A closer look on natural agents: facts and future aspects

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Natural agents have always been a topical issue and also the object of vigorous advertising campaigns. The general public certainly associates the terms natural and biological with purity, harmlessness and good tolerance. However, not every product labeled with the term natural also contains pure natural ingredients. As usual, there are the little things that always cause trouble and particular attention should be paid to the specific terminology.

A lot of active agents which have been rediscovered in the traditional folk medicine demonstrate over and over again that natural substances are very interesting ingredients for cosmetic products. The latest trends are cosmetic and medical treatments borrowed from the traditional medicine of the Far East, ranging from the Indian ayurveda science to the Indonesian Jamu medicine. Many of the plants and extracts described there have also been adopted by today's wellness and anti-aging sector.
Very rarely singular vegetable agents are used in their pure form. Isolating a singular substance from a multitude of different ingredients is a very difficult, time-consuming and costly process. Frequently it also turns out that the alleged active agent has lost its efficacy after being extracted from its natural matrix. This is also a well-known effect in the medical field. There obviously is a synergy effect between different substances which is lost whenever the specific substance is isolated.

Natural or synthetic?

Active agents gained from natural sources are supposed to be more valuable than their synthetic counterparts. This, however, is not correct. Regarding quality aspects, the synthetic agent frequently is the purer and less expensive solution. Critical points here are only the chemical composition and physical properties. The same applies for biotechnological substances which frequently can replace substances of animal origin. Natural substances are chemically synthesized products of Mother Nature and subject to the same structural principles as synthetic products. Thus, the term nature-identical means that a man-made synthetic substance shows the identical composition of the respective natural substance. An example here is the salicylic acid which has keratolytic and antibacterial effects. The substance used to be gained from the bark of the willow tree; today however, salicylic acid exclusively is of synthetic origin.
Modified natural products are natural or nature-identical substances which have been synthetically modified. In general, these substances do not exist in natural environment and regarding their properties, they frequently outdo the natural substances from which they were developed. Mentioned in this connection should be the vitamins used as acetates (combined with acetic acid) or palmitates (combined with palmitic acid) with both of the combinations showing more stability against atmospheric oxygen than the natural substance and thus also providing a longer shelf life when mixed into a cream. Hydrolyzed by enzyme reaction in the skin they release the nature-identical vitamin.
A further aspect here is solubility. A large number of natural substances as e.g. cellulose are insoluble. By introducing a synthetic carboxymethyl group (CM), they become water-soluble and will form highly effective additives to control the consistency or even adopt cell protective properties like CM glucan for example.

Chemistry - without limits

Both, nature as well as chemical industry have in common that besides completely harmless substances, they also produce highly effective poisons. So the amount of prussic acid produced by nature itself definitely is higher than the synthetically produced quantity. And formaldehyde neither was developed by chemists. As a matter of fact, in the vegetable as well as animal kingdom formaldehyde occurs in huge quantities and even in the human body it exists in bound form.

Natural cosmetics

Whether the terms natural cosmetics or biolo-

gical cosmetics may be used for advertising purposes whenever a skin care product consists partially, mainly or completely of natural, nature-identical or modified natural substances has been an ongoing issue not only among non-professionals but also in professional and lawyer circles. The point is also whether paraffin oil which is gained by a physical separation process from the naturally occurring substance crude oil, known for everything else but being environmentally safe and non-irritant also belongs to the natural substances? Paraffin oil is a refattening ingredient in a large number of cosmetic products and ointments. And to quote a further example, is refined vegetable oil still a natural substance? It is a fact though that a whole range of skin-caring substances which are synthesized in natural environment are ideal components of cosmetic products, either "processed" or "unprocessed". Self-made quality seals, frequently used to support sales promotions and very selectively admitting or rejecting the one or other argumentation, rather are an artificial barrier. Actually, the most important criterion is whether the substances applied correspond to the physiology of the skin. And, in this case, we are talking of a natural effect.

Better not forget the physical aspects...

Besides the chemical composition also physical aspects are important. Considering the skin itself, the answer to the question whether an emulsion is a natural product strictly is "no". Studies with the electron microscope show that emulsifying substances, either natural or synthetic, considerably affect if not ruin the barrier function of the skin. This is the reason why natural cosmetics should be completely free of emulsifying substances.
Conclusion: The basic idea of natural cosmetics should be the ideal physiological tolerance or, in other words, it should allow that natural substances may be smoothly integrated into the skin. It is important to state that besides its origins, the active agent also is evaluated in view of the targeted organ.

Quality control is the keyword

A very interesting aspect are genetically engineered plants. Also in this connection there is need for an accurate quality control. As far as a thorough analysis of the agents or agent mixtures gained from genetically engineered plants proves that they are identical with the substances gained from the original plant it is of no importance whether there has been a genetic manipulation.

However, reading the INCI it is sometimes hard to judge what kind of agent we are dealing with. Just mentioning the term tocopherol for example. Among others, natural tocopherol consists of the variants α-, β-, γ-, δ-tocopherol which differ in their number and position of methyl groups while the basic structure remains the same. Every single one of the mentioned tocopherols may again occur in two mirror-image like d- and l-forms whereas nature as in general only synthesizes one of the two variants. Biologically, d-α-tocopherol is the most efficient form and, in the narrower sense we call it vitamin E. Synthetic vitamin E generally is d,l-α-tocopherol, which means that it equally consists of the d and the l form.

Evaluating the extracts

The same problems may be encountered when evaluating the extracts which are mentioned in the INCI with their botanical term. This however does not give any clues regarding the purification process of the extract. In its original form algae extract for instance has a fishlike smell which may not really be appreciated by some of the consumers. Inodorous extracts however may compromise on their efficacy due to additional manufacturing steps.
Frequently also the percentage of agents contained is explicitly mentioned in the advertising campaigns and sometimes the concentrations seem quite unrealistic. In these cases the quantities mentioned generally relate to the total percentage of the extract in the finished product. Extracts also contain a high percentage of water and/or solvents though with a realistic agent content of a few per cents only, which leads to the fact that the total substance content in the finished product only amounts to a tiny fraction of the percentage stated. Thus, it is highly recommended to ask for the agent content in form of dry matter which definitely is the only dependable value in this connection.
Very often also preserved extracts are used whereas the INCI here only mentions the botanical term of the extract while the preservative is neglected. Frequently, the concentration of preservatives in the extract is high enough to preserve the whole finished product. In these specific cases allergenic reactions are almost inevitable.

Important natural agents

Of all the natural agents specifically the **fatty oils** are important ingredients in the cosmetic area. Particularly in this connection there is a whole range of different compounds: saturated, unsaturated and polyunsaturated fatty acids (omega-3, omega-6) with byproducts like vita-

mins and phytosterols. Extensive professional knowledge as well as experience with skin analysis are required to recommend the individually best adapted product to the consumer.
Another significant group are the amino acids which are the most effective moisturizers (cf. the composition of the natural NMF). As a matter of fact, they stop and destroy the radicals which are penetrating from the outside into the skin. A well-balanced NMF though is the best precondition against a premature skin aging process. Today, almost all the amino acids on the market are synthetically produced.
A third and also very important group are the **additives to control the consistency** and the **filming agents**. We are mostly dealing here with large molecules (polymers) with differently structured and bound sugar units. They also are able to retain the moisture and to smooth the skin. Other substances, as for example the aloe mucins also have anti-inflammatory effects.

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