

## MICROBIOTA-FRIENDS AND PRESERVATIVE SYSTEM: IS IT A LOVE STORY?

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### LET ME INTRODUCE YOU...

#### MICROBIOTA AND ITS FRIENDS

I bet many of you nowadays have found the word “Microbiota” and its definition pretty much everywhere in personal care magazines, articles or any cosmetic-related discussion. In case you did miss it, Microbiota refers to the assemblage of microorganisms present in a defined environment, such as the human body or individual body-sites. Trust me, they are a lot! In the Personal Care field, the main interest is of course on Skin Microbiota, which means all those microorganisms living on our skin. They are an army of 100 quadrillion cells, which keep us safe and have a key role in skin’s health and appearance. So, what do we mean when we talk about Microbiota-friendly ingredients? A lot of different substances, honestly. We can divide them in four main categories, that are sometimes wrongly swapped with each other: prebiotics, probiotics, postbiotics and biome-friendly. Prebiotics are food for the microorganisms, in fact they induce microbial growth; probiotics, instead, are the actual microorganisms, believed to provide health benefits. These however, so far, cannot be introduced in a cosmetic formula if they are still alive: we

can use as ingredients their “dead / inactivated” version instead, meaning lysate or tyndallized. The lysate is a mixture of microorganism components obtained with a method called “Lysis”, which consists in breaking down the cell walls. Tyndallized bacteria, on the other hand, are strains that have been subjected to heat treatment, therefore are inactivated; this means they are unable to metabolize and reproduce. Going back to our four ingredient categories, postbiotics are bacteria-derived metabolites, while biome-friendly are those that do not harm the beneficial bacteria of the skin and/or mimic the natural healthy barrier. Another important difference in terms of wording is the Microbiota/ Microbiome couple. While we defined the first at the beginning of this article, we have not mentioned the second one yet. It is nonetheless the total microbial community, including biomolecules, within a defined environment such as the human body. Now that I have acted as a vocabulary for the past 5 minutes... let us dive into the heart of the argument.

#### YES, WE NEED TO PROTECT COSMETIC FORMULAS

Jumping right into the Personal Care field, we know that a preservative system is absolutely required to

perform a stable and safe formula. Despite all the negative words you might have heard in the past few years about preservatives, we cannot untie the connection between product safety and accurate formula protection. In fact, a wrong preservation can lead to recalls of cosmetics due to microbial contamination (a number that doubled in the last five years), that can consequently cause skin and eyes recoverable diseases. It is the reason why it is important to remind that cosmetic formulations need to be protected from spoilage, both on shelf and when used by end users. At the same time, we cannot forget safety for the skin either, so this is another key concept in order to achieve a successful formula. Since preservatives as defined have a biocidal activity, we have to make sure that our skin inhabitants are safe as well. Of course, this is a delicate topic and it is definitely not easy to study the possible interaction between our skin microbiota and preservative systems, but let us take challenges one step at a time.

#### MARKET TRENDS

This whole Skin Microbiota concept is in line with the market trends: in the last three years, considering the European Union, the launch of new products with microbiome/microbiota claim on their label has increased exponentially, in the cosmetics industry.

[Watch the Video](#)



## MICROBIOTA-FRIENDLY INGREDIENTS



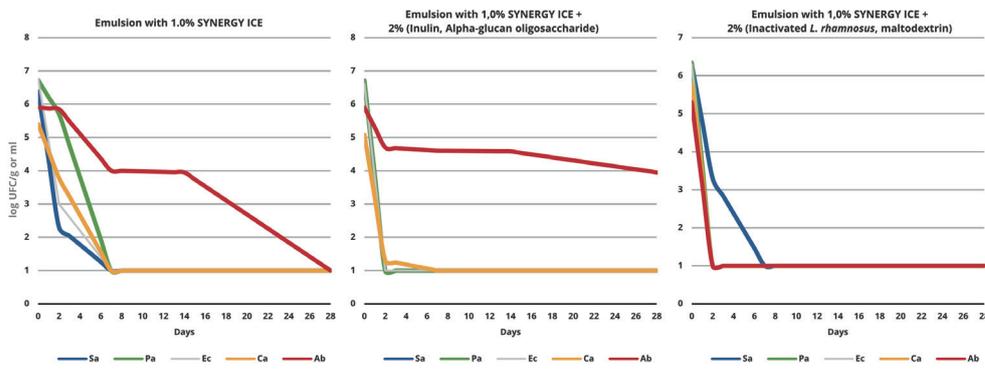


Figure 1. Challenge tests of the three compared formulas.

- *Staphylococcus Aureus* (Sa) in blue color
- *Pseudomonas Aeruginosa* (Pa) in green color
- *Escherichia Coli* (Ec) in grey color
- *Candida Albicans* (Ca) in yellow color
- *Aspergillus Brasiliensis* (Ab) in red color

As reported in Figure 1, the cream containing the prebiotic seemed to almost enhance the antimicrobial activity towards bacteria and the yeast, compared to the cream itself; speaking about the mould (*Aspergillus Brasiliensis*), it would seem that there is a slightly lower decrease of the count, but still respecting the criteria. On the other hand, when tyndallized microorganisms are added to the formula, the antimicrobial activity towards all strains seems to be even boosted, if compared to the cream itself.

This is of course a preliminary study, but let us collect what we can: the ingredients we introduced in the formulas did not affect considerably the preservation system, which is in contrast with the reasonable expectation that these Microbiota-friends would affect the preservatives efficacy. We could suppose that the vice versa is true as well, meaning that also preservatives do not affect that much the skin microbiota *eubiosis*, but at the same time we can't be sure about it. That is the reason why this topic needs to be deepened, for example with *in-vivo* treatments and metagenomic analysis, which are the next steps in our project.

We hope our first walk in this research field will lead to more studies and investigations, since there are many questions to be answered and legitimate doubts. In fact, the possible impact of preservatives on skin microbiota and on microbiota-friendly ingredients are still open topics. So far, we can state that Skin Microbiota-friends and our preservative system do not hate each other, we do not know if a love story will eventually bloom, but stay tuned to find it out!

Will all of us get to know the truth in the next 5 minutes? No! Should we stop investigating just because there are so many variables? Absolutely not! Research has given us amazing results during the years and a scientific approach is the best way to discover new worlds! ■

This "new" discovery – not so new actually, our micro-friends are with us since forever, or better, they were on this planet long time before us – has enlarged the frontiers of cosmetics development. However, it has to face regulatory updates (it is not easy to regulate what is brand new on the market, considering that it is so different from common ingredients) and formulators are being challenged for finding new solutions.

Following this trend, there has been an increasing interest for ingredients and formulations meant to protect, optimize and/or restore skin microbial balance. This can be achieved by including in the finished products ingredients like "Microbiota-friends" compounds, thus having formulations meant to maintain or strengthen but never damage our skin flora. This leads directly to another big question mark that needs to be evaluated: may Microbiota-friendly ingredients interfere with preservatives efficacy? Because the former are supposed to benefit and support microbial growth while the latter is included in the formula in order to avoid it, could these two ingredients categories contrast each other?

### OUR EXPERIMENTAL APPROACH

Although these questions are really delicate and difficult to answer to, I would like to present a preliminary study to approach this topic by trying to give a reasonable answer through experimental data. We compared three different formulations:

1. A base cream (INCI: *Aqua, Stearic Acid, Cetearyl Alcohol, Isononyl isononate, Sodium hydroxide, Disodium EDTA*) preserved with one of our preservative systems

(BiosControl® Synergy ICE, INCI: *Caprylyl Glycol, Ethylhexylglycerin, o-Cymen-5-ol*);

2. The same base cream with the same preservation system plus a prebiotic (2%);
3. Thirdly, again the same formula plus tyndallized microorganisms (2% as well).

The prebiotic we used is a mixture of Inulin and Alpha-glucan oligosaccharide, acting as a supplement for commensal bacteria (main components of microbiota), while not being digestible by transient pathogenic organisms (capable of invading and causing harm). As tyndallized we chose the *Lactobacillus rhamnosus*, that has been inactivated through a heat treatment prolonged for days. In order to facilitate its formulation into the base cream, it has been diluted in maltodextrin. The reason why for adding these ingredients is that they should support and strengthen the skin barrier along with balancing the skin microbiota composition and make it stronger against external factors and possible aggression by pathogens.

As a step forward, we performed a challenge test, to evaluate the antimicrobial activity of a preservation system in a finished product. We used as microorganisms five common strains that are typically used in the Personal Care field and cover a wide variety of microflora: gram- positive and gram-negative bacteria, yeasts and moulds.

In Figure 1, the variation of the microbial count (log UFC/g or ml) for each formulation, during 28 days, is reported. The analysis has been performed on: