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# *FACT SHEET* **SAFETY OF SOY MYTHS AND FACTS**

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## **Summary**

Despite the fear mongering about soy via the internet, there is overwhelming scientific evidence that soy foods can be part of a healthy balanced diet. Soy foods have anti-inflammatory properties and they lower LDL cholesterol levels, blood pressure levels in hypertensives, and also reduce the risk of some cancers. They improve kidney function and reduce menopausal symptoms. Important evidence shows that starting children early on soy foods, especially girls, is beneficial.

## **Introduction**

The scientific evidence for the health benefits of regularly consuming soy foods is irrefutable (Anderson, Smith, & Washnock, 1999; M. J. Messina, 1999). Yet misinformation persists on the internet and published in books. The purpose of this fact sheet is to dispel some of the myths surrounding soy and determine if soy can be part of a healthy balanced diet.

## **Evidence-based research on health benefits of soy**

With more than 2000 soy-related peer-reviewed articles published annually, the weight of evidence shows significant health benefits when consuming soy foods as

part of a healthy diet. And the best evidence for the safety and health benefits of soy foods comes from human studies, particularly those who have consumed soy for centuries. Over the years, studies of soy and soy isoflavones have shown lower rates of chronic diseases in Asian populations compared to Western populations that ate little or no soy (K. D. Setchell, Borriello, Hulme, Kirk, & Axelson, 1984). Typically, Asian diets include tofu, miso, tempeh, soy milk and fermented soybeans as part of their traditional diet. Whereas, western diets include whole soybeans such as edamame, soy nuts, soy milk and foods made from isolated soy protein, but in smaller amounts.

## **Nutrient content of soy**

Soybeans have a unique nutrient profile, including hundreds of beneficial biologically active phytonutrients. Compared to other legumes, soybeans are much higher in protein and the quality of protein is exceptional. It is also a source of low GI carbohydrate (oligosaccharides, a prebiotic important for gut health). They are low in saturated fat and contain no cholesterol, but are a good source of essential fatty acids (omega-3 and omega-6). Being lactose free, soy milks and other soy products are a great alternative for those who are lactose intolerant. They are also a good source of vitamins and minerals, including potassium, iron and calcium. One of the most interesting features of soy are the phytonutrients, isoflavones (genistein, daidzein and glycitein) (Mark Messina, 2014) and S-equol (produced by specific gut bacteria, although not everyone is able to produce S-equol) (K. D. Setchell & Clerici, 2010).

## **What are isoflavones?**

Isoflavones (often referred to as phytoestrogens or plant estrogens) are similar in chemical structure to the human hormone estrogen, yet they act quite differently. They mimic some of the positive effects of estrogen, but not their negative effects; for this reason they are considered “good estrogens” (K. D. R. Setchell, 2017). Most research focuses on soy’s effects on hormonally-influenced cancers, such as breast and prostate, showing that soy isoflavones have no effect on hormone levels (Hooper et al., 2009), and are highly protective against hormone-dependent cancers (M. Messina, 2016; K. D. R. Setchell, 2017).

## **Heart health and soy**

Soybeans are a heart-healthy food as they are low in saturated fat, contain no cholesterol and are a good source of polyunsaturated fats. Hence, soy helps to reduce LDL-cholesterol, increase HDL-cholesterol and lower triglycerides when eaten in place of animal protein (K. D. R. Setchell, 2017). Soy isoflavones are powerful antioxidants with anti-inflammatory effects, which helps reduce inflammation and oxidative stress, and helps lower blood pressure in those with hypertension. All of these properties

confirm the heart health benefits of a diet that includes only 25g of soy protein.

### **Breast cancer and soy**

The safety of soy for women with breast cancer or family history of breast cancer has been controversial. Some believe they should avoid soy, claiming that soy products stimulate cancer growth. However, studies show that soy protein and isoflavones protect against breast cancer and are also safe for breast cancer survivors (M. Messina, 2016; K. D. R. Setchell, 2017). Eating soy leads to a better prognosis and improved survival rates, with reduced risk of cancer recurrence and death. In fact, the greatest benefits are seen when more soy is eaten (Chi et al., 2013). Soy is also safe for those receiving breast cancer treatment (medication) and may even enhance the medication's effect (Nechuta et al., 2012). Overall, the earlier in life soy is consumed, the greater the health benefit (Korde et al., 2009). Soy is therefore an excellent food for children and adolescents as it has the potential for long-term health benefits.

### **Menopause and soy**

Nothing will be as effective as the hormone estrogen for relieving hot flashes, but isoflavones have shown benefits for some menopausal women. However, not all soy isoflavones supplements appear to be effective (Taku, Melby, Kronenberg, Kurzer, & Messina, 2012)--only those containing the highest amounts of genistein (>18.8 mg) will provide the most relief, particularly for those with the greatest severity and frequency of hot flashes. There is also interest now in S-equol for alleviating hot flashes.

### **Prostate cancer and soy**

Prostate cancer is the most common cancer among US men and the second most common cause of cancer death. Like breast cancer, the rates of prostate cancer are relatively low in people who commonly consume soy. There is a large amount of evidence suggesting soy foods reduce the risk of prostate cancer by as much as 50% (Zhang et al., 2017), and may also be beneficial for men who are being treated for prostate cancer. Isoflavones have a positive effect on PSA levels, slowing their rise and lessening the side effects of radiation treatment (M. Messina, 2016). Isoflavones may also inhibit the spread of prostate cancer (Pavese, Krishna, & Bergan, 2014).

### **Kidney function and soy**

One of the kidney's important roles is to metabolise protein from our meals, making it available for cells throughout the body. Consuming soy protein in place of animal protein puts less stress on the kidneys, allowing them to do their work more efficiently. With the rise in diabetes and the complications of renal failure that may result, soy

protein may protect kidney function, reducing risk of disease in susceptible people, including those with diabetes (Anderson, 2008; Azadbakht & Esmailzadeh, 2009). Soy protein may decrease serum creatinine, phosphorus, inflammation and protein in the urine (proteinuria).

## **Debunking myths associated with soy safety**

**Fertility and soy:** There is no credible evidence that hormone levels and fertility are affected by soy whatsoever (Hamilton-Reeves et al., 2010; Hooper et al., 2009). Soy isoflavones do not directly change the natural estrogen levels in the human body. In women, soy foods may lengthen the menstrual cycle by a day, but soy foods do not prevent ovulation or cause sterility. In men, evidence shows soy isoflavones have no effect on sperm concentration or quality (Beaton, McVeigh, Dillingham, Lampe, & Duncan, 2010) and in fact improved sperm quality and quantity is seen in a male partner of an infertile couple (Casini, Gerli, & Unfer, 2006). Evidence clearly shows that soy foods and soy isoflavone intake is unrelated to fertilization rates or other concerns related to pregnancy and birth.

**Male feminization and soy:** Some men are reluctant to eat soy believing phytoestrogens are feminizing, producing male breasts, reduced testosterone levels and reduced sperm concentration. But neither soy protein nor isoflavones negatively affect male hormones or cause feminization. In fact, breast development in men is more likely due to over nutrition and alcohol intake. Overall evidence shows that the recommended consumption of two servings of soy (~50-75mg isoflavones) per day as part of a balanced diet has health benefits without any feminizing effects.

**Thyroid function and soy:** Evidence is clear that neither soy foods nor soy isoflavones adversely affect thyroid function in men or women who have normal thyroid function (M. Messina & Redmond, 2006; Zhou, Alekel, Dixon, Messina, & Reddy, 2011). For those who have abnormal thyroid function (i.e., hypothyroidism), soy foods may increase the amount of thyroid medication required as isoflavones may interfere with absorption, as can drugs and herbs, and calcium supplements. By taking thyroid medication on an empty stomach it is not necessary to avoid these foods.

### **Fermented vs unfermented soy**

Some evidence suggests that fermented soy foods such as miso, tempeh and natto may have greater health benefits than non-fermented soy foods (K. D. R. Setchell, 2017). This may be due to the presence of isoflavones that have been modified by the fermentation process and are readily absorbed (Applegate, Rowles, Ranard, Jeon, & Erdman, 2018). Overall, the best advice is to eat both fermented and unfermented soy, as both forms ultimately provide isoflavones that are beneficial for health.

## **Whole soybeans vs isolated soy protein**

Soy milks are made with either isolated soy protein (ISP) or whole soybeans and both provide a range of health benefits. ISP is extracted from whole soybeans, with the outer hull, fat and carbs (oligosaccharides) removed. Whole soybeans on the other hand are processed by grinding the beans, removal of okara (insoluble part of the bean), enzyme inactivation, and deodorisation. Important nutritional components are retained during both processes. For example, isoflavones are substantially retained in ISP processing, but levels of isoflavones may be more variable in whole bean processing (K. D. Setchell & Cole, 2003). The soy foods that feature in traditional Asian diets (e.g. soy milks, tofu) are less processed. However, the vast body of clinical studies highlighting soy protein's health benefits were conducted on ISP, whereas few studies have been done using whole bean soy products. The few clinical studies which compare the health effects of ISP versus whole bean show no significant differences in benefit.

## **Anti-nutrients and mineral absorption**

Soybeans, like other legumes, wholegrains, nuts and seeds, contain phytate which binds to minerals such as iron, zinc and calcium, interfering with their absorption. Processing such as heating, soaking, sprouting and fermentation, inactivates both the protease inhibitors and phytate, improving digestion and mineral absorption. In fact, the absorption of calcium from calcium-fortified soy beverages and tofu is similar to cow's milk (Weaver et al., 2002; Zhao, Martin, & Weaver, 2005). Also absorption of iron from soybeans is relatively high because this iron is in the form of ferritin (Lönnerdal, 2009). Our body also tends to adapt to high levels of phytate consumption with improved iron absorption (Armah, Boy, Chen, Candal, & Reddy, 2015).

## **GMOs and soy**

Many Western countries don't consider genetically modified organisms (GMOs) to be safe, with significant restrictions or outright bans on the production and sale of GMOs. To the contrary, respected food and health organisations in the US have stated that consuming foods containing ingredients derived from genetically modified (GM) crops, is not an enhanced risk. While foods do not have to be labelled in the US as GMO, some companies voluntarily do label food as such. About 10% of all soybeans grown in the US are non-GMO. Many food companies use non-GM soy, certified as organic, so there are plenty of choices for the consumer. By contrast, some countries ensure that GM foods and ingredients (including soy) must be labelled GM, including any with altered nutritional profile due to genetic engineering.

## **Feeding your infants and children soy**

The growth of children raised on soy milk is observed to be normal and similar to that of children raised on cow's milk or breast milk. No adverse effects on child growth or their endocrine system have been reported in scientific journals after 60 years of feeding commercial soy infant formulas to millions of children. Soy allergy is one of the more common food allergies, especially among babies and children. Approximately 4 out of every 1000 children may be allergic to soy. Studies indicate that small children with a soy allergy often outgrow it by age three. Soy allergies are, however, much less common than cow's milk allergies.

## **Recommendation by health organizations**

Large health organisations such as the American Cancer Society (Rock et al., 2012) recommend soy as part of a healthy diet. Soy may lower cancer risk since isoflavones and other soy compounds slow cancer cell growth and prevent tumor formation. The American Cancer Society says that soy foods do not increase risk of breast cancer and soy can be safely consumed by breast cancer patients. There is a possible link between consuming soy foods and improved breast cancer prognosis (World Cancer Research Fund, 2014).

## **Daily soy intake recommendations**

One average serving of soy is equivalent to 1 cup (250ml) soymilk, ½ cup tofu (100g), tempeh, soybeans or soy meats. One serve contains approximately 8-10g protein/25 mg isoflavones. The recommended two servings of traditional soy foods per day will offer the abovementioned health benefits. An upper limit for adults would be 3-4 servings per day and for children, 2 servings per day.

## **Conclusion**

Although soy isoflavones are a distinguishing characteristic of soybeans, providing significant targeted health benefits, these phytoestrogens are often misunderstood by consumers. But as we have seen, these concerns are not supported by any solid scientific evidence in humans. In fact, soy foods can be part of a balanced diet without fear of detrimental effects. The overwhelming evidence is that soy foods contribute to less heart disease, lowering LDL cholesterol, and blood pressure. The evidence is also strong that soy foods reduce risk of breast cancer and prostate cancer, improve kidney function and reduce menopausal symptoms. Evidence shows the benefits of starting children early on soy foods, especially for girls.

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