

It's not like Lego

Genetic Engineering: If living things were as simple as the gene-tech industry claims, then genetically modified plants would not be a problem.

In recent years it has become increasingly clear that the basic understanding of genetic material as a system of building blocks – the dogma that individual genes could be moved around between species, retaining their functions unchanged – is based on a false understanding. For genes are not lego pieces: they are ambivalent and dynamic, they communicate and interact with other genes and molecules and are subject to complex regulatory mechanisms. In this the so-called epigenetics also plays a much greater role than has long been thought.

Epigenetics is a 'higher level' system of information. With the system's help cells can regulate the activity of genes, turning them on or off or even changing them. Various molecules (proteins or small DNA sequences) are available to do this. What is emerging is a new picture of life, although much is still unknown. According to the old dogma, genetic engineering of plants seemed reliable. Although in the meantime it has been refuted, it is still the official safety philosophy today, even if small adjustments have been made.

"Today's products of genetic engineering are at a dinosaur technology level," is the judgement of molecular biologist Cesare Gessler from the Swiss Federal Institute of Technology in Zurich, Switzerland. "We use foreign genes without knowing where they are located in the genome or what else in the whole chain from gene to protein will be changed. We don't know where we are intervening in the chain of regulatory connections," says the plant expert.

Because so many questions are unresolved, Gessler thinks it's wrong to release today's transgenic plants. It is also unnecessary, as a lot of research in the greenhouse is still needed beforehand. "When everything works and we have tested everything, then we can put something in the fields. But we are far from that point", Gessler is convinced. Instead he advocates using the large amount of genetic knowledge for the so-called "Marker Assisted Breeding" technique, which uses genetic markers in conventional breeding. This could make breeding quicker and more precise; he has used the technique himself for breeding apples. Geissler considers the transfer of genetic material within species through genetic engineering as a possible vision for the future.

The molecular biologist Marcello Buiatti from the University of Florence also stresses that science is just at the beginning of research on epigenetic mechanisms. Epigenetic changes play a much larger role in plants than in animals or people, thinks Buiatti: "Various plant cells have for example, unnecessarily – as is normally the case with animals -- the same genotype, in other words the same genes. Tissues in one and the same plant have different numbers of chromosomes, carry differently mutated genes and can often show different varieties of the same gene. Thus plants can at any time in their life and under varying environmental conditions choose from the specific appropriate variation; their reservoir of variations is much larger than that of animals." This makes genetic changes in plants even less predictable.

Thus far there are almost no studies on the unwanted effects of epigenetic changes. That does not surprise Gilles-Eric Seralini, microbiologist at the University in Caen in France. Seralini is on two French government commissions for evaluating risks of genetically modified plants. He says that in order to produce GMO plants many experiments were done and the transfer of genes only worked in a very few of these. In around 98 percent of all transgenic plants it did not function, for various reasons. These plants were just thrown away and not examined further. "So you find very few studies on the subject. Thus we should be aware that investigations on the composition of genetically modified organisms are by far inadequate to predict the toxicity or any other unexpected effect of such plants."

Seralini points out another problem: almost one hundred percent of all genetically modified plants tolerate herbicides or produce pesticides. And between 75 to 80 percent of all these plants are made resistant to one single herbicide - Roundup Ready from Monsanto. This herbicide is, however, not harmless: “We were able to show in our laboratory that human cells are very sensitive to Roundup Ready, even at lower concentrations than in agricultural use. This could explain the miscarriages and premature babies experienced by North American farmwomen. We have also detected other effects.” Seralini suggests that GMOs be tested, like pesticides, for their toxicity. “It is idiotic that people face on-going exposure to GMOs, while three months of toxicity tests are not even required.”

Florianne Koechlin

Terminator Plants

Gene-tech multinationals develop plants with built-in killer genes, so farmers must buy new seed every year

Despite world-wide protests, the US government and biotech corporations are still continuing to develop plants made infertile by the Terminator technology. These plants can grow and bear fruit, but their seeds are infertile. In the context of the United Nations Convention on Biodiversity, a de-facto moratorium on release of Terminator plants was adopted. But despite this agreement, the US government and gene-tech corporations continued working on the technology.

Their different methods to make plants infertile came under the title GURT, Genetic Use Restriction Technology. One of these technologies for instance assured that the ‘killer gene’ could be controlled by adding certain chemicals. Most gene technology corporations own patents for GURT technologies. The Terminator technology would be very practical for them – saving on expensive patent disputes, lawyers and detectives. For if seeds from the last harvest aren’t fertile, the farmer must buy new seed every year. The Terminator technology is sold to the public as a solution for the co-existence problem, as the unwanted spread of GMO plants could thus be prevented. An illusory promise: for pollen flies from Terminator plants too. Other plants can be pollinated and the killer gene could even spread to cultivated plants.

Thus the danger exists that the killer gene, without being noticed at first, could cross into other plants and only come into force in later generations. It would be especially dramatic if Terminator seeds were used in developing countries, as there a part of the last harvest is very often used for seed.

The biotech lobby has been trying for some time to increase acceptance for Terminator plants. The responsible UN bodies will be discussing the technology in the next weeks. Opponents of the Terminator technology are currently mobilizing at the international level to get public discussion going again.

Infos: <http://www.banterminator.org/>

BRIGITTE ZARZER is a correspondent for the internet magazine *Telepolis*. In 2005, her book *‘Einfach GEN:ial – Die grüne Gentechnik’* (Heise Verlag) was published.

BOOK TIPS

Epigenetics: Underestimated Risk

On December 1, 2005, a conference on the subject of epigenetics was held in Frankfurt am Main, Germany, organized by Greenpeace, the Öko-Institut for Applied Ecology in Freiburg, and the Swiss-based Blueridge Institute. The conference speakers and some experts present were interviewed earlier, and these interviews have been published by Greenpeace in a brochure available in English: “Risk Underestimated. Interviews with nine scientists on GMO.”

Those interviewed include: Marcello Buiatti (Univ. Florence, Italy), Richard Firn (Univ. York, GB), Matthias Fladung (Univ. Grosshansdorf, Germany), Cesare Gessler (Swiss Federal Institute of Technology, Zurich), Martin Heisenberg (Univ. Würzburg, Germany), Manuela Malatesta (Univ. of Urbino, Italy), Gilles-Eric Seralini (Univ. Caen, France), Richard Strohman (ret., Univ. Berkeley, CA USA), and Beatrix Tappeser (Federal Office for the Protection of Nature, Bonn).

The 37-page publication is available from Greenpeace e.V., 22745 Hamburg, Germany, or as a PDF download at: www.greenpeace.de/themen/gentechnik/publikationen

Cell Whispers

Cells whisper continuously to their neighbours. Genes are ambiguous and dynamic. Plants communicate with each other through scents; they learn, and remember each other. Are they intelligent? For more than 20 years Florianne Koechlin, the Swiss biologist, author and critic of genetic engineering, has opposed the overly simple dogmas of genetic manipulation, the myths and false promises. But for her, critique alone was not enough. And so she searched for alternative theories and a deeper understanding of life. In her latest book she presents material from interviews and personal meetings during her travels: from the shamanic knowledge of the Ashaninca Indians to the abstract world of quantum physics, from the comprehensive biology of Adolf Portmann to the newest discoveries of molecular biology.

Florianne Koechlin: Zellgeflüster. Streifzüge durch wissenschaftliches Neuland, Lenos Verlag, ISBN 3-85787-368-X, 20.50 Euro (“Cell Whispers: journeys through new realms of science”) Available in German.