

# Facial cleansing – ingredients & equipment

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All sorts of things end up on the skin as the day progresses – a lot of them unintentionally, some deliberately, and what then remains is produced by the skin itself. Now the question arises how to cleanse the skin so that unwanted substances are removed on the one hand and that the skin will not suffer from repetitive cleansing rituals on the other hand? The following article deals with the daily cleansing procedures which should be individually reviewed and which also require instinctive feeling.

In the past, skin cleansing and particularly facial cleansing was quite a simple procedure using water and possibly a washcloth and a piece of soap. This rather plain ritual developed into a skin cleansing science that can hardly be understood without some knowledge in chemistry, physics and microbiology. It is all the more important to know what kind of effects and adverse effects are associated with today's standard cleansing procedures. As a rule, it is no longer a matter of removing external substances from the skin but of combined treatments including disinfection, preparation for follow-up treatments and triggering of skin regeneration processes.

## Many and varied impurities.....

There is a long list of substances ending up on our (facial) skin day in, day out:

- **Natural substances of our body:** skin barrier substances, skin cells, scabs, glandular secretions such as sebum, sweat, earwax, lacrimal fluid and saliva. Curiously enough, most of them belong to the natural cleansing programme of the body.
- **Substances of our natural environment:** mineral dusts (clay, silicic acid, salts etc.), plant-based substances (hydrocarbons, lipids, waxes, pollen etc.), peroxidized hydrocarbons such as peroxyacetyl nitrate (PAN).
- **Reaction products of skin components with gases** such as oxygen, ozone, nitrogen oxide, sulphur dioxide and chlorine.
- **Anthropogenous substances:** dusts and aerosols (house-, industrial- and road dust including soot particles and polycyclic aromatic hydrocarbons), occupational substances, household substances and fashion jewelry components (silver- and nickel compounds).
- **Body care products:** lipids, active agents, pigments (from lipsticks,

make-up, camouflage, powders and mineral-based sun protection products), dyes (mascara, eyeliner pencils) and cosmetic additives of all kinds.

- **Microorganisms** and their by-products and metabolites including enzymes and fatty acids.

## .....require many and varied cleansing products

The above-mentioned substances can be water-soluble, oil- respectively fat-soluble, non-soluble or tightly adherent substances. These characteristics determine the selection of the appropriate cleansing agent:

- Aqueous tensides in the form of a syndet-based **bar of soap, cleansing gels** or oil-in-water-**emulsions** have a high dirt suspending power and usually are most appropriate to remove all kinds of substances.
- **Micelle water** rather is a light **cleansing lotion** and also consists of water and tensides. Hence micelle water is not a new invention as current sales promotion schemes intend to suggest.
- The term "**microemulsion**" is a technical expression for highly concentrated, tenside-containing formulations, with tensides and water forming a homogenous phase. Shampoos frequently are based on microemulsions.
- In the case of tightly adhering cosmetic products (make-up, camouflage) also short-chained **oils** (triglycerides, synthetic esters) are appropriate cleansing products which in turn can be removed with aqueous tensides. An alternative are non-aqueous tenside-containing oils that, when combined with water, subsequently form emulsions on the skin and thus can be easily removed (2-in-1 products).
- In the case of very sensitive skin and for toddlers, also pure virgin oils or

emulsions with high oil content (**cleansing milk**) can be used. The latter mentioned even are appropriate for skin care purposes (2-in-1 products, see below) provided that they have a lamellar structure and are formulated without emulsifiers. Cleansing milk can also be used for make-up removal; in this case, emulsifiers facilitate the rinsing with water.

- The use of electrical **brushes** can intensify the cleansing effect. This process also intensifies the removal of loose skin scales.

### Tensides & emulsifiers

Just as emulsifiers, tensides are surface-active substances – often with the same chemical structure so that the terms practically are interchangeable. In the case of cleansing preparations we speak of tensides and in the context of skin care products we speak of emulsifiers. Both the substance groups cause a washout effect which is intended with cleansing products however not wanted in the context of skin care products. A qualitative distinguishing characteristic is the critical micelle concentration (CMC), a physical value which indicates the concentration in which the surface-active substances congregate in water to form aggregates (micelles). Tensides tend to have a higher CMC. With increasing CMC usually also the potential for irritations increases. That is why cleansing products should remain on the skin for a short time only and then be rinsed off. In this context, sodium lauryl sulfate (INCI) is well-known to be a very aggressive agent; for purposes of comparison it even is used as a standard irritant in skin tolerance tests of cleansing products.

In promotional texts the above-mentioned product names often are ambiguously used. In addition, a multitude of other denominations are circulated and even combined with each other. In order to sort out the fantasy names when buying a product it is recommended to memorize the INCI codes of certain substances and to pay attention to the order of substances (in descending order) on the product labels. It takes a little practice but then the different products can be evaluated regarding their suitability and effectiveness.

### Treatment procedures

The above described cleansing products are used as such or integrated into more complex treatment procedures in which they, to some extent, are a pre-cleansing of the skin to be succeeded by an often more intense (deep-

pore)cleansing, a particular conditioning or a procedure to boost the skin regeneration.

The treatments depend on the individual (problem) skin condition and the related customer requirements. In the case that follow-up treatments are intended, care should be taken that the initial cleansing products do not contain re-fattening substances that interfere with the treatment later on.

Thus the cleansing frequently is followed by the treatment of blackheads and comedones, a controversially discussed routine that is carried out with the help of vaporizers (Vapozon) and/or disinfecting lotions. Skin disinfection after cleansings also is important in order to prepare a dermal needling treatment, no matter whether the treatment is done with short (cosmetics) or long needles (dermatology). Among others, aqueous PHMB solutions have proved to be adequate disinfecting products. In analogy to the natural antimicrobial peptides (AMP) of the body, PHMB alias polyhexanide with its cationic structure attacks bacteria and viruses. It is also referred to as an AMP booster. Both 70% (V/V) alcohol and 1-propanol (with similar water content) are alternative non-sensitizing disinfecting agents.

### Exfoliation procedures

The exfoliation procedures to remove parts of the stratum corneum and not just loose skin scales also presuppose a cleansed skin. Major exfoliation techniques are:

- Mechanical peelings with water-resistant abrasive bodies – preferably consisting of degradable wax pellets. Synthetic polymers (PE, PP, PUR) are on the decline due to the discussions on microplastics. (Sea) salt peelings are combined with herbal oils; they are advantageous insofar as the salt dissolves in water.
- Enzyme peelings contain proteases which primarily break the peptide bonds of the keratin.
- Chemical peelings with their keratolytic effect based on fruit acids (cosmetics) or trichloroacetic acid and phenolic compounds (dermatology). Herbal peelings with analogous natural chemical reactions show the same effect. Sometimes fruit- and lactic acids are already formulated in cleansing gels (see above).
- Microdermabrasion is an instrument-based mechanical peeling in which ultrafine particles either consisting of quartz, aluminum oxide or similar materials are blown on the skin

through a nozzle ("sandblasting").

- Dermabrasion with aqueous liquids sprayed with high pressure through a nozzle ("water jets").

Peelings generally imply the idea of triggering an intense skin regeneration which leads to antiaging effects. Long-term observations however, particularly regarding Celtic skin types, indicate an increased sensitivity of the skin to rosacea and perioral dermatitis after extended and repeated fruit acid peelings. As is often the case, excessive treatments (too much skin care) are counterproductive for the skin.

Light peeling effects can be achieved with healing earth masks. Facial masks usually are applied to optimize skin cleansing effects ("cleansing masks"). Besides healing earth, also kaolin, zeolites and even activated charcoal are used to adsorb the unwanted substances out of the skin. On the other hand, facial masks are used as a medium to apply active agents on the cleansed skin since the actives can now easily permeate through the skin barrier. In this context also substances as for instance ascorbic acid derivatives and tranexamic acid are used to treat blotchy skin (hyperpigmentation, capillary redness).

If the focus of facial masks is on the permeation of active agents instead of a skin cleansing, a toning is added between cleansing and mask. The aqueous tonics prepare the skin in a way that it becomes more receptive to active agents. For this purpose they contain penetration boosters such as D-panthenol or also (empty) liposomes based on phosphatidylcholine. The latter mentioned are very effective in the case of bad skin and already established acne. Depending on the composition, tonics also are used to finish a cleansing or to lightly cleanse and refresh the skin during the day.

### **Disorders of skin barrier and microbiome**

Every cleansing procedure leaves its traces in the skin barrier and the skin flora. Without application of skin care preparations the skin tends to become dehydrated since the trans-epidermal water loss (TEWL) increases and since natural moisturizing substances of the skin are removed. Also the susceptibility to external substances (environment, occupation, household) and sun radiation can be increased. The more intense the skin is cleansed and the more preservatives and disinfecting agents are used the more the skin flora alias microbiome will suffer. Accordingly the acid mantle of the skin is weakened and infections are facilitated. Such processes have to be kept in mind when selecting the cleansing products and the frequency of cleansings.

There is a lot of discussion on the pH of cleansing products. The pH-values of cleansing products can be neutral up to lightly acidic. When buffer substances (phosphates, citrates etc.) are contained in high dosage, a pH-value of about 5.5 would be adequate. In the case of small quantities or no buffer substances at all, the pH of the preparations does not play a significant role since the buffer capacity of the skin will rebalance the physiological pH in no time. Due to the removed acid mantle, alkaline-adjusted cleansing products cause irritations on the skin to which the skin responds with an increased formation of barrier components.

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