

A REVIEW ON NANOEMULGEL FOR THE TREATMENT OF PSORIASIS

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ABSTRACT

Psoriasis affects 2-5% of the global population. It is a chronic inflammatory skin disease with a strong genetic predisposition and autoimmune disease. Psoriasis can be mild-moderate or severe depending on the area affected of the skin. On the basis of severity of disease, location and type of psoriasis, treatment approaches can vary treatment includes topical, systemic and phototherapy. As conventional drug delivery approaches face various disadvantages, therefore, a need for better novel drug delivery system is required. Topical nanoemulgel is a convenient drug delivery system. As it increases skin permeability and also helps in controlled release of the drug. The review paper focuses on nanoemulgel for aspects of psoriasis and the novel

treatment which can help in tackling the disease.

INTRODUCTION

Psoriasis is one of the most common chronic immune-mediated inflammatory erythematous squamous dermatoses, prevalent among 2-5% of the world population. It is characterized by keratinocytes hyperproliferation, of inflammatory leukocytes in the epidermis and dermis. The clinical feature of the visible disfiguration of erythematous skin lesion covered with white silvery scales at the skin surface often inflicts upon patient through the psychological burden and decreased quality of life.^[1]

The most evident pathogenetic change leading to psoriasis is an alteration in the cell kinetics of keratinocytes i.e., abnormal differentiation and hyperproliferation of keratinocytes. Keratinocytes are cells in the epidermis that produce keratin, a "protein that helps to protect the skin and underlying tissues from heat, microbes, and chemicals." Patients with psoriasis

shed and replace these cells every two to six days, a quite bit faster than normal which is 21 to 28 days leading to build-up of dead and living cells.^[2]

Psoriasis can be categorized as mild, moderate, and severe conditions. Mild psoriasis leads to the formation of rashes, and when it becomes moderate, the skin turns scaly. In severe conditions, red patches may be present on the skin surface and become itchy. Topical delivery of the drug is always prescribed for psoriasis for local action.^[3]

Psoriasis can be highly variable in morphology, distribution, and severity. Despite the classic presentation described above, the morphology can range from small tear-shaped papules (guttate psoriasis) to pustules (pustular psoriasis) and generalized erythema and scale (erythrodermic psoriasis). In addition, these different forms of psoriasis may be localized or widespread, and disabling. Further, psoriasis may have a variable course presenting as chronic, stable plaques or may present acutely, with a rapid progression and widespread involvement. Psoriasis may be symptomatic with patients complaining of intense pruritus or burning.^[4]

Psoriasis Vulgaris is about 90% of psoriasis cases correspond to chronic plaque-type psoriasis. The classical clinical manifestations are sharply demarcated, erythematous, pruritic plaques covered in silvery scales. The plaques can coalesce and cover large areas of skin. Common locations include the trunk, the extensor surfaces of the limbs, and the scalp as shown in Table I.^[5,6,7,8]

Pustular psoriasis can be a severe type of psoriasis where lots of small blisters appear on the skin. It is characterized by multiple, coalescing sterile pustules. It can be localized or generalized. Localized are of two phenotypes i.e., pustulosa palmoplantar (ppp) and acrodermatitis continua of hallopeau. Both affect the hands and feet. Generalized presents with an acute and rapidly progressive course characterized by diffuse redness and often accompanied by systemic symptoms.^[9]

Erythrodermic psoriasis is uncommon aggressive, inflammatory form of psoriasis. It is most severe type of psoriasis symptoms includes peeling rash across entire surface of body, intense and burning rash and it spreads quickly.^[10]

Inverse psoriasis sometimes called hidden psoriasis or an intertriginous psoriasis is a form of psoriasis that affects skin folds. These are areas of the body where skin rubs against skin.

Inverse psoriasis can occur underarms, under a women's breast, or in the groin or inner thigh area.^[11]

Psoriasis is a multifactorial disorder that has several risk factors that participated in the etiology of psoriasis-like:

1. Genetic predisposition
2. Immunologically mediated inflammation

Researchers suggest that the T cells in the dermis are primarily maintained and initiated the immune-based inflammatory mechanism.

Psoriasis is a skin disease with an increased rate of epidermal turnover the pathogenesis is linked with various cellular mechanisms and certain growth factors like Vascular endothelial growth factor (VEGF), Keratinocyte's growth factor (KGF), the role of T cell, keratinocytes, Langerhans's cell, antigen-presenting cell (APCs), natural killer cells, macrophages, etc. the activation of T lymphocytes leads to inflammation to the dermal component.^[12,13] The various mechanism is involved in the pathogenesis of psoriasis "Fig. 1".

- 1) Role of dendritic cell
- 2) Hyperproliferation of keratinocytes
- 3) T cell function
- 4) Cytokine mediators
- 5) Reduced apoptosis
- 6) Role of oxidation and antioxidation in psoriasis
- 7) Genetic factors
- 8) Angiogenesis^[14,15]

Psoriasis is a chronic relapsing disease, which often has long-term therapy. The choice of therapy is depending on the severity of disease, comorbidities, access to health care, its effect on the quality of life, and patient's perception of their illness. According to the severity of disease, psoriasis patients are categorized into two groups i.e., mild or moderate psoriasis to severe psoriasis. Mild & moderate psoriasis can be treated with a combination of glucocorticoids, vit D analogues & phototherapy.

In this review, we will address the novel topical therapies for the treatment of psoriasis.^[16,17] The topical treatment is mostly a prescribed method as transdermal delivery is the first line of

defence for psoriasis skin. when there is excess growth of skin cells due to faulty signals produced by the immune system in psoriasis. These rapidly growing skin cells can be easily controlled by the novel topical medication.^[18,19]

Topical agents like TCS, vitamin D analogue, tazarotene anthralin and coal tar, salicylic acid, and calcineurin inhibitors for the treatment of thick limited plaques to increase absorption in psoriatic plaques. Then for facial/ flexural psoriasis and palmoplantar / thick psoriasis lesions low to mild and high potent TCS are used. The tacrolimus and pimecrolimus can also be used for facial and Intertriginous psoriasis.^[20] The topical treatment of psoriasis shown in “Fig. 3”.

Challenges in the topical treatment of psoriasis: the efficient delivery of anti-psoriatic drugs depends on a variety of physicochemical characteristics of the carrier and the active drug used.

1. Effective management of psoriasis there is combination therapy is used to minimizing side effects for example systemic therapy and or phototherapy.
2. In the different morphology of the skin, it increases diversity in drug absorption, as psoriatic lesion can have both significantly thickened and thinned epidermis hence it increases challenges in formulation development.
3. As new topical formulation must have appropriate cosmetic elegance such as ease of use, no potential staining on clothing, bedding, etc. in order to improve patient adherence to therapy. The formulation must be rapid absorption and less greasy.^[21,22]

Nanoemulsion is dispersed system contain two immiscible liquid phase water, oil and emulsifier. Nano emulsion is multiphase colloidal dispersion of oil and water stabilized by an interfacial film of surfactant and co- surfactant molecules. The schematic representation of nanoemulgel as shown in “Fig. 2”.

Nanoemulgel is formation of nano emulsion based on hydrogel is addition of nano emulsion integrated into hydrogel matrix which influence better skin penetration.

Nanoemulgel are novel formulation for topical delivery of the drugs. As nanoemulgel is loading of less amount drug, so it reduces the risk of adverse effects of high doses of drug. It also increases absorption rate of drug in submicron size (up to 10- 200 nm).^[23]

The nanoemulgel act as drug reservoir, influencing the release of drug from inner phase to outer phase. When nanoemulgel intact with skin release the oil droplets from the gel and this oil droplet penetrate into stratum corneum of skin and deliver the drug to intended site.^[24] As nanogel has good adhesion property and high solubilising of drug in oil phase leads to larger concentration gradient towards skin and increase skin penetration of drug.^[25,26] Nanoemulgel is an emergency technique for topical drug delivery, is currently being explored the treatment of various kinds of skin disorders from viral, bacterial and fungal infection including eczema, psoriasis, herpes simplex, acne etc.

Nanoemulgel has various advantages over the conventional formulation:

1. Increases the rate of absorption.
2. Helps to solubilize lipophilic drug.
3. Increases bioavailability.
4. Provide local drug delivery.
5. Controlled release of drug having the short half-life.
6. Nontoxic and non-irritant.
7. Better loading of drug compares to other formulation.
8. Helpful in taste masking.
9. Patient compliance.
10. Rapid and efficient penetration of drug moiety.^[27]

Nanoemulgel is act as alternative to increase the efficacy of poorly soluble drugs by increasing its absorption through the skin. nanoemulgel is hypothesized to penetrate the rough surface of plaques psoriatic skin by swelling of skin lipids and achieve enhanced penetration through the pores of the skin.^[28,29] as it can be easily loaded into gel for, which improve the deliverability of drugs into the skin by hydration and enhancing retention of drug in the skin.^[30,31,32]

Effectiveness of the psoriasis treatment. It was based on prolonged action of drug, without any adverse reaction. By replacing the conventional systems with novel drug delivery was found to be more effective and safety.^[33]

Sarfaraz Alam *et.al.*, have developed oil in water nanoemulsion in which oil phase is composed of clobetasol propionate.^[34] Although several formulation strategies have been developed in that B.V. Avasthi *et. al.*, was developing a nanogel composed of methotrexate-

loaded NLCs which has its potential in imiquimod- induced psoriasis model to ameliorate symptoms of psoriasis.^[35]

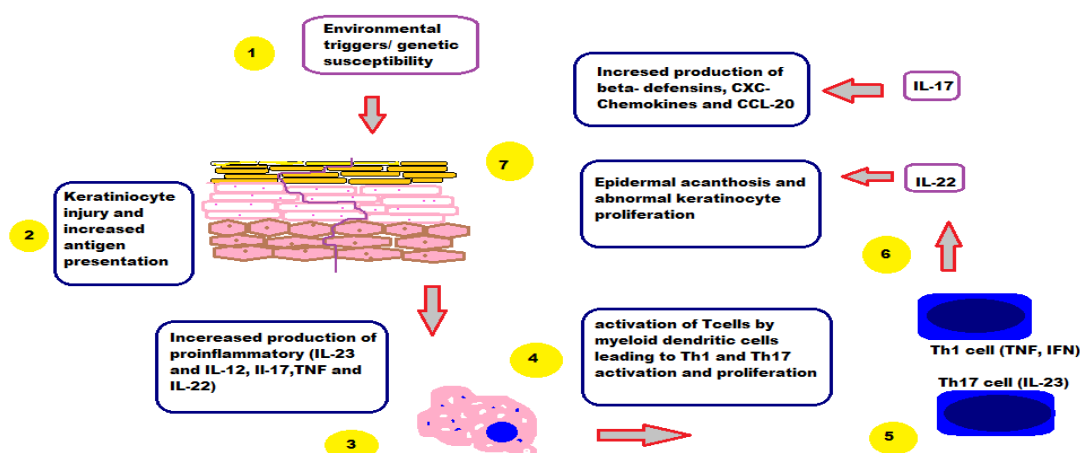


Fig. 1: Pathogenesis of psoriasis.

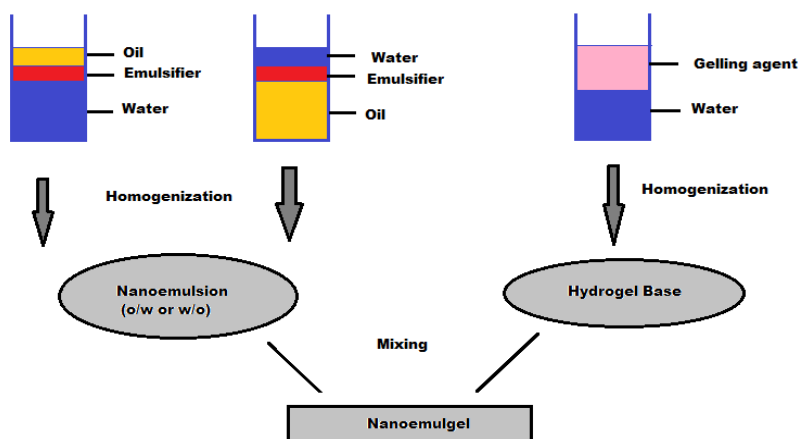


Fig. 2: Schematic representation of preparation of nanoemulgel.

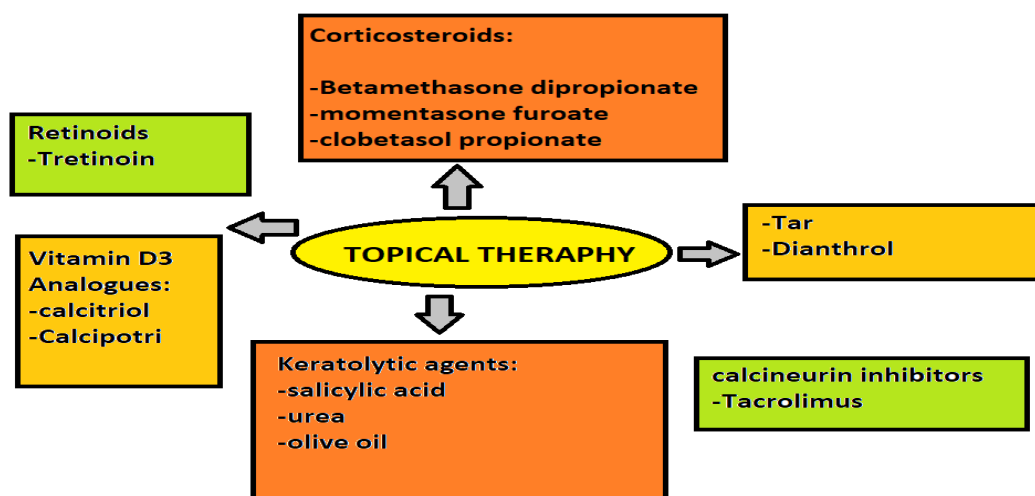


Fig. 3: Topical treatment of psoriasis.

Table I: Classification of psoriasis.

Sr. no.	Types of psoriasis	Characteristics
1	Plaque psoriasis	Most people have plaque psoriasis. This looks like dry patches of pink or red skin covered with silvery white scales (sometimes called plaque). The silvery white scales are dead skin cells. The patches slightly raised from the surface of the skin.
2	Guttate psoriasis	In this drop-like, discrete papules and small plaques observed after streptococcal infection.
3	Pustular psoriasis	This can be a severe type of psoriasis where lots of small pus-like blisters appear on your skin. It needs emergency medical attention. The fluid contains WBCs.
4	Erythrodermic psoriasis	This is a rare and severe type of psoriasis. Exfoliation of fine scales, wide-spread and most of the time skin on the body becomes red and inflamed. It often accompanied by severe itching and pain. It needs emergency medical attention.
5	Scalp, facial and flexural psoriasis	Psoriasis can be more difficult to treat on some parts of the body. Flexural psoriasis happens in skin folds, armpits, under the breast, between buttocks and in the groin are where it can affect the genitals.
6	Nail psoriasis	In this type of psoriasis pitting, subungual hyperkeratosis, onycholysis, yellow/brown spots under the plate occur in the nail.

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