

Water and water – just not the same things: water qualities

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When discussing active agents in cosmetics, very often the most important one is ignored: water! Professor Albert M. Kligman even speaks of "water dermatology" as an essential element of corneotherapy. In fact the quality of the water significantly influences the skin condition in a positive as well as in a negative way.

From our daily nutrition we know us that water and water are not the same things. The same applies for our daily care: there is water for the personal hygiene and water (INCI: aqua) as a component of creams and other cosmetic products.

Water hardness

Everybody knows about the difference between soft and hard water i.e. water with a low content of dissolved salts and water with high concentrations of hardeners like calcium and magnesium salts. Hard water can be identified by its lime scales on taps and in boilers. Rain water is largely free of salts and actually, it is the prototype of soft water. As it originates from evaporation and condensation it is very similar to distilled water. Exposing the skin to rain water is a well-known and successful recipe for beautiful skin with the hydrating effect of water in combination with temperature stimuli (cold/warm).

Besides sweat, the water running down the body in the sauna has been condensed in the moist air which means that it also is distilled water.

Demineralized water

As the salts contained in water may have negative influences on the manufacturing of cosmetic products distilled or demineralized water is used. Demineralized or deionized water as it is also called is obtained by treating tap water with ion exchangers, a process in which the metal ions contained in water like sodium (Na^+), potassium (K^+), calcium (Ca^{2+}) and magnesium (Mg^{2+}) are exchanged for hydrogen ions by means of flowing through a specifically composed resin. At the same time, ions with negative charge like chloride (Cl^-), sulphate (SO_4^{2-}), and nitrate (NO_3^-) are removed and hydroxyl ions (OH^-) are released. The hydrogen (H^+) and hydroxyl ions (OH^-) which are equally generated in this process are neutralized and also form water (H_2O).

Private households are frequently equipped with ion exchangers who only substitute calcium and magnesium against sodium, which means that only the hardeners are removed. This generally is sufficient to avoid lime scales in appliances and pipes.

Due to the high concentration of salt, sea water is desalinated by reverse osmosis, a process in which the water is set under high pressure and driven through a specific membrane which is impermeable to salts.

The application is important

From the nutritional point of view a demineralization of drinking water is not recommended as the human body requires a specific amount of salts. As a rule, though, the daily need of salts is covered by other types of food. In case of increased dehydration due to diuretic beverages like coffee or tea or strenuous activities and the increased perspiration involved, salt containing mineral waters or comparable beverages are indispensable as a salt deficiency even may lead to a collapse.

For external use, individuals with skin barrier disorders like dehydrated skin and above all, neurodermatitis should mind to use soft water. Through reaction with the palmitic acid of the skin the carbonate hardness resulting from calcium and magnesium hydrogen carbonate as well as the sulphate hardness from calcium sulphate which is also known as gypsum leads to a further deterioration of the skin barrier, a fact which still may increase the suffering. The skin reaction can externally be observed by washing with the traditional curd soap which consists of sodium salts of the palmitic and stearic acid and hard water. In this process white flakes of lime soaps (calcium salts of the palmitic and stearic acid) will develop which will form deposits on the wash basin or the bath tub and that is exactly the kind of lime soap which will be formed in the skin.

In this connection it is worth mentioning that therapeutic mud and healing earth have descaling effects as the humic acids contained

absorb the hardeners. They are specifically suitable for packs for the sensitive skin.

Spring water & co.

On cosmetic products sometimes the term fresh spring water or also well water is emphasized. Frequently we are dealing here with water with a low salt content which is subject to the requirements of processed drinking water. The advantage here is that because of its use for food purposes a sterilization as well as the addition of chlorine to kill the germs can be avoided. Spring water with a considerable amount of solid or gaseous substances is also called mineral water.

The term purified water (aqua purificata) can also be found. This specific type of water corresponds with the purity requirements of the European pharmacopoeia (Ph. Eur.). It is either obtained by distillation of drinking water, the use of ion exchangers or other appropriate methods. It may contain 100 colonizing aerobic microorganisms per milliliter at most and beyond this still has to fulfill a series of further specific requirements. There is absolutely no question that the manufacturers of cosmetics observe the requirements mentioned and as a consequence there is no need to mention it.

The “super” waters

Beyond that, there is a whole variety of different waters with alleged specific properties on the market and a web search on this topic may be very entertaining. There is levitated water enriched with energy (life) through specific vibrations or “oxygen-enriched” water with a specifically high oxygen content, “ionized” water with different pH levels depending whether it is taken from the positive or negative electrode and a specific composition which depends on the dissolved salts – in case that it is based on electrolysis.

Furthermore, there is “colloidal” water and “structured” water with alleged molecular aggregates which have not been proved yet. There is also “moon water” which is bottled in specific moon phases only and “magnetized” water on supply. The production process of these and further “super” and “ultra” waters remains in the obscure as well as their effects, properties and therapeutic use which until now have not been or even cannot be proved and which frequently violate existing food and drug laws. Placebo effects cannot be excluded either.

Concluding, products and devices only prove advantageous for the supplier also what the prices are concerned. Glacier water also belongs to this category. Compared with rain

water or distilled water there is no advantage with one exception however: it contains small amounts of hydrogen peroxide which is responsible for the slightly bleaching and anti-microbial effect. Hydrogen peroxide is formed through reaction of atmospheric oxygen with water under the influence of UV light which is specifically active in mountainous areas. Dissolved gases like in oxygen enriched waters are without any benefit for the production of cosmetics as these are manufactured in vacuum conditions to avoid the inclusion of gas bubbles. Accordingly dissolved gases are largely removed during the production process.

Thermal waters

Trace elements (iron, copper, zinc, iodine etc.) and an appropriate temperature are the specific properties of thermal waters which have been attributed a therapeutic effect and which on the other hand are used for physiotherapeutic measures. In cosmetic products nowadays, thermal waters also are used instead of demineralized water. A possible effect of the trace elements on the skin has to be proved by the manufacturer in case he uses the effects of thermal waters for marketing purposes.

The pH level of water

The pH level of the water, i.e. the measure of its acidic or alkali reaction is an important criterion for quality. Comparable high pH levels in a bath lead to a more apparent swelling of the skin than lower levels. Swellings should be avoided at all as they are a sign for a damaged skin barrier. Swellings are increased by adding salts with alkaline reactions and surface-active agents as e.g. by the single drop of detergent in the kitchen or by skin cleansing substances. This is why in the long run, individuals working in wet environment may develop occupational dermatoses. Persons working as hair cutters or in the cleaning business like window or façade cleaners are specifically at risk. Also beauticians may be concerned. In these cases a specific prevention by appropriate skin care products supporting the regeneration of the skin is important.

Sea water

High contents of salts as for example in the Dead Sea in form of sodium or magnesium salts slow down the cell proliferation in the skin. This is the reason why persons with psoriasis are recommended to take baths in the Dead Sea or also tub baths with salts from

the Dead Sea. Neurodermatitis patients also may feel positive effects from normal sea water baths. It is relaxing for the skin and supplies physiological salts.

How sensitive the skin reacts to salt concentrations can be gathered from the itching and redness especially on sensitive skin after the salts or perspiration dried on the surface. Hence, in the production of cosmetics salt water cannot replace the water phase; at best it can be used as an additive.

Water as raw material

Water by far is the least expensive raw material in the production of cosmetics, despite of all the various properties mentioned. It is an important component of emulsions and in combination with the droplet-like dispersion of lipids it supports the care of the skin (O/W emulsions) thus considerably facilitating their application on the skin. This also applies for W/O emulsions where in reverse order, water droplets are included in the lipid phase. The evaporation of water is felt as an agreeable and cooling effect. Besides that, water plays an important role as solvent for polar (hydrophilic) agents and additives.

“Water dermatology”

In combination with moisturizing agents the water content effectively increases the skin moisture not only temporarily but on the long run and this effect can also be measured. This exactly is the specific topic where corneotherapy sets in, a therapy developed and influenced by Professor A. Kligman who also sometimes used the term water dermatology. Accordingly, water is the most important active agent. In his studies he was able to prove that an effective water bonding in the stratum corneum may have clinically evident effects in cases of severe skin barrier damages i.e. it can have the same results as topically applied pharmaceuticals however without their side effects. This is the reason why the water used in cosmetic products, its quality as well as the substances dissolved are extremely important. A precise analysis of the skin and the recommendation of an appropriate product, which contains adequate moisturizers in the water phase as e.g. urea, amino acids and skin identical glycerin in appropriate concentration, are more important than any of the highly appraised super-waters.

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