

# Whitening – lightening the skin tone

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Pigmentation marks, freckles and reddened skin are frequently felt as a nuisance. As only very few individuals however are endowed with an even skin tone, so called whitening products become increasingly popular.

**S**kin generally is considered as strikingly beautiful when it shows an even complexion without any noticeable pigmentation marks, freckles, blood vessels or reddened spots etc. As mother nature has endowed only very few persons with this ideal condition, there is a wide range of cosmetic products available for appropriate corrective measures. Besides make-up and self-tanning lotions especially bleaching products are in the focus of attention.

It is a strange fact that women with low-pigmented skin frequently care for a darker complexion and those with a naturally brown complexion prefer fair skin. The latter especially applies for the Asian countries where bleaching products are booming. The advantage of bleaching products consists in the fact that the skin shows a fair complexion even without make-up or camouflage. These preparations are called whitening or lightening products and they provide different ways of bleaching the skin tone.

## Hydroquinone

Hydroquinone, which in Germany only is allowed in hair dyes (0.3 percent maximum) with the condition that the indication "containing hydroquinone" is marked on the label inhibits the activity of tyrosinase which is an enzyme located in the melanosomes (cell organelles) and transforms the amino acid dopa (3.4-dihydroxyphenylalanine) into melanin. Melanin is found in two different types of skin which is eumelanin (black-brown) and pheomelanin (reddish-yellow). Both together determine the skin color. In UV radiation the formation of melanin is increased. Melanosomes and melanocytes increase and the skin-tanning process will start. This process also includes hyperpigmentations i.e. age spots or freckles develop an increased pigmentation in comparison to their environment.

[It is generally supposed that hydroquinone also contributes to the destruction of melanosomes and the de-activation of melanocytes whereas the keratinocytes are not affected.](#)

[The natural substance arbutin with a glycoside linkage of hydroquinone to glucose shows similar reactions. In comparison to hydroquinone however this substance has the advantage of showing better resistance to atmospheric oxygen. Hydroquinone and arbutin may cause irritations or even allergic reactions in persons with a specific sensitive disposition<sup>1</sup>\).](#)

## Kojic acid – a controversial substance

Just like hydroquinone, kojic acid (5-hydroxy-2-hydroxymethyl-4H-pyran-4-on) is a strong reducing agent and a tyrosinase inhibitor. Kojic acid is a very effective bleaching agent and very popular in Asia. In Europe however, kojic acid is discussed quite controversially as it shows mutagenic effects on bacteria and may cause contact dermatitis on sensitive skin. On the part of the German Cosmetic Decree (KVO) the application of kojic acid is not yet restricted though. The effects of kojic acid may be increased by adding AHA acids. Just like glycolic acid AHA acids have peeling effects thus removing melanin-containing substances from the skin surface on the one hand and stimulating cell formation in order to increase the exchange of melanin-containing cells on the other hand. Vitamin A as well as vitamin A acid (dermatology) may lead to an increased loss of pigmentation due to cell renewal. Keratolytic substances like salicylic acid and highly concentrated vitamin C equally support this process, a fact which to a minor degree also applies for enzyme peelings on the basis of pineapple and papaya extracts.

## Polyphenols and extracts

Vegetable extracts play a major role in skin whitening. Pertaining to this group are concentrates rich in polyphenols like liquorice or appropriate extract combinations which are better known by the popular term gigawhite: mallow, (malva sylvestris), peppermint (mentha piperita), primrose which is also called cowslip (primula veris), lady's mantle (alchemilla vulgaris), veronica, also called

speedwell (*veronica officinalis*), balm (*melissa officinalis*) yarrow (*achillea millefolium*). Most of the components are tyrosinase inhibitors. Decisive factor here is a transport vehicle which penetrates the effective agents into the skin. In this case, liposomes and nanoparticles have proved successful.

Whereas pure vitamin C only has topical effects similar to AHA acid, the reducing effect of vitamin C which penetrated into the skin inhibits the formation of intermediate products of the melanin synthesis. A very important prerequisite for the penetration is that the derivatives are encapsulated as for example vitamin C palmitate which generally is encapsulated in nanoparticles because of its solubility in fats. After its penetration into the skin, enzyme activity causes the molecule to break down by means of esterases into palmitic acid and free vitamin C which then is able to inhibit the formation of melanin. A further vitamin C derivative is sodium ascorbyl phosphate which is encapsulated in liposomes due to its water solubility. The advantage of these preparations is the formation of components quite identical to endogenic substances as well as their low concentration. Unlike hydroquinone or arbutin only the melanin synthesis is inhibited in this case whereas the existing melanin will not be affected. This however involves the fact that vitamin C derivatives have to be used as a preventive measure for an extended period before its effects become visible. The products however are highly effective and free of any side effects. A further advantage of encapsulated vitamin C derivatives as against free vitamin C is their extended shelf life.

### Preventive measures

Avoiding sun radiation as well as applying sun screen products are the most essential preventive measures accompanying skin lightening. It has to be kept in mind however, that a certain amount of UV radiation is vital for the skin in order to form vitamin D. High concentrations of UV screens though will chronically stress the skin.

The fact, that pigmentation marks frequently are caused by photosensitizing substances often is ignored. This also applies for certain medication and some home remedies too like St. John's wort belong to this group. Also some fragrances like bergamot essence which is contained in a lot of perfumes show photosensitizing effects.

Two further substances are important for an even skin complexion: echinacea extract and vitamin K. Both have positive effects in cases

of couperosis and reddened skin, vitamin K additionally in cases of rosacea, purpura and dark rings under the eyes.

### Protecting against UV radiation

By nature, the sensitivity against UV rays increases with the application of bleaching products as the natural protection of melanin is suppressed. A very interesting aspect in this case is the application of CM-glucan as a skin protecting substance.

A preventive application of vitamin C liposomes in combination with gigawhite liposomes also is an alternative. The latest findings show that the linoleic acid which is chemically bound in liposomes contributes to the synergy here. Encapsulation in liposomes increases the effects and enables a low dosage which means that the products can be used on a long-term base. Adding CM-glucane (photo-protective) and vitamin K (against reddened skin) is an almost ideal combination of substances.

In case of a long-term application preservatives which are listed in the supplement of the German Cosmetic Decree (KVO) should be avoided in order to reduce allergic reactions to a minimum. Regarding pigmentation marks the dermatologist should be contacted in any case of doubt in order to exclude the formation of melanoma.

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<sup>1)</sup> Passages marked in blue are not included in the original publication.