

# Lipophilic substances – oils and lipids in cosmetic products

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Although they apparently fail to show any spectacular effects, oils and lipids belong to the most important ingredients in cosmetic products. From the corneotherapeutic point of view they are right in the focus of current interest: selectively applied they help to regenerate damaged skin.

Lipophilic substances all show the characteristic feature of being more or less insoluble in water. Hence, they are generally used to support the lipid layer of the skin. It is a well-known fact that the lipid layer acts as the major barrier against external influences. Lipophilic substances make the skin water-resistant, reduce the transepidermal water loss and thus protect the skin against dehydration. By filling up microscopic indentations in the skin they lead to a noticeable smoothing of the skin which simultaneously also reduces minor wrinkles. Besides these common features there are also some specific properties.

Creams based on oils with low solidification point spread easily and evenly on the skin. Lipids and waxes with a higher melting point show a more solid consistency which for example is needed for lipsticks.

Hydrocarbons, paraffin, silicones and most of the waxes are particularly recommended for products with an extended shelf life. However, they lack the effects of vegetable oils which are partly broken down in the skin and thus release valuable fatty acids. As these fatty acids, unlike the fatty acids assimilated with our daily nutrition are subject to a completely different metabolic process they are quite important.

## Vegetable oils

Also, the interesting effects of accompanying substances play an important role in vegetable lipid substances. Frequently oils contain fat-soluble vitamins or provitamins as e.g. beta-carotene and vitamin A in carrot and avocado oil, vitamin E in almost every vegetable oil, and in wheat germ oil even up to 0.5 %. Another important component of vegetable oils and waxes are phytosterols. Avocado oil and shea butter show particularly high percentages. The structure of phytosterols is similar to that of the cholesterol and phytosterols are able to largely

substitute it in the skin. This can be noticed by a specifically barrier-strengthening effect. In this case animal cholesterol can be avoided. Especially for the older skin phytosterols have a specific skin caring effect. To what extent small amounts of phytohormones as e.g. isoflavones may have specific effects depends on the particular oil and, above all, on its manufacturing and refining process.

## Selection criteria

An important criterion for the selection of an oil is the composition of the triglycerides contained as for example of its glycerol-bound fatty acids. Unsaturated fatty acids cause that the triglycerides are liquid and can be spread easily. This is the reason for the use of oleic acid containing vegetable oils like olive oil for the skin care.

Higher unsaturated oils like sunflower, soybean, safflower and wheat germ oils release linoleic acid e.g. which prevents scaly skin as it is integrated into the barrier substance ceramide I. Gamma linolenic acid (evening primrose oil, borage oil) has anti-inflammatory and anti-pruritic effects and thus is used in topical preparations for the treatment of dehydrated and atopic skin conditions. The active agent effects of these oils may still be increased by applying them encapsulated in nanoparticles which augment their penetration into the skin.

Low concentrations of unsaturated triglycerides can be found in coconut and palm nut oil. This is the reason why they are less prone to turn rancid. Almond and apricot stone oil are frequently used for the young skin while macadamia nut oil is typical oil for the mature and dehydrated skin.

## Beeswax et al.

Lipid-like bee-products like beeswax and propolis have lipophilic properties as well. Due

to its flavone content, propolis shows anti-microbial, anti-oxidative and frequently even anti-inflammatory effects. Among other ingredients, beeswax also contains long-chain alcohols which may retain low amounts of water. A liquid vegetable wax which is frequently used is jojoba oil which is tolerated by every type of skin due to its neutral nature. Shea butter is an example for a solid vegetable wax which is a frequent component in today's skin care creams.

### Physiology of the oils

Taking the structure of the human skin and especially the stratum corneum as a basis with the objective to strengthen the barrier function in the most natural way possible, vegetable oils and phytosterols containing components like shea butter are given priority. Though hydrocarbons can also be found in the lipid layer of the skin, topically applied high concentrations of exogenous paraffin oils or vaseline lead to a decreased regeneration activity of the skin as they form an impermeable film on the skin surface. These substances mainly are used because they will not form any decomposition products and are resistant against atmospheric oxygen and radiation while vegetable oils have to be supplied with antioxidants to protect them against these influences.

As oils and lipid substances are basically insoluble in water they have to be brought into a very stable dispersion for a water containing cream. Today, mostly emulsifiers are used for this purpose. Skin care products for the sensitive skin should be prepared with membrane-forming components as the physical structure of these products perfectly corresponds with the natural skin condition. As an alternative, oils can be processed into oleogels in order to be used like creams however, without containing water. The advantage is that these products as such are microbiologically stable. Oils can also have additive properties as e.g. when they are used as carriers for fragrance or oil-soluble vitamins.

### Specific active agent features

Besides the "fatty" oils as already described above, the essential oils should be mentioned. They also are insoluble in water and added during the cooling phase of the cream production process due to their high volatility. They consist of relatively short-chain terpenes, aldehydes, ketones, alcohols, aromatic compounds and esters. The different substances are provided with a specific scent depending

on plant and origin and are mostly used for the characteristic perfuming of products. There is also a large variety of oils with specific active agent effects as for example chamomile, rosemary, balm oil, caraway oil or tea tree oil. Components of essential oils can easily penetrate into the skin due to their small size of the molecules.

### Corneotherapy

During the past several years it has turned out that a selective application of specific cosmetic substances – and especially physiological lipids and moisturizing substances are focused here – may substantially contribute to the regeneration of damaged skin. Just to emphasize it: comparative surveys have showed that for the dermatological treatment of barrier and cornification disorders they can be as effective as pharmaceutical agents. However, there is a disadvantage to be mentioned: The treatment generally takes a longer time. But there also is an advantage: they are free of any side effects. As cosmetic products primarily are intended to prevent skin diseases and avoid the premature aging process of the skin, the selection of appropriate products can be a major step forward in this field. Professor Albert Kligman, PhD, the famous US dermatologist who coined the term of corneotherapy speaks of an "outside in" therapy, when pathogenic conditions in deeper layers of the skin can be influenced by a sensible treatment of the stratum corneum. Being the main components of the stratum corneum, lipophilic substances play a specific role here.

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