

PHYTOSTEROLS and PHYTOSTEROL ESTERS in Nutrition and Cosmetics



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WHAT ARE PHYTOSTEROLS?

PHYTOSTEROLS, also referred to as plant sterols, are common plant and vegetable constituents, and are therefore normal components of the human diet. They are structurally related to cholesterol, but differ from cholesterol in the structure of the side chain. PHYTOSTEROLS are isolated from vegetable oils, such as soy bean oil.

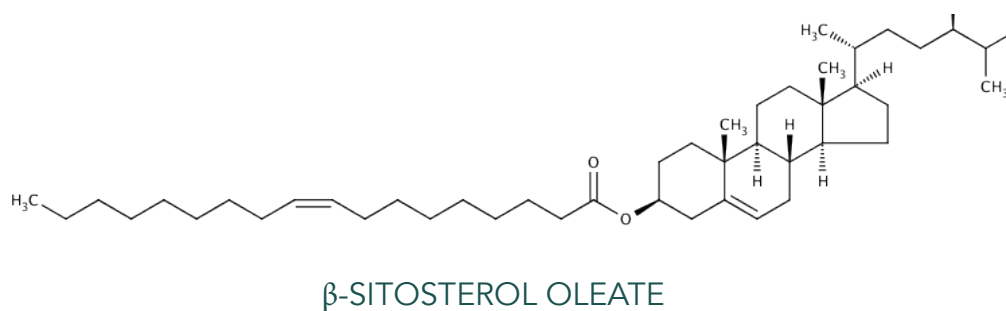
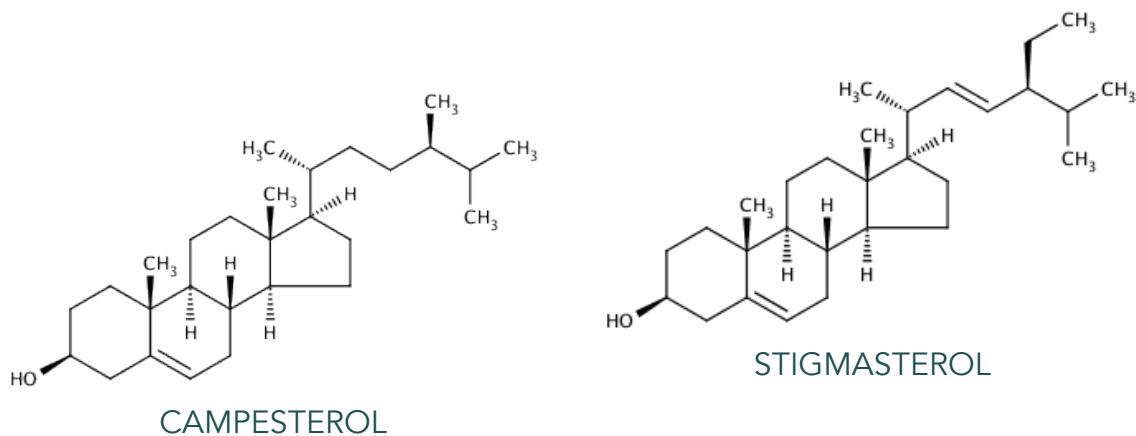
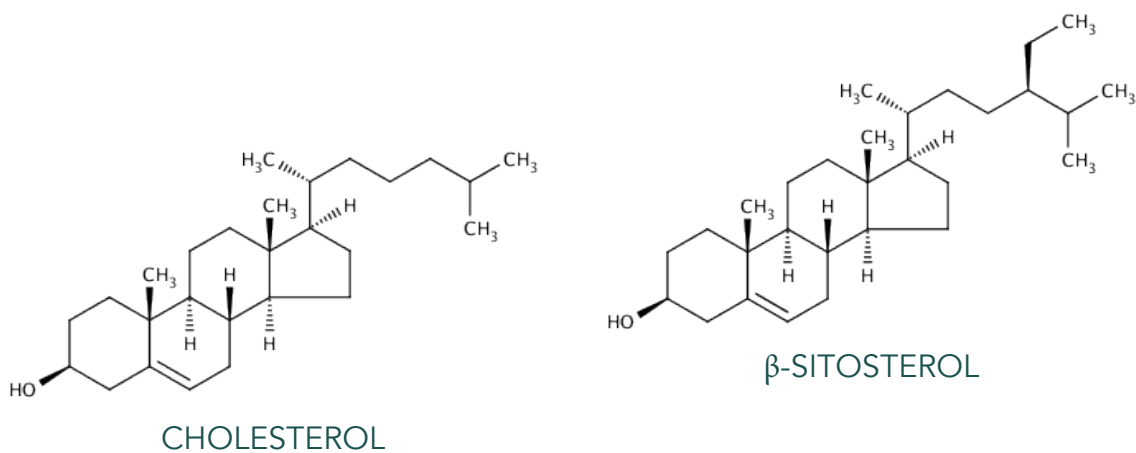
PHYTOSTEROLS, which are a high-melting powder, can be esterified with fatty acids of vegetable origin. The resulting esters are semi-liquid materials, having comparable chemical and physical properties to edible fats and oils, enabling the supplementation of various processed foods with PHYTOSTEROL ESTERS.

NATURAL HEALTH BENEFITS

PHYTOSTEROLS, in free or esterified form, are added to foods for their capacity to reduce the absorption of cholesterol in the gut and thereby lower blood cholesterol levels. Soy PHYTOSTEROLS are widely used in the cosmetics field as active ingredients in creams and lipsticks. Furthermore, they deserve an important place among nutraceuticals; in fact, after their absorption from the diet they are transferred from the plasma to the skin, playing an important role in the constitution of skin surface lipids.

THE CHEMISTRY BEHIND

PHYTOSTEROLS are a large group of compounds that are found exclusively in plants. They are structurally related to the animal-sourced cholesterol, but differ from cholesterol in the structure of the side chain. They consist of a steroid skeleton with a hydroxyl group attached to the C-3 atom of the A-ring and an aliphatic side chain attached to the C-17 atom of the D-ring. Sterols have a double bond, typically between C-5 and C-6 of the sterol moiety.



PHYTOSTEROLS IN NUTRITION

PHYTOSTEROLS IN THE DAILY DIET

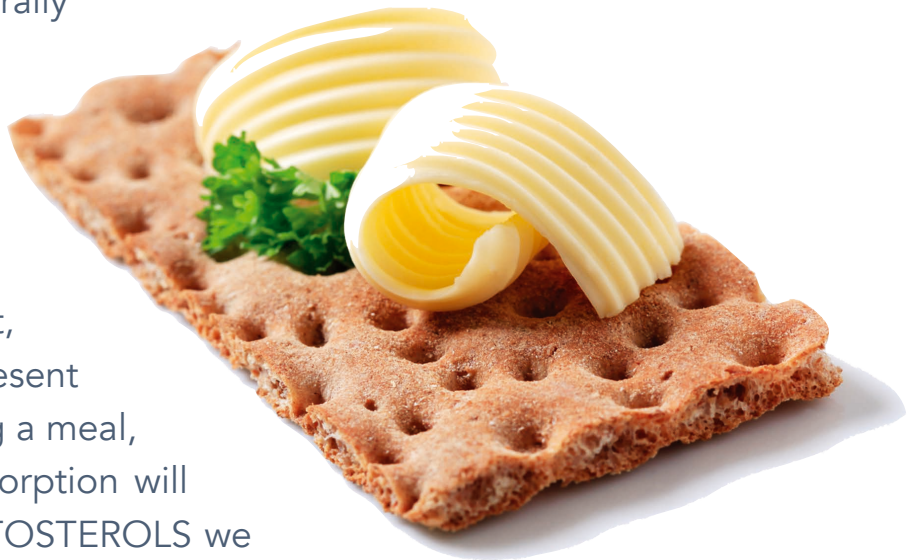
The dietary intake of PHYTOSTEROLS ranges from 150-400 mg/day in a typical western diet. The daily doses considered optimal for the purpose of lowering blood cholesterol levels are 2-3 g of PHYTOSTEROLS, which translates to 3.4-5.2 g in esterified form. This recommended daily dose is typically divided into 1-3 portions of food providing 1.7-5.2 g ester, which equals 1-3 g PHYTOSTEROLS equivalents.

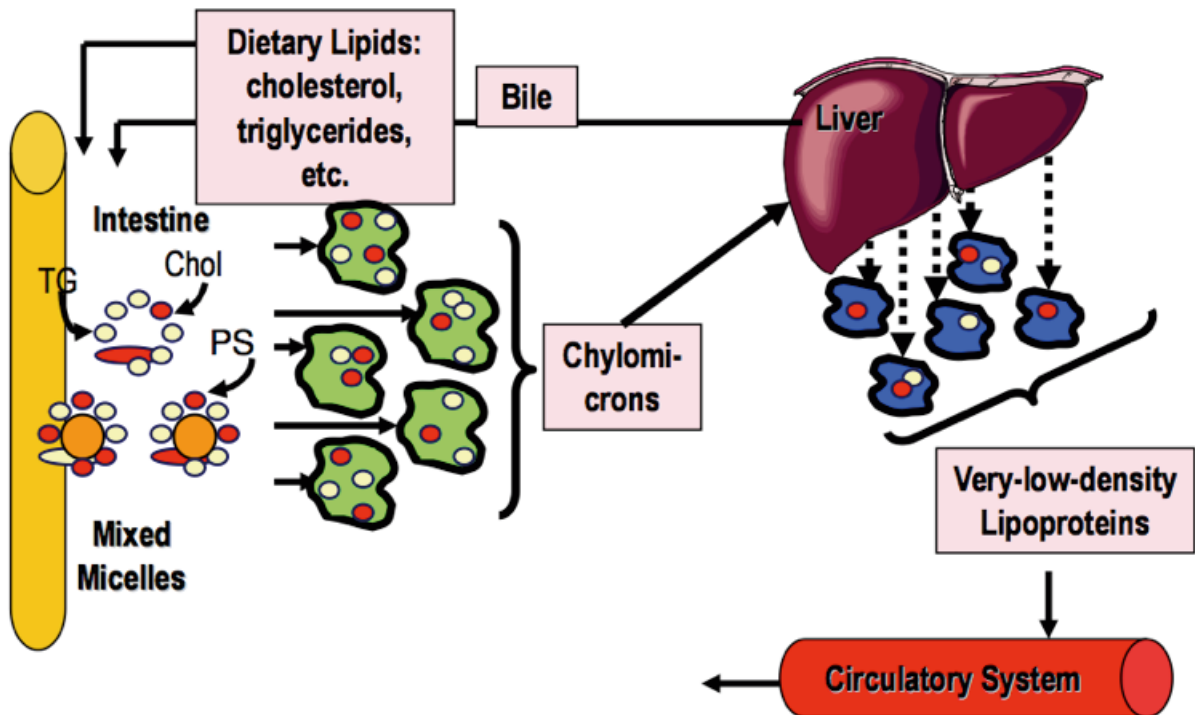


PHYTOSTEROL ESTERS can be used as a fat replacer because the sterol moiety of the ester molecule does not provide any energy to the body. Moreover, PHYTOSTEROL ESTERS may be used to modify the fatty acid composition of a fat blend and replace part of the hard fat in margarines and spreads. PHYTOSTEROL ESTERS give an enhanced creamy texture to low-fat dairy products (yoghurt/ drinking yoghurt). They may also improve the taste of food products by masking bitterness and hence reduce the amount of sugar or other sweetener required to obtain a pleasant taste and texture (e.g., in soy drinks).

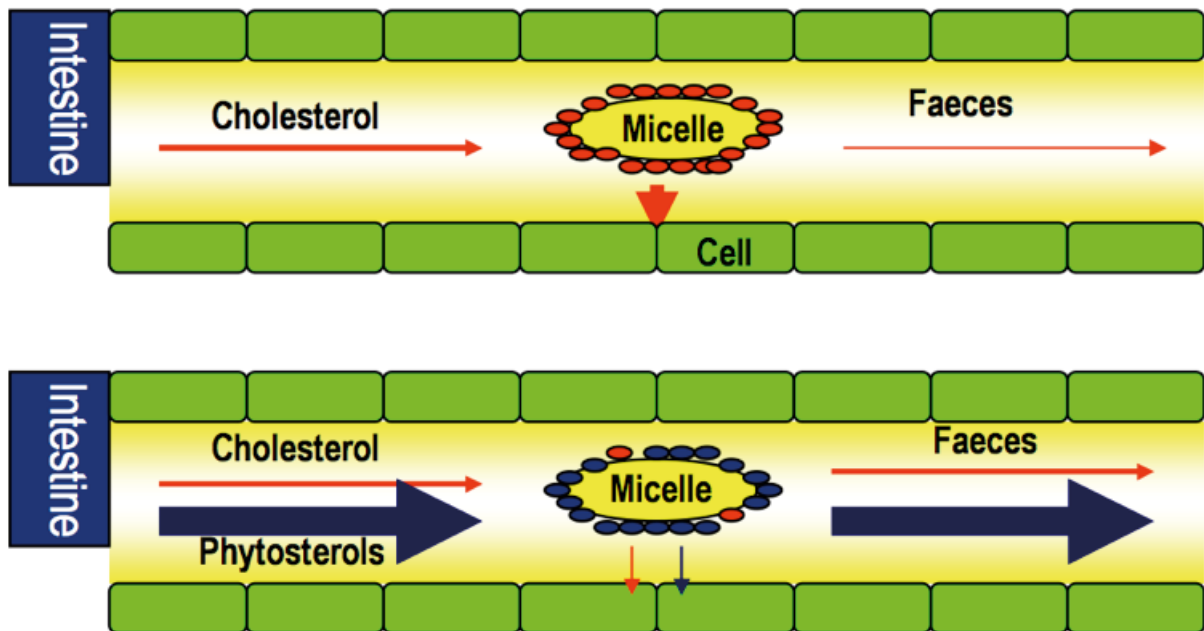
EFFECT OF PHYTOSTEROLS IN FOOD

Eating food products enriched with plant sterol esters helps promote healthy blood cholesterol levels. Lipase enzymes, present in the human digestive tract, cleave plant sterol esters to liberate plant sterols in the gastrointestinal tract. Because PHYTOSTEROLS are structurally similar to cholesterol, they compete with the cholesterol we ingest for absorption through the small intestine. Up to a point, the more plant sterol present in the intestine following a meal, the less cholesterol absorption will occur. Further, the PHYTOSTEROLS we consume are not absorbed themselves to any appreciable extent. As such, when you consume PHYTOSTEROLS you not only inhibit the uptake of cholesterol by the body, but you 'flush' the plant sterols through the system without absorbing them as well. The overall effect is an average 'bad' (LDL) cholesterol decline of 8-15%, with no observed adverse effects.





CHOLESTEROL DIGESTION AND ABSORPTION



EFFECTS OF PHYTOSTEROLS IN THE INTESTINE

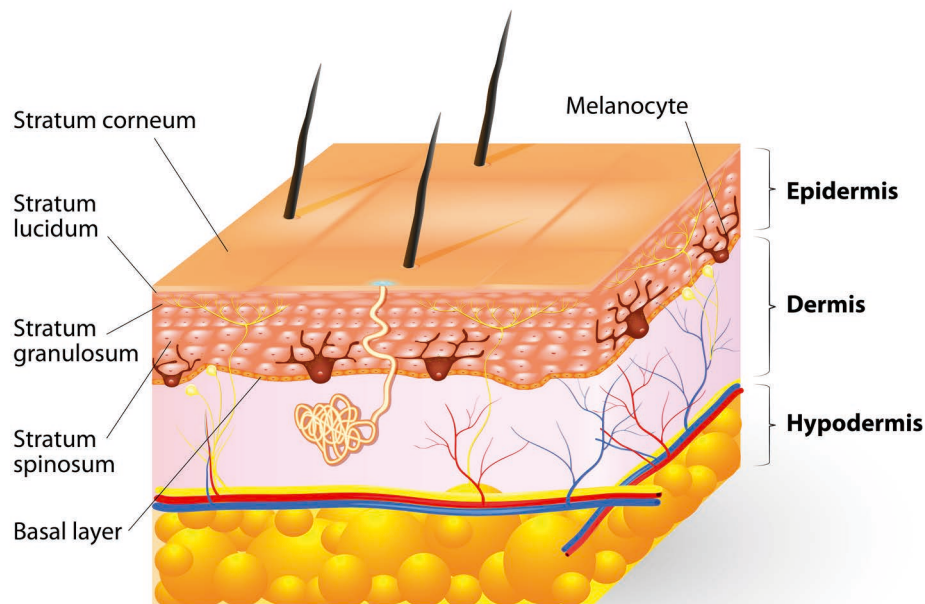
ARE PLANT STEROLS SAFE?

Yes. Scores of human studies with plant sterols have shown no adverse effects. Based on the extensive toxicological testing of PHYTOSTEROLS preparations in a 13-week feeding study with rats, in a two-generation feeding study with rats, in studies on oestrogenic potential and in tests on genotoxicity, no safety concerns were apparent. Some studies have found that large doses of plant sterols reduce the absorption of the pre-vitamin beta-carotene. However, clinical trials have demonstrated that even in the face of rather large daily intakes of plant sterols, serum fat-soluble vitamin levels, including vitamin A, remained well within normal ranges. There is no reason not to consume and enjoy products containing plant sterols on a regular basis.

PHYTOSTEROLS IN COSMETICS

THE SKIN BARRIER

The stratum corneum (SC) is the permeability barrier of the skin. The main components of the SC are ceramides, free fatty acids and sterols. It is the major obstacle to the penetration of exogenous substances through the skin. Moreover, it protects the human body from uncontrolled water loss. These features of the SC are dependent on its elasticity, determined by the content of fats as well as by the hydration state. In addition, skin moisturisation depends upon the presence of lipids in the SC as well as guaranteeing softer and healthy skin with a more pleasing appearance.



EFFECTS OF PHYTOSTEROLS ON THE SKIN

Cholesterol plays an important role in maintaining healthy skin. However, when it is applied directly to the skin, it can lead to inflammation and acne. In contrast, PHYTOSTEROLS and their esters are well tolerated by the skin, but they mimic the function of cholesterol at the same time. Moreover, they exhibit a strong anti-inflammatory effect. In several clinical studies, PHYTOSTEROLS showed remarkable effects for skin health:

- Recovery of skin barrier function
- Improved skin elasticity and decreased skin roughness
- Increased collagen and hyaluronic acid production



PHYTOSTEROLS IN COSMETIC PRODUCTS

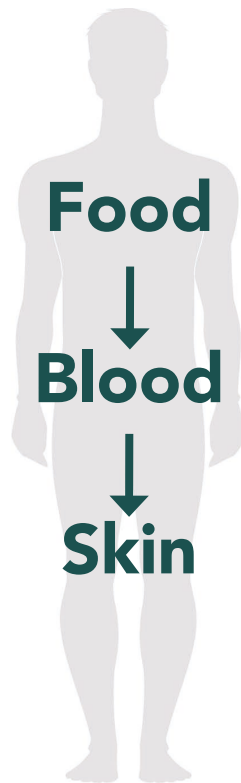
PHYTOSTEROLS can be used in cosmetics either in their free form or as esters. The free sterols are W/O emulsifiers and can increase the stability of both W/O and O/W emulsions. Since they have a rather low solubility in plant oils (less than 5%), only smaller concentrations should be incorporated from the free sterols to avoid possible recrystallisation. PHYTOSTEROL ESTERS, on the other hand, are almost freely miscible with plant oils and can be used to increase the viscosity of lotions and creams and give them a shiny appearance. Commonly, PHYTOSTEROLS are used in creams in concentrations between 0.5% and 2%. PHYTOSTEROL ESTERS should be used in higher concentrations up to 5%.

PHYTOSTEROLS are preferably used in anti-aging creams and sun-care lotions. Oils and creams containing PHYTOSTEROLS exhibit strong UV-protection. Furthermore, their anti-inflammatory effects make them an ideal ingredient for use in products intended for the treatment of atopic eczema and the protection of baby skin. Added to shampoos and hair conditioners at a concentration of around 1%, PHYTOSTEROLS can give a velvety shine and increase the combability of the hair after drying. Finally, phytosterols and their esters can add texture and gloss to decorative cosmetics, such as lipsticks, face powders and mascara.



SKIN CARE FROM WITHIN

The benefits of PHYTOSTEROLS for skin health are widely known. However, many do not know that it is possible to increase the level of phytosterols in the skin (and therefore skin health) not only by applying the sterols on the skin, but also by dietary uptake. PHYTOSTEROLS sourcing from food or nutritional supplements are to a certain extent taken up to the blood system and are eventually transferred to the skin.



It was shown in a clinical study that nutritional PHYTOSTEROLS accumulate in the skin¹, where they can increase moisture content and elasticity in the same way as topical applied PHYTOSTEROLS.

¹ Ashim K Bhattacharya, William E Connor, Lin DS 1983. The origin of plant sterols in the skin surface lipids in humans- from diet to plasma to skin. The Journal of Investigative Dermatology 80:294-296.

Our Product Range

Coatings

Flavonoids

Gelatine

Gelatine Capsules

Globules

Isinglass

Collagen Hydrolysate

Parmcompress

Parmcel

Parmlub

Parmlub SSF

Pea Protein

Phytosterols

Pullucaps®

Surinerts®

Tocopherol

Tocotrienol

Ultramyl



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