USANA Technical Bulletin

Soy

Technical Background

- Soybeans are a good source of carbohydrates, fat, protein, fiber, and calcium. For this reason alone soy foods are nutritious. Scientists are now identifying other beneficial compounds in soy foods. Among these compounds are genistein, daidzien, and other biologically active portions of the protein such as protease inhibitors, phytates, phytosterols, lecithins, saponins, and phenolic acids.
- The high consumption of soy in China and Japan correlates with relatively low rates of colon, breast and prostate cancer. This research indicates that soy has a protective effect.[1]
- In one study when animal protein was replaced with soy protein, LDL and total cholesterol decreased and HDL cholesterol increased.[2, 3] In humans, daily consumption of 31 to 47 grams of soy protein significantly decreased blood cholesterol and LDL cholesterol concentrations. The greatest benefit was shown in patients with higher initial serum cholesterol levels.[3]
- The isoflavones genistein and diadzien are protective phytoestrogens. Soy protein, with intact genistein and daidzein, significantly decreased LDL cholesterol 30% to 40% and significantly increased HDL cholesterol to LDL cholesterol ratios by 15%.[4] Possible mechanisms for soy's cholesterol lowering effect include an increase in bile acid excretion, a preferable ratio of the amino acids arginine and lysine, and changes in liver metabolism of cholesterol.[5]
- It has been proposed that soy isoflavones also act as estrogen-like compounds. Forty-five grams of dietary soy, per day for 12 weeks decreased post-menopausal hot flashes.[6]
- Soy supplementation has been suggested as a possible alternative to hormone replacement therapy. Post-menopausal symptoms decreased after soy supplementation.[7]
- Research has shown that protease inhibitors and phytic acid, two of the non-nutritive compounds in soybeans, contribute to the anti-carcinogenic effect of soy.[8]
- Soy has also shown to improve bone health by decreasing bone breakdown.[9]

Sources and Recommendation Intake

- There is no RDA for soy. Soy can be found in a variety of forms such as tofu, and is also used as the main protein source for many other foods, including many meat-substitute products.
- Soy intakes of 40 gram per day for 6 months increased bone mineral content and bone density in postmenopausal women.[10]

Abstracts

Anderson JW, Johnstone BM, Cook-Newell ME. Meta-analysis of the effects of soy protein intake on serum lipids. N Engl J Med 1995; 333(5):276-82.

BACKGROUND. In laboratory animals' the consumption of soy protein' rather than animal protein' decreases serum cholesterol concentrations' but studies in humans have been inconclusive. In this meta-analysis of 38 controlled clinical trials' we examined the relation between soy protein consumption and serum lipid concentrations in humans. METHODS. We used a random-effects model to quantify the average effects of soy protein intake on serum lipids in the studies we examined and used hierarchical mixed-effects regression models to predict variation as a function of the characteristics of the studies. RESULTS. In most of the studies' the intake of energy' fat' saturated fat' and cholesterol was similar when the subJects ingested control and soy-containing diets; soy protein intake averaged 47 g per day. Ingestion of soy protein was associated with the following net changes in serum lipid concentrations from the concentrations reached with the control diet: total cholesterol' a decrease of 23.2 mg per deciliter (0.60 mmol per liter); 95 percent confidence interval' 13.5 to 32.9 mg per deciliter [0.35 to 0.85 mmol per liter)' or 9.3 percent; low-density lipoprotein (LDL) cholesterol' a decrease of 21.7 mg per deciliter (0.56 mmol per liter); 95 percent confidence interval' 11.2 to 31.7 mg per deciliter [0.30 to 0.82 mmol per liter)' or 12.9 percent; and triglycerides' a decrease of 13.3 mg per deciliter (0.15 mmol per liter; 95 percent confidence interval' 0.3 to 25.7 mg per deciliter [0.003 to 0.29 mmol per liter)' or 10.5 percent. The changes in serum cholesterol and LDL cholesterol concentrations were directly related to the initial serum cholesterol concentration ($P < 0.001$). The ingestion of soy protein was associated with a nonsignificant 2.4 percent increase in serum concentrations of high-density lipoprotein (HDL) cholesterol. CONCLUSIONS. In this meta-analysis we found that the consumption of soy protein rather than animal protein significantly decreased serum concentrations of total cholesterol' LDL cholesterol' and triglycerides without significantly affecting serum HDL cholesterol concentrations.

Wang C, Kurzer MS. Phytoestrogen concentration determines effects on DNA synthesis in human breast cancer cells. Nutr Cancer 1997;28(3):236-47.

Thirteen isoflavonoids, flavonoids, and lignans, including some known phytoestrogens, were evaluated for their effects on DNA synthesis in estrogen-dependent (MCF-7) and -independent (MDA-MB-231) human breast cancer cells. Treatment for 24 hours with most of the compounds at 20-80 microM sharply inhibited DNA synthesis in MDA-MB-231 cells. In MCF-7 cells, on the other hand, biphasic effects were seen. At 0.1-10 microM, coumestrol, genistein, biochanin A, apigenin, luteolin, kaempferol, and enterolactone induced DNA synthesis 150-235% and, at 20-90 microM, inhibited DNA synthesis by 50%. Treatment of MCF-7 cells for 10 days with genistein or coumestrol showed continuous stimulation of DNA synthesis at low concentrations. Time-course experiments with genistein in MCF-7 cells showed effects to be reversed by 48-hour withdrawal of genistein at most concentrations. Induction of DNA synthesis in MCF-7 cells, but not in MDA-MB-231 cells, is consistent with an estrogenic effect of these compounds. Inhibition of estrogen-dependent and -independent breast cancer cells at high concentrations suggests additional mechanisms independent of the estrogen receptor. The current focus on the role of phytoestrogens in cancer prevention must take into account the biphasic effects observed in this study, showing inhibition of DNA synthesis at high concentrations but induction at concentrations close to probable levels in humans.

References

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