

## **The Roles of Cutaneous Microbiota in Skin Physiology and Immunity: A Review**

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### **Structured Abstract**

**Background:** The skin, the body's largest organ, hosts a diverse microbiome consisting of bacteria, fungi, and viruses known as cutaneous microbiome is crucial for maintaining skin health, regulating the immune system, and preventing inappropriate inflammatory reactions. Most of these microorganisms are harmless or beneficial to their host. However, despite the growing recognition of the cutaneous microbiome's significance, there remains a critical gap in our understanding of the precise mechanisms by which alterations in microbial community's influence skin health and immune responses. Therefore, this review aims to explore the composition of the cutaneous microbiota, their interactions with the immune system, the effects of microbial changes on skin disorders, and potential therapeutic strategies for managing the skin microbiota.

**Methods:** This study employed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method, resulting in the inclusion of a total of 109 studies.

**Results:** This review highlights the composition of cutaneous microbiota and its role in maintaining skin health by regulating pH and producing antimicrobial compounds. It examines how skin-resident bacteria interact with the host immune system through pattern recognition receptors (PRRs) like Toll-like receptors (TLRs). Additionally, it links alterations in the cutaneous microbiota to skin disorders such as acne vulgaris, atopic dermatitis, and psoriasis, which significantly impact the immune response. The review also discusses the relationship between microbial diversity and the skin's defense against pathogens via colonization resistance, and explores therapeutic strategies for manipulating the cutaneous microbiota, including bacteriophage therapy and probiotics treatment.

**Conclusion:** In conclusion, the findings of this review reveals that the cutaneous microbiome, comprising diverse bacteria, fungi, and viruses, is crucial for maintaining skin health by regulating pH and producing antimicrobial compounds. Dysbiosis is linked to conditions such as acne and eczema, affecting immune responses and causing inflammation. Understanding these interactions can lead to novel treatments, including probiotics. Further research is essential to elucidate these pathways and develop precise therapies.

**Keywords:** Dysbiosis, cutaneous microbiome, skin disorders, bacteriophage therapy, probiotics.

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