

Under close scrutiny - phytohormones

published in *Kosmetische Praxis* 2006 (1), 13-15

Hormones control our bodily functions throughout our entire life. They also have effects on our skin. As hormones have a systemic influence though, they are not allowed in cosmetic products. The research for substances with hormone-like effects proved successful in plants. Detailed information on these specific components which are called vegetable hormones or phytohormones will be provided in the following article.

Hormones determine our whole life. Just like an internal clock they program bodily functions and sexuality from the cradle to the grave. In other words they are our lifetime companions, their presence or absence determines whether we have chubby cheeks, whether we look young, the face shows its first fine lines, the skin loses elasticity or whether the typical signs of elderly skin appear.

Starting from the toddler age to adolescence and menopause up to ripe old age the amounts of hormones produced by our body and the interrelations among hormones constantly change and combined with it also the respective influence on our skin. As these connections have already been scientifically studied, for quite some time now there have been set up theories to compensate hormone imbalances and deficits with specific preparations. An excellent example here is the hormone replacement therapy for women starting menopause.

There are some legal limits...

An improved skin condition observed during pregnancy and while taking the contraceptive pill was the starting point for medication of the elderly skin and the preventive anti-aging treatment with hormone products.

As hormone products involve systemic effects the use of "substances with both estrogen and gestagen effects" as well as "anti-androgens with steroidal structure" in cosmetic applications had been explicitly prohibited already a long time ago. This is the reason why they can be found in the supplement of the list of illegal substances of the European Cosmetic Decree. Permitted however under medical supervision are applications in dermatological products. The increase of breast cancer cases among individuals taking the contraceptive pill or applying hormone replacement therapies were another reason for reservations against comparable skin care products. Nevertheless

there has been a multitude of cosmetic products like living cell extracts, caviar liposomes, colostrum and egg products subliminally aiming at hormone like effects. As the use of "products with cells, tissue and products of human origin" finally had been prohibited and animal products were regarded as a contentious issue they were losing significance.

Isoflavones & co.

To be effective hormones need an adequate receptor in the human body, a fact which can be compared with a lock that can only be opened with a particular key which in this case is the hormone. While looking for hormone-like keys specific vegetable components had been discovered. These substances were called vegetable hormones or phytohormones, a term that relates to the Greek expression for plant "phyton". As the key is not exactly fitting they have hormonal effects which are slightly weaker than the effects of the human hormones. The vegetable isoflavones, lignans and coumestanes bind to hormone receptors. Although, strictly speaking, isoflavones are part of the substances with estrogen effects, the lawmaker yet has refrained from prohibiting their use. Accordingly, they are called phytoestrogens or vegetable estrogens. They can be found in soybeans, red clover and flax and are even part of the daily nutrition. We know from experience that women in Asia where soybeans play a significant part in the daily nutrition are less afflicted with menopause related problems than women in Europe.

Manifold effects...

A closer look at the four different classes of hormones which are relevant for the human body i.e.

- steroid hormones,
- peptide hormones,
- amine-derived hormones (derived from amino acids like acetylcholine which is

- prohibited in cosmetic products,
- hormones derived from unsaturated fatty acids i.e. prostaglandins

shows that the structure of phytoestrogens is similar to the one of steroid hormones. Although they are not provided with an explicit steroid structure their polyphenol arrangement can be compared with the interior texture of estradiol which is the most effective of the estrogens.

Red clover isoflavones hence bind to the estradiol receptors and influence a multitude of complex enzymatic processes connected with estrogens. This effect can also be observed with applications on the skin, as e.g. estrogen deficiencies can be compensated, both the collagen synthesis and cell formation are stimulated and the collagen reduction will be slowed down. A further study with soybean extracts shows that a testosterone induced activity of sebum glands can be adjusted to normal function which led to the conclusion that cases of oily skin related to increased testosterone level and acne cases can also be treated with soybean isoflavones.

And what about the risk of cancer?

Whether there is an increased risk of cancer related to a long-term treatment with red clover and soybean products, which can be medicated orally as well as topically in comparison with the increased risk of a long-term estrogen treatment, is currently being studied on a broad level. In this case, exactly the opposite situation seems to turn out as some studies describe a decreased risk of cancer of both breast and prostate. In vitro examinations using UV-B radiation on cultivated tumor cells even show an activation of DNA repair cells which is a fact that could be exploited for protective measures against light-induced skin damages. This however is not yet sufficient evidence to prove a comprehensive protection against tumors.

Protective effects against tumors are also reported of other isoflavone-related polyphenols as for example of certain green tea components. Flavonoids of green tea and phytoestrogens have in common that their structures preferably react with oxygen containing free radicals. This includes the oxidation of molecules. To what extent however this radical scavenging activity frequently quoted in connection with anti aging products and also the focus of a multitude of in vitro studies, plays a significant in vivo role i.e. in living skin cells, has not yet been sufficiently clarified. More and more serious publications rather classify the effect as a minor part in the process.

Whitening and other effects...

The whitening effect of phytoestrogens can also be assigned to the polyphenol structure. A lot of these compounds inhibit the enzymatic formation of melanin which means that they can also be preventively used against hyperpigmentation and age spots. A selection of other substances like vitamin C and specific vegetable extracts in liposomal encapsulation are a lot more effective though.

Advertising slogans of anti aging products specifically focus on skin tightening and an improved retention of skin moisture which both are well-known effects of the hormone replacement therapy. There are also reports on lipolytic effects in the cellulite treatment as well as inhibited hair growth.

Product safety and side effects

Clinical studies on the safety of long-term medication of red clover have been initiated. Indisputable results however have not yet been obtained. Experience shows that equivalent effects also involve such side effects. Phytoestrogens have two major benefits though. Compared with their dosage their effects are significantly smaller than in estrogens and accordingly, the number of side effects, if there are any at all, could appropriately be infinitesimal. On the other hand phytoestrogens metabolize differently to estrogens which means that the effects connected with the biochemical transformation (metabolism) of estrogens are not to be expected.

In case of a long-term application however it is important to keep in mind that the human body is a complex control circuit adjusting itself to the specific phases of life. This also applies for the skin. Thus, in case of an external application on the skin adverse regulations may develop which means that the anti aging effects may diminish after a certain period of time.

Phyto "squared"...

Base substance for the human steroid hormones is cholesterol which is also an important barrier substance in the skin. Among others it is synthesized from progesterone (the natural gestagen or progestin, corpus luteum hormone).

It is an interesting fact that cholesterol in the skin can be replaced by phytosterols (vegetable sterols) with a structure equivalent to the steroid structure of cholesterol. Phytosterols are mostly represented in form of sitosterol and can be found in shea butter or avocado oil.

Consequently, for skin care purposes a combination of phytosterols and vegetable hormones seems appropriate.

The most important representatives

The most important phytoestrogens found in soybeans and red clover are genistein and daidzein. Additionally, red clover contains the methyl derivatives of both the above mentioned substances, formononetin and biochanin A. In plants phytoestrogens are bound to sugars. So genistin (spelled without an "e") for instance is the combination of genistein with glucose. In case of oral medication the sugars are cleaved in the gastroenteric tract and the released phytoestrogen can be absorbed. For skin care purposes as well only sugar free phytoestrogens are used.

As there is still an increased demand for dermatological products containing estrogens it can be expected that also in the area of skin care the application of phytoestrogens still remains on the agenda and that further findings will follow.

Dr. Hans Lautenschläger