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5/2021

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## BODY CARE

Possibilities of neurocosmetics

p 36

## PACKAGING

Sustainability potential of aluminium

p 52

## "UPCYCLING CARBON FOR PERFUMES"

Thierry Moliere, SVP R&D, Coty

p 58

# FIGHTING MASKNE

**Analyses** | Acne caused by wearing masks, so-called “maskne”, is the new challenge that the cosmetics industry has to face. Michel Salmon explains what role a 3D model of the skin can play when it comes to finding the right active ingredient and the right dose for the next skin care product.

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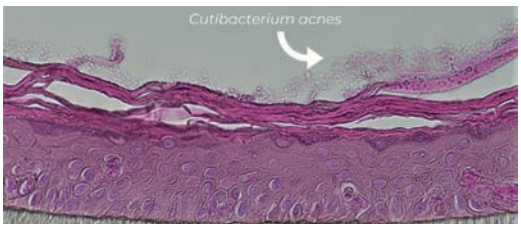


figure 1: Hemalun/Eosin histological staining of reconstructed human epidermis colonised with Cutibacterium acnes.

figures: Strat-

While it protects us against the spread of viruses, the face mask we wear every day affects our skin. In this occlusive environment, the high humidity and continuous friction increase the level of sebum production which favour the apparition of acne spots. This new skin phenomenon is known as "maskne", a combination of mask and acne.

It has recently become the battle horse of cosmetics who are trying to provide effective and innovative anti-acne solutions. The first question to be asked is who is the target? Cutibacterium acnes (C.acnes). This anaerobic bacterium of the cutaneous flora feeds on sebum excess, which releases short-chain fatty acids responsible for local inflammation – and for inflammatory acne pimples appear on the skin. Today, it is also known that the IA1 phylotype of C. acnes must be targeted in anti-acne treatments, since it is largely dominant in acne flora[1,2].

As for other skin bacteria, its **study in microbiological culture provides initial information on the effectiveness of ingredients** in modifying its growth. However, a cutaneous model is required to study the bacteria on their natural environment.

This is why StratiCell have set up a microbiological platform[3] where the company colonises its 3D reconstructed epidermis with various natural strains such as Staphylococcus epidermidis, S. aureus and C. acnes.

### Reliable 3D skin model

Three-dimensional skin models are reliable systems to study interactions between components of the commensal flora and dermo-cosmetic ingredients within the real complexity of skin tissue responses. **The development of a 3D skin model colonised with living bacteria relies on the capacity to adapt culture conditions for both skin and bacteria.** Maintaining the growth of C. acnes in the presence of sebum

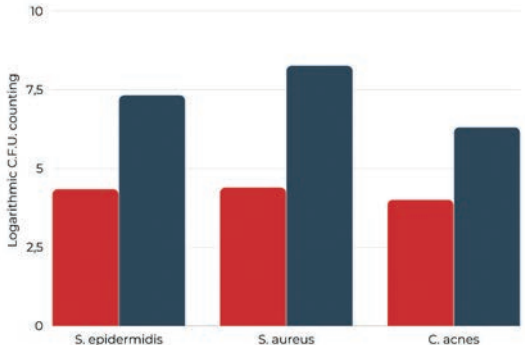


figure 2: Bacterial colony forming unit (C.F.U.) counting after 0h (red) and 24h (blue) growth of Staphylococcus epidermidis, S. aureus or Cutibacterium acnes on top of reconstructed human epidermis

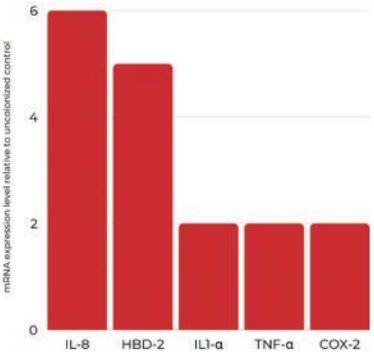


figure 3: Effect of Cutibacterium acnes on the expression of inflammatory genes of colonised reconstructed human epidermis

was a challenging issue that was overcome with an optimised feeder lipid mixture. The living IA1 strains applied on top of reconstructed epidermis can be visualised by histology (figure 1), and variations in bacterial adhesion and/or growth under the influence of specific dermo-cosmetic actives can be monitored by counting bacterial colonies using classical microbiology techniques (figure 2).

## Reducing inflammatory acne

The team of microbiologists goes even further and uses this model to also analyse the response of the epidermis in this infectious context. It has long been described that C. acnes interacts with the keratinocytes to activate innate immunity, with an impact on the local inflammation[4]. Through activation of Toll-like receptors, C. acnes up-regulates pro-inflammatory mediators such as interleukins IL-6, IL-8, Cox-2 or TNF-alpha, as well as the defensin HBD-2. The ability of an ingredient to reduce this inflammatory status can therefore be objectively assessed by monitoring the expression of these key biomarkers, at the gene and the protein levels (figure 3).

## Conclusions

Skin models infected with commensal strains are becoming essential tools for highlighting the positive, negative, or neutral effects of dermo-cosmetic ingredients on the skin flora. Within the microbiological platform a double approach to study the cutaneous flora possible, namely the monitoring of the bacterial behaviour on the one hand and of the tissue response to the bacterial infection on the other hand. Given the importance of C. acnes in the inflammatory acne, such in vitro efficacy data will clearly support the objectivation of innovative compounds to restore acne and so-called maskne disorders. □

References
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figures: StratiCell