

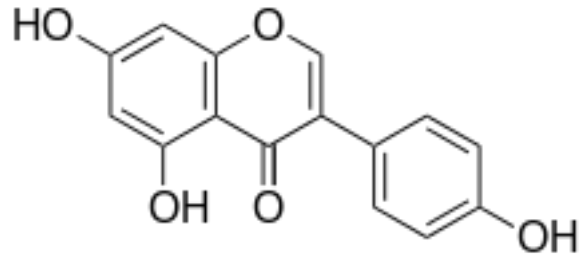
Nutrition and Health Info Sheet: Soy

For Health Professionals

Produced by:
Lori Nguyen, PhD Candidate
Francene Steinberg, PhD, RD
Sheri-Zidenberg-Cherr, PhD
Center for Nutrition in Schools
Department of Nutrition
University of California, Davis
January 2016

What is soy?

The soybean is a legume that provides a low-cost source of plant protein. Soy has been consumed in Asian nations for many centuries. This food is a low fat source of protein, fiber, minerals, and isoflavones (a type of flavonoid, a bioactive plant metabolite), all beneficial nutrients that may contribute to a reduction in chronic disease risk. Regular intake of this food is thought to be partially responsible for the lower rates of heart disease, stroke, and cancer observed in Asian populations.



Genistein, a common isoflavone found in soy.

What are the isoflavones contained in soy?

The isoflavones genistein, daidzein, and glycitein are the isoflavone components of soy protein. Also known as phytoestrogens, these compounds are structurally similar to the hormone estrogen, and they interact with estrogen receptors in the body. Many researchers believe that the isoflavones may be a biologically active component of soy, along with the soy proteins, that are responsible for the beneficial effects observed after soy consumption.¹ Due to concerns that have been raised by the use of hormone replacement therapy, many researchers are looking to soy as a possible natural alternative to prevent some of the symptoms associated with menopause.¹ While epidemiological studies have demonstrated that phytoestrogens may alleviate menopausal symptoms, toxicity is not yet determined and more research is needed before recommendations can be made regarding soy intake for this purpose.²

What are good sources of soy?

There are many soy products out on the market; however, most of these have undergone such high levels of processing that much of the nutritional benefit is lost. Below is a listing of high-quality sources.

Edamame or Soy Beans

Soy beans are the least processed form of soy protein. Available in most grocery stores, they can be purchased in fresh, frozen, or roasted forms. These beans can be eaten alone, like peas, or added to salads and stir-fries.



Photo by: Tammy Green via Wikimedia Commons

Tofu

Tofu, or bean curd, is made by curdling soymilk with a coagulant. Available in both soft and firm forms, tofu can be used in a variety of recipes to partially replace either meat or dairy products. Due to the common use of calcium sulfate as the curdling agent, tofu can also be a good source of calcium. A 1/2 cup serving may contain as much as 130 mg of calcium.



Photo by: LinasD via Wikimedia Commons

Soymilk

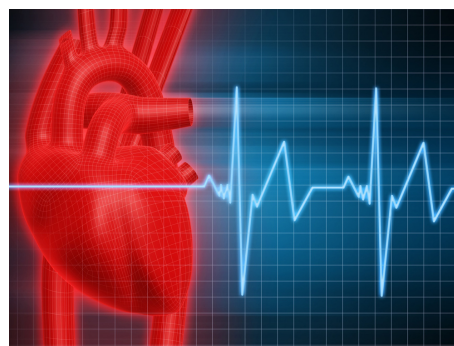
Soymilk is another high-quality source of soy protein that is available in a variety of forms, including plain, vanilla, and chocolate. It can be used to replace milk added to coffee, tea, or cereal. A one-cup serving can have as much as 300 mg of calcium.

Why should people eat soy?

Epidemiological studies suggest that regular consumption of plant-based protein foods reduces one's risk for chronic diseases such as cancer, and heart disease.³⁻⁷ Plant-based foods, such as soy, can provide the body with beneficial agents including vitamins, minerals, fiber, and flavonoids. Numerous clinical trials have investigated the potential of soy to protect against the risk of chronic disease. Below is a listing of some of these findings.

Soy and Heart Disease

Isoflavones have been associated with lowering total and LDL cholesterol, and increasing HDL cholesterol, reducing LDL oxidation, and improving vascular function, possibly reducing the risk of coronary artery disease.³⁻⁵ Consumption of soy has been associated with modest improvements in lipoproteins and blood pressure; however, consumption of soy protein-rich foods may indirectly reduce heart disease risk if it serves as a substitute for animal protein, which contains saturated fat and cholesterol while soy does not.⁵



Soy and Cancer

Numerous studies have investigated the anticarcinogenic properties of soy. It has been suggested that soy isoflavones may provide antioxidant defense, DNA repair, and inhibition of cancerous cell growth.⁷ Regular consumption of soy protein by healthy adult populations has been associated with a reduction in risk of both breast and prostate cancer. As with any

significant dietary change, women with breast cancer or elevated risk for this disease should consult their physician before adding soy to their diet.

Soy and Osteoporosis

Due to the similarity in the structures of the isoflavones and estrogen, several studies are investigating the ability of isoflavones to reduce the rapid rate of bone loss that is associated with the onset of menopause. However, recent clinical trials are reporting minimal effect of these soy isoflavones on bone loss in postmenopausal women.^{8,9}

Soy and Diabetes

Habitual consumption of soy may help to reduce the risk of Type 2 Diabetes.¹⁰ Soy has also been shown to help manage symptoms of diabetes by decreasing postprandial hyperglycemia, improving glucose tolerance, and decreasing amounts of glycosylated hemoglobin.¹¹

Soy and Obesity

A recent observational investigation in postmenopausal women found a favorable association between regular consumption of soy protein and a lower body mass index, higher HDL cholesterol concentration, and lower fasting insulin levels.¹¹ More research must be completed before any firm conclusions can be made.

How much soy is recommended?

According to the American Heart Association and the US Food and Drug Administration (FDA), soy products have beneficial nutrient profiles and daily consumption of 25 grams or more of soy protein with isoflavones can help lower cholesterol levels in individuals at high risk for heart disease.¹² An average serving of soy foods provides 6.25 grams of soy protein, so an individual who is trying to lower his or her cholesterol should aim for eating about four servings of high-quality soy foods a day. If a breast cancer patient, or person who is at high risk for this disease, enjoys eating soy, occasional consumption does not appear to pose any risk; however, these individuals should consult their physicians before adding soy to their diets.¹²



Can too much soy be harmful?

Numerous clinical studies have found that daily consumption of up to 50 grams of soy protein is not only safe, but may also be effective in improving risk factors for chronic disease such as some types of cancer, diabetes, and cardiovascular disease.¹²

There is little basis for concern that excessive amounts of dietary soy, even in those with or at high risk for breast cancer, will lead to adverse health effects.^{13,14} Even still, there are many types of low fat, high fiber legume options and eating a varied diet is recommended to harvest a variety of nutrients.



What are some ways to increase soy intake?

Below is a list of suggestions to help you achieve the American Heart Association and the FDA's recommended four servings of soy per day.

Replace some or all of the meat in your favorite recipes with tofu or texturized vegetable protein (TVP).

- In spaghetti sauce, replace half of your ground beef with TVP.
- In stir-fry or fajitas, replace the usual chicken or beef with cubed firm tofu.
- In chili, replace half of your ground beef with TVP.
- Make tacos with TVP.
- Add some TVP to meatloaf.

Use silken tofu to replace sour cream, yogurt, or cheese in recipes.

- Make a dip for vegetables with half silken tofu and half sour cream. Add one package of dried onion soup mix, combine in a blender, and serve.
- Make a morning smoothie with silken tofu instead of the usual yogurt.
- Replace half of the ricotta cheese with puréed firm tofu in lasagna.
- Use silken tofu to replace the heavy cream in your favorite soup recipe.
- Make a mixture of half sour cream and half silken tofu to use as a low-fat topping on baked potatoes.



Photo by: United Soybean Board

Try some of the new soy products available at the super market.

- Replace your morning breakfast sausage with soy sausage or soyriso (soy chorizo).
- Try some of the numerous types of garden of eden or soy burgers.
- Use soymilk instead of creamer in your morning coffee or tea or on your breakfast cereal.
- Use soy nuts as a salad topper or eat them alone as a snack.
- Try soy nut butter and jelly for your next brown bag lunch

Should people take isoflavone supplements?

Although many researchers have attempted to isolate the active component of soy to create an effective soy supplement, there appears to be some additional benefit provided by consuming the intact protein particularly for lowering cholesterol. Furthermore, the actual isoflavone content of any supplement cannot be guaranteed. For these reasons, it is recommended that people wishing to lower their cholesterol attempt to incorporate high-quality sources of soy protein into their diet rather than resorting to supplements.

Listed below are some common foods and their soy protein content.

Food	Serving	Soy Protein (g)	Isoflavone Content* (mg)	Calories
soy burger	1 patty	8	7	100
soy nuts	1 oz	12	38	150
soy milk	1 cup	8	24	100
texturized vegetable protein (TVP)	<1/4> cup	14	27	50
tofu	3 oz	9	33	45
soy protein bar	1 bar	6	10-15 [†]	180
soy breakfast pattie	2 patties	16	4	160
soy flour	<1/4> cup	12	33	90
soy beans, boiled	<1/2> cup	7	47	190
tempeh	<1/2> cup	18	36	200
soy nut butter	2 Tbs	8	0	160

*Obtained from the USDA-Iowa State University database on the isoflavone content of food.

[†]Estimated from nutrition label information.

Acknowledgements:

Karrie Heneman, PhD contributed to this Fact Sheet.

References:

1. Song WO, et al. Soy isoflavones as safe functional ingredients. *JH Med Food*. 2007;10(4): 571-580.
2. Moreira AC, et al. Phytoestrogens as alternative hormone replacement therapy in menopause: What is real, what is unknown. *J Steroid Biochem Mol Biol*. 2014;1 143: 61-71.
3. Rangel-Huerta OD, et al. A systematic review of the efficacy of bioactive compounds in cardiovascular disease: Phenolic compounds. *Nutrients*. 2015; 7(7):5177-5216.
4. Anderson JW, et al. Soy proteins effects on serum lipoproteins: a quality assessment and meta-analysis of randomized, controlled studies. *J Am Coll Nutr*. 2011; 30:79-91.
5. Eilat-Adar S, et al. Nutritional recommendations for cardiovascular disease prevention. *Nutrients*. 2013; 5(9):3646-3683.
6. Wu YC, et al. Meta-analysis of studies on breast cancer risk and diet in Chinese women. *Int J Clin Exp Med*. 2015; 8(1):73-85.
7. Mahmoud AM, et al. Soy isoflavones and Prostate Cancer: A Review of Molecular Mechanisms. *J Steroid Biochem Mol Bio*. 2014; 140:116-132.
8. Alekal DL, et al. The Soy Isoflavones for Reducing Bone Loss (SIRBL) Study: a 3-y randomized controlled trial in postmenopausal women. *Am J Clin Nutr*. 2010; 91(1):218-230.
9. Tai TY, et al. The effect of soy isoflavone on bone mineral density in postmenopausal Taiwanese women with bone loss: a 2-year randomized double-blind placebo-controlled study. *Osteoporosis Int*. 2012; 23(5):1571-1580.
10. Soy intake and risk of type 2 diabetes mellitus in Chinese Singaporeans. *Eur J Nutr*. 2012; 51(8):1033-1040.
11. Bathena SJ, and Velasquez MT. Beneficial role of dietary phytoestrogens in obesity and diabetes. *Am J Clin Nutr*. 2002; 76:1191-1201.
12. Sacks FM, et al. Soy protein, isoflavones and cardiovascular health. *Circulation*. 2006; 113:1034-1044.

13. Messina M, Soy foods, isoflavones, and the health of postmenopausal women. *Am J Clin Nutr.* 2014; 100(suppl):423S-30S.
14. Steinberg FM, et al. Clinical outcomes of a 2-y soy isoflavone supplementation in menopausal women. *Am J Clin Nutr.* 2011; 93(2):356-357.

The University of California prohibits discrimination or harassment of any person on the basis of race, color, national origin, religion, sex, gender identity, pregnancy (including childbirth, and medical conditions related to pregnancy or childbirth), physical or mental disability, medical condition (cancer-related or genetic characteristics), ancestry, marital status, age, sexual orientation, citizenship, or service in the uniformed services (as defined by the Uniformed Services Employment and Reemployment Rights Act of 1994: service in the uniformed services includes membership, application for membership, performance of service, application for service, or obligation for service in the uniformed services) in any of its programs or activities.

University policy also prohibits reprisal or retaliation against any person in any of its programs or activities for making a complaint of discrimination or sexual harassment or for using or participating in the investigation or resolution process of any such complaint.

University policy is intended to be consistent with the provisions of applicable State and Federal laws.

Inquiries regarding the University's nondiscrimination policies may be directed to the Affirmative Action/Equal Opportunity Director, University of California, Agriculture and Natural Resources, 1111 Franklin Street, 6th Floor, Oakland, CA 94607, (510) 987-0096.

Copyright © The Regents of the University of California, Davis campus, 2016. All rights reserved. Inquiries regarding this publication may be directed to cns@ucdavis.edu. The information provided in this publication is intended for general consumer understanding, and is not intended to be used for medical diagnosis or treatment, or to substitute for professional medical advice.