

Commonly Asked Questions

Are soy foods high in Aluminium?
Should people with kidney failure avoid soy foods?
Is soy beneficial for brain (cognitive) function?
Does tofu cause dementia?
Could the isoflavones in soy infant formula cause long-term reproductive problems or infertility for human infants?
Does soy infant formula cause thyroid disease in healthy infants?
Have soy beans been genetically modified?
Are non-GM soy foods and ingredients available in Australia and New Zealand?
Are soy foods harmful to thyroid function?
Will consuming soy foods reduce fertility in men?
Will consuming soy foods reduce fertility in women?
Can I consume soy during pregnancy?
Can I consume soy while breastfeeding?

1. Are soy foods high in Aluminium?

Aluminium is a naturally occurring element present in abundant levels in soil (in fact, it is the third most abundant element in the earth's crust), and is therefore naturally present in most plant foods, including soybeans.

In soy drinks, the tiny amount of aluminium present comes from the soybeans, via the soil in which they grow. It is useful to compare levels of aluminium in soy products with those of other common foods.

Table 1: Aluminium Content of Some Typical Foods as Consumed ^{1, 2, 3}

	mg per 100g	mg per serving
Yogurt, plain	0.112mg	0.224mg /200g
Cheese, American	41.100mg	12.3mg / 30g
Cheese, Swiss	1.9mg	0.57mg / 30g
Beef, minced, cooked	0.019mg	0.019mg / 100g
Frankfurter, boiled	0.247mg	0.124mg / 50g
Peanut Butter	0.576mg	0.173mg / 30g
Asparagus, boiled	0.141mg	0.141mg / 100g
Pinto Beans, boiled	0.252mg	0.252mg / 100g
Spinach, boiled	2.500mg	2.500mg / 100g
Potato, baked	2.600mg	2.600mg / 100g
Muffins, blueberry	12.800mg	6.4mg / 50g
1/4 Hamburger (fast food)	2.040mg	4.080mg / 200g
Tea	0.446mg	1..12mg / 250mL

Stringy bark (dark) honey - Australia	5.77mg	0.289mg / 5g
White clover (light) honey - Australia	0.47mg	0.024mg / 5g
Dairy based infant formula, 0-6 months, made up ²	0.098mg	0.9mg / recommended total daily intake
Soy based infant formula, made up ²	0.587mg	5.5mg / recommended total daily intake
So Good ² soy milk ³	0.030mg	0.075mg / 250mL

In a recent report from the Water Services Association of Australia⁴ the average weekly aluminium intake is the equivalent of 35mg for a 70kg male and 30mg for a 60kg female (0.5mg/kg body weight). In Australian children, the average weekly intake of aluminium was 1.4mg / kg body weight. These figures are well below the Food and Agricultural Organisation/World Health Organisation (FAO/WHO) provisional tolerable intake of 7mg / kg body weight per week (which correlates to 490mg aluminium / week for average males and 420mg aluminium / week for average females).

In 1992, the Australia New Zealand Food Authority (ANZFA, now called Food Standards Australia New Zealand, FSANZ), measured the aluminium intakes of Australian infants as part of the Australian Market Basket Survey (which is now known as the Total Diet Survey). It was found that although soy based infant formulas contained higher levels of aluminium than other formulas or breast milk, the estimated aluminium intake was still well below estimated safe levels². Interestingly, the Total Diet Survey no longer includes aluminium intakes as part of the survey, which is conducted to monitor dietary intakes of pesticides and other toxic components, such as cadmium, mercury and lead.

Aluminium is not an essential nutrient in the diet, and the body has highly effective barriers to limit its uptake. Only a very small percentage of what is ingested is absorbed by the stomach and intestines, and almost all of what is absorbed is passed through the kidneys and eliminated as waste.

Dr. Gruskin, the chairman of the Department of Pediatrics, Wayne State University, Michigan⁵ recently stated that he had not been able to find any data to suggest or prove that the quantities of aluminium fed to full-term infants with normal renal function are either harmful or accumulate in tissues. Also of interest is that aluminum is virtually non-detectable in bone obtained from normal adults.

¹*The Total Diet Survey monitors the levels of pesticides and contaminants in foods and the Australian public's dietary exposure to these compounds. Foods that are representative of a balanced diet, that are commonly consumed and/or of particular interest from a pesticide or contaminant viewpoint are included in the survey. The results are used as background information for developing food standards and as part of the registration process for agricultural chemicals¹⁰.*

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2. Should people with kidney failure avoid soy foods?

In recent years, a concern about aluminum has developed in regard to individuals with kidney failure⁶⁻⁹. As a result of malfunctioning kidneys, aluminum accumulates in body tissues. Most of this is thought to originate from dialysis fluids and/or intravenous feeding. There is no evidence that dietary intake of aluminium is a major contributor. Individuals with impaired renal function should always consult with their physician and dietitian before changing their diet.

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3. Is soy beneficial for brain (cognitive) function?

The hormone oestrogen is thought to be beneficial for maintaining cognitive function (and reducing the risk for dementia) in older age. Some population studies have linked the use of oestrogen in post-menopausal women with a reduced risk of Alzheimer's disease in later life¹. As a result, researchers have questioned whether soy isoflavones may be effective in helping to maintain brain function in later life since these natural compounds share similarities to oestrogen, although they are not identical.

While there are no studies in humans especially designed to establish whether consuming soy foods or soy isoflavones can prevent or reduce the risk of dementia, several population studies have found that certain groups of people, that are known to habitually consume soy foods, have lower rates of dementia.

Researchers at the Australian National University recently analysed 23 studies comparing the incidence of dementia and Alzheimer's disease in different countries. They found that people in East Asian countries, where soy is a staple in the diet, have a significantly lower incidence of dementia and also tend towards a lower incidence of Alzheimer's disease compared to people from European countries².

Results from a study of Seventh-day Adventists³, who have been shown in a number of studies to live a healthier lifestyle than the general population, indicated that the meat eaters were more than twice as likely to develop dementia compared to the vegetarians (who consume soy regularly). There was also a trend towards delayed onset of dementia in the vegetarians.

Studies in animals are underway to determine the potential benefits of soy in cognitive function. In a study from the University of Alabama⁴, Dr Helen Kim investigated the effect of dietary soy protein with naturally occurring isoflavones in aged monkeys for three years. She measured levels of a protein in the brain that is specifically related to Alzheimer's disease and found that the level of this protein, called tau protein was suppressed in the brains of the monkeys who had been given the soy protein with natural levels of isoflavones. This indicates that regular consumption of soy protein with naturally occurring isoflavones may protect against the accumulation of Alzheimer's disease-related proteins in the brain.

Researchers from Wake Forest University in the USA looked at the effect of soy isoflavones compared to oestrogen on cognitive function in rats⁵. Markers of memory, using approved radial arm maze tests, were measured after eight weeks of oestrogen treatment or soy isoflavone consumption. Both oestrogen and soy isoflavones improved the levels of the memory markers, however the effect of soy isoflavones on some markers was lower than oestrogen.

The role of soy protein and soy isoflavones in mediating brain (cognitive) function is an emerging area of research. More studies are needed, particularly in humans, before conclusions regarding the effect of soy on brain function can be made.

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4. Does tofu cause dementia?

One study reported a link between tofu consumption during mid-life and early brain aging in a group of American-Japanese men living on the Island of Oahu in Hawaii⁶. In this observational study, the men who consumed two or more servings of tofu per week during their middle years were found to have lower scores on tests of brain function (cognitive performance), and a lower brain weight in later life. Interestingly, miso soup consumption was also measured. However consumption of this food was not related to poorer brain function scores. Miso is a fermented soy product containing significant levels of isoflavones⁷.

The principal investigator of this study, Dr Lon White and his colleagues concluded that education level, age and a history of prior strokes were the three most important predictors of cognitive functioning. These factors explained over one quarter (27.8%) of the differences in test scores of brain function in these Japanese-American men. Tofu intake accounted for less than 1% of the difference in test scores of brain function. This study does not provide evidence that soy foods in general, nor isoflavones specifically, are related to an increased risk of dementia. Further, it is contrary to the epidemiological evidence that indicates populations who consume soy as a staple in the diet have a lower incidence of dementia, compared to Western populations².

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5. Could the isoflavones in soy infant formula cause long-term reproductive problems or infertility for human infants?

Dr. Kenneth Setchell from the Children's Hospital Medical Center, Cincinnati, USA, first reported that soy infant formulas contained high levels of naturally occurring isoflavones¹, confirming observations made 13 years ago². Despite these high levels, there have never been any case reports in the medical and scientific literature that isoflavones cause later infertility in human infants.

Recent questions regarding the levels of isoflavones in soy-based infant formulas have been raised. The negative effects of extremely high doses of isoflavones on the fertility and development in animals such as sheep³ and cheetah⁴ have been known for many years and extensively investigated. In these cases, blood levels were 100-500 times higher than what we see in infants fed soy infant formula. However, there are large species differences in how phytoestrogens are handled, and in their effects. Animals such as monkeys⁵, rats⁶, mares and cattle⁷ do not experience reproductive problems when fed a diet containing soy protein or isoflavones.

With regard to humans, the Australia New Zealand Food Authority (ANZFA, now called Food Standards Australia New Zealand, FSANZ) conducted a safety review and found no evidence that exposure of healthy infants to soy-based infant formula over some 30 years of use has been associated with any demonstrated harm⁸. A retrospective study by Dr. Strom and his colleagues from the University of Iowa, USA, did not find any delayed negative effects in young men and women, who had been fed soy-based infant formula as infants. There were no statistically significant differences between those adults who were fed milk-based formula versus soy-based formula, with many variables being studied including adult height, usual weight, body mass index, indices of precocity, and a large number of other non-reproductive and reproductive outcomes such as cancer and infertility⁹.

There is a long history of safe and effective use of commercially available soy-based infant formulas¹⁰. There are also no reports that Asian populations, which ingest high quantities of soy from early life, have impaired sexual development or higher rates of infertility later in life.

If more recent studies using suitable animal models can be extrapolated to humans, the early introduction of soy and its isoflavones, even for short periods of time, may lead to a decreased risk of breast cancer later in life¹¹. The soy isoflavones appear to cause beneficial changes to the architecture of the breast making it more resistant to cancer. This is an area of great research interest at present.

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6. Does soy infant formula cause thyroid disease in healthy infants?

Prior to the 1960's soy formula was made from soy flour and was deficient in iodine¹². Iodine deficiency is known to cause goiter (an enlarged thyroid gland). Worldwide, however, there were only a small number of case reports (comprising 12 individuals) linking thyroid abnormalities in infants to this early type of soy-based infant formula^{13,14,15,16}. Since iodine supplementation was introduced in 1959, only one case has been reported in the medical literature, associating the consumption of soy protein with thyroid abnormality¹⁷.

All modern infant formulas, including soy-based infant formula, are designed to provide a nutritionally balanced diet when used as the sole source of nutrition for an infant. While experts agree that breast milk is the best choice of food for infants, soy infant formulas are a suitable alternative to breast milk or cow's milk formula for healthy term infants.

The New Zealand Ministry of Health recommends that clinicians who are treating infants with hypothyroidism (by replacing thyroxine - a thyroid hormone), closely monitor those infants fed soy-based formula or consuming large amounts of soy-containing infant foods, as they may require higher levels of thyroxine¹⁸.

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7. Have soy beans been genetically modified?

Soybeans have been identified as one of several crops that have genetically modified analogs with improved growing characteristics and yields. Other crops with genetically modified analogues include corn, cotton and canola.

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8. Are non-GM soy foods and ingredients available in Canada?

Not all soy-containing foods and food ingredients used in Canada are derived from genetically modified soybeans.

Some companies use non-GM soy that is grown under an Identity Preservation (IP) system. This follows soy production from non-GM soybean seed, right through to the food manufacturer. Each element in the chain is documented with the whole system being independently audited.

Consumers interested in which soy products in the supermarket contain non-GM soy should check on the label of the particular product or alternatively contact the manufacturer directly.

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9. Are soy foods harmful to thyroid function?

There is no scientific evidence showing a correlation between soy consumption and thyroid disorders in humans. A number of clinical studies have also failed to note clinically significant changes in thyroid hormones in either men or women consuming soy protein or isoflavones¹⁻⁴.

Recent studies in test tubes have shown that, under certain experimental conditions, the principle isoflavones in soy, genistein and daidzein, can inhibit the enzyme thyroid peroxidase (TPO)⁵. This enzyme is responsible for the conversion of thyroglobulin to thyroid hormone.

It must be emphasised, however, that this occurs only with large amounts of soy isoflavones (more than an adult could typically consume as part of a normal diet), and/or when the diet is low in iodine. The inhibition of this enzyme can be completely abolished in the presence of iodine⁵.

Further, soy isoflavones are not the only natural dietary constituents that inhibit TPO. A variety of other closely related flavonoids have been shown to be even more potent in inhibiting the activity of this enzyme. These flavonoids are present in a number of plant based foods, including cabbage, broccoli and cauliflower⁶, and would be consumed at relatively high levels by vegetarians, yet these individuals do not have a significant increased incidence of goitre. In addition, flavonoid consumption has been associated with significantly reducing the risk of coronary heart disease⁷.

If people have any questions regarding soy and thyroid function, they should consult their health care practitioner.

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10. Will consuming soy foods reduce fertility in men?

There has been concern raised that sperm counts in men are falling, and that exposure to synthetic estrogens may be a contributing factor¹. Some people have also speculated that phytoestrogens - the natural phytonutrients found in soy foods - might be implicated. However, there is no evidence that fertility is affected when humans eat soy foods as part of their regular diet.

In a comprehensive review of soy based infant formulas, Food Standards Australia New Zealand (our food regulatory body), concluded that there is no evidence that exposure of healthy infants to soy-based infant formula has been associated with any demonstrated harm or that it reduces fertility². In addition, there is no evidence suggesting that sperm quality or fertility is adversely affected in men from Asian countries who traditionally consume soy foods frequently in their diet.

Researchers at the Rowett Research Institute in Scotland also showed that there is no difference in the reproductive health of young, healthy adult males consuming 40mg of isoflavones per day as a supplement. Isoflavones are the main type of phytoestrogens found in soy³. After two months of consuming an isoflavone supplement, no differences were seen in semen quality (including sperm

concentrations and sperm motility), testicular volume, testosterone and other hormone levels (such as estrogen). A recent review of several scientific studies concluded that there is no evidence to suggest that consuming isoflavones has adverse effects on sperm quality in men⁴.

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11. Will consuming soy foods reduce fertility in women?

A concern has been raised that consuming soy may interfere with a woman's chance of falling pregnant. One unpublished study (which was presented in June 2005), found that combining genistein (one of the isoflavones in soybeans) and two other 'environmental estrogens' (chemicals from industrial products) in a test tube triggered sperm to undergo a reaction that could potentially reduce its ability to fertilise an egg . The authors speculated that it might therefore be best to avoid soy in case sperm also respond this way to genistein inside the body.

However, there is no evidence that fertility is affected in women consuming soy foods as part of a balanced diet. Even in Asian populations where soy foods have been consumed as a staple part of the diet for centuries, it has never been suggested that soy interferes with conception.

Genistein is one of several components in soy. However, people do not eat genistein, they eat soy foods. In common with how other nutrients work in isolation, an extract of pure genistein will behave differently in the body than genistein consumed as part of a food - in this case a soy food. In addition, a study conducted in test-tube studies does not reflect the complex nature of the human body.

Soy has been widely used as a protein source in the diets of laboratory animals . Consumption of these diets has not resulted in adverse effects on the reproductive ability of these animals. For example, researchers from the University of Arkansas conducted a multi-generation study in rats aimed at examining the long-term health consequences of early consumption of soy protein. The number of offspring, gender ratios, birth weights, birth lengths, health, and general appearance of soy-fed rats was no different to rats raised on animal proteins.

To date there have been no credible reports in medical and scientific journals of reproductive problems in humans who include soy foods as part of their regular diet.

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12. Can I consume soy during pregnancy?

A hypothetical concern has been raised about consuming soy during pregnancy due to the presence of naturally occurring isoflavones in soy foods. Under certain circumstances, isoflavones can provide weak oestrogen-like effects according to animal studies and research in human adults. However, it is important to understand that these substances are not real 'oestrogens' and there is no evidence that babies born to mums who consume soy regularly during their pregnancy have increased health problems.

When a pregnant woman includes soy in her diet, isoflavones cross the placenta and reach the developing baby - in the same way as other nutrients do - according to studies on Japanese¹ and Indonesian² women who regularly eat soy foods. This transfer of isoflavones occurs in both animals and humans. However, to put this into context, during pregnancy a baby in the uterus is bathed in a sea of estrogens coming from the mother, which are much more powerful than the isoflavones derived from soy foods. To guard against too much exposure, the foetus has high levels of a protein called alpha-fetoprotein. This protein strongly binds oestrogens and isoflavones to reduce their hormonal potency and keep the foetus protected³.

Women in Asia, as well as many vegetarians in western countries, have been including soy foods in their diets for centuries. These women don't stop eating soy when they become pregnant and they give birth to healthy babies with good long-term health statistics.

It is important that women eat a wide variety of nutritious foods during pregnancy. Including legumes, such as soybeans and soy foods, is one way to provide a good source of protein, fibre and minerals.

There is no evidence that eating soy foods during pregnancy will result in any harm to a developing baby.

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13. Can I consume soy while breastfeeding?

It has been suggested that women should avoid soy foods while breastfeeding because their babies will be exposed to high levels of oestrogenic compounds (called isoflavones) from the soybeans.

While it is true that isoflavones can mimic the hormone oestrogen, they are much weaker in their effects. Paradoxically, isoflavones can also block oestrogens when the levels of oestrogen are too high in the body. In addition, isoflavones provide many other effects such as antioxidant benefits. An overwhelming number of studies suggest that a diet rich in isoflavones protects against many chronic diseases, such as heart disease and cancer¹.

Breast milk is not a good source of isoflavones, even if a woman eats a lot of soy each day. Research has shown that breast milk from mothers who regularly consume soy contains only 0.015-0.03 mg per litre² - the daily amount consumed by a four month old infant. These are miniscule amounts! To put this into some perspective, one glass of soy milk provides around 15 mg, depending on the brand. Even vegetarian and Asian women, despite regularly including soy foods in their diet, don't produce isoflavone-rich breast milk.

On the other hand, in the first few days of lactation a baby will be exposed to high levels of oestrogens from breast milk that have accumulated in the breast during pregnancy³. But it is the

environmental oestrogens - such as pesticides - that we should be concerned about as these also find their way into breast milk.

In conclusion, breast milk is a poor source of isoflavones, even if a nursing mother eats soy foods on a regular basis. There is no evidence that eating soy during breastfeeding is unsafe for the mother or infant.

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