Biomedical Data Science
2026, VOL. 6, NO. 1, 112-115
DOI: 10.47297/wspbdsWSP2752-630525.20260601

Research Progress on Traditional Chinese Medicine Fumigation in the Treatment of Demodex Blepharitis

Yue Li

Eye School of Chengdu University of TCM, Sichuan, Chengdu, 610032, China

ABSTRACT
Demodex blepharitis is an ocular surface disease caused by Demodex mite infection. In recent years, the incidence rate has been gradually increasing, and severe cases can significantly impact patients' daily lives. Currently, treatment for this condition primarily relies on Western medical approaches such as topical corticosteroids and antibiotics; however, these methods are relatively limited in scope and carry significant side effects. Based on the principles of Traditional Chinese Medicine (TCM)—namely, "clearing heat and draining dampness, dispelling wind, killing parasites, and relieving itching"—this study explores the advantages and future research directions of TCM herbal fumigation therapy for treating demodicosis of the eyelid margin. The analysis covers the TCM pathogenesis and pathomechanism of the condition, an examination of fumigation therapy, the classification of commonly used herbs in herbal fumigation, and recent advances in clinical research.

KEYWORDS
Mites; Blepharitis; Herbal steam therapy; Traditional Chinese medicine; Treatment

1 Introduction

Demodex blepharitis is an ocular surface disease caused by Demodex mite infection, characterized by symptoms such as redness, itching, and a foreign body sensation; it is often misdiagnosed or overlooked. Demodex mites congregate in large numbers within the eyelash follicles, sebaceous glands, or meibomian glands, causing dilation and obstruction of the follicles and glands; The mites' feeding, mating, and other activities can damage the hair follicles and glands; their excretions and metabolic byproducts cause chemical irritation and blockages; and as the mites enter and exit the hair follicles and sebaceous glands, they introduce pathogenic microorganisms, thereby causing eyelid margin inflammation, entropion, styes, chalazia, and meibomian gland dysfunction. In severe cases, this can lead to demodex-associated keratoconjunctivitis [1]. In recent years, the prevalence of demodectic blepharitis has been rising. Overseas prevalence rates range from 13% to 70% [2-4], while the average prevalence in China is 30.53% [5]. The longer the duration of demodectic blepharitis, the higher the incidence of other serious eye-related diseases, and the more severe the damage to the eye becomes. If not treated or managed properly, this condition can lead to a severe decline in patients' visual acuity and quality of life. Given the difficulty in preventing and treating demodicosis, it has become a significant public health issue. Currently, clinical treatment for demodicosis primarily relies on Western medical approaches, such as the topical application of antibiotics and corticosteroids; however, long-term use of Western medications like corticosteroids can lead to side effects such as elevated intraocular pressure and corneal damage. In contrast, based on the principles of Traditional Chinese Medicine (TCM)—specifically "clearing heat and draining dampness, dispelling wind, eliminating parasites, and relieving itching"—the use of herbal steam therapy to treat demodicosis of the eyelid margin significantly reduces the side effects associated with Western medicine alone. This TCM approach also highlights the advantages of traditional Chinese medicine, including high efficacy, low cost, and few or no adverse reactions, thereby providing new therapeutic concepts and methods for the modern prevention and treatment of demodicosis of the eyelid margin.

2 Etiology and Pathogenesis of Demodex Blepharitis in Traditional Chinese Medicine

In traditional Chinese medicine, demodex blepharitis is also known as "red and ulcerated eyelid margins," "wind-induced red and ulcerated eyes," or "red and ulcerated eyes caused by exposure to wind." The earliest recorded name for this condition appears in *Yin Hai Jing Wei: Tai Feng Chi Lan*. regarding the etiology and pathogenesis of this disease, *Zhu Bing Yuan Hou Lun: Mu Bing Zhu Hou: Mu Chi Lan Zi Hou* [6] states: " 'This is caused by exposure to wind and sun, with wind-heat pathogens injuring the eyes.' The *Zhengzhi Zhunsheng: Seven Orifices* [7] states: "When wind ascends along the ocular meridians and encounters accumulated heat, combined with anger arising from diet, it forms stubborn phlegm that obstructs the channels. Turbid qi fails to descend, and clear qi fails to ascend. Consequently, fire becomes more intense and water becomes more deficient. Over time, pus accumulates, causing the eyelids to swell. Fine, thread-like worms develop within, leading to a chronic condition that does not heal and is accompanied by severe itching." The *Compendium of Ophthalmology* [8] states: "In this condition, the eyelids are red and ulcerated, accompanied by itching or pain. Generally speaking, redness is attributed to fire, ulceration to dampness, itching to wind, and pain to heat." Based on clinical

observations, the etiology and pathogenesis of this disease can be summarized as follows: Heat accumulates in the spleen and stomach, which is further invaded by wind-pathogen; the combined wind-heat pathogen affects the eyelid margins, damaging body fluids and leading to dryness. Damp-heat in the spleen and stomach is further invaded by wind-pathogen; the combined wind, damp, and heat pathogens interact, ascend along the meridians to attack the eyelid margins, and cause the disease. Excessive internal heart fire is invaded by wind-pathogen, which stirs up the heart fire; the combined wind and fire rise upward, scorching the eyelids and the corners of the eyes.

3 An Analysis of Aromatherapy

3.1 How Aromatherapy Works

Fumigation therapy is highly effective and free of toxic side effects. Its clinical efficacy primarily stems from the interaction between heat and medicinal agents within the body. Heat is a physical factor, and heat therapy falls under the category of physical therapy. The thermal effects of the fumigation process result from a continuous stream of medicated steam acting directly on the body through convection and conduction. The therapeutic effects of the medicinal components, on the one hand, result from the direct action of herbal particles released from the fumigating agents on the body's surface, producing effects such as insecticidal, bactericidal, anti-inflammatory, anti-pruritic, and analgesic actions; on the other hand, they are exerted through transdermal absorption into the body, where they stimulate receptors in tissue cells or participate in biochemical processes such as the regulation of metabolic levels [9]. Among some ethnic minorities, steam therapy is known as "Hongya." Steam therapy can unblock meridians, harmonize qi and blood, reduce inflammation and relieve pain, and promote blood circulation to dispel blood stasis. During the Eastern Han Dynasty, the medical sage Zhang Zhongjing's Essentials of the Golden Cabinet documented the use of fumigation and washing methods to treat trauma and abscesses; Sun Simiao's *Essential Prescriptions Worth a Thousand Pieces of Gold* described herbal fumigation therapy used in the imperial palace to treat the Empress Dowager's severe stroke. At the time, Empress Dowager Liu had suffered a stroke and was unable to speak, but through herbal fumigation and manual therapy, she was revived; The *Formulas of the Imperial Pharmacy* from the Yuan Dynasty records fumigation formulas for the emperor and empress, as well as various formulas for treating joint pain, hemorrhoids, erectile dysfunction, and scrotal swelling and pain [10]. Today, fumigation therapy has expanded to cover internal medicine, surgery, gynecology, pediatrics, dermatology, otolaryngology, orthopedics, rehabilitation medicine, and cosmetic and health care. In the treatment of demodectic blepharitis, a traditional Chinese medicine vaporization solution is sprayed in the form of a mist. The rising heat raises the temperature of the eyelids, causing the capillaries in the eye area to dilate, which improves blood circulation, enhances drug absorption, and boosts the therapeutic effect.

3.2 Fumigation Technical Parameters (Temperature, Time)

In addition to the chemicals used in fumigation, temperature and duration are two key factors that influence clinical efficacy. The entire life cycle of Demodex mites generally lasts 15 – 21 days. They exhibit negative phototaxis and temperature sensitivity, and their optimal developmental conditions are a slightly acidic, humid environment with a pH of 5 – 6.5 and a temperature of 16 – 20° C. Relevant studies indicate that the optimal temperature for demodex mite development is 37°C; their activity increases as the temperature rises, but decreases when temperatures exceed 45°C, and they are likely to die when temperatures exceed 54°C. Professor Zhao Ya'e's team demonstrated through experiments that temperatures above 37°C are detrimental to the survival and activity of mites; 54°C is lethal, with mites surviving for approximately 3 – 5 minutes at this temperature; 58° C is considered the most effective temperature for killing mites, causing them to die within 1 minute .

An appropriate duration of herbal steam therapy promotes capillary dilation and smooth blood circulation, thereby enhancing the efficacy of the treatment. Generally, the higher the skin temperature, the greater its permeability and absorption capacity, which further facilitates the penetration and diffusion of medicinal substances; conversely, excessively low temperatures may slow blood flow, thereby compromising therapeutic outcomes. However, higher temperatures do not necessarily yield better therapeutic results. Animal studies have confirmed that medicinal solutions at 35°C and 45°C are less effective than those at 40°C; 40°C is more conducive to the dilation of local capillaries, thereby facilitating better absorption of the medicinal solution . Furthermore, excessively high steam temperatures can be difficult for patients to tolerate; in severe cases, they may experience dizziness, chest tightness, palpitations, or skin burns.

4 Common Herbs Used in Traditional Chinese Medicine Steam Therapy

Table 1 Classification Table of Common Herbs Used in Traditional Chinese Medicine Steam Therapy

Drug Category	Exemplary drugs	Benefits	Modern Pharmacological Basis
Parasite-killing Herbs	Stemonae Radix	Moistens the lungs and relieves coughs; kills parasites and eliminates lice	a. The compound yebai bu alkaloid has an acute toxic effect on parasites b. It kills the insects by acting as an acetylcholinesterase inhibitor and an acetylcholine receptor agonist
	Melia Cortex	Antiparasitic and detoxifying, drying dampness and relieving itching	a. Contains a variety of insecticidal active ingredients b. It has an inhibitory effect on Staphylococcus aureus, Escherichia coli and various skin fungi
	Zanthoxyli Pericarpium	Warms the middle burner, relieves pain, kills parasites and relieves itching	a. The essential oils and alkaloids it contains can repel insects b. The bergapten and alisol it contains have anti-inflammatory and analgesic properties
Heat-Clearing Herbs	Phellodendri Chinensis Cortex	Clears heat and dries dampness; purges fire and alleviates night sweats; detoxifies and treats skin ulcers	a. The compound dihydroberberine has anti-inflammatory properties b. Inhibits the activity of xanthine oxidase in the liver, thereby reducing serum uric acid levels c. Inhibits the activity of xanthine oxidase in the liver and enhances the body's metabolism
	Scutellariae Radix	Clears heat and dries dampness; purges fire and detoxifies; stops bleeding; stabilises the pregnancy	a. It contains flavonoids, essential oils, organic acids and other compounds, and exhibits pharmacological effects such as anti-inflammatory, antioxidant, antibacterial and antiviral properties
	Borneolum Syntheticum	Clears heat and relieves pain; opens the orifices and revives the mind	a. It has the effect of clearing heat and relieving pain, directly alleviating symptoms such as redness, swelling, itching and pain around the eyelids b. By modulating the phospholipid bilayer of the corneal epithelial cell membrane, its permeability can be improved, thereby promoting the penetration and absorption of drugs
Antipruritic Herbs	Kochiae Fructus	Dispels wind and relieves itching; clears heat and dries dampness	a. Kochia saponin Ic and oleanolic acid glycoside exert anti-inflammatory, anti-allergic and anti-pruritic effects by inhibiting the release of various inflammatory mediators
	Cnidii Fructus	Relieves itching, dispels wind and dries dampness	a. Supercritical extract of Cnidium monnieri exhibits significant anti-itching effects and antagonises the release of histamine
	Sophorae Flavescentis Radix	Relieves itching and kills parasites; clears heat and dries dampness; promotes urination and disperses nodules	a. The compound sophocarpine F can suppress itching b. It has an inhibitory effect on Staphylococcus aureus, Escherichia coli and various skin fungi

5 Advances in Clinical Research

In recent years, the use of traditional Chinese medicine (TCM) fumigation therapy has become increasingly widespread in the field of ophthalmology. With regard to clinical research on the treatment of demodectic blepharitis using TCM fumigation, given the limitations of monotherapy, many scholars are currently investigating the clinical efficacy of combining TCM fumigation with conventional Western medical treatments for this condition.

Li Yunfan combined ocular fumigation with traditional Chinese medicines (Sophora flavescens and Mentha) with irrigation using 0.5% metronidazole and sodium chloride injection, The study found that the combination of traditional Chinese medicine (Sophora flavescens and Mentha) ocular fumigation with 0.5% metronidazole and sodium chloride injection for irrigation was significantly more effective than the use of either traditional Chinese medicine (Sophora flavescens and Mentha) ocular fumigation or 0.5% metronidazole and sodium chloride injection for irrigation alone; the overall response rate in the combination group reached 91.18%. Shan Tingting combined traditional Chinese medicine fumigation (De-Damp Decoction) with tea tree essential oil to treat demodicosis of the eyelid margin of the damp-heat type. Through a comparison of clinical efficacy observations with a control group using tea tree essential oil alone, the results indicated that the group receiving Chinese herbal steam therapy (De-dampness Decoction) combined with tea tree oil showed significantly better outcomes than the control group using tea tree oil alone in terms of improving eyelid margin signs, TCM symptoms, and prolonging tear film break-up time. The treatment efficacy rate was 95.12%, higher than the 78.05% observed in the control group using tea tree oil alone. Bao Mingyao demonstrated through research that the combination of the Eyelid String Parasite-Eradicating Formula and 4-terpineol wipes was significantly effective in improving patients' OSDI scores, alleviating TCM symptoms, alleviating eyelid margin signs, prolonging tear film break-

up time, and reducing mite counts, outperforming the use of either the Eyelid String Parasite-Eradicating Formula or 4-terpineol wipes alone. Wang Feibo et al. confirmed through the treatment of 69 patients with blepharitis that the addition of herbal decoction steam baths and massage therapy to standard treatment can shorten the duration of treatment for blepharitis.

In summary, existing clinical studies have preliminarily confirmed the definite efficacy and unique advantages of traditional Chinese medicine fumigation in the treatment of demodectic blepharitis. Numerous studies indicate that Chinese herbal steam therapy demonstrates positive effects in alleviating subjective symptoms such as eye itching and eyelid margin congestion, as well as in reducing objective indicators such as mite counts and prolonging tear film break-up time. In particular, when used as a complementary treatment, it can significantly enhance the efficacy of standard therapy, thereby demonstrating the clinical value of integrating traditional Chinese and Western medicine.

6 Research Gaps and Future Prospects

Existing clinical studies have preliminarily confirmed the efficacy and safety of traditional Chinese medicine fumigation therapy for treating demodectic blepharitis, demonstrating particular advantages in symptom relief and as an adjunctive treatment. However, contemporary research on the use of Chinese herbal steam therapy for demodectic blepharitis still faces the following issues: Firstly, the treatment of demodectic blepharitis inherently requires a long-term course of therapy, and the condition is highly prone to recurrence; yet, there remains a lack of research into the correlation between the recurrence rate of this condition and individual TCM constitutional types. Constitution is determined by both innate and acquired factors; if it is demonstrated that the recurrence rate of this condition is closely linked to an individual ' s TCM constitution, then the constitution can be regulated through medication and related therapeutic measures, thereby reducing the recurrence rate of demodectic blepharitis. A review of the literature reveals that the vast majority of clinical observations have focused on the combined use of Chinese herbal fumigation and conventional Western medical treatment, with a lack of high-quality randomised controlled trials comparing Chinese herbal fumigation alone against a blank control or placebo. This makes it difficult to fully isolate the influence of the underlying Western medical treatment, thereby preventing an accurate assessment of the absolute efficacy of the Chinese herbal fumigation therapy itself. Future research should be designed with greater rigour to clarify the independent efficacy of fumigation alone in terms of mite eradication and anti-inflammatory effects. Thirdly, it is worth noting that most current studies on the use of TCM fumigation for blepharitis do not differentiate between aetiologies (such as whether the condition is caused by mites). This may lead to heterogeneity in the study population and results in a relative scarcity of specific evidence regarding mite-induced blepharitis. Future research should conduct specific randomised controlled trials targeting mite infections, based on a clear pathogenetic diagnosis.

References

[1] Zha Y Eoet al.,(2005).Observations on morphology and the survival temperature range of Demodexfolliculorum.Acta Entomologica Sinica,(05), 754-758.

[2] HorváthA, et al., Prevalence and Risk Factors of Demodex Mites in Young Adults. (2011). Acta Micro biolImmunol Hung, 58(2):145-155.

[3] KaramanÜet al.,Epidemiology of Demodex Mites among College Students Living in Dormitories in Ordu. (2014). Turkiye Parazitol Derg,2014, 38(3):166-171.

[4] ElstonCA, ElstonDM. Demodexmites. (2014). ClininDermatol, 32(6):739-743.

[5] Yin X Y. (2015). Study on Different Doses of Essential Oils in Human Demodex Mites Kill Function. Journal of Liaoning University of Traditional Chinese Medicine, 17 (12), 109-111.

[6] Li X. (2013). A Collection of Ophthalmological Experiences by Liao Pin-zheng. China Publishing House of Traditional Chinese Medicine. 2013:46.

[7] Wang K T. (1997). Zhengzhi Zhunsheng. Beijing: Ancient Chinese Medicine Classics Press, 1997:45.

[8] Huang T J.(2015). Mujing Dacheng. Beijing: China Publishing House of Traditional Chinese Medicine,2015.

[9] Liu X. (2001). My Views on Herbal Steam Therapy. Beijing Journal of Traditional Chinese Medicine, (06), 34-37.

[10] Yan H.(2013).Herbal Steam Therapy.Proceedings of the 14th Southeast Asian Congress of Aesthetic Medicine,117-119.