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Beyond Conventional Approach: Clinical Superiority and Emerging Challenges in Psoriasis Treatment

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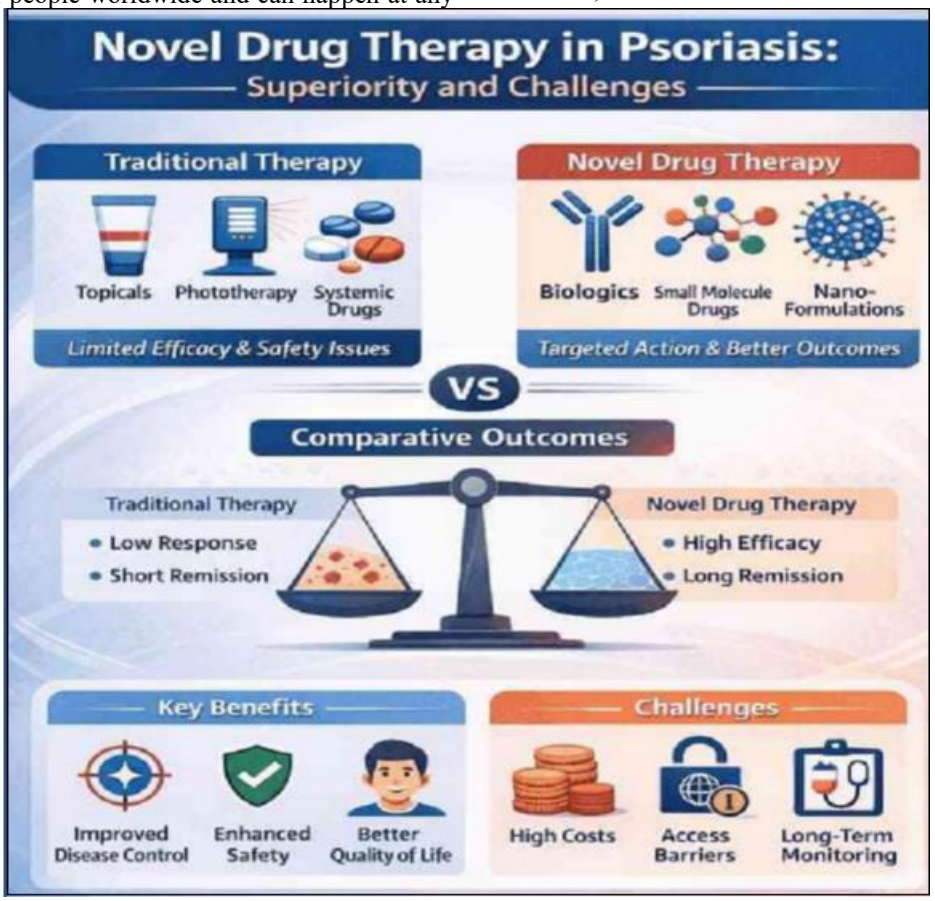
Abstract: ***Background**: A combination of immunological, environmental, and genetic factors can cause psoriasis, a persistent inflammatory dermatosis. It can manifest in the clinic in a variety of ways and has a significant impact on people's quality of life. Despite their widespread use, standard treatment approaches still have problems with long-term safety and efficacy, particularly in mild to severe cases. **Approach**: With an emphasis on contemporary therapeutic possibilities, this study extensively examines the pathophysiology, clinical features, causes, and dissemination of psoriasis. Biological agents, small-molecule medications, nano-formulations, and current medications are examples of novel approaches to illness treatment that are contrasted with conventional techniques. Traditional vs innovative treatments are compared in terms of their effectiveness, safety, and therapeutic relevance. **Conclusion**: New pharmaceutical therapy works better because it targets crucial inflammatory pathways that are associated to psoriasis. Even if they are expensive and hard to get, new methods work better than old treatments because they make patients more likely to follow their treatment, keep them in remission longer, and work better overall. In today's clinical practice, the newest and most popular way to treat psoriasis is using innovative therapy.*

Keywords: psoriasis, Novel Treatment, Biological Agents, Nano-formulations, Conventional treatments, Innovative treatments

1. Introduction

Psoriasis is a chronic, systemic immune-mediated inflammatory skin illness that is characterized by red, scaly skin patches that can be bothersome and itchy. It affects two to three percent of people worldwide and can happen at any age, albeit it It primarily affects individuals between the ages of 15 and 35, while it can sometimes affect extremely young children. According to the National Psoriasis Foundation, psoriasis is a non-communicable condition that causes dermal cells to proliferate more quickly on the skin's surface (MR et al., 2024).



Psoriasis is thought to be influenced by a combination of environmental and genetic factors. Psoriasis is more common in people with a family history of the disorder, in addition to particular triggers like stress, infections, and medications. Psoriasis with plaque, It is the most common form of psoriasis, accounting for 80–90% of cases. Erythrodermic, guttate, inverse, and pustular psoriasis are other types of psoriasis, each with a distinct set of symptoms and characteristics. Although there is currently no cure for psoriasis, there are a number of treatment and management options that can help control its symptoms (Falto et al.,2020)

Both topical and systemic therapies are available as systemic options include intravenous, subcutaneous, and oral administration. There are other subcutaneous drugs than biologics, such as methotrexate (MTX). can be given in this manner as well. Even with today's treatment choices, psoriasis can still have a substantial impact on a person's mental health and quality of life. Patients with psoriasis should see medical professionals and mental health experts as needed. Psoriasis education and counseling can help patients better understand their condition, control flare-ups, and cope with the psychological effects of having it. (Hu et al.,2021).

Psoriasis affects more than simply physical symptoms; because it recurs frequently, it significantly lowers quality of life (QoL). Patients sometimes have persistent discomfort, scaling, and pruritus that hinders their ability to sleep, communicate with others, go about their everyday lives, and be productive at work. Visible lesions can lead to social disengagement, low self-esteem, stigma, and difficulties in interpersonal and professional relationships, all of which can contribute to high rates of anxiety and depression. Crucially, even minor disease can result in significant psychological discomfort; therefore, the impact on quality of life does not always correspond with clinical severity. As a result, in addition to clinical indices, health-related quality of life measures should be used to assess psoriasis. This highlights the importance of a comprehensive, patient-centered approach that takes into account social functioning, psychological health, and physical symptoms (Ponikowska et al.,2025)

2. Epidemiology and Etiology

2.1 Prevalence

The World Health Organization brought attention to the increasing prevalence of psoriasis worldwide in 2024, which prompted the Global Psoriasis Atlas to keep working to produce reliable epidemiological data. 48 new studies were found in updated literature from 2019 to January 2024, increasing prevalence estimates to 170 population-based studies globally. Bayesian hierarchical modeling demonstrated an increase in the overall frequency of the disease, particularly in high-income nations, where the adult lifetime prevalence reached 1.40%. There were 23.14 cases of this disease per 100,000 person-years in Taiwan and 321.0 cases per 100,000 person-years in Italy. It is very crucial to increase global surveillance because 76% of nations still don't have good epidemiological data (Aalemi et al.,2024).

The number of persons with psoriasis and the number of new instances can change based on where they reside, how old they are, and other factors. Psoriasis affects 2.3% of people worldwide, with the highest rates in Europe and North America. The study also found that older persons were more likely to have psoriasis, with the highest rates in people over 60. It was also shown that men are more likely than women to have psoriasis (Armstrong et al.,2020).

A 2015 population-based analysis found that there are 98 cases of psoriasis for every 100,000 person-years in the United States (Rapp et al., 1999)

Due to non-mandatory case registration, there are few trustworthy research on the incidence of psoriasis, which varies greatly between locations. In Minnesota (1980–1983), incidence rates ranged from 0.60 per 1,000 person-years to 10.36–15.04 per 1,000 in nations in North Africa (2012). Prevalence has been the subject of more research, although different approaches (definitions, population ages, and diagnostic tools) make it difficult to compare findings.

Worldwide, frequency is often lower in Eastern Asia, with Taiwan reporting a prevalence as low as 0.05%, and greater in Northern European populations, such as those in Norway (up to 11.4%). Adults are more likely than children to have psoriasis, with the highest prevalence observed in across Australasia, North America, and Western Europe. Some of the greatest lifetime physician-diagnosed prevalence rates are found in Australia, Norway, and Israel. Psoriasis was projected to affect 29.5 million persons worldwide in 2017, which translates to a lifetime prevalence of 0.59% of the adult population (WHO, 2016)

The difference in prevalence between high-income and low-income regions is also highlighted in the WHO's global report on psoriasis, with higher incidence reported in areas like Europe and Australasia than in East Asia. In children, the prevalence is usually less than that of adults (Sandoval et al., 2014)

2.2 Causes

The prevalence of psoriasis ranges from 0.2% to 4.8%. Although the precise cause is uncertain, it is thought to be an autoimmune condition that is mediated by T cells. Many psoriatic patients, especially those from different racial and cultural backgrounds, have a connection with HLA antigens. Its genetic propensity is suggested by its familial occurrence. Psoriasis lesions are caused by mechanical, chemical, and radiological damage (Yui et al.,2018). Psoriasis lesions are caused by mechanical, chemical, and radiation damage. Chloroquine, lithium, beta-blockers, steroids, and NSAIDs are among the medications that can exacerbate psoriasis. Psoriasis usually gets better in the summer, but winter Psoriasis lesions are caused by mechanical, chemical, and radiological damage. Chloroquine, lithium, beta-blockers, steroids, and NSAIDs are among the medications that can exacerbate psoriasis. Psoriasis usually gets better in the summer, but in winter (Armstrong et al.,2020).

2.3 Type and symptoms

2.3.1 Plaque Psoriasis

About 80–90% of cases of psoriasis are plaque psoriasis, which is the most prevalent clinical type. Excessive keratinocyte proliferation and ongoing skin inflammation are the hallmarks of this immune-mediated, chronic inflammatory disease. Lesions typically affect the body's extensor surfaces and are symmetrical.

Usually affecting the elbows, knees, scalp, and lumbosacral regions, they frequently show clearly defined erythematous plaques with thick, silvery-white scales covering them. Pruritus, burning feeling, skin soreness, and fissuring are common side effects of these cutaneous lesions, which might lead to bleeding. The Auspitz sign and the candle-wax scaling phenomena are two typical clinical signs that are frequently visible (Nestle et al.,2009).

2.3.2 Guttate Psoriasis

A fast emergence of extensive lesions is the hallmark of guttate psoriasis, an acute clinical variation of psoriasis that primarily affects children and young people. This type is frequently brought on by streptococcal infections, especially those of the upper respiratory tract. It is an immune-mediated inflammatory reaction that involves aberrant T-cell activation and cytokine production. Guttate psoriasis can develop in those with a family history of psoriasis or appear as the disease's first symptom (Nestle et al.,2009).

Symptoms Guttate psoriasis manifests clinically as a large number of tiny, drop-shaped erythematous papules and plaques with fine scaling. Usually, the face, scalp, proximal extremities, and trunk are affected, but the palms and soles are spared. Although systemic symptoms are typically absent, patients may report mild to severe itching. Lesions usually go away on their own, but in those who are vulnerable, guttate psoriasis can develop into persistent plaque psoriasis (Sarac et al 2016)

2.3.3 Inverse Psoriasis (Flexural Psoriasis)

A unique clinical variation of psoriasis, inverse psoriasis mostly affects intertriginous (skin fold) areas. Friction and wetness make scaling bad in this scenario, which could make it harder for doctors to tell exactly what's wrong. It frequently develops in people with diabetes or obesity, and it frequently coexists with other forms of psoriasis. (Sarac et al.,2016)

One kind of psoriasis that mostly affects intertriginous (skin folds) areas is called inverse psoriasis. Moisture and friction cause slight scaling, which could make diagnosis more difficult for doctors. It frequently develops in people with diabetes or obesity, and it frequently coexists with other forms of psoriasis. (Boehncke et al., 2015)

2.3.4 Pustular Psoriasis

A rare and dangerous form of psoriasis, pustular psoriasis is characterized by the development of sterile pustules as a result of severe neutrophilic inflammation. It may manifest as a localized form, such as palmoplantar pustulosis, or as generalized pustular psoriasis, a skin emergency.

On an erythematous backdrop, develop sterile, yellowish-white pustules that may unite to form pus lakes. While widespread pustular psoriasis is often accompanied by fever, malaise, tiredness, leukocytosis, and systemic toxicity, localized pustular psoriasis causes excruciating discomfort and functional impairment of the hands and feet. (Martini et al 2017).

2.3.5 Erythrodermic Psoriasis

Widespread skin inflammation is caused by erythrodermic psoriasis, an uncommon but possibly fatal kind of psoriasis. It can be brought on by stress, systemic drug withdrawal, infections, and unstable plaque psoriasis. Clinically, it presents as diffuse erythema and extensive scaling that covers more than 75–90% of the body's surface area. Patients suffer from severe skin irritation, dehydration, protein loss, improper thermoregulation, increased susceptibility to infections, and cardiovascular issues. (Su et al., 2023).

2.3.6 Nail Psoriasis

One common symptom is nail psoriasis, which can occur alone or in combination with cutaneous psoriasis and psoriatic arthritis. Nail involvement is closely associated with joint disease and is thought to indicate the severity of the condition.ail pitting, onycholysis, subungual hyperkeratosis, discolouration, and thickness of the nail plate are typical characteristics. Pain, decreased manual function, and severe cosmetic and psychological discomfort could result from these alterations (de et al., 2014).

2.3.7 Scalp psoriasis

One of the most prevalent psoriasis localizations is scalp psoriasis, which can develop on its own or in conjunction with generalized plaque psoriasis. It can have a major impact on quality of life and frequently goes beyond the hairline.

People with this condition have thick, erythematous scalp plaques that are covered with adhering scales. Severe itching, dandruff-like flaking, and perhaps transient hair loss from persistent scratching or irritation are among the symptoms McMichael et al., 2025)

2.3.8 Arthritis psoriasis

A chronic inflammatory musculoskeletal condition linked to psoriasis, psoriatic arthritis can occur before, concurrently with, or after cutaneous symptoms. To avoid irreparable joint damage, early detection is crucial (liu et al., 2025)

Joint pain, stiffness, swelling, enthesitis, dactylitis (sausage-shaped digits), and decreased amobility are its hallmarks. Physical function and quality of life may be severely compromised by increasing joint damage and impairment brought on by chronic illness.

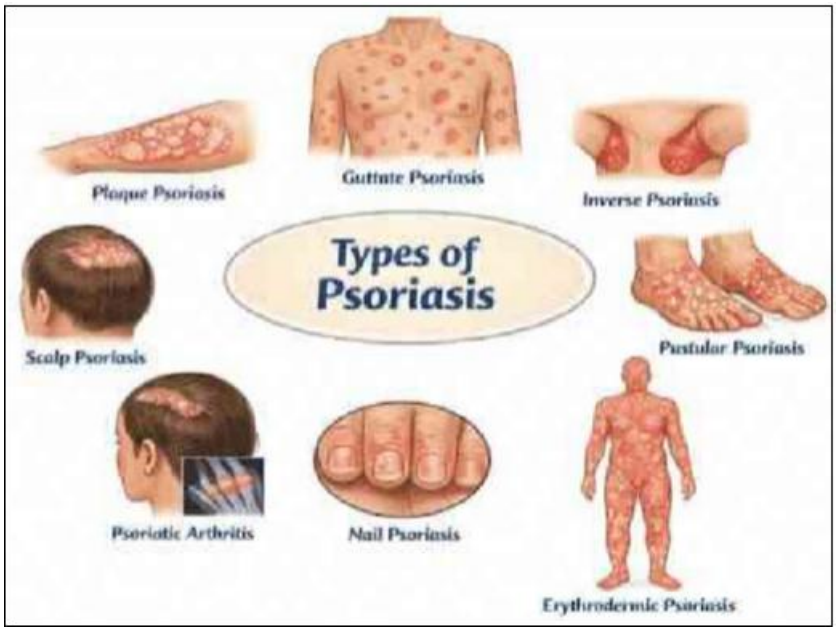


Figure 1: Type of Psoriasis

3. Pathophysiology of Psoriasis

3.1 Genetic Susceptibility and Molecular Predisposition

Genetically predisposed people with susceptibility loci- most notably PSORS1, which has the HLA-C*06:02 allele- develop psoriasis. These genes affect cytokine signaling pathways, T-cell activation, and antigen presentation. Psoriasis has been established as a polygenic disease by genome-wide association studies that have found new genes implicated in interferon pathways, NF-κB activation, and IL-23 signalling (Kumar et al., 2025)

3.2 Environmental Triggers and Disease Initiation

For those who are genetically vulnerable, environmental circumstances serve as beginning triggers. Streptococcal infections, mechanical trauma (Koebner phenomena), psychological stress, smoking, alcohol, and medications such as β-blockers, lithium, and antimalarials are common triggers. Antimicrobial peptides like LL-37, which function as autoantigens, are released when these triggers activate innate immune sensors in the skin, especially keratinocytes and dendritic cells (Singh et al., 2025)

Activation of Innate Immunity The innate immune system is triggered by an initial skin damage or infection. Early in the course of a disease, keratinocytes release antimicrobial peptides and inflammatory mediators that activate macrophages and dendritic cells (Olisova et al.,2025).

3.3 Dendritic Cell Activation and T-Cell Differentiation

Cytokines like IL-12 and IL-23 are released by activated dendritic cells, which encourage naïve T cells to differentiate into Th1, Th17, and Th22 subsets. These T cells return to the skin, where they continue to cause inflammation (sun et al.,2025).
Cytokine-Mediated Inflammatory Cascade psoriasis

Large levels of TNF-α, IL-17, IL-22, IL-23, and IFN-γ are released by activated T cells, resulting in a self-sustaining inflammatory loop that intensifies immune responses and sustains chronic inflammation (Li et al., 2025)
Vascular Changes

Angiogenesis and cutaneous blood vessel dilatation brought on by inflammation increase blood flow and contribute to the erythematous look of psoriatic plaques (Zhu et al., 2022).

3.4 Chronicity and Relapse

Because immune cells and keratinocytes are constantly interacting, the illness endures. The chronic and recurrent nature of psoriasis can be explained by the presence of resident memory T cells in the skin even during remission. (Masson et al., 2022)

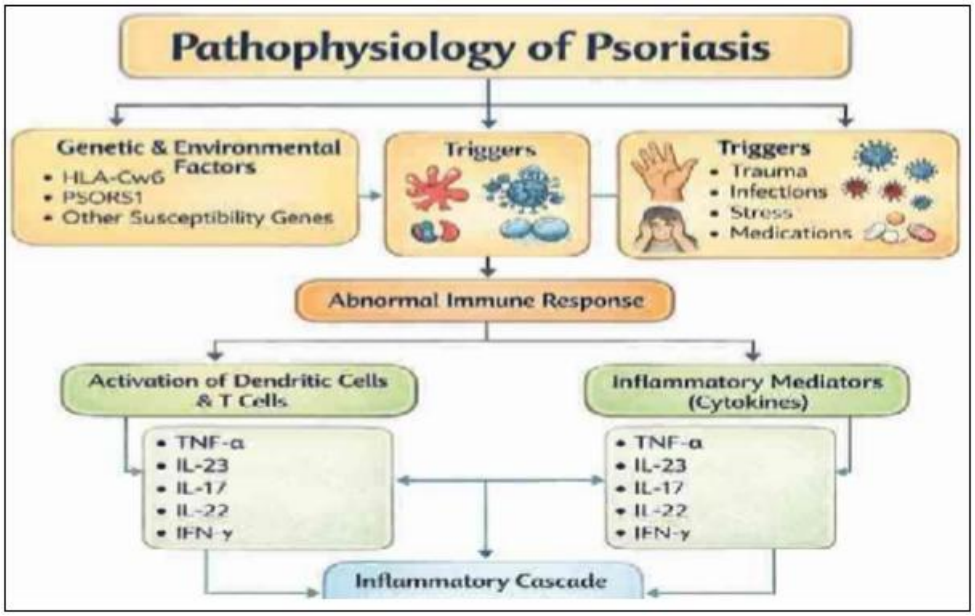


Figure 2: Pathophysiology of Psoriasis

4. Traditional Drug Therapy

Traditional medication therapies, such as topical medications, phototherapy, and systemic non-biologic medications, have historically been used to treat psoriasis. The purpose of these therapies is to manage how the skin cells grow, minimize redness and scaling, and stop inflammation. People with mild to moderate psoriasis typically utilize topical co Systemic medications like methotrexate, cyclosporine, and acitretin are used when psoriasis is moderate to severe or does not respond to conventional treatments. rticosteroids, vitamin D analogues, retinoids, coal tar, and keratolytic medicines to treat it. (Nestle et al.,2009)

Table 1: Traditional Drug Therapy for Psoriasis

S. No.	Drug	Category	Therapeutic Role / Mechanism	References
1	Topical Corticosteroids	Topical therapy	anti-inflammatory; inhibits keratinocyte growth and cytokine release	Svendsen et al., 2025
2	Vitamin D Analogues (Calcipotriol)	Topical therapy	controls the development and proliferation of keratinocytes.	Mai et al.,2025
3	Coal Tar	Topical therapy	Anti-pruritic and antiproliferative properties	Zhu et al.,2025
4	Tazarotene	Topical retinoid	restores epidermal differentiation to normal.	Draelos et al.,2025
5	Methotrexate	Systemic antimetabolite	prevents keratinocyte growth and T-cell activation.	Bar et al.,2025
6	Cyclosporine	Systemic immunosuppressant	Inhibition of calcineurin leads to decreased T-cell and IL-2 activity.	Grabarek et al., 2025
7	Acitretin	Oral retinoid	restores normal epidermal development in cases of severe psoriasis	Wang et al., 2025
8	Phototherapy 7/ (NB-UVB / PUVA)	Physical therapy	reduces inflammation and hyperproliferation of the epidermis	Hauptman et al .,2025
9	Salicylic Acid	Keratolytic agent	improves drug penetration and lessens hyperkeratosis	Draelos et al., 2022

5. Noval Drug Therapy

New treatment approaches have been developed as a result of significant advancements in our understanding of the immunopathogenesis of psoriasis. The crucial role of dysregulated immune signaling pathways, especially those associated with TNF-α, IL-17, IL-23, and intracellular kinases, has fueled the creation of customized treatment approaches. Biologic drugs such as oral active small-molecule inhibitors and monoclonal antibodies that specifically target certain inflammatory mediators rather than reducing the immune system overall are examples of these innovative approaches. Ethosomes, liposomes, nanocarriers, and microneedle-based platforms are examples of new topical therapies and enhanced drug delivery systems that have been developed to increase the stability of medications, improve their skin penetration, and reduce adverse effects throughout the body.

When combined, these cutting-edge strategies aim to improve patient compliance, extend remission, expedite clinical response, and ensure safety. They represent a paradigm shift in psoriasis management away from conventional symptomatic treatment and toward precision-based and mechanism-oriented approaches. (Zhu et al., 2025).

Table 2: Biological Therapies for Psoriasis

S. No.	Drug	Target / Class	Mechanism of Action	References
1	Secukinumab	IL-17A inhibitor	IL-17A is specifically neutralized by a human monoclonal antibody	Blauvelt et al.,2016
2	Ustekinumab	IL-12/IL-23 (p40) inhibitor	Monoclonal antibody inhibiting the signalling of IL-12 and IL-23	Savage et al.,2015
3	Etanercept	TNF-α inhibitor	TNF-α-neutralizing soluble TNF receptors fusion protein	Leonardi et al.,2003
4	Infliximab	TNF-α inhibitor	TNF-α-specific chimeric monoclonal antibody	Gottlieb et al.,2003
5	Etanercept	TNF-α inhibitor	TNF-α-neutralizing soluble TNF receptors fusion protein	Leonardi et al.,2003

Table 3: Small-Molecule Drugs for Psoriasis

S. No.	Drug	Class	Mechanism of Action	References
1	Tofacitinib	JAK inhibitor	prevents intracellular cytokine-mediated inflammation by inhibiting JAK1/JAK3 signaling.	Berekmeri et al.,2018
2	Apremilast	PDE-4 inhibitor	reduces TNF-α, IL-17, and IL-23 and increases intracellular cAMP by inhibiting phosphodiesterase-4.	Papp et al.,2012

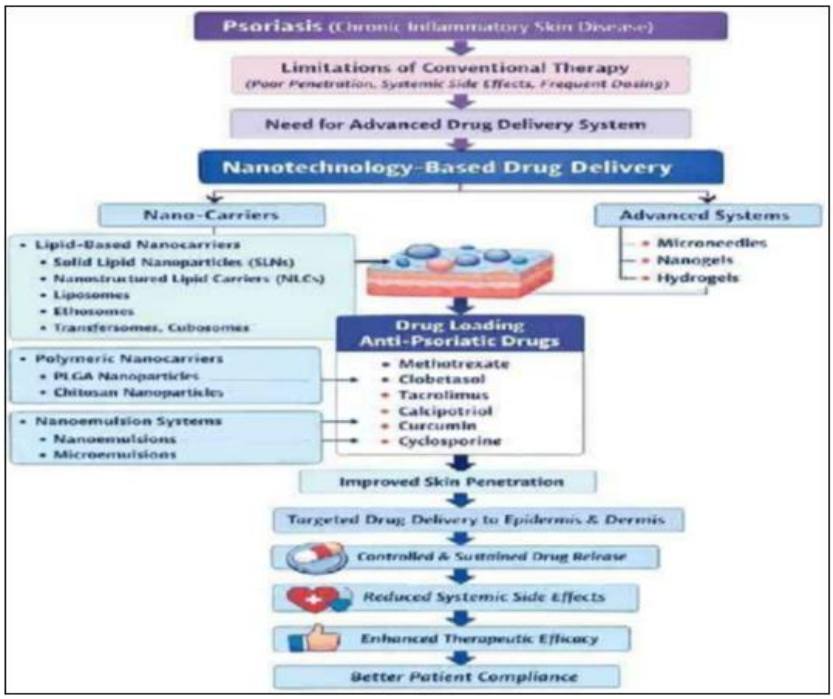


Figure 3: Nnao-technology-based drug delivery

Table 4: Nano-Formulations Developed for Psoriasis Treatment

S. No.	Formulation	Active / System	Key Findings	References
1	Nanospheres	Betamethasone bisodium phosphate	prolonged release of corticosteroids; inhibition of inflammatory cytokines	Wilson et al.,2026
2	NLC-based NLC gel	Hesperidin	Improved anti-psoriatic effectiveness and penetration	Rani et al.,2025
3	Nanofibrous patch	Indigo naturalis	PASI improvement in long-term plaque psoriasis	Zhao et al.,2025
4	Nanomedicine review	Multiple nano approaches	summarizes the treatment of psoriasis in nanotechnology.	Li et al., 2025
5	Tapinarof Nanogels	Tapinarof	Better medication release and nanoscale formulation	Balogh et al., 2025
6	Zn-doped Mesoporous Silica MN Patches	Betamethasone dipropionate	Improved transdermal administration and anti-inflammatory properties	Li et al., 2024
7	Polymeric nanogel	Curcumin	Decreased inflammation, scaling, and erythema	Ahmad etal.,2024
8	Lipid nanoparticles	Apremilast	Enhanced epidermal deposition and solubility	Rapalli et al., 2023
9	Solid Lipid Nanoparticles (SLN)	Calcipotriol	Controlled release, epidermal targeting	Pradhan et al., 2021
10	Solid Lipid Nanoparticles (SLNs)	Fluocinolone Acetonide	Extended release of corticosteroids; less irritation of the skin	Desoqi et al, 2021
11	Nanospheres (Tyrospheres)	Vitamin D3	improves skin absorption and controls the growth and differentiation of keratinocytes	Petit et al, 2021
12	Nanostructured Lipid Carrier (NLC) gel	Methotrexate	Thickness of the skin, TNF-α, and IL-17	Agrawal et al., 2020
13	Liposomal & Ethosomal nano-gel	Anthralin	PASI score improvement and decreased irritation	Fathalla et al.,2020
14	Nanoemulsion gel	Clobetasol propionate	Enhanced penetration and less systemic toxicity	Kaur et al., 2017
15	Nanocapsules	Dexamethasone	controlled release and epidermal anti-inflammatory effects	Marchiori et al., 2010

6. Marketed drug available for the treatment of Psoriasis

The treatment of psoriasis has significantly changed as a result of the availability of several commercially available drugs that target both symptoms and underlying immune systems. Due to their shown effectiveness and affordability, conventional treatments, including methotrexate, cyclosporine, and acitretin, are still often utilized, especially in cases of moderate to severe illness.

Table 5: Market drug available for the treatment of Psoriasis

S. No.	Active Drug	Trade Name	Therapeutic Action	References
1	Infliximab	Remicade	Chimeric monoclonal antibody targeting TNF-α	Siuchnińska et al.,2025
2	Secukinumab	Cosentyx	TNF-α-targeting chimeric monoclonal antibody	Pisal et al.,2025
3	Ixekizumab	Taltz	IL-17A neutralization with a high affinity	Noval et al.,2025
4	Brodalumab	Siliq	disrupts the signaling of the IL-17 receptor	Bubna et al.,2025
5	Ustekinumab	Stelara	IL-12 and IL-23 pathway dual inhibition	Szepietowski et al.,2025
6	Roflumilast	Zoryve	inhibits PDE-4 to suppress inflammatory mediators.	Nicolas et al., 2023
7	Guselkumab	Tremfya	Selective IL-23 (p19 subunit) blockade	Boehncke et al.,2021
8	Risankizumab	Skyrizi	Blockade of specific IL-23 (p19 subunit)	Blair et al.,2020
9	Acitretin	Soriatane	modifies epidermal turnover and keratinization	Guenther et al., 2017
10	Tazarotene	Tazorac	restores epidermal differentiation to normal (retinoid action)	Gregoriou et al.,2014
11	Adalimumab	Humira	inhibits inflammatory signals mediated by TNF-α	Hu et al.,2013
12	Apremilast	Otezla	reduces the production of cytokines by blocking PDE-4.	Schett et al.,2010
13	Calcipotriol + Betamethasone	Daivobet	Anti-inflammatory and anti-proliferative properties combined	Vakirlis et al.,2008
14	Etanercept	Enbrel	reduces the action of tumor necrosis factor-α	Schottelius et al., 2004
15	Cyclosporine	Neoral	inhibits calcineurin, which lowers T-cell activation	Reynolds et al., 2000
16	Calcipotriol	Daivonex	uses the vitamin D receptor to control keratinocyte growth.	Koo et al.,1997

7. Comparative Review Traditional vs Novel Approaches

Novel therapy has proven to be the most successful method for treating psoriasis when compared to conventional medication therapy. Conventional therapies mostly have a non-specific effect and are frequently linked to long-term safety issues as well as poor efficacy in cases of severe illness. On the other hand, new treatments like biologics and targeted small-molecule medications directly target important pathogenic processes that cause psoriasis. This targeted approach results in longer remission periods, higher rates of illness clearance, and faster clinical healing. Additionally, new therapies significantly enhance overall quality of life, safety, and patient adherence. Since new pharmacological therapy works effectively, has a known mechanism of action, and continues to function over time, it is thought to be the best option for treating moderate to severe psoriasis.

8. Novel Therapy in Psoriasis: Superiority and Associated Challenges

When compared to traditional systemic medications, novel therapeutics for psoriasis have enhanced safety, increased efficacy, and a quicker beginning of action. While small-molecule agents like phosphodiesterase-4 and Janus kinase inhibitors offer efficient oral alternatives with predictable pharmacological profiles, targeted biologics like tumor necrosis factor-α, interleukin-17, and interleukin-23 inhibitors selectively modulate important immune pathways involved in psoriatic inflammation to achieve profound and sustained skin clearance. These developments have lowered relapse rates, greatly enhanced patient quality of life, and made individualized treatment plans possible. Despite its advantages, innovative medicines have significant drawbacks, such as high treatment costs, restricted accessibility in places with limited resources, and the requirement for long-term safety monitoring because of hazards like infections, immunogenicity, and uncommon adverse events. Furthermore, the need for cautious patient selection and continual pharmacovigilance is highlighted by variations in patient response, worries about efficacy loss over time, and the necessity of continued therapy. As a result, even while new treatments are a significant advancement in the treatment of psoriasis, striking a balance between their therapeutic advantages and factors related to accessibility, safety, and cost is still a significant challenge in day-to-day practice.

9. Conclusion

By offering patient-centered, highly effective, and personalized therapy alternatives that outperform traditional medicines in terms of efficacy and disease control, new therapeutics have significantly advanced the treatment of psoriasis. Many patients' long-term quality of life has improved as a result of these treatments, which have also changed clinical outcomes. However, their universal applicability is limited by issues including high cost, limited availability, long-term safety concerns, and interindividual variability in therapy response. To fully exploit the potential of innovative medicines and guarantee their sustainable integration into routine psoriasis care, these concerns must be addressed by ongoing research, the creation of real-world evidence, cost-effective tactics, and individualized treatment approaches.

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