

The role of plant sterols in dietary control of high plasma cholesterol levels

There is irrefutable evidence that high cholesterol levels are associated with an increased risk of coronary heart disease (CHD). The first approach to lowering cholesterol levels is through lifestyle changes such as dietary modification, increased exercise and weight loss (if overweight). Changing to a more plant-based diet, low in cholesterol and saturated fats, is usually the first change recommended by physicians. However, most of us are not psychologically or practically able to comply with such lifestyle changes over the long term. New ideas are needed to improve the cholesterol-lowering effects of dietary interventions, including the development of healthier foods.

Plants do not make cholesterol; instead they make large, waxy sterol compounds that are chemically related to cholesterol. It has been known since the 1950s that certain types of these naturally occurring plant sterols, called phytosterols, could lower cholesterol levels in both humans and animals. Plant sterols, although structurally similar to cholesterol, differ sufficiently from cholesterol that they are not absorbed to any clinically significant degree by humans. In fact, when ingested in large quantities, plant sterols and their saturated derivatives, stanols, actually interfere with the absorption of cholesterol from the digestive tract, causing blood cholesterol levels to drop.

Beta-sitosterol, the major phytosterol, was chemically defined in 1922 and has only recently enjoyed biological importance as the natural approach to control plasma cholesterol levels. However, isolated reports through the years have ascribed other properties to these molecules, including their ability to reduce inflammation in animal models,¹ their insulin-releasing activity (hence their potential use in diabetes),² and their inhibitory activity *vis-à-vis* cancer cell lines.³ More recently, their immune modulatory properties have also been well described.⁴ Large epidemiological reports have correlated the intake of plant material (diets rich in vegetables and fruits) to a lower incidence of cardiovascular diseases, cancer and diabetes in such population groups, and yet the identity and/or mechanism of action of the active principles remain elusive.

Possibly the most important contribution to the scientific literature has been the large body of research conducted in order to determine the best way to administer the plant sterols. Most research has focused on the sterols and only limited data are available on the esters, stanols. In general, plant stanols are absorbed less than the sterols, so from a nutritional perspective sitostanol is thought to be safer than the non-esterified sterol. Extensive studies conducted in animals, and more recently large human safety studies, have confirmed the non-toxicity of

these molecules, even when ingested in large quantities relative to normal dietary intake levels. One aspect that has been debated for several years is whether the intake of these plant sterols could interfere with the absorption of fat-soluble vitamins or pro-vitamins. The latest literature would indicate that no significant reduction in serum levels of vitamins could be detected: the only element that could pose some concern is lycopene.⁵ It is for this reason that increased intake of fruits and vegetables is advised when intervening with functional foods such as sterol-enriched margarines or other foods such as oils, dressings, or mayonnaise.

The Finnish RAISIO Group were the first to develop an esterified plant stanol that could be incorporated into foods (particularly fatty foods) without affecting the appearance and taste. In 1995, a landmark clinical study conducted in Finland showed that a plant stanol-enriched margarine spread caused substantial and clinically relevant reduction in both total and low-density lipoprotein cholesterol of 10% and 14% respectively in patients with mild hypercholesterolaemia.⁶ The amount of stanol consumed by the trial participants was approximately 3 g per day and the spread was exchanged for other dietary fat (e.g. butter). Since this initial study, many larger studies have confirmed the benefit of ingesting these 'functional' margarines.

Since the landmark study conducted in Finland, similar enriched margarines and oils have entered the marketplace as a means of controlling serum cholesterol levels. These have different trade names, and some are marketed as having competitor advantage since the added molecule is not chemically modified but rather incorporated as the native molecule, thereby making it more 'natural'. Locally, such a preparation exists (Pro-activ) and it is of interest that the current issue of the *SAJCN* includes a review of the safety, efficacy and the need for such margarine in our local population.

The high incidence of ischaemic heart disease in our South African population makes the use of such a functional food attractive in order to prevent chronic conditions in the long term. While some cynics have questioned the necessity for such products in a country where other chronic diseases such as tuberculosis, HIV and malaria are ravaging our population, this is not an excuse to ignore other debilitating and costly conditions, which affect a large portion of our country. The issue of cost has also been raised: Vorster *et al.* have addressed this and provide the reader with comparative prices of other margarines. Is a mere R1.40 per day too much to pay for long-term preventive health care? Compared with the cost of

prescription drugs for hypercholesterolaemic patients, this is cheap. It may only target the affluent South African sector at present, but this scenario may change over time as more South Africans become urbanised and their earning power improves.

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Application for research grant

To promote knowledge about the role of sugar in health and nutrition, the South African Sugar Association looks to the scientific community for reliable and up-to-date information. As part of this process it supports scientific research projects, designed to clarify issues which arise in the public domain.

The Sugar Association acts on the recommendations of an independent Research Advisor and Advisory Panel.

Priorities for research funding by the Sugar Association are currently in the following areas:

- Obesity and the comparative role of different dietary factors and forms of exercise.
- Causes and prevention of dental caries.
- Current practices in normal diets, especially for children, and its relation to health.
- Diet in relation to diabetes mellitus.
- Physical work, exercise or sport in relation to diet.

Proposals in any one of these priority fields will be given consideration with preference given for research with unique opportunities in South Africa. The research grants are awarded for one year or for a maximum of two years.

The deadline for proposals to be submitted is 21 November 2003.

Applications forms are available from and, when completed, should be returned to:

**The Nutrition Manager, The South African Sugar Association,
PO Box 700, Mount Edgecombe, Durban, 4300.**

NEITHER LATE APPLICATIONS NOR APPLICATIONS RECEIVED BY FACSIMILE OR EMAIL WILL BE ACCEPTED.

SOUTH AFRICAN SUGAR ASSOCIATION

