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Incorporating soy protein into a low-fat, low-cholesterol diet

ABSTRACT

The US Food and Drug Administration recommends including four servings of at least 6.25 g each (25 g/day) of soy protein into a diet low in saturated fat and cholesterol to reduce the risk of heart disease. Patients are more likely to comply with this dietary change if they have their physician's support. The author discusses how the clinician can help patients incorporate soy protein into a low-cholesterol, low-fat diet.

KEY POINTS

A meta-analysis found that soy protein consumption achieved an average 9.3% decrease in total cholesterol, a 12.9% decrease in low-density lipoprotein (LDL) cholesterol, and a 10.5% decrease in triglycerides.

Soy pills and supplements such as isoflavone are not recommended. The cholesterol-lowering benefit has only been observed when the intact soy protein is used.

Soy milk can be used in place of milk in coffee or over breakfast cereal, as well as in milkshakes and other blended drinks. Soy milk can be substituted for milk in many recipes.

PATIENT INFORMATION
Putting soy in your diet, page 772

HOW CAN CLINICIANS help patients integrate 25 g of soy protein into their daily diet, as now recommended by the US Food and Drug Administration (FDA) to reduce the risk of coronary heart disease?

The wide range of soy products available makes the recommended four daily servings of 6.25 g of soy protein easy to include in a meal plan. Clinicians who know what soy foods are available and who can help patients overcome initial difficulties are more likely to achieve compliance. In this article, I examine the rationale behind the FDA recommendation and the range of soy products available, with practical suggestions on getting patients to include soy products in their diet.

RATIONALE BEHIND THE RECOMMENDATION

According to the National Cholesterol Education Program (NCEP) guidelines, approximately 52 million Americans are candidates for medically based nutritional therapy for dyslipidemia. Every 1% reduction in serum cholesterol decreases the estimated risk of myocardial infarction by 2%.[1] Adhering to an American Heart Association (AHA) Step I diet is expected to achieve a 5% reduction in serum cholesterol levels (8% for a Step II diet).

In any nutritional therapy, the degree of risk reduction depends on the ratio of saturated fat to total fat, the amount of dietary cholesterol consumed, and patient compliance.[2] Nutritional therapies should also increase food sources of soluble fiber and antioxidant vitamins. Since soybeans are extremely low in saturated fat (1 g saturated fat per half-cup serving of soybeans) and high in soluble fiber, they

are a reasonable addition to a nutritional therapy program such as the Step I diet.

Evidence from clinical trials

The FDA recommendation on soy protein was based on a meta-analysis[3] of 38 clinical studies involving more than 700 people. The meta-analysis found that soy protein consumption achieved, on average, a 9.3% decrease in total cholesterol, a 12.9% decrease in low-density lipoprotein (LDL) cholesterol, and a 10.5% decrease in triglycerides without significantly affecting high-density lipoprotein (HDL) cholesterol concentrations. (A net increase of 2.4% in HDL levels was seen.)

Further observations of the meta-analysis:

- Of the 38 trials analyzed, 34 reported decreases in LDL-cholesterol
- The average intake of soy was 47 g/day (range 17 to 124 g/day) and 14 studies used 31 g/day or less
- One study[4] demonstrated that 25 g/day may be enough to lower cholesterol
- Some studies reported large decreases in cholesterol in response to soy protein, while others reported only minor decreases
- In most studies, animal protein in the diet was replaced by soy protein, but some studies showed a reduction in cholesterol levels by adding soy without decreasing animal protein
- Patients who originally had the highest blood cholesterol levels experienced the greatest degree of cholesterol reduction
- Adults and children showed similar reductions in cholesterol levels.

Advise patients to get soy protein from whole foods, not supplements

QUESTIONS AND CLAIMS ABOUT SOY PROTEIN

How soy reduces cholesterol levels remains unclear.[5] Soybeans contain amino acids, globulins, isoflavones (specifically daidzein and genistein), soy fiber, phytic acid, saponins, and trypsin inhibitors, as well as linolenic acid, an omega-3 fatty acid. Any of these may exert a favorable effect. For example, linolenic acid is thought to reduce cardiovascular risk via an antiarrhythmic effect.[5] Genistein, the isoflavone present in soy in the largest amount, may interfere with the formation of blood clots. Genistein and daidzein may act to reduce the oxidation of LDL cholesterol. Some experts hypothesize that soy enhances bile acid secretion, alters endocrine hormone levels, or directly affects the hepatic metabolism of cholesterol.[6]

Further research is needed to study the precise effects of soy on the human body. Still, its true mechanism of action is likely to be very complicated and to involve a combination of these factors.

The whole soy is better than any of its parts

Since the exact components of soy that provide the health benefits are not known, ingesting the whole soy product is essential. The FDA does not recommend isolating parts of soy and ingesting them as pills to lower cholesterol (eg, as with isoflavone supplements), but rather specifies the use of the intact soy protein for benefit to be achieved.

Other purported health benefits of soy

Even though only soy's cholesterol-lowering ability has been substantiated in clinical trials, claims about other health benefits of soy abound: it has been said to diminish hot flashes and premenstrual symptoms, stop osteoporosis, and decrease the risk of certain cancers.

Despite claims about a benefit of soy in patients with breast cancer,[7] postmenopausal women with estrogen-responsive tumors should avoid consuming high doses of isoflavones (via isoflavone supplements), a soybean component with alleged health benefits. Isoflavone powders, pills, or capsules are currently unregulated, and different brands may contain different concentrations. Isoflavones are biologically active, and the effect of high concentrations is not known. Again, advise patients to get soy from whole foods, not from supplements.

Soy is safe

Although hard data on the safety of soy foods and their benefits on human health are scant, soy has been consumed safely in eastern Asia for at least 4,000 years. The Japanese consume from 10 to 50 g/day of soy protein per person (vs 1 to 3 g/day in the United States). Soy has been used for many years in infant formulas and adult enteral supplements. Vegetarians and athletes typically consume soy products.

SOY FOOD LABELING REQUIREMENTS

To include any claim of cholesterol-lowering benefits, soy products must contain, per serving:

- At least 6.25 g of soy protein
- Less than 3 g of fat
- Less 1 g of saturated fat
- Less than 20 mg of cholesterol
- Less than 480 mg of sodium for a single serving, less than 720 mg if classified as a main dish, and less than 960 mg if classified as a meal.

Because soybeans are extremely low in fat, foods made from whole soybeans qualify for the health claim if they contain no additional fat.

The soy protein content of soy foods varies widely (TABLE 1). Soy sauce and soy oil do not contain soy protein.

TABLE 1

Average soy protein content of common soy foods

FOOD	GRAMS OF SOY PROTEIN
Tempeh, 1/2 cup or 4 ounces	16
Soybeans, cooked or canned, 1/2 cup	13
Textured soy protein, dry, 1/4 cup	12
Soynuts (roasted soybeans), 1/4 cup or 1 ounce	12
Soy burger, 1 burger, one 3-ounce burger	10
Soybeans, black, 1/2 cup	9
Soy ground "crumbles," 1/2 cup or 2 ounces	9
Tofu, water-packed, 3 ounces	8.5
Soy milk, plain, 8 ounces	8
Soy nut butter, 2 tablespoons	8
Soybeans, green, 1/2 cup	7
Soy breakfast links, 2 links	6.5
Soy breakfast patty, 1 patty	6.5
Tofu, silken, firm, 3 ounces	6
Soy milk, vanilla, 8 ounces	6

FROM THE INDIANA SOYBEAN BOARD

HOW TO ADD SOY PROTEIN TO THE DIET

Some patients may have initial concerns about the taste or the availability of soy products. However, a survey by the United Soybean Board showed that 68% of those who tried soy products said they used them regularly. The survey also found that 24% of all Americans now use soy or soy protein products at least once a week, and that people are aware of such soy products as beverages, tofu, and soy burgers (textured soy protein burgers). Currently, a wide variety of soy foods is available in most grocery stores.

Patients unfamiliar with soy products may be more willing to try soy foods that closely mimic foods they are familiar with: for example, soy beverages are similar to milk, soybeans are similar to other types of beans, and textured soy protein is similar to ground meat.

Soy milk and other soy beverages

Soy milk is made by pressing the liquid from ground soybeans. Brands vary in taste, color, and texture. Soy milk fortified with calcium and vitamin D is an adequate replacement for cow's milk. Soy milk is available plain (unflavored) or flavored with chocolate, carob, or vanilla.

For patients who drink milk, soy milk may be a good introduction to soy. Soy milk can be used in place of milk in coffee or over breakfast cereal, as well as in milkshakes and other blended drinks. Soy milk also can be substituted for milk in many recipes.

Patients unable to drink milk because of allergy or lactose intolerance can drink soy milk, which is non-dairy and lactose-free.

For patients who have difficulty acquiring a taste for soy milk, suggest adding soy milk to cow's milk and slowly titrating upward the amount of soy milk.

Soy milk is usually found alongside cow's milk in the dairy case, or on the shelf in the organic and baby formula sections of most grocery stores. It is sold in waxed cardboard or aseptic paper cartons ranging in size from 8 ounces to 1/2 gallon. It is also sold in cans as liquid or powder. Aseptic containers and dried powders are useful for hiking, camping, and travel.

Soy sauce and soybean oil contain no soy protein

Soybeans

Soybeans are widely available and inexpensive and can be bought raw, frozen, canned, dried, or roasted. They can often be purchased in bulk.

Soybeans can easily be substituted for other beans in any bean dish (eg, chili, baked beans). They can be served with rice or pasta, in soup, stir-fried, or sprinkled cold over salads. Roasted soybeans (soy "nuts") can be eaten as a snack, sprinkled on salads, or included in stir-fry dishes and desserts.

Textured soy protein

Textured soy protein is made from defatted soy flour. It is compressed and processed into granules or chunks and closely resembles ground meat when reconstituted. It is often available in dried form, which is rehydrated with an equal amount of boiling water.

Textured soy protein can replace all or part of the ground meat in most recipes (eg, chili, tacos, burritos, stuffed peppers, spaghetti sauce, lasagna, Sloppy Joes, cabbage rolls). It has been used for years as a meat extender in institutional cooking. Textured soy protein takes on the flavor of whatever it is cooked with and tastes best in spicy or highly flavored dishes.

Frozen, reconstituted textured soy protein is labeled as "ground soy meat alternative" or "soy burger style crumbles." This form is prebrowned and can be directly added to any dish and heated. Most contain little if any fat and no saturated fat.

Gradually introducing soy into the diet minimizes flatulence and bowel discomfort

Tofu, tempeh

Tofu (soybean curd) and tempeh (fermented soybeans) are soy foods often used as a meat substitute in Asian cooking and are available in many stores. They come in various forms, consistencies, and flavors. As with textured soy protein, they can be added to any dish, and they take on the flavor of whatever they are cooked with.

Read labels carefully

Other products such as burgers, hot dogs, "chicken-style" patties, and breakfast and dinner patties may contain only small amounts of soy protein. Advise patients to check the ingredients, listed in descending order by weight. If the label lists egg whites, oats, flour, cheese, or other products first, the soy protein content is probably low. Some vegetable burgers contain no soy: they are made from vegetables and grains.

The label should list soy protein concentrate, textured soy protein, or soy protein isolate as the main ingredient. Until food labels on soy foods are printed with the new soy protein health claims, the protein value listed on the nutrition facts label refers to total protein, not soy protein.

MINIMIZING INTESTINAL SYMPTOMS

Patients who introduce soy, especially soybeans, into their diet may experience flatulence and intestinal discomfort. Soy is a fiber-rich food, and taking in too much too fast may cause discomfort. In addition, soybeans contain several sugars that human enzymes cannot digest. These sugars are fermented by bacteria in the gut, producing flatulence.

To minimize flatulence and intestinal discomfort, advise patients to incorporate soy gradually. They should start by adding one soy serving one or two times per week. Increase this to one serving per day, then to two to four servings per day over a period of several weeks. Drinking plenty of fluids helps with digestion. If flatulence persists, an over-the-counter alpha-galactoside enzyme preparation may help.

PATIENT MOTIVATION

Physician encouragement is essential in helping patients to adopt soy into a low-cholesterol, low-fat diet—either as a trial treatment to lower LDL cholesterol levels or as an adjunct to cholesterol-lowering drug therapy. Suggesting specific meal plans helps compliance, and providing patients with sources from which to learn more about soy products may also be helpful. The **Patient Information page, "Putting soy in your diet," page 772**, is designed to help patients make the transition.

In patients with comorbid conditions, such as hypertension or diabetes mellitus, individualized dietary therapy and consultation with a registered dietitian or other nutrition professional often improves dietary adherence[8] and can be a useful adjunct to pharmacologic treatment. Multiple sessions with a registered dietitian have been found to be effective.[9]

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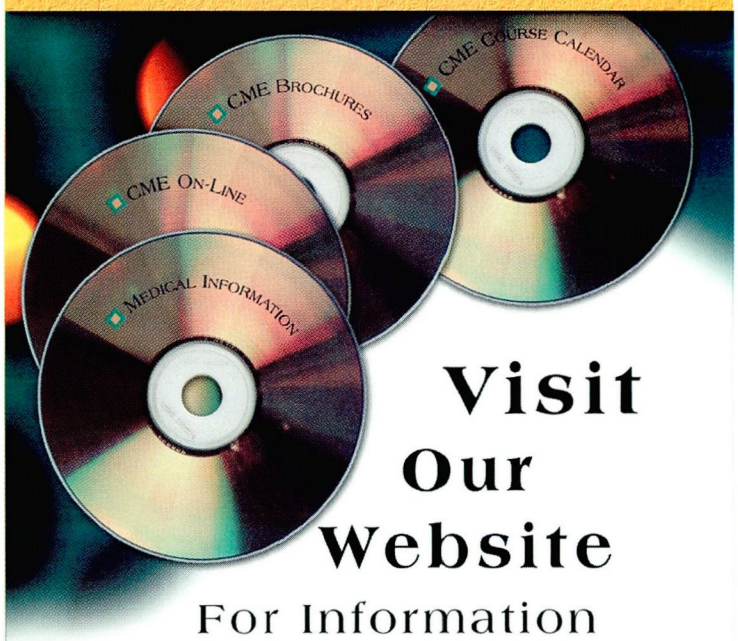

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