On human objectivation of the microbiome

THE SKIN MICROBIOTA AND THE COSMETICS

Since the discovery of the intestinal microbiota, the question of the skin microbiota (micro-organisms, bacteria, viruses, fungi, yeasts), is under every lip. 100 trillions of bacteria are living in our bodies and everybody wants to know more about the impact of the cosmetics use on the skin bacteria ecosystem and how these phenomena can be measured? The microbiota is usually subdivided in 2 groups:

- the **transient flora**, saprophytic and pathogens microorganisms with Staphylococcus, aureus, Escherichia coli, Pseudomonas aeruginosa and Bacillus species...
- The **resident flora**, pathogenic and commensal microorganisms with Proteobacteria, epidermids, S. hominis Propionibacterium, Corynebacterium, Dermabacter, Brevibacterium, Micrococcus, P. aeruginosa, Pityrosporum, Malassezia, Demodex...

This bacteria ecosystem synthesizes a myriad of elements which have an important metabolic activity for our skin health. It could be necessary to protect, to rebalance and activate it on the cosmetics side. Simply said the aim for personal care could be to reduce the “bad” bacteria and protect the “good” ones! But the notion of “bad” or “good” is relative depending of the physiological state of the skin. Now things are not so simple!

The balance of cutaneous microbiota (500 bacteria species) is dependent of the several conditions of its ecosystem: temperature, pH, hormones, light, UV, lipids, proteins, water... It is mainly influenced by the genetic, the life style and the diet. Each person has its own skin flora composition, distributed from the epidermis until the dermis, which is lifelong qualitatively stable, like a **personal microbial footprint**. This skin microbiota is fundamental for the skin homeostasis and participates to the immune and barrier functions. Various bacteria disorders might be considered as a source of cutaneous dysfunctions like acne, eczema or atopic dermatitis modifying this precious balance.

The cosmetics search for 3 main benefits:
- the rebalancing,
- the probiotic-like,
- the anti-microbial effects.

Is the microbiota the era of a new revolution for the cosmetics?

Currently, the approach of supporting this activity of cosmetics is still in its early stages. Many testing laboratories are studying these new claims looking in the direction of the metagenomic field. The study of the cutaneous flora is complex and it is not always easy to understand its functionalities and interactions with the skin metabolism. The first way is to analyse the genome of the bacteria of the skin flora. It is a living layer of the skin to be discovered like a new continent of the body.

What methods exist today to evaluate the cutaneous microbiota thanks to human testing?

As the important intra-individual diversity of the cutaneous flora is also associated with a high level of inter-individual variability, the protocols will compare the skin swabbing of the treated zone and of the non-treated or placebo zone, before and after treatment. It is possible to evaluate the changes balance. To go deeply in this objectivation, it is also possible to study the microbiota and the skin simultaneously and investigate what are the functions and the metabolic pathways impacted.

Two main diagnosis opportunities:
1. **Counts method at cell level** by Zurko Research, Bio-ec
2. **Quantitative methods at molecular level**

The assays enable the taxonomic analysis of the bacteria, identifying what are the bacteria that can be found. Then the genome of the bacteria to better know their action. Now a major part of the skin bacteria is known.

- PCRs by Phylogene
- rRNA, by Dermscan, Dermatec, Intertek, Bio-ec...
- S16 rDNA + ITS sequencing: microbiote + fungi, bacterial diversity index by Dermatec, Phylogene, Intertek, Inra geT-IT.
- Mass Spectrometry: Cosmepar, Spincontrol...
- High-resolution Nano LC-MS/MS by Phylogene, Dermatec, Intertek.

- Multi-omics approach (mechanisms assessment) by Phylogene, Oxiroteomics.

The microbiota will play a key role in the cosmetics of tomorrow. We move towards personalized and preventive cosmetics. Claim substantiation will evolve with the regulation and the products development. We must keep in mind the diversity and the balance of the skin flora in the future developments of actives and personal cares. Maybe one day we should measure their impact on the microbiota before launching the products on the market.

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