anti-inflammatory, immunomodulatory, and bronchodilatory actions. Clinical trials are needed to validate these effects and explore ZWT's integration into conventional medicine. Its components' synergistic interactions could open

new avenues for asthma treatment, especially concerning the lung-gut axis and microbial health. This case highlights the need for personalized and sustainable disease management strategies, as well as the relevance of TCM's diagnostic framework in modern clinical investigations.

Informed Consent and Safety

The patient provided written informed consent for the publication of this case report, and a copy is on file with the authors. There were minimal safety concerns during treatment, and no adverse events were reported.

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