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GM Crops - How Corporations Rule and Ruin the World

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The proposal that "agricultural biotechnology is vital for the future of the developing world" can immediately be contradicted if we are talking about GM crops. Evidence is building up that they are unsafe, unsound and unsustainable. If they're not good for us here they can't be good for the developing world. GM crops allow corporations to tighten their monopoly on agriculture though patented seeds that farmers can't resow. And that is especially important for the developing world.

Last month, it transpired that GM canola fields in Canada had contaminated non-GM seeds sold to Europe, after tens of thousands of hectares have been planted.

GM pollution is not restricted to cross-pollination between the same or related species. Prof. Kaatz of Jena has just discovered that GM genes may have jumped from GM pollen to bacteria and yeasts in the gut of baby bees [1]. The finding is not unexpected, as scientists including myself have been warning of this possibility for years. The risks of gene jumping are inherent to the GM technology.

GM genetic material is not like ordinary genetic material. Natural genetic material in

non-GM food is broken down by special enzymes to provide energy and building-blocks for growth and repair. And should the foreign genetic material get into a cell's own genetic material -- its genome -- other enzymes can still put it out of action. All these are part of the biological barrier that keeps species distinct, so gene exchange across species is held in check.

But along come the genome invaders, genetic engineers and the artificial constructs they make, which are designed to cross all species barriers and to literally invade genomes [2]. Genetic material of dangerous bacteria, viruses and other genetic parasites from widely different origins are combined into new constructs that have never existed in billions of years of evolution. And genes are transferred between species that would never interbreed. These constructs include antibiotic resistance genes that make bacterial infections untreatable. They include aggressive gene-switches or promoters from viruses that make genes over-express continuously -- something which never happens in healthy organisms -- and are active across a wide range of species. One such promoter, from the cauliflower mosaic virus, or CaMV, is in practically all GM crops already commercialized or undergoing field trials. Colleagues and I have reviewed the scientific evidence surrounding the CaMV promoter and called for all these crops to be withdrawn on grounds that they are unsafe [3].

GM constructs are designed to jump into genomes. Unfortunately, they can also jump out again, to invade other genomes. GM lines are well-known to be unstable, partly because the integrated GM construct can be lost [4], and the viral promoter makes it worse.

Experiments have shown that GM genes can transfer from plants to soil fungi and bacteria. Two German geneticists monitored fields where GM sugar beet was planted [5]. They found that the GM construct has persisted in the soil for at least two years after the plants were removed, and some bacteria in the soil may have taken up different parts of the construct.

The same kinds of constructs are used to genetic engineer animals and human beings. Recent experiments in so-called gene therapy leave little doubt that these constructs can get into all mammalian cells including our own, and in many instances, become incorporated into the cell's genome [6].

What are the dangers of GM gene jumping? GM constructs are made from viruses and bacteria and designed to cross species barriers. In the process, they may recombine with other viruses and bacteria to create new pathogens. The antibiotic resistance genes may also spread to bacteria associated with serious diseases such as meningitis and tuberculosis. Artificial constructs invading genomes may also wake up dormant viruses that are in all genomes. The CaMV promoter, which is necessary for the virus to multiply, has been found to be interchangeable, in part or in whole with promoters of other viruses to give infectious viruses. Alien genetic material invading genomes also give rise to gene mutations, some of which may result in cancer**.**

GM crops are turning out to be useless as well as unsafe. The bacterial bt-toxins, engineered into many crops are poisonous for beneficial and endangered species such as lacewings and the Monarch butterfly. They also encourage new resistant pests to evolve. Stink Bugs in North Carolina and Georgia are eating up the bt-cotton crops [7]. Monsanto recommends spraying with toxic pesticides including methyl parathion, among the deadliest chemicals

used in American agriculture. Studies in the University of Nebraska indicate that GM Roundup Ready soya yielded 6-11% less than non-GM soya, and needed 2-5 times more herbicide.

So-called second generation GM crops are worse. This includes the ‘golden rice’ engineered to make pro-vitamin A in the polished grain and promoted as the cure for vitamin A deficiency in the Third World. The scientists are supposedly offering Third World farmers "free" access to the grain while allowing it to be commercially exploited in the developed world. They didn’t mention that there are already 70 patent claims on the genes and gene-constructs. It has also cost US$100 million to produce, and may need as much to develop.

To offer that to the poor and malnourished is worse than telling them to eat cake. There are plenty of alternative, infinitely cheaper sources of pro-vitamin A such as green vegetables and unpolished rice. It is the substitution of the traditional varied diets in the Third World by green revolution monoculture crops that’s responsible for vitamin A deficiency as well as deficiencies of iron, iodine and other micronutrients.

‘Golden rice’ is an abomination. The technology is standard first generation ie, unpredictable, unreliable and uncontrollable [8]; the constructs just as unsafe if not more so. There are at least two genes with the CaMV promoter, one of which codes for antibiotic resistance.

The way to feed the world is definitely not GM crops. World population figures have been wildly exaggerated. Norman Borlaug, father of the green revolution, claims GM crops are needed to feed 10 billion. In fact, figures have had to be revised downwards several times in the late 1990s. By mid-1998, the UN’s estimate was that world population will peak at 7.7 billion in 2040, then go into long term decline to 3.6 billion by 2150, less than two-third of today’s number [9].

Population arguments are based on the ecological notion of carrying capacity. But the carrying capacity of an ecosystem depends on its organization. Ecologists are increasingly finding that the more biodiverse the ecosystem, the greater the carrying capacity, and hence the more people and wild-life it can support. Also, biodiverse systems are more stable and resilient. The same principles have guided traditional indigenous farming systems, and are now being re-applied in holistic approaches that integrate indigenous and western scientific knowledge [10]. Some 12.5 million hectares around the world are already farmed in this way. The yields have doubled and tripled and are still increasing. At the same time, these agricultural systems have been reversing some of the worst environmental, social and health impacts of the green revolution.

World market for GM crops has collapsed because people all over the world are rejecting them and opting for organic sustainable agriculture [11]. An organic revolution is rising from the grass-roots and also sweeping across the disciplines within western science. From quantum physics to the ecology of complexity and the new genetics, the message is the same: nature is dynamic, interconnected and interdependent. Proponents of GM technology are stuck in the mechanistic era, it is that above all that makes the technology both futile and dangerous.

In conclusion, this house must reject GM crops because it is not safe, not needed and fundamentally unsound. It is standing in the way of the necessary global shift to sustainable organic agriculture that can really provide food security and health around the world.

Notes and References

1. Barnett, A. (2000). GM genes 'jump species barrier' The Observer May 28, 2000.

2. For details see Ho, M.W. (1998,1999). *Genetic Engineering Dream or Nightmare?* Gateway, Gill & Macmillan, Dublin.

3. Ho, M.W., Ryan, A. and Cummins, J. (1999). Cauliflower mosaic viral promoter -- a recipe for Disaster? *Microbial Ecology in Health and Disease* 11, 194-197; Cummins, J., Ho, M.W. and Ryan, A. (2000). Hazards of CaMV Promoter? *Nature Biotechnology* 18, 363; Ho, M.W., Ryan, A. and Cummins, J. (2000). Hazards of transgenic plants with the cauliflower mosaic viral promoter. *Microbial Ecology in Health and Disease* (in press).

4. See Pawlowski, W.P. and Somers, D.A. (1996). Transgene inheritance in plants genetically engineered by microprojectile bombardment. *Molecular Biotechnology* 6, 17-30.

5. Gebhard, F. and Smalla, K. (1999). Monitoring field releases of genetically modified sugar beets for persistence of transgenic plant DNA and horizontal gene transfer. *FEMS Microbiology Ecology* 28, 261-272.

6. Reviewed by Ho, M.W., Ryan, A., Cummins, J. and Traavik, T. (2000). *Unregulated Hazards: 'Naked' and 'Free' Nucleic Acids*, ISIS and TWN Report, Jan. 2000, London and Penang .

7. See Biodemocracy News #27, www.purefood.org

8. This can be seen in the scientific report itself: Ye, X., Al-Babili, S., Kloti, A., Zhang, J., Lucca, P., Beyer, P. and Potrykus, I. (2000). Engineering the provitamin A (b-carotene) biosynthetic pathway into (carotenoid-free) rice endosperm. *Science* 287, 303-305; see also *ISIS Sustainable Science Audit #1: The Golden Rice -- An Exercise in How Not to Do Science.*

9. World Population Projections to 2150, UN Population Division, New York, 1998.

10. See Altieri, M., Rosset, P. and Trupp, L.A. (1998). *The Potential of Agroecology to Combat Hunger in the Developing World* , Institute for Food and Development Policy Report, Oakland, California; also Rosset, P. personal communication.

11. Over the past four years, US corn exports to the EU have fallen from $360 million a year to near zero, while soya exports have fallen from $2.6 billion annually to $1 billion- and expected to fall even further as major food processors, supermarkets, and fast-food chains ban GM soya or soya derivatives in animal feeds. Canada's canola exports to Europe similarly fell from $500 million a year to near zero. From Biodemocracy News #27 www.purefood.org

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