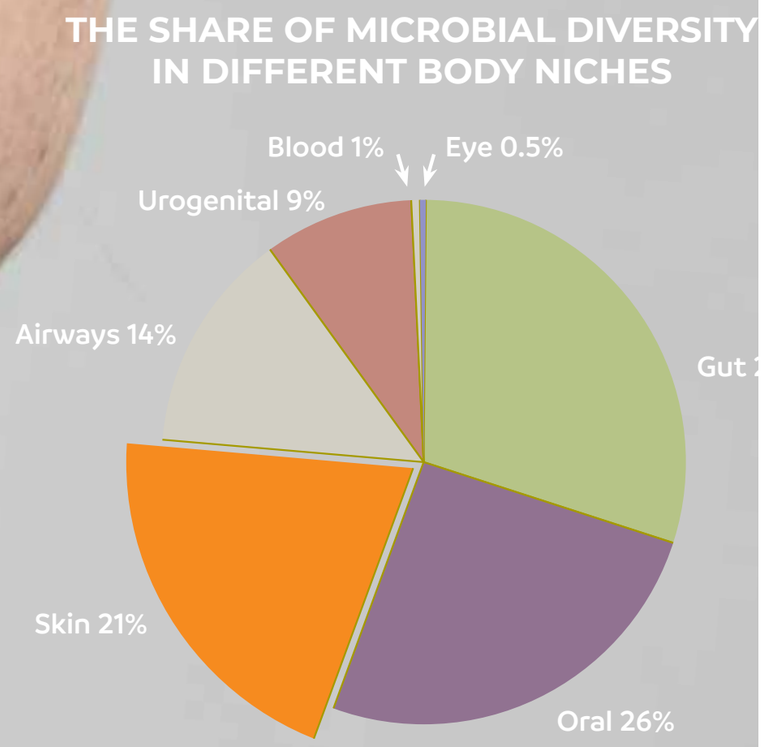
THE MICROBIOME

INTRODUCTION



The Human Microbiome Project (HMP) was a United States National Institutes of Health research initiative that ran from 2007 to 2016.

This project was specifically focused on understanding the microbial flora involved in human health and disease. The first phase was mainly concerned with identifying and characterising human microbial flora whereas the second phase looked at the specific roles of microbes in health and diseased states.

Since the completion of the HMP, it has become clear that each of us is a complex mix of microbes and human cells. There are more microbes in your body than human cells... at least ten times more if you include viruses... and this has fundamentally changed our understanding of what it means to be human.

You are not just you... you are an ecology of thousands of interdependent species and you would not last long without your microbial friends.

What is a microbiome?

It is the sum of all microbes living in and on the body. These microbes mainly consist of bacteria, viruses, fungi (usually yeasts) and archaea.

It is important to note that the microbiome does not only originate from the gut. Different body niches have different microbiomes and can be found as part of the urogenital system, the respiratory system, the digestive system, the eyes, the mouth and the integumentary system.

The microbiome plays an active role in protection, digestion, production of vitamins, regulation of the immune function, metabolism of toxins and it can also guide epigenetics. In short, the microbiome does more to keep an individual healthy than their human cells do.

WHAT IS THE PERFECT SKIN MICROBIOME?

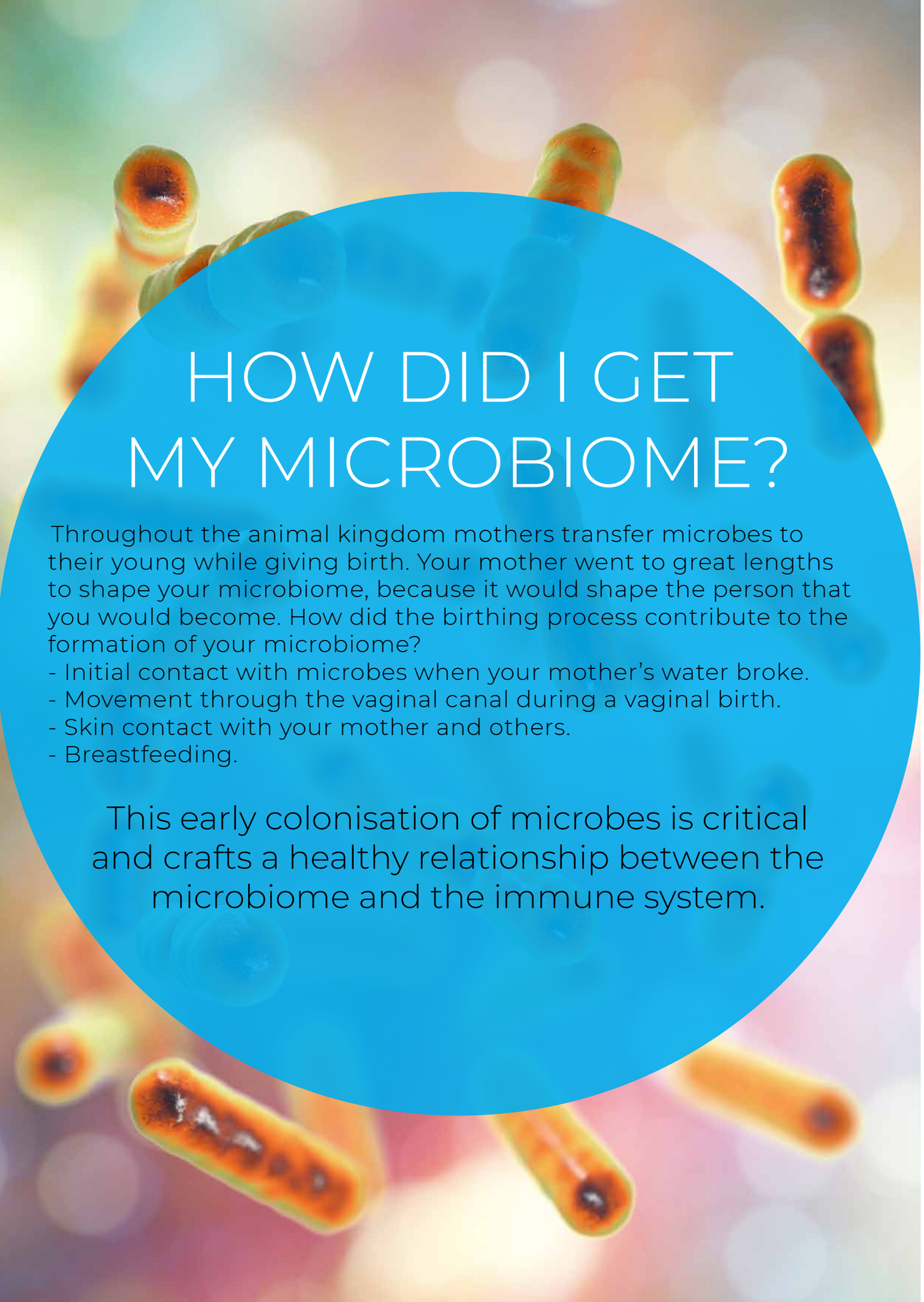
The skin is now viewed as an ecosystem … so how would you answer the question: What is the perfect ecosystem?
Is it a rainforest? Which type of rainforest? Or is it a coral reef or a savannah? Think of these ecosystems as the earth's skin microbiome.

One way to measure the health of an ecosystem is diversity. Diversity is a measure of how many species there are.

Our modern lifestyle has resulted in the loss of a large part of the microbial diversity on our skin. Hunter-gatherers have a lot more diversity in both their gut and skin microbiomes than we do. On the other hand, the skin works hard to exclude most incoming microbes by maintaining a low pH (4,5), secreting anti-microbial compounds (like sapienic acid), and keeping the salt levels high (through sweating). We do not want the skin to be too permissive and allow any microbe to set up shop.

So we need diversity, but only within the group of microbes that are supposed to live on the skin.

The Esse response to this new knowledge is to build diversity amongst a very select group of co-evolved skin microbes. Esse mimics the conditions for which our skins have evolved and in this way favours a diverse, healthy skin microbiome.



HOW DID I GET MY MICROBIOME?

Throughout the animal kingdom mothers transfer microbes to their young while giving birth. Your mother went to great lengths to shape your microbiome, because it would shape the person that you would become. How did the birthing process contribute to the formation of your microbiome?

- Initial contact with microbes when your mother's water broke.
- Movement through the vaginal canal during a vaginal birth.
- Skin contact with your mother and others.
- Breastfeeding.

This early colonisation of microbes is critical and crafts a healthy relationship between the microbiome and the immune system.

What affects my skin microbiome?

Many factors affect which microbes thrive on your skin.

- Antibiotics
- Preservatives
- How you were delivered (C-section or naturally)
- Daily bathing in treated water
- The temperature, humidity and light that you are exposed to

For the last 2 million years we have been in constant contact with the natural world. Every day there has been a flow of microbes onto our skin from the microbiomes of the soil and plants around us. In the last hundred years, things have changed.
The best way to improve your skin microbiome is to get out into nature and interact … or at least to garden a bit.

How does my skin microbiome change over time?

On the whole, we maintain our particular strains, rather than acquiring new ones from our surroundings. As our skin sloughs off at the stratum corneum, we will be continuously seeding our preferred microbial partners from below.
So, to some extent, you're stuck with the skin you're in.

If my skin microbiome is mostly stable, then how do I change it?

If you want to add a microbe to your skin microbiome, your skin's immune system will need to become habituated to it over time so that it doesn't perceive it as a threat. This means that you will need to come into regular contact with the microbe and it will have to find the food and other conditions that it needs on the surface of your skin.
By avoiding substances that can wreak havoc on microbes, you will be well on your way to shifting your microbiome in the right direction.
So yes, you can change your skin microbiome, but it means changing your skincare habits for a long time.

Overuse of antibiotics

Chemicals in cosmetic products

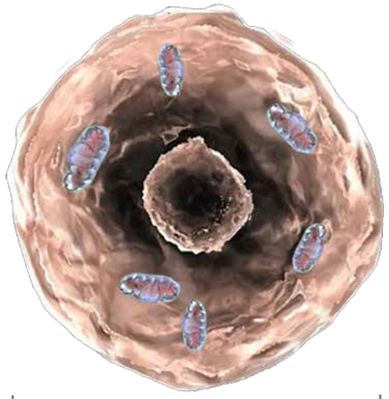
Daily bathing in treated water

High Caesarean-section rate

Lack of contact with nature

WHY IS ALL THIS MICROBIOME STUFF HAPPENING NOW?

RELATIVE SIZE:



60 Microns

HUMAN SKIN CELL

6-8 Microns

HUMAN RED BLOOD CELLS

0,2-10 Microns

BACTERIUM

0,02-0,03 Microns

VIRUS

We have been observing microbes through microscopes since 1676. Why did it take more than 300 years to realise that we have more microbes than human cells? How did science miss something this big?

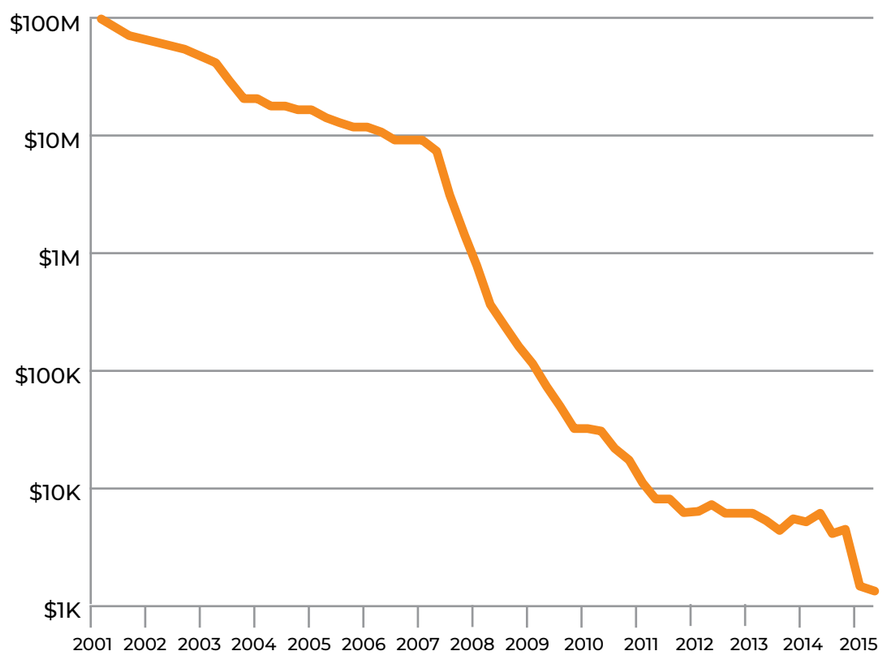
Microbes are about ten times smaller than human epithelial cells and they are everywhere, so, unless you know what you are looking for it is difficult to see the big picture through a microscope. The polymerase chain reaction, discovered by Kerry Mullis in 1983, allows us to identify microbes by deciphering their DNA. These advances in science now allow us to “see” DNA and we can now study ecosystems that were previously too small to study.
So, it was only when scientists could see through the lens of next-generation DNA sequencing that it became possible to take a proper rollcall of who was there.

WHY WOULD I SEQUENCE MY SKIN MICROBIOME?

Gene sequencing uses a chemical reaction to “magnify” the genes in a sample. It is called the Polymerase Chain Reaction … PCR.

Over the last few years, the cost of sequencing DNA has fallen enough to make this service available outside of high-end research settings. These advances are not likely to slow down, and we can look forward to a future where everyone’s sequenced microbiome can be used to determine a customised probiotic regime to achieve maximum anti-ageing results.

By sequencing your skin microbiome, you can determine your ecology. Once you have a clear idea of what is going on in your skin, you will be able to shift your microbiome in the right direction by promoting the growth of symbiotic bacteria and inhibiting the growth of pathogenic bacteria. Only then will targeted therapies with the correct products and treatment protocols be able to optimise the health of your skin.



Source: National Human Genome Research Institute

IS SUNLIGHT GOOD OR BAD FOR MY MICROBIOME?

We were told that sun exposure is bad, it is pro-ageing, it causes cancer, and so zero sun must be good? Humans evolved with the sun and we need the sun to stay healthy.
For our bodies to synthesise vitamin D, we need to expose our unprotected skin to UV rays daily. Vitamin D deficiency has been linked with depression, hypertension and cancer.
But what about my microbes? Sunlight will favour co-evolved microbes over pathogens, so when you have a healthy microbiome, it will probably be good.

What is the difference between a probiotic and a prebiotic?

Probiotics are live microbes with a beneficial effect. They can grow and form colonies and are measured in colony-forming units (CFU/ml).

A prebiotic is a nutrient source that favours co-evolved microbes. Esse makes use of a proprietary prebiotic mix made up of inulin, alpha-glucan oligosaccharides and yacon root extract.

Even though we make use of sugar-based prebiotics, it is important to note that the primary source of nutrients on the skin isn't sugar-based but lipid-based. These lipids include fatty acids that heavily favour co-evolved microbes. Human sebum is unique and strange in comparison to other mammals. Sapienic acid makes up the bulk of this fatty acid mix. It is toxic to Staphylococcus aureus but can be used as a nutrient by the skin microbiome. Sapienic acid comes at a high genetic and metabolic cost and is difficult to make.

We need to consider this before we just wash sebum down the drain. This forces body to produce more "lower quality" sebum which is not as specifically tailored for your co-evolved skin microbes.

WHERE DO THE PROBIOTICS COME FROM?

The Lactobacillus bacteria that we use originally came from healthy human donors. They are now cultured on a plant-based nutrient medium before they are centrifuged, encapsulated and freeze-dried.

Is Lactobacillus normally a part of the skin microbiome?

Lactobacilli naturally make up a small part of the skin microbiome. Less than 1%.
This does not mean that they do not have an effect.
Take humans for example. We make up less than 0,01% of the biomass of the planet and we have certainly made an impact on it.
Lactobacillus produces many substances that influence the behaviour of other microbial species. It also changes the environment by producing lactic acid and this influences which other microbes can thrive.
So, yes. Lactobacillus is a normal resident on the skin and even though it does not make up a large percentage of the biomass, it still affects the skin microbiome.

How do Lactobacilli help my skin?

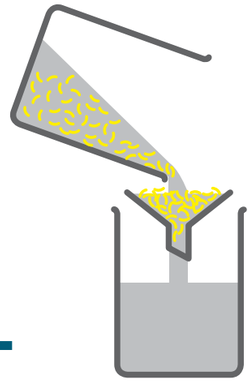
> They protect you from pathogens (like armour for your face)
> They improve barrier function
> They maintain calm and reduce sensitivity
> They manufacture moisturising factors
> They maintain skin pH

How important is the strain of probiotic?

We have a lot to learn about the role of different microbial strains in the skin ecology but the strain definitely makes a big difference.
This can now be seen in the distribution of species across different body sites. As an example, some strains of S. epidermidis occur only on the foot and as a rule, different strains of S. epidermidis colonise different body sites on an individual. This is not necessarily true for P. acnes where the same strain seems to appear in multiple body sites on the same person.
This has consequences when we start adding probiotics to achieve a desired result. The strain is very important and needs to be tailored for the body site.

HOW DO YOU MAKE THE PROBIOTICS?

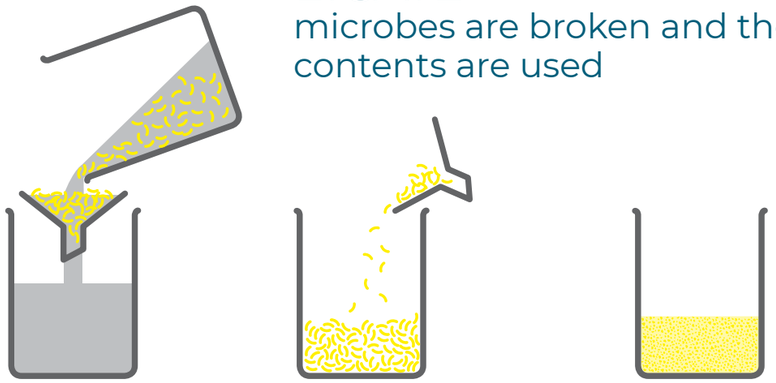
1



BROTH
microbes are removed and the ferment is used

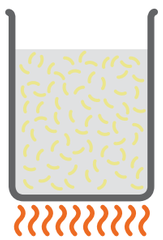
Probiotic microbes are inoculated into a liquid nutrient broth; allowed to multiply and then the broth is filtered off and used in the final product.

2



LYSATE
microbes are broken and their contents are used

3



TYNDALLISATION
microbes are killed by heat, but are kept whole

Instead of lysing the probiotic cells, they are deactivated using heat and then added to the product.

4

LIVE PROBIOTIC
microbes are live and able to colonise

A true probiotic product is alive and can grow to form colonies. The product will have millions of colony forming units per millilitre (CFU per ml)

> Level 1 (Broth)
No actual microbes - just the broth they leave behind

> Level 2 (Lysates)
The ‘juice’ from inside probiotic microbes

> Level 3 (Tyndallisation)
Whole, dead probiotic microbes

These three levels of probiotic supplementation are relatively easy to use in cosmetics. The ingredient is simply added to the formulation at the end of the manufacturing process with no real change in the preservative system or the rest of the product.

> Level 4 – This is the real thing ... live microbes that can grow and form colonies.

What happens to my skin microbiome when I use the Probiotic Serum?

By using the Probiotic Serum, you add 1 billion live CFU/ml to your skin, providing a solid covering of beneficial microbes to protect you from incoming pathogenic microbes. Through “competitive exclusion”, these microbes occupy all the space and use up all the nutrients, making it difficult for a pathogenic microbe to survive.

THE FACTS

How do you keep the probiotics alive in the Probiotic Serum?

First, we encapsulate the Lactobacillus in a water-soluble prebiotic so that we have tiny spheres that contain the live bacteria. The Probiotic Serum is oil-based and into this oil, we distribute the capsules of live Lactobacillus. This protects them from the outside world until they come into contact with water on the surface of your skin. This water will dissolve the capsule and release the living Lactobacillus. The capsule will also provide food for the bacteria to start growing.

Will the probiotics in the Probiotic Serum grow on my skin? Can I just use it once?

Even after 24 hours of applying the Probiotic Serum, Lactobacillus is still one of the dominating microbial species in comparison to the species present before application. However, it is noteworthy to mention that the population declines with time when you compare a sample taken after 8 hours of application and then again after 24 hours of application.

So will the Probiotic Serum grow on your skin? Yes. The 1 billion CFU/ml will colonise your skin and protect, balance and moisturise it.

But is this enough to change my microbiome if I use it just once?

No. Compare it to something like cardiovascular exercise. Will you get fit? Yes. Will you get fit if you only do it once? No. You might get your heart rate up, but not enough to maintain your fitness level over a longer period.

Which ingredients should I then avoid if I want to show my skin microbes some love?
Avoid products that will drastically alter the pH of your skin since having an environment too alkaline or too acidic will create a less-desirable environment for microbes.
Avoid anti-microbials (preservatives and other) since they kill not only the bad guys but the good guys as well.

Be wary of harsh surfactants and emulsifiers as these can often remove natural skin oils that are the primary food for your skin microbiome, disturbing the natural balance.

Avoid synthetic ingredients that can be damaging to the skin microbiome. Synthetics tend to pollute the ecosystem and compromise the microbiome. These ingredients include fragrances, colourants and preservatives that often leave a chemical residue on the skin, causing skin sensitivity, impaired skin barrier function and an overactive immune system, which can have knock-on effects on the microbiome.

YOUR SKIN IS AN ECOSYSTEM

You wear the microbes on your skin like living armour. Your microbiome protects you from pathogens and is essential for healthy-looking skin.

Over the last 100 years, industrial beauty has disrupted and polluted this complex ecosystem and balance was replaced with chemical dependence. We lost a microbiome perfected by thousands of years of evolution and we have paid the price with massive increases in sensitive skin and acne.

Esse researches rewilding techniques to restore your skin's microbiome with probiotics and green chemistry.