

PHYTOSTEROLS AND THE HEALTH

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Abstract:

Phytosterols are a family of compounds similar to cholesterol, which have been shown to lower cholesterol levels when supplemented in the diet. A daily dose of 2–3 g of phytosterols has been shown to reduce LDL-cholesterol levels by 5–15%. They can be consumed in the form of phytosterol enriched functional foods or nutraceutical preparations. Increasing the amount of phytosterols consumed in a variety of foods may be an important way of reducing cholesterol levels and preventing coronary heart disease.

Keywords: Cholesterol, Phytosterols, Sterols

Introduction:

Phytosterols are cholesterol like compounds found in plants. There are over 200 different phytosterols known, and the highest concentrations of phytosterols are found naturally in vegetable oils, legumes and nuts (1). Their benefits now being recognized and foods are being fortified with phytosterols as the awareness is spreading regarding their health benefits (1,2). An experimental plant-based diet that was naturally high in phytosterols was demonstrated to dramatically reduce LDL-cholesterol concentrations within one week (3).

Health benefits: Cholesterol lowering effect: A phytosterol is a plant compound

that has resemblance to cholesterol. Studies have shown that phytosterols compete for absorption with cholesterol in the digestive tract (2). They while preventing the absorption of regular dietary cholesterol, are themselves not easily absorbed, leading to a total lower cholesterol level. It is a known fact that lowers cholesterol lead to other benefits, such as a reduced risk for heart disease, stroke and heart attacks (4, 5).

Cancer protection benefits: Studies have proved the evidence that the phytosterols have a role in protecting against the development of various cancers: ovarian, breast, stomach, prostate and lung cancer (6). This has been attributed to the effect of phytosterols on membrane structure and

function of tumor and host tissue, stopping the growth and spread of cancer cells and encouraging apoptosis. Their high anti-oxidant levels are also believed to contribute (7, 8).

Immunomodulation: Plant phytosterols play a role in the functioning of the immune system. They have an effect on lymphocyte activity, especially in the mechanism against cancer cells (9, 10). Phytosterols have also been used as supportive therapy in chronic conditions in which an inflammatory response plays a large role, including cardiovascular conditions and cancer (9).

Skin protection: The aging of the skin involves the breakdown and loss of collagen (the main component in connective skin tissue) along with sun exposure. The studies have shown beneficial effects of topical anti-aging preparations containing phytosterols and other natural fats, which encourage new collagen production which is slowed down by the sun exposure (9).

Common food Sources of phytosterols (Table 1):

Phytosterols occur naturally in plants. They are similar to cholesterol in structure, but consumption of phytosterols has a cardioprotective effect by lowering blood cholesterol levels. This is achieved through an inhibition of cholesterol absorption from the intestines. Due to this property, phytosterols are sometimes added to some premium brands of margarines, butters and spreads, and marketed as cholesterol-lowering foods (4).

Nuts:

Nuts are known to contain high levels of phytosterols, especially walnuts, almonds, pistachios and macadamias. Evidence suggests that nut consumption is associated with a decreased risk of coronary heart disease (11). An 8.3 percent reduction in risk for every weekly serving of nuts was observed, which was achieved through a lowering of total and low-density cholesterol

and an optimization of the LDL: HDL cholesterol ratio. Other heart-protective nutrients found in nuts include fiber, alpha-tocopherol, folic acid, magnesium and copper (11).

Flaxseed oil:

Flaxseed oil, known for its content of omega-3 fatty acids, which are associated with several health benefits, is also a good source of phytosterols. Flaxseed oil reduces blood pressure and decreases the risk of stroke through a reduction in total cholesterol and LDL cholesterol and elevation of high-density lipoprotein (12, 13). Also, due to its significant anti-inflammatory effects it has been found useful in gout and lupus (10).

Broccoli:

Broccoli is a good source of phytosterols, along with antioxidants, vitamins A, C and K, fiber, and minerals like potassium, magnesium, manganese, phosphorus, and iron. It has been reported that broccoli contains anti-cancer nutrients, such as di-indolylmethane, indole-3-carbinol and glucoraphanin. Di-indolylmethane also has antibacterial and antiviral properties while indole-3-carbinol aids in DNA repair (10,12,13).

Grains:

Wheat germ and wheat bran have one of the highest concentrations of phytosterols (11).

Avocados:

Avocados are potent cholesterol-lowering fruits found in America and this is believed to be achieved through three nutrients: the phytosterol beta-sitosterol, fiber and monounsaturated fat causing reduction in triglycerides and an increase in HDL cholesterol (11,12).

Conclusions:

Phytosterols are a family of compounds similar to cholesterol, which have been shown to lower cholesterol levels when supplemented in the diet. A daily dose of 2–3 g of phytosterols has been shown to reduce

LDL-cholesterol levels by 5–15%. They can be consumed in the form of phytosterol enriched functional foods or nutraceutical preparations. The type of phytosterol supplemented, such as plant sterol or saturated plant stanol appears to be equally effective in lowering cholesterol levels (14).

Thus phytosterol rich plant food can be advised in high amounts in the DASH (dietary approach to stop hypertension) diet regimen and in patients with metabolic syndrome for the reduction of cholesterol and the cardiovascular benefits.

Table 1: Phytosterol food sources(15)	
Total phytosterol content (mg/100g)	
Oils	
Rice bran	1055
Corn	952
Wheat germ	553
Flax seed	338
Cottonseed	327
Soybean	221
Peanut	206
Olive	176
Coconut	91
Palm	49
Vegetables	
Beet root	25
Brussels sprout	24
Cauliflower	18
Onion	15
Carrot	12
Cabbage	11
Fruits	
Orange	24
Banana	16
Apple	12
Cherry	12
Pear	8
Nuts	
Cashew	158
Almond	143
Pistachio	108
Walnut	108
Legumes	
Pea	135
Kidney bean	127
Broad bean	124

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