



Editorial

Topical use of probiotics: The natural balance

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Inhabited by over 100 distinct species of microorganisms, and lodging 1-million microorganisms per square centimeter, the skin is the major interface between the body and the surrounding environment, and our largest organ. The diversity is determined by various factors such as age, site, genetic predisposition, lifestyle and host characteristics.¹ Despite all the variations, the skin microbiome is dominated for the most part by just four phyla: Actinobacteria, Proteobacteria, Bacteroidetes and Firmicutes.² In particular, three genera – *Staphylococcus*, *Corynebacterium* and *Propionibacterium* – account for over 60% of the bacterial species present. The skin's resident microbiota acts as a first line of defence by producing anti-microbial peptides or by boosting the immune arsenal of toll-like receptors, Langerhans cells and T cells.³ It is a complex and dynamic ecosystem, where microbial equilibrium can be easily disturbed, resulting in changes in the composition of skin bacteria, or an alteration of the host's immune response, or both; in either case the result is a cascade of clinical manifestations associated with several skin disorders.

Probiotics are single strain or a mixture of microorganisms claimed to having an array of beneficial effects in the human organism such as strengthening the immune system, reducing inflammation and speeding the wound healing process.⁴ This is achieved through a myriad of mechanisms such as the production of inhibitory substances like acids or bacteriocins, excretion of natural antibiotics, blockage of pathogen adhesion, nutrient competition and antioxidant activity. Known mainly for their action upon the intestinal microbiota, probiotics have been widely marketed and consumed, mostly as dietary supplements or functional foods.⁵ They exert their action through epithelial repair, enhancement of the gut barrier and modulation of the immune response. Likewise, the idea of using probiotics to counteract skin dysbiosis, seemed feasible and promising. Clinical studies have already reported that probiotics may exert other health-promoting effects beyond the gut well-being such as improving atopic eczema, atopic dermatitis, healing of burn and scars, rejuvenating the skin and also improving the skin's innate immunity.⁶ In 2010, Arck et al.⁷ proposed the gut–brain–skin axis concept, which suggests that modulation of the microbiome by deployment of probiotics can exert profound beneficial effects, for example, on skin inflammation and

skin homeostasis. Evidence exists confirming an association of certain diseases, with noticeable dysbiosis, where supplementation with probiotics has successfully attenuated the symptoms associated with the disorders. Nonetheless, most of the existing studies in the literature that have focused on skin outcomes had probiotics administered via ingestion. Scientific studies relating to the topical application are scant, but new solutions are rapidly appearing, regardless being greatly limited by regulatory aspects. The first difficulty arises on the classification of probiotic-containing products; with the range of applications from food (nutraceuticals), to pharmaceutical or cosmetics (cosmeceuticals), probiotics fall short of a specific categorization. Plus, the lack of consensus on regulatory aspects in different parts of the world has certainly hindered investment in research by producers that could corroborate the health benefits of the strains and/or products. In order to gain credibility, research dedicated on providing verifiable evidence for probiotic use should be an overriding priority. The benefits of “cosmeceuticals” marketed for skin rejuvenation lack good scientific proof; as well as the “health benefits” conferred by probiotic body lotions and shampoos are obviously also in need of scientific validation⁸ providing that validation of a health benefit conferred by a topically applied product, is a challenge.

In spite of all this, we have recently assisted to an increasing demand for probiotic dermal formulations; for e.g., dairy companies have been defied to develop ointments to provide the skin with “good” bacteria. The idea is to deliver these bacteria in a cream/lotion/serum and then apply it to the face to reestablish the skin's native community.⁹ However, as most scientists agree, there is not enough evidence yet to know, one way or the other, whether such probiotic solutions work.⁸ However, microbiome manipulations may be a way of the future. Not that probiotics might single-handedly be the answer to skin disorders, but they may act as adjuvants in the therapeutic plan. Between changes in lifestyle, diet, hygiene practices, and more, we can dramatically alter our skin microbiota. Most importantly, such probiotic plans, may need to be personalized given the diversity and heterogeneity of the skin's bacterial communities.

In conclusion, the solution to the problem of using probiotics for topical applications lies first in defining a strategy that clearly demonstrates a health benefit. Designing and conducting studies that unequivocally show that health has been improved, is the call. Can we identify specific, valid biomarkers that can then be easily monitored in a large population? Before we address these issues,

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little can be done to extend probiotic use. In addition, more studies showing evidence on the mechanisms through which probiotics can balance the skin microbiota, are also urgent. Only then, we will be ready to approach the treatment of skin diseases in an informed, educated manner, and design new personalized and adequate therapeutic strategies for each condition, according to the manifested clinical symptoms.

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