Moducare: *Plant sterols/sterolins*

Common Indications:

- Helps maintain a healthy and balanced immune system. (Th1/Th2)
- Aid in healthy cholesterol levels.
- Reduced risk of heart disease.
- Used to reduce immune inflammation associated with autoimmune conditions and decrease chronic inflammatory conditions.
- Adaptogenic influence, excellent for athletes

General Comments:

Moducare is a combination of plant fats (sterols & sterolins) extracted from the Maritime pine (*Pinus pinaster*). Moducare uses a clinically proven ratio of 100:1, shown to modulate the immune system.

Plant sterols, also called phytosterols, have been reported to enhance immune function and support the body's inflammation response. Plant sterols are present naturally in small quantities in many fruits, vegetables, nuts, seeds, cereals, legumes, vegetable oils, and other plant sources. Chemically, plant sterols are very similar to the animal fat cholesterol. Plant sterols differ from cholesterol in that they can only be obtained through dietary sources. Although abundant in plants, phytosterols are only consumed in small quantities because the processing of most foods leeches the naturally occurring sterols from plant food sources.

Foods and beverages supplemented with plant sterols are reported to reduce cholesterol and are a promising addition to interventions aimed at lowering heart disease risk. To make plant sterols easier to incorporate in foods with relatively higher fat content (e.g., spreads and salad dressings), food processing techniques extract these plant components from vegetable oils then modify their chemical structure to form esters. The FDA (US Food and Drug Administration) has approved 'health claims' on plant sterol and stanol products. The possible claim is that phytosterols may maintain healthy cholesterol with a low fat diet.

Sterols found in Moducare are not esterified. These sterols have been reported to help improve immunity by working to increase the output and responsiveness of Th1 (T- helper) cells. With this effect, plant sterols found in Moducare can help balance the Th1 and Th2 components of innate immunity and help decrease the effects of chronic inflammatory signaling. Plant sterols also increase the effects of natural killer (NK) cells and other cells of the immune system, all providing

an increase in immune responsiveness.

Chronic inflammation is reported to increase insulin resistance and lead to a host of metabolic problems, from sleep disturbances and weight gain to type 2 diabetes and heart disease.

Benefits & Mechanism of Action:

- Enhances cell division of peripheral blood lymphocytes when stimulated
- Enhances cytotoxicity of natural killer cells.
- β-sitosterol may suppress tumor cell growth.
- Anti-inflammatory properties by switching off the release of pro- inflammatory factors such as Interleukin 6 (IL6) and Tumor Necrosis Factor- alpha (TNF-) from activated monocytes
- Enhances TH1-TH2 balance, promoting TH1 helper cells thus down-regulating B lymphocyte activity. Moducare helps to control inflammatory signaling by inducing a shift from a predominantly humoral immune response to a more protective cellular response (i.e. Th2 to Th1 shift).
- Increases the secretion of IL12, the cytokine released from antigen-presenting cells that promotes the differentiation of precursor T-helper cells into the more polarized Th1 cells
- Adreno-cortical effects by decreasing the cortisol: DHEA ratio suggestive that it enhances the synthesis of DHEA which ultimately, decreases the release of cortisol. This action is akin to adaptogenic influence.
- Plant sterols are poorly absorbed. In the case of β-sitosterol, only 5% is absorbed from the GIT.

Lipid Impact

- Plant sterols decrease total serum cholesterol and LDL cholesterol concentrations in a dose dependent manner, but not serum HDL cholesterol.

The mechanism by which plant sterols lower cholesterol has not been fully determined. Theories include:

- Compete efficiently with dietary cholesterol for micelle incorporation
- Displace cholesterol from bile, decreasing reabsorption
- Decrease hydrolysis of cholesterol esters in the small intestine

Since plant sterols and stanols may alter micelle formation, it is possible that absorption of fat-

soluble nutrients (such as vitamin E and carotenoids) is diminished.

Dose: 1-2 capsules, 3 times daily, taken on an empty stomach. Or 3 capsules twice daily. Do not take Moducare with fat containing beverages as this will limit absorption.

STANDARDIZATION: Moducare® is a mixture of plant sterols/sterolins, namely ß-sitosterol and ß-sitosterol glucoside, in a 100:1 ratio. Moducare contains 20 mg ß-sitosterol and 0.2 mg ß-sitosterol glucoside per capsule.

Cautions & Side Effects:

- Moducare has been reported to be safe in recommended doses.
- The safety of Moducare in pregnancy and breastfeeding has not been established.

Food Sources: Sterols and sterolins occurs in high concentrations in *Brassica* family vegetables, including broccoli, cauliflower, Brussels sprouts, and cabbage.

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