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A USER GUIDE TO GE TERMS AND ABBREVIATIONS

Science

Genetic engineering, genetic modification, genetic manipulation, transgenic:

Terms that describe the same process. Whereas the original scientific term was 'genetic manipulation', public objections to the technology forced the biotech industry to introduce the term 'genetic modification'. This term has a more moderate tone. 'Genetic enhancement' is sometimes also used to describe the process, as it has pleasing connotations.

GE (genetic engineering): The general, scientifically precise term for the technology. As the term implies, it is about the actual engineering of new organisms with new DNA, in a manner that wouldn't occur naturally in nature. That makes it very different to research which looks to understand genetics without creating new organisms.

GMO (genetically modified organisms): "An organism in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination". 'GMO' is not used in scientific language, however is used in Australian legislation and therefore by the regulatory authority the Office of the Gene Technology Regulator (OGTR). The term 'modified' is often criticised for making the process sound less harmful.

LMO (living modified organisms): Specifically introduced and used in the Cartagena protocol on Biosafety (see *Biosafety Protocol* below).

Biotechnology: Biotechnology encompasses a wide range of traditional practices such as cheese making and beer brewing – practices that are not in any way like genetic engineering. However, the industry surrounding the creation of genetically engineered crops is often referred to as the 'biotechnology industry'.

Gene technology: A 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. This term is, however, also sometimes used with reference to GE crops and foods.

Gene flow: The flow of genes from one organism to another, whether the organism is a related species or not.

Gene stacking: Development in a plant of resistance to more than one herbicide, is known as 'gene stacking'. This arises through the pollination of one herbicide resistant variety to another.

Horizontal gene transfer (HGT): When DNA or genes cross out of one organism and become incorporated in another. This happens mainly through viruses and bacteria and seems to be more frequent amongst genetically engineered organisms, indicating that their genetic sequences are less stable.

Expression of traits: Genes aren't always 'switched on' to express the information they are coded for. For example, you might have a gene for a certain illness (trait) which however, never manifests.

Volunteers: When crops appear in plantations of another crop and are therefore unwanted weeds.

Identity preservation: The paper trail process followed to ensure a (food) product did not use any GMOs in its production. Whereas in Australia many companies are still only testing the end product (because this is only what needs to be labelled in Australia), labelling regulations in Europe are now requiring food companies to get an assurance from their supplier that the ingredients do not come from genetically engineered crops. This is known as identity preservation or IP.

Political

Patents on life: Under the new WTO rules set out in TRIPS (Agreement on Trade Related Intellectual Property Rights systems) every country which is part of the WTO must recognise patents on living organisms, include. micro-organisms and parts thereof. The patenting of genetic sequences allows the patent holder to own this DNA wherever it appears which means they can stop you from using that DNA and demand royalties for it. The Greenpeace position is that DNA can never be an invention (like a device for example), but is always merely a discovery and can therefore not be patented.

Biopiracy: Biopiracy is a term used for companies patenting DNA, plants and substances from these plants which have clearly been used by a community, often indigenous people over long periods of time. Often the knowledge about the use of the plant (medical or agricultural) comes directly from this community.

Treaty to Share the Genetic Commons: Currently still in its draft stage, the treaty to share 'the genetic commons' is an attempt to declare the worlds gene pool (all living organisms), property of all people and therefore unable to be patented, owned or sold. Put forward by organisations worldwide including ETCgroup, Vandana Shiva, Greenpeace International, National Family Farm Coalition, Indigenous Peoples' Biodiversity Network, Indigenous Peoples Council on Biocolonialism, SEARICE, Council for responsible Genetics (www.ukabc.org/genetic_commons_treaty.htm)

Biosafety Protocol: Also known as the Cartagena Protocol on Biosafety, this protocol is part of the United Nations Convention on Biodiversity and was adopted in Montreal, Canada, during 29 January 2000. It sets down international rules to control the transportation across borders, handling and uses of any genetically engineered (GE) organisms that could adversely effect the conservation and sustainable use of biological diversity, and that could create risks to human health. In order for it to be legally binding it has to be ratified by 50 countries. In April 2000, 17 countries had ratified it. The Australian government has not only refused to ratify the protocol, but has been trying to block it from coming into force during international negotiations.

The Codex Alimentarius Commission: Aims to set up an international standard for labelling of GE food. Whereas it would be good to enforce the labelling of anything which has used GE anywhere in its production, it is feared that this commission might set very low standards. Being a reference for the World Trade Organisation any labelling going beyond what is set down could be argued to be an illegal 'trade barrier'. The Australian government has in fact pushed for the (US) option that only foods be labelled which pose a significant 'health risk'. This is a far lower standard than already exists in Australia and would essentially mean that virtually nothing would be labelled.

Websites, email lists and books on GE

Greenpeace websites:

www.greenpeace.org.au/truefood Greenpeace Australia's GE website hosting the True Food Network and True Food Guide.

www.greenpeace.org/ Greenpeace International website.

www.truefoodnow.org Greenpeace USA Truefood Network – inspiring action. Includes downloadable Supermarket action kit.

www.farmingsolutions.org Joint Greenpeace website with Oxfam and ILEIA - documents sustainable farming practices from around the world.

<http://www.greenpeace.org.nz/campaigns/ge/intro.asp> Greenpeace NZ GE and Truefood website

GE and Farmers:

<http://www.non-gm-farmers.com/> Network of Concerned Farmers in Australia: info on liability and markets

<http://www.cropchoice.com/> Alternative GE news source for American farmers

<http://www.percyschmeiser.com> Percy Schmeiser is the Canadian farmer sued by Monsanto.

Australian GE sites:

www.geneethics.org The GeneEthics Network is the backbone of the anti GE movement in Australia.

http://www.sydney.foe.org.au/gene_ethics/index.html Friends of the Earth - Sydney.

<http://www.brisbane.foe.org.au/> Friends of the Earth – Brisbane.

<http://www.gefreeaustralia.com/index.htm> South Australian anti-GE campaigning group.

<http://www.green.net.au/gefreetasmania/> Tasmanian anti-GE campaigning group.

<http://www.bobbrown.org.au/> Green Party Leader Bob Brown's website.

<http://www.cat.org.au/~predator/mol.html> Molecular biology and genetic engineering explained.

International GE sites:

<http://www.foei.org/gmo/index.html> Friends of the Earth International website on GE

<http://www.biotech-info.net> Extensive and well organised archive maintained by Dr Charles Benbrook, ex-USDA Agricultural Economist. Facts on GE crops, pesticide use and other agronomic information. Also libraries of papers on environmental impacts, health risks etc. Authoritative documents and peer reviewed studies.

www.etcgroup.org Formerly Rural Advancement Foundation International (RAFI). One of the first NGOs to raise the alarm on GE. Discovered and named 'terminator' seeds, 'junky' seeds. Work on farmers' rights and patents on life. With their new name Erosion, Technology and Concentration, they have broadened their scope to look at technologies such as nanotechnology and bioweaponry. Humour, cartoons and wordplay.

www.genewatch.org Briefings on all aspects of GE – reasoned, accessible and well referenced.

www.gefoodalert.org Coalition of major environmental groups in the US campaigning against GE food/

www.nerage.org US grassroots organisation, North East Resistance Against GE have a 'newswire' on GE issues, collecting stories from email lists and posting them on the web.

www.oneworld.org/penguin/genetics/home.html Great kids introduction to GE, as narrated by Tikki the Penguin.

<http://www.gmcommission.govt.nz/> New Zealand's Royal Commission into GE left an archive of submissions - ranging from Maori ethics to horizontal gene transfer. Also excellent international testimonies from experts including Arpad Pustzai, Judy Carman, Peter Wills, Terje Traavik.

Activism:

www.ngin.org.uk Norfolk Genetic Information Network (NGIN) began as a local anti-GE information service in the east of England. Well regarded for writing standard – popular world-wide.

www.groundup.org Maintained by European based network of youth direct action groups, ASEED.

<http://www.togg.org.uk/resources/images.html> UK grassroots group with freely available images.

www.wen.org.uk/gen_eng/Genetics/Gene_files/index.html The Gene Files are a set of 6 downloadable briefings by the scientists at The Womens' Environmental Network.

<http://www.geneticsaction.org.uk/> Genetic Engineering Network: the backbone of UK genetics activism.

www.geaction.org GEAN – GE Action Network - an information for action network for US grassroots activists.

www.labelthis.org US site for own labelling direct actions in supermarkets. Includes downloadable labels.

<http://ngin.tripod.com/poetry.htm> Norfolk Genetic Information Network (UK) has info + "verse & worse" page

www.resistanceisfertile.com Housing actions against GE.

www.organicconsumers.org Organic Consumers Federation are a US movement campaigning against bovine growth hormone. Also the GE campaign against Starbucks.

<http://www.madge.net.nz/> Mothers against genetic engineering in food and the environment. Includes celebrity Alannah Currie, ex-'Thompson Twins' rock band.

Allergies:

http://www.econexus.info/Publications/AllergyPortfolio/Allergy_portfolio.htm Portfolio of info on GE crops and allergenicity, written for the British Allergies Association.

www.biotechvictims.org Dedicated to people who claim to have suffered allergies from eating GE corn (Starlink). Includes photos of Dr Keith Finger MD, who self administered Starlink and documented the process.

GE science:

<http://www.ucsus.org/food/Obiotechnology.html> Union of Concerned Scientists Biotech experts Dr Margaret Mellon and Dr Jane Rissler on the ecological threats of transgenic organisms.

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<http://www.i-sis.org.uk> The Institute for Science in Society is run by Dr Mae Wan Ho. Science-based critiques on GE crops and foods.

<http://www.psrast.org> Physicians and Scientists for Responsible Application of Science and Technology.

GE regulations around the world:

www.oqtr.gov.au The Office of the Gene Technology Regulator regulates dealings with GMOs in Australia.

<http://www.foodstandards.gov.au/> Foodstandards Australia New Zealand FSANZ (formerly ANZFA) regulates labelling and approval of GE in Australian food.

<http://binas.unido.org/binas/regs.php3> UN website giving an overview of international GE regulations.

<http://www.fas.usda.gov/scripts/attacherep/default.asp> The Food and Agriculture Service of the US Department of Agriculture. International agricultural information from attaches. Archived reports by country and topic. Good source for import/export and production statistics.

www.gaaget.org Global Alliance against genetically engineered trees – includes reports and a global map of GE tree field trials, including four field trials in Australia.

www.stopgefish.org Friends of the Earth (USA) campaign - focused on AF Protein's GE salmon.

Sustainable agriculture:

www.farmingsolutions.org Joint Greenpeace, Oxfam and ILEIA website promoting sustainable agriculture.

www.iatp.org The Institute of Agriculture and Trade Policy is a US based group who challenge corporate dominated food trade and promote small farmer agriculture in the US.

www.bfa.com.au Biological Farmers of Australia -the largest organic certifier in Australia.

www.ifoam.org International federation of the Organic Agriculture Movement. The global umbrella group for 750 organic certifiers in 100 countries. Standards defining 'organic' and organic industry perspectives on GE.

http://www.ifoam.org/ge_ifoam_2.pdf Organic agriculture v GE.

GE companies / corporate control:

<http://www.groundup.org/fcorp.htm> Corporate genomics – repository of information on key biotech companies. Eg: reports from 'monsantowatch'.

http://www.corporatewatch.org/pages/food_chain.htm Corporate Watch (UK) monitors multinationals giving special attention to GE.

GE and world hunger:

www.foodfirst.org The Institute for Food and Development Policy (also known as FoodFirst) - exposing the real causes of food insecurity and shattering the myths.

<http://www.twinside.org.sg/bio.htm> Third World Network pages on GE and Biosafety.

<http://www.christian-aid.org.uk/indepth/9905suic/suicide1.htm> 'Selling Suicide' report by UK aid organisation on why GE crops are a bad deal for the Third world.

<http://www.actionaid.org/ourpriorities/foodrights/foodrights.shtml> Food Rights campaign for UK Action Aid.

Patents on life / Biopiracy:

www.grain.org Genetic Resources Action International. Email lists on intellectual property rights and produce quarterly magazine, 'Seedling'.

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www.ipcb.org Indigenous Peoples' Council on Biocolonialism.

http://www.atsic.gov.au/issues/Indigenous_Rights/intellectual_property/Default.asp ATSI's webpage on Aboriginal and Torres Strait Islander intellectual property rights, include patents and copyright.



Email lists:

truefood@au.greenpeace.org Greenpeace Australia Pacific True Food Network – monthly news and action alerts on the True Food campaign.

geneethics@acfonline.org.au Australian GE info list run by Bob Phelps – medium to high e-mail volume.

ngin@icsenglish.com Norfolk Genetic Information Network – high volume email list, moderated and with UK focus. Strong on watching the PR activities of pro-GE lobby.

biotech_activists@iatp.org Institute of Agriculture Trade and Policy. Unmoderated North American list. High volume and comprehensive. To join send an email to listserv@iatp.org. In the body of the message type: 'subscribe biotech_activists'. Archives can be viewed online at www.iatp.org

Books:

Biopiracy: The Plunder of Nature and Knowledge, Dr Vandana Shiva, Green Books, 1998.

Genetic Engineering, Food, and Our Environment; Luke Anderson, Chelsea Green Publ , ISBN 1-890132-55-1.

Genetic Engineering: Dream or Nightmare? The Brave New World of Bad Science and Big Business; Dr Mae-Wan Ho, Gateway Books, 1998.

Monocultures of the Mind; Vandana Shiva, Third World Network, ISBN: 983-9747-04-5.

Redesigning Life: The Worldwide Challenge to Genetic Engineering; Brian Tokar, Zed Books; ISBN: 1856498352; 2001.

The Biotech Century: Harnessing the Gene and Remaking the World; Jeremy Rifkin, Tarcher/Putnam, New York, 1998.

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.

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

Dr. Michael Antoniou (Senior Lecturer in Molecular Biology, London)

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 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, corn, canola, 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, canola, corn and chicory, but only GE corn has been grown commercially (on a small scale in France, Germany and Spain, for the first time in 1998).

GE soybean, corn and canola 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 corn. 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 corn and soybean or Canadian imports of canola 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.*"¹⁶

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 corn, 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

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- 3 *The New York Times Magazine*, 28th October 1998
 - 4 Frank, S. & Keller, B. (1995). Produktesicherheit von krankheitsresistenten Nutzpflanzen: Toxikologie, allergenes Potential, Sekundäreffekte und Markergene Eidg. Forschungsanstalt für landwirtschaftlichen Pflanzenbau, Zurich.
 - 5 ENDS Report 283 August 1998 p.22