

Enzymes and fermentation

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Enzymes play a central role in our lives – not only within our bodies, but also on the surface of our skin and in our diet. Bacterial and fungal cultures with their enzymes have been used for food fermentation since time immemorial. Can skincare benefit from this?

Sourdough and the resulting baked goods are considered to be particularly easy to digest. What's more, they are characterised by their low use of baking aids, which are commonplace in industrial bread production. In other words, sourdough is in line with today's trend towards less chemicals and more nature. The highlight: apart from the flour, it is available free of charge. In a way, the helpers are waiting everywhere to do their work. All you need is a little patience.

Lactic acid bacteria

We are talking about a working group consisting of lactic acid bacteria and yeasts, which find their own way into flour-water mixtures when they are left to stand and use their enzymes to break down various flour components. This produces lactic acid, acetic acid, proteins, alcohol and carbon dioxide, among other things, and ultimately flavourings during baking at the latest. The results can be continuously optimised by "maintaining" the starter cultures.

The enzymatic processes known as fermentation lower the pH and make food unattractive to other microorganisms, thus extending its shelf life. They can be transferred to many other foods using different bacterial and yeast cultures, resulting in tasty fruit and vegetable juices, dairy products such as yoghurt and kefir. Sauerkraut, apple and wine vinegar are classics – not forgetting beer and the refinement of grape juices into wine.

Low-energy kitchen

From a technical point of view, fermentations are attractive because they require little or no energy. In addition, the equipment required is minimal, meaning that fermentations in all their diversity can easily be run in the home kitchen. Kimchi, kombucha, kōji, natto, salgam and kvass send their regards.

Enzymes work like catalysers in chemistry. Before chemical reactions can start, a certain amount of starting energy must first be made available. This activation energy is significantly

reduced with catalysts, and the same applies to biocatalysts. Consisting of peptides, which are formed by linking amino acids, they are thought to have been the precursors of life in evolution. After their incorporation into the first microorganisms, the enzymes worked hand in hand. To this day, later large organisms are only viable because they in turn rely on the detailed work of microorganisms and their enzymes. This also applies to humans. Without the microbiome in digestion and on the skin, nothing would work. Furthermore, organisational units in large organisms indicate that they originate from the naturalisation of earlier microorganisms.

Excessive personal hygiene

This is where it becomes clear that today's ideas about personal hygiene are often exaggerated and counterproductive. The skin microbiome in particular is constantly under attack, be it with the daily shower including pore-deep cleansing with surfactants or with the supposedly good skin care that contains high doses of preservatives, antioxidants and complexing agents. This completely ignores the skin's effective self-cleansing programme.

In many cases, it is the intact skin microbiome that makes the absorption of skin care products possible in the first place, for example by breaking down large molecules with its enzymes. With its diversity of microorganisms, the skin microbiome masters practically all types of chemical reactions that enzymes are capable of and which are described elsewhere.¹

Superfood for the skin flora?

So-called superfoods contain essential fatty acids, vitamins, trace elements, amino acids, proteins and much more. They are subliminally attributed special properties, some of which have healing and anti-ageing effects – even in the case of probiotic components. However,

¹ Kooperation ist alles, *Medical by Beauty Forum 2022 (6)*, 9-11

theory and reality often diverge, especially with regard to the reorganisation of the intestinal flora. Nevertheless, it has been concluded that this principle is also helpful for the skin microbiome.

Accordingly, probiotic preparations have been developed based on experience with yoghurt, quark and cucumber masks, mainly based on lactic acid bacteria cultures – comparable to sourdough preparations from the bag. For example, probiotics that release lactic acid and stabilise the pH value of around 4 are used as an adjunct to treatment for a disturbed vaginal environment. It is reported that defensins are stimulated; these are epidermal antimicrobial peptides (AMP). Apart from their use in masks, probiotic preparations have rather limited performance.

Prebiotic cosmetics

Prebiotic products, whose task it is to support the skin flora by serving as food for certain germs, were developed in line with the considerations on fibre-rich food for the intestines. What appears to be progressive and simple in advertising is, however, quite complicated in practice. The diversity of species in the microbiome is immense and it is practically impossible to distinguish the good organisms from the bad ones – apart from the fact that each species in the network has tasks of which we have virtually no knowledge to date. This even applies to facultative pathogenic species, which are always present but do not cause any problems if the populations are in a "healthy" balance.

Prebiotic components are not recognisable in the INCI. The information on the label is usually limited to statements such as "prebiotically effective". There is a lack of verifiable evidence for this. Not only in cosmetics, but also in medical products, the composition sometimes contradicts the specified compatibility with the microbiome.

Enzyme substrates

A good working hypothesis is that ingredients that harmonise physiologically with the epidermis also get along well with the microbiome. This is because the epidermis and its microbiome have been a well-oiled team since time immemorial. Accordingly, it is crucial not to use the well-known counterproductive substances. In addition, enzyme substrates consisting of natural triglycerides or essential fatty acids, for example, are particularly suitable for the care of skin and flora.²

² Mikrobiom und Hautentzündungen, Beauty Forum medical 2019 (4), 24-25

Fermentation on the skin

Finally, it should be noted that enzyme peelings practically cause direct fermentation of the skin surface. Esterases, which break down fats, and proteases, which dissolve the peptide bonds of dead cells, are important here. By the way: Anyone who has ever grated potatoes without gloves can also experience the fermentative effect of plant esterases up close in the kitchen.

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