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THE SKIN MICROBIOME: A NEW ERA IN DERMATOCOSMETOLOGY

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ABSTRACT

The skin microbiome remains one of the most promising directions in modern dermatocosmetology, both in research and practical application. This article explores the structure and function of the skin microbiome and its role in skin health and cosmetic product development. The impact of probiotic, prebiotic, and postbiotic cosmetics on the microbiome, as well as modern microbiome-based products and their effectiveness, are discussed based on scientific evidence. The article also highlights ways to maintain microbiome balance, its use in cosmetic procedures, and future perspectives.

Keywords: skin microbiome, probiotic cosmetics, prebiotic, postbiotic, dermatocosmetology, microbiome balance, modern cosmetics

INTRODUCTION

The skin microbiome is the collection of microorganisms living on the surface of the skin, including bacteria, fungi, viruses, and other microscopic organisms. This community plays a vital role in skin health, defense mechanisms, and aesthetics. Recent research has demonstrated that the skin microbiome is a complex, multifaceted system.

In dermatocosmetology, the microbiome has emerged as a new paradigm. Unlike traditional cosmetics, which focus on chemical solutions, microbiome-based products emphasize natural, effective approaches. This has sparked a revolution in the cosmetic industry.

The importance of microbiome studies lies in the fact that the skin houses about 10% of the total body microbiota, reaching up to 10^12 microorganisms. These figures highlight the complexity and significance of the microbiome.

THE SKIN MICROBIOME SYSTEM

The skin microbiome consists of bacteria, fungi, viruses, and archaea. Dominant bacterial genera include Staphylococcus, Streptococcus, Corynebacterium, Propionibacterium, and Micrococcus.

Distribution varies by body site: oily areas (face, back, chest) are rich in Propionibacterium acnes; dry areas (hands, feet) host more Staphylococcus epidermidis; moist areas (armpits, between toes) have more Corynebacterium.

Key functions:
- Protection: prevents harmful microbes from colonizing the skin
- Immune regulation: influences inflammation and immune responses
- Barrier support: helps maintain moisture and integrity

Microbiome balance is influenced by age, gender, location, diet, hygiene, stress, and other factors. A healthy microbiome is diverse and well-balanced.

MICROBIOME AND SKIN DISEASES

Microbiome imbalance (dysbiosis) is linked to many skin disorders, including atopic dermatitis, rosacea, acne vulgaris, and seborrheic dermatitis.

- Acne: overgrowth of Propionibacterium acnes triggers inflammation
- Atopic dermatitis: increase in Staphylococcus aureus, reduction in beneficial microbes, leads to barrier disruption
- Rosacea: involvement of Demodex folliculorum and Bacillus oleronius, intensifying redness and swelling

PROBIOTIC COSMETICS

Probiotic cosmetics contain live beneficial bacteria or their metabolites. Moisturizers with probiotic lysates are now commercially available and scientifically validated.

Mechanisms:
- Competition with harmful microbes
- Production of antimicrobial substances like bacteriocins

Common strains: Lactobacillus, Bifidobacterium, Streptococcus thermophilus, Vitreoscilla filiformis
- Lactobacillus: produces lactic acid, balances skin pH
- Bifidobacterium: synthesizes vitamins and amino acids, reduces irritation
- Vitreoscilla filiformis: anti-inflammatory properties

PREBIOTIC COSMETICS

Prebiotic cosmetics support the growth and activity of beneficial bacteria. These substances are not microbes but feed them.

Common ingredients: oligosaccharides, inulin, fructooligosaccharides, alpha-glucan

Studies show improved skin hydration and microbiome diversity after 4 weeks of use. Prebiotics play a key role in restoring balance, especially in dysbiosis.

POSTBIOTIC COSMETICS

Postbiotics are bioactive compounds produced by probiotic bacteria. They offer the benefits of probiotics without containing live microbes, ensuring safety and stability.

Key compounds: peptidoglycans, teichoic acids, short-chain fatty acids, bacterial exopolysaccharides

Effects:
- Strengthen skin barrier
- Reduce inflammation
- Accelerate regeneration

MODERN MICROBIOME RESEARCH

Modern literature focuses on microbiome composition, function, significance, and its role in aging. These studies guide the development of innovative products.

Japanese studies show links between microbiome evolution and signs of aging, paving the way for anti-aging products.

Advanced technologies like genomic sequencing, metabolomics, bioinformatics, and AI help analyze microbiome systems at a deep level.

CLINICAL STUDIES AND EFFICACY

Clinical trials up to 2024 examined how dermatological treatments affect the microbiome.

Findings:
- Improve skin barrier function by 25–30%
- Reduce inflammation by 40–50%
- Increase hydration and elasticity by 20–35%

Probiotic cosmetic effects appear within 2–4 weeks, with microbiome balance improving first, followed by visible skin improvements.

Results vary by age: younger users see faster effects; older users see slower but more stable improvements.

APPLICATION IN COSMETIC PRACTICE

Microbiome cosmetics are available as creams, serums, toners, masks, and cleansers, each with distinct advantages:
- Creams: deep and long-lasting effects
- Serums: fast absorption and concentrated action
- Toners: daily use to maintain balance

Usage guidelines:
- Clean skin before application; avoid harsh cleansers

- Use products regularly
- Ensure compatibility with other skincare products

Product selection depends on skin type:
- Oily skin: probiotics that regulate sebum
- Dry skin: prebiotics for moisture
- Sensitive skin: postbiotics with soothing properties

SAFETY AND QUALITY CONTROL

Safety is critical for microbiome cosmetics. Working with live microbes requires special technology and strict quality control.

Manufacturing must comply with GMP standards: sterility, stability, and safety ensured.

Quality indicators:
- Microbe count and viability
- Lack of contamination
- pH level, osmolarity, product stability

Although allergic reactions are rare, patch testing is recommended, especially for sensitive skin.

CONCLUSION

The skin microbiome is revolutionizing dermatocosmetology. Scientific findings reveal its complexity and value, inspiring a new generation of cosmetic products.

Probiotic, prebiotic, and postbiotic cosmetics have proven effectiveness, offering new solutions for skin health and beauty. Future advances in technology and personalized care will enhance results.

Microbiome cosmetics represent not only skincare products but a science-based dermatocosmetic approach. This marks the beginning of a new era.

Ongoing research, personalization, nanotechnology, and AI will continue to shape the field, offering opportunities for users of all ages.

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