

SOY

& HEALTH

Incorporating Optimal Levels of Protein in the Diet



Soyfoods Contain High Quality Protein

Soyfoods are a source of high quality protein.^{1,2,3,4} In addition, consumption of soy protein provides health benefits that may help prevent or treat certain chronic diseases.

Soybeans have a high protein content.¹ In most legumes, protein accounts for 20% to 30% of the weight. In whole soybeans, protein accounts for about 35% to 38% of the weight.¹ The amount of protein varies in soy products, with the following products generally containing these percentages: soy flour, 50%; soy concentrate, 70%; and soy isolate, 90%.

Plant proteins are often considered to be of lower quality than animal proteins because they have a lower content of certain essential amino acids. Grains tend to be low in lysine, while beans tend to be low in the sulfur amino acids, methionine and cysteine. Though still limited in sulfur amino acids, soybeans have more than other beans.¹ The amino acid profile of soybeans compares well with human requirements.² The World Health Organization has established that when consumed at the recommended level of protein intake, soy protein contains sufficient amounts of all essential amino acids for human needs, and is considered equivalent to animal protein in quality.³

A new method of evaluating protein quality has helped to clarify the real value of soy proteins.⁴ The old method of evaluating proteins was the protein efficiency ratio (PER). It was based on the response of growing rats to a given amount of protein. The PER values were skewed because rat protein requirements are quite different from those of humans. For example, a rat has a 50% higher methionine requirement, so the PER ratings did not do justice to legumes in general. The new evaluation method is called the protein digestibility corrected amino acid score (PDCAAS). It takes into account the amino acid profile of the protein, plus a rating of its digestibility by humans. Using this method of evaluation, soy protein has the same score as egg white and milk protein.⁴

Among humans, children under age two have the greatest protein needs, on a per kg of body weight basis. For this reason, infant formulas are often supplemented with methionine for added assurance.

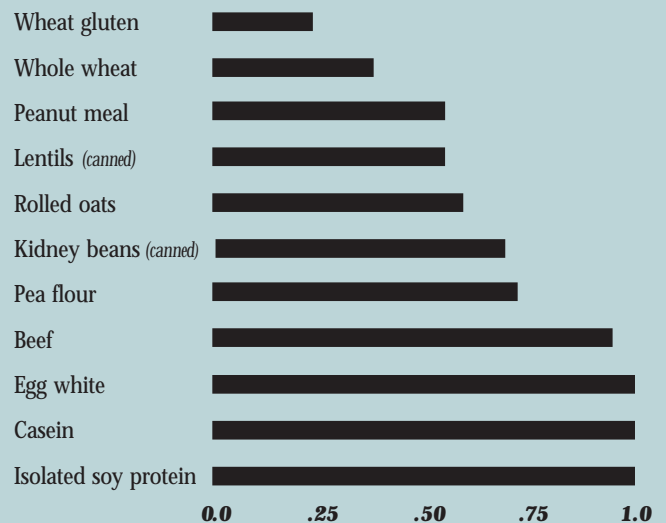
Soy Protein May Help Reduce Heart Disease Risk

Currently a great deal of research is being conducted to investigate possible health benefits of soy protein.

Dietary soy protein may help reduce risk for heart disease by lowering blood levels of LDL cholesterol and lipids.^{5,6,7} For many years scientists have noticed that consumption of soyfoods tends to have a cholesterol-lowering effect. Soybeans are low in saturated fat, and have no cholesterol. Replacing animal protein with soy protein in the diet has been shown to lower blood cholesterol levels, in both



PDCAAS of Selected Food Proteins*



* from Protein Quality Evaluation, Report of the Joint FAO/WHO Expert Consultation, FAO/WHO, 1989

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animals and humans.⁵

A recent meta-analysis of 38 studies concluded that consuming soy protein decreases total cholesterol, LDL cholesterol and triglycerides, without lowering HDL cholesterol, in humans with high cholesterol.⁶ As little as 25 grams of soy protein per day was shown to reduce cholesterol levels in hypercholesterolemic men.⁷ It is not clear how this works, but there are several theories.

Researchers have found that isoflavones associated with soy proteins enhance the cholesterol-lowering effects in rhesus monkeys.⁸ The synergy between proteins and isoflavones may be a major factor in soy's ability to lower cholesterol.⁸ Soy protein has also been shown to interfere with the oxidation of LDL cholesterol.⁹ This is another way in which soy protein may help in the prevention of atherosclerosis.

There is evidence that consumption of soy protein may help reduce risk of osteoporosis.^{10,11} Soy protein isolate consumption was found to prevent bone loss in ovariectomized rats.¹⁰ The rats in the study served as an animal model of osteoporosis. Further research is needed to clarify whether the protective effect of soy was due to the protein or the isoflavones associated with it. Other researchers have found that humans consuming soy protein lose less calcium in their urine than those consuming animal protein.¹¹ Excessive intake of sulfur amino acids, found at high levels in animal protein, tends to promote urinary loss of calcium.¹¹

Soy protein consumption also has a favorable effect on kidney function.^{12,13} When rats were challenged with experimental renal disease, those ingesting soy protein diets had better survival rates and less renal damage than those on casein diets.¹² A study of healthy human volunteers showed differences in renal function when consuming soy and meat diets with equal levels of protein.¹³ While consuming the soy diet, the subjects had a lower glomerular filtration rate, renal plasma flow and fractional clearance of albumin.¹³ The practical implication of this study is that renal patients may be able to achieve the same results with a soy diet as with a protein-restricted diet.

Dietary soy protein appears to have beneficial effects in several different areas of health. Mechanisms by which these health benefits occur are not completely understood. In some cases, a combination of soy protein and isoflavones may be necessary to achieve the effect.^{8,10,14}

Conclusion Soy protein meets biological requirements when consumed at the recommended level of protein intake. In addition, consumption of soy protein may help prevent or treat certain chronic diseases including atherosclerosis, osteoporosis and renal disease.

For more information, call 1-800-TALK SOY. Or visit our Web site at www.talksoy.com

References

1. United States Department of Agriculture. Composition of Foods: Legumes and Legume Products. Washington, DC: USDA, 1986. (USDA handbook 8-16)
2. Young, VR. Soy protein in relation to human protein and amino acid nutrition. J Am Diet Assoc. 1991; 91: 828-835
3. FAO/WHO/UNU Expert Consultation. Energy and Protein Requirements. Geneva: World Health Organization, 1985. (WHO technical report, series 724)
4. Federal Register: Food and Drug Administration. 21 CFR, Part 101, et al. Part III. Food Labeling. 1991
5. Carroll, KK. Review of clinical studies on cholesterol-lowering response to soy protein. J Am Diet Assoc. 1991; 91: 820-827
6. 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: 276-282
7. Bakhit, RM, Klein, BP, et al. Intake of 25g of soybean protein with or without soybean fiber alters plasma lipids in men with elevated cholesterol concentrations. J Nutr. 1994; 124:213-222
8. Anthony, MS, Clarkson, TB, et al. Soybean isoflavones improve cardiovascular risk factors without affecting the reproductive system of peripubertal rhesus monkeys. J Nutr. 1996; 126: 43-50
9. Kanazawa, T, Osanai, T, et al. Protective effects of soy protein on the peroxidizability of lipoproteins in cerebrovascular diseases. J Nutr. 1995; 125: 639S-646S
10. Arjmandi, BH, Alekel, L, et al. Dietary soybean protein prevents bone loss in an ovariectomized rat model of osteoporosis. J Nutr. 1996; 126: 161-167
11. Breslau, NA, Brinkley, L, Hill, KD, Pak, CYC. Relationship of animal protein-rich diet to kidney stone formation and calcium metabolism. J Clin Endocrinol Metab. 1988; 66: 140-6
12. Williams, AJ, Baker, F, Walls, J. Effect of varying quantity and quality of dietary protein intake in experimental renal disease in rats. Nephron. 1987; 46: 83-90
13. Kontessis, P, Jones, S, et al. Renal, metabolic and hormonal responses to ingestion of animal and vegetable proteins. Kidney Int. 1990; 38: 136-144
14. Chait, A, Brunzell, JD, Denke, MA, et al. Rationale of the diet-heart statement of the American Heart Association: report of the Nutrition Committee. Circulation 1993; 88: 3008-29