

Whitening

An effective and natural blend

The new, naturally-derived, whitening blend Dermofeel Enlight from Dr. Straetmans combines the antioxidant and whitening properties of sustainably gained rice bran with the multiple bioactive substances of the natural extract from white mulberry. The active ingredient showed a significant whitening effect on age spots.

For many centuries, and in many different cultures, a more uniform skin tone without local irregularities in melanin distribution has been a concept of ideal beauty. Cosmetic treatments of the skin are not a modern phenomenon – they were already performed in third century Japan, where women used cloth bags containing rice bran to polish and whiten their skin². Even in rural Japan, female rice farmers used the remaining water from washing the rice (called Yu-Su-Ru) for washing their hair³ and skin. Today we know that a major bioactive substance responsible for this reported whitening effect of rice bran is phytic acid.

Phytic acid and its salt sodium phytate have been reported to stimulate the naturally-occurring exfoliation (skin peeling) of the present hyperpigmented corneocytes on the skin surface⁴, as well as to reduce the melanin synthesis in the newly emerging epidermis cells (through the inhibition of the tyrosinase enzyme activity⁵). This natural skin peeling process is assumed to be promoted in parts by the chelation and inactivation of calcium ions, which are involved in the cohesion of the stratum corneum cells by proteins. This was reported to have a mild effect on the cell-cell adhesions⁶, thereby accelerating the natural exfoliation and cell renewal of the superficial layer of melanin-filled corneo-

cytes. Moreover, phytic acid, due to its strong impact on oxidative processes, was demonstrated to protect human keratinocytes against the damaging effects of UV radiation in vivo⁷. Now, adopting the ancient Asian skin care concept, based on rice bran, and combining it with decades of experience in raw material development and cosmetic formulation, resulted in the launch of Dermofeel Enlight* a new 100% naturally-derived whitening agent.

The whitening product blend can be used in a variety of natural, as well as conventional, skin care product concepts for the treatment of age spots, in skin lightening products, or to balance out an uneven skin tone. In addition, this active ingredient offers good skin compatibility and, due to its

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biodegradability, can be considered environmentally friendly.

It combines the well-described antioxidant and whitening properties of the single rice bran ingredient sodium phytate with the multiple bioactive substances of the natural extract from white mulberry (*Morus alba* L.) fruits. Both the rice bran, as well as the fruits from the white mulberry tree, are gained from sustainable sources. As the rice bran is a by-product in the milling process of the food industry and is normally discarded as waste or is used in animal feed, the production of sodium phytate gives it a higher value.

The white mulberry tree offers a multitude of functions and has been cultivated for over 4,000 years because of its leaves used for the silkworm cultivation. In the ripening process the colour of the fruits changes from white to purple-red. This is a transformation in colour which, according to an ancient legend, is the result of the tragic death under a tree of two lovers, Pyramus and Thisbe, whose fate served Shakespeare later as a source of inspiration for Romeo and Juliet. The fruits comprise a multitude of bioactive substances with beneficial characteristics, such as antioxidant and whitening properties (tyrosinase inhibition), such as stilbenoids, e.g. Piceid^{8, 9},



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Naturally-derived whitening blend that combines the antioxidant and whitening properties of rice bran with the multiple bioactive substances of the natural extract from white mulberry

anthocyanins, e.g. Cyanidin 3-glucoside^{10, 11}, and flavonoids, e.g. Rutin (Quercetin-3-O-rutinoside)^{12, 13}.

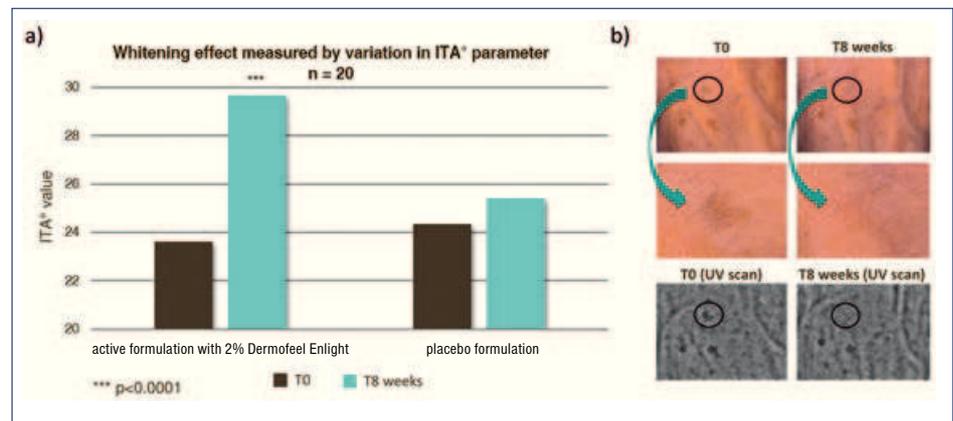
What to keep in mind in the formulation process

Dermofeel Enlight is a water soluble liquid without any listed preservatives (EU cosmetic regulation). It has a low pH of around 3.0 and, therefore, should be incorporated into formulations before the final pH-adjustment. For optimal efficacy, 2% should be incorporated into formulations with a pH between 4.0 and 5.5. In addition, the sodium phytate of this active ingredient stabilises cosmetic formulations via the chelation of heavy metal ions, which in formulations promote oxidation reactions of, for example, unsaturated oils. Furthermore, it is advisable to add the active ingredient in emulsions after they have been homogenised and at a temperature < 40°C. The product should be added in small portions under constant stirring in order to avoid a locally restricted reduction of the pH.

The active ingredient is compatible with a wide range of UV-Filters, gelling agents, oils, emollients, emulsifiers and other whitening agents. There may be incompatibilities with divalent ions – due to complexation – and various electrolyte-sensitive materials and acrylate thickeners.

Proven whitening effect

In a randomized in-vivo-double-blind study conducted by an independent research institute, the active ingre-



Significant whitening effect on age spots with 2% of the active ingredient
Increased mean ITA° value: ITA° values ($ITA^\circ = \{\text{Arc.tang.} [(L^*-50) / b^*]\} \times 180 / \pi$) inversely correlated to the pigmentation intensity – the higher the values, the clearer the color (left)
Changes in pigmentation intensity of age spots clearly visible on digital images (right)

redient resulted in a significant whitening effect of age spots in comparison to a placebo formulation. Twenty women at the age of 40 to 70 years were asked to apply a hydrogel formulation containing 2% of this ingredient (L070-2.6-1014) and a placebo formulation (L070-2.7-1014) twice a day over a course of 8 weeks on age spots on the face or hands. In order to evaluate the product efficacy, pigmentation intensity parameters L^* (luminosity, black to white color) and b^* (yellow to blue color) were measured with the **Minolta chromameter CR-400** at the beginning and end of the 8 weeks of treatment. Then the individual topological angle (ITA° value) was calculated, which expresses the melanin index and is inversely correlated to the pigmentation intensity. An increase of the ITA° value indicates a decrease in skin pigmentation. For visual representation, digital images of the selected dark spots were taken before and after the treatment.

In contrast to the placebo formulation, a highly significant increase of the

mean ITA° value of around a quarter (25.6%, Figure a) was detected. ITA° values ($ITA^\circ = \{\text{Arc.tang.} [(L^*-50) / b^*]\} \times 180 / \pi$) are inversely correlated to pigmentation intensity – the higher the values, the clearer the color. Also, the skin luminosity (L^*) value was significantly increased after 8 weeks of treatment with the active formulation.

This improvement of the two sensible indexes of pigmentation intensity was clearly visible to the naked eye and on digital images of the skin (see Figure b). Changes in pigmentation intensity of age spots (treated with the active formulation) were visualized with the help of **Fotofinder Dermoscope Ver. 2.0** in their natural real colors and converted into monochromatic images by means of a **UV Scan** software module. Regarding the skin compatibility of the active ingredient, no skin irritations were observed. In our application technology laboratory, a variety of stable, natural and conventional skin care formulations containing this active ingredient were developed, such as **Anti-Aging Spot Caring Mask, Natural Anti-Aging Spot Serum, First Aid Hand Cream for dry Skin and Age Spot Correcting Hand Milk**.

*INCI: Aqua; Sodium Phytate; Glycerin; Morus Alba Fruit Extract

The reference list as well as formulations can be found on the Internet – see Internet panel



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Disturbed melanin synthesis

Melanin is a pigment common to a variety of animals, plants and microorganisms. In humans, it resides in the skin, the hair and the iris and retina of the eye. Melanin **provides the skin with its colour** and **protects it against the damaging effects of UV sun radiation**.

In the skin, it is **produced in the melanocytes of the epidermis**. An enzyme called **tyrosinase catalyzes** the first two, rate-limiting steps of the **melanin synthesis** starting with the amino acid tyrosine. The melanocytes possess **dendrites** (protuberances of the cell) through which the melanin is **transported to the neighbouring keratinocyte cells**. The epidermis is **constantly renewed** from its basis by the **migration of the keratinocytes**, together with the **melanin**, to the outer cell layers, where the **keratinocytes lose their nucleus** and become **lifeless corneocytes** in the horny layer.

However, in some cases the regular melanin synthesis is disturbed, causing **irregularities in the melanin skin distribution**. Possible phenotypic outcomes are an uneven skin tone and local hyperpigmentations caused by an **increased melanin production** in the form of birthmarks, freckles, age spots, melasma or post-inflammatory hyperpigmentations. **Causes** for this increased local melanin synthesis **may be excessive sun exposure, hormonal changes** during pregnancy or due to oral contraceptives, and **skin inflammations**. The relevance of cosmetic products minimizing these local irregularities in the epidermis lies in the perception of consumers and their desire for a more regular skin tone, which was also shown to be perceived as a sign of ageing¹.

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