REVIEW

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Making the most of cholesterol-lowering margarines

ABSTRACT

Used as a substitute for normal dietary intake of saturated fatty acids, margarines containing plant sterols can cause a modest reduction in serum total cholesterol and low-density lipoprotein cholesterol levels. They have been shown effective in patients with mild hypercholesterolemia, but they are also useful in the general population.

KEY POINTS

Margarines made predominantly of monounsaturated fats fortified with plant sterols lower serum total cholesterol and low-density lipoprotein (LDL) cholesterol in moderately hyperlipidemic persons.

Combining cholesterol-lowering margarines with statin therapy may produce additional significant reductions in serum total cholesterol and LDL cholesterol.

WHILE CHOLESTEROL SYNTHESIS inhibitors can reduce serum cholesterol levels by 25%,[1–3] cholesterol-lowering margarines offer a more modest reduction of about 10%. Who should use these margarines? What is their effect when combined with drug therapy?

Americans consume 12% of total calories as saturated fat and 270 mg per day of dietary cholesterol. Replacement of dietary saturated fat with cholesterol-lowering margarines is an appealing strategy to reduce serum cholesterol in the population at large, although questions remain about cost, long-term effects, and whether they actually have any effect on coronary artery disease.

This article examines the potential role of the margarines Benecol and Take Control, based on data from clinical trials.

HOW CHOLESTEROL-LOWERING MARGARINES WORK

In 1999, the US Food and Drug Administration approved Benecol and Take Control with the designation "functional food." Both margarines are monounsaturated fats (mainly canola oil) fortified with plant sterols (including sterol esters, stanols, and stanol esters). Benecol is fortified with sitostanol ester, whereas Take Control is fortified with less-refined plant sterols. Both products have been found to lower serum total cholesterol and low-density lipoprotein (LDL) cholesterol levels in moderately hyperlipidemic people.

Plant sterols are found in pine wood pulp and vegetable oils (eg, soybean oil), and in small amounts in wheat, rye, oats, and olive oil. Since the 1950s, plant sterols have been added to patients' diets for the treatment of hypercholesterolemia.[4]

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Oral administration of plant sterols inhibits intestinal absorption of cholesterol and increases fecal excretion of both dietary and biliary cholesterol. The exact mechanism is not known. Some experts hypothesize that because their chemical structure closely mimics that of cholesterol, plant sterols compete with cholesterol for micellar solubilization in the gut.[3,5–7]

Plant sterols are poorly absorbed, and those that are absorbed are excreted in the bile; therefore, very little accumulates in plasma and tissues.

EVIDENCE OF CHOLESTEROL-LOWERING EFFECT IN CLINICAL TRIALS

Effects of cholesterol-lowering margarines alone

In a 1-year randomized, double-blind study that compared patients taking margarine with sitostanol ester vs patients taking margarine without sitostanol ester, Miettinen et al[8] concluded that margarine containing sitostanol ester (a highly soluble form of plant sterol) decreased serum total cholesterol by 10% and LDL cholesterol by 14% in patients with mild hypercholesterolemia compared with the control group. The margarine containing sitostanol ester was well tolerated. It had no apparent effect on serum triglyceride or HDL cholesterol levels.

Effect of cholesterol-lowering margarines plus statin therapy

A similarly designed short-term trial found additional significant reductions in serum total cholesterol and LDL cholesterol when combined with statin therapy.[3] In 22 women with angiographically documented coronary artery disease, sitostanol ester margarine alone lowered total cholesterol by 13% ($P < .05$) and lowered LDL cholesterol by 20% ($P < .01$). Combined with simvastatin, sitostanol still reduced total cholesterol by 11% (± 3%, $P < .01$) and LDL cholesterol by 16% (± 5%, $P < .01$). Dietary use of sitostanol ester margarines normalizes LDL cholesterol in about one third of women with previous myocardial infarction, especially in those with high baseline absorption and low synthesis of cholesterol; in combination with statins, it reduces the necessary drug dose.[9]

Sterol ester (Take Control) vs sitostanol ester (Benecol)

Margarine fortified with plant sterols or stanol esters reduces serum total and LDL cholesterol concentrations in subjects with mild hypercholesterolemia. Findings suggest that long-term use of sitostanol ester margarine as a substitute for part of normal dietary saturated fat has favorable effects.[3,6–8]

A study by Denke[10] showed a weak response of the serum cholesterol concentration to dietary sitostanol intake, possibly due to low dietary cholesterol intake (< 200 mg per day) and to the sitostanol preparation used (capsules taken with meals vs sitostanol-fortified canola oil margarine used in previous positive studies).

Though most studies have involved stanol esters, the cholesterol-lowering effects of plant sterols have also been demonstrated. Weststrate et al[9] compared the effects of margarines fortified with different vegetable oil sterols or sitostanol ester on plasma total cholesterol, LDL cholesterol, and HDL cholesterol concentrations. The margarine containing plant sterols was as effective as margarine with sitostanol ester in lowering serum total and LDL cholesterol.[3,9]

Plant sterols increase fecal excretion of cholesterol

THE ROLE OF CHOLESTEROL-LOWERING MARGARINES

Benecol and Take Control are both low in trans-fatty acids (Benecol contains 0.5 g per 1-teaspoon serving); this plus the fact that they are made from predominantly monounsaturated fat should be of additional benefit as a dietary measure to reduce the atherogenic effects of LDL cholesterol oxidation.[11]

When used as a substitute for normal dietary saturated fat intake, cholesterol-lowering margarines are beneficial in patients with mild hypercholesterolemia

The general population may also benefit from using these products, since the average American still consumes far more cholesterol and saturated fat than recommended in American Heart Association Step I dietary guidelines[12]

The plant sterol or stanol added to a 1-tablespoon (2-gram) daily portion of margarine reduces serum total and LDL choles-

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terol by up to 14%; a 25% reduction in coronary artery disease risk would be expected for this reduction in cholesterol, which is greater than the effect that could be expected from reducing saturated fatty acids

These products are expensive: in the United States, 12 oz of Take Control costs $3.79, and 8 oz of Benecol costs $4.99; however, as stanols and sterols become less expensive and are used more widely, these products will become an important innovation in dietary interventions to reduce coronary artery disease.

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