Interactions between human skin microbiota and plant extracts traditionally used in the treatment of skin conditions

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The human skin is a multifunctional organ that serves as a physical, chemical, and immunological barrier while simultaneously hosting a diverse and dynamic microbiota. Increasing evidence indicates that the skin microbiota is an integral component of cutaneous homeostasis, actively contributing to barrier integrity, immune regulation, and protection against pathogenic colonization. Alterations in microbiota composition or function have been associated with numerous inflammatory and infectious skin disorders, underscoring the clinical relevance of host-microbiota interactions in dermatology.

Medicinal plants have been traditionally used in the treatment of skin conditions due to their anti-inflammatory, antimicrobial, and wound-healing properties. However, the mechanisms underlying their therapeutic effects remain not fully understood. While extensive research has demonstrated the role of the gut microbiota in the biotransformation of natural compounds, the capacity of the skin microbiota to metabolize plant-derived substances applied typically has received comparatively little scientific attention.

This dissertation addresses this knowledge gap by examining the interactions between human skin microbiota and plant extracts traditionally used in dermatological conditions. Through a combination of literature analysis, pharmaceutical market evaluation, and experimental studies, the work investigates how selected plant materials interact with the skin microbiota and how these interactions influence chemical components of extracts, microbiota structure, and host responses. Emphasis is placed on microbiota-mediated metabolism of plant-derived compounds, an underexplored but potentially critical factor affecting the safety, stability, and biological behavior of topical herbal preparations.

The presented research demonstrates that skin microbiota-plant extract interactions are compound-dependent and that microbial biotransformation can

selectively affect specific classes of phytochemicals without inducing global microbial dysbiosis. Furthermore, the findings support the concept that traditional medicinal plants may exert their effects not only through direct action on skin cells but also via microbiota-related processes. Collectively, this work establishes an integrated framework for understanding skin microbiota-plant extract interactions and provides a scientific basis for the rational development of microbiota-conscious topical formulations in modern dermatology and pharmacognosy.

Keywords: skin microbiota; medicinal plants; plant extracts; microbiota-plant extract interactions; microbiota-mediated metabolism; microbial biotransformation; dysbiosis; skin health; topical phytotherapy.