

PROTECTING THE SKIN



New active ingredients in cosmetics protect the skin from increasing environmental pollution. They boost the body's own detoxification processes and bring the skin flora into balance

TEXT **BERND KALTWASSER**

Human skin is really a high-performance organ. It keeps our bodies from drying out and losing essential minerals. Despite the skin's minuscule thickness of only a few millimeters, if it is healthy it also reliably prevents dirt and microbes from penetrating the body. In the summer, the skin is often exposed to intense UV radiation, in addition to the environmental impacts to which it is subjected all year round. It is also subject to stressors such as particulates, diesel soot, and the acid rain that still falls in some regions of the world.

These external pressures are still growing. That's why it's becoming increasingly important to preserve the skin's ability to

function by giving it targeted and effective care. "In recent years the cosmetics sector has expanded its focus and worked harder to develop new active ingredients," says Professor Jean Krutmann from the Leibniz Research Institute for Environmental Medicine in Düsseldorf. "The goal is to protect the skin and help it if it has been thrown out of balance by environmental impacts."

NEW APPROACHES TO PROTECTING SKIN CELLS

Krutmann is one of Germany's leading experts when it comes to deciphering the complex interactions between biological processes in the skin and external stress factors. He was one of the first re-

searchers to successfully demonstrate, through epidemiological and mechanistic studies, that there is a causal link between fine particulate pollution and skin aging. In order to understand these connections even better, Krutmann, a licensed physician, has been supervising large-scale national and international cohort studies since 2012. Some of these studies are working with volunteers from the Ruhr region of Germany, the heavily polluted Taizhou region of China, and New Delhi, India, the city with the dirtiest air in the world.

"By now we've been able to demonstrate that between 70 and 80 percent of all skin changes are due to external influences. Only between 20 and 30 percent are caused by inevitable genetically caused aging processes. The most important environmental factor driving the skin aging process is air pollution, next to natural ultraviolet radiation," Krutmann recently reported at the Evonik Meets Science conference. At this regularly held science forum, experts from Evonik discuss ideas with renowned German researchers concerning a variety of innovation-related themes. More than 250 participants gathered in Berlin for the most recent meeting, which was held in September.

In past years, Evonik has discovered a range of new approaches to protecting skin cells against premature skin aging due to environmental stress. "We offer a wide range of cosmetic active ingredients with scientifically proven effectiveness," says Peter Lersch, Head of Global Innovation Management Personal Care at Evonik's Nutrition & Care segment.

One important starting point is the external layer of the skin. Its structure, which is similar to that of a brick wall, consists of dead horn cells that use lipid bilayers with a complex structure as a binder to form a highly effective barrier. If this structure is destroyed, the skin dries out and becomes rougher and more cracked, thus becoming more vulnerable to penetration by harmful substances. "Skin-identical, synergistic sphingolipid mixtures can balance out defects in the membranes, strengthen the skin's defenses, improve its moisture levels, and thus bring the skin barrier back into balance quickly and lastingly," says Lersch. His business line already developed such products a few years ago.

Even if the skin is already irritated, cosmetic ingredients can help to provide effective relief. "We know that aryl hydrocarbon receptors inside the skin cells react to diesel soot," explains Krutmann. These AH receptors are basically present in an inactive form. But if they are activated by soot particles, for example, they drift into the nucleus of the cell, where they launch a program that can contribute to skin aging.

SKIN CARE COSMETICS BOOST THE BODY'S OWN DETOXIFICATION

Skin care cosmetics can counter this aging effect, either by neutralizing the metabolic pathways that have been activated by soot particles or by stimulating the body's own detoxification processes so that the environmental stress is reduced. Free radicals are highly reactive oxygen molecules. If they are present in large numbers, they cause damage to cells and tissue that the body cannot readily repair on its own. Natural scavengers of free radicals in the skin,

"The skin's microbiome has a decisive influence on health"

JEAN KRUTMANN, LEIBNIZ RESEARCH INSTITUTE FOR ENVIRONMENTAL MEDICINE

such as thioredoxin, dock onto these oxygen molecules, making them less reactive and thus harmless. TEGO Turmerone is a natural substance that is extracted from turmeric. As a cosmetic ingredient, it activates the thioredoxin signal cascade and thus promotes the formation of the skin's own scavengers of free radicals.

SKIN MODELS FOR ACTIVE INGREDIENT RESEARCH

For quite a while now, dermatological research has focused increasingly on the natural colonies of microorganisms in the skin. "Today we know that a balanced composition of the skin's microbiome has a decisive influence on health and well-being," says Krutmann. Whereas healthy skin has a great variety of microorganisms, in pathological skin conditions the diversity of the microbiome often decreases. In order to reinforce the natural balance of the skin flora, the researchers at Evonik have developed a special microbiotic product called Skinolance. This cell-free extract of *Lactobacillus brevis* lactic acid bacteria stimulates the growth of other desirable bacteria called *Staphylococcus epidermidis*. This has a positive effect on the skin's barrier function, inhibits inflammation, and thus prevents the skin from becoming rough and drying out. These effects on the skin flora and the skin's appearance have been demonstrated by a clinical study.

Skinolance is thus the most recent example of Evonik researchers' intention to provide scientific proof of the effectiveness of the company's own cosmetic ingredients. "This is why we are also participating in the new Tissue Engineering Project House in Singapore," says Lersch. In the Project Houses of the strategic innovation unit Creavis, researchers work on innovation projects that are relevant to the company as a whole. The projects in Singapore will include the development of new skin models that will be used, for example, to screen new ingredients for cosmetics in order to assess the possible effects of potential active ingredients. "The influence of ethnic factors on the biological mechanisms of skin changes is another extremely interesting area that we also want to investigate in Singapore," says Lersch. So far there have been a number of interesting approaches, but on the whole we still understand far too little about possible differences. So this is exactly the right time for Evonik to tackle this theme together with partners doing scientific research. —