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Going organic – is it nutritionally better?

Yaso Shan examines the claims that organic food is a better nutritional option

Confidence in the food markets, the sale of genetically modified (GM) foods, the use of ingredients derived from GM crops, organic foods, the use of pesticides and health risks associated with pesticide residues and the inclusion of food additives are sparking debate and discussion. The food industry has been quick to capitalise on the increasing demand and trend for organic produce. Many leading supermarkets now stock organic ranges. But is this a real alternative? How can consumers be certain that organic food is safer or indeed if it is nutritionally superior?

Organic foods have been available for many years as a food option and have been a popular choice for those who could afford it and for those concerned about modern farming methods and food manufacturing techniques, their environment and the nutritional and health benefits of their foods. Many advocates of organic food consumption believe that foods grown

without the use of chemical additives are 'superior'. Moreover, food scares such as the Para Red and Sudan III incidents (BBC News 2005) have done more than any campaign to champion the cause for organic foods.

Without definitive or scientific evidence on the health benefits of organic produce, many people are not convinced that going organic is the healthier option. The lack of scientific evidence is due to the difficulty in conducting trials over a number of years in individuals who can only consume organic foods; it is flawed, impractical and impossible to monitor rigorously. Therefore, a lack of proof is more to do with limitations in trial design for a long-term study than conclusive evidence that organic produce is no better than conventionally grown food. So what is the driving force behind those who vehemently support the argument for going organic?

This article aims to highlight the health benefits

claimed about the consumption of organic foods compared with conventionally grown foods. It will also examine the health risks associated with non-organic produce such as additives and the practices and use of pesticides within modern farming. So what is the real difference in organic foods, how are they grown and why would it benefit health in the long-term?

Reasons for going organic

Organic food is grown and stored without the use of pesticides, fertilisers and artificial additives. The exponential rise in cases of asthma (Salam *et al* 2004), cancers (Muir 2005), heart disease and dietary disorders such as the inflammatory bowel diseases (IBD) and irritable bowel syndrome (IBS), are linked to a poor quality diet, increased pollution and intensive farming techniques. However, lifestyle factors – of which diet is just one – are also at play. The rise in these illnesses may well be due to a lack of a well-balanced diet rather than the consumption of non-organic foods.

Modern farming and risks to health

The health risks of pesticide residues in food as well as the environment are slowly becoming clear; they include immune suppression, hormone disruption, neurological damage and other adverse effects (Heaton 2001). These residues may be more toxic than initially expected due to the synergistic effects of multiple residues on a variety of foods which can accumulate in human tissue. The counter-argument is based on accusations that organic foods pose a greater toxicological risk from pathogens such as the *E.coli* 0157:H7 and aflatoxins. The Soil Association (2001), the UK's leading campaigning and certification body for all organic food and farming, says these accusations remain unsubstantiated with no real evidence or logic to justify them.

The range of chemicals used, invariably sprayed, have included the organochlorine insecticides such as DDT (which has now been banned in the developed world for many years) and others such as lindane and atrazine. In recent years, UK government research has consistently found pesticide residues in foods. Organophosphates, one of the most dangerous pesticides, have been linked to a range of conditions such as cancer, reduced male fertility, foetal abnormalities, chronic fatigue syndrome in children and Parkinson's disease (BMA 1992 and

Robbins 1991). Several studies have shown that those with high exposures to pesticides such as farm workers have higher incidences of cancer (Schreinemachers 2000, Alavanja *et al* 2003). A further concern is the 'cocktail effect', which occurs when different types of pesticides are sprayed on crops. Studies show that combinations of pesticides such as low-level insecticides, herbicides and nitrates can affect health in ways that spraying them individually would not (Boyd *et al* 1990, Porter *et al* 1999).

Endocrine disruption is as a result of long-term exposure to very small doses of pesticide residues, which accumulate over time and become concentrated to the extent that they can disrupt normal metabolic processes. Similarly, nitrate residues can also accumulate in the body over time and disrupt some of the metabolic processes (Porter *et al* 1999). So far, 568 chemical products have been identified as endocrine disruptors such as those that mimic, alter or modulate hormonal activity, of which organophosphate pesticides are one type (Segarra 2003). Further, the unknown health risks continue to exist for the breakdown products and the metabolites of pesticides.

Additional risks are present with dioxins, which are the main by-products of industrial processes such as the manufacture of herbicides and pesticides. Short-term exposure to high levels of dioxins may result in skin lesions and altered liver function. Long-term exposure is linked to impairment in the immune system, the nervous system, the endocrine system and reproductive function. Chronic exposure of animals to dioxins has resulted in several types of cancer (WHO 1999). The WHO (1999) estimates that 33 per cent of all illnesses are due to environmental causes, a figure which rises to 40 per cent in children. For cancer specifically, genetic factors represent scarcely 10 per cent of cases.

Some non-organic manufacturers routinely add antibiotics and other drugs to prevent crop disease and wastage. This also includes the production of meat and poultry, though the UK has stricter laws than most other countries in this regard, particularly the US. Many American non-organic meats are likely to have been subjected to a host of chemical drugs, especially antibiotics and growth hormones.

The debate over the long-term safety of genetically modified foods has been raging for some time now. Scientists warn that genetic manipulation can increase the levels of natural plant toxins or allergens in foods (or create entirely new ones) in unexpected ways by switching on

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Table 1. Some of the banned additives under organic food regulations and reasons for their ban

Banned substance/additive	Reason for ban
Hydrogenated fat	Linked to heart disease. The FSA states that it has no nutritional value and is banned under organic food standards.
Phosphoric acid	A highly acidic ingredient that is added to fizzy drinks. It can leave bones brittle and porous. This could increase the risk of osteoporosis at a later stage.
Aspartame	A neurotoxin and the most widely used artificial sweetener.
MSG	Thought to be responsible for the 'Chinese restaurant syndrome'. Symptoms of exposure include dizziness, headaches and asthma attacks. In some people it can cause tachycardia (rapid heart rate), flushing, sweating and numbness or burning around the mouth.
Sulphur dioxide	Can often cause problems in people who have asthma.

Table 2. Component mean % increase in organic vs non-organic produce

Component	% increase compared to conventionally grown foods
Dry matter	+26
Potassium	+13
Calcium	+56
Magnesium	+49
Iron	+290
Copper	+34
Manganese	+28
Protein	+12
Essential amino acids	+35
Nitrates	+69
Phosphorus	+6

genes that produce poisons. In 1994, the EU banned the use of recombinant bovine growth hormone (rBGH) in cows, but it is still approved in the US. However, scientists have warned that significantly higher levels (400-500 per cent or more) of a potent chemical hormone (Insulin-like Growth Factor or IGF-1) in milk and dairy products of rBGH injected cows could pose serious hazards such as breast, prostate and colon cancer (Cummins 1999).

Further, there are other dangers including antibiotic resistance (through antibiotic resistant marker genes), increased pesticide residues (contrary to reports claiming otherwise, GM crops are subjected to just as many toxic pesticides and herbicides as conventional crops), genetic pollution (through cross-pollination between GM crops and non-GM crops in adjoining fields), damage to beneficial insects and soil fertility, creation of 'superweeds' and 'superpests', new viruses and pathogens, genetic 'bio-invasion' (and subsequent ecological imbalance), socio-economic hazards and ethical hazards (Cummins 1999).

In the UK, there are around 300 food additives (including preservatives) which all have EU approval and though their inclusion in food has been argued over for sometime, the FSA does not deem them unsafe. One example is the yellow food colouring tartrazine (E102), which has been linked to allergic reactions, headaches, asthma, growth retardation and hyperactivity in children (Hanssen and Marsden 1987, Ward *et al* 1990). The FSA does, however, ban the use of artificial additives and preservatives in all baby foods. Organic foods do not permit the use of some specific additives because of evidence that they can be damaging to health.

These include monosodium glutamate (MSG), aspartame, phosphoric acid, sulphur dioxide and hydrogenated fats. Table 1 gives further reasons why organic foods are banned from including these additives.

Going organic

To authenticate all organic foods, manufacturers must satisfy the UK Registered Organic Food Standards (UKROFS), which is the legal body that inspects, regulates and ensures that standards for all organic produce in and outside the UK are being complied with. The EC Regulation currently provides rules for the production of all organic foods within the European Community.

From a nutritional standpoint, there has been enormous speculation and discussion whether organic food is better. Many consumers expect organic food to be healthier than food produced under conventional conditions but there is a lack of scientific evidence to support this view. However, a review of 41 published studies comparing the nutritional value of organically grown and conventionally grown fruits, vegetables and grains, concluded that there are significantly more of the several nutrients in organic crops. These included 27 per cent more vitamin C, 21.1 per cent more iron, 29.3 per cent more magnesium and 13.6 per cent more phosphorus (Worthington 2001). In addition, organic foods had 15.1 per cent less nitrates than their conventional counterparts, particularly leafy vegetables (Williams 2002). The Soil Association produced a host of information about this very argument, the most extensive report being the one published in 2001 (Heaton 2001). Table 2 illustrates a straightforward nutritional analysis comparing organic and non-organic produce.

Many consumers are put off buying organic because it tends to be more expensive, the price difference being around 20 per cent. However, organic produce was found, on average, to contain 26 per cent more dry matter (less water). The use of agro-chemicals can speed up the growth of a plant, changing its structure to contain increased levels of water. This is why conventionally grown foods tend to shrink more on cooking as the high water content evaporates.

Organic farming also keeps animals healthy as the use of drugs is restricted (Sams 1999). So salmonella, cryptosporidium and listeria are rare in organic foods. *E.coli* O157:H7 infection arises directly from intensive farming and kills over 200 people each year both in the UK and the US. It is virtually non-existent in organic meat and

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Table 3. Defining some of the new terminology within the food industry

Method/concept	Description
The 'super foods' concept	Any substance that can be considered a food or part of a food and provides medicinal or health benefits, including the prevention and treatment of disease.
Nutraceuticals/functional foods	Nutraceuticals can be a fortified food or dietary supplement that provides health benefits. They are biologically active substances in the body that don't fall into a category such as a vitamin, mineral or herb. They are derived from nature (plants or animals) and can work with vitamins, minerals and herbs to treat many conditions and help optimise bodily functions. Nutraceuticals are also described as 'super foods' or 'functional foods'.
Nutrigenomics	This term refers to the study of our food and how it influences our health through interactions with our genetic make-up. It is suggested that one day many of our ailments might be treated with special diets. Just as pharmacogenomics has led to the concept of 'personalised medicine' and 'designer drugs', so will the new field of nutrigenomics open the way for 'personalised nutrition' by precisely matching a person's diet with their unique genetic make-up.
Grown 'biodynamically'	Biodynamically grown food comes from farms designed to be self-contained sustainable ecosystems that bring together the complex interrelationships of plants, animals, and soil, with the warmth of the sun, the seasonal energies of the earth, and the rhythms of the cosmos. It is a special type of organically grown food that meets or exceeds all organic growing standards.

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poultry. Moreover, growing fruit and vegetables organically encourages higher flavonoid levels as a natural defence mechanism against pests that feed on them. Flavonoids play an important role in preventing heart disease and cancer. Equally, organic produce will contain more antioxidants such as lycopene (from tomatoes) and other key phyto-nutrients such as tannins.

Increased risk in children

The risk to children should not be ignored either as they are more vulnerable to the chemical toxins in our food. They have a higher intake of food and water per unit body weight than adults and their relatively immature organ systems may have limited ability to detoxify these substances (Eskenazi *et al* 1999).

Other alternatives

The food industry in Britain is big business. New products and methods of growing and marketing food are fast emerging to keep in line with modern trends and fads. Some utilise scientific innovation and technology and are advertised in such a manner that encourages consumers to be convinced that these methods produce superior quality foods that will be healthier and more beneficial. Some of these new methods are summarised in Table 3.

Additionally, foods that claim to be 'fresh' may not always be so since EC food labelling laws permit a product to be labelled thus even if it is three years old. Consumers are duped into the notion that fresh is healthier and are therefore more likely to buy it. For example, the average frozen turkey could have been sitting around for a perfectly legal five years with the 'best before' dates not applying. Meat and fish could be as old as a few weeks to a year and mass-produced pasta, apples and 'freshly squeezed' orange juice could be as old as one or two years.

Conclusion

While it is important to acknowledge and embrace new methods and technologies, advances should not compromise health or the quality of foods. This applies both to organic produce as well as conventionally grown foods. Good nutrition is critical to human health and well-being and what we consume as fuel for our bodies may be putting our health at risk or cause serious damage and illness in as much as sustain us. In light of current concerns regarding traces of illegal dyes and forbidden ingredients, the link between pesticide residues and disease, food additives and illness, there is an increasing market trend for organically grown produce and a pressing call for traditional methods of farming and food manufacturing processes. What are considered safe limits for additives and chemicals by the regulatory authorities should be examined on the basis of whether additives are necessary at all.

Market trends for organic produce may create pressure to purchase such foods on the basis of good nutrition but its superiority in this regard is yet to be proved and should be borne in mind during purchase. Lifestyles may be modern but our bodies continue to be fundamentally unchanged in terms of its requirements and constitution. There is a strong call from public opinion for going back to basics. Going organic may assist in curbing or preventing the increasing incidence of some of the most invasive and infiltrative diseases witnessed in modern times that have shown a direct link to diet ■

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