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HERBAL AND NANOTECHNOLOGY IN THE TREATMENT OF PSORIASIS

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Abstract: The skin contains several epidermal and immunological elements that make up the skin-associated lymphoid tissue (SALT), which acts as a first line of defense against injury. Psoriasis is a persistent dermatological skin disease characterized by an autoimmune reaction. It has a substantial influence on the quality of life of patients. Despite the fact that there are numerous methods for psoriasis treatment, no single treatment provides a complete and acceptable cure. As a result, in recent years, it has become a prominent research topic. Anti-inflammatory drugs, immune suppressants, biologic therapy, and phototherapy are among of the most popular treatments. Several medicinal treatments are utilized topically and systemically, however they all have negative side effects. Herbal medicine has been frequently used as a substitute for these medications. Nanotechnology offers intriguing qualities that enable for the customization of a drug carrier to achieve cutaneous targeting, increased effectiveness, and reduced unwanted side effects, and thus the herbal Nano-tech drugs are more therapeutically effective and have fewer negative effects. As there are a variety of herbal formulation in the market, Nano herbal medication delivery systems have a bright future in terms of enhancing activity and solving difficulties associated with medicinal plants. The goal of this study is to look at the psoriasis disease and efficacy of Nano-herbal medications for psoriasis management and treatment.

Index Terms- Psoriasis, Dermatology, Nanotechnology, Autoimmune, Nano dermatology, Herbal medicine, Nano herbal medication.

I. INTRODUCTION

In 2013, skin disorders were the fourth greatest cause of disability globally. Skin diseases, which afflict millions of people every day and impact people of all ages, are one of the most frequent illnesses. Many pathogenic infections or inflammatory disorders have been the main causes. Skin-related illnesses cover a wide range of conditions, from benign conditions like psoriasis to life-threatening conditions like skin melanoma. The symptoms and severity of skin problems vary greatly. Some can be ascribed to environmental factors, while others can be hereditary in nature [1].

Psoriasis is a genetically-based, immune-mediated chronic inflammatory disease of the skin and joints with high clinical polymorphism of expression. This is the most frequent skin disease in clinical practice and affecting both men and women. In a normal scenario, skin cells regenerate every 28 days; however, in psoriasis, cell renewal is up to seven times faster, with transit periods from the basal layer ranging from 3 to 4 days [2][3]. The most common variety, *Psoriasis vulgaris*, is characterized by erythematous, scaly plaques that are well-defined and occasionally pruritic in sites of frequent skin damage, such as the elbows, knees, and scalp [4].

HISTORICAL FRAME OF REFERENCE AND EPIDEMIOLOGICAL RESEARCH:

Psoriasis is a worldwide inflammatory disease that has existed since ancient times. The Corpus Hippocraticum was the first to describe it. Hippocrates (460-377 BC) coined the term psora, which literally means "to itch." Psoriasis is a non-communicable chronic skin disorder that causes rapid skin cell proliferation, resulting in red, dry, thicker skin patches. Dry flakes and skin scales are the result of skin cells forming suddenly and without warning. The skin of the elbows, knees, and scalp are typically affected by psoriasis. Psoriatic arthritis can cause nail deterioration in 10-30% of patients, in addition to unpleasant and unattractive skin ulcers. The swelling in the joints resembles Rheumatoid arthritis (RA) in some ways, yet psoriasis is a seronegative arthritis (no

rheumatoid factor is present in the blood). As a result, the different clinical evidences of psoriasis make it more than a skin illness, as it interferes with daily activities such as hand use, sleeping, walking, and so on. Other than arthritis, Crohn disease, an inflammatory bowel ailment, is one of the most significant problems associated with psoriasis [5] [6].

PATHOPHYSIOLOGY OF PSORIASIS:

A large number of activated T cells enter the epidermis, where they appear to stimulate keratinocyte development. This notion is supported by histologic and immunohistochemical staining of psoriatic plaques, which demonstrate substantial numbers of T lymphocytes within the psoriasis lesions. According to study, a patient with psoriasis lesions covering 20% of their body surface area has roughly 8 billion blood circulating T cells, compared to approximately 20 billion T cells in psoriasis plaques' dermis and epidermis [7].

Finally, an enhanced, deregulated inflammatory response occurs, resulting in a high production of numerous cytokines (e.g., tumor necrosis factor-α [TNF-α], interferon-gamma and interleukin-12). The high production of such mediators explains many of the clinical aspects of psoriasis. Surprisingly, increased TNF-α levels have been observed to correspond with psoriasis outbreaks.

Vascular engorgement due to superficial blood vessel dilation and an altered epidermal cell cycle are two key findings in psoriasis patients' afflicted skin. Epidermal hyperplasia causes an increase in cell turnover (from 23 to 3-5 days), which causes inappropriate cell maturation. Parakeratosis is a condition in which cells that ordinarily lose their nuclei in the stratum granulosum retain their nuclei. Aside from parakeratosis, afflicted epidermal cells fail to release sufficient amounts of lipids, which typically cement corneocyte adhesions. As a result, a poorly adhering stratum corneum develops, resulting in peeling, scaly psoriasis lesions with a superficial that look like silver scales.

ETIOLOGY OF PSORIASIS:

Psoriasis is characterized by an increase in the rate of epidermal cell turnover and hyper proliferation of keratinocytes in the epidermis. As indicated by the so-called Koebner phenomenon, psoriasis is a complex illness in which both extrinsic and intrinsic causes play key roles. Nonspecific extrinsic triggers cause the skin of individuals who are genetically set to develop psoriatic lesions to display typical psoriatic lesions locally. Numerous reasons for overall aggravation have also been identified. The resulting are some of the variables that have been associated to the growth or deteriorating of psoriasis.

1. Environmental Factors:

- Scratching, piercings, tattoos, sunburns, and chemical irritants are all examples of mild localized trauma (the "traditional" Koebner phenomenon).
- B-blockers, lithium, antimalarial, and non-steroidal anti-inflammatory medications are examples of drugs [8].
- HIV infection [9].
- Streptococcal pharyngitis [10].

Psoriasis is more common in those who have chronic gingivitis, according to one research. Treatment of gingivitis effectively improved psoriasis management but had little effect on long-term incidence, reflecting the disease's complex and hereditary implications [11].

2. Immunologic Factors:

Your immune system serves as your body's defense against sickness and infection. T-cells are one of the most common kinds of cells utilized by the immune system. T-cells generally circulate throughout the body, detecting and combating invading pathogens such as bacteria. However, in persons with psoriasis, they begin to target healthy skin cells unintentionally. This causes the deepest layer of skin to create more skin cells than usual, causing the immune system to produce more T-cells. TNF- levels in the dermis and blood have been shown to be elevated in studies. TNF-inhibitors are frequently effective treatments. Increased T cell activation in the underlying skin is linked to psoriatic lesions.

3. Genetic Factors:

For than a century, scientists have recognized the genetic foundation of psoriasis, genetics is one of the most important factors. The following observations show the relevance of genetic influences.

- Monozygotic twins' concordance rates are up to three times greater than dizygotic twins'[12].
- Psoriasis is more common among first- and second-degree relatives of sufferers than in the general population, according to demographic surveys [13].

Psoriasis is linked to a number of human leukocyte antigen (HLA) alleles, the most powerful of which is human leukocyte antigen Cw6 (HLA-Cw6). Psoriasis is an autosomal dominant feature in some families. HLA-B27, HLA-B13, HLA-B17, and HLA-DR7 are further HLA antigens that have been linked to psoriasis and psoriatic subtypes. A multicentre meta-analysis confirmed that deletion of 2 late cornified envelope (LCE) genes, *LCE3C* and *LCE3B*, is a common genetic factor for susceptibility to psoriasis in different populations.

PATHOGENESIS:

Psoriasis is a chronic, hyperproliferative skin condition characterized by an abnormally high rate of epidermal turnover. The pathogenesis of psoriasis is been associated to a variation of cellular mechanisms, with the role of T cells, antigen presenting cells (APCs), keratinocytes, Langerhans cells, macrophages, and natural killer cells, as well as a variety of Th1-type cytokines and certain growth factors such as vascular endothelial growth factor (VEGF), keratinocytes growth factor (KGF), and others [14].

Numerous mechanisms have been proposed to have a role in the pathophysiology of psoriasis:

1. The Role of T Cells: T lymphocytes are divided into two functional subsets: helper T cells and cytolytic T cells. T cells are primarily responsible for recognizing processed peptide antigens coupled to proteins produced by MHC class II genes. As a result, T cells require APCs to digest and display peptide fragments on the APC cell surface in order to activate. T cells produce a variety of lymphokines. T cells can also act as suppressors of immunological responses; in this capacity, they are referred to as suppressor T cells. Different T cell groups express distinct cell membrane proteins. The majority of helper T cells express CD4 whereas cytolytic and suppressor cells express CD8. T cells must be activated in three steps: [15] a. Affixing b. Activation in response to a particular antigen (signal 1) c. Cell-cell contact that is not antigen-specific (signal 2).

2. Dendritic Cells: Their Function: Dendritic cells are a significant type of antigen-presenting cells that are overrepresented in psoriatic skin lesions [16]. Langerhans cells are a kind of immature dendritic cell (iDC) that are detected in normal epidermis and psoriasis lesions [17]. iDCs are immunostimulatory cells generated from blood monocytes or other myeloid progenitors. These iDCs are then encouraged further to grow into DCs (mDCs). Dermal DCs are significantly increased in psoriasis lesions. Myeloid DCs or iDCs express XIIIa and CD11c, whereas mDCs express CD83 and DC-LAMP proteins.

3. Keratinocyte Hyperproliferation: The skin's stratified structure serves as a protective mechanism. Five layers comprise the epidermis: the stratum basale, the stratum spinosum, the stratum granulosum, the stratum lucidium, and the stratum corneum. Keratinocytes are primarily generated in the stratum basale and move to the stratum corneum. As cells approach the surface, their organelles vanish and are replaced by keratin. Keratin's outermost layer serves as a protective layer. In normal settings, the epidermal cell cycle takes around four weeks to complete. However, the epidermal cell cycle is accelerated in psoriatic skin. Cell division occurs every 1.5 days in the basal layer, and keratinocytes migrate to the stratum corneum within roughly 4 days. This leads in keratinocyte hyperproliferation.

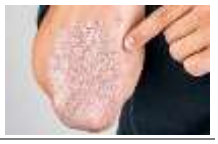
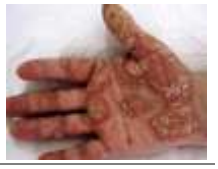
4. Angiogenesis: Although keratinocytes release proangiogenic cytokines (VEGF, IL-8), the exact mechanism of angiogenesis in psoriasis remains uncertain. In psoriasis, endothelial cells expand and become active; these activated endothelial cells move, sprout, and create novel vessel networks by laying down a basement membrane with pericytes for structural support [18]. This leads in an expansion of the intercellular gaps, and consequently dilation of the dermal blood vessels, which facilitates leukocyte migration into the skin [19].

5. Mediators of Cytokine Production: Cytokines cause epidermal hyper proliferation, vascular dilatation, and dermal inflammation in psoriasis. Cytokines such as granulocyte-macrophage-colony-stimulating-factor (GMCSF), epithelial-growth-factor (EGF), IL-8, IL-12, IL-1, IL-6, IFN-, and TNF- are implicated in the development of psoriasis. These cytokines promote keratinocyte proliferation, neutrophil migration, angiogenesis, adhesion molecule upregulation, and epidermal hyperplasia.

6. Apoptosis Is Inhibited: To maintain the epidermis's consistent thickness, apoptotic cell death regulates keratinocyte growth in the normal epidermis. The epidermal hyperplasia associated with psoriasis is thought to be caused by overexpression of P53, and proliferating cells normally produce Bcl-2, which shields them against apoptotic stimuli, but terminally differentiated cells lack Bcl-2 expression [20].

TYPES OF PSORIASIS:

Table. Brief summery on the types of psoriasis.

Types Of Psoriasis	Symptoms	Treatment	Medication	Images
Psoriasis Vulgaris	Itching, burning, swollen joints	Topical therapies Photodynamic Therapy	Corticosteroid, Retinoid, Vitamin(D) Analogues,	
Guttate Psoriasis	Inflamed skin, pain ,fever	Topical therapies, Phototherapy, Non-steroidal treatments	Infliximab, Adalimumab	
Erythrodermic Psoriasis	Severe Pain, Fast Heart Rate ,Itching	Topical therapies, Phototherapy	Cyclosporine, Infliximab	
Palmoplantar Psoriasis	Itching, burning, soreness, cracking and bleeding in defined places.	Topical therapies, Topical steroids, Phototherapy or PUVA	Acitretin Tablets, Risakizumab	
Psoriatic Arthritis	Joint pain, nail separation, eye inflammation ,foot pain	Topical therapies Non-steroidal anti-inflammatory drug ,UV light therapy	Methotrexate, Lefunomide, Sulfalazine & Other	
Inverse Psoriasis	Discomfort, pain, severe itching and splitting of the skin	Topical corticosteroids, Immunomodulation	Acitrecin, Apremilast, Methotrexate	
Generalized Pustular Psoriasis	General symptoms, such as high fever, lassitude.	Topical therapies	Cyclosporine, Ixekizumab, Secukinumab,	
Localized Pustular Psoriasis	Fever, chills, severe itching,	Topical therapies Corticosteroid Phototherapy	Entanerecept, Infliximab	

SEVERITY OF DISEASE:

There are several forms of psoriasis, as well as varying degrees of severity—mild, moderate, and severe. To ensure that each case is dealt effectively, it is critical that it be accurately classified. Given the distressing symptoms of psoriasis, you may be tempted to attempt the most extreme treatments.

Body Surface Area (BSA)

Psoriasis Area and Severity Index (PASI) Scores

Dermatology Life Quality Index (DLQI)

Physician Global Assessment (PGA)

Table. Severity of psoriasis.

SEVERITY	BSA	PASI	DLQI	PGA
MILD	<3%	<5	<5	1- 2
MODERATE	3%- 10%	5 - 10	5- 10	3
SEVERE	>10%	>10	>10	4

DIAGNOSIS METHODS FOR PSORIASIS.

1. The Clinical Spectrum:

Psoriasis has a wide and inconsistent Clinical Manifestations. Basic skin lesions may range in appearance from macules to papules, plaques, and pustules. The condition is not always limited to the skin and nails. Around 30% of patients develop inflammatory arthritis, and those with psoriatic disorder may also develop uveitis or inflammatory bowel disease on occasion. Additionally, the appearance varies significantly from patient to patient. Skin symptoms might be mild or severe, monomorphic or polymorphic, and affect anyone at any age. Thus, psoriasis may be considered as a spectrum of illness, and because to the variety in clinical presentation, definitive diagnostic criteria for psoriasis have yet to be established.

2. Disease Categorization:

The disease range or clinical phenotypes of psoriasis have been characterized according to several characteristics of the illness, including age of onset, degree of skin involvement, morphologic pattern, and predominance of involvement in certain anatomic sites of the body [21].

3. Nano Diagnosis for Psoriasis:

Nanoparticles are currently being used in a variety of diagnostic modalities due to a number of benefits, including increased sensitivity of permitted detection techniques and the ability to analyze smaller tissue samples. Conjugating them with monoclonal antibodies improves their specificity. Because of a change in the particle's surface, the particles are less likely to clump together and are more readily absorbed by cells [22]. Nanoparticle-based diagnostic applications are expected to be extremely sensitive and specific, using a little amount of tissue sample and providing findings quickly. Optical fabric, gold nanoparticles, quantum dots, nanoparticles with magnetic characteristics, and other nanoparticles may be used in nanodiagnosis [23].

TRADITIONAL TREATMENTS FOR PSORIASIS:

Psoriasis may be treated using a variety of methods. Any treatment should be examined on long term basis. Systemic medications (medicines taken inside), topical agents (medicines applied to the skin), and phototherapy are all common treatments for psoriasis. All these therapies may be utilized solo or in conjunction with one another. The best therapy for the person is selected by the doctor based on the type and severity of the psoriasis [24].

TYPES OF THERAPIES

1. Topical Therapy:

These are the drugs that are administered directly to the skin and are used as the first line of treatment. Topical creams, sprays, and lotions are immensely useful and safe for mild psoriasis. Topical therapies include corticosteroids, vitamin D-3 derivatives, retinoids, coal tar, and anthralin. Sometimes a hybrid of these preparations is used. Keratolytics, for example, are often used in topical treatments [25].

Table. Drawbacks of Topical Medicines

Topical Medicines	Disadvantages
Corticosteroids	Short duration of remission. Risk of cutaneous atrophy and rebound of psoriasis on discontinuation. myelosuppression, alopecia, teratogenic.
Vitamin D analogues (calcipotriol)	Short duration of remission necessitates constant treatment. Irritant, hypercalcemia.
Retinoids (tazarotene)	Irritant, teratogenic, Pruritis.
Calcineurin inhibitors	Transient burning sensation
Tar (crude coal tar)	Long contact time required. Irritation, unpleasant odor, folliculitis, possible carcinogen.
Dithranol (anthralin)	Dithranol stains skin, clothing and skin Irritation.

2. Phototherapy:

This treatment involves exposing the patient to UV rays using specialized equipment that contains a fluorescent light source that emits a particular wavelength of radiation. UV rays cause psoriasis to flare up. When exposed to sunlight or artificial UV rays on a regular basis, symptoms improve. The following methods are used:

2.1. Heliotherapy: Heliotherapy (short, daily exposures to sunlight) may help with psoriasis [26].

2.2. UVB Broadband: UVB broadband light from an artificial light source may be used to treat isolated patches, extensive psoriasis, and psoriasis that does not respond to topical therapies. Redness, irritation, and dry skin are possible short-term adverse effects. [27].

2.3. UVB Narrowband: UVB narrowband light therapy may be more successful than UVB broadband light therapy, and in many regions, it has largely supplanted broadband therapy. Narrowband UVB phototherapy, on the other hand, has the potential to cause more severe and long-lasting burns [28].

2.4. Psoralen Plus Ultraviolet A (PUVA): This treatment comprises taking a light-sensitizing medication (psoralen) prior to UVA light exposure. UVA radiation penetrates the skin further than UVB light, and psoralen enhances the skin's susceptibility to UVA exposures [29].

2.5. Excimer laser: A powerful UVB light is used to target just the afflicted skin using this kind of light treatment. Redness and blistering are possible side effects [30].

3. Systemic Therapy:

Systemic Therapy is often utilized in moderate to severe instances or when topical treatment and phototherapy have failed to provide results. Because the drugs employed are hazardous, patients who get systemic therapy must have periodic blood and liver function testing [31].

Table. Systemic Drugs in the Treatment of Psoriasis

Drug	Mechanism	Site
Methotrexate	Dihydrofolate reductase inhibition blocks purine biosynthesis; induction of lymphocyte apoptosis	SC/ Oral
Cyclosporin	Calcineurin inhibition leading to reduced IL-2	Oral
Acitretin	Normalization of keratinocyte proliferation/differentiation through retinoid receptor binding	Oral

Fumarate	Intracellular glutathione, modulation of Nrf2, NF-_B, and HIF-1_; promoting a shift from a pro-inflammatory Th1/Th17 response to an anti-inflammatory/regulatory Th2 response.	Oral
Apremilast	PDE4 inhibitor increases in tracellular cAMP levels in immune and non-immune cell types modulating inflammation	Oral

Table. Drawbacks of Systemic Therapy

Medicines	**Disadvantages**
Methotrexate	Bone Marrow Suppression, Hepatic Fibrosis, Nausea,
Cyclosporine	Nephrotoxicity, Immunosuppression Hypertension.
Acitretin	Slow Onset Of Action, Teratogenicity, and Raised Plasma Lipids.
Fumariate	GIT Complications (Flushing Episodes, Diarrhoea), Lymphopenia .

4. Treatment Using Biologics:

Biologics are drugs that block key molecular processes in the disease's etiology. They've gained popularity in recent years as a viable alternative to traditional psoriasis treatments. Biologics are distinct from standard systemic medications that effect the whole immune system. Only some components of the immune system are targeted by biologics. The biologics used to treat psoriatic disease suppress the function of a particular kind of immune cell called a T-cell. Examples; Alefacept, Infliximab, Guselkumab, Etanercept, Adalimumab, Risankizumab, Golimumab, Ixekizumab, Ustekinumab, Secukinumab, Certolizumab, Brodalumab, [32].

Table. Disadvantages of Biologics in Treatment of Psoriasis.

Biologics	**Disadvantages**
Infliximab	Serum sickness and infusion responses, Infections (e.g., tuberculosis) and cancers, such as hepatosplenic T-cell lymphoma (in children), lupus without renal or CNS symptoms, cytopenia, MS, and aggravation and new onset of CHF are all rare.
Entercept	Injection site responses that are mildly pruritic, Infections (such as tuberculosis) and malignancies, lupus without renal or CNS consequences, cytopenia, MS, and aggravation or new development of CHF are also rare.
Itolizumab	Infusion responses, infections, and exfoliative dermatitis, erythrodermic psoriasis, anxiety-related adjustment disorder, and bacterial arthritis are all possible complications.
Secukinumab	Inflammatory bowel disease, nasopharyngitis, diarrhea, and upper respiratory tract infection, as well as a higher risk of candidal infection.

5. Herbal Therapy:

Traditional remedies, especially in tropical developing countries like India, show enormous promise as a source of readily accessible, efficient treatment for skin problems. Herbal remedies do not have as many adverse effects as manufactured pharmaceuticals.

Herbal resources now play a significant role in the treatment of skin and inflammatory illnesses. According to several research, psoriasis symptoms may be alleviated by altering one's diet and lifestyle. Psoriasis symptoms have been relieved by a fasting period, a low-energy diet, and a vegetarian diet. [33].

Aloe Vera:

Aloe barbadensis Miller. Anthroquinones, steroids, saponins, mucopolysaccharides, and salicylic acid are all found in aloe vera. It belongs to the lily (Liliaceae) family. Aloe vera's active ingredients have been proven to have significant analgesic, antipruritic, wound-healing, and anti-inflammatory capabilities, indicating that it might be used to treat psoriasis [34].

Fig. Aloe Vera

Capsicum Annuum/ Capsicum Frutescens:

Capsaicin is the main chemical constitution found in the capsicum annum also called as cayenne pepper. Fruit and leafs of this spice are edible and possess antibacterial and anti-inflammatory properties. Creams of cayenne pepper can be used as a topical agent to treat moderate or severe type of psoriasis.

Fig. Capsicum Annuum

Silybum Marianum:

Milk thistle, often known as milk thistle from Asteraceae family. Every component of the plant is edible. The hepatoprotective, anti-inflammatory & antioxidant properties of this herb are widely established. Milk thistle is thought to aid in the prevention of psoriasis flares by promoting healthy liver function. Certain chemicals linked to psoriasis are neutralized by the liver. This plant oil has also been recommended as a source of vitamin E, -linolenic acid, and linoleic acid [35].

Fig. Silybum Marianum

Burdock:

Burdock belongs to the compositae/Asteraceae family (daisy). Burdock is used to treat fevers, eczema, psoriasis and other dermatological diseases. Active components in Arctium lappa consists of Mucilages and polysaccharides. This herb has anti-inflammatory, antimicrobial (antibacterial, antiviral), antineoplastic (antimutagenic, anticancer), and antioxidant properties [36].

Fig. Burdock

Oregano Oil

Oregano oil has antibacterial and antifungal effects, which might aid with certain psoriasis-related illnesses. The major constituents of oregano essential oil are carvacrol, Beta-fenchyl alcohol, thymol, and γ-terpinene. However, current research has shown that these chemicals are also effective antioxidants, anti-inflammatory, anti-diabetic, and cancer suppressors. [37].

Fig. Oregano

Feverfew:

Feverfew is a Compositae/Asteraceae family fragrant plant. Feverfew is a traditional herb used to treat arthritis, contact dermatitis, and other skin problems. Germacrene and guianane are the biologically active compounds in the herb's dried leaves.

Fig. Feverfew

Devil's Claw:

Devil's claw, Harpagophytum procumbens (Pedaliaceae). A set of decarboxylated iridoid glycosides, comprising harpagoside as the primary component and minor quantities of procumbide, harpagide, and 8-(4-coumaroyl) harpagide, are the principal elements of devil's claw root. Secondary root preparations have earned a reputation as an antiinflammatory and antirheumatic medicine for treating pain and inflammation in arthritis and rheumatic diseases.

Fig. Devil's claw

Liquorice:

Glycyrrhiza glabra is another name for licorice. The dried, unpeeled rhizome and its root are the most important parts. (Liquiritigenin and isoliquiritigenin) flavonoids in liquorice root, give it its vivid yellow hue. Its anti-pain effects were also responsible for its usage as a natural demulcent. Liquorice extracts have been shown to have corticosteroid-like and anti-inflammatory properties in recent studies. [38].

Fig. Liquorice

Tea Tree Oil:

Tea tree oil is a yellow essential oil derived from the leaves of the Melaleuca alternifolia plant. The plant is native to Australia, where it has been used to heal minor wounds and skin disorders for than a century. Tea tree oil seems to have antibacterial, antifungal, anti-inflammatory, and antiviral effects. As a consequence, tea tree oil is used to treat a variety of skin irritations and health issues, including acne, lice, and psoriasis. [39].

Fig. Tea Tree Oil

Matricaria Recutita:

Chamomile is a popular name for it. Chamazulene, a by-product of the non-volatile oil extract matricin, has anti-inflammatory, antibacterial characterestiics, making it ideal for treating burns, bruises, psoriasis, and eczema. It may also equalize skin tone, erase dark spots and blemishes, and bring brightness to the face because to its antioxidant components [40]. Development of allergic reactions such as contact dermatitis [41].

Fig. Matricaria Recutita

Turmeric:

In traditional Chinese medicine, the spice has a long history of usage. Turmeric is available in pill form as a nutritional supplement, but many individuals who contact the Foundation prefer to use the powdered version of the spice, which they add into their meals. Turmeric has also been shown to aid with arthritis-related swelling, discomfort, and inflammation [42].

Fig. Turmeric

Wrightia Tinctoria:

Wrightia tinctoria, often known as Dyer's oleander or Indrajau, is a member of the Apocynaceae family. Astringent, anti-inflammatory, and antibacterial qualities of the leaves are used to treat a variety of skin conditions. This plant's leaves yielded a hydro alcoholic extract with antipsoriatic properties. Antioxidant activity is high in this extract. These leaves include beta amyrin and glucoside, which are both useful for the plant's skin-healing abilities.

Figure. Wrightia Tinctoria

Patients often embrace herbal medications because they are seen to be safer than conventional therapies. Herbal items also have a lot of structural variety and multidirectional methods of action that synthetic drugs don't have. In contrast to conventional medications, herbal pharmaceuticals may become an effective therapy for psoriasis, resulting in reduced costs and fewer side- or harmful effects. As a result, scientists are still on the lookout for new botanical products and/or active ingredients. **P**lants are now used in a wide range of industries. The cosmetics sector is particularly interested in this area. Table below, indicate the most regularly used skin-care botanicals and skin-care formulations, respectively.

Table. Herbal Plants and there Cosmetic Applications.

Name	**Used Part**	**Applications**
Aloe vera	Leaf	Moisturizer, Sun screen, Emollient
Brahmi	Plant	Wound healing, reduce stretch marks
Cobras saffron	Flower	Astringent
Galanga	Rhizome	Aromatic, dusting powders
Garlic	Bulb	Promotes wound healing, antibacterial properties
Ginseng	Root	Stimulate blood flow to skin
Jawasa	Leaves	Treating skin disorders
Kanchivala	Bark, leaves	Skin disorders
Marigold	Flower	Skin care, anti-inflammatory, antiseptic creams.
Neem	Leaf	Antiseptic, reduce dark spots, antibacterial
Oat	Fruit	Moisturizer, skin tonic
Sweet flag	Rhizome	Aromatic, dusting powders, treating skin lotions
Zizyphus	Fruit	Skin care

NANOTHERAPEUTICS FOR PSORIASIS:

The pharmacological treatment of psoriasis has lately become safer and more successful, thanks to breakthroughs in nanotechnology, which have resulted in the creation of novel psoriasis-targeting Nano-drugs. By encapsulating, entrapping, or conjugating medicines inside or onto Nano-scale structures, they may be used as drug delivery systems and therefore, Nanotechnology is the study and manipulation of structures ranging in size from one to a few hundred nanometers in at least one dimension [43].

Organic compounds like as phospholipids or fatty acids may be used to make these nanoscale drug carriers, making them extremely biocompatible. Nanocarriers are divided into three categories:

(1) Vesicular carriers, one that encapsulate drugs in an aqueous core.

(2) Polymer-based nanocarriers that encapsulate or entrap drugs in a hydrophobic core.

(3) solid-phase carriers, which entrap drugs within a solid matrix or have drugs directly conjugated to them.

Preventing drug degradation, promoting drug absorption and prolonged drug release, and limiting drug interactions with non-target locations are all qualities that may lead to improved effectiveness when therapies are localized inside or onto nanocarriers [44].

Nanocarriers medication delivery characteristics are very beneficial for psoriasis treatments. The incorporation of pharmaceuticals inside nanocarriers avoids drug aggregation within this film, which is typical with free medications and resulting in restricted drug penetration into the stratum corneum. Nanocarriers in the film provide a high drug concentration gradient at the skin's exterior, allowing the medication to diffuse into the skin for a long time. Nanocarriers may also lodge inside the stratum corneum's lipid matrix, resulting in delayed, sustained drug release as well as drug retention in the skin for longer periods of time contrast with free drug. Drugs in nanocarriers are also protected against degradation, extending the active drug half-life [44]. When compared to free pharmaceuticals, sustained drug release and longer half-life may lower the dosages of medications employed in nanocarriers as well as the number of applications necessary, reducing cutaneous adverse effects and enhancing effectiveness. Because the medication stays in the skin rather than being taken into the circulation, the improved drug retention given by nanocarriers also decreases systemic adverse effects [45].

SIGNIFICANT ROLE OF HERBAL NANOTECHNOLOGY IN THE TREATMENT OF PSORIASIS.

Colloidal systems with particle sizes ranging from 10 nm to 1000 nm are known as Nano particles. These are structures that are Nano or sub-Nano in size and are formed of synthetic or semi-synthetic polymers. Plant medicine nanoparticles are now garnering a lot of interest. Due to poor solubility, limited bioavailability, instability in biological medium, high first pass metabolism, and poor permeability, herbal medication administration has a number of issues. All of these issues can be solved by nanotechnology [46] [47].

ADVANTAGES OF NANODRUG DELIVERY: [48] [49].

1. Drug targeting may be accomplished by using the pathophysiological characteristics of sick tissues. Nano-medicine may be used to deliver medications to particular locations.

2. Nanotechnological products have a benefits over conventional medications in that they have a long half-life, are present at suitable concentrations at the target location, and do not lose their activity or therapeutic effectiveness while in circulation.

3. Increased vascular permeability, along with decreased lymphatic drainage, provides for greater permeability and retention of Nano systems in tumour or inflamed tissues.

4. Regenerative medicine is a kind of medicine that involves the regeneration of cells. Instead of just destroying or removing damaged or diseased tissue, or replacing it with non-biological materials, the goal of regenerative medicine is to assist the body heal and restore lost or damaged tissue.

5. The existence of the blood-brain barrier reduces the therapeutic potential of several promising medications for the treatment of different neurological illnesses. The blood-brain barrier is a special membrane that keeps the brain apart from the rest of the body's blood. As a result, medication delivery to this organ is difficult due to the brain's high level of protection. Nanoparticles can be utilized to successfully transport medications to the brain

6. The nanosystem also provides a great possibility for passive medication targeting to macrophages in the liver and spleen. As a result, medications for intracellular infections may be targeted using this natural mechanism.

7. Nanoparticles can be utilized to successfully transport medications to the brain Antibodies that have been synthesized. Nanomedicine was the first to envision artificial red and white blood cells, and it subsequently shown that positive patients may

now be treated by injecting artificial red blood cells to balance the blood level in the human body. Artificial antibodies, white and red blood cells, and antiviral nanorobots are examples of effective nanomedicine uses.

8. Reagents (imaging and therapeutic medicines) might be encapsulated in nanocarriers to carry them to the sites of action in the body while limiting systemic toxicity and enzymatic breakdown. These functional systems have the potential to become a universal medication delivery method.

- ✓ Increase solubility and pharmacokinetics.
- ✓ Reduces adverse effects & Drug degradation
- ✓ Chemical modification
- ✓ Water soluble and biocompatible
- ✓ Efficient loading
- ✓ Drug bioavailability could be improved.
- ✓ The API are delivered to desired location.
- ✓ Biocompatible
- ✓ Longer duration of circulation
- ✓ Amphiphilic

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