Proceedings of ICBioMed 2026 Symposium: Biomedical Engineering and Smart Medicine
DOI: 10.54254/2753-8818/2026.HZ36251

The External Application of Traditional Chinese Medicine in the Treatment of Rosacea

Siwen Gao

Xinglin College of Liaoning University of Traditional Chinese Medicine, Shenyang, China
gaosiwenyouxiang001@outlook.com

Abstract. Rosacea is a chronic inflammatory skin disease with persistent erythema, telangiectasia, papules and pustules as the main manifestations. The course of the disease is often prolonged and repeated, and often accompanied by anxiety, depression and other emotional disorders. External application of traditional Chinese medicine (TCM) in the treatment of rosacea has the advantages of mild and safe, can directly affect the location of the disease, multi-target regulation, and significant curative effect. This paper systematically reviewed the etiology and pathogenesis of rosacea in TCM, external application forms of TCM, medication rules, modern mechanism research and the progress of multimodal combination therapy, and analyzed its molecular mechanism from the aspects of anti-inflammatory, neurovascular regulation, anti proliferation and barrier repair, aiming to provide new solutions for the safety and recurrence problems existing in western medicine treatment. In the future, it is necessary to establish standardized syndrome differentiation and treatment schemes, carry out high-quality multicenter randomized controlled trials, deepen mechanism research, and develop external preparations of TCM with dual effects of anti-inflammatory and emotion regulation, so as to achieve the same treatment of body and mind.

Keywords: Rosacea, Traditional Chinese medicine, External therapys

1. Introduction

Rosacea is closely related to immune inflammation, abnormal neurovascular regulation and emotional factors. About 5.46% of adults in the world are troubled by it. The course of the disease is prolonged, and the recurrence rate is high, which seriously affects the quality of life of patients, and is considered by many people to be very difficult to treat.

The use of Western Medicine (WM) on the face is one of the most commonly used methods for the treatment of rosacea, mainly including metronidazole, azelaic acid, benzoyl peroxide, minocycline, brimonidine, etc. Most WM external medicine uses a single component, targeted and powerful intervention mode, which can quickly control symptoms, but its powerful mechanism often interferes with the normal physiological process of the skin, resulting in skin irritation, pigmentation, rebound after drug withdrawal and other adverse reactions. For example, azelaic acid for external use can cause skin irritation and burning pain; Minocycline can cause pigment deposition in skin and sclera; The recurrence rate is as high as 35% after 5.5 months of isotretinoin

© 2026 The Authors. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

DOI: 10.54254/2753-8818/2026.HZ36251

withdrawal [1]. These limitations cannot be ignored. As one of the characteristic therapies of traditional Chinese medicine (TCM) external application of TCM, which uses natural drugs and pays attention to the overall regulation, has the advantages of multi-target treatment, flexible synergistic application with physical therapy and oral prescriptions, and relatively low recurrence rate after treatment. These can make up for these deficiencies of WM. Recent years, it has been widely concerned in the treatment of rosacea. The commonly used forms include TCM facial mask, wet compress, sloughing, rubbing and cold spray, involving rhubarb, Phellodendron amurense, Stemona, sulfur and other drugs. Modern pharmacological studies have also confirmed that these drugs can exert anti-inflammatory and other multiple effects by regulating a variety of pathways and targets. At present, the field is still in the stage of exploration and development. Several small samples randomized controlled trials and a meta-analysis have confirmed its effectiveness, but the existing studies mostly focus on the observation of curative effect. There is a lack of systematic induction on the dosage forms, medication rules and combined treatment of TCM and WM of different external application of TCM, and the correlation between its mechanism and modern medical pathogenesis theory has not been fully clarified.

Therefore, first of all, this paper constructs the corresponding framework of "disease syndrome mechanism" to endow TCM pathogenesis with modern molecular connotation. Breaking through the simple listing of syndrome differentiation in traditional reviews, second, establishing a systematic pharmacological evidence chain of "traditional Chinese medicine ingredients molecular targets pathological links". Beyond the scattered description of single drug effects, a hierarchical multi-target synergistic mechanism network was constructed. Third, accurately identify the blind area of Western medicine treatment, and establish the clinical positioning of external application of traditional Chinese medicine for synergistic supplement. This paper systematically combed the research progress of external application of traditional Chinese medicine in the treatment of rosacea from a multi-dimensional perspective, provided references for optimizing clinical treatment strategies, and pointed out the direction for subsequent research.

2. Etiology and pathogenesis of TCM

The core pathogenesis of rosacea is visceral disorder, which is invaded by external pathogens and accumulates in the body. The wind, heat, dampness, blood stasis and phlegm accumulate in the body, fumigating the head and face, fighting with evil heat, resulting in Qi and blood disorder, thus causing symptoms in the skin of nose and face. The location of the disease involves the heart, lung, stomach, spleen, liver and other viscera.

The theory of this disease has a long history. "Su Wen: Qi Tong Tian Lun" believes that the sweat pores of human body open after work, and if the wind cold is felt at this time, the wind cold evil Qi will invade by taking advantage of the deficiency. Because the lung is in charge of skin and hair, and the nose is the opening of the lung on the body surface, the wind cold evil Qi will invade the lung and fumigate upward to the head and face. "San Yin Fang: Volume 16" also indicates that lung heat may cause the nose to turn red and result in the appearance of red maculopapular. In the context of TCM, the nasal tip and both sides of the nasal wings are regions governed by the spleen and stomach. "Su Wen: Discussion on Puncturing for Fever" posits that heat in the spleen and stomach initially manifests as redness of the nose. At the same time, the heart fire is too strong, and the fire is upward, fumigating the facial skin, which can lead to erythema and papules. Additionally, Professor Yan Shiyun emphasized the close association between rosacea and the liver [2].

Factors such as alcohol consumption, personal physique and mood fluctuation can also induce or aggravate rosacea. Chao elucidated in Treatise on the Etiology and Manifestations of Various

DOI: 10.54254/2753-8818/2026.HZ36251

Diseases that following alcohol consumption, the heat ascends to the face; when it interacts with cold wind, this can lead to the development of red papules and herpes on the nasal and facial regions. Zhang Ruixue further posited that the fundamental cause of rosacea resides in the patient's inherent predisposition to the condition, while the crucial factor in its pathogenesis lies in the obstruction caused by toxic turbidity and blood stasis. Professor Yang divided the disease into four types: wind heat in lung meridian, liver stagnation and blood heat, damp heat in spleen and stomach, and phlegm and blood stasis. At the initial stage, lung and stomach heat generate wind, causing facial erythema or telangiectasia; In the middle stage, the spleen and stomach were steaming with damp heat, and the hair was red papules and pustules; The course of the disease is prolonged, qi stagnation and blood stasis, evil toxin invagination, and rhinorrhea and ocular manifestations may occur in severe cases [2]. Clinically, it necessitates differentiation and treatment based on disease stages and corresponding syndromes.

Modern research provides microscopic basis for the above pathogenesis. A case study in 2025 confirmed that there were significant microvascular structural abnormalities in rosacea patients, and the positive rate of tortuous dilated capillaries was as high as 48%, which was positively correlated with the severity of the disease. Microvascular hemorrhage suggested a prolonged course, tortuous dilation of micro vessels, and slow blood flow, which corresponded to the blood stasis of veins and meridians in the theory of TCM [3]. Another review in 2024 confirmed from the molecular level, Overexpression of vascular endothelial growth factor (VEGF) is the core driver of abnormal vascular proliferation. VEGF is directly involved in the formation of rosacea persistent erythema and telangiectasia by promoting angiogenesis and inducing inflammatory response [4]. The sustained activation of VEGF is similar to the pathological changes of blood heat in TCM, and finally forms the pathological evolution from blood heat to blood stasis. These findings provide a modern scientific basis for the method of clearing heat and cooling blood, activating blood circulation and removing blood stasis.

3. Medication rule

Wu et al. [5] found that there were 13 kinds of high-frequency drugs ≥ 6 for the external treatment of rosacea, mainly cold (53.11%) and bitter (40.99%), most of which were liver, spleen, stomach, large intestine and lung meridian. These drugs can be summarized into three categories: clearing heat, drying dampness and detoxification, killing insects and itching, and promoting blood circulation and removing blood stasis. Rhubarb, Phellodendron amurense, Scutellaria baicalensis and Sophora flavescens are commonly used drugs. The active ingredients contained in these TCMs (such as emodin, berberine, baicalin and matrine) can reduce the release of a variety of inflammatory factors by controlling the activation of NF-κB signaling pathway, and show a clear antibacterial effect on Propionibacterium acnes.

Although the overall use rate of heat-clearing, dampness-drying, and detoxification drugs is the highest, there are significant differences in medication among different syndrome types. The lung meridian wind heat type is mainly composed of Scutellaria baicalensis Georgi, mulberry bark, loquat leaves and other lung clearing and wind dispersing herbs, which embodies the treatment of fire depression; The spleen stomach damp heat type uses Coptis chinensis, Phellodendron amurense, Sophora flavescens and other bitter cold and dampness drying TCMs to directly break the damp heat in the middle energizer; On the basis of clearing away heat, the liver stagnation and blood heat type is often combined with Chaihu, gardenia, Danpi and other products to soothe the liver and cool the blood, taking into account emotional factors; However, for the type of phlegm and blood stasis (with vegetative stage in the nose), peach kernel, safflower, Fritillaria thunbergii and other drugs for

DOI: 10.54254/2753-8818/2026.HZ36251

activating blood circulation and resolving phlegm, softening, firming and dispersing nodules should be added, which reflects the idea that long-term illness enters the collaterals and blood stasis must be treated according to syndrome differentiation.

Insecticides and antipruritic drugs (such as Stemona and Cnidium monnieri) also account for a certain proportion of prescriptions, mainly for the common follicle demodex infection in rosacea patients. The effective components of this kind of medicinal materials can effectively kill Demodex and reduce the production of inflammatory mediators.

In terms of core matching, rhubarb sulfur powder (inverted powder) is the most representative drug pair. Rhubarb is bitter and cold in nature, and is good at clearing heat, cooling blood, detoxifying and removing blood stasis; It is good at detoxifying, killing insects, drying dampness and relieving itching. The combination of the two drugs, cold and temperature, and both clearing and drying, plays the functions of clearing away heat, detoxifying, drying and dampness, and killing insects. It is especially suitable for papular pustular rosacea, which reflects the treatment of heat, cold and dampness. In addition, rhubarb and Phellodendron amurense, Sophora flavescens and Fructus Cnidii are also commonly used in compatibility, reflecting the treatment core of clearing heat and dampness, detoxifying and killing insects. This rule provides clues for the follow-up pharmacological mechanism exploration and clinical prescription optimization.

4. Modern pharmacological mechanism research

4.1. Anti inflammatory effect

External application of TCM can achieve multi-target CO treatment through the different effects of different drugs in its compound. Saikosaponin a (SSA) is one of the main active ingredients in the root of Bupleurum chinense, a TCM. It has a triterpenoid structure and exerts anti-inflammatory effects by regulating cytokines and ROS. According to the anti-inflammatory effect of SSA in rosacea, Wang Ying et al. [6] constructed the ll-37-induced mouse rosacea model and found that the erythema score, lesion area and inflammatory cell infiltration density in tissue sections of mice in the high-dose SSA group were significantly reduced . Mechanistically, SSA can inhibit the phosphorylation of ERK (extracellular signal regulated kinase), thereby blocking the activation of downstream NF-κB pathway and downregulating the transcription and release of proinflammatory factors such as TNF-α, IL-6, and IL-1β.

Licochalcone A is a flavonoid compound in the root of Glycyrrhiza uralensis. Liu et al. [7]'s review pointed out that glycyrrhizin chalcone a can directly target the NLRP3 inflammasome, inhibit the shear activation of pro-caspase-1, and then block the conversion of pro-IL1 β to mature IL-1 β, thereby alleviating the NLRP3 mediated inflammatory response.

The above studies confirmed that triterpenoids and flavonoids in TCM can exert inflammatory effects through ERK/NF-κ B and other signaling pathways. This provides a scientific basis for the use of Bupleurum combined with Danpi and gardenia in rosacea of liver stagnation and blood heat type. It can not only soothe the liver and relieve depression to regulate emotion, but also directly inhibit neurogenic inflammation.

4.2. Neurovascular regulation

TRPV1 (transient receptor potential vanilloid subtype 1) is a key target of facial flushing and burning, and can be activated by heat (>43 ℃), acidic environment, capsaicin and inflammatory mediators (such as PGE2 and bradykinin). The activated TRPV1 channel opens, prompting calcium

DOI: 10.54254/2753-8818/2026.HZ36251

influx, which in turn triggers the release of substance P and calcitonin gene-related peptide (CGRP) from sensory nerve terminals. On the one hand, these neuropeptides directly induce local vasodilation, plasma extravasation, and cause paroxysmal flushing; On the other hand, it can activate neighboring mast cells, release histamine and proinflammatory cytokines, and further amplify neurogenic inflammation. Vascular endothelial growth factor (VEGF) is a key molecule that causes abnormal proliferation of blood vessels. VEGF expression was significantly upregulated in rosacea lesions. VEGF binds to VEGFR2 receptor on the surface of endothelial cells, activates PI3K/AKT signaling pathway through phosphorylation, and then promotes endothelial cell proliferation, migration and lumen formation, leading to persistent erythema and telangiectasia. Blood cooling TCM has the function of cooling blood and eliminating redness, which can improve paroxysmal flushing and burning by inhibiting TRPV1 channel activation and reducing neuropeptide release. However, this inference needs further experimental verification.

4.3. Anti vascular proliferation

In terms of inhibiting vascular proliferation, multiple studies have provided evidence for the role of active ingredients of TCM. Zhou et al. found in the ll-37-induced rosacea mouse model that chelerythrine can significantly reduce the inflammatory response and reduce the micro vessel density in the lesion area by inhibiting the phosphorylation of the NK-κB/p38 MAPK/STAT3 signaling pathway, showing a direct anti-angioproliferative effect [8].

In addition, Zuo et al. confirmed in the study of drug resistance model of breast cancer that chelerythia chinensis Yuanhu drug pair can inhibit the phosphorylation of PI3K/AKT signaling pathway, and then block VEGF/VEGFR2 downstream signaling [9]. Given that VEGF/VEGFR2 pathway is also one of the core mechanisms that drives vascular dysplasia in rosacea, whether chelerythrine and other components can play a vascular regulatory role in rosacea by regulating this pathway is worthy of further verification by subsequent studies. The latest research by Li Ji and others revealed that activating the metabolite receptor oxgr1 can initiate the contractile signal of vascular smooth muscle, providing a new pharmacological target for the treatment of vascular dilation in rosacea [10]

4.4. Antibacterial and barrier repair

The gel preparation of Phellodendron amurense and Sophora flavescens prepared by Wang et al. [11] has an antibacterial rate of more than 90% against Propionibacterium acnes. In mechanism, berberine, the main active component of Phellodendron amurense, can exert antibacterial effect by inhibiting bacterial DNA synthesis and topoisomerase activity; Matrine in Sophora flavescens is thought to synergize by destroying the integrity of bacterial cell membrane, but the exact mechanism needs further study.

In general, external application of TCM and WM treatment are not simply superimposed, but complementary mechanisms: WM can quickly control symptoms, TCM can regulate the local microenvironment, repair the barrier, and reduce the recurrence risk from the root. The combination of the two can achieve the synergistic treatment goal of "increasing efficiency and reducing toxicity".

DOI: 10.54254/2753-8818/2026.HZ36251

5. Clinical research evidence

5.1. Mate analysis of efficacy and safety

Clinical studies have confirmed that external application of TCM, as an auxiliary treatment, can improve the curative effect, reduce adverse reactions, and improve the skin barrier function in combination with oral administration of WM or physical therapy. A meta-analysis including 10 randomized controlled trials and 833 patients showed that the total effective rate of external application of TCM in the treatment of rosacea was better than that of the control group (RR = 1.21, 95% CI: 1.09-1.34), and the incidence of adverse reactions was lower than that of conventional WM (12.3% vs 18.7%) [12]. In addition, the meta-analysis of 13 RCTs (a total of 1348 patients) included by Ruoxi Yu et al. [13] further confirmed that the combined treatment of TCM and WM could significantly reduce the recurrence rate (RR=0.27), while improving the clinical symptom score, dermatological quality of life index (DLQI), erythema index (EI) and IL-37 level.

5.2. Clinical research on multiple combination therapies

In terms of combined oral and external use of WM, doxycycline is one of the commonly used drugs for oral treatment of rosacea at present, but there are problems such as gastrointestinal reaction and recurrence after drug withdrawal after long-term use. Qu et al. [14] randomly divided 85 patients with moderate to severe papular pustular rosacea into the combination group (doxycycline oral + rhubarb Glycyrrhiza Decoction external application) and the control group (doxycycline alone) for 4 weeks. The results showed that the total effective rate of the combined group was 95.24%, significantly higher than 79.07% of the control group ($p<0.05$). The incidence of adverse reactions in the combination group was 9.52%, which was lower than 11.63% in the control group. The study shows that the combination of external application of TCM and doxycycline can ensure the curative effect and reduce the incidence of adverse reactions at the same time . Intense pulsed light and pulsed dye laser are commonly used in physical therapy of rosacea. Bai et al. [15]. Randomly divided 98 patients with rosacea into the combination group (Qingre Jiedu Shengji Fang local cold compress + pulse dye laser) and the control group (pulse dye laser alone), treated for 3 months. The results showed that the total effective rate of the combined group was 94.00%, significantly higher than 80.00% of the control group ($p<0.05$), and the combined group was better than the control group in skin lesion score, erythema score and pain degree. In addition, the study of photoelectric synergistic technology combined with TCM facial mask in the treatment of mild to moderate rosacea also showed that the combined group was significantly better than the photoelectric synergistic technology alone in skin barrier function indicators such as stratum corneum moisture content and percutaneous water diversion loss. In terms of barrier repair, the clinical study of Xiaohong soothing TCM mask combined with Dan Zhi Xiao Yao Powder in the treatment of rosacea shows that the transepidermal water loss rate of patients after treatment is significantly reduced, and the water content of stratum corneum is significantly increased, indicating that the external application of TCM can effectively repair the damaged skin barrier function [16, 17]. The above evidence shows that external application of TCM has definite clinical value, but the existing research still needs to be deepened in terms of design quality and mechanism interpretation.

DOI: 10.54254/2753-8818/2026.HZ36251

6. Conclusion

There are various dosage forms of external application of TCM in the treatment of rosacea. Most of the drugs are heat clearing. Due to the advantages of multi-target regulation, the scheme can be flexibly selected according to the skin lesions. Clinical research evidence shows that external application of TCM combined with oral WM or physical therapy can increase the absolute value of the overall effective rate by 15% - 20%, and effectively reduce the incidence of local adverse reactions. This article initially established the docking framework between the pathogenesis of heat, toxin, blood stasis and modern molecular mechanism in TCM from the level of NF-κB, VEGF, TRPV1 and other signaling pathways, responded to the clinical dilemma of rosacea that the course of the disease is prolonged, easy to repeat, WM is highly irritating, and easy to rebound, confirmed the unique advantages of external application of TCM, such as safety and mild, provided a theoretical basis for the collaborative treatment of TCM and WM, and proposed the innovative direction of the spray type of body and mind treatment.

However, at this stage, there are some limitations in the research, such as the lack of research on the mechanism of emotional comorbidity, unclear composition and dose effect of TCM compound, different standards of syndrome differentiation and typing, and lack of high-quality randomized controlled trials. Future research should further reveal the mechanism of compound action, improve the unity of evidence-based evidence system, carry out large sample, multi center, long-term follow-up randomized controlled trials, and further explore a new type of topical preparation for the treatment of rosacea based on the theory of the integration of form and spirit, in order to promote the diagnosis and treatment of rosacea to be more precise and humanized. At this stage, there are still deficiencies in the standardization of syndrome differentiation, dose-response relationship of compound prescription and high-quality evidence-based evidence. In the future, it needs to be improved through standardized multi center randomized controlled trials and multi omics research, and further explore new topical preparations with the same treatment of body and mind, so as to promote the development of rosacea diagnosis and treatment in a more precise and humanized direction.

References

[1] King, A., et al. (2025). Low-dose isotretinoin for the management of rosacea: A systematic review and meta-analysis. *Journal of the European Academy of Dermatology and Venereology, 39*(4), 785-792.
[2] Wang, Y. X., et al. (2026). Research progress of traditional Chinese medicine in the treatment of rosacea. *Modern Traditional Chinese Medicine, 46*(1), 49-54.
[3] Demirbas, A., Demirbas, G. U., & Diremsizoglu, E. (2025). Vascular remodeling in rosacea: A study on microcirculatory insights using oral capillaroscopy. *Journal of Cosmetic Dermatology, 24*(2), e70012.
[4] Yang, F., et al. (2024). Signaling pathways and targeted therapy for rosacea. *Frontiers in Immunology, 15*, 1367994.
[5] Wu, S. Q., et al. (2025). Medication regularity of topical traditional Chinese medicine for rosacea based on data mining. *Pharmacology and Clinics of Chinese Materia Medica, 41*(2), 90-95.
[6] Mansfield, K. E., et al. (2021). British Association of Dermatologists guidelines for the diagnosis and management of rosacea 2021. *British Journal of Dermatology, 185*(4), 722-728.
[7] Wang, Y., et al. (2023). Saikosaponin A alleviates rosacea-like inflammatory response in mice by regulating the ERK/NF-κB signaling pathway. *Chinese Journal of Dermatovenereology, 37*(5), 516-523.
[8] Liu, M., Du, Y., & Gao, D. (2024). Licochalcone A: A review of its pharmacological activities and molecular mechanisms. *Frontiers in Pharmacology, 15*, 1453426.
[9] Zhou, R., et al. (2026). Chelerythrine alleviates inflammation and angiogenesis in a mouse rosacea model via suppressing the NF-κB/p38 MAPK/STAT3 pathways. *Biochemistry and Cell Biology, 104*, 1-12.
[10] Zou, X., et al. (2024). Study on the pharmacodynamic substances of Chelidonium majus–Corydalis yanhusuo herb pair reversing doxorubicin resistance in breast cancer. *Chinese Traditional and Herbal Drugs, 55*(7), 2259-2270.

DOI: 10.54254/2753-8818/2026.HZ36251

[11] Xiao, W., et al. (2026). Metabolite-gated vascular contractility switch: OXGR1 activation mechanism enables agonist therapy for rosacea erythema. *Cell, 189*(7), 1990-2006.e30.
[12] Wang, J. H., et al. (2025). Preparation of Sophora flavescens gel and evaluation of its soothing and antibacterial effects. *Jiangxi Chemical Industry, 41*(1), 62-66.
[13] Hsu, H., et al. (2025). Effects of topical herbal medicine on rosacea: A systematic review and meta-analysis. *Journal of Herbal Medicine, 51*, 101022.
[14] Yu, R., et al. (2024). Combination of traditional Chinese medicine and standard biomedical treatment for rosacea: A systematic review and meta-analysis. *Frontiers in Pharmacology, 15*, 1397141.
[15] Qu, J., et al. (2024). Effects of topical application of Dahuang Gancao Decoction combined with doxycycline on symptoms and skin barrier function in patients with moderate-to-severe papulopustular rosacea. *Chinese Journal of Dermatovenereology of Integrated Traditional and Western Medicine, 23*(5), 413-417.
[16] Bai, X., et al. (2025). Efficacy analysis of local cold compress with Qingre Jiedu Shengji Formula combined with pulsed dye laser in rosacea treatment. *Chinese Journal of Aesthetic Medicine, 34*(5), 81-84.
[17] Qu, J., et al. (2024). Therapeutic effects of anti-redness soothing herbal mask combined with Danzhi Xiaoyao Powder on rosacea patients and its influence on skin barrier function, BDNF and TrKB expression. *World Journal of Integrated Traditional and Western Medicine, 19*(10), 2061-2066.