

# History and current aspects of corneotherapy<sup>1)</sup>

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## Keywords

Corneotherapy, homeostasis, stratum corneum, atopic dermatitis, cornification disorders, dermatoses, phosphatidylcholine, membrane creams, liposomes, nanoparticles, oleogels

## Summary

The term corneotherapy was coined by A. Kligman. A persistent corneotherapeutic treatment of the disturbed homeostasis as the characteristic feature of atopic dermatitis with appropriate skin care substances may achieve substantial clinical effects. In summary, it can be said that corneotherapy aims at the recovery of the stratum corneum and above all, it improves the function of the skin barrier and subsequently also the overall homeostasis of the skin. For the purposes of a preventive corneotherapy it is essential to avoid skin care products with harmful substances such as irritants and allergens, to select the appropriate skin care substances, to individually adapt the skin care products to the specific skin problems and to possibly change behavioral patterns following a corneotherapeutic consultation. Recent clinical studies have indicated that not only barrier disorders like atopic dermatitis respond to corneotherapy. Also cornification disorders and dermatoses may be treated adjuvantly with success. The studies are based on a therapy with membrane structure products closely related to the chemical and physical structure in the stratum corneum. An important precondition obviously is the presence of phosphatidylcholine. Phosphatidylcholine may be used in membrane creams (barrier creams) and liposomes. Further galenic forms are nanoparticles and oleogels. It depends on the skin analysis and the specific skin problem which galenic form is the most effective treatment for the particular case. Moreover, modular systems allow the addition of pharmaceutical and cosmetic actives. One of the major advantages is the fact that corneotherapy is largely free of the side effects known from topical pharmaceuticals. Preventively applied, corneotherapy may extend the intervals between attacks and reduce or even avoid the use of conventional dermatics.

## History

The term corneotherapy was first coined by A. Kligman and mentioned in an editorial of Lübke<sup>2)</sup> Whereas J. Lübke predicted a major significance for this issue, corneotherapy up to date has rather been neglected by the public at large which however may be attributed to the fact that it basically confirmed the findings formerly classified as the so called water dermatology<sup>3)</sup>. That is to say that a repeated application of appropriate moisturizers may increase the skin hydration and significantly improve the barrier function of the skin<sup>4)</sup>. A consequent therapy of a disordered homeostasis of the skin as it can be observed in cases of atopic dermatitis, based on these substances may achieve substantial clinical effects. The findings mentioned however involve far-reaching consequences for the applied dermatological skin care as further base substances such as lipids and filming agents<sup>5)</sup> may also have positive effects on the homeostasis. Hence, corneotherapy is a significant adjuvant skin care<sup>6)</sup> for the dermatological treatment of skin barrier disorders.

## Outside-in therapy

Without discussing the complicated biophysical processes in detail, in summary it may be said, that corneotherapy aims at a recovery of the stratum corneum and above all, that it improves the skin barrier function and consequently the homeostasis of the skin. In this connection, A. Kligman speaks of an outside-in therapy whereas "outside" is the stratum corneum and "in" are the therapeutic effects starting in the stratum corneum and working their way into the deeper skin layers. On the other hand, there is the conventional inside-out therapy where the pharmaceutical agents inhibit inflammatory processes in the skin or influence the immune system and only have secondary effects on the stratum corneum ("out"). The comparison clearly shows the potential significance of an adjuvant care of the stratum corneum even in combination with a conventional therapy. A healthy condition of the skin barrier inhibits pathogenic germs such as staphylococcus aureus which is widely spread in cases of atopic dermatitis<sup>6)</sup> from penetrating into the

epidermis. A disordered stratum corneum however tends to support recurrences. This example shows the importance of avoiding counterproductive effects of skin care. It has been known for quite some time, that skin cleanser components like sodium lauryl sulfate (SDS) may cause major skin irritations by firstly damaging the barrier function and subsequently causing cellular reactions. In the meantime SDS is used as a standard irritant in dermatological research. Moreover, the damaged barrier enables sensitizing substances which are used to preserve and perfume skin care products to easily penetrate into the skin.

### Preventive corneotherapy

In industrial countries, there is an increasing number of allergies and atopic dermatitis to observe. An interesting phenomenon also is dehydrated skin and more and more people complain about the symptom. There is however no need for an extensive research just to find out that cultural influence plays a major role in this connection. One reason among others is frequent skin cleansing combined with the washout of protective substances and the intense however inadequate care of the skin. For the purposes of a preventive corneotherapy though the following issues are of major importance:

- Avoiding skin care products which contain harmful substances such as irritants and allergens
- Selecting skin care products with appropriate skin care substances
- Individually adapting the skin care products to the specific skin problems
- Reducing excessive hygienic procedures like washing and showering
- Avoiding inadequate, tight and occlusive clothing

Among the obviously harmful substances are surfactants, emulsifiers, preservatives and allergenic perfume substances. Although increasing the skin hydration, it should be kept in mind that occlusive substances minimize the regeneration of the skin<sup>7)</sup> on the other hand. Occlusive substances are paraffin oils, petrolatum and mineral waxes specifically in high concentrations. An excellent alternative in this case are triglyceride based lipids which are adapted to the physiology of the skin. Appropriate skin care substances are those related to the stratum corneum. As the barrier layers of the stratum corneum have the same structure as lipid bilayers, skin-related prepa-

rations are an advantage as in contrast to emulsifiers they may also be equipped with a membrane structure. It has been known for quite some time that stratum corneum lipids in combination with water and ultrasound may form liposomal structures<sup>8-9)</sup>. This means that, just the other way round, liposomal products are also perfectly suitable for corneotherapeutic purposes. Skin care products with membrane structure may be individually adapted to a skin with specific problems which is most important as the skin conditions may vary and as, on the other hand, further adaptations are possible in the course of the therapy<sup>10)</sup>.

### Clinical studies

Most recent clinical studies<sup>11)</sup> have shown that not only barrier disorders like atopic dermatitis respond to corneotherapy. Also cornification disorders and dermatoses may adjuvantly be treated with success. The studies used products with membrane structures which in chemical as well as physical respect corresponded to the condition in the stratum corneum. An important precondition seems to be the presence of phosphatidylcholine. This substance plays a significant role as a natural component of cell membranes. Moreover, in its native form it provides the linoleic acid for the formation of ceramide I. Linoleic acid also is a very effective substance for the treatment of 1<sup>st</sup> and 2<sup>nd</sup> grade acne vulgaris caused by a cornification disorder at the exits of the sebaceous glands. Phosphatidylcholine is an essential element for the transformation of ceramides into sphingomyelins. It is an interesting fact, that the fluidity of the skin barrier layers may shortly be increased with the linoleic acid-containing phosphatidylcholine. This particular characteristic corresponds with the specific mechanism of an increased penetration of substances through liposomal encapsulation. On the other hand, the fluidity of the skin barrier may be reduced with hydrogenated phosphatidylcholine. Thus, the skin barrier may intentionally be adapted to either a passing or barrier function, a property with major practical significance on the one hand for the transport of actives and on the other hand for the natural skin protection. In summary, corneotherapy is recommended in the following cases

- Neurodermatitis
- Ichthyosis
- Psoriasis
- Acne (oily skin)
- Acne (dehydrated skin)

- Perioral dermatitis
- Cheilitis
- Perianal barrier disorders
- Irritative contact dermatoses (in general)
- Wear-and-tear-dermatoses

### Specific galenic features

As mentioned above, phosphatidylcholine may be used in membrane creams (barrier creams) and liposomes. Further galenic forms are nanoparticles and oleogels. Nanoparticles consist of a phosphatidylcholine monolayer with oily nucleus whereas the water phase is completely absent in oleogels. These systems are preferred if a higher lipid content is required for corneotherapeutic purposes. The skin hydration level however shows different characteristics. It depends on the particular skin analysis and the individual skin problem, which galenic form is the most adequate treatment for the particular case. Moreover, modular systems allow the addition of pharmaceutical and cosmetic actives<sup>10)</sup>. For the preventive treatment put into practice, it is essential that modular systems are also compatible with decorative components as these may conceal visible skin abnormalities and thus reduce the suffering of the persons affected. Just like for the base formulations, a precondition for decorative components however is the absence of irritating, sensitizing and occlusive additives.

### Outlook

One of the major advantages of corneotherapy is that it is largely free of side effects in comparison with a treatment with topical pharmaceuticals. Preventively applied corneotherapy may extend the intervals between attacks and reduce or even avoid the application of conventional dermatics. Precondition for a successful corneotherapy however is a precise diagnosis of the skin and great expertise regarding the structure of skin care products and their components. Besides the above mentioned moisturizing substances, lipids and filming agents, ceramides as well as amides play a significant role for the selection of components<sup>8)</sup>.

There is only hope that corneotherapy with its relatively unspectacular procedures compared with conventional treatments may soon gain acceptance.

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