



SOY OH SOY!

Is it really bad for you?

BY DAVID SCHARDT

Big soymilk fan? Can't live without tofu or veggie burgers? You're in trouble, at least according to the always-reliable Internet, where thehealthyhomeeconomist.com reveals the "170 Scientific Reasons to Lose Soy in Your Diet" and mercola.com warns of the "thousands of studies" that link soy to everything from cancer to mental decline. There's more. Lot's more.

Could a food that's been eaten for thousands of years—and that we scarf down to the tune of \$4.5 billion a year's worth of veggie burgers, protein bars, tofu, edamame, and soy yogurt, milk, cereal, spreads, and creamers—be harmful? Here's what we know.

Breast Cancer

The rap: "Researchers have linked soy to an early form of breast cancer."

—rethinkingcancer.org

The real story: "When I started out in soy research 20 years ago, most researchers were convinced that soy was a great food for preventing cancer," says Gertraud Maskarinec, a professor at the University of Hawaii Cancer Center.

That's because women in Japan, China, and Singapore, where soy is a diet staple, had (and still have) lower rates of breast cancer than U.S. women.

That belief was shaken in 1996, when a pilot study suggested that soy protein and soy isoflavones—compounds in soybeans that are similar to, but much weaker than, estrogen—stimulated the breast to produce more abnormal cells, which could boost cancer risk.¹

"The study did an incredible amount of harm to women, because it was interpreted out of proportion to what it was capable of showing," says Maskarinec.

The researchers looked at the breast fluid of 24 women who for six months ate no soy and for six months ate 37 grams a day of soy protein. (That's what you'd get in about a pound of tofu or 1½ cups of shelled and cooked edamame.)

But studies that try to collect fluid from the breast are tricky. "There isn't always enough, and some days there are cells in the fluid and some days there are none,"

explains Maskarinec, whose 2013 study contradicted the earlier results.²

"In our study, 82 women consumed a diet containing either two servings of soy foods each day or less than three servings a week, and they ate each diet for six months," she notes.

More soy made no difference. "Less than half the women were able to provide enough fluid. In what we were able to collect, we found no indication that they had more aberrant cells when they consumed lots of soy foods."



Soy protein (isolate, concentrate, flakes, or grits) is added to many protein bars, veggie burgers, cereals, and other foods.

A better way to test whether soy promotes cancer, suggests Maskarinec, is to look at breast density. Women who have dense breasts—their breasts have an abundance of fibrous or glandular tissue

and not much fat—have a higher risk of breast cancer.

"If you give hormone therapy—estrogen plus progestin—to postmenopausal women, within three months the density of their breast tissue goes up," says Maskarinec. Not so with soy.

"We have done quite a few studies, and we have seen absolutely no change in breast density from consuming soy or isoflavones."³

Another alarm over soy and the breast: in 1998, researchers reported that genistein, a major soy isoflavone, stimulated the growth of estrogen receptor-positive (ER+) breast tumors in a special strain of mice.⁴

But "a recent study showed that these mice metabolize isoflavones very differently than humans," points out Mark Messina, of Loma Linda University in California. "So they may not be a suitable model for what happens in people."⁵

(Messina, a leading authority on soy, consults for companies that make soy foods and supplements.)

Maskarinec's bottom line: "The evidence shows that soy foods don't seem to increase or decrease the risk of breast cancer in Western women."

In 10 studies that tracked nearly 250,000 U.S. and European women for two to 13 years, for example, those who got the most soy isoflavones from food were no more—or less—likely to be diagnosed with breast cancer than those who got the least.⁶

"On the other hand, soy foods do seem to help protect Asian women," says Maskarinec. In four studies that tracked a total of more than 130,000 women in Japan, China, and Singapore for seven to 11 years, those who got the most isoflavones from their food were 24 percent less likely to be diagnosed with breast cancer than those who got the least.⁶

Why the difference? For starters, the "most" isoflavones typically means only

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about 2 milligrams a day in the United States and Europe, but 25 to 50 mg a day in Asia. The “least” is also far higher there.

What’s more, “In Asian societies, girls grow up eating soy foods, and isoflavones may affect breast tissue early in life in a way that provides some protection later on,” says Maskarinec.

What about women *with* breast cancer? Could soy foods cause tumors to recur? That’s looking less and less likely.

In two studies that tracked 4,658 U.S. women with breast cancer for an average of seven years, those who got the most isoflavones (at least 10 mg a day) from soy foods had a 24 percent *lower* risk of breast cancer recurrence than those who got the least (less than 4 mg a day).⁷

But the soy eaters in both studies were more health conscious, so something else about them could explain their lower risk.

The Thyroid

The rap: “Soy will destroy your thyroid.”
—foodrenegade.com

The real story: “Eating soy foods doesn’t harm the thyroid glands of most people,” says Hossein Gharib, president of the American Thyroid Association and an endocrinologist at the Mayo Clinic College of Medicine in Rochester, Minnesota.

Doctors gauge thyroid function by looking at blood levels of thyroid hormone (thyroxine, or T4) and thyroid stimulating hormone (TSH), which prods the gland to produce more T4 when needed.

In test tubes, soy isoflavones can interfere with the enzyme that helps the thyroid make T4. In most studies done so far in healthy people, however, soy foods or isoflavones have no impact on levels of T4 or TSH.

That was the case for 63 women who ate two to three servings a day of either soy foods (yogurt, burgers, and milk) or beef, chicken, and dairy for 10 weeks.⁸ And it was true for 206 middle-aged or older women who took 90 to 200 mg of soy isoflavones or a placebo every day for six months to two years.^{9,10}

But soy foods may make people with subclinical hypothyroidism more likely to become hypothyroid, says Gharib.

About 1 percent of the U.S. population has hypothyroidism (an underactive thyroid), which means they have low T4,

high TSH, and symptoms like fatigue and increased sensitivity to cold. Another 3 to 5 percent have subclinical hypothyroidism. They have no symptoms and their T4 levels are normal, but their TSH is high (a sign that the body is working hard to keep T4 levels up).

In 2011, British researchers gave 60 middle-aged and older people with subclinical hypothyroidism a daily dose of 30 grams of soy protein. For eight weeks the powder contained 16 mg of soy isoflavones and for eight weeks it contained only 2 mg. Six of the 60—all



Looking for isoflavones? Some rough numbers: 3 oz. firm tofu: 20 mg, ½ cup shelled edamame: 15 mg, 1 cup soymilk: 30 mg.

women—progressed to hypothyroidism while taking the higher dose.¹¹

That’s just one small study that needs to be confirmed. In the meantime, “If a routine blood test shows that someone has an elevated TSH level of 5, 6, 7, or 8 and they want to continue eating a lot of soy, they should have their TSH levels tested every six to 12 months to make sure they aren’t progressing to full-blown hypothyroidism,” says Gharib.

Masculinity

The rap: “Soy protein powder strips your masculinity!”
—thehealthyhomeeconomist.com

The real story: “Some people assume that the plant estrogens in soy must be interfering with reproductive hormones in men,” says Christopher D’Adamo, an assistant professor at the University of Maryland School of Medicine in Baltimore. But the evidence to support that claim is scarce.

■ **Testosterone.** Fourteen trials have looked at men with a wide range of testosterone levels who consumed different amounts of soy protein or a placebo (typically a dairy food) every day for 25 days to four years.

“In all 14 studies, testosterone levels did not differ between the two groups,” says Jill Hamilton-Reeves, of the University of Kansas, who led a review of them.¹²

■ **Estrogen.** Thenewcenturyman.com, a website that helps men “reclaim their masculinity,” gets right to the point: “Soy is creating man boobs.”

The scare may have started with a 2008 report in a medical journal about a 60-year-old Texas man who complained of sore, enlarged breasts and a decreased libido.¹³

Tests revealed that his level of blood estrogens was up to eight times higher than the top of the normal range. The man said he was lactose intolerant and drank three quarts of soymilk a day. That would have given him a daily dose of 360 mg of isoflavones, about 10 times what the average man in Asia consumes.

After the man stopped drinking soymilk, his estrogens returned to normal and his breast tenderness disappeared. No other similar cases have ever been reported.

That’s not surprising. In nine studies, estrogen levels remained within the normal range whether men consumed soy foods, isoflavone supplements, or a placebo.¹⁴

In the largest trial, Australian researchers told 42 healthy men aged 35 to 62 to eat a diet with either 5 oz. of lean meat or 10 oz. of tofu every day. After a month, there was no difference in blood levels of estradiol (the major estrogen) or testosterone.¹⁵

■ **Fertility.** “Tofu a day, sperm goes away,” read the headline in Canada’s *The Globe and Mail*. The newspaper was describing the results of a 2008 study by researchers at the Harvard School of Public Health.

But the men in the study *didn’t* eat tofu every day...and their sperm *didn’t* go away.

Among 99 male patients at a Boston fertility clinic, total sperm count and sperm quality (that is, how well the sperm moved and were shaped) were the same in those who reported consuming the most soy foods (three to four servings a week) as in those who said they never ate soy.¹⁶

However, the men who ate the most soy had lower sperm concentration, though it was still in the normal range.

Soy with Benefits?

Not everyone is scared of soy. Some people go out of their way to get more. Here's what soy can—and can't—do.

■ **Menopausal symptoms.** “It's clear that soy and its isoflavones protect against hot flashes in women during menopause,” says the University of Maryland's Chris D'Adamo.

Since 2000, 13 studies have given a placebo or a daily isoflavone supplement to a total of nearly 1,200 menopausal women in six countries for six weeks to one year. Those taking the isoflavones reported 21 percent fewer hot flashes. And in the nine studies that looked, hot flashes were less severe.¹

■ **Cardiovascular disease.** In 1999, the Food and Drug Administration ruled that

25 grams of soy protein a day can lower cholesterol levels enough to reduce the risk of heart disease. But since then, the evidence for soy has weakened.

For instance, the Women's Isoflavone Soy Health (WISH) trial gave 325 healthy postmenopausal women 25 grams a day of either soy protein (with 91 milligrams of isoflavones) or milk protein for three years.²

“We didn't find strong evidence for any significant cholesterol-lowering effect from the soy,” says USC's Wendy Mack. And thickening of the carotid artery wall, a measure of atherosclerosis, “progressed at the same rate in both the soy eaters and the dairy eaters.”

Eating soy-based veggieburgers or tofu

in place of *red meat*, on the other hand, should help lower your cholesterol and your risk of colon cancer. But that's probably because you're eating less red meat and more of soy's polyunsaturated fat.

■ **Bones.** The evidence that soy isoflavones can protect women's bones is unimpressive.

In two recent studies of a total of 332 women, taking 80 to 200 mg of isoflavones every day for two or three years had no more impact on the density of their hip bones and spines than taking a placebo.^{3,4}

¹ *Menopause* 19: 776, 2012.

² *Stroke* 42: 3168, 2011.

³ *Am. J. Clin. Nutr.* 91: 218, 2010.

⁴ *Arch. Intern. Med.* 171: 1363, 2011.

Only two good studies have measured what happens when men are fed soy. In the more recent one, researchers gave 32 Canadian young men soy protein with high levels (62 mg) or low levels (2 mg) of isoflavones or milk protein every day for two months.¹⁷

“Soy protein and isoflavones had no effect on their sperm concentration, sperm count, sperm quality, or semen volume, compared with milk protein,” says co-author Hamilton-Reeves. She concedes, however, that if soy altered the formation of new sperm, two months may have been too short a time to see it.

The earlier study found essentially the same results.

Nutrients

The rap: “Soy blocks vitamin and mineral absorption, denying your body the health building tools it needs.”

—cancerdefeated.com

The real story: Raw soybeans contain phytic acid, which can interfere with the body's ability to absorb minerals like iron and zinc.

“But soaking, fermenting, cooking, and other processing methods reduce the phytic acid levels,” says Mian Riaz, director of the Food Protein Research & Development Center at Texas A&M University. And any phytic acid that's left doesn't seem to impair mineral absorption.

For example, researchers gave 69 menopausal women 40 grams a day of soy protein that was either rich or poor in isoflavones or 40 grams of whey (milk) protein. After six months, all the wom-

en had similar blood levels of iron and hemoglobin.¹⁸

And blood levels of zinc and iron were no different when researchers gave 63 young women two to three servings a day of either soy foods or beef, chicken, or dairy for 10 weeks.⁸

Cognition

The rap: “If we want to protect our brains, we might want to not consume a lot of soy.”
—anti-soy activist Kaayla Daniel

The real story: The soy world got a jolt in 2000, when University of Hawaii researchers reported that among more than 3,300 Japanese-American men, those who ate two or more servings of tofu a week

analyses—only muddied the waters.^{20,21}

To see whether soy affects memory and thinking, researchers need to pit it against a (soy-less) placebo, says Wendy Mack, professor of preventive medicine at the University of Southern California.

In 2011, she and her colleagues randomly assigned 313 healthy women aged 45 to 92 to consume 25 grams a day of either soy protein (with 91 mg of isoflavones) or milk protein.²² After 2½ years, “the soy takers scored no differently than the dairy takers on a battery of tests assessing a broad spectrum of cognitive skills,” says Mack.

And Dutch scientists found no difference on similar tests when they gave 175 older women 26 grams a day of soy protein (with 99 mg of isoflavones) or milk powder for a year.²³



Want to boost your soy protein or isoflavone intake? Soy sauce or miso soup won't help.

during middle age were at greater risk of cognitive decline—and brain atrophy—years later.¹⁹

Two surveys of Indonesians—with conflicting results and unsophisticated

¹ *Cancer Epidemiol. Biomarkers Prev.* 5: 785, 1996.

² *Nutr. Cancer* 65: 1116, 2013.

³ *J. Nutr.* 139: 981, 2009.

⁴ *Cancer Res.* 58: 3833, 1998.

⁵ *Am. J. Clin. Nutr.* 94: 1284, 2011.

⁶ *Breast Cancer Res. Treat.* 125: 315, 2011.

⁷ *Am. J. Clin. Nutr.* 96: 123, 2012.

⁸ *J. Womens Health* 20: 771, 2011.

⁹ *Arch. Intern. Med.* 171: 1363, 2011.

¹⁰ *J. Med. Food* 6: 309, 2003.

¹¹ *Clin. Endocrinol. Metab.* 96: 1442, 2011.

¹² *Fertil. Steril.* 94: 997, 2010.

¹³ *Endocr. Pract.* 14: 415, 2008.

¹⁴ *Fertil. Steril.* 93: 2095, 2010.

¹⁵ *Br. J. Nutr.* 84: T557, 2000.

¹⁶ *Hum. Reprod.* 23: 2584, 2008.

¹⁷ *Fertil. Steril.* 94: 1717, 2010.

¹⁸ *Am. J. Clin. Nutr.* 76: 165, 2002.

¹⁹ *J. Am. Coll. Nutr.* 19: 242, 2000.

²⁰ *Dement. Geriatr. Cogn. Disord.* 26: 50, 2008.

²¹ *Brain Res.* 1379: 206, 2011.

²² *Neurology* 78: 1841, 2012.

²³ *JAMA* 292: 65, 2004.