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The Role of Cannabinoids in the Treatment of Skin Diseases: A Review of Mechanisms of Action and Clinical Evidence

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Abstract

Background:
Cannabinoids derived from Cannabis sativa L., particularly cannabidiol (CBD) and minor cannabinoids such as cannabigerol (CBG), cannabichromene (CBC), tetrahydrocannabivarin (THCV), and cannabidivarin (CBDV), have attracted increasing interest due to their potential therapeutic properties in dermatology. These compounds exert anti-inflammatory, antimicrobial, immunomodulatory, sebostatic, and antiproliferative effects, which may benefit a range of skin conditions.
Aim:
To review and synthesize current scientific evidence regarding the therapeutic application of cannabinoids in selected dermatological diseases, with particular focus on mechanisms of action, clinical efficacy, limitations, and future research directions.

Material and Methods:
This narrative review is based on an analysis of peer-reviewed publications, including in vitro and in vivo studies, clinical trials, case reports, and review articles related to cannabinoid use in dermatology. Conditions discussed include epidermolysis bullosa (EB), bacterial and fungal skin infections, pruritus, androgenetic alopecia, alopecia areata, acne vulgaris, and psoriasis.
Results:
Preclinical and early clinical data suggest that cannabinoids may effectively alleviate inflammation, pain, pruritus, and microbial infections in various dermatologic disorders. Topical and transdermal routes show promise due to improved safety and targeted delivery. CBD has demonstrated efficacy in reducing sebum production in acne, modulating immune responses in psoriasis, and accelerating wound healing in EB. However, findings for alopecia areata remain inconsistent. Emerging delivery systems, including CBG-based emulgels and CBD transdermal patches, may improve local bioavailability and clinical outcomes.
Conclusions:
Cannabinoids, especially CBD, exhibit significant potential as adjuvant or alternative treatments for inflammatory, infectious, and autoimmune skin diseases. Despite promising preliminary results, large-scale, randomized, placebo-controlled trials are needed to establish optimal dosing, formulations, safety, and long-term efficacy in clinical dermatology.

Keywords:
Cannabinoids, cannabidiol, dermatology, Cannabis sativa, CBD, epidermolysis bullosa, acne, psoriasis, alopecia, skin infections, pruritus, transdermal therapy, emulgel, CBG, wound healing.

Introduction

Cannabis sativa L., commonly known as cannabis or hemp, has been used for medicinal purposes for over 4,000 years. Modern science, supported by advancements in extraction technologies and sophisticated chemical analysis, has once again turned its attention to the therapeutic potential of this plant, focusing primarily on its bioactive compounds—cannabinoids. Among the more than 100 identified cannabinoids, the greatest clinical significance is attributed to tetrahydrocannabinol (THC) and cannabidiol (CBD). THC is known for its psychoactive properties, which limits its application and subjects it to strict legal regulations. In contrast, CBD, which lacks psychotomimetic effects, exhibits a broad spectrum of biological activity, including anti-inflammatory, analgesic, anxiolytic, and neuroprotective properties (Tihăuan BM et al., 2025; Kuzumi A et al., 2024).
In dermatology, CBD has gained particular interest due to its ability to modulate the skin's inflammatory response, reduce pruritus, support wound healing, and its potential antibacterial and antifungal activity. The cutaneous endocannabinoid system—which includes CB1 and CB2 receptors, endogenous ligands, and metabolic enzymes—plays a crucial role in regulating skin homeostasis, immune processes, and pain perception. Consequently, cannabinoids such as CBD

are regarded as promising adjuvant agents in the treatment of various dermatoses, including those with inflammatory, autoimmune, or infectious origins (Tihăuan BM et al., 2025).
Despite the growing popularity of CBD in cosmetic products, dietary supplements, and medicinal preparations, its application faces several challenges. Its low oral bioavailability (6–20%) and poor water solubility limit the effectiveness of systemic therapies, which has drawn the attention of researchers toward alternative delivery routes, such as transdermal application. Transdermal delivery of CBD allows the compound to bypass the hepatic first-pass metabolism, enables controlled release of the active substance, and enhances local therapeutic efficacy—an aspect of particular importance in dermatology (Tihăuan BM et al., 2025; Kuzumi A et al., 2024; Shah P. et al., 2024).
Due to the increasing interest in this compound, it is essential to deepen our understanding of its actual therapeutic potential and mechanisms of action in the context of skin diseases.
The aim of this review is to summarize the current scientific data on the potential use of cannabinoids—particularly CBD—in the treatment of selected skin disorders such as epidermolysis bullosa (EB), bacterial and fungal infections, pruritus, androgenetic alopecia, alopecia areata, acne vulgaris, and psoriasis. This work discusses both experimental and observational data, with particular emphasis on mechanisms of action, limitations of current research, and the clinical potential of cannabis in dermatology.

Blistering of the epidermidis

Blistering of the epidermis (Epidermolysis Bullosa - EB) belongs to a group of rare genetic connective tissue disorders that cause the formation of very delicate skin prone to blistering. There are four primary subtypes of EB, determined by which proteins within the dermalepidermal junction are affected: EB simplex, junctional EB, dystrophic EB, and Kindler syndrome. Blistering of the epidermis, medically referred to as Epidermolysis Bullosa (EB), is a collection of rare genetic disorders that significantly compromise the integrity of the skin and mucous membranes (Schräder et al., 2021). Characterized by extraordinarily fragile skin, individuals with EB are prone to the formation of blisters in response to minor friction, trauma, or even spontaneous occurrences. The condition is both chronic and debilitating, often leading to severe complications and necessitating comprehensive medical care. Epidermolysis Bullosa is categorized into four primary subtypes, each defined by specific genetic mutations affecting various proteins at the dermal-epidermal junction. This junction is a critical area where the epidermis (outer skin layer) and dermis (inner skin layer) connect, ensuring skin cohesion and resilience. The four main subtypes of EB are:

1. EB Simplex (EBS): This subtype is the most common and typically the least severe. It results from mutations in the genes encoding keratins 5 and 14. Blistering in EBS occurs within the basal keratinocytes of the epidermis, often leading to localized and relatively manageable skin lesions.
2. Junctional EB (JEB): A more severe form of the disorder, JEB is caused by mutations in genes such as LAMA3, LAMB3, and LAMC2, which are crucial for the production of laminin-332, a protein essential for the structural integrity of the skin. Blisters in JEB form within the lamina lucida of the basement membrane, often resulting in extensive and life-threatening skin damage.

3. Dystrophic EB (DEB): This subtype is characterized by mutations in the COL7A1 gene, which encodes type VII collagen, a protein vital for anchoring fibrils that secure the epidermis to the dermis. Blistering in DEB occurs below the lamina densa within the upper dermis, frequently leading to severe scarring and an increased risk of developing squamous cell carcinoma in adulthood.
4. Kindler Syndrome: This rare form of EB involves mutations in the FERMT1 gene, which impacts the protein kindlin-1. Unlike the other types, Kindler Syndrome affects multiple layers of the skin, leading to progressive poikiloderma (a condition characterized by skin atrophy, pigmentation changes, and telangiectasia) and photosensitivity in addition to blistering.

Clinical Evidence on Cannabinoid Use in EB

A study was conducted to investigate whether preparations containing cannabis extract affect the course of symptoms associated with blistering of the epidermis (Schräder et al., 2021). A group of 71 patients used cannabinoid-based medicines from March to August 2020. Those products were administered externally in the form of oils and pastes, and internally – infused or cooked into foods. Most study participants used cannabinoid-based medicines CBM preparations at least once daily, although the amount of administered infusion fluctuated throughout the study. The majority of participants reported that pain and burning decreased by 3 points on a painchange scale from 0 to 10. The most commonly reported improvements were relief of general symptoms (95%), pain (94%), itching (91%), and improvement in wound healing (81%). 79% of participants reported taking fewer painkillers. The main side effect was dry mouth, which occurred in 44% of study participants. Due to the potential legal conflicts, the study was not widely distributed, so only a few people participated in it. Additionally, participants used preparations in various forms, which does not allow for standardization of doses, forms, and routes of administration, so the study should be repeated taking these parameters into account In a different set of cases, three patients independently began using different topical CBD formulations to address epidermolysis bullosa lesions (Parikh et al., 2024). The formulations varied between cases, and there was no standardized application method. (Schräder et al., 2022) One patient was weaned completely off oral opioid analgesics. All 3 reported faster wound healing, less blistering, and amelioration of pain with cannabidiol use.

Implications and Future Directions

Although these results demonstrate promise, further randomized, double-blind clinical trials are necessary to provide scientific evidence of our observed benefits of cannabidiol for the treatment of epidermolysis bullosa. Results from the study were anticipated to be available by late 2023. As of now, we are awaiting the findings, which are expected to contribute significantly to the understanding of pain management options for individuals with EB.

Bacterial Skin Infections: Clinical Background

Bacterial skin diseases pose a significant health problem, associated with infections caused by various types of bacteria, which may naturally occur on the skin or be transmitted from the

outside. These infections are caused by streptococci, staphylococci, or other Gram-negative bacteria, as well as other bacterial skin diseases such as erysipelas, erythema migrans, actinomycosis, and Lyme disease. This group of diseases also includes skin tuberculosis, syphilis, and gonorrhea. The most resistant to treatment are the strains of Staphylococcus aureus, *Streptococcus pneumoniae*, and *Clostridioides difficile*. (Blaskovich et al., 2021) These Bacterial infections manifest in diverse ways, from pustular skin eruptions to inflammations and other skin abnormalities. Conditions such as impetigo, pustules, pityriasis versicolor, or even complications related to other skin diseases like psoriasis can be caused by bacterial infections. In the case of certain infections, such as erysipelas or impetigo contagiosa, bacterial skin diseases can lead to serious complications, especially in individuals with weakened immune systems. Globally, there is also a concerning trend of increasing bacterial resistance to antibiotics. This is especially true for infections caused by gram-negative bacteria, where since the 1960s, practically no new molecular classes have been discovered and approved for clinical use. However, there is also a need for better therapies for infections caused by gram-positive bacteria, as they still cause significant mortality.

Antibacterial Properties of Cannabis sativa Extracts Against Gram-Positive Pathogens

Cannabis sativa extracts, particularly those derived from its seeds and whole plant, have demonstrated significant antibacterial effects against a range of Gram-positive bacteria, including *Staphylococcus aureus*, *Streptococcus alpha haemolyticus*, *Streptococcus beta haemolyticus*, *Enterococcus*, *Diplococcus pneumoniae*, *Bacillus subtilis*, *Bacillus anthracis*, *Corynebacterium diphtheriae*, *Corynebacterium cutis*, *Erysipelothrix rhusiopathiae*, *Clostridium perfringens*, and *Mycobacterium tuberculosis* (Schofs, L. et al., 2022).

Potential of Cannabinoids in Mucosal Infections and Oncology-Associated Microbiota

A study was conducted using ointments containing CBD concentrations of 5, 10, 15, and 20% across a range of formulations based on different silicones, petrolatum, transcutol and polyethylene glycol. They were applied hourly under laboratory conditions to infected porcine skin (Blaskovich et al., 2021). The results showed that all concentrations of the ointment were effective and significantly reduced the amount of bacteria. The research has revealed that CBD and other cannabinoids exhibit targeted effectiveness against a subset of gram-negative bacteria, notably including *N. gonorrhoeae*, classified as a CDC urgent priority and WHO high priority drug-resistant pathogen. Additionally, a broader spectrum of CBD activity against gram-positive pathogens, such as vancomycin-resistant *E. faecium* and *MRSA*, was observed, exceeding the scope previously assumed by the WHO. Crucially, repeated exposure to CBD does not induce resistance. A summary study on the impact of various compounds on bacterial infections has shown that Cannabis sativa may contribute to reducing *S. aureus* infections in cases of conjunctivitis. It has also been noted that cannabidiol affects microorganisms in mucous membranes, which may be particularly important in the course of squamous cell carcinoma of the head and neck (especially the tongue and throat). which typically target the skin, hair, and nails (Makhakhe, L., 2022).

Clinical Manifestations of Cutaneous Fungal Infections

Symptoms of skin fungus may include redness, itching, cracking, and flaking of the skin. Common examples include candidiasis in the corners of the mouth (caused by *Candida albicans*) and pityriasis versicolor caused by *Malassezia furfur*.

Antifungal Activity of Cannabidiol: Mechanisms of Action and Spectrum of Efficacy

Research (Makhakhe, L., 2022) suggests that Cannabidiol acts on fungal skin infection through several mechanisms. Firstly, it acts on cannabinoid receptors CB1 and CB2, which are present in the endocannabinoid system (Schofs, L. et al., 2022). These receptors are present in the skin and influence its functions, including inflammation and immune response(Yoo EH et al., 2023). CBD acts on fungal cell walls, causing damage and inhibiting their growth. Research has also shown that CBD may have antifungal effects on various types of fungi. In vitro studies have demonstrated that CBD exhibits activity against *Candida albicans*, one of the most common causes of fungal infections in humans, as well as against other types of fungi such as *Aspergillus niger*, *Penicillium expansum*, *Fusarium graminearum*, and *Rhizopus stolonifer*.
Pruritus, an uncomfortable sensation prompting the urge to scratch, is a common symptom in dermatologic conditions caused by fungal infections, and can signify underlying systemic diseases. An emollient containing topical endocannabinoids resulted in an average 86% reduction in subjective pruritus. In a 3-week open-label study of 21 patients with uremic pruritus, twice-daily application of an endocannabinoids-containing cream for three weeks eliminated pruritus entirely in over 38% of subjects, with an additional 52% reporting significant reduction. However, as these studies lacked a control group, it remains unclear how much improvement in pruritus would occur with the emollient vehicle alone. Nevertheless, topical preparations with endocannabinoids may alleviate pruritus by modulating mast cell activity, suppressing inflammatory cytokines, reducing tumor necrosis factor (TNF), or providing inherent analgesic effects (Makhakhe, L., 2022).

Cannabinoids in Hair Loss Disorders: From Clinical Evidence to Molecular Mechanisms

Androgenetic Alopecia (AGA**)** is a prevalent condition affecting both men and women, with its frequency increasing as individuals age (Smith, G.; Satino, J., 2021). It stands as the most common cause of hair loss and thinning, typically commencing in the third or fourth decade of life and showing a notable rise in prevalence among women post-menopause. Research suggests that by the age of 50, approximately 50% of Caucasian men and 19% of Caucasian women are affected, although the prevalence and severity are lower in Asian and black men. The psychological and social impacts of AGA can be significant, particularly for women. The condition is characterized by the miniaturization of hair follicles in a specific pattern, influenced by systemic androgens and genetic factors. In males, this pattern presents as a receding hairline at the temples and crown, while females typically experience diffuse thinning with the preservation of the frontal hairline. AGA arises from disruptions in the cyclical transformation of hair follicles, transitioning from active hair growth and pigment production (anagen) to apoptosis-driven follicle involution (catagen). Immunohistochemical studies of human hair

follicles have shown differences in the distribution of CB1R and CB2R receptors in different parts of the hair, which may provide a basis for further research into the use of cannabidiol.

Cannabidiol in the Treatment of AA

A study was conducted to check the effects of cannabidiol in patients suffering from androgenetic alopecia (Smith, G.; Satino, J., 2021; Schofs, L. et al., 2022). Adult participants, who were not currently using minoxidil or finasteride, were invited to receive complimentary hemp oil extract via social media. Thirtyfive individuals (28 males, 7 females) were chosen as the initial respondents. All of them were Caucasian and diagnosed with androgenetic alopecia (AA) characterized by gradual bitemporal and/or vertex hair loss.

The test results were as follows: Hair density in the temporal region saw an average rise of 74.1% among men and 55.2% among women, while in the vertex region, it increased by an average of 120.1% for men and 64.9% for women. The initial hair count for all males stood at 18.28 escalating to 33.21 after six months. Similarly, for all females, the baseline hair count was 19.57, increasing to 30.57 after six months, with a statistically significant difference noted when combining temporal and vertex areas. Overall, males and the vertex area exhibited the most substantial improvements, although all subjects experienced some increase in hair count. Unlike androgenetic alopecia, cannabidiol has not proven to be effective in the treatment of alopecia areata (Han, J. et al., 2022). Alopecia areata (AA), also known as spot baldness, is a chronic inflammatory disease characterized by damage to hair follicles and hair loss on areas of the body covered with hair, including not only the scalp but also the eyebrows, eyelashes, armpits, and genital areas. The prevalence of this disease is estimated to be around 2% in the general population.

With alopecia areata, other conditions often coexist, such as depression, thyroid diseases, and anxiety disorders. Patients with alopecia areata may be more susceptible to developing certain autoimmune diseases, such as type 1 diabetes and inflammatory bowel diseases. Genome-wide association studies (GWAS) have identified 14 genetic loci associated with AA, which are relevant to the functioning of the immune system.

Between March 9th and March 22nd, 2021, a study was conducted to assess the efficacy of Cannabidiol in patients with alopecia areata (Smith, G.; Satino, J., 2021). The usage of cannabis encompassed various forms, including smoking marijuana or cannabidiol (CBD), ingesting marijuana, tetrahydrocannabinol (THC), or CBD, inhaling vaporized liquid THC, hash oil, or CBD, as well as using CBD lotions and creams. The term "current" cannabis use was defined based on the CDC's criteria, indicating usage within the preceding 30 days. Those who had a history of cannabis use but hadn't used it within the last 30 days were classified as "former" cannabis users. In the study, 1087 participants completed the survey, achieving a completion rate of 88.1%. Predominantly, participants were female (83.3%) and Caucasian (73.8%). Among participants with AA, 65.9% had a history of cannabis use, of which 51.8% were current cannabis users. The primary motive for current cannabis users was alleviating AA-related symptoms (55.7%), notably experiencing perceived improvements in stress symptoms (73.1%) and symptoms of anxiety, sadness, and depression (65.6%). A significant portion, 80.4%, reported that cannabis had no effect on their hair loss.

The case study from 2019 highlights the effectiveness of extracted cannabis oil in treating alopecia areata in a 52-year-old male patient (Vorasun Buranakarn, 2019). After conventional treatments, including desoximetasone cream and minoxidil, failed to yield results, the application of cannabis oil led to significant hair regrowth within five months. The study

suggests that the unique properties of cannabis oil, particularly its anti-inflammatory effects, may play a crucial role in stimulating hair growth by reducing inflammation and promoting healing through the body's endocannabinoid system. While the results are promising, the authors emphasize the need for further research to establish standardized treatment protocols and dosage guidelines for the use of cannabis oil in alopecia areata and other hair loss conditions.
Another research driven in 2021 investigates the regulatory effects of cannabidiol (CBD) on βcatenin expression in alopecia models, specifically focusing on dermal papilla cells affected by testosterone and phorbol 12-myristate 13-acetate (PMA) (Park, Y.-J. et al., 2021). The study began with structural and anatomical analyses of hair tissues from alopecia patients, revealing morphological deformations and a loss of cell numbers in the hair shaft. Immunohistochemical (IHC) analysis indicated a significant reduction in β-catenin expression within the inner shaft of alopecia affected hair tissues, highlighting its critical role in hair growth regulation through the Wnt/βcatenin signaling pathway. The research further demonstrated that treatment with testosterone or PMA led to decreased βcatenin expression in dermal papilla cells, suggesting a model for studying alopecia's molecular mechanisms. Although CBD did not alter gene expression levels of β-catenin, it effectively restored the reduced β-catenin levels induced by testosterone or PMA treatment. This indicates that CBD may have a modulating effect on alopecia caused by hormonal influences or excessive signaling pathways. The findings suggest that CBD holds promise as a potential treatment for alopecia, warranting further exploration in clinical applications.

Cannabinoids in the Treatment of Acne Vulgaris and Acne Scarring: Anti-Inflammatory, Sebostatic, and Regenerative Potential

Acne vulgaris is a chronic inflammatory disease of the pilosebaceous unit, commonly affecting adolescents but often persisting or recurring in adulthood. Clinically, it presents with comedones, papules, pustules, inflammatory nodules, and, in more severe cases, cysts and scarring. The pathogenesis of acne is multifactorial and includes excessive sebum production, colonization of the skin by *Cutibacterium acnes*, hyperkeratinization of the follicular epithelium, and local inflammation. In many cases, acne is resistant to both topical and systemic treatment, leading to frustration and significantly reduced quality of life (Kwiecień E, Kowalczuk D., 2023).
The psychosocial impact of acne extends far beyond its physical manifestations. Numerous studies have shown that it may cause lowered self-esteem, social withdrawal, and even depression, especially in cases involving visible scarring. Conventional therapies—such as retinoids, antibiotics, hormonal treatments, and isotretinoin—are often associated with side effects, limited efficacy, or a high risk of relapse. Therefore, there is an increasing demand for safer and more effective therapeutic alternatives (Kuzumi A et al., 2024; Shah P et al., 2024; Lee JH et al., 2024).
Cannabinoids, including both major ones (CBD, THC) and so-called minor cannabinoids such as CBG, CBC, CBDV, and THCV, have gained attention in this context. As shown in a review by Varadi et al. (2023), these compounds exhibit lipostatic, anti-inflammatory, and antimicrobial properties. Their efficacy in acne treatment is primarily based on their ability to reduce sebum production by sebaceous glands, regulate cutaneous immune responses, and inhibit the growth of *C. acnes*. Among these compounds, THCV is particularly promising due to its strong ability to regulate sebum production, a key factor in acne pathophysiology.

In addition to active inflammatory lesions, atrophic acne scars represent a major therapeutic challenge. Traditional methods such as chemical peels, microneedling, and laser therapy often produce inconsistent results and may carry the risk of adverse effects. Thus, cannabinoids are also being explored for their potential in scar management.

In a study published by Lee et al. (2024), the effects of CBD and hemp seed extracts were investigated in the context of skin inflammation and repair. CBD was tested at concentrations of 0.1, 1, 5, 10, 50, and 100 μM on immortalized human sebocyte lines (SEB-1), cultured in serum-free DMEM supplemented with glucose and antibiotics. Additionally, human fibroblasts (Detroit 551 cell line) were cultured in EMEM and DMEM supplemented with 10% fetal bovine serum. The study found that CBD modulates lipid synthesis via the Akt/AMPK–SREBP-1 signaling pathway, leading to reduced sebum production. This mechanism is highly relevant, as excess sebum contributes to pore blockage and inflammation. Furthermore, hexane seed hemp extracts (HSHE) at a concentration of 0.6% effectively inhibited *C. acnes*-induced inflammation in human keratinocytes.

In a 12-week clinical study involving human volunteers, application of a cream containing 3% hemp seed extract significantly reduced skin erythema and inflammation, while showing good tolerability, with no allergic or irritant reactions reported (Ali A, Akhtar N., 2015). Importantly, for the management of acne scars, topical application of an ointment containing epidermal growth factor (EGF) and CBD stimulated the production of type I and III collagen and elastin—key components of healthy skin structure. Additionally, decreased levels of IL-1α and keratin 16 were observed, suggesting a reduction in local inflammation and potential remodeling of scar tissue.

These findings indicate that cannabinoids—whether used as purified compounds or in plant-based extracts—may offer a novel, effective, and well-tolerated option for the treatment of both active acne lesions and post-acne scarring. However, further clinical studies involving larger patient populations are needed to determine optimal dosages, delivery methods, and long-term safety of cannabinoid-based acne therapies.

Cannabidiol in Psoriasis Management: Immunomodulation, Clinical Applications, and Transdermal Delivery

Psoriasis is a chronic, relapsing inflammatory skin disease with a complex etiopathogenesis, in which both genetic and immunological factors play a key role. It is characterized by excessive proliferation of keratinocytes, impaired differentiation of epidermal cells, and chronic inflammation involving T lymphocytes, dendritic cells, and pro-inflammatory cytokines such as TNF-α, IL-17, and IL-23. The typical clinical manifestation includes well-demarcated, erythematous, scaly plaques, most commonly located on the elbows, knees, scalp, and lower back. This disease significantly impacts patients' quality of life, often leading to physical discomfort (itching, burning) as well as psychological symptoms such as depression, social withdrawal, and anxiety disorders (Veale JD et al., 2025). In recent years, there has been growing interest in cannabinoids as potential adjunctive agents in the treatment of psoriasis.

In 2024, an in vitro study was conducted to evaluate the effects of cannabidiol (CBD) on the immune function of blood cells in patients with psoriasis (Pagano C et al., 2024). A group of n = 8 individuals was recruited, including 4 healthy controls and 4 patients with a confirmed diagnosis of psoriasis. Peripheral blood mononuclear cells (PBMCs) were isolated from all participants, cultured, and then treated with CBD.

The analyses showed that in patients with psoriasis, CBD modulated the activity of immune cells that play a crucial role in the pathogenesis of this skin disease. A shift in the inflammatory response from the Th1-dominant profile (typical in psoriasis) toward a Th2 profile was observed, indicating a reduction in pro-inflammatory activity. CBD also inhibited the migration of monocytes and their differentiation into dendritic cells—key immune activators commonly found in the dermis of psoriatic patients. Additionally, it promoted the polarization of macrophages toward the M2 phenotype, which contributes to the resolution of chronic skin inflammation. The effect of CBD on natural killer (NK) cells also suggests the potential to reduce keratinocyte damage.
These results indicate that CBD exerts a multifaceted immunomodulatory effect, which may be significant in controlling chronic inflammation and abnormal cell differentiation in psoriasis. These mechanisms—operating within the skin microenvironment—suggest that cannabidiol could serve as a potential adjunct therapy for psoriasis, especially in cases resistant to conventional treatments.
Also in 2024, a review article was published that analyzed the existing scientific evidence on the use of cannabidiol (CBD) in psoriasis therapy (Stanescu AMA et al., 2024). The review included both laboratory studies and clinical observations, focusing on aspects such as anti-inflammatory, antioxidant, antipruritic, antiproliferative, and moisturizing effects on the skin. The findings discussed in the review suggest that CBD inhibits the excessive proliferation of keratinocytes, reduces oxidative stress, alleviates itching, diminishes inflammation, and improves skin hydration. The mechanism of action includes modulation of inflammatory pathways and interactions with the skin's endocannabinoid system. This suggests that CBD, due to its broad biological activity, may serve as an effective support in the treatment of psoriasis, addressing both symptoms and underlying mechanisms. However, the authors emphasize the need for further well-designed clinical trials to confirm the efficacy and long-term safety of CBD use in psoriatic patients.
In 2024, a randomized, double-blind, placebo-controlled clinical trial (Sermsaksasithorn P et al., 2024) was conducted to evaluate the efficacy and safety of transdermal cannabidiol (CBD) patches in alleviating symptoms of plaque psoriasis. Over 60 patients with mild to moderate forms of the disease were enrolled and randomly assigned to receive either a CBD patch (containing minimal trace amounts of THC) or a placebo patch. The products were applied in an outpatient setting for 90 days, with clinical evaluations performed on days 0, 30, 60, and 90. The study assessed the following parameters:

- local Psoriasis Severity Index (LPSI),
- subjective itch severity (measured using a Visual Analog Scale – VAS),
- incidence of adverse events,

and microbiome changes in the skin, gastrointestinal tract, and oral cavity in selected participants.
Importantly, all participants who completed the 18-month follow-up period showed no abnormalities in liver function tests. This is particularly relevant considering that long-term oral administration of CBD has previously been associated with elevated liver transaminase levels. Transdermal administration may therefore represent a safer long-term delivery method for CBD. According to the study protocol, the trial was scheduled to conclude by the end of 2024, and the final results are expected to be published soon. These findings are anticipated to provide

valuable clinical evidence on the effectiveness and safety of topical CBD in psoriasis treatment, without the systemic adverse effects associated with oral formulations.

Innovative CBG-Based Emulgel Formulation: Enhanced Topical Delivery and Skin Retention

One of the most recent studies focused on the development and evaluation of the physicochemical and dermatological properties of a formulation containing cannabigerol (CBG) in the form of an emulgel, which was subsequently converted into a spray-dried powder. In this study, an oil-in-gel emulsion was prepared using 1% CBG and hemp oil, then processed via spray-drying to obtain a stable, easy-to-store powder formulation. Upon reconstitution, the emulgel maintained appropriate pH and viscosity, making it suitable for topical application. The product was then tested for its skin permeation and retention properties using in vitro assays with biomimetic membranes. The results showed that CBG demonstrated significantly better retention in skin structures compared to CBD, suggesting longer-lasting and more effective action following topical use. These findings indicate that CBG in emulgel form may serve as an effective ingredient in dermatological formulations, offering potential advantages over the more commonly used CBD in terms of local skin bioavailability (Picco A et al., 2023).

Discussion

The present review highlights the growing scientific interest in the application of cannabinoids—particularly cannabidiol (CBD)—as potential therapeutic agents in the treatment of a wide range of dermatological conditions. Emerging evidence suggests that cannabinoids exert multi-directional effects on the skin via modulation of the endocannabinoid system, encompassing anti-inflammatory, antimicrobial, immunomodulatory, sebostatic, and antipruritic properties. These actions, observed in both in vitro and in vivo studies, position cannabinoids as promising adjuvants or alternatives to conventional dermatological therapies.
In diseases such as epidermolysis bullosa, psoriasis, and acne vulgaris, CBD and other cannabinoids have demonstrated the ability to reduce inflammation, promote wound healing, and alleviate pruritus or pain, often with favorable tolerability and minimal adverse effects. Additionally, studies have shown antibacterial and antifungal properties of cannabinoids, which may offer solutions in the era of rising antibiotic resistance, particularly against multidrug-resistant strains like MRSA or N. gonorrhoeae.
In androgenetic alopecia, CBD has shown promise in stimulating hair growth, possibly through mechanisms involving the Wnt/β-catenin signaling pathway, though results remain inconsistent across different types of alopecia, especially alopecia areata, where effects are limited and appear predominantly symptomatic or indirect (e.g., stress reduction). Likewise, the development of novel delivery forms, such as transdermal patches or CBG-based emulgels, may overcome pharmacokinetic limitations of cannabinoids, improving local bioavailability while reducing systemic exposure and potential toxicity.
Despite encouraging preliminary data, the current body of evidence remains limited by small sample sizes, lack of standardization, and the predominance of observational or in vitro studies. Many clinical trials are still ongoing or unpublished, and heterogeneity in formulations, dosing, and outcome measures hampers direct comparison. Therefore, while the therapeutic rationale is strong, more robust, randomized, and placebo-controlled clinical trials are essential to confirm efficacy, establish safety profiles, and develop evidence-based guidelines for dermatologic use of cannabinoids.

Conclusions

Cannabinoids—particularly CBD—exhibit promising therapeutic potential in dermatology due to their anti-inflammatory, antimicrobial, antipruritic, and immunomodulatory effects. Preliminary studies suggest their efficacy in managing conditions such as epidermolysis bullosa, psoriasis, acne, pruritus, and bacterial or fungal infections. Novel formulations, such as emulgels or transdermal systems, offer enhanced delivery and tolerability.

However, to translate these findings into clinical practice, further high-quality research is necessary. Future studies should focus on determining optimal dosages, long-term safety, pharmacokinetics, and standardized therapeutic protocols. Cannabinoids may eventually complement or even replace certain conventional treatments, offering patients novel options with fewer side effects—particularly in chronic, relapsing, or treatment-resistant dermatoses.

Disclossure

The authors declare no conflicts of interest related to this publication.

References

1. Tihăuan BM, Onisei T, Slootweg W, Gună D, Iliescu C, Chifiriuc MC. Cannabidiol-A friend or a foe? Eur J Pharm Sci. 2025 May 1;208:107036. https://doi.org/10.1016/j.ejps.2025.107036. Epub 2025 Feb 8. PMID: 39929375.
2. Schräder, N.H.B.; Gorell, E.S.; Stewart, R.E.; Duipmans, J.C.; Harris, N.; Perez, V.A.; Tang, J.Y.; Wolff, A.P.; Bolling, M.C. Cannabinoid Use and Effects in Patients with Epidermolysis Bullosa: An International Cross-Sectional Survey Study. Orphanet J. Rare Dis. 2021, 16, 377, https://doi.org/10.1186/s13023-021-02010-0
3. Parikh, A.C.; Jeffery, C.S.; Sandhu, Z.; Brownlee, B.P.; Queimado, L.; Mims, M.M. The Effect of Cannabinoids on Wound Healing: A Review. Health Sci. Rep. 2024, 7, e1908, https://doi.org/10.1002/hsr2.1908
4. Schräder, N.H.B.; Duipmans, J.C.; Renken, R.J.; Sörös, P.; Vermeulen, K.M.; Bolling, M.C.; Wolff, A.P. The C4EB Study—Transvamix (10% THC / 5% CBD) to Treat Chronic Pain in Epidermolysis Bullosa: A Protocol for an Explorative Randomized, Placebo Controlled, and Double Blind Intervention Crossover Study. PLOS ONE 2022, 17, e0277512, https://doi.org/10.1371/journal.pone.0277512
5. Blaskovich, M.A.T.; Kavanagh, A.M.; Elliott, A.G.; Zhang, B.; Ramu, S.; Amado, M.; Lowe, G.J.; Hinton, A.O.; Pham, D.M.T.; Zuegg, J.; et al. The Antimicrobial Potential of Cannabidiol. Commun. Biol. 2021, 4, 7, https://doi.org/10.1038/s42003-020-01530-y
6. Schofs, L.; Sparo, M.D.; Sánchez Bruni, S.F. The Antimicrobial Effect behind Cannabis Sativa. Pharmacol. Res. Perspect. 2021, 9, e00761, https://doi.org/10.1002/prp2.761
7. Makhakhe, L. Topical Cannabidiol (CBD) in Skin Pathology – A Comprehensive Review and Prospects for New Therapeutic Opportunities. South Afr. Fam. Pract. 2022, 64, https://doi.org/10.4102/safp.v64i1.5493
8. Smith, G.; Satino, J. Hair Regrowth with Cannabidiol (CBD)-Rich Hemp Extract – A Case Series. Cannabis 2021, 4, 53–59, https://doi.org/10.26828/cannabis/2021.01.003
9. Han, J.; Faletsky, A.; Mostaghimi, A.; Huang, K. Cannabis Use among Patients with Alopecia Areata: A Cross-Sectional Survey Study. Int. J. Trichology 2022, 14, 21, https://doi.org/10.4103/ijt.ijt_96_21
10. Vorasun Buranakarn, Alopecia Areata Treatment with Extracted Cannabis Oil: Case Study 52-Year-Old Asian Male. Dec 31 2019, https://doi.org/10.4103/ijt.ijt_96_21
11. Park, Y.-J.; Ryu, J.-M.; Na, H.-H.; Jung, H.-S.; Kim, B.; Park, J.-S.; Ahn, B.-S.; Kim, K.- C. Regulatory Effect of Cannabidiol (CBD) on Decreased β-Catenin Expression in Alopecia Models by Testosterone and PMA Treatment in Dermal

Papilla Cells. J. Pharmacopuncture 2021, 24, 68–75, https://doi.org/10.3831/kpi.2021.24.2.68

12. Kuzumi A, Yoshizaki-Ogawa A, Fukasawa T, Sato S, Yoshizaki A. The Potential Role of Cannabidiol in Cosmetic Dermatology: A Literature Review. Am J Clin Dermatol. 2024 Nov;25(6):951-966. https://doi.org/10.1007/s40257-024-00891-y. Epub 2024 Oct 5. PMID: 39369127; PMCID: PMC11511700.
13. Shah P, Holmes K, Chibane F, Wang P, Chagas P, Salles E, Jones M, Palines P, Masoumy M, Baban B, Yu J. Cutaneous Wound Healing and the Effects of Cannabidiol. Int J Mol Sci. 2024 Jun 28;25(13):7137. https://doi.org/10.3390/ijms25137137. PMID: 39000244; PMCID: PMC11241632.
14. Kwiecień E, Kowalczuk D. Therapeutic Potential of Minor Cannabinoids in Dermatological Diseases-A Synthetic Review. Molecules. 2023 Aug 20;28(16):6149. https://doi.org/10.3390/molecules28166149. PMID: 37630401; PMCID: PMC10459035.
15. Lee JH, Yoon JY, Kim DH, Kwon YG, Kim GH, Park BJ, Suh DH. Potential of cannabidiol as acne and acne scar treatment: novel insights into molecular pathways of pathophysiological factors. Arch Dermatol Res. 2024 Jun 21;316(7):428. https://doi.org/10.1007/s00403-024-03131-9. PMID: 38904694; PMCID: PMC11192675.
16. Ali A, Akhtar N. The safety and efficacy of 3% Cannabis seeds extract cream for reduction of human cheek skin sebum and erythema content. Pak J Pharm Sci. 2015 Jul;28(4):1389-95. PMID: 26142529.
17. Yoo EH, Lee JH. Cannabinoids and Their Receptors in Skin Diseases. Int J Mol Sci. 2023 Nov 20;24(22):16523. https://doi.org/10.3390/ijms242216523. PMID: 38003712; PMCID: PMC10672037.
18. Pagano C, Ciaglia E, Coppola L, Lopardo V, Raimondo A, Giuseppe M, Lembo S, Laezza C, Bifulco M. Cannabidiol exerts multitarget immunomodulatory effects on PBMCs from individuals with psoriasis vulgaris. Front Immunol. 2024 Mar 27;15:1373435. https://doi.org/10.3389/fimmu.2024.1373435. PMID: 38601151; PMCID: PMC11004238.
19. Stanescu AMA, Bejan GC, Balta MD, Andronic O, Toma C, Busnatu S. The Perspective of Cannabidiol in Psoriasis Therapy. Psoriasis (Auckl). 2024 Jun 19;14:51-61. https://doi.org/10.2147/ptt.s469698. PMID: 38911997; PMCID: PMC11193997.
20. Sermsaksasithorn P, Asawanonda P, Phutrakool P, Ondee T, Chariyavilaskul P, Payungporn S, Pongpirul K, Hirankarn N. Efficacy and Safety of Cannabis Transdermal Patch for Alleviating Psoriasis Symptoms: Protocol for a Randomized Controlled Trial (CanPatch). Med Cannabis Cannabinoids. 2024 May 30;7(1):99-110. https://doi.org/10.1159/000539492. PMID: 39015605; PMCID: PMC11249749.

21. Picco A, Segale L, Miletto I, Pollastro F, Aprile S, Locatelli M, Bari E, Torre ML, Giovannelli L. Spray-Dried Powder Containing Cannabigerol: A New Extemporaneous Emulgel for Topical Administration. Pharmaceutics. 2023 Dec 8;15(12):2747. https://doi.org/10.3390/pharmaceutics15122747. PMID: 38140088; PMCID: PMC10747370.
22. Veale JD, Gorman Á, Veale DJ, Fearon U, Orr C, Marzaioli V. Investigation of serum biomarkers in rheumatoid and psoriatic arthritis patients for disease-specific signatures. Arthritis Res Ther. 2025 Jul 10;27(1):147. https://doi.org/10.1186/s13075-025-03608-6. PMID: 40640860.