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About this kit

In early 2002, Greenpeace Australia Pacific began its campaign to stop the release of genetically engineered organisms into the environment. Recognising the enormous threat genetic engineering (GE) poses to both the environment and to food itself, we have now joined 24 Greenpeace offices around the world and numerous international groups, to work toward an environment and food supply that is GE-free.

This kit has been developed to empower you to get active on the issue of GE in Australia. As more and more people reject GE in their daily lives, so governments, regulators and the food industry will be forced to respond.

The kit provides you with information on GE in Australian food and fields; briefings on various aspects of the technology; and a range of ideas and tools to help you get active. There are links to further information, a contact list of existing GE groups and a supermarket activist kit!

Greenpeace gratefully acknowledges permission to reprint outstanding contributions by Dr Judy Carman, Gyorgy Scrinis, Prof Peter Wills, Prof. Barry Commoner and Warren Kalinko.

Further information on this kit and electronic copies of its documents are also available from Greenpeace (contact details below). Go to www.greenpeace.org.au/truefood for more information on the Greenpeace GE campaign or to join the Truefood Network, a community of people working to stop GE food.

Greenpeace encourages you to take back control of your food and your environment. We hope this kit will help you achieve this. Together we can create a future that is GE-free from paddock to plate!

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Genetic engineering: a recipe for disaster

"Our morality up to now has been to go ahead without restriction to learn all that we can about nature. Restructuring nature was not part of the bargain"[1].
Dr George Wald, Nobel laureate.

Disregarding nature

Genetic engineering is a crude new technology that allows scientists to move genes between different species. Using laboratory techniques, scientists can create life-forms that could not occur in nature. This is done by taking genes from one organism and forcing them into another, in the hope of achieving a specific and desired change within the organism. The genes used in this process can be completely unrelated – crossing species that could never breed naturally. For example, cow genes have been inserted into soybeans[2], rat genes into lettuce[3] and human genes have been forced into pigs and rice.[4]

From an evolutionary perspective, organisms have developed through a progression of stages (frogs developed from fish, humans from apes) - not in a random manner. The process of genetic engineering however, forces genes together from organisms that appear at completely different stages of the evolutionary tree.[5] Scientists themselves have no idea what effects this might have in the long term – neither on the organism itself, on humans, nor on ecosystems, once these organisms are released into the environment.

The gene insertions described above mostly take place in one of the following ways. A virus or bacterium acts as a 'ferry' and 'smuggles' the engineered DNA into the host organism, thereby inserting the new DNA; or through shooting genetically engineered DNA to particles of gold and shooting them into the host organism with a 'molecular shotgun'. Often the host organism does not successfully take up the new genes.

In order to find out which organisms have taken up the new genes, antibiotic resistance genes are also added to the DNA intended for insertion. When covering the host organisms with antibiotics, only those that have taken up the foreign DNA (with the antibiotic resistance genes) will survive. This method of selecting successful insertions shows how immature this technology really is. There is no way of actually predicting or controlling where the foreign DNA goes within the organism.

A simplistic science

[1] Source: George Wald, "The Case Against Genetic Engineering," in David Jackson and Stephan Stich, eds., The Recombinant DNA Debate, (Englewood Cliffs, N.J.: Prentice-Hall, 1979), pp.127-128.
[2] To express milk proteins, http://www.nbiap.vt.edu/cfdocs/fieldtests1.cfm
[3] Jain, AK, Nesler CL (2000) Metabolic engineering of an alternative pathway for ascorbic acid biosynthesis in plants, *Molecular Breeding*, vol.6, isue 1, pp 73-78
[4] http://archive.greenpeace.org/~geneng/highlights/food/pharmrice.htm
[5] See Peter Wills' graphic, http://www.phy.auckland.ac.nz/staff/prw/biocomplexity/evolutionary_tree.htm

President of the chemical giant Monsanto, Hendrik Verfaillie, once said, "What you see today is the very, very early beginning of biotechnology... We have the first products in the marketplace, we see the promise of what's coming and quite frankly, we can only imagine the future."[6]

The very science on which the technology is based, has in fact already been refuted. Genetic engineering is based on the very simple assumption that one gene creates one protein that then creates one trait (eg: blue eye colour). The Human Genome Project, however, set out to identify all human genes, showed that humans only have approximately 30,000 genes which code for around 250,000 proteins. This means that genes do not only code for one protein, but for several. Additionally, it has been shown that it's not a one-way road - genes not only determine proteins, but proteins can also affect genes.[7]

Greenpeace International GE campaigner Benedikt Haerlin says, "Identifying genes is like recognising a random collection of letters. We still don't know, though, which words the letters form and which story they might tell".

The other central assumption of genetic engineering is that a gene will express the same trait, no matter where it is placed or which organism it is in — bacterial or human. However, Dr Michael Antoniou explains that " Genes are arranged along the DNA in groups or 'families'. The function of a given gene in a group is dependant on all the other genes that are present within the same family. Furthermore, the genetic activity in one family of genes can affect the function of genes in other groups of genes. It is also clear that genes and the proteins they give rise to, have co-evolved together to form an extremely intricate, interconnected network of finely balanced functions, the complexities of which we are only just beginning to understand and appreciate."[8] The term 'junk-DNA' illustrates this naive approach: 'If we don't know what function it has, then it has no function.'[9]

This argument is not merely academic. In 1999, Belgian researchers found that Monsanto's Round-up Ready soybeans (approved as food in most countries including Australia), not only contained undeclared DNA, they also contained 'unidentified' DNA.[10] Although the source of this DNA has still not been clarified, the product is still approved for use in our food supply.[11]

Experiences with DDT, thalidomide and Mad Cow disease in recent decades should have served as a reminder that nature is complex and cyclical. Whether looking at an ecosystem as vast as Australia, or at the molecular level of an organism, interfering in a cycle at one point will always have ramifications at another. Some effects are immediate and obvious. Others only appear later and often somewhere unexpected[12].

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[6] Monsanto's Verfaille sees bright biotech future. CEO wants his company to be socially responsible, St. Louis Post-Dispatch, September 11, 2002, by Rachel Melce

[7] Unraveling the DNA myth.The spurious foundation of genetic engineering, Barry Commoner, Harper's Magazine Feb 2002

[8] Genetic Engineering and Traditional Breeding Methods: A Technical Perspective', Michael Antoniou, Physicians and Scientists for Responsible Applications of Science and Technology, www.psrast.org/mainbree.htm

[9] "Junk DNA". Over 95 percent of DNA has largely unknown function, Jan Suurkula MD, Physicians and Scientists for Responsible Application of Science and Technology, http://www.psrast.org/junkdna.htm

[10] Windels, P., Taverniers, I. Depicker, A. Van Bockstaele, E. & De Loose, M., 2001, Characterisation of the Roundup Ready soybean insert. *European Food Research Technology*, (in press), http://link.springer-ny.com/link/service/journals/00217/contents/01/00336/

[11] http://www.foodstandards.gov.au/whatsinfood/gmfoods/gmcurrentapplication1030.cfm

[12] See Prof Peter Wills' website visually showing the various levels of complexity, from protein interactions to food webs, http://www.phy.auckland.ac.nz/staff/prw/biocomplexity/summary.htm

Tampering with genes whose function we have yet to fully understand, makes the threat of something going wrong all the more significant. Numerous 'unexpected' side-effects have already appeared in genetically engineered organisms and remain largely unsolved: GE soybean pods, for example, were found to crack when exposed to heat, other GE crops produced lower yields and new toxins[13]. Such side-effects are 'unexpected' because potential or novel problems are simply not looked for. The United Nations FAO/WHO Codex Alimentarius commission draft guidelines state: "Unintended effects can result from the random insertion of DNA sequences into the plant genome which may cause disruption or silencing of existing genes, or modifications in the expression of existing genes." We therefore need to ask ourselves, is it really possible to take all necessary precautions when releasing a completely new species onto the face of the earth? And how can the risk of releasing genetically engineered organisms be justified, when so much is at stake?

Australia's latest cane toad?

Magnifying the threat of genetic engineering, is the fact that it produces living organisms. Once released into the environment genetically engineered organisms cannot be recalled. As life-forms, they do what they are designed to do — they spread and reproduce. Releasing new forms of life into the environment, without being able to assess their long-term impact, is clearly irresponsible.

The Precautionary Principle set down at the 1992 Rio Environment Conference states that, "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason to postpone cost-effective measures to prevent environmental degradation".[14]

Genetically engineered canola serves as a clear warning of how genetically engineered organisms are able to spread. With its tiny seeds and fine pollen, the DNA of this plant is easily carried through farming land by wind, insects and birds. Australia is facing the pending release of GE canola in early 2003. Canada, Australia's prime competitor in canola production, already suffers from massive GE contamination, with its canola crops and seed (including foundation seed stock), permanently affected[15]. This lead to uncontrollable 'superweeds' that are immune to conventional herbicide treatments. As a 'promiscuous' species of the brassica family, canola also readily crosses out to other brassicas like wild radish and wild turnip, common weeds in Australian agriculture and bushland[16]. Horizontal gene transfer, the transfer of DNA between unrelated species, has already occurred between GE food and gut bacteria, as well as between GE crops and the bacteria in soils[17].

Releasing genetically engineered organisms into the environment, is therefore allowing a flawed technology to jeopardise the integrity of organisms, ecosystems, our food supply and human health. Bt (Bacillus thuringiensis) crops, for example, are genetically engineered to generate their own pesticide (as opposed to pesticide being sprayed on the plants

[13] Seeds of doubt, North American Farmers' experiences of GM crops, UK Soil Association, http://www.soilassociation.org/, p 13
[14] Principle 15, http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm
[15] For further references see *GE canola – out of control in Canada*, April 2002, Greenpeace International
[16] Lefol, E., Danielou, V., Darmency, H., Boucher, F., Maillet, J. & Renard, M. (1995) Gene dispersal from transgenic crops. I. Growth of interspecific hybrids between canola and the wild hoary mustard. Journal of Applied Ecology 32: 803-808. Microbiology Reviews 22: 79-103. 17 BMA (1999) The impact of genetic modification on agriculture, food and health. An interim statement. British Medical Association: London.
[17] Mercer D., Scott K., Bruce-Johnson A., Glover L. and Flint H. (1999) Fate of Free DNA and Transformation of the Oral Bacterium Streptococcus gordonii DL1 by Plasmid DNA in Human Saliva, Applied and Environmental Microbiology, Vol 65, No. 1, p 6-10

selectively). Experiences with Bt crops illustrate how GE plants can affect organisms at various points of the food chain: When a Bt crop was grown in a US field trial, the larvae of Monarch butterflies were found to be harmed. The larvae were affected not by the Bt pollen on the plant itself, but on neighbouring milkweed which been contaminated with Bt through insects and wind[18]. Bt cotton, widely grown in Australia, is engineered to repel the cotton bollworm. However, the crop has been found to also affect the insects that are the natural parasites of the bollworm[19]. When such 'beneficial insects' are affected down the food chain, the entire ecology of an area is altered. As with the Australian experience of the cane toad, this can mean that the end result is simply new, different and more difficult pest problems. These secondary effects demand more frequent and often stronger applications of pesticides, forcing farmers onto a treadmill of pesticide dependence[20].

The Australian Office of the Gene Technology Regulator (OGTR) refuses to take the environmental and health impacts of these inevitable secondary effects and necessary measures (like using more toxic herbicides) into account, when considering applications to grow GE crops in this country. If all of the above impacts were considered under the precautionary principle, it would become clear that, as with the cane toad, genetically engineered organisms may generate untold environmental and economic costs.

Corporate control of life

Genetic engineering is based on the patenting of living organisms. By patenting genes, biotech companies acquire 'ownership' of those genes, ensuring no-one 'uses' the genes without permission (licence agreements) and the payment of royalties. Patent law has now become so powerful that Canadian farmer Percy Schmeiser, whose canola crop was contaminated by GE against his will, was recently successfully sued when Monsanto's patented genes were found to be present in his crop[21]. Such examples of corporate control show that profit is a prime force behind the development, sale and release of genetically engineered organisms. If genetic engineering's main aim were scientific research, these altered organisms would be appropriately kept in the laboratory. Instead, they are fast-tracked into the market place and any calls for precaution are swiftly silenced.

This control by companies with vested interest is also apparent in the safety testing of GE crops and food. The official assessment of the safety of these is based on the notion of 'substantial equivalence'. In effect, this concept is that GE crops and food are regarded to be no different from conventional crops and food. This assessment is despite the fact that, in order to be granted a patent, biotech companies are required to establish the 'novelty' of their gene, genetic sequence or plant, so it can be classified as an invention and not merely a discovery of something that already exists. So while these biotech companies are arguing the 'novelty' of their engineered organisms when applying for a patent, the same organisms are argued to be 'substantially' the same as those in existence, thus posing no threat.

The corporate control of agriculture is not only detrimental for our food supply, but also for farmers, in industrialised and developing countries. Patented seed forces farmers to

[18] Hansen, LC and Obrycki, JJ. 2000. "Field deposition of Bt transgenic corn pollen: lethal effects on the monarch butterfly" Department of Entomology, Iowa State University, Ames IA 50011.USA
[19] BT Cotton in China, A summary of the environmental impact, Dayuan Xue, Nanjing Institue of Environmental Science, The State Environmental Protection Administration of China, http://www.greenpeace.org/multimedia/download/1/8965/0/btcottonchina.pdf
[20] Outcrossing Between Canola Varieties - A Volunteer Canola Control Issue. http://www.agric.gov.ab.ca/crops/canola/outcrossing.html
[21] http://www.percyschmeiser.com

repurchase their seed each year, making the age-old farmers' right to save seed, an illegal activity. Farmers thus become dependant on the companies who are not only producing the GE seed, but who are also binding farmers by contract to use only their brand of herbicide.

In both 1997 and 1998, over 99 percent of GE crops grown worldwide were engineered for herbicide or pest resistance.[22] This reveals that GE crops offer no benefits to the consumer or the environment. They do, however, ensure the continued sale of agrochemical products. In an effort to attain higher profit margins or to overcome environmental factors such as pests or drought, farmers may feel they have little choice but to use risky GE technology in their farming practices. However, the biotech companies responsible for producing the genetically engineered crops, bear no liability for the performance of their crops[23] or for the impacts of their product on farmers, consumers or the environment.

A GE-free future starts in your trolley

Despite the power of these multinational companies however, they remain susceptible to public pressure. Whilst companies like Monsanto and Bayer may have influence ranging from the farm to government, the one thing over which they have no control, is consumer rejection of GE food. Europe has been a great example of the success of this strategy. In this region, prominent food companies such as Nestle that had previously advocated the use of GE food, were forced to respond to an overwhelming consumer rejection of it, by removing GE from their products. Supermarkets too, such as Tescos in the UK, banned GE from their own brands, following consistent consumer outrage. Generating a flow on effect, when people don't buy GE food, companies won't use it, farmers won't grow it and biotech companies will thus have no reason to market their product.

In this way, the path of genetic engineering for Australia is not an inevitable one. Early examples of GE foods overseas, such as potatoes and tomatoes, were withdrawn from the shelf after complete market failure. The commercialisation of GE wheat has been postponed, due to a dire lack of consumer acceptance. Responding to rising concern among consumers the world over meanwhile, savvy food companies are proudly declaring themselves GE-free and demand for organic produce is steadily on the rise.

In Europe, the tightening of the EU's labelling legislation is a further indication that Australia cannot simply be forced to accept GE crops. The EU's threshold of GE contamination in food has now been reduced from 1% to 0.5%. Labelling of products is required if ingredients are derived from GE crops. Contrary to Australia, where GE labelling is based on testing the end product for DNA (thereby excluding highly refined ingredients and ingredients from animals fed on GE animal feed), Europe's legislation requires manufacturers to obtain GE-free assurances right down their supply chain.

As we have seen in the last few years all over the world, the more people know about GE food and the technology, the more they reject it. In Australia, 68% of people would be less likely to buy a food if they knew it had been genetically engineered.[24]

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[22] C. James, "Global review of commercialized transgenic crops: 1998," ISAAA Briefs No. 8, ISAAA, Ithaca, N.Y.; Biotechnology Industry Organization (BIO), Washington, D.C., November 1998

[23] GE crops have had lower yields due to various unexpected side-effects! See Seeds of doubt, North American Farmers' experiences of GM crops, UK Soil Association, http://www.soilassociation.org/, p 11-14

[24] Taylor Nelson Sofres, April 2002, Poll on Genetically Engineered foods for Greenpeace

GE-free from paddock to plate

Stopping the release of genetically engineered organisms will involve widespread engagement on a range of levels.

Pressuring government is necessary — either on a case by case basis, or by introducing legislation to ban the release of genetically engineered organisms. However, it is important to consider what will actually facilitate the end of GE releases politically — rather than merely assisting to amend GE legislation or to improve regulation of the biotech industry.

Currently, the State Governments are the key to stopping the release in their states, as the legislation enables them to declare GE-free zones for crops on marketing grounds.

Similarly, the OGTR, responsible for assessing applications to release genetically engineered organisms, does not include public concern, or the exponential nature of GE, in its brief. Its jurisdiction is limited to environmental and health threats. Thus, it needs to be considered, in which situations it is relevant to target this body.

Demanding GE-free food from companies, as mentioned, can stop the GE industry at its root. Food companies operate customer service systems, to assess customer reaction or to monitor consumer trends. These companies have often invested most in their brand and are therefore more sensitive to customer concern, than to government regulations. The daily vote for or against a particular food product, can spell the rise or fall of a food company. The Greenpeace True Food campaign recognises the power of this opportunity and encourages everyday Australians to voice their rejection of GE foods, in their daily shopping lives. (See The True Food Campaign in this kit, for more information).

Finally, the release of genetically engineered organisms can also be stopped at the farm gate. Farmers too, are ‘consumers’ of GE products. For this reason, Greenpeace is also working with the Australian farming community — offering it detailed information on GE crops and helping it voice its concerns about GE technology.

Through these various methods, we can together regain control of our food and reject genetically engineered organisms at every level. Greenpeace believes it is a fundamental human right to be able to choose food that is natural and safe. It believes genetically engineered food is unnatural, unnecessary and unwanted. This right, coupled with the precautionary principle, are reasons enough to stop the release of genetically engineered organisms into the environment. For as eminent biologist, Professor Barry Commoner writes, “What the public fears is not the experimental science, but the fundamentally irrational decision to let (the products of gene technology) out of the laboratory into the real world — before we truly understand it”[25].

Tina Meckel, GE campaigner, Greenpeace Australia Pacific, October 2002

[25] Unraveling the DNA myth.The spurious foundation of genetic engineering, Barry Commoner, Harper's Magazine Feb 2002

GREENPEACE

Genetic Engineering ACTION KIT

Frequently asked questions

The Basics

What is genetic engineering?

Genetic engineering (GE) is a technique in which scientists move genes from one species to another, or change the genetic composition of an organism (living things).

Genes are the small pieces of DNA (the “blueprints” of life) found in all organisms. Genetic engineers use viruses, bacteria, or a device called a “gene gun” to randomly move genes between organisms. This creates new life forms that could never occur naturally.

Genetic engineering is used on food crops to make the plants grow differently. For example, a gene from an arctic flounder fish was added to the DNA of tomatoes in order to make the tomatoes resist the cold.

The GE food crops currently grown are engineered for pesticide resistance or herbicide tolerance. Through genetic engineering, industry hopes to find new uses for living things. In short, they are messing with nature for profit.

What does GMO stand for?

Genetic engineering is sometimes called “genetic manipulation” or “genetic modification” (GM). The resulting new life-forms are then known as genetically modified organisms (GMOs).

Both these terms were invented by industry to “soften” the true meaning of genetic engineering.

Genetic engineering is a form of “biotechnology”. However, biotechnology includes a wide range of traditional practices such as cheese-making and brewing — practices that are not at all like genetic engineering.

“Gene technology” is another broad term that includes techniques such as cloning and gene therapy. These are also different from genetic engineering because they do not necessarily involve moving genes between species.

What’s the problem?

Genetic engineering raises issues across the board. We know GE crops affect the environment. There are concerns GE foods can affect our health. We cannot know about the long-term effects of messing with nature.

Genetic engineering is still an experiment, yet it’s being forced on farmers and consumers, sometimes without their knowledge.

Scientists understand very little about how genes work, so genetic engineers often come across unexpected side effects when they perform genetic engineering on organisms.

These unexpected effects can include the production of new or ‘novel’ proteins that may cause allergies or have toxic effects. Genetic engineering can change a plant (making it have different characteristics), so other effects may occur that scientists don’t even notice — because they don’t know what to look for.

Worse, the companies that profit from GE are keen to avoid testing for unexpected effects, so these effects only emerge after the crops have been released. For example, Monsanto's GE soy plants with extra lignin (the woody part of a stem) began to crack when exposed to heat, nobody knew why…A genetically engineered bacteria, Klebsellia Planticola, produced so much alcohol that it killed soil life.

We don't know how many more problems lie undiscovered in genetically engineered crops. And the biggest threat is that we won't know until it is too late. Once GE organisms are released into the environment and the food chain, they cannot be recalled. GE organisms will replicate forever.

What is Greenpeace's position on GE?

Greenpeace is opposed to the release of genetically engineered crops into the environment. They have been released without adequate knowledge about their effects on the ecology, wildlife and human health. Greenpeace does not campaign against the contained use of genetically engineered organisms, such as for medical applications. Greenpeace is opposed to the patenting of life. Living organisms like plants and animals, but also parts of them, so organs, cells, substances and genes are a product of nature, not of corporations and therefore belongs to us all.

The Main Players

Who's behind it?

Three multinational chemical companies control the market in genetically engineered crops: Monsanto, Bayer (formerly Aventis) and Syngenta.

Monsanto is an American-based chemical company that produces genetically engineered soy, corn, cotton and canola. It is hoping to grow GE canola commercially in Australia.

Monsanto's high profile products include aspartame (or Nutrasweet, which has been linked with brain seizures) and a broadspectrum weed killer called Roundup, which kills almost all plant life — except Monsanto's own genetically engineered crops.

Monsanto has a long history of producing highly toxic chemicals. Many of these chemical are now banned or restricted, including dangerous industrial chemicals called PCBs and the notorious pesticide Agent Orange.

BayerCropscience is a European-based chemical company who has bought the biotech company AventisCropscience. Like Monsanto, Bayer produces a powerful weedkiller (called Liberty/Basta) that kills all plant life except the crops that are genetically engineered to resist it.

Aventis also produced Starlink, a GE corn believed to cause allergies. In 2001 Starlink contaminated the entire US corn supply and had to be recalled at a cost of over a billion US dollars.

Bayer wants to grow its commercial GE canola all over Australia, but has already has failed to comply with the rules for growing trial crops.

Syngenta was formed when two other chemical companies, Astra Zeneca and Novartis decided to dispose of their genetic engineering divisions and merge them into a new company. Syngenta is based in Switzerland and produces a genetically engineered corn banned in several European countries.

Who supports it?

Monsanto, Bayer and Syngenta have quite a bit of sway around the world – not to mention a lot of money. In Australia, the following organisations promote genetic engineering:

- The Life Sciences Network
- Avcare (the peak body of the agricultural chemicals industry)
- Agrifood Awareness

The Australian Food and Grocery Council (which represents major food companies) also consistently supports GE foods.

Three government-funded agencies actively promote the genetic engineering of food too:

- Biotechnology Australia promotes public support for GE foods
- FSANZ (Food Standards Australia New Zealand) is supposed to regulate GE foods but it regularly defends GE foods as a whole
- Some parts of the CSIRO undertake research and develop new GE foods in partnership with the grains industry.

Why?

The only reason why these companies want to "improve" nature is to increase profits. For chemical companies like Monsanto, genetically engineered crops are a way to continue the sale of agrochemical products. Monsanto's patent for its widely used weedkiller 'Roundup" has run out and in Australia we are already seeing cheaper imports of weedkillers with the same active ingredient as Roundup: glyphosate. When using Monsanto's "Roundup Ready" crops, farmers are prohibited from using any other glyphosate weedkiller than Monsanto's Roundup.

The Impacts on Food and our Health

What is wrong with genetically engineering food?

No-one knows what the long-term effects of eating genetically engineered food will be. We do know that allergies can be triggered from genetic engineering. We know that levels of toxins in food can also increase. Medical experts warn that antibiotics could become useless because of gene engineers' use of antibiotic resistance genes.

Worse, there is actually no documented independent evidence that genetically engineered food is safe. The powerful GE industry has turned the "burden of proof" on its head, and its risky technology is deemed innocent until proven dangerous.

Should we be concerned about eating GE foods?

Yes. Several groups, including the Public Health Association of Australia and the British Medical Association, have raised concerns about the safety of GE foods.

There are many reasons for concern, such as the use of antibiotic-resistance genes in GE plants. These genes are added to GE foods merely as markers but could transfer into bacteria to render existing antibiotics useless.

Another concern is our potential exposure to unfamiliar or unexpected proteins, toxins and allergens through eating GE food. Overseas, a soybean that was genetically engineered with a brazil nut gene triggered a potentially fatal reaction in the blood serum of people with an allergy to brazil nuts. A genetically engineered corn, called Starlink, was only not approved for human consumption because of concerns over allergic reactions — unfortunately it found its way into countless food goods that had to be recalled.

GE agriculture may also mean more pesticides in our food. At the same time as GE foods (most of which were Monsanto's Roundup Ready Soybeans) were entering Australia's food supply, the Food Standards Authority of Australia and New Zealand (FSANZ) increased the allowable level of glyphosate (Roundup) weedkiller 200-fold in our food. In California, where there is mandatory monitoring of pesticides, Roundup is the cause of more reported illnesses than any other chemical.

Current safety testing of GE foods is minimal. Tests are done by GE company employees or laboratories paid by GE companies. The results are rarely published for scientific review. In Australia, FSANZ is the sole body to assess these company documents. Their fundamental precept is that GE foods are 'substantially equivalent' to conventional foods — that is, that they are the same as non-GE foods and thus are safe. However, an independent review of FSANZ reports has revealed that its tests are inadequate, that GE foods have never been tested on humans and that some GE foods have not even been tested on animals.

In the United States, a scandal erupted when the Food and Drug Administration (FDA) ignored warnings from its own scientists about the threat GE poses to human health and the environment. The FDA decided that genetically engineered foods could be marketed with no requirement for long-term safety testing or labelling, and with no formal pre-marketing approval required as is standard for any food additive.

What foods are genetically engineered?

GE ingredients can be used in items such as bread, pastries, snack foods, baked goods, vegetable oils, margarine, flours, starches, sauces, fried foods, soy foods, lecithin, sweets, soft drinks and sausage skins.

GE ingredients are mostly derived from four crops:

Imported

- canola
- Corn (or maize)
- Soy

Local and imported cottonseed products.

Some GE ingredients are even more elusive. For example, soy can be in up to 60% of all processed food (as soy flour, soy oil, and as smaller ingredients such as lecithin). GE corn appears as cornstarch, corn flour, corn oil and hidden ingredients such as maltodextrin.

The largest use of GE crops is not to feed people directly, but is used as animal feed. Fresh meat, milk and eggs may be derived from pigs, cows and chickens fed on GE grains.

As we only grow GE cotton commercially in Australia, foods labelled 'Product of Australia' are GE-free, unless they contain cottonseed oil or animal ingredients which could have come from animals fed GE cottonseed or trash. Foods labelled 'Made in Australia' may contain imported GE ingredients including soy, canola and corn.

Fresh fruit and vegetables sold in Australia should all be GE-free. Biodynamic and organic foods are certified to be GE-free.

Browse the True Food Guide to check on the GE status of your favourite products.

Are GE foods labelled?

GE ingredients are often hidden ingredients in processed foods and in the meat, eggs and milk produced from animals fed on GE grains. Ninety two percent of all Australians want comprehensive labelling of GE foods[1]. But under Australian labelling laws, only foods where GE proteins can be detected need to be labelled. The following types of food are exempt:

- Foods where ingredients are made from animals fed with GE feed (eg: meat, milk, eggs, honey)
- Food where GE ingredients are highly refined (eg: cooking oils, sugars, starches). Most processed foods fall into this category and contain some kind of oil or starch.
- Foods that are prepared at bakeries, restaurants, takeaways etc. So a Big Mac could be full of genetically engineered ingredients and McDonalds would not have to tell you by law.
- Foods that are 'unintentionally' contaminated by up to 1% per ingredient.
- Foods that are processed before 7th December 2001. The Australian government has allowed companies a one year grace period to change their packaging and is allowing them to use old packaging from before the labelling regulations.
- Foods that use processing aids or food additives using GE microbes
- Foods that contain GE flavours present at less than 0.1%

Why is animal feed important?

Commonly genetically engineered crops, like soy, corn and cotton, are also used to feed animals. Various products are then sourced from these animals (meat, milk and eggs etc). The health effects GE feed has on the animals forced to eat it are unknown - and so are the possible health effects on humans who consume these animal products.

Under current Australian labelling laws, meat, milk and eggs derived from animals fed on GE grains, DON'T have to be labelled. Up to half of an average chicken's diet is thought to be genetically engineered. But if you bought the eggs or meat from that chicken, you would have no way of knowing this.

[1] Taylor Nelson Sofres, April 2002 Poll on Genetic Engineering for Greenpeace

Many food companies don't even know the source of ingredients such as whey powder, which is produced from cow's milk. Ask food companies whether the animals used in the production of their food product, were fed on GE feed. Demand that their food production guarantees there is no GE used anywhere in the supply chain.

Impacts on the Environment

What are the threats to the environment?

Genetically engineered crops are living organisms that reproduce and spread, posing an ongoing threat to the environment. GE pollution can never be recalled or cleaned up.

Ecologists believe these unpredictable organisms could have far reaching consequences in much the same way that non-native species such as the cane toad have become pests. Such effects may only emerge after a few generations.

Persistent GE crops may cross-breed with related weeds to become “superweeds” (particularly vigorous weeds that compete with other plants, win and destroy natural plant ecosystems).

GE crops produce seed and pollen that can contaminate other crops and soil. Soil is extremely complex and there is already some evidence that GE crops have affected the fertility of soil.

One type of GE crop designed to produce their own insecticide has proven harmful to the larvae of butterflies, to ladybirds and other important insects. Beekeepers are concerned that such crops may also be harmful to bees (who ingest pollen). The real impact of GE crops on the environment can never be truly forecast.

Don’t genetically engineered crops use less chemicals?

So far, most of the GE crops that are grown are designed to be used with powerful weedkillers produced by the same companies that make the seed. When ‘Roundup Ready canola’ is sprayed with Roundup weedkiller, the GE plant lives but all other plants die.

Genetically engineered crops are engineered to withstand high doses of farm poisons. Application of toxic chemicals becomes a necessity, while more environmentally sound techniques fall by the wayside. An analysis of more than 8,200 university field trials in the USA, found that farmers who grow GE soybeans use 2-5 times more herbicides than farmers who grow natural soy varieties.

Are GE crops grown in Australia?

Unfortunately, yes. Australia is one of the few countries in the world that allows GE crops to be grown commercially. The crop in question is cotton.

GE cotton grown in the north of the country is known as Bt cotton. It produces a genetically engineered toxin called Bacillus thuringiensis (Bt), used to kill the cotton bollworm. Bt cotton

produces this toxin in every part of the plant and there are many concerns that it is affecting soil and beneficial insects.

Bt cotton is used for cloth and cotton products and the cottonseed is crushed for oil and used in food. Cotton “trash” or meal is also often fed to the cattle that produce our milk and meat. Some food companies such as Heinz Watties and Unilever now make sure that the milk used in their foods is from cows who are not fed GE cotton trash.

Australia is currently facing the arrival its first true GE food crop. Chemical companies Monsanto and Bayer have applied to commercially grow GE canola across the country. These applications are expected to be approved in early 2003. GE canola represents one of the greatest threats to our agricultural heritage. As part of the brassica family (like cabbages, broccoli etc), canola is an extremely ‘promiscuous’ crop — sure to escape and contaminate organic or conventional crops, or breed with related weed species such as wild radish. In Canada, where GE canola has already contaminated the prairie, farmers are battling a massive GE weed problem and have lost lucrative export markets. Leaders in the Australian food industry such as Dick Smith and Doug Shears (CEO of Berri foods) have warned that if Aussie farmers grow GE canola they too will lose markets abroad.

Almost 900 smaller trials of GE crops (canola, corn, pineapples, papaya and gum trees) have been grown in Australia. Although called “experimental trials”, they are grown in the open air and can contaminate both the environment and other farms.

Carnation flowers, genetically engineered to be blue, are also grown in this country and are often sold in nurseries for home gardens.

The Bottom Line

Does growing GE crops benefit farmers?

“Genetic engineering in agriculture has significantly increased the economic uncertainty of family farmers throughout the US and the world. “— Statement released by 33 farm and agriculture groups in the USA and Canada.

The agrochemical companies that produce GE seeds require farmers to sign legal agreements specifying they only use the chemical company’s brand of weedkiller and prohibiting farmers from saving seed. They also expect farmers to pay royalties. Companies such as Monsanto then aggressively sue farmers who they believe are using their seeds without signing such agreements. Unfortunately due to contamination, many farmers are finding they have GE crops on their land whether they asked for it or not. In Canada, Monsanto sued a canola grower called Percy Schmeiser, because GE canola was growing on his land as a result of contamination. Even though Schmeiser did not want the contamination, Monsanto argued successfully that he owed them money anyway.

Conventional growers are discovering that GE crops from neighbouring fields have become weeds on their own land. These weeds often cannot be killed with herbicides, because they have in-built resistance. The Royal Society of Canada has warned that most of the country's prairie land is now contaminated with herbicide-resistant canola weeds.

At the end of harvest, US and Canadian farmers are discovering a further problem of GE crops — that export markets won't buy them. Following the introduction of GE canola in Canada, sales to Europe dried up. The same is true of US corn, which is no longer sold to Europe and has lost important markets in Asia.

The Big Picture

Will genetically engineered foods feed the world?

No. There is no simple solution to end world hunger. Genetic engineering is not the answer, just as pesticides are not the answer. Even increasing food production is not the answer. It is said that the world already produces one and a half times the amount of food we need.

World hunger will only end when the underlying causes, such as poverty, are addressed. People stricken by poverty have no means to purchase food or no access to farmland and natural resources. Genetically engineering crops does nothing to resolve the poverty that causes hunger — in fact they could make it worse.

In developing countries, sustainable farming solutions will reduce hunger and secure stable livelihoods. High tech agricultural technical packages, in contrast, make farmers dependant on these inputs (as they lose their practices and seeds), force them into growing cash crops in order to buy the chemical inputs and therefore contribute to global food insecurity.

The monopolisation of the seed market and the way in which GE companies' deny farmers their ancient right to save, exchange and replant seeds go against the best interests of the poor.

At www.farmingsolutions.org, Greenpeace, Oxfam and other groups concerned with real solutions to hunger have documented the ways that poor communities already sustainably feed themselves — without using GE crops.

The Solutions

What are the alternatives?

Organic agriculture uses environmentally-friendly farming methods. Organic foods are not only good for the environment — they are healthier and tastier too.

Here are some of the main features of organic farming:

- Organic farming does not use artificial chemical fertilisers and pesticides;
- Instead, organic farmers rely on developing a healthy, fertile soil and growing a mixture of crops;
- Organic animals are reared to high animal welfare standards, without the routine use of drugs, antibiotics; and
- Organic farming bans any use of GE organisms.

Organic farming practices are carefully controlled by a number of certification bodies who check and enforce high environmental standards. In Australia, look out for organic

certification symbols from one of these bodies: Demeter, Biological Farmers of Australia, National Association of Sustainable Agriculture Australia, Organic Food Chain and Tasmania Organic-Dynamic Producers. Going organic can be a way of life. Organic clothing, cosmetics, gardening products and even restaurants can all be found and all of them are GE-free.
