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# Importance of preserving the resident microflora of the skin to improve immunological response

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As an interface with the outside environment, skin is colonized by a diverse collection of microorganisms—including bacteria, fungi, archaea, and viruses, protecting against invasion by more harmful or pathogenic organisms.

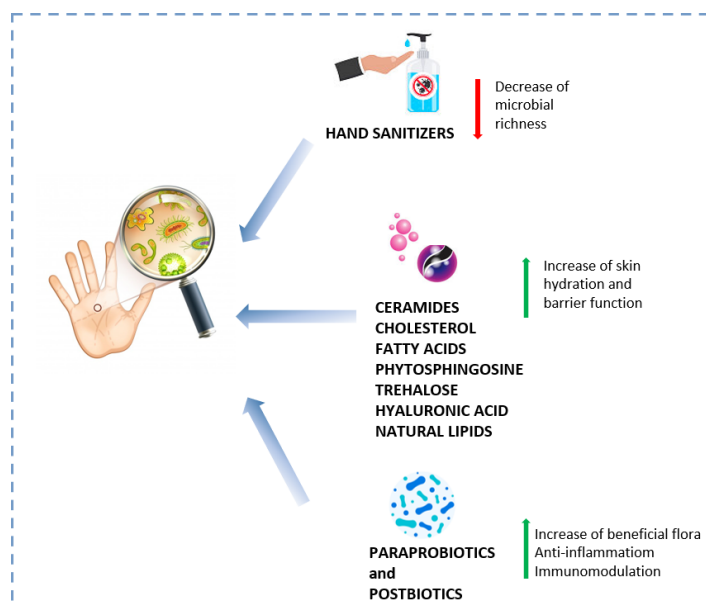
Skin acts also as an immunological barrier<sup>1</sup> by educating the billions of T cells inside the skin. This role is crucial in wounding and infection and for modulating the commensal microbiota that colonizes the skin. Indeed, by means of pattern recognition receptors, such as Toll-like receptors, mannose receptors, and the nucleotide-binding oligomerization domain-like receptor (NOD receptors), keratinocytes continuously sample the microbiota colonizing the skin surface.<sup>2</sup>

In this view, skin microbiota must be considered as one of the main factors influencing the response to infection since it has been recognized as a necessary element of immunity, being able to regulate the immune response of the host and also to maintain homeostasis.<sup>3</sup>

Hands represent a primary vector for infection transmission, including the so actual COVID-19 infection. The continuous presence of the virus forces almost all people to use Personal protective equipment (PPE) and disinfectant gels. They are fundamental, but they determine a series of skin alterations such as the

disruption of the skin microbiome up to irritative dermatitis and alterations of the protective skin barrier.<sup>4,5</sup> Because of the alteration of the skin barrier, there is an increase in the ability of microorganisms to spread through the skin and a decrease of the skin's immune response.

Hand microbiota is, among other body sites, one of the most subjected to a temporal variability<sup>6</sup> because of handwashing routine and hand sanitizer usage. These routines help us to protect against pathogens but what are they doing to hand's resident skin microbiota? Handwashing minimally impacts on microbiota healthiness but the widespread use of disinfectants, especially during COVID-19, has been reported to be detrimental to hand's microbiota homeostasis and antibacterial potential.<sup>4</sup> This is the consequence of the reduction of species richness leading also to the alteration of skin structure (eg, barrier, hydrolipidic film) and functions such as immune response, colonization resistance (due to the presence of triclosan in hand sanitizers) but also the lowering of the production of antimicrobial peptides (dermcidin, LL-37) and exacerbation of inflammatory milieu. Indeed, the high content of alcohol in these products is responsible also for the dryness of the skin as for skin chronic inflammation.



**Figure 1** Schematic representation of the main factors affecting hand's microbiota.



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This evidence poses the need, now, more than ever, for specific topical formulations which can help to prevent and heal damages deriving from repeated hand sanitization procedure (figure 1).

The use of natural antimicrobial peptides and substances able to stimulate the natural defense system of the skin, for example probiotics, could represent a very innovative as well as an effective approach. A new perspective is also that represented by postbiotics, active metabolites from probiotics with high specificity and effectiveness in both microbiota and immune defense modulation.

It is advisable, in our opinion, to adopt habits combining disinfectant gels and frequent washing to 'beneficial' topical formulation. As a result, also the immune response of the skin could be preserved.

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