

The safety of soya

We give you the facts on the wealth of health benefits and the supposed risks of the humble soya bean

Over the last few years we have heard how soya is a very good source of nutrients and can protect against heart disease, certain cancers and may reduce the risk of osteoporosis and menopausal symptoms; it might even help boost brain power. However, not all the reports on soya are favourable; the health benefits have been questioned by some while others have gone even further, launching a vigorous anti-soya crusade. The result is confusion – people don't know what to believe. Viva!Health has looked at the research in its entirety and sets the record straight.

There is a long history of people safely consuming soya beans, dating back to the 11th century BC (3,000 years ago) in the Eastern part of Northern China. The period from the first century AD to the 15th-16th century saw the introduction of soya beans in many parts of Asia, including Japan and India, and in 1765 the soya bean was introduced to the USA (JHCL, 2002). Since then, it has become an important part of the diets of many populations and in more recent years has found favour with vegetarians and vegans because of its versatility, many nutrients and health benefits. However, as the popularity of soya has grown, so has the number of critics questioning the benefits of this humble bean.

Nutritional value

Soya (*Glycine max*) is a particularly good source of protein as it contains all eight essential amino acids (protein building blocks) which the human body needs. It is also a rich source of polyunsaturated fatty acids (including the 'good' fats – omega-3s) and is free of cholesterol. Compared to cow's milk, soya milk contains less saturated fat and more unsaturated essential fatty acids, which can lower cholesterol levels.

Soya products provide an excellent source of disease-busting antioxidants, B vitamins (including folate) and iron. Calcium-fortified soya products such as soya milk and tofu provide a valuable source of this important mineral without the saturated animal fat, animal protein (casein) and cholesterol found in dairy products. One serving of 200ml (7 fl oz) of Alpro soya with added calcium and vitamins (blue pack) contains 30 per cent of the recommended daily amount (RDA) of calcium – equivalent to cow's milk. It is also fortified with vitamin B12 and 200ml provides 80 per cent of the RDA of this important nutrient.

Many soya foods also contain valuable fibre which is important for good bowel health and can also lower cholesterol. **Soya foods, particularly those made from whole soya beans, offer a wide range of nutritional and health benefits.**

Phytoestrogens

Phytoestrogens are natural substances found in many fruits, vegetables, dried beans, peas, and wholegrains. Isoflavones are a type of phytoestrogen found in soya beans. Soya isoflavones include



compounds called genistein, daidzein, glycitein and equol. Each gram of soya protein in traditional soya foods provides about three to four milligrams (mg) of isoflavones (Messina and Redmond, 2006).

The chemical structure of phytoestrogens is similar, but not identical to, human oestrogen and many of the beneficial effects – and supposed health risks – of soya foods are thought to be related to the presence of phytoestrogens.

Phytoestrogens can act in a similar way to the hormone oestrogen, but they are far less potent (Coldham *et al.*, 1997). Some phytoestrogens (isoflavones) are estimated to be between 100 and 100,000 times weaker than the oestrogens that occur naturally in humans (Messina *et al.*, 2006).

It is thought that phytoestrogens can have a normalising effect on the body's natural oestrogen levels (Kurzer, 2000) – if a woman has a high oestrogen level, phytoestrogens may reduce it by binding to oestrogen receptors and blocking some access from the stronger oestrogens. When oestrogen levels are low, such as in postmenopausal women, the weak effect of phytoestrogens can slightly increase the body's oestrogen and so relieve menopausal symptoms.

Soya isoflavones have been a part of the diet of millions of adults and children in Asia for centuries and are generally regarded as extremely healthy. A 2003 review came to the conclusion that the current scientific literature, taken as a whole, shows that isoflavones from soya foods are completely safe (Munro *et al.*, 2003).

Interest in phytoestrogens has increased dramatically over the last decade. The concerns raised are based on animal experiments which suggest that phytoestrogens can affect sexual development and reproduction function. These experiments are fundamentally flawed on many levels.

Firstly, isoflavones behave differently in different species so animal studies bear little relevance to humans. Secondly, the intestines act as a barrier through which isoflavones are absorbed gradually together with other nutrients so injecting animals with high doses of isolated isoflavones has no relevance. Finally, many of these experiments have exposed animals to isoflavones at levels many, many times higher than those consumed by people. More and more scientists and doctors are acknowledging that the results of animal experiments should not form the basis of a public health policy. Dr Kenneth Setchell, Professor of Pediatrics at Cincinnati Children's Hospital Medical Centre, states that mice, rats and monkeys all metabolise soya isoflavones differently from humans and that the only appropriate model for examining human reproductive development is the human infant (Setchell, 2006).

One study specifically examining the effect of soya-based formula on sexual development and fertility (Strom *et al.*, 2001) found no evidence of adverse effects on either sexual development or reproductive health. The authors said that their findings were reassuring about the safety of soya-based infant formula.

And a study reviewing all the available scientific studies on soya isoflavones and their possible effect on male hormones and reproductive functions (Messina, 2010) concluded that there is essentially no basis for concern. Isoflavone exposure at levels even greatly exceeding reasonable dietary intakes did not affect sex hormones in men or sperm and semen parameters.

The UK Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment conducted an in-depth analysis of soya effects on human health (COT, 2003) and **acknowledged that there is no evidence that populations which regularly eat high quantities of soya, such as the Chinese and Japanese, have altered sexual development or impaired fertility.**

A recent overview of the effects of isoflavones on human health showed that soya isoflavones can help prevent and treat some diseases (see below) and did not confirm any of the supposed risks

(Wang *et al.*, 2013). It was concluded that the function of soya isoflavones in the prevention and treatment of these diseases largely results from their phytoestrogen and antioxidant properties.

The protein and isoflavone content of some soya foods available in the UK is below.

Health benefits

Heart health

Scientists agree that soya can promote heart health – a fact supported by dozens of controlled clinical trials. The latest review investigating the effect of soya on cholesterol levels and heart disease risk (Mannu *et al.*, 2013) concluded that 30 grams of soya protein per day can significantly reduce both. The review also highlighted that soya consumption has been shown to reduce plaque build-up in the arteries and helps improve healthy blood flow. Another 2013 review of how soya isoflavones influence human health reached the same conclusion and also pointed at possible further beneficial effects of soya isoflavones on heart health (Wang *et al.*, 2013).

The role of soya protein in heart health has since been widely accepted and approved by many different health bodies. The UK government's Joint Health Claims Initiative (JHCI) offers market advice and a code of practice for both the UK food industry and consumers to ensure that health claims on foods are both scientifically truthful and legally acceptable. In 2002 the JHCI approved the health claim: **"the inclusion of at least 25 grams soya protein per day as part of a diet low in saturated fat can help reduce blood cholesterol"** (JHCI, 2002a).

One of the ways in which soya protein helps prevent or treat heart disease is that it interferes with cholesterol synthesis in the liver (Oliveira *et al.*, 2012).

Another study looked at the cholesterol-lowering effects of soya proteins in healthy young men, a sub-group that has been somewhat overlooked. It showed that soya protein, regardless of its isoflavone content, reduces cholesterol (McVeigh *et al.*, 2006).

These studies suggest that this effect involves a combination of factors in soya, including: isoflavones, soya protein peptides (small chains of amino acids) and its amino acid content (the sequence of amino acids that make up soya protein and which may differ significantly to that of animal protein). These factors appear to work together to lower cholesterol and so reduce the risk of heart attack and stroke.

Table 1: Soya protein and isoflavone content of soya foods readily available in the UK

Food	Daily serving (g)	Soya protein per serving (g)	Isoflavones per serving (mg)*
Soya milk alternative	Two large glasses (2x250ml)	15	33-50
Soya nuts (roasted Edamame beans)	A handful 28g	15	33-50
Soya mince/chunks – chilled/frozen	100g	16.4	36-54
Tofu – silken hard	100g	15	33-50
Tofu – marinated	60	16.8	37-55
Dried soya beans	100g (cooked weight)	16.5	36-54
Fresh or frozen soya young/Edamame beans**	80g	9.9	22-33
Soya yoghurt alternatives – vanilla or fruit varieties	2 x 125g pots	9	20-30
Soya shakes – chocolate, strawberry, vanilla	250ml	8.3	18-27
Soya Simply Plain or Vanilla alternative to yoghurt	200g	8	18-26
Soya custard	200g	6	13-20

* Isoflavone content varies depending on soil/growing conditions and production methods where up to 80 percent of isoflavones can be lost. Table uses standard estimated value of 2.2mg-3.3mg isoflavones per 1.0g soya protein.

** Average of the three current brands on the market

Magee, 2014

Menopausal symptoms

In Japan, where soya consumption is higher than most other places in the world, the incidence of menopausal hot flushes is much lower than in the West. However, within Japan there are variations. A six-year study of over 1,000 Japanese women showed that those who consumed the most soya foods had less than half the number of hot flushes compared to women consuming the least amount of soya (Nagata, 2001).

There are many studies showing that supplementing the diet with soya foods or soya isoflavones can reduce the frequency or severity of hot flushes and other menopausal symptoms in women. A study comparing the effects of soya supplementation, low-dose hormone therapy and placebo on menopausal symptoms found that soya supplementation reduced hot flushes by almost a half and in that aspect was as effective as hormone therapy (Carmignani *et al.*, 2010). The latest scientific review on the topic concluded that soya isoflavones are effective in reducing both the frequency and severity of hot flushes (Taku *et al.*, 2012).

A comprehensive review of available research on soya and menopausal symptoms by the North American Menopause Society came to the conclusion that soya isoflavones are effective in controlling hot flushes. The minimal dose at which significant benefit has been seen is 50 mg isoflavones per day and any improvements will show within 12 weeks. Supplements providing pure or higher proportions of the isoflavone genistein have shown particular benefit (NAMS, 2011).

However, as the overall diet has an effect on our health, obtaining isoflavones from soya foods as a primary source is advisable (with the addition of a supplement if needs be). The best sources of isoflavones are the least processed foods such as edamame, tofu, tempeh, miso and soya milk.

Bone health

Sex hormones such as oestrogen and testosterone are important for bone maintenance and when oestrogen levels in women drop during menopause, their risk of bone thinning, possibly leading to osteoporosis, increases.

The first published human trial investigating the effects of soya foods on bone health and osteoporosis indicated that soya protein may be effective in reducing the risk of this debilitating disease due to its weak oestrogen-like effects (Potter *et al.*, 1998). It was found that supplementing the diet of postmenopausal women with 40 grams of soya protein a day (containing 90mg of isoflavones) for six months significantly increased both the bone mineral content and density of the lumbar spine.

These findings were supported by a later study that looked at the effect of 80mg of soya isoflavones a day on bone density (Alekel *et al.*, 2000). This also showed that isoflavones reduced bone loss from the lumbar spine of women who may otherwise be expected to lose two to three per cent of bone per year. In 2003, a review of the published research concluded that diets rich in phytoestrogens (and therefore isoflavones) were likely to benefit bone health (Setchell and Lydeking-Olsen, 2003).

Studies from Japan and China show that postmenopausal women with the highest intake of isoflavone-rich soya foods have the highest bone mineral density in the lumbar spine compared with women with low intakes of soya (Somekawa *et al.*, 2001; Mei *et al.*, 2001). A more recent study of Chinese women, published in the European Journal of Nutrition, confirmed a strong link between soya isoflavones and a reduction of bone loss in postmenopausal women who were not obese (Ye *et al.*, 2006).

A recent review of research studies concluded that isoflavones can increase bone mineral density and decrease bone loss (Castelo-Branco and Soveral, 2013).

However, some studies showed that isoflavones extracted from soya did not have such substantive effects and it has been suggested that whole soya foods or protein may offer more benefit than extracted isoflavones.

Cancer risk

The low rates of breast and prostate cancers seen in Asian countries have encouraged scientists to investigate the role of soya foods on these and other hormone-related cancers.

Breast cancer

There is some evidence that soya intake during adolescence may reduce the risk of breast cancer later in life. *The Shanghai Breast Cancer Study* investigated 1,400 breast cancer cases in China (Shu *et al.*, 2001) and found that women who consumed the most soya as teenagers had half the risk of breast cancer as adults.

A year later, scientists investigated the link between adolescent soya intake and breast cancer in Asian-American women (Wu *et al.*, 2002). They found that women who consumed soya at least once a week during adolescence had a significantly reduced risk of breast cancer.

More recently, a study of more than 1,500 Asian-American women found that eating soya foods during childhood could reduce the risk of breast cancer by 60 per cent (Korde *et al.*, 2009). The greatest protective effect was seen in those eating soya six times a month or more, compared to less than three, from childhood onwards.

These studies suggest that high soya intake during adolescence reduces breast cancer risk and the risk continues to fall if people continue to eat soya as an adult. Drawing the evidence together, Trock *et al.* performed a review of 18 studies on soya exposure and breast cancer risk published between 1978 and 2004 (Trock *et al.*, 2006). **Results show a modest association between a high soya intake and a reduced breast cancer risk.** However, the authors



warn that this result should be interpreted with caution and that recommendations for high-dose isoflavone supplementation to prevent breast cancer or prevent its recurrence would be premature. Therefore, consuming soya as a part of a healthy diet is highly commendable, whilst more research on taking high-dose isoflavone supplements is needed.

The protective effect of soya was recently shown to apply to women who have breast cancer too. The Shanghai Breast Cancer Survival Study looked at over 5,000 women previously diagnosed with breast cancer (Shu *et al.*, 2009). Results showed that those who ate more soya foods (11 grams of soya protein per day, equivalent to one and a half servings of tofu or soya milk) were less likely to die from the disease and had a significantly lower risk of recurrence.

Another study of almost 10,000 women (Nechuta *et al.*, 2012) revealed that soya consumption after the breast cancer diagnosis slightly decreased the risk of death and significantly decreased the risk of developing a new tumour. And a similar study of breast cancer patients and soya food intake concluded that soya intake equivalent to about one serving of soya based food per day is associated with longer survival and low recurrence among breast cancer patients (Zhang *et al.*, 2012).

Some healthcare professionals are cautious and think that even the small oestrogen-like effect of soya foods may be detrimental for women with oestrogen-receptor positive (hormone sensitive) breast cancer who have gone through the menopause and whose natural oestrogen levels have dropped (PCRM, 2002).

Their concern is that the weak oestrogen activity of soya isoflavones may stimulate the growth of tumours which are sensitive to oestrogen. This is not a concern for premenopausal women, who have much higher levels of oestrogens which are many times more potent than phytoestrogens. However, these concerns are based largely on the results of in vitro (test tube) and animal studies but human studies never confirmed them. In fact, more and more human studies show that soya is safe and can be even beneficial for breast cancer patients. As the 2013 study on the effects of isoflavones on breast cancer showed – intake of soya isoflavones reduced postmenopausal breast cancer risk and contributed to a slight reduction in overall breast cancer risk (Boucher *et al.*, 2013). Another study examining soya consumption and its effect on breast cancer found that the risk of postmenopausal breast cancer was lower among women with higher intakes of soya and isoflavones (Wada *et al.*, 2013). And for postmenopausal women with breast cancer, higher soya and isoflavone intake was linked to lower risk of cancer recurrence (Kang *et al.*, 2010).

On the whole, the evidence suggests that consuming moderate amounts of soya foods is safe for women of all stages of life and likely to benefit health, both in terms of breast cancer risk and other chronic diseases.

Prostate cancer

Prostate cancer rates also vary widely around the world, tending to peak in developed, wealthy countries. Japan is the exception, where prostate cancer rates are surprisingly low, despite its high standard of living, and some research suggests that soya may be responsible.

There is a growing body of evidence establishing a strong association between diet and prostate cancer and soya foods in particular have been linked to lower risk of disease development (Gardner *et al.*, 2009).

An analysis of a number of studies on the subject showed that soya foods could lower the risk of prostate cancer by up to 30 per cent. Interestingly, this research found that while non-fermented soya foods, such as tofu and soya milk, lowered the risk, fermented ones such as miso and soya sauce, did not (Yan and Spitznagel, 2009).

Another research project analysing soya and isoflavone intake and prostate cancer (Gardner *et al.*, 2009) found that isoflavone levels in the prostate tend to be higher than blood levels. The

authors suggested this might explain the protective effect of soya on the prostate – if men eat soya on a regular basis, the prostate isoflavone levels reach concentrations that might interfere with cancer growth. However, further research is needed.

In summary, there are no human studies that show an increased risk of cancer due to soya consumption but plenty of evidence suggesting that it provides protection for both men and women.

Other types of cancer

Soya is a widely studied food and many scientists suggest it might be beneficial in the prevention of more types of cancer than previously thought.

A long-term, 13-year study of nearly 50,000 women of all ethnicities, revealed that regular intake of isoflavones can significantly reduce the risk of endometrial cancer (Ollberding *et al.*, 2012). Endometrial cancer usually means cancer of the inner lining of the uterus but it can spread to, or affect, surrounding tissues.

A recent study focused on whether one of the soya isoflavones, genistein, can affect human colon cancer cells (Mizushima *et al.*, 2013). The results showed that genistein was able to prevent the cancer cells from multiplying and the authors suggested that it may be an anticancer food component.

And another substantial study of almost 10,000 people investigating if soya intake has any effect on the risk of stomach cancer (Kwang-Pil *et al.*, 2013) discovered that people who consumed soya foods more than three to four times a week were significantly less likely to develop stomach cancer. It's interesting to note that the study also revealed that frequent intake of fried food increased the cancer risk, whilst high intake of green vegetables decreased it.

There are now thousands of studies on soya and its effects on human health published every year and they paint a very positive picture – soya is potentially beneficial in the prevention and treatment of many diseases, including many types of cancer.

Cognitive effects

Several studies indicate that soya intake may improve both short-term and long-term memory, mental flexibility and planning. Researchers at the Centre for Neuroscience at King's College, London, investigated the effects of a high soya diet (100mg isoflavones per day, equivalent to two to four servings of soya-based foods or drink) compared to a low soya diet (0.5mg isoflavones per day) in student volunteers (File *et al.*, 2001). **After just 10 weeks, those receiving the high soya diet exhibited significant improvements in short-term and long-term memory and in mental flexibility.**

Another study investigated the effects of soya isoflavones (60mg per day) on the cognitive ability of postmenopausal women (Duffy *et al.*, 2003). After 12 weeks, significant improvements were seen in the soya group, including their recall of pictures and in a sustained attention task. Its conclusion was that **significant cognitive improvements in postmenopausal women can be gained from 12 weeks of consumption of soya isoflavones.**

A recent study with a similar setup found that although isoflavone supplementation did not affect overall cognition, it did improve visual memory (Henderson *et al.*, 2012).

Another study investigated the effects of soya supplements (60mg isoflavones per day) on postmenopausal women and found that after just six weeks, the soya group showed a greater improvement of nonverbal (identifying objects, for example) short-term memory than the placebo group (File *et al.*, 2005). What's more, those on soya produced significantly better performances in mental flexibility and planning ability. There were, however, no improvements in long-term memory generation or sustained attention.

These studies show that soya isoflavones can have a significant positive effect on cognitive ability but the benefits may be restricted to people under the age of 65 (Kritz-Silverstein *et al.*, 2003; Kreijkamp-Kaspers *et al.*, 2004). Certainly, further investigation is warranted.

Soya infant formula

Nutritional adequacy

Viva!Health supports the World Health Organisation's recommendation that babies should be fed only breast milk for their first six months of life. However, some mothers are unable to, or choose not to, breast feed and in these circumstances specially formulated milks are recommended until the child is one year old. Soya-based infant formulas can provide all the nutrients required by a growing infant. In the US, 20-25 per cent of all formula-fed babies use soya (USDA, 2010). A number of studies confirm that infants fed soya-based formulas show normal growth and development. One study compared weight, length and head circumference of healthy, full-term infants up to one year old who were fed either soya-based formula or who were fed only breast milk for at least two months and were then weaned on to cow's milk formula. Both groups showed similar growth rates in the first year of life (Lasekan *et al.*, 1999).

Another study compared the nutritional status and growth of 168 infants who were allergic to cow's milk and were fed either soya-based infant formula or hydrolysed whey formula. In both groups, nutrient intake and growth were 'within reference values' – in other words, they grew normally (Seppo *et al.*, 2005).

And a study comparing brain development of infants who were breastfed or fed soya or cow's milk formula showed differences in the way the brain developed between breastfed and formula-fed babies, but there was no significant difference between the formula-fed groups (Jing *et al.*, 2010). This conclusion is supported by the results of a more recent study that compared the development of babies fed cow's milk or soya formula and breastfed babies (Andres *et al.*, 2012). The study found that infants fed soya formula grew normally and were on the same level with other formula-fed infants in terms of mental, psychomotor and language development.

In 2010 The National Toxicology Program (NTP) – an American institution – released its draft opinion on the potential of soya infant formula to cause adverse human developmental effects. Soya formula was labelled as being of "minimal" concern level and one of the experts stated that soya formulas have been used for over 50 years without reports of negative reproductive or developmental effects (Tillet, 2010).

There is currently no vegan infant soya formula on the UK market. Vegetarian soya-based infant formulas (the only animal derived ingredient being vitamin D3) are InfaSoy from Cow & Gate and Wysoy from SMA Nutrition.

In summary, soya-based infant formulas continue to provide a safe feeding option for infants. They meet all a baby's nutritional requirements but have none of the detrimental effects associated with cow's milk formulas. For more information on the health consequences of consuming cow's milk, see the Viva!Health's White Lies report online at www.whitelies.org.uk/materials or order a copy by calling Viva!Health on 0117 944 1000 Mon-Fri 9am-5pm. For more information on soya infant formulas see the Viva!Health's fact sheet Soya-Based Infant Formula.

Is soya safe for babies?

Soya-based nutrition during infancy has a long history of safe use around the world dating back centuries. The first report of soya-based infant formula in the West was in 1909 (Ruhrah, 1909) and soya-based infant formula was used in cases of infantile eczema as early as the 1920s (Hill and Stuart, 1929). Since those days, formulas have come a long way. They now contain all the necessary nutrients and can be used as a safe alternative to breast milk or as a supplement to it.

Use of soya-based infant formulas in the UK has grown since the 1960s and they are currently fed to about one per cent of all formula-fed babies aged four to 10 weeks, rising to about two per cent of infants aged 10-14 weeks (Hamlyn *et al.*, 2002). **In the US, soya infant formulas are consumed by 20-25 per cent of all babies who are fed formulas of whatever type** (USDA, 2010). Despite this, the UK Food Standards Agency (FSA) advise that you should only give your baby soya-based infant formula if your GP or health visitor advises it (FSA, 2007).

However, FSA also says that, until a full review of the evidence both for and against soya formula has been completed, there is no reason to stop your baby having a soya formula – but only if it has been suggested by a health professional. All these uncertainties are based on animal studies where rats and mice were either fed or injected very high doses of isoflavones – studies that have been highly criticised and deemed unreliable.

Millions of infants have been raised on soya formulas in the UK and US, many of whom are now well into their late 30s and early 40s. What's more, there are no reports from Japan and China that the use of soya has affected fertility rates. In fact, **the absence of any reported ill effects on millions of babies would suggest there are no adverse effects, either biological or clinical** (Klein, 1998). Heather Payne, of the Infant and Dietetic Food Association, said:

"Soya milk has been used for decades, and if there had been a problem I think it really would have come to light by now."
(BBC Health)

Oestrogen in cow's milk

The hormonal content of cow's milk has been widely discussed amongst scientists for the last few years. Cow's milk has been shown to contain over 35 different hormones and 11 growth factors (Grosvenor *et al.*, 1992).

Some scientists are particularly concerned about the oestrogen content of cow's milk, suggesting that it is one of the main ways we are exposed to it (Ganmaa and Sato, 2005). What concerns them is that cow's milk has changed drastically over the last 100 years. For most of the time that a cow is milked, she is also pregnant and therefore secreting high levels of hormones into the milk (Webster, 2005; Danby, 2005). These hormones have been linked to a wide range of illnesses and diseases, including certain hormone-dependent cancers such as ovarian and breast cancer. And research has shown that pasteurisation and homogenisation has only a small effect on the hormone levels and there's no difference between the hormone content of conventional versus organic dairy products (Pape-Zambito *et al.*, 2010).

The hormones and growth factors in milk act as signalling molecules, carrying important messages from the mother to the infant animal that encourage rapid growth and development. Cow's milk is designed to turn a small calf into a big cow in just one year.

Considering the main complaint about soya is that it contains phytoestrogens, many thousand times weaker than animal oestrogens, it begs the question: what is the real motivation behind the anti-soya crusade?



Soya and thyroid function

The thyroid is a small gland found in the front of the neck. It produces the important hormone thyroxine, which helps control how fast the body makes and uses the energy it obtains from food. The thyroid gland needs iodine from food to function and a lack of it can make the gland enlarge, forming a goitre. It can happen whether the thyroid is overactive or underactive. An overactive thyroid causes an illness called hyperthyroidism while an underactive gland causes hypothyroidism. The concerns about soya and the thyroid focus on two components – goitrogens and isoflavones.

Goitrogens are found naturally in soya, broccoli, kale, cabbage, turnips, millet, peanuts and pine nuts. They can interfere with the uptake of iodine and this might eventually lead to a goitre. However, this is not a problem if the diet provides enough iodine. Moreover, goitrogens get mostly destroyed by cooking in cruciferous vegetables (broccoli, cabbage, etc.) and fermenting reduces their content in soya products such as tempeh or miso.

A limited number of studies have suggested that isoflavones may affect thyroid function by lowering thyroxine concentrations. In a cautionary statement, COT advises physicians and other health care workers to be aware of possible links between isoflavones in soya-based infant formulas and thyroid function, particularly in cases of congenital hypothyroidism (COT, 2003).

However, a review of 14 trials which investigated the effects of soya on thyroid function concluded that there was little evidence that it had an adverse effect in people whose thyroid function is normal and whose diet contains adequate iodine (Messina and Redmond, 2006). The authors raise the possibility that soya foods may interfere with absorption of medications containing synthetic thyroid hormone taken by hypothyroid patients, but say that hypothyroid adults need not avoid soya foods.

There is a theoretical concern that in individuals with compromised thyroid function and/or whose iodine intake is marginal, soya foods may increase risk of developing hypothyroidism. The general consensus is that all people, soya consumers or not, should ensure their intake of iodine is adequate.

The Department of Health recommends that toddlers aged one to three should get 70 micrograms of iodine per day and adults 140 micrograms (Department of Health, 1991). You should be able to get all the iodine you need by eating a varied and balanced diet (FSA, 2007). Good sources of iodine include seaweed such as nori and kelp and Vecon vegetable stock. Adults can supplement their diet with kelp tablets but these are not suitable for children. Iodine is also found in cereals and grains, such as whole wheat

and rye, but levels vary depending on the amount of iodine in the soil where the plants are grown.

It is important not to take too much iodine as this can be harmful. The FSA consider that 500 micrograms or less a day is unlikely to cause any harm (FSA, 2010a).

Allergies

Although severe reactions to food are rare, approximately six per cent of children under three years old are thought to be affected by food allergy, the most common culprits being cow's milk and eggs. The number of people affected by food allergies tends to decline with age, with around four per cent of adults being affected, with shellfish and nuts being the most common causes (Department of Health, 2006).

Just a small number of foods are responsible for 90 per cent of all allergic food reactions and include: cow's milk and dairy products, eggs, peanuts, tree nuts (including Brazil nuts, hazelnuts, almonds and walnuts), fish, shellfish, including mussels, crab and shrimps, wheat and soya (FSA, 2010b). The symptoms of soya allergy include rashes, diarrhoea, vomiting, stomach cramps and breathing difficulties. Very rarely, soya can cause anaphylaxis (FSA, 2010c) – a severe and potentially fatal 'toxic shock'. Since November 2005, food labelling rules require pre-packed food sold in the UK to show clearly on the label if it contains soya (FSA, 2007c).

There are concerns that genetically modified (GM) soya may be more likely to cause an allergic reaction than non-GM soya (Soil Association, 2007). These concerns have been met by biotechnology companies producing even more GM soya, but with the specific proteins thought to cause the allergic reactions removed. GM products, especially soya and maize, are now in so many foods that it can be difficult to avoid them. If you want to avoid GM foods then choose foods that are certified organic.

Environmental impact of soya

Some people attempt to condemn soya by citing the environmental impact soya farming is having on the Amazonian rainforest. They are right to be concerned but people eating soya are not the problem – around 75 per cent of the world's soya production is fed to livestock so that people can eat meat and dairy foods (WWF, 2014). Much of the remainder is used as padding in a wide range of mainstream food products such as meat pies and pasties. Both the rainforests and our health would benefit tremendously if more people became vegetarian or vegan, even if they ate more soya.



Soya production

Long-established soya foods such as soya sauce, tamari, miso, tempeh, tofu and soya milk were originally developed in Asia using traditional fermentation or precipitation methods. Many of these foods use the whole bean and are healthier than foods based on soya protein isolates, which are extracts from soya beans and include textured vegetable protein (TVP) and other meat substitutes.

As with all processed foods, the nutrient content is partly determined by the processing method. Viva!Health does not recommend over-consumption of any highly-processed foods as they tend to contain high levels of fat, salt, sugar and artificial additives, which have all been linked to health problems. However, many of the 'mock meats' do provide a valuable low-fat and cholesterol-free source of good protein and increasingly they do not contain unhealthy hydrogenated fats (check the label!). This makes them a better option than their meaty milky equivalents, which contain saturated fat, animal protein, cholesterol and hormones.

The key to good health is to eat a wide range of foods including plenty of wholegrains such as wholemeal bread, brown pasta and brown rice, pulses (peas, beans – including soya – and lentils), fruit and vegetables and nuts and seeds.



Summary

- Soya beans are cholesterol-free and are a good source of protein, polyunsaturated fatty acids, antioxidants, B vitamins and iron.
- Calcium-fortified soya products such as soya milk and tofu provide a valuable source of this important mineral.
- Vitamin B12-fortified products such as soya milk provide a vital source of this nutrient.
- Soya protein lowers cholesterol and can protect heart health.
- Soya foods can reduce menopausal symptoms.
- Soya protein can protect bone health and reduce the risk of osteoporosis.
- Soya foods may reduce the risk of breast cancer.
- Soya is safe to eat by women of all ages including pre- and post-menopausal women who have had or have breast cancer.
- Soya foods may reduce the risk of prostate cancer.
- Soya foods can help improve cognitive skills.
- Millions of people have been safely consuming soya foods for thousands of years.
- Phytoestrogens (plant hormones) are much weaker than the natural oestrogens consumed in dairy products and red meat and may have a normalising effect on hormone levels.
- Soya-based infant formula can be used as a safe alternative or supplement to breast milk as it meets the nutritional requirements of the child.
- Millions of healthy infants have been safely raised on soya-based infant formulas.
- There is no evidence that soya adversely affects the sexual development or reproductive health of humans.
- Intakes of phytoestrogens in the UK are no greater than those consumed in Eastern countries for thousands of years.
- For the vast majority of people, soya does not disrupt thyroid function.
- Although soya may be responsible for some food allergies, it is not the main culprit.
- Soya 'mock meats' provide a valuable source of protein.
- Cow's milk contains over 35 different hormones and 11 growth factors, several of which have been linked to cancer.
- 75 per cent of the world's soya production is fed to livestock.

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