

INCI - Declaration

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The ingredients of cosmetic products are declared in accordance with INCI standards. Knowing how to read the INCI provides information on the ingredients and gives important clues whether the particular customer can tolerate certain products or whether the cosmetics contain substances which should rather be avoided.

According to the German Cosmetic Decree (Kosmetikverordnung - KVO), the ingredients in compliance with the INCI (International Nomenclature of Cosmetic Ingredients) standards have to be listed on the container, the outer packaging or the package insert of every cosmetic product. Every single ingredient is specified in the INCI list which enables the users to realize whether they can tolerate the product or whether it contains substances which should rather be avoided due to their current skin condition.

Following § 5a of the German Cosmetic Decree (Kosmetikverordnung), the ingredients are listed according to their weight ratio in decreasing order, however, contents of less than one per cent may also be listed unsorted. Aromatic principles or fragrances are just declared as perfumes or essences. Unfortunately, the INCI list expects non-professionals to have a basic knowledge in chemistry and some detective talent. Though the professional training for cosmeticians includes instructions on this subject, experience shows that there is some need for catching-up.

Substance classification

It takes some experience to recognize whether the substances used are base substances, active agents or additives. Base substances are the substances that every skin needs and which, for the most part, are natural skin components as e.g. oil-based substances (triglycerides, wax esters), (essential) fatty acids, barrier and moisturizing substances. Active agents are used in cases, where specific effects are desired besides the basic skin-caring substances (basis). Additives are less intended for the skin care, but rather used to provide additional product features. Perfumes and fragrances improve the sensory acceptance, anti-oxidants and complexing agents enable a long-term shelf-life; emulsifiers, stabilizers and preservatives support the product stability for transport purposes and

extend the physical and microbiological stability.

The skin - a model for base substances

The base substances conform to the sebum and barrier layer composition (approximate values): Sebum (dermal surface fat):

41% triglycerides

25% wax ester

16% fatty acids

12% squalene

2% diglycerides

2% cholesterol esters

1-2% cholesterol

Barrier layers ("mortar" between dead corneocytes):

25% triglyceride

20% free fatty acids

18% ceramide

14% cholesterol

11% hydrocarbons (e.g. squalene)

The objective should be to appropriately balance the respective deficits of fat, fatty acids and moisturizing components with skin-identical base substances. Unfortunately, the substances listed above involve a complicated process to combine them together into one product. By using high-pressure homogenization and adding water, instead of creams lamellar structures are formed which are well-known from skin-barrier layers and liposomes. In contrast to that, the manufacturing of conventional creams is by far less complicated, as in this process emulsifiers are added which is the reason why most products today include this type of additives. Recently developed products, however, closely follow nature's example which means that by adding membrane-building components lamellar structures are formed. Instead of using emulsifiers, this process is supported by adding ceramides and phosphatidylcholine to the base substances. Like ceramides, phosphatidylcholine is found in the barrier layers of the skin, however, in small amounts only, whereas it can be abundantly found in

the membranes of living cell structures. The products resulting from this process are called DMS creams (DMS = Derma Membrane Structure).

Base substances

Substantial components of base substances as to their percentage are fatty acids and oils (triglycerides, diglycerides) which are reasonably easy to identify in the INCI code as e.g. capric/caprylic triglyceride. The prefixes refer to the underlying acids which are combined with glycerine.

Significant here are capric acid, caprylic acid, both belonging to the group of medium-chain fatty acids and palmitic acid, stearic acid, behenic acid and linoleic acid which are part of the group of long-chain fatty acids. Linoleic acid is an essential fatty acid which cannot be synthesized by the human body; within the skin, linoleic acid is a component of ceramide I which is one of the substantial skin protection substances.

The INCI term for triglycerides can also be tristearin (triglyceride of the stearic acid) and analogical to it, tripalmitin, tribehenin and trilinolein. Frequently, the different acids also are included in the prescription as free fatty acids and can be found separately in the INCI as e.g. stearic acid. The term diglyceride indicates that there are 2 fatty acids combined with glycerine. Free glycerine itself is a significant natural moisturizing component for the skin.

A very common wax ester also is jojoba oil (INCI: *buxus chinensis* or *simmondsia chinensis*). Shea butter (INCI: *Butyrospermum Parkii*) also contains triglycerides as well as wax esters and due to its high content of phytosterols it also acts as a substitute for the skin-own cholesterol and its esters. Ceramide III (INCI: Ceramide III) frequently is used as a ceramide as this specific type can easily be extracted from yeast. Squalene mostly is replaced by squalane (INCI: squalane) which is less sensitive to handle and can be found in olives.

Besides glycerine, also chemically related glycols (INCI: propylene glycol, pentylene glycol, sorbitol) as well as urea (INCI: urea) are used as moisturizing components. Sometimes, also mineral oil products are referred to as base substances as e.g. Vaseline (trade name for soft paraffin - INCI: petrolatum), microcrystalline wax (INCI: microcrystalline wax), paraffin oil (INCI: mineral oil, paraffinum liquidum), ceresine (INCI: ceresine, ozokerite). In terms of physiology, however, these substances are not related to the skin and

applied in high concentration; they will reduce the natural regeneration of the skin.

Active agents

As a rule, active agents are easy to identify as their technical terms sound more familiar. Examples here are vitamin A (retinol; in retinol palmitate, vitamin A is chemically combined with palmitic acid), vitamin C (ascorbic acid; ascorbyl palmitate), vitamin E (tocopherol; in tocopherol acetate, vitamin E is chemically combined with acetic acid), D-panthenol (panthenol), coenzyme Q10 (ubichinone), hyaluronic acid, and lactic acid.

Plant and other extracts can be identified with the help of their botanical terms which also inform of their origin. The alga extract with the INCI term *fucus vesiculosus* e.g. is produced from the alga *fucus vesiculosus*. In addition to that, the natural oils with a high fat content which also are applied as base substances due to their high triglyceride percentage have botanical terms too, as e.g. macadamia nut oil (*macadamia ternifolia*), wheat germ oil (*triticum vulgare*), avocado oil (*persea gratissima*).

Additives

Very frequently, the additives by far outnumber the base substances or active agents on the INCI list. This specific field obviously is very complicated for the non-professional and in the following, only a few important terms will be explained.

The INCI term 'perfume' stands for a substance mixture which quite frequently may encompass more than a hundred different components which are not specifically declared in detail. For persons suffering from allergies this should be a clear indication to test the product very carefully or even avoid it.

They also should refrain from anti-oxidants of the butyl hydroxytoluene (BHT) type and rather choose the vitamin C and E derivatives (see active agents) which are more appropriate. In combination with anti-oxidants, sometimes complexing agents are used, which are supposed to deactivate radical-generating heavy metals. Among others, ethylenediamine-tetraacetate isodium (Disodium EDTA) and citric acid are part of this group.

A vast area also are additives used to control the consistency of the product, as e.g. to increase viscosity or solidity and INCI examples here are xanthan gum, hydroxyethylcellulose and sodium carbomer. Today, ethoxilated compounds play an important role among emulsifiers. Due to their wash-out effect on the skin and their risk of causing

Majorca acne they are less appropriate for sensitive and neurodermitic skin. The INCI terms ending with "eth" indicate that these specific types of additives are included as e.g. cetareth, pareth, laureth and also laureth sulfate or cetareth phosphate whereas the last-named are found in neutralized form. The supplement "sodium" refers to sodium salt. Frequently used neutralizers also are alkanolamines, and among them the widely applied triethanolamine. In gels and O/W emulsions polyethyleneglycols (PEG) can be found which also belong to the ethoxilated compounds. Like mineral oils, silicones are a widespread component of skin care creams. They have increased water-repellent and smoothing properties and can be identified by their suffix "cone" as e.g. dimethicone.

A complete list of the licensed preservatives can be found in appendix 6 of the German Cosmetic Decree (KVO) so there is no need to list all of them at this place. The INCI terms are not directly assigned to the listed preservatives; however, they can easily be related as the chemical terms are almost completely adopted. Appendix 5 of the German Cosmetic Decree informs on dyes and pigments which are easily to be noticed by their numbers, e.g. C77491 for red ferric oxide. Appendix 7 includes the officially licensed UV filters for sun protection products. Regarding the INCI code, the same rules apply as for the preservatives.

By the way, with the exception of UV filters and additives to control the consistency, already today most of the so-called additives can be avoided.

Limits of the INCI

The INCI is no guarantee for quality as the information sometimes proves ambiguous.

Just to add an example to underline this statement: avocadin is an extract gained from the avocado oil with a high content of phytosterols used for skin care purposes. However, avocadin has the same INCI term as avocado oil which is *persea gratissima*!

The specific substance concentrations in the product are also very difficult to estimate. Frequently, there are so many active agents listed in the INCI that it is quite complicated to predict any possible effects.

There is, however, one important general rule: the less substances are mixed in a cream the less the risk of intolerances. As a matter of principle, the base substances should be part of the basic skin care and attention should be paid to apply the appropriate combination for the specific type of skin as e.g. a low

percentage of triglycerides for oily skin and, accordingly, a high percentage for a low-fat skin.

Further information

- H. P. Fiedler, Lexikon der Hilfsstoffe, Verlag Editio Cantor, Aulendorf
- A. Domsch, Die kosmetischen Präparate, Verlag für chem. Industrie, Augsburg

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