

The truth about soya

For Dr Mike Fitzpatrick, the saga of soya began in Monty Python-style with a dead parrot. His investigations into the ubiquitous bean started in 1991 when Richard James, a multimillionaire American lawyer, turned up at the laboratory in New Zealand where Fitzpatrick was working as a consultant toxicologist. James was sure that soya beans were killing his rare birds.

"We thought he was mad, but he had a lot of money and wanted us to find out what was going on," Fitzpatrick recalls.

Over the next months, Fitzpatrick carried out an exhaustive study of soya and its effects. "We discovered quite quickly," he recalls, "that soya contains toxins and plant oestrogens powerful enough to disrupt women's menstrual cycles in experiments. It also appeared damaging to the thyroid." James's lobbying eventually forced governments to investigate. In 2002, the British government's expert committee on the toxicity of food (CoT) published the results of its inquiry into the safety of plant oestrogens, mainly from soya proteins, in modern food. It concluded that in general the health benefits claimed for soya were not supported by clear evidence and judged that there could be risks from high levels of consumption for certain age groups. Yet little has happened to curb soya's growth since.

More than 60% of all processed food in Britain today contains soya in some form, according to food industry estimates. It is in breakfast cereals, cereal bars and biscuits, cheeses, cakes, dairy desserts, gravies, noodles, pastries, soups, sausage casings, sauces and sandwich spreads. Soya, crushed, separated and refined into its different parts, can appear on food labels as soya flour, hydrolysed vegetable protein, soy protein isolate, protein concentrate, textured vegetable protein, vegetable oil (simple, fully, or partially hydrogenated), plant sterols, or the emulsifier lecithin. Its many guises hint at its value to manufacturers.

Soya increases the protein content of processed meat products. It replaces them altogether in vegetarian foods. It stops industrial breads shrinking. It helps manufacturers mix water into oil. Hydrogenated, its oil is used to deep-fry fast food.

Soya is also in cat food and dog food. But above all it is used in agricultural feeds for intensive chicken, beef, dairy, pig and fish farming. Soya protein - which accounts for 35% of the raw bean - is what has made the global factory farming of livestock for cheap meat a possibility. Soya oil - high in omega 6 fatty acids and 18% of the whole bean - has meanwhile driven the postwar explosion in snack foods around the world.

Crisps, confectionery, deep-fried foods, ready meals, ice-creams, mayonnaise and margarines all make liberal use of it. Its widespread presence is one of the reasons our balance of omega 3 to omega 6 essential fatty acids is so out of kilter.

You may think that when you order a skinny soya latte, you are choosing a commodity blessed with an unadulterated aura of health. But soya today is in fact associated with patterns of food consumption that have been linked to diet-related diseases.

In 1965, the earliest year for which the Chicago Board of Trade keeps figures, global soya bean production was just 30m tonnes. By 2005, the world was consuming nine times that a year, at 270m tonnes. World soya oil production, meanwhile, has increased sevenfold over the same period, from 5m tonnes to 34m tonnes a year.

To feed demand, new agricultural frontiers are being opened up in Brazil, where large areas of virgin rainforest have been illegally felled to make room for the crop. US-based transnationals are now exporting soya back to China, the country from which it originated, as newly urbanised Chinese switch to industrialised western diets. Thanks to US agribusiness, we have developed an apparently insatiable global appetite for the bean produced by farmers in the Americas.

James and Fitzpatrick became convinced early on that this entirely new dependence on soya was, in fact, a dangerous experiment. The dead parrots were no joke - they were the canaries in the coalmine.

For James and his wife Valerie, breeding the exotic birds was a retirement dream. They wanted to feed their young birds the best, so they began giving the chicks a soya feed. Parrots do not eat soya beans in the wild but the high-protein animal feed had been marketed in the US as a new miracle food.

The result was a catastrophic breeding year. Some of the birds were infertile; many died. Other young male birds aged prematurely or reached puberty years early. "We realised there was some sort of hormonal disruption going on but we'd eliminated other possible hormone- disrupting chemicals such as pesticides from the inquiry," Fitzpatrick says.

So the toxicologist began a systematic review of the scientific literature on soya. After finding out about the plant oestrogens in soya, Fitzpatrick says, "My next thought was: what about children who are fed soya milk?" He calculated that babies fed exclusively on soya formula could receive the oestrogenic equivalent, based on body weight, of five birth control pills a day.

In fact, it had been known since the early 1980s that plant oestrogens, or phyto-oestrogens, could produce biological effects in humans. The most common of these were a group of compounds in soya protein called isoflavones. Food manufacturers had variously marketed soya foods as an antidote to menopausal hot flushes and osteoporosis, and as a protective ingredient against cardiovascular disease and hormone-related cancers.

The hypothesis behind the health claims is that rates of heart disease and certain cancers such as breast and prostate cancer are lower in east Asian populations with soya-rich diets than in western countries, and that the oestrogens in soya might have a protective effect.

Fitzpatrick, however, looked into historic soya consumption in Japan and China and concluded that Asians did not actually eat that much. What they did eat tended to have been fermented for months. "If you look at people who are into health fads here, they are eating soya steaks and veggie burgers or veggie sausages and drinking soya milk - they are getting over 100g a day. They are eating tonnes of the raw stuff."

Mass exposure to isoflavones in the West has only occurred in the past 30 years due to the widespread incorporation of soya protein into processed foods, a fact noted by the Royal Society in its expert report on Endocrine Disrupting Chemicals in 2000. When the independent experts on the scientific committee on toxicity trawled through all the scientific data, they concluded that soya milk should not be recommended for infants even when they had cow's milk allergies, except on medical advice, because of the high levels of oestrogenic isoflavones it contains.

On breast cancer, they decided that "despite the suggested benefits of phyto-oestrogens in lowering risk of developing breast cancer, there is also evidence that they may stimulate the progression of the disease". The lower risk of certain cancers among Asian populations might be due to other factors - their high consumption of fish, for example. They advised caution. On the effects on menopause symptoms, the evidence was inconclusive, the experts ruled. The evidence on prostate cancer was mixed. Since isoflavones cross the placenta, the implications of pregnant women eating large quantities of soya were unclear.

What the committee also pointed out was that the way soya was processed affected the levels of phyto-oestrogens. Traditional fermentation reduces the levels of isoflavones two- to threefold. Modern factory processes do not. Moreover, modern American strains of soya have significantly higher levels of isoflavones than Japanese or Chinese ones because they have been bred to be more resistant to pests. (One way to tackle pests is to stop them breeding by making them infertile. It turns out that unfermented soya did play one role in traditional Asian diets - it was eaten by monks to dampen down their libido.)

The Food Standards Agency advice is that soya's potential to have an adverse effect on babies' hormonal development is still controversial, but that soya formula should only be given to infants under 12 months old in exceptional circumstances.

Professor Richard Sharpe, head of the Medical Research Council's human reproductive sciences unit at Edinburgh University, was a member of the committee's working group on phyto-oestrogens in food. He has

been studying the decline in male fertility in the past half-century. He recently completed studies on the effects of soya milk on young male monkeys, which showed that it interferes with testosterone levels. Manufacturers, however, argue that soya infant formula has been widely used without problems. While 30-40% of all infants in the US are raised on soya formula - not least because it is given away in welfare programmes - soya milk for babies has always been confined to a small minority in the UK. So does Sharpe think exposure to soya from other sources - vegetarian soya proteins, the soya flour in factory bread, the hydrolysed proteins added as flavourings, for example - has a cumulative effect that might be worrying to other age groups? "If someone said they were adding a hormone to your foods, would you be happy with that? There may be lots of effects, some of them may be beneficial, but would you be happy with that? I am not a fan of processed foods, full stop. And these quick fixes for protecting against ill-health - you know they can't be true," he adds.

Soya is used in traditional oriental diets after cultures, moulds or precipitants have achieved a biochemical transformation, because in its raw form the mature bean is known not only for its oestrogenic qualities but for also its antinutrients, according to the clinical nutritionist Kaayla Daniel, author of *The Whole Soy Story*. Soya was originally grown in China as a green manure, for its ability to fix nitrogen in the soil, rather than as a food crop, until the Chinese discovered ways of fermenting it.

The young green beans, now sold as a fashionable snack, edamame, are lower in oestrogens and antinutrients, though not free of them. But raw mature soya beans contain phytates that prevent mineral absorption and enzyme inhibitors that block the key enzymes we need to digest protein. They are also famous for inducing flatulence.

In so-called naturally brewed soya sauces the processed soy protein meal is mixed with the mould spores and given accelerated ageing at high temperatures for three to six months. Non-brewed soya sauce is made in just two days. Defatted soya flour is mixed with hydrochloric acid at high temperatures and under pressure to create hydrolysed vegetable protein. Salt, caramel and chemical preservatives and flavourings are then added to provide colour and taste. This rapid hydrolysis method uses the enzyme glutamase as a reactor and creates large amounts of the unnatural form of glutamate that is found in MSG. Most commercial soya milk is made from soya isolates.

Today the global soya market is dominated by a handful of American trading companies. Three of them - Bunge, ADM and Cargill - control 80% of the European soya bean crushing industry. These three, together with allied companies, are also estimated to control up to 80% of European animal feed manufacturing.

They dominate the US soya market, and also account for 60% of Brazil's soya exports.

Before the first world war, only a very few soya beans were crushed. The Americans had begun experimenting with using the protein meal as animal feed, but farmers were reluctant to take it up because it was indigestible to chicken and pigs. It was mainly used in soaps because it was considered unpalatable.

(Henry Ford later funded research projects to turn soya into plastic for car parts.)

It was not until the 1940s that industry worked out how to deactivate the enzyme inhibitor in the protein meal sufficiently for animals to tolerate it, and it was only technology taken from the Nazis at the end of the second world war that solved the problem of the oil's horrible smell and flavour. That left the way for the US to promote the soya that suited its agricultural conditions as part of the reconstruction of Europe through the 1950s. Soya oil exports to Europe tripled under the Marshall Plan, and heavily subsidised exports of surplus US soya ensured the commodity's dominance in animal feed. The subsidies continue. Between 1998 and 2004, US department of agriculture figures show that its soya farming received \$13bn in subsidies from the American taxpayer.

Until 2003, the US was the largest exporter of soya. But through the 1990s, multinationals promoted the expansion of the crop in Latin America, helping finance farmers and building the infrastructure for soya exports. The attraction of Latin America is that land is cheap and labour costs are minimal too. Three years

ago, the combined exports from Brazil and Argentina surpassed US exports for the first time. The cost is now being counted there in environmental damage and social upheaval. The cost to western consumers may yet be counted in health.