

Genetic Engineering: A Costly Risk

Genetic scientists are altering life itself - artificially modifying genes to produce plants and animals which could never have evolved naturally. The products of their labours are already present in the food we eat and the fields around us, even though little is known about the long term effects on human health and the environment.

The risks are enormous and the consequences potentially catastrophic, and yet the new technology is being rapidly introduced into every aspect of our lives with little regard for safety.

What is genetic engineering?

Genetic engineering enables scientists to use living organisms as their basic building materials to change existing life forms and construct new ones.

A gene is a segment of DNA (Deoxyribonucleic Acid) which, in combination with other genes, determines the makeup of living cells. Genes carry the chemical instructions needed to make the organism behave in a certain way, and since they are passed on from one generation to the next, offspring inherit these traits from their parents. Constantly developing,

genes enable the organism to adapt to its environment. This is called evolution. Genetic engineering uses enzymes to break the DNA strand at certain places, insert new segments, and "stitch" the strand back together again. Genetic engineers can "cut and paste" genes from one organism into another so that the makeup of the organism is changed and its natural biology is manipulated

for the expression of certain traits (e.g. genes may be inserted so a plant will produce toxins against pests). Such methods are very different from the naturally occurring

inheritance and

development of genes. The precise location of an inserted gene cannot be accurately controlled and this can cause unexpected results if genes in other parts of the organism are affected.

Mounting concern over the ethics and risks of genetic engineering stems primarily from the fact that genes are transferred between unrelated species - animal genes into vegetables, bacteria genes into food crops, even human genes into animals. The genetic engineering industry does not respect

This is an imperfect technology with inherent dangers. It is the unpredictability of the outcomes that is most worrying.

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**GENETIC
EXPERIMENT**

**Don't
do it**

nature's boundaries - boundaries designed to protect the uniqueness of individual species and assure the genetic integrity of future generations.

As more and more genes are isolated from their natural sources, scientists aim to control more and more aspects of life. They can create their own animals, plants, trees, and food crops, none of which could ever occur naturally. In effect, the industry is attempting to direct the course of evolution itself.

What is being genetically engineered?

Genetically engineered (GE) versions of the majority of the world's most important food crops have already been created in laboratories or are currently under development. The unrestricted cultivation and marketing of certain GE varieties of tomato, soybean, cotton, maize, oilseed rape, squash and potato have been allowed in the USA. There has also been extensive commercial growing of GE crops in Argentina and Canada. In Europe, marketing approval has been granted to GE tobacco, soybeans, oilseed rape, corn and chicory, but only GE maize has been grown commercially (on a small scale in France, Germany and Spain, for the first time in 1998).

GE soybean, maize and oilseed rape are being exported from America to be used widely in processed foods and animal feeds. It has been estimated that approximately 60% of processed foods may contain GE soybean derivatives and 50% include ingredients from GE maize. However, because many of these products such as oil from soybeans do not have to be labelled under European legislation it is impossible to know the extent to which GE foods are already on our tables. There are no requirements to label GE

foods at all in the USA or Canada, and in Japan and Australia labelling regulations are only just being implemented. In most other parts of the world, governments are not even notified if US imports of maize and soybean or Canadian imports of oilseed rape are from GE crops.

In addition to those which are already being marketed, many new GE foods are waiting in the wings. These include:

- salmon, trout, and rice with a human gene introduced;
- potatoes with a chicken gene;
- cucumber and tomatoes with bacteria and virus genes.

At the moment, there is widespread opposition to genetically contaminated food, with consumers, retailers and food producers demanding "real" food, free of GE ingredients (see Greenpeace Briefing: "*Food producers, retailers and consumers say no to genetically engineered products*"). Despite major concerns, the uncontrolled introduction of GE foods continues at an alarming rate. Unless opposition is sustained and strengthened, the next few years will see an even more dramatic influx of such foods, and choosing to avoid them will cease to be an option.

What are the impacts of genetic engineering?

While the genetic engineering industry continues to create whole new life forms which could never have evolved naturally, it consistently refuses to acknowledge the seriousness of the potential risks:

Environmental Risks

There is a wealth of evidence to demonstrate that introducing non-indigenous species into new environments can cause extensive and irreversible damage. We know that

changing one element of the environment can set off a domino effect of cascading changes throughout entire ecosystems. Yet the genetic engineering industry maintains that its GE species will not cause problems.

There are, however, many reasons why such complacency over the release of genetically modified organisms (GMOs) into the environment is entirely inappropriate. For example:

- **They are inherently unstable.** It cannot be claimed that genetic engineering is a precise science. There are literally millions of genes in a living organism and they do not just work on a "one gene one trait" system. Genes are complex and work together to perform certain functions, while at the same time being affected by - and affecting - their immediate environment.
- **Outcomes are therefore unpredictable.** Many of the trials conducted on GMOs have led to unexpected and unwelcome results. For instance, a bacterium genetically altered to clean up soil polluted by a chemical herbicide was effective against the herbicide, but it degraded the herbicide to a substance that was highly toxic and killed crucial soil fungi, thus diminishing soil fertility¹. In another example - this time on a commercial scale - GE cotton crops designed to be resistant to insects were still devoured by some insects and thousands of hectares of the crop were destroyed with an estimated loss of \$1 billion².
- **GE crops could cause genetic pollution by transferring their foreign genes to related plants.** Pesticide resistance genes could turn weeds into "superweeds" and insect-resistance genes could turn insects

into "super-bugs" - both impossible to control without massive applications of chemicals.

- **GE crops could have a devastating effect on native flora and fauna.** Because such crops may have a competitive advantage over natural wild plants, the latter may be unable to survive. Furthermore, beneficial insects and other wildlife could be threatened by crops which produce their own insecticide or crops that encourage greater use of toxic chemicals.
- **Any damage caused by releasing GMOs into the environment is likely to be irreversible.** Because they are alive, GMOs can mutate, multiply, breed with other living organisms, and go on breeding for generations to come. Potentially, therefore, they are far more

dangerous than even chemical pollutants.

*[We have] no need to guarantee the safety of genetically modified food products.*³

Monsanto's Communications Director, Phil Angell

Health Risks

Scientists have already introduced genes from

bacteria, scorpions and jellyfish into food crops. Yet tests on the safety of new foods containing foreign genes and the regulations governing their introduction have been grossly inadequate.

The risks, however, are very real. For example:

- **Foods produced from some GE crops could severely undermine the treatment of human and animal disease.** This is because many GE crops contain antibiotic resistance genes. If the resistance gene spreads to harmful bacteria, it could render them immune to the effects of the antibiotic and add to the already alarming medical problem of the spread of disease-causing

bacteria that are immune to common antibiotics.

- **GE foods could increase the risk of dangerous and possibly life-threatening allergies.** Many people are allergic to food plants because of proteins produced by the plant. There is evidence to suggest that GE crops will have an even greater allergenic potential than conventional crops⁴.

Despite such risks, GE foods are already on sale. However, because GE crops are not segregated from traditional crops and because labelling regulations are inadequate, consumers are being deprived of the right to avoid them.

Who says it's safe?

Although genetic engineering could cause such wide-ranging problems for the environment and human and animal health, tests for safety are disturbingly lax.

Field trials conducted to assess environmental safety are usually short term and small scale. They rarely last for more than one growing season, whereas it could take years for most ecological effects to become apparent. Nor do the test sites accurately reproduce the real conditions the crops will meet once grown in the environment. Professor John Beringer, chairperson of the British Advisory Committee on Releases to the Environment, has himself admitted that, "*We can't really learn anything from them.*"⁵

Current measures intended to ensure the safety of GE foods are no less flawed than those governing the environmental risks. Even so, regulatory authorities such as the European Commission, the US Department of Agriculture and the US

Food and Drug Administration have continued to approve the use and distribution of GE products. In most cases, they have based their decisions on evidence provided solely by the companies themselves.

We are witnessing a global experiment with nature and evolution, the results of which are impossible to predict. Inadequate testing and regulatory controls mean that the potentially harmful effects of GE crops and foods will only be discovered when it may already be too late.

Who stands to gain?

Given the risks associated with genetic engineering and widespread public concern over its safety, it is difficult to understand exactly who will benefit from the products of the technology. The agrochemical multinationals - or "life science" companies as they call themselves - which are developing and promoting them have made numerous claims concerning the advantages to be gained, but few can be substantiated.

They claim, for instance, that GE crops will increase yields and be particularly beneficial for small-scale farmers in developing countries. At the same time, however, these same companies - many of which are enormous chemical corporations - have been patenting genes used in the manufacture of the new organisms.

Once protected by patents, seeds will only be available on payment of annual royalties and farmers will no longer be able to save seeds for sowing in subsequent seasons. Furthermore, as already occurs in the USA, legal contracts will force them into using packages of seeds and herbicides.

The life science companies are only too aware that, by gaining control of all the

world's staple crops, including maize, rice, and wheat, and by patenting the seeds, there are enormous profits to be made. If the current trend of mergers and take-overs continues, a handful of companies could ultimately control almost all of the world's food production. By claiming ownership of genes, they are gradually taking control of life itself.

References

- 1 Summarised in Doyle JD, Stotzky G, McClung G & Hendricks C W (1995) Effects of Genetically Engineered Microorganisms on Microbial Populations and Processes in Natural Habitats, *Advances in Applied Microbiology*, Vol. 40 (Academic Press)
- 2 *Science* 273: 1641, 20 September 1996
- 3 *The New York Times Magazine*, 28th October 1998
- 4 Frank, S. & Keller, B. (1995). Produktesicherheit von krankheitsresistenten Nutzpflanzen: Toxikologie, allergenes Potential, Sekundaereffekte und Markergene Eidg. Forschungsanstalt fur landwirtschaftlichen Pflanzenbau, Zurich.
- 5 ENDS Report 283 August 1998 p.22