Three times active against wrinkles

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Cosmetic active ingredients have multiple functions. Taken together, the spectrum of activities corresponds to the typical set of instruments against premature skin ageing, i.e., anti-aging. It can be divided into preventive protective, regenerative and anti-inflammatory activities. Sustainability plays an increasingly important role here.

The functions of cosmetic active ingredients comprise different facets that vary in importance depending on the individual's condition, indications and circumstances:

- Skin protection against:
  - physical influences (radiation, mechanics and erosion)
  - chemical influences (household, workplace and environment)
  - microbial influences (microbiome and external microorganisms)
- Treatment & regeneration of:
  - barrier disorders
  - cornification disorders
  - connective tissue and vascular disorders
  - irritations, allergies and inflammations
  - pigmentation disorders
- Compensation of endogenous deficits, for example enzyme deficiencies:
  - preventive care
  - sustainable (= without long-term side effects)
  - accompanying indication
  - camouflage treatments with decorative products

Cosmeceuticals are a group of cosmetic active ingredients, some of which have been documented in clinical studies. They occupy a niche between pharmaceuticals and cosmetics. However, there are no generally applicable rules for classifying active ingredients as cosmeceuticals.

Documentation

To enable high availability and effect at the target site, cosmetic active ingredients must be able to penetrate the skin barrier and, if necessary, also permeate (e.g. vitamins).
Activity measured in vitro is not sufficient for proof. Reproducible studies and significant causalities are therefore desirable, but in many cases not available. In addition, the activities may only have a local and not a systemic effect. Furthermore, conformity with the European Cosmetics Regulation and documented safety (safety report) are required.
Substances prohibited in the European Cosmetics Regulation such as hormones are not allowed to be used, but active pharmaceutical ingredients may be used to a limited extent if the skin condition is improved, stabilised and skin disorders are eliminated – examples are D-panthenol (provitamin B_5) for a tendency to skin redness, azelaic acid ≤ 1% for a tendency to impure skin, acne, rosacea & perioral dermatitis, tranexamic acid for skin lightening and reduction of skin redness, piroctone olamine (INN) alias 1-hydroxy-4-methyl-6-(2,4,4-trimethylpentyl)-2(1H)-pyridone monoethanolamine salt for scaly scalp. However, in these cases, advertising with wound healing (D-panthenol), acne treatment (azelaic acid) and antimycotic effects (piroctone olamine) is prohibited under the European Cosmetics Regulation.

Examples of anti-inflammatory agents

- 15-Lipoxygenase substrates – omega-3 and omega-6 fatty acids such as linoleic acid (from vegetable oils, phosphatidylcholine), gamma-linolenic acid (evening primrose, borage) and alpha-linolenic acid (flax, kiwi, rosehip, phosphatidylcholine [soy]). The metabolites of essential fatty acids produced by the body's own 15-lipoxygenase have anti-inflammatory effects.
- 5-Lipoxygenase inhibitors – 3,4-dihydroxycinnamic acid (caffeic acid), curcumin (turmeric roots), hyperforin (St. John's wort), 3-O-acetyl-11-keto-ß-boswellic acid (frankincense extract in vitro). By means of 5-lipoxygenase, leukotrienes are formed from the body's own arachidonic acid, which, among other things, trigger allergic and inflammatory reactions.
- Antibacterial substances such as azelaic acid ≤ 1% (found in cereals), which in this case specifically inhibits the growth of anaerobic germs.

- Protease inhibitors - boswellic acids (frankincense extract in vivo) inhibit proteases.
- Macrophage-activating substances - phosphatidylserine (soy, endogenous) activate the immune system.

Examples of regenerative agents

- Retinoids, which stimulate growth factors, among other things: Vitamin A (retinol) and esters, retinal (aldehyde), provitamin A (β-carotene and carotenoids). An effective metabolite is vitamin A acid (INN: tretinoin), which is banned in cosmetics. Applications: Skin smoothing, impure skin (acne). The German Federal Institute for Risk Assessment (BfR) recommends restriction to the face.
- Vitamin B series – stimulation of growth factors, among other things. Examples: Vitamin B_3 (niacinamide: anti-inflammatory for blemished skin or acne), provitamin B_5 (D-panthenol: irritated skin, soreness).
- Vitamin E improves epithelialisation and the skin's ability to retain moisture.
- Sphingosine-1-phosphate – Inhibition of keratinocyte proliferation: Skin care for psoriasis.
- Zinc salts (≤ 1%) – are involved in the formation of oxidoreductases such as superoxide dismutase (SOD).
- Isoflavonoids – phytohormones, binding to local oestrogen receptors.
- Gamma-linolenic acid – for delta-6-desaturase enzyme defects (atopic skin).
- Growth factors & messengers – different peptide structures.
- The category of predominantly temporarily effective substances includes wrinkle-reducing oligopeptides, spilanthol [(2E,6Z,8E)-N-(2-methylpropyl)-2,6,8-decatrienamide], hyaluronic acid as well as skin-firming extracts and active ingredients such as Centella asiatica, kigelia extract, saponins, N-acetylglucosamine. They are frequent representatives in products advertised as "anti-aging".

Examples of protective agents

- Barrier-active components such as long-chain fatty acids, cholesterol and phytosterols, ceramides, hydrogenated phosphatidylcholine (PC-H), squalane/squalene. In addition, other lipids in the form of triglycerides and wax esters. Note: The lipid content of creams is still an important criterion among dermatologists and cosmeticians today. However, without knowledge of the type and concentration of the emulsifiers used, the indication is worthless as the wash-out effect associated with them cannot be estimated.
- Linoleic acid – ceramide I substrate (important for the elasticity of the skin barrier).
- Moisturisers such as glycerol, glycols, urea, amino acids of the NMF, mineral salts and superficially acting film-forming but water vapour permeable polysaccharides such as hyaluronic acid, alginates and cellulose derivatives. Amino acids of the Natural Moisturising Factor (NMF) are natural radical scavengers.
- UV filters convert radiation into heat. They are part of "medical skin care" in many countries and are subject to particularly intensive testing there. Sun protection factors are to be rated in such a way that they render harmless the radiation that is not eliminated by melanin. This ensures that melanin formation is still stimulated to a small extent and vitamin D is formed. Additional antioxidants in sun protection products are counterproductive for melanin formation, apart from the fact that they are very short-lived under irradiation and support radical chain formation in higher concentrations.
- Antioxidants: Vitamins A, E, C, isoflavonoids, polyphenols and derivatives in appropriate (!) concentrations. Strong antioxidants are counterproductive when healing and pigmentation processes are present that are consistently radical (!).
- Tyrosinase inhibitors prevent melanin formation – often antioxidants used against hyperpigmentation. Liposomal ascorbyl phosphate (alias vitamin C-phosphate) in concentrations of ≤ 1% effectively inhibits pigmentation in laser treatments and promotes collagen formation.
- Tranexamic acid (≤ 2%) stabilises superficial vessels (rosacea, redness) and inhibits melanin formation. It is particularly popular for Asian skin with a flawless white appearance.

Essential elements in the application of active ingredients are skin diagnosis with appropriate probes, camera and recording of the client's history, treatment by reducing active ingredients to

what is individually necessary, focus on causality (cause & effect) and adequate dosages as well as the compatibility of the end products. The question of whether a component comes from nature or synthesis is irrelevant.
Component purity, physiological compatibility, known & non-critical metabolism (without long-term side effects) and microbiome compatibility are important.
If, which is not uncommon, sustainable, preventive skin care is to accompany or follow a therapy, it is advisable to use pharmacopoeia-compliant base creams that avoid a system change. This ensures a high degree of adherence to the therapy and optimal care accompanying the indication.
The pharmaceutical (therapy) and cosmetic active ingredients (care) can be coordinated with each other Modular systems allow the incorporation of pharmaceutical substances (pharmacy) and cosmetic active ingredient concentrates (cosmetic institutes) into the base creams.

Anti-pollution

Recently propagated active agents against particulate environmental contaminants ("anti-pollution") have only limited benefits. Effective commercial skin protection, skin care with barrier-active, non-occlusive components, the moderate antioxidant effect of amino acids (NMF) and mild skin cleansing (surfactants with low CMC) are completely sufficient. Exposure to max. 10 µm ("PM10") and 2.5 µm alveolar particles ("PM2.5") has been declining in Germany for years.

Literature:
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