

# A Comprehensive Review of Herbal Lotions for Treatment of Dermal Infections Caused by Various Microbial Strains

Gururaj S kulkarni<sup>1\*</sup>, Aditya J<sup>1</sup>, Aparna OM<sup>1</sup>, Arroju Hrithik<sup>1</sup>, Sreelakshmi S<sup>1</sup>, Swetha G<sup>1</sup>, Padma M parak<sup>2</sup>, A Muthukumar<sup>3</sup>

<sup>1</sup>Department of pharmaceutics The Oxford College of Pharmacy, <sup>2</sup>Department of pharmacognosy The Oxford College of Pharmacy, <sup>3</sup>Department of pharmacology The Oxford College of Pharmacy.

<sup>1</sup>adityaj1607@gmail.com

## Abstract:

Several research studies show that herbal medicines have more benefits than synthetic ones. Most infection, especially (skin infections) are affected by bacteria like Staphylococcus aureus, Pseudomonas aeruginosa, Escherichia coli, Klebsiella pneumonia, conform bacteria by incorporating several herbs like Azardirachta indica, Tabebuia impetiginosa, Zizipus Rhamnaceae, Hazy strict, Asp ilia Africana. Which can inhibit the growth of micro-organism with minimum toxic or side effects. This study's main aim is to know the importance of herbs for preventing several skin infections because herbal cosmetics have played an essential role since ancient times.

## Keywords:

Herbal lotion, anti-bacterial, skin infections, Azardirachta indica, Aspilla Africana, s.aureus, E.coli.

## Introduction:

Herbal extracts are commonly used in cosmetic preparations due to their antioxidant, antibacterial, and anti-inflammatory properties. They can be used as topical suspensions, solutions, or emulsions for drugs, emollients, or protective dressings. However, characterization techniques are challenging due to their complex physical structure. Herbal remedies provide nutrients and minerals, and plants have many active ingredients that can calm, heal, and protect the skin.[1]

Herbs involve medications that slow down bacterial growth, but antibiotic resistance continues to pose a global threat. Plant metabolites have gained attention as antibacterial agents to combat multidrug resistance and infectious diseases. Inflammation, a complex biological response, can be treated with nonsteroidal anti-inflammatory drugs, but long-term use can lead to side effects like gastrointestinal erosion, peptic ulcers, nephrotoxicity, leukopenia, and allergic manifestations. Using plant secondary metabolites as resistance-modifying agents can help address these issues. Skin infections can range from mild to severe, with most being treatable. People with weakened immune systems are at higher risk due to health conditions, medication side effects, age, or obesity. Over-the-counter medications and home remedies can treat mild infections, but more require medical attention. Bacterial skin infections occur when bacteria enter the skin from an outside source or through hair follicles or wounds. Common types include Anthrax, Staphylococcus, and Streptococcus. They can be systemic or local, causing symptoms throughout the body or affecting specific areas. Some infections, like impetigo, can spread through direct contact or contaminated surfaces, while others, like cellulitis, are not contagious. Herbal medicines are considered less toxic and have fewer side effects than synthetic drugs, but their ultimate norm is nontoxicity, effectiveness, specificity, stability, and potency.[2] Various type of species, infection, synthetic and herbal treatment were shown in (Table-1)

**Table-1 Infectious agents and Treatment**

<b>Species causing skin infection</b>	<b>Type of skin infection</b>	<b>Synthetic products</b>	<b>Herbs used for infection</b>	<b>Reference</b>
Staphylococcus aureus	Cellulitis,Furuncle	Mupirocin	Azadirachta indica	[1]
Pseudomonas aeruginosa	Bacteremia	Silver sulfadiazine	Tabebuia impetiginosa	[2]
Escherichia coli	Skin and soft tissue infection(SSTI)	Polysporin	Ziziphus Rhamnaceae	[2]
Klebsiella pneumoniae	Necrotizing softtissue infection(NSTIs)	Sodium hypochloride	Rhazya stricta	[3]
Corneform bacteria	Coagulase negative staphylococci(cons)	Nadibact	Aspilia Africana	[3]
Propionibacterium acnes	Acne	Clacoterone	Neem,Turmeric	[4]
Bacillus anthracis	Anthrax	Ciprofloxacin	Allium cepa L,	[5]
Staphylococcus pyogenes	Erysipelas	Penicillin,amoxicillin	Thyme	[6]
S. Clostridium	Necrotizing fascitis	Ceftriaxone	Curcumin	[7]
Beta hemolytic strephylococci	Ecthyma	Mupirocin	Aloe vera	[8]
Group A Streptococcus	Erysipelas Impetigo	Penicillin	Aloe vera	[8]
Bacteroides fragillis	Necrotizing fascitis	Penicillin	Aloe vera	[8]

### **Staphylococcus aureus:**

Staphylococcus aureus is a bacterium commonly found on human skin and mucous membranes. It can be harmless in many cases but can also cause various infections, including skin infections. Staphylococcus aureus can enter the body through cuts, insect bites, or other breaks in the skin. It can also enter through hair follicles and become inflamed and infected.

When the bacteria enter the skin, it may multiply and colonize the area, producing enzymes and toxins that can damage the skin and surrounding tissue. The bacteria trigger an immune response, leading to inflammation at the site of infection. It also often leads to pus-filled pocks or abscesses beneath the skin. It can cause skin lesions.[3] If untreated, it can lead to more severe health issues such as bloodstream infection (sepsis) or the development of deep tissue infection. Good hygiene practices, like regular handwashing, can help reduce the risk of staphylococcal skin infections. Skin infections caused by *Staphylococcus aureus* includes (Abscess, Bacterial skin infection, Cellulitis, Furuncle, as shown in figure1. For bacterial skin infections, you can use lotions made of chemicals, such as Nadifloxacin, a topical fluoroquinolone that works well against aerobic, gram-negative, gram-positive, and anaerobic bacteria with few side effects. [3] Furuncle synthetic lotion, clindamycin 2% gel, twice daily.[4] The herbal extract protects against bacterial skin infection; the goldenseal plant kills bacteria; and furuncle infection is cured by Indian lilac or *Azadirachta indica*, commonly known as neem.

### ***Pseudomonas aeruginosa***

*Pseudomonas aeruginosa* is a bacterium characterized by its gram-negative rod shape, with dimensions ranging from 0.5 to 0.8  $\mu\text{m}$  in width and 1.5 to 3.0  $\mu\text{m}$  in length. The majority of strains exhibit motility via the use of a solitary polar flagellum. This bacterium is classified as a free-living organism often seen in terrestrial and aquatic environments. The microorganism mentioned above is classified as a member of the gamma proteobacteria, displaying gram-negative, aerobic, and rod-shaped characteristics. It is taxonomically classified under the bacterial family Pseudomonadaceae. According to the analysis of conserved macromolecules, namely 16S ribosomal RNA, the family only comprises organisms belonging to *Pseudomonas*, which may be further classified into eight distinct groups. *Pseudomonas aeruginosa* is a representative species within its taxonomic category, with an additional 12 members.[5] The majority of clinical cases involving *Pseudomonas aeruginosa* infection are often linked to the impairment of the host's defensive mechanisms, particularly in individuals who have suffered burn injuries. Numerous instances of *Pseudomonas aeruginosa* infection may be ascribed to a state of overall immunosuppression, such as in individuals with AIDS. In this regard, three human illnesses that are known to be caused by *Pseudomonas aeruginosa* are considered to be particularly instructive. [6]

- 1) Bacteremia in individuals with severe burn injuries.
- 2) The persistent pulmonary infection seen in individuals diagnosed with cystic fibrosis.

Acute ulcerative keratitis has been seen in individuals who use extended-wear soft contact lenses.

Researching and testing bacterial virulence factors in experiments has given us much information about how *Pseudomonas aeruginosa* can make people sick by messing up normal bodily functions. These observations provide valuable insights into the molecular and cellular mechanisms underlying the emergence and significance of *P. aeruginosa* as a prominent human pathogen in the context of infection. Common skin infections such as green nail syndrome, toe web infection, hot tub folliculitis, and external otitis are often seen as shown in figure 2. These infections typically respond well to localized therapies and have a favorable prognosis in those with a healthy immune system.

The samples from *Tabebuia impetiginosa*, which is sometimes called "Tahuari," and *Maytenus macrocarpa*, which is sometimes called "Chuchuhuasi," were very good at killing *Pseudomonas aeruginosa* bacteria. The extracts of *Tabebuia impetiginosa* and *Maytenus macrocarpa* were better at stopping the growth of *P. aeruginosa* strains, which shows that they are more potent at killing bacteria.

### ***Klebsiella pneumoniae***

Bacterial skin infections are commonplace, particularly among people with leg ulcers, surgical and traumatic wounds, and other forms of skin disruption as in the figure 4. Gram-positive bacteria, such as *Staphylococcus aureus* and group A-hemolytic *Streptococcus*, cause most skin infections. Nevertheless, it is worth noting that Gram-negative bacteria such as *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Acinetobacter baumannii* have the potential to induce skin infections as well[7]. There are many reasons why the number of skin infections has gone up:

- The population is getting older.
- There are more people with severe illnesses and weak immune systems.
- Microbes that are resistant to multiple drugs have become common.

The issue of multidrug resistance is a substantial challenge within the healthcare domain, as it pertains to the ability of bacteria to resist medications from two or more distinct categories. In the United Kingdom and Europe, the prevalence of drug-resistant bacteria leads to a mortality rate exceeding 30,000 individuals per year.

Similarly, in the United States, an estimated 23,000 fatalities occur annually as a result of infections that have developed resistance to existing antibiotic treatments. The results of this study show that an extract from *Rhazya stricta* leaves is very good at killing *Klebsiella pneumoniae* isolates and breaking down biofilms. This characteristic makes it a viable option for the treatment or prophylaxis of diseases associated with *K. pneumoniae*. [7]

## Staphylococcus haemolyticus

Staphylococcus haemolyticus, a Coagulase-negative staphylococci (CoNS), is the most common microorganism in the human skin microbiota. Unfortunately, it is also a significant cause of nosocomial infections among medical personnel and in hospitals.[8] Despite this, many microbiology laboratories still need to include a clear species identification for these diseases, leading to underestimating their prevalence. According to scientists, CoNS infections are on the rise. In the USA, CoNS-causing nosocomial bacteremia as in the figure 5, increased from 9 to 27% between 1980 and 1989. Genetically, the different types of Staphylococci are very similar. For example, *S. aureus* and CoNS, which include *S. epidermidis* and *S. haemolyticus*, share an average of 75% of the identical nucleotides. *S. haemolyticus* is one of the most significant components of CoNS species and skin microflora. It is the second-highest species in frequency and significance among isolates from clinical infections, accounting for 10–20% of clinical CoNS infections. This microorganism has been linked to several clinical illnesses, such as bacteremia, meningitis, skin, eye, and urinary tract infections, as well as peritonitis and male genital dysfunction. Furthermore, strains of *S. haemolyticus* have been found in dogs and their owners, indicating the possibility of zoonotic transmission. One of the critical characteristics of *S. haemolyticus* is its ability to create biofilms, which are essential for spreading diseases[9]. CoNS, such as *S. haemolyticus*, begin colonizing the body surfaces early in infancy through the birth canal or interaction with nursery workers. The most frequently occupied species are *S. epidermidis*, *S. warneri*, and *S. haemolyticus*. Therefore, it is essential to take the necessary precautions in hospitals to prevent the spread of these infections.[10]

**Figures:**



Figure 1. : cellulitis



Figure 2: Bacteremia



Figure 3: skin and soft tissue infection



Figure 4: Necrotizing soft tissue infection



Figure 5: Coagulase negative staphylococci(coNS)

## Conclusion:

Cosmetics use herbal extracts owing to their inherent antioxidant, antibacterial, and anti-inflammatory qualities. Topical suspensions, solutions, or emulsions may be used to administer medications, emollients, or protective dressings. Herbal medicines provide a rich source of essential nutrients and minerals, while plants possess bioactive compounds that exhibit soothing, curative, and protective properties for the skin. The use of herbs has the potential to effectively address the issue of antibiotic resistance and provide therapeutic benefits for a spectrum of skin infections, varying in severity. Herbal medications are widely acknowledged for their comparatively lower toxicity and reduced incidence of side effects in comparison to synthetic treatments. However, it is essential to note that the fundamental criteria for herbal medicines are centred around their non-toxic nature, efficacy, specificity, stability, and potency. This discussion focuses on the significance of herbal remedies in addressing various skin illnesses, considering the many adverse effects associated with the use of synthetic medications.

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