REVIEW ARTICLE

Multidimensional Perspectives on Psoriasis Treatment: Current State and Future Directions

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ABSTRACT

Millions of people are afflicted with psoriasis, which is a chronic inflammatory skin disease throughout the world. Despite modern treatments for psoriasis remain unmet needs and challenges in achieving optimal results. This review article aims to present a multidimensional view of the research and therapy for psoriasis, which encompasses not only the cellular and molecular mechanisms but also the network pharmacology of traditional Chinese medicine, novel therapeutic targets and strategies as well as autophagy plays a role on psoriasis pathogenesis or treatment. At the same time discussion on bimekizumab, once was declared an initial proof of concept biological agent that acts by both inhibiting interleukin-17 A and F (two cytokines slightly different) in psoriasis.

Keywords: Psoriasis, Network pharmacology, Biologics, Animal model, Cell culture.

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INTRODUCTION

Psoriasis is a chronic inflammatory skin disorder that affects millions worldwide (Figure 1) with no regard for ethnicity or gender, distributing equally amongst individuals.[1] Itcan cause physical discomfort due to its patches' redness and itchiness in any part of the bodyit develops on.[2] Furthermore, psoriasis distorts one's self-image reality, making them experience social rejection concerning their appearance, which leaves them with emotional turmoil taking a toll on their mental health.[1] Scientists have identified genetic predisposition along with biological factors as significant influencers triggering abnormal immune responses (Figure 2) resulting in cell hyperproliferation causing thickening while uncalled-for inflammation occurs.[3] About 80 to 90% of people with psoriasis have chronic plaque psoriasiform dermatitis, and erythrodermic psoriasis is another kind that its symptoms and diagnosis may distinguish.[4] Comorbidities associated with psoriasis are considerable and significantly increase the morbidity of individuals.[5]

Numerous problems about determining trustworthy biomarkers for prediction or therapeutic response techniques about complications that arise after developing the illness remain unanswered, despite the fact that medical research is constantly increasing its understanding the biology and applications of the disease.[6] The review article aims to provide an approach by summarizing recent advancements in psoriasis research and therapy from multidimensional perspectives. A more significant impact on all stakeholders involved, including patients seeking safer treatments or living effectively in their current situation and researchers pursuing new avenues for innovation, discovery, and policymakers allocating resources appropriately, can be achieved by thoroughly examining these angles and analyzing perspectives that may appear outside conventional boundaries.[7] We evaluate numerous aspects from different angles like related studies done on cultured cells or animals using various drugs[8,9] along with how network pharmacology works in helping mechanisms plus emerging trends stemming from novel approaches or findings pertinent to autophagy modulators[10] impact as well as dioxins influence over the disease. We further scrutinize bimekizumab as a new biologic agent targeting the two primary cytokines responsible for psoriasis development.[11] Going through this comprehensive approach helps offer a more effective path toward understanding and managing psoriasis effectively. In doing so, we highlight the complex nature of psoriasis, providing essential insights into its pathogenesis, including gene expression and inflammatory processes. However, despite these promising results, converting them into efficacious therapies remains challenging due to the disease's multifarious nature. We shall now examine the existing treatment strategies

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and evaluate how effectively they tackle these challenges. The treatments are arranged in chronological order from old to new, reflecting the progress and development of psoriasis therapy over time.

Assessing the Effects of Drugs for Psoriasis in Cultured Cells

One essential approach towards addressing the challenges posed by psoriasis is through subjecting different drug therapies to cultured cells, and molecular and cellular processes involved within psoriasis pathogenesis' crucial feedback loop. Generally exploring certain drug effects on cultural cell models like keratinocytes function, inflammation, apoptosis and differentiation mechanisms of actions to insights about pharmacological qualities and clinical implications relative to treating psoriasis, these approaches provide a better insight into psoriasis management.

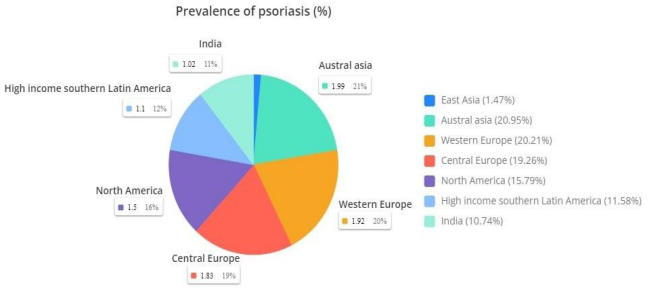


Figure 1: A map showing the prevalence of psoriasis in exclusive areas of the arena. The map suggests that psoriasis impacts approximately 2–3% of the global populace, with some versions across areas. The maximum occurrence of psoriasis is located in Northern Europe and North America, while the lowest occurrence is discovered in Asia and Africa. [Generated from the data of Damiani *et al.*]

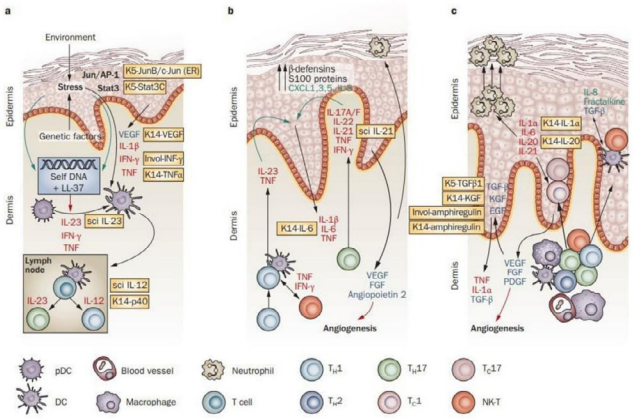


Figure 2: A schematic diagram of the pathophysiology of psoriasis. The diagram shows the complex interactions between genetic, environmental, and immunological factors that trigger and maintain psoriasis. The diagram illustrates how environmental factors, such as infections, stress, or drugs, can activate innate immune cells, such as dendritic cells and macrophages, which produce cytokines, such as IL-23 and IL-12, that stimulate adaptive immune cells, such as Th1 and Th17 cells. These cells secrete cytokines, such as IFN-g, TNF-a, IL-17, and IL-22, that act on keratinocytes and induce their hyperproliferation and abnormal differentiation. The diagram also shows how keratinocytes produce chemokines and antimicrobial peptides that recruit more immune cells and create a positive feedback loop that sustains inflammation and epidermal thickening.

A Curcumin-Mycophenolic Acid Conjugate for Inhibiting Keratinocyte Hyperproliferation:

Psoriasis and other autoimmune conditions are often treated with immune suppressants. Mycophenolate, for example, suppresses disease symptoms by preventing purine production and stopping T and B lymphocyte proliferation. A recent study by Yuyun *et al.* (2020) investigated the effects of mycophenolic acid-curcumin (MPA CUR) on rapidly growing human HaCaT cells, which become activated by tumor necrosis factor (TNF). The researchers tested how this conjugate compared to curcumin or MPA alone and found that it inhibited cell multiplication more effectively as well as induced apoptosis more effectively. Elements that activate the inflammasome pathways, Absent in melanoma two and NOD-like receptor family, pyrin domain-containing 3 (AIM2, NLRP3) (Figure 3). Scientists are seeking to enhance their understanding of how TLR7-, 8-, and 9blockers work and how strongly therapy may be effective. Overall, TLR inhibition should be considered

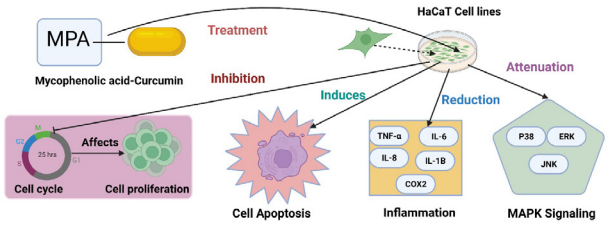


Figure 3: MPA-CUR inhibits Human Epidermal keratinocytes (HaCaT) cell proliferation, induces apoptosis, and relieves irritation. As shown in the figure, MPA-CUR decreases cell viability, increases cell death, lowers inflammatory gene expression, and suppresses mitogen-activated protein kinase MAPK signaling. MAPK Proteins- P38: p38 mitogen-activated protein kinase, ERK: Extracellular signal-regulated kinase, JNK: c-Jun N-terminal kinase. [Created with BioRender.com, generated from the data Yuyun *et al.*]

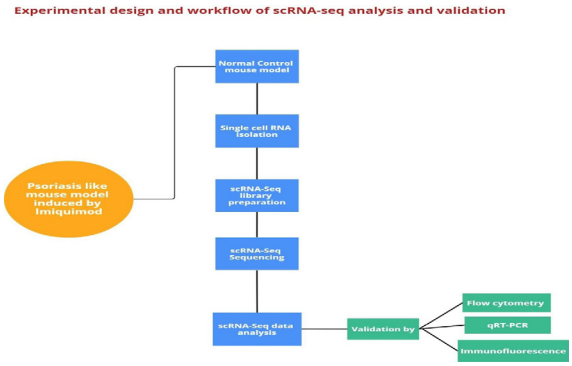


Figure 4: Experimental layout and workflow of scRNA-seq analysis and validation. Psoriasis-like and ordinary control mouse fashions had been triggered via IMQ and vehicle, respectively. Single-cell RNA became remoted from the skin samples and subjected to scRNA-seq library practice and sequencing. The scRNA-seq facts have been analyzed using numerous bioinformatics gear and methods to perceive immune cell clusters, marker genes, and differential expression. The effects were tested through drift cytometry, Quantitative reverse transcription polymerase chain reaction (qRT-PCR), and immunofluorescence in skin samples. [Generated from the data Jin *et al.* (2022)]

as a potentially effective way to target psoriasis-associated inflammatory pathways.[12]

Emerging Trends in Psoriasis Treatment

It is essential in the treatment of psoriasis to find new effective therapies that target fundamental mechanisms. There have been recent trends in treating this condition with novel biologics that target specific cytokines. RNA sequencing technologies have also identified immune characteristics behind psoriasis and microneedle patches that deliver methotrexate-loaded albumin nanoparticles to immune cells have shown promise. This section explains these emerging treatments in detail, explains the findings, and discusses theirimplications.

Single-Cell RNA Sequencing Reveals the Immune Environment Characteristics of Psoriasis in Mice

By using scRNA seq technology, gene expression can be studied at a single-cell level. Using scRNA sequencing, conditions like psoriasis can be illuminated because of heterogeneity/dynamics sometimes concealed during bulk RNA sequencing. Jin *et al*. (2022) sought to discover nuances in immune cell populations in mice prepared using imiquimod-based medications to develop psoriasis symptoms similar to those observed in humans. An amount of 14,439 cells were examined, resulting in the identification of ten distinct immune cell types, including macrophages, Natural killer T cells (NK/T cells), and conventional dendritic cells (cDC). Psoriatic mice also had increased plasmacytoid dendritic cells (pDCs). The functional enrichment analysis revealed that these identified immune cell subsets are involved in a variety of inflammation/immunity processes. Their extensive work (Figure 4) has advanced our knowledge about immunological responses in mouse models that mimic human psoriasis.[13]

Microneedle Patch Achieves a Potent Antipsoriatic Effect by Delivering Methotrexate-Loaded Albumin Nanoparticles to Immune Cells

A new transdermal drug delivery system and treatment for psoriasis can be delivered with microneedle patches developed by Wang *et al*. (2022). Psoriasis is currently managed with methotrexate, but its use orally or intravenously is limited due to adverse effects. Through thedelivery of methotrexate-loaded albumin nanoparticles to lymph nodes (LNs), the HM/MN patch significantly enhances antipsoriatic treatments without causing harmful side effects. Applying this novel therapy lowered inflammatory cytokines, inhibited erythema, inhibited scaling, and prevented skin thickening. Furthermore, the study revealed a reduction in inflammatory factors (Figure 5) like IL 1, IL 6, TNF-α, and Cox2 as well as lowered hypoxia-inducible factor 1/Vascular endothelial growth factor (HIF 1/VEGF) pathways, all pointing to potential improvements utilizing HM/MN patch therapy in managing psoriasis without significant adverse effects on patients.[14]

Efficacy and Safety of IL-23 Inhibitors in Psoriasis

Interleukin-23 inhibitors have made major advances in the fight against psoriasis. Biologics offer an innovative way to

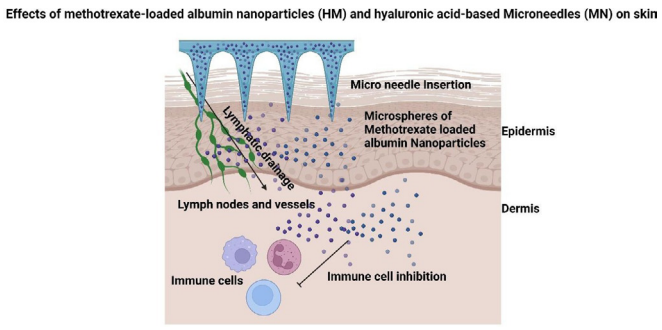


Figure 5: Schematic diagram displaying the effects of methotrexate-loaded albumin nanoparticles (HM) and hyaluronic acid-based microneedles (MN) on skin. MN are inserted into the dermis and launch HM, which deliver methotrexate to the dermis and the epidermis. Methotrexate inhibits the activation of immune cells, which includes dendritic cells and T cells, which can be worried within the pathogenesis of psoriasis. Methotrexate also reaches the lymph node via the lymphatic vessel andmodulates the immune reaction. MN: microneedle; HM: methotrexate-loaded albumin nanoparticle; LN: lymph node. [Created with BioRender.com, generated from the data Wang *et al*. (2022)]

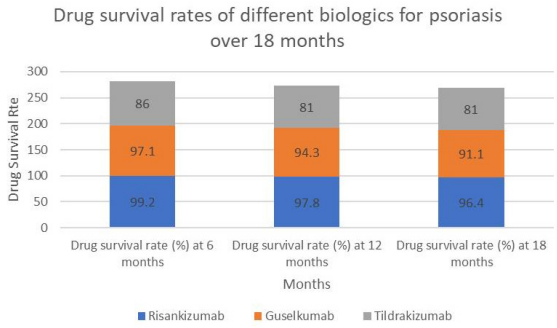


Figure 6: Drug survival rates of biologics for psoriasis treatment: a meta-evaluation. The bar graphshows the drug survival rates of three biologics (Risankizumab, Guselkumab, Tildrakizumab) for psoriasis remedy over different time periods primarily based on a meta-analysisstudy. [Generated from the data Ruggiero *et al*.'s (2022)]

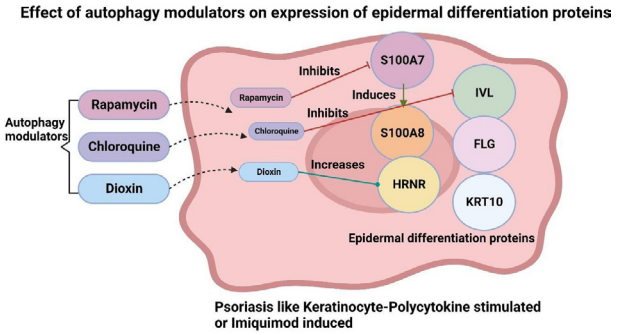


Figure 7: Schematic diagram displaying how autophagy modulators (chloroquine and rapamycin)and dioxin affect the expression of epidermal differentiation proteinsS100 calcium-binding protein A7(S100A7), S100 calcium-binding protein A8(S100A8), Hornerin (HRNR), Involucrin (IVL), Filaggrin (FLG), andkeratin 10(KRT10) in psoriasis-like keratinocytes in-vitro. Green arrows imply high-quality consequences, red strains indicate bad outcomes, and dashed lines imply permeability. The size of the circles and the thickness of the traces replicate the relative expression stages or resultsof the proteins or modulators. [Created with BioRender.com, generated from dataKim *et al*. (2022)]

treat chronic inflammation. Clinical trials showed significant efficacy and safety profiles targeting the IL 23/IL 17 pathway. These clinical findings are promising that uncertainties regarding real-world applications beyond controlled trials due to symptom variations among patients. Accordingly, Ruggiero *et al*.'s (2022) review offers exceptional insights into reliability as a psoriasis treatment. As shown in Figure 6, patients treated with IL 23 inhibitors (guselkumab, risankizumab, and tildrakizumab) report high efficacy and safety outcomes. Additionally, the authors address practical challenges associated with the clinical use of IL-23 inhibitors. Despite this, these findings provide encouragement to psoriasis patients by highlighting the success of innovative treatments.

A Novel Biologic that Targets IL-17A and IL-17F Shows Superior Efficacy and Safety in Psoriasis Trials

Despite the challenges of treating plaque psoriasis, Ruggiero (2022) suggests bimekizumab that targets two pro-inflammatory cytokines: interleukins (IL-17A and IL-17F) consistently found in affected skin patches. This monoclonal antibody blocks downstream signaling through the interaction of IL-17 receptors by binding to both cytokines. Overall, enhancing the healing rate for moderate/severe illnesses by reducing inflammation greatly. Past phase II/III trial evaluations (Table 1) showed significant improvement against adalimumab, ustekinumab,or secukinumab treatments. However, mild side effects, including nasopharyngitis, oral candidiasis, and upper respiratory tract infections, were observed (Table 2). The treatment of plaque psoriasis with bimekizumab is a breakthrough. Research on its long-term safety and effectiveness is still needed.[15]

Effects of Autophagy Modulators and Dioxin on Psoriasis

Cells use autophagy to break down damaged organelles and large molecules. Numerous physiological and pathological conditions, including psoriasis, are linked to this complex mechanism and dioxin and autophagy modulators have been studied. Alternatively, autophagy modulators can reduce or stimulate autophagy. Environmental toxins like dioxin

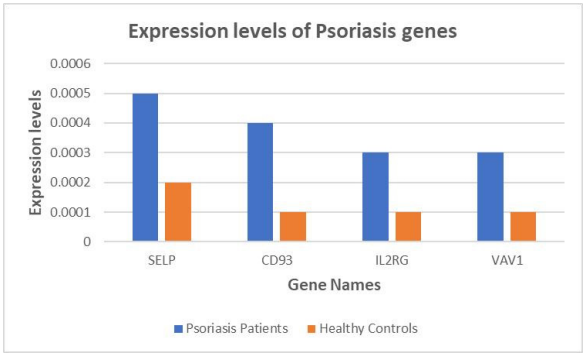


Figure 8: Expression stages of psoriasis diagnostic biomarkers related to atherosclerosis. The Bar chart indicates the expression degrees of four genes (SELP, CD93, IL2RG, and VAV1) that have beendiagnosed as capability biomarkers for psoriasis prognosis based totally on their association with atherosclerosis, in psoriasis sufferers and healthy controls. The bar chart suggests that those genes were drastically upregulated in psoriasis patients in comparison to wholesome controls. [Generated from data Liu *et al*. (2023)]

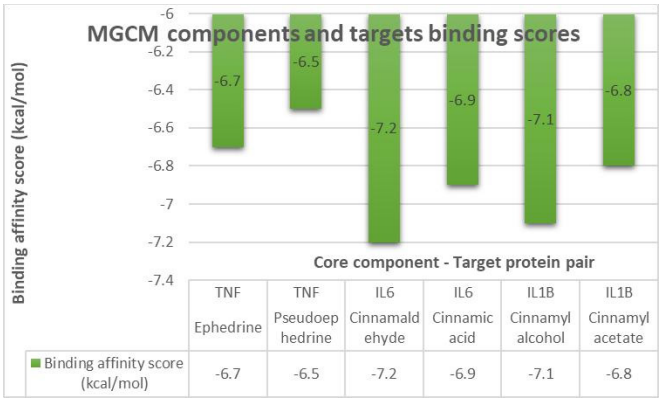
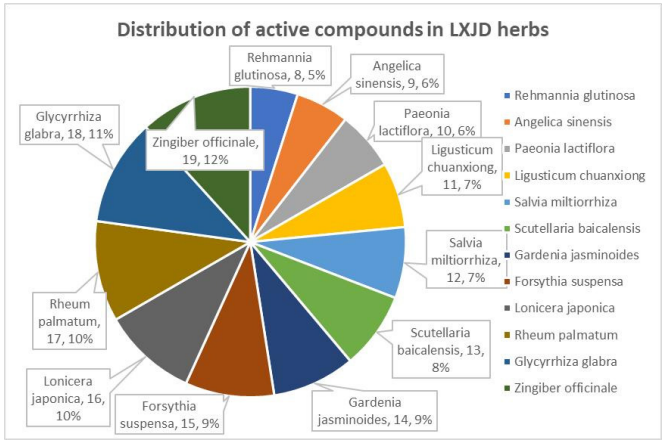


Figure 9: Binding scores of MGCM components and targets. The bar chart shows the binding scores of the four components of MGCM (magnolia grandiflora cortex methanol extract) and the four targets involved in psoriasis pathogenesis. Binding data are calculated by molecular docking simulation using Auto Dock Vina software. The higher the binding number, the stronger the interaction between the part and the target.



[Generated from data Guo *et al*. (2021)]

Figure 10: Distribution of active ingredients in LXJD herbs. LXJD is a traditional Chinese medicine consisting of four herbs: Radix Angelicae Sinensis, Radix Paeoniae Alba, Radix Rehmanniae Preparata, and Cortex Moutan. The figure shows the number and percentage of active compounds identified in each herb through network pharmacology analysis. [Generated from the data Zhao *et al*. (2021)]

can cause skin lesions in humans and animals similar to psoriasis.[16] Both agents regulate cytokine expression to provoke inflammation - TNF α, IL 17 IL 22 and IL 23 are vital mediators contributing to psoriasis pathogenesis. A study by Liu *et al*. (2019) illustrates how rapamycin, a promoter of autophagy, reduced TNF " and IL 17 levels in imiquimod-induced mice (Figure 7), at the same time inhibiting autophagy with three methyladenine raised these cytokine levels.[17] Wang *et al*. s' (2018) work showed that exposing keratinocytes to dioxin mediated an increase in TNF-α alongside IL-23 expression while inducing Th17 cell differentiation.[18] In addition, dioxin and autophagy modulators affect the differentiation or proliferation of keratinocytes involved in psoriasis. According to Zhang *et al*. (2018), rapamycin reduces keratinocyte proliferation and promotes differentiation in vitro, while three methyladenine causes the opposite effect.[19] Kim

Table 1: Characteristics of clinical trials of bimekizumab for moderate to severe plaquepsoriasis

Study	*Design*	*Participants*	*Dose and frequency*
Bimekizumab versus Secukinumab in plaque psoriasis	Phase 3b, randomized, open-label, active- comparator trial	743 patients with moderate-to-severeplaque psoriasis	Bimekizumab 320 mg every 4 or 8 weeks; Secukinumab 300 mg weeklyto week 4, then every 4 weeks.[13]
Bimekizumabefficacy and safety in moderate to severe plaque psoriasis (BE READY)	Phase 3, multicentre,double-blind, placebo-controlled, randomized withdrawal trial	435 patients with moderate-to-severeplaque psoriasis	Bimekizumab 320 mg every 4 weeks;Placebo every 4 weeks.[14]
Efficacy and safety of bimekizumab for the treatment of psoriasis: a systematic review and meta-analysis	Systematic review and meta-analysis ofrandomized controlled trials	Six trials with a totalof 2556 patients withmoderate-to-severe plaque psoriasis	Bimekizumab at different doses and frequencies; Placebo or other biologicsas comparators.[15]
Bimekizumab versus adalimumab in plaque psoriasis	Phase 3, multicentre,double-blind, active-comparator trial witha randomized withdrawal period and a re-treatment period	478 patients with moderate-to-severe plaque psoriasis whowere candidates for systemic therapy or phototherapy	Bimekizumab 320 mg every 4 weeks;Adalimumab starting dose of 80 mg followed by a dose of 40 mg every other week beginning one week after the initial dose; Placebo every other week during withdrawal period; Re- treatment with bimekizumab or adalimumab after relapse during withdrawal period.[16]

Table 2: Efficacy and safety outcomes of clinical trials of bimekizumab for moderate tosevere plaque psoriasis

Study	*Primary endpoint*	*Main outcomes*	*Main adverse events*
Bimekizumab versus Secukinumab in plaque psoriasis	PASI 100 at week 16	Bimekizumab was superior to secukinumab in achieving PASI 100 at week 16 (61.7% vs. 48.9%) and week 48 (67.0% vs. 46.2%)	Oral candidiasis occurred more often with bimekizumab (19.3%) than with secukinumab (3.0%).[13]
Bimekizumab efficacy and safety in moderateto severe plaque psoriasis (BE READY)	PASI 90 at week 16 and week 56	Bimekizumab was superior to placebo in achieving PASI 90 atweek 16 (86.2% vs. 8.7%) and week 56 (84.0% vs. 7.0%)	Oral candidiasis occurred more often with bimekizumab (17.9%) than with placebo (1.5%).[14]
Efficacy and safety of bimekizumab for the treatment of psoriasis: a systematic reviewand meta-analysis	PASI response rates atdifferent time points	Bimekizumab was superior to placebo or other biologics in achieving PASI response rates at different time points, especially PASI 90 and PASI 100	Oral candidiasis was the most common adverse eventassociated with bimekizumab.[15]
Bimekizumab versus adalimumab in plaque psoriasis	PASI response rates at different time points; IGA response rates at different time points; DLQI response rates atdifferent time points; Relapse rates during withdrawal period; Re-treatment efficacy after relapse during withdrawal period; Safety outcomes during treatment period, withdrawal period, and re- treatment period	Bimekizumab was noninferior and superior to adalimumab through week 16 in reducing symptoms and signs of plaque psoriasis as measured by PASI response rates, IGA response rates, and DLQI response rates; Bimekizumab was superior to adalimumab through week 24 in maintaining skin clearance as measured by relapse rates during withdrawal period; Bimekizumab was superior to adalimumab through week 56 in re- establishing skin clearance as measured by re-treatment efficacyafter relapse during withdrawal period	Oral candidiasis and diarrheaoccurred more frequently with bimekizumab than withadalimumab.[16]

et al. (2022) found that dioxin weakened Treg cell functions while increasing Th17 cell functions. Researchers believe that understanding autophagy's role might be pivotal in treating or preventing psoriasis. This presents a new therapeutic target. There is still an inadequate understanding of how autophagy affects psoriasis, necessitating further research.[20]

Identification of Psoriasis Diagnostic Biomarkers Associated with Atherosclerosis

Psoriasis symptoms are best managed by accurate diagnoses, prognosis predictions and treatment resolutions based on reliable biomarkers. Using sophisticated bioinformatics, Liu *et al*. (2023) isolated likely biomarkers by studying their interaction with its common comorbidity, atherosclerosis. Four genes (Figure 8) were identified using data gathered through various microarray datasets: Sel P- selectin (SELP), CD93 molecule (CD93), interleukin-2 receptor gamma chain (IL2RG), and VAV Guanine nucleotide exchange factor 1 (VAV1). Gene expression in skin tissue samples validated the high diagnostic efficacy of these biomarkers for psoriasis patients. In addition, they evaluated immune function, immune cell activity, and lipid metabolism. Using Long intergenic non-coding RNAs, microRNAs, and Messenger RNAs(lincRNAs,

Treatment	TNF-α	IL-6	IL-17	IL-22	IL-23
Control	1	1	1	1	1
Semen Persicae	0.65	0.72	0.68	0.74	0.69
Carthami Flos	0.59	0.63	0.57	0.61	0.58
Semen Persicae–Carthami Flos	0.42	0.48	0.44	0.46	0.45

Figure 11: Changes in Protein Expression in Psoriasis-Like Mice Treated with Semen Persicae– Carthami Flos. A heat map is a graphical representation where values are represented by colors. The heat map shows the levels of different proteins in mice with psoriasis treated with Semen Persicae-Carthami Flos (PCF) or vehicle (model group). Rows represent proteins and columns represent treatment groups. The color scale goes from red to green, indicating high to low levels, respectively. The heat map allows us to compare the expression levels of different proteins across the different treatment groups and to identify proteins that are significantly altered by PCF treatment. [Generated from the dataWang *et al*. (2021)]

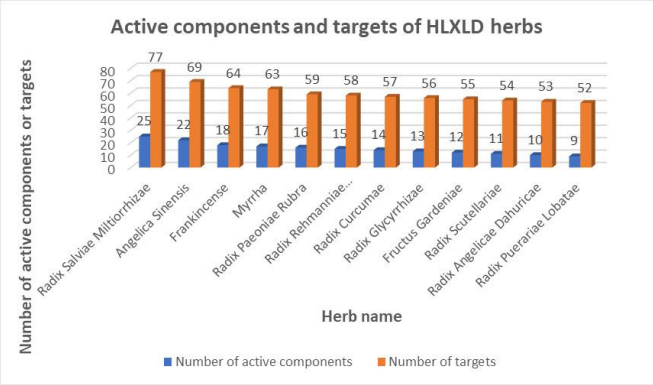


Figure 12: Functional components and herbal targets of HLXLD. HLXLD is a traditional Chinese medicine that consists of four herbs: Radix Salviae Miltiorrhizae, Radix Paeoniae Rubra, Radix Angelicae Sinensis, and Rhizoma Chuanxiong. The diagram shows the network of active components and herbal targets of HLXLD based on network pharmacology analysis [Generated from the data Gong *et al*. (2022)]

miRNAs, and mRNAs) to construct intricate regulatory mechanisms, they examined potential psoriasis pathogens. This innovative study will impact psoriasis management and indicates psoriasis genes can be used as biomarkers for diagnosis as well as treatment.[21,22]

Although advanced treatment in psoriasis conditions has failed to achieve adequate results despite therapy, others experience significant side effects and discomfort during treatment periods—prompted by network pharmacology and traditional Chinese medicine (TCM). Using network pharmacology, we are able to study gene functionality during disease transmission cases by analyzing interactions between multiple signaling pathways affecting gene functionality. Using TCM's holistic therapy practices along with this strategy, psoriatic conditions have been successfully treated.

Jueyin granules: A Chinese Herbal Remedy with Antioxidant and Anti-Inflammatory Effects on Psoriasis

Traditional Chinese medicine has been used for centuries to treat various human ailments. Among the oldest traditional medicine formulas is Jueyin granules (JYG), used for psoriasis relief. Thus researchers have studied traditional medicines to understand their biological mechanisms to know the drugs. JYG was studied by Kuai *et al*. in 2020, focusing on its multi-component mechanism in treating psoriasis with network pharmacology. Active compounds of 144 were identified based on the traditional Chinese medicine systems pharmacology database (TCMSP) and BATMAN databases related to immune responses, gene expression, cell proliferation and apoptosis across different species. Furthermore, docking experiments showed that active ingredients have strong binding to target proteins responsible for therapeutic effects. According to this analysis, JYG's successful treatment of psoriasis can be attributed to a multifactor approach involving multiple targets.[23]

Ephedrae Herba-Cinnamomi Ramulus: A Chinese Herbal Pair with Antipsoriatic Effects

Traditional Chinese medicine uses Ephedrae Herba-Cinnamomi Ramulus couplet medicine (MGCM) to treat psoriasis by using Ma Huang, an Ephedrae Herb, together with Gui Zhi, also called *Ramulus cinnamomi*. Through network pharmacology and molecular docking, Guo *et al*. (2021) investigated MGCM works pharmacologically against psoriasis. By using BATMAN-TCM database and molecular docking technology the investigation determined that this combination consists of 52 active ingredients as well as 19 key goals. Apoptosis, inflammation, immune response, and an increase in cells were enriched with core targets that relate to various biological processes. Auto Dock Vina (Figure 9) and PyMOL Molecular Graphics System software were used to verify the bond between key elements and targets. Manifold compounds, various targets, and multi-pathways might contribute to the remedy's effects on psoriasis. A rigorous and extensive clinical trial is needed to assess MGCM's safetyand efficacy.[24]

LiangXueJieDu: A Chinese Herbal Formula with Anti-Inflammatory and Anti-Proliferative Actions on Psoriasis

Traditional Chinese medicine LiangXueJieDu herbal formula (LXJD) can help treat psoriasis vulgaris with blood heat syndrome (Figure 10). Zhao *et al*. s' (2021) study applied a systems pharmacology approach accompanied by metabolomics experiments and evaluation to determine the herbs treat psoriasis. According to the research findings, LXJD contained some key active ingredients - 144 active compounds and 125 target proteins involved in inflammation, immune response, cell proliferation and apoptosis. The vivo experiments were performed and showed that LXJD alleviates irregularities like psoriasis lesions, improves Keratinocyte proliferation and differentiation, and reduces inflammatory factors like T cells. In addition, serum samples taken from Psoriasis patients showed an increase in glycerophospholipid metabolism and steroid hormone synthesis. This complex therapeutic mechanism involving multiple pathways and chemicals explains the activity of LXJDs on psoriasis. The

study provides a definitive approach to understanding how LXJD prevents psoriasis' complex nature.[25]

Semen Persicae–Carthami Flos: A Chinese Herbal Combination with Multiple Components and Targets for Psoriasis

Most conventional medicines don't offer total relief from the symptoms of skin conditions such as psoriasis. Accordingly, ancient remedies like semen Persicae–Carthami Flos (PC) provide holistic solutions based on traditional Chinese medicine theory. The recent study by Wang *et al*. (2021) analyzed PC performance using network pharmacology and molecular docking methods. The researchers discovered 62 common targets between PC and psoriasis related to inflammations, apoptosis and signaling PC components exhibit strong binding activity to target proteins, demonstrating its competence in healing the symptoms. In this study, Semen Persicae–Carthami Flos (PC) was evaluated as an alternative therapeutic strategy for treating psoriasis (Figure 11).[26]

Huoluo Xiaoling Dan: A Chinese Herbal Medicine with Multiple Targets and Pathways for Psoriasis

A traditional Chinese medicine formulation called Huoluo Xiaoling Dan (HLXLD) has been used for decades to manage psoriasis caused by blood stasis syndrome. Radix Salviae, Angelica Sinensis, Frankincense, and Myrrha make up this medication. In a recent study, Gong *et al*. (2022) explored HLXLd's mechanism via network pharmacology and molecular docking. Using the Chinese Medicinal Substances Pharmacology (CMSP) database processed through Venny tools, the team discovered 126 active components and 123 drug-disease targets (Figure 12) The inflammation responses gene expression, cell proliferation, and apoptosis were targeted. By molecular docking, the researchers further demonstrated that HLXLD compounds bind tightly to target proteins. HLXLD's therapeutic properties may be attributed to its diverse constituents and multi-target approach toward multiple pathways, thuspaving the way for further examination and possible clinical application.[26]

Therapeutic Insights: Shenling Baizhu Powder's Role in Psoriasis Management

In the realm of dermatological research, a novel study has emerged by Bin Tang *et al*. (2024), casting light on the therapeutic potential of Shenling Baizhu Powder (SLBZP) in the management of psoriasis. This traditional Chinese medicine formulation has been scrutinized for its influence on lipid metabolism and gut microbiota, two pivotal factors in the pathogenesis of psoriasis. The study meticulously integrates component analysis with network pharmacology and corroborates its findings through experimental validation in mouse models. The results are promising, indicating significant alterations in skin pathology and biomarkers, which point towards the efficacy of SLBZP in mitigating psoriatic symptoms. Central to the study's findings is the modulation of gut microbiota, which, when balanced, may attenuate inflammation mediators, thereby offering a therapeutic advantage. This research not only reinforces the gut-skin axis theory but also positions lipid metabolism modulation as a prospective new frontier in psoriasis treatment strategies. Such insights are invaluable, as they pave the way for innovative approaches to managing this chronic and often debilitating skin condition.[27]

Limitations and Future Directions

Even though considerable progress has been made in treating and researching psoriasis, significant constraints still exist. This article provides a multidimensional perspective on some potential limitations and future propulsions for improvement.

- A significant limitation of psoriasis is multifaceted root causes like genetics, environmental factors, immunology, and psychology etc. Better outcomes may be achieved through personalized treatment approaches.
- Animal models and cultured cells still require validation from clinical studies before implementation have limited human replications leading to inaccurate interpretation.
- Traditional methods alone can make it difficult to understand the intricacies of psoriasis treatment. In spite of this, network pharmacology and metabolomics can helps the drugs interact with diseases and results must be validated experimentally.
- The long-term safety and durability of biologics targeting IL 17A/F, an essential cytokine in the treatment of psoriasis, have not been adequately established. They are effective and continuous monitoring of a variety of outcomes including immunogenicity, resistance development or loss (remissions or relapses) and quality of life improvements should be prioritized.
- There is limited knowledge about autophagy modulators and dioxin's impact onpsoriasis. The exploration of these factors could potentially lead to new therapeutic targets for psoriasis.

CONCLUSION

Psoriasis is a complex and diverse skin disorder that needs further research and innovation. We summarized cell culture, animal experiments, network pharmacology, traditional Chinese medicine, novel biologics, autophagy modulators, and dioxin froma variety of sources, and diagnosing the treating psoriasis remains a challenge. The need for reliable biomarkers, real-world evidence, and personalized medicine is important. We hope this review article will encourage further research and innovation in psoriasis treatment. As a result, psoriasis patients will have a better quality of life.

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