All-purpose talcum free powder bases with urea

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Summary: All-purpose powder bases for use in decorative cosmetics, skin care and dermatology are described. Besides covering compounds, such as mineral pigments and physiologically compatible amides, urea plays a major role, particularly in use of powder bases on problem skin.

Cosmetic Powders

For quite a long time cosmetic powders have been used to enhance the skin color, cover up bad skin and to minimize the shine on make-ups. The most frequently used types are loose powders and pressed powders (compact powder). Accordingly, powders contain specific ingredients to influence the adhesive, gliding, flow and covering characteristics and the absorption of lipids and moisture, just to mention the major features. Besides, they include additives to reduce excess dusting of loose powders, to avoid microbiological contamination (preservatives) and to protect organic ingredients from atmospheric oxygen (antioxidants).

Composition

One of the most frequently used bases for cosmetic and dermatological powders is talcum which is a natural silicate with fatty character. Due to its relation with asbestos which means that talcum may also contain traces of asbestos, today talcum is rather seen as a health hazard especially if its particle size is small enough to end up in the respiratory tract. Frequently used are also preservatives which may trigger allergies and sensitization, and antioxidants like 2.6-di-tert-butyl-p-kresol (BHT) or 2-tert-butyl-4-methoxyphenol which are reported to have similar effects. Therefore the allergy rates regarding powder bases and cosmetics generally are relatively high and are still increasing in industrial countries. Consequently, and not least also because of the higher frequency of atopic skin conditions and other barrier disorders there is a particular interest in powders with specifically defined ingredients in order to minimize the risk of irritations and sensitization. A major objective is to reduce the number of ingredients as this is a major clue to reducing potential side effects. This especially applies for face and body powders. It is however important, that the functional properties of the powder bases will not be changed.

Powder profile for diseased skin

Just one glance on the extensive INCI declarations proves the complexity of the powder preparations sold on the market. In compliance with the legal regulations of many countries the cosmetic powder formulations are tested on healthy skin. For diseased skin as well as skin with barrier and cornification disorders however these formulations often are completely inadequate as said skin tends to react particularly sensitive to superficially applied foreign substances. Neurodermatic skin for instance is specifically permeable which means that the risk of sensitization through preservatives, perfumes and synthetic antioxidants is considerably higher than on healthy skin. Especially in case of barrier and cornification disorders and the resulting bad skin in these cases there is also an increased need for makeup and powder products to conceal the respective skin disorder. The perfect solution here are makeup and powder products which provide a healthy look on the one hand and rather support than impede the background healing process on the other hand. Dehydration of the skin resulting from the absorption of skin lipids by the powder base and the increase of the transepidermal water loss (TEWL) involved should also be avoided. It has to be added though that the above mentioned absorption of skin lipids in some cases may also be a desired effect as for example in case of oily acne skin.
Concluding, there is an obvious demand for powder bases which are simultaneously tolerable on healthy and diseased skin and whose

ingredients correspond to the above mentioned objectives. Focus of attention here are allergen and irritation free powder formulations whose main components are covering substances and physiologically compatible pigments and substances in order to add additional features.

Additional characteristics

A specification of additional powder characteristics has to be based on chemical, physical and biological criteria. A first criterion here is the guaranteed sterile condition of the powder base with the emphasis on physiological tolerance. It is recommended that the appropriate substances can be added in powder form to the base, that they have antimicrobial effects in both, dry and humid conditions in case that the powder base absorbs atmospheric moisture in humid conditions. The molecular weight should be comparatively low in order to build up a relatively high osmotic pressure when moisture is absorbed as a high osmotic pressure also has antimicrobial effects. It avoids that spores are developed and already developed bacteria cells are dehydrated and die off. On the other hand powders should have antioxidative effects against aggressive radicals which among others also are formed by the singlet oxygen content in the atmosphere to make them ineffective already on the surface of the skin in order to inhibit reactions with the skin components from the very beginning. A further important function of additional components is an increased adhesion of the powder pigments on the skin surface. Adhesion takes place through interaction with the keratin of the skin and the ideal solution would be to build up hydrogen bonds to the keratin and to the pigments used which normally consist of metal oxides as e.g. iron oxide, titan oxide, silicon oxide, aluminum oxide or the metal salts of organic or inorganic acids. Furthermore anti-inflammatory and anti-pruritic characteristics are needed to avoid irritations due to the superficial application on the skin on the one hand and on the other hand to reduce already existing irritations on the skin and support the healing process below the powdered surface. The water binding capacity has to be adequate in order to keep the powdered surface stable under sweating conditions. On the other hand covering, flow and gliding characteristics of the powder bases should not be affected. The manufacturing of compact powders which means a compression of loose powders should be ensured especially if besides the covering substances also lipophilic components like oils and lipids are contained.

Multifunctional substances - illustrated by the example of urea

It would be welcome to combine the additional properties mentioned above into one multifunctional substance in order to keep the number of powder components at the lowest possible level. An excellent example for a multifunctional substance is urea [1] which, at first sight seems exceptional as urea is able to transform into the ammonium salt of the isocyanic acid preferably in aqueous solutions and subsequently hydrolyses to ammonium carbaminate. This specific process is disadvantageous for a multitude of products and above all for water containing cosmetic products as the non-ionic compound (carbonic diamide) transforms into a salt. This is the reason why urea is only used in dermatological products for specific applications. In powders this process can also be triggered in case atmospheric water is absorbed which involves the risk of microbiological contamination. If isocyanic acid forms in this specific case it has only negative effects in creams; in other products isocyanic acid may react with the protein and amino acid structures of the microorganisms with the result that carbamoyl derivates (H_2N-CO-) are formed which will damage the contaminants. On the other side the high osmotic pressure formed due to the low molecular weight of urea will still be increased again by the above mentioned transformation. Adding small amounts of urea powder will be sufficient to achieve antimicrobial effects. And, urea may also combine with the keratin of the skin and the pigments of the powder base via hydrogen bonds and thus improve the adhesive effects of the pigments. Urea has anti-pruritic, antiseptic, anti-inflammatory effects, impairs aggressive (oxygen) radicals and supports the healing process of diseased skin. The covering power of pigments will not be affected, the gliding characteristics of loose powders will be enhanced and on the other side the cohesion of compact powders considerably improved. The static electricity of loose powders will be reduced and hence also the tendency to excessive dusting. Urea is a body-related substance, non-toxic for the skin, non-allergenic and thus will avoid the typical irritations the caused by the preservatives used today.

Consequently additive free

Urea adds a further characteristic to powder bases. As mentioned above powders easily absorb lipid substances and among others also sebum components. This is a desired effect in

case of oily skin in order to reduce the oily appearance. In cases of barrier and cornification disorders however it is a disadvantage as the moisture loss is intensified and the skin will further dehydrate due to the thin lipid layer. Specifically the dehydration process is effectively stopped by urea as it binds sufficient water on the skin surface.
Adding urea and consequently avoiding a multitude of additives in powder bases represent a new concept in dermatological cosmetics. It is also an advantage that, besides decorative applications powder bases can also be used for dermatological purposes due to their specific properties. The formulations correspond with the criteria of corneotherapy [2,3] which presents itself more and more often as an alternative to the therapy of skin diseases with pharmaceutical agents.

Powder bases with urea

By appropriately selecting the pigments and by adding polyamides which are compatible with urea it can be achieved that the powder bases adapt to all types of skin. They help to minimize shine as well as to create an even complexion and natural skin tone. A frequent use is also the finishing touch on camouflage and foundations. The product can be applied and spread on the skin with the help of a brush, a sponge or even manually. The powders are very well tolerable even for hypersensitive skin, dry and barrier-damaged skin, after esthetic surgery as well as in the framework of corneotherapeutic principles.
The pigments of the powder bases may be used in coated form. As examples may be added mica coated with titan oxide and/or iron oxide and silicon dioxide coated with titan dioxide and/or iron oxide. Using adequately selected pigments may achieve a visible smoothing and an even complexion due to the modified light reflection. This specific feature allows softening uneven spots like scars and wrinkles even on atrophic and dry skin and causes a natural appearance.
The powder bases have antimicrobial, anti-inflammatory, anti-pruritic and moisture-binding (important for dry skin) effects, they absorb lipids (important for oily skin) and partly or completely protect the skin against harmful UV radiation not least because of the pigments contained. Typical ingredients according to the INCI list are urea, mica and/or silica (coated with iron oxide), nylon-12, bolus alba, magnesium stearate.

The powder bases of the above mentioned preparation may be applied either as loose powders or compressed in form of compact powders. They can also be used as bases for medical powders which then may contain additional pharmaceutical agents.

References

1 Klein E, Lautenschläger H, Stadler C; Universal powder base, DE 10 2005 045 989 (German patent application, 27 September 2005)
2 Lautenschläger H, History and current aspects of corneotherapy, Kosmetische Medizin 2005;2:58-60
3 Lautenschläger H, Specific active agents and base substances in corneotherapy, Kosmetische Medizin 2004;2:72-74

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