

Mammon Gone Mad: the dangers of biotechnology

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You may think I'm exaggerating if I say: 'there are lies, damned lies, and there's bio-technology'. I am, but only slightly. It is being sold to us as a great benefit to mankind. Yet there is probably no field of science on which there has been more secrecy, more dis-information, less regard for ethics, less respect for life, such a lack of monitoring, or such irresponsible legislation. Nor is there any field of human endeavour which more threatens us, the planet and our children.

Biotechnology has, of course, some good uses. But hiding behind the cosy face of Dolly the sheep are experiments with life itself every bit as unwise and unpredictable as those illustrated in Jurassic Park genetic changes which could damage the eco-system, alter the food chain, create fatal diseases, irreversibly destroy soil fertility, and change the face of the planet. Yet worldwide such work is virtually uncontrolled, unregulated, and unsupervised, and is being done, not on dinosaurs, but at a level so microscopic that we may not even be aware of the damage until too late.

In her new book *Genetic Engineering: Dream or Nightmare?* Dr Mae-Wan Ho, Reader in Biology at the Open University and Fellow of the US National Genetics Foundation, spells out the earth-threatening situation which has been created by the 'alliance between big business and bad science'. In this 'Silent Spring' of the 90's she warns of dangers even greater than those which Rachel Carson exposed. Like other scientists, Dr Ho does not condemn bio-technology itself, only its irresponsible use: use which ignores the enormous risks and creates what she believes is 'the biggest single danger facing mankind today'. If you have read one of the cosy government and supermarket leaflets on genetic engineering (GE) all that may surprise you, for they suggest that genetically modified (GM) food is a natural extension of centuries-old cross-breeding and cross-fertilization. A curious claim, for nature only allows cross-breeding within species: you cannot cross a cat with a dog or an apple with a rose, still less a dog with a rose. Yet GE involves gene transfer both across species and between humans, animals, plants, and fish using means which are decidedly unnatural. Comparing GE with normal cross-breeding is like saying there is no difference between cross-pollinating two apple trees and grafting an ear from your dog or cat onto your neighbour's tortoise. A sickening idea but some aspects of GE are sickening.

Most bio-technology is in the hands of big chemical companies which understand inanimate substances chemicals and money more than the complex interactions of life itself. Yet bio-tech companies claim GE will benefit the world: abolish hunger, reduce the need for herbicides, create better food, produce healthier children; a host of unimaginable benefits. Moreover that it is a safe and exact science, approved on good criteria.

The reverse is the case on every count.

Cheating the Third World

The scope, and potential harm, of GE is so great that we need to look at the industry's claims one by one. On beneficence we need only turn to the Third World. To monopolize potentially useful gene sources, GE companies are slapping patents on food plants and natural medicines used by the Third World for centuries, making them unobtainable or

unaffordable, and so forcing poor countries to submit to bio-piracy or spend on legal battles money desperately needed for development. Far from feeding the world GE is, in the opinion of some of leading experts on Third World Development, fostering even greater poverty, malnutrition and sickness.

The bio-giants have even taken out patents on the genes of indigenous people, so removing their legal rights over what should be an inalienable birthright the tissue of their own bodies. The aim of this theft is to ensure that, if someone's genes contain a genetic asset, it will be the biotech company which gets rich, not the rightful owner. Yet, such is the influence of bio-giants, that both the EU and USA have created laws allowing this.

More herbicide not less

As to GM reducing the need for herbicides: is a herbicide manufacturer likely to create plants which reduce herbicide use? Or ones which increase it? There are no prizes for the right answer. Monsanto, maker of the herbicide Round-up, has created GM herbicide tolerant soya beans, and seriously wants us to believe it will cut herbicide use.

Yet again, the truth is the opposite of what we are told: farmers can spray herbicide tolerant plants more often, and closer to cropping. Which is why Monsanto asked the US and EU to allow a three-fold increase in the permitted residue levels of the glyphosate-based herbicide Round-up in a range of GE crops. America and the EU agreed so increasing the world's chemical load.

But once a new plant, creature or organism is out of the laboratory there is no controlling it. Life interacts with life, genetically modified or not. So, characteristics created by GM may be transferred to the natural world by normal cross-breeding and pollination.. Already, in tests herbicide tolerant rape has crossed with weed relatives, creating herbicide resistant weeds. Such crosses could fuel a demand for even stronger herbicides which in turn will still further reduce biodiversity, and increase the toxic load on the environment. This is no small matter at a time when the WHO is investigating links between escalating chemical use and the increase in cancer.

Interactions between herbicide tolerant crops and herbicides can also pose hazards. For example, glyphosate can make herbicide tolerant members of the bean family produce high levels of plant-oestrogens which can mimic female hormones. Dr Ricarda Steinbrecher, a genetic scientist and member of the British Society for Allergy, Environmental and Nutritional Medicine, believes that beans containing too high a level of such oestrogens could 'present a severe risk to children' and 'may cause severe dysfunction of the reproductive system especially in boys'.

The emperor's new clothes

We in the industrialized world don't, of course, need GM foods to keep our plates full. So why should we permit such risks? Before us, the bio-tech companies dangle the magic word 'progress' plus the curious promise of better food and an end to genetic diseases implying they can cut and paste any genes they choose to create a precise result.

They can't. Originally, scientists thought genes worked like beads in a necklace, each carrying a single characteristic. This, excitingly, suggested a 'bead' could be whipped out of one organism and popped into another to produce precise benefits. That simplistic theory was sold to the media and public and triggered huge investment in bio-technology. At last

mankind seemed to have the power to tailor-make life. However, since the chemical giants first trumpeted the promise of their new GM crops, evidence has built up that things are not as safe and predictable as was claimed. And the emperor's new clothes not quite what they're cracked up to be.

Caution Genes at work

The bead theory was not only wrong but ignored the complex, interactive, nature of life. In reality, genes interact with the environment and with each other. And they aren't soloists: they work as a team. Extract a footballer from his team and dump him in one playing a different game and speaking a different language, and you might see as much of his aggression as his ball skills. Moreover, the new team might respond in kind. The same goes for genes. Like footballers, each gene carries more than one characteristic and the outcome of its interaction with host genes is unpredictable.

This raises important medical and ethical questions in relation to manipulating human genes. What is more they can't yet place a gene exactly, all they can do is pop it somewhere along the sequence of chromosomes and hope for the best. Transfer a gene for red petals to a vegetable, and besides red flowers you may also get reduced fertility and nutritional value, crop failure, and even bizarre changes. There are numerous examples of this happening. Some salmon bred to grow faster have turned green. Moreover, such mishaps are not the only danger implicit in genetically modified salmon. Some GE salmon escape will inevitably escape from fish-farms into the wild, cross-breed with normal salmon, and thus potentially contaminate both wild salmon themselves and public trust in all salmon as part of their diet, with predictable economic consequences.

Yet biotech companies are marketing GM crops before unexpected effects have even been ironed out (if they can be). For example, farmers who grew Monsanto's GM cotton in 1997 are taking legal action because the cotton balls fell off. And some 30 organizations are also prosecuting because **GM pest-resistant crops are causing pests to become resistant to the most effective organic pesticide so threatening organic food production.**

The so-called terminator gene, whose patent is owned by Monsanto, may pose an even greater threat to world food supplies. It allows crops to set seed that appears normal, but which is sterile. If the saved seed used by traditional farmers were to be accidentally cross-pollinated with this gene their crops will fail and they would starve.

Hidden poisons

The first impact GE will have on our lives is via GM foodstuffs. If GM seeds are being sold before unexpected agricultural side-effects have been detected can we be sure they are not being marketed before other side effects have been found? Probably not. Yet GM can trigger the production of poison. For example, a gene inserted in tobacco produced an unexpected and highly toxic acid known as OTA. And some GE strains of yeast, intended for use in beer and bread, have been found to accumulate the highly toxic substance methylglyoxal which can deform unborn children of which more later.

Since GM can unexpectedly trigger known toxins you may be wondering if it can trigger unknown toxins. It would be surprising if it couldn't. In 1989, 5,000 Americans became ill after taking a GM derived food supplement, 37 died and 1,500 were permanently disabled.

Debate continues as to whether or not the toxin resulted directly from GM, a fundamental problem being that too little is still known about GM related toxins.

That highlights how hard it is to assess the safety of GM foodstuffs. For, of course, standard tests only spot known toxins or allergens. Finding unknown ones takes extensive, long-term, carefully monitored, multi-generational animal and human trials for each new GM foodstuff. These haven't been done. Nor have changes to digestibility and nutrition been fully explored. Research is also lacking on the effects of eating animals which have been fed on GM plants. Officials say there is no risk to man but they said that about cattle fed on animal remains. Scientists who tried to warn the authorities about BSE were pooh-poohed. So are those who warn of the dangers of GE.

An issue of human rights

Despite all that, and despite warnings from scientists, GM foodstuffs are already being used in a wide range of food. Sixty per cent of processed food contains soya and many British manufacturers use soya from America, where GM and normal soya are lumped together. Without adequate trials, this means we are all guinea pigs in a vast uncontrolled experiment. Yet any harm may not show for generations: a pregnant woman's diet may have more impact on her grand-daughter than her daughter.

Since the risks from GM foodstuffs are unlike any others, you'd have thought that, in a democracy, we'd have been asked if we wanted GM organisms in our fields and our shops. We weren't. What then of our basic human right to choose what we put into our bodies? The government hasn't even required food manufacturers to show they've used GM material. But how can we exercise our right to avoid GM organisms if we don't know they are there?

That lack of labelling is curious. If GM food is good news you'd think every biotech company would be dying to blazon on every packet, 'Contains GM created by Genebusters or whoever. They're not. Significantly, we may have no redress if GM puts toxins or allergens into our food; in processed food we'll meet GM foodstuffs in so many combinations, that it may be impossible to find the culprit.

A licence to kill

We are so used to the 'nanny state' protecting us that all this may seem hard to believe. There is worse to come: For, in both America and here nanny has passed laws on bio-technology which are so indulgent they might have been written by a chemical giant's mother. And in Britain the screening procedure for GM foodstuffs is so lax it beggars belief.

Dr Michael Antonio, senior lecturer in molecular pathology at a major London teaching hospital, is a bio-technology advisor and an expert on food hazards. In his article *Substantial Equivalence: A Licence to Kill?* in *Nutritional Therapy Today*, he attacks the screening of GM foodstuffs as grossly inadequate a view confirmed by a recent National Consumer Council report which says the risks of GM food cannot be quantified because 'conventional risk analysis' is impossible and the regulatory system is 'still flawed'.

The flaws arise because so-called risk assessment rests on whether the GM organism is 'substantially equivalent' to a non-GE counterpart. In other words, if a roughly similar natural organism exists, the GM version is assumed to be safe. This is farcical, when it is known that genetic modification can produce unexpected poisons.

The poisoned womb

Dr Antonio damningly tells how the researchers who found the mutagen methylglyoxal in GM yeast (mentioned above) warned that the government criteria of substantial equivalence would be unlikely to identify the harmful substance the GM yeast accumulated though it was highly toxic and could damage babies in the womb.

When the drug thalidomide was marketed in the 1960s it had passed laboratory tests just as GE food has. But it lacked other vital trials just as GE does. Sadly that drug led to many babies being born without arms, a tragedy which thorough trials could have prevented. Yet the lesson of thalidomide seems lost on bio-tech companies and governments.

Speaking this March, Dr Vyvyan Howard, President of the Royal Microscopical Society and Head of Research on Foetal Toxicology at the University of Liverpool, said he believed the first evidence of the harm done by GM foodstuffs would be seen in damage to unborn children. And in an article for Science in Parliament he calls for an end to the 'Gadarene rush' to modify 'the staples of the human food chain'.

Disease to go

Dr Mae-Wan Ho is also calling for a halt for re-appraisal. She believes some of the gravest risks of all lie in the techniques used in the very act of gene transfer: techniques which could put the health of the world in jeopardy through its use of viruses and bacteria.

Getting alien genes in contact with host genes is tricky. One GE solution is to couple the new gene with part of a virus or bacteria and use its invasive skills to get the gene in. Incredibly, even antibiotic resistant bacteria are used. In addition, germs are being manipulated in areas like pest control, for example, to make mice sterile.

Of course, GE aims to disable all the disease organisms that are used. So, in theory, they just die before they can do any harm. But anyone who has even a nodding acquaintance with germs knows they're the Houdinis of the natural world, adept escapologists and quick change artists, and impossible to restrain. So even disabled viruses can 'mate' with others and move on in a recombined, and potent, form. What is more, whenever any part of their GM host moves around, they'll go with it be it in pollen, dead skin, or scales. And having been created to cross species boundaries they present a new risk of disease organisms which can move between plants, animals and man, possibly carrying engineered characteristics such as sterility or antibiotic resistance. In addition, such germs may take on new or more virulent forms, for that is how germs often adapt.

This fact needs to be seen in the context of medicine today. At least 50 new human viruses have surfaced since 1978, of which AIDS is only one. At the same time, some germs have become far more virulent. The E. coli which proved fatal in Scotland, for example, was very different from that which has long inhabited the guts of man and beast. So far as we know none of this is in connection with GE, although this rise coincides with GE's immense growth.

Simultaneously antibiotic resistance is rising at an unprecedented rate. In one hospital the incidence of vancomycin resistance rose from 3% in 1993 to 95% in 1997. This pattern has been repeated globally for such a wide range of antibiotics and bacteria that diseases such as tuberculosis, formerly thought controllable, are out of control, and operations and even hospitalization present increasing risks.

Can it possibly be responsible for GE companies to pour petrol on that fire by furthering the creation of new and more serious diseases? Or to spread antibiotic resistance, so putting one of the major tools of modern medicine still further in jeopardy? Even if there were no hazards, should we really accept the idea that we have a right to cut and splice plants, animals and germs at will?

Our fragile earth

The greatest insanity lies in the threat to the ecosystem of the earth itself, on which all life on earth depends; a self-sustaining system whose complexity we should reverence not destroy.

What if cross pollination between GM plants and wild ones renders plants which are vital to wild animals poisonous? What if a GM microbe mutates to a form which sterilizes or kills bees upon which so many plants depend for fertility? Or what if decomposing GM material releases into the soil toxins, or microbes which damage the delicate unseen micro-organisms which maintain soil fertility? The gravity of such risks is incalculable.

We can seal up Chernobyls and missiles, stop making chemical pollutants and CFCs. But genetically modified organisms are alive and, once out of the laboratory, unstoppable. Already food made without using GM foodstuffs cannot say 'contains no GM material' for GM organisms are now in the air. We cannot halt the movement of pollen or ring-fence viruses. Nor contain microbial damage to the soil within some man-made fire-wall. Moreover, if damage is done it will be done for all of time. There will be no antidote.

Yet GE is a vast multi-billion dollar industry able to manipulate politicians and with many key scientists in its pocket. This makes it exceptionally hard for the media to pass on unbiased facts. Equally, life can be manipulated and exploited in quirky, hidden, back-street laboratories. So we should be suspicious of any reassuring words on safety. To quote Michael Crichton's factual introduction to Jurassic Park, 'This enterprise [GE] has proceeded so rapidly with so little outside commentary that its dimensions and implications are hardly understood at all... The work is uncontrolled... There is no coherent government policy, in America, or anywhere else in the world. There are very few molecular biologists and very few research institutions without commercial affiliations... Genetic research continues at a more furious pace than ever. It is done in secret, in haste, and for profit.'

Is it not madness for us humans, who do not even understand ourselves, still less the miraculous, beautiful, infinitely complex interactions between everything on this planet, to suppose we can improve on the building blocks of a natural world which has taken millennia to create? To allow genetic engineering, with infantile arrogance, to mess with the very stuff of life itself as casually as a toddler mixes finger paints? While retaining whatever is good, ethical and responsible, do we not owe it to future generations to do all we can to minimize the damage done by this most irresponsible of industries? To achieve that, should we not call a halt, through a moratorium, until all the risks have been thoroughly assessed?

Taking action

Issue 41 of *Caduceus* will carry an update on GE and information on ways to oppose its excesses (copies may be ordered directly from the publisher on +44-1926-451897). Meanwhile, the most important thing you can do is to pass on the facts to as many people as possible.

Literature sources and contact organizations

1. *Genetic Engineering: Dream or Nightmare? The Brave New World of Bad Science & Big Business* by Dr Mae-Wan Ho (Bath: Gateway, p/b, £9.95) seeks to expose all the complex worldwide dangers human, social, ecological and financial which arise from genetic engineering and bio-piracy. See review on page 46.
2. Greenpeace, Friends of the Earth, and Genetic Engineering Network have a joint campaign against GE food. The hotline in the UK is: 0171 865 8222.
3. Genetic Engineering Network publishes a free newsheet on GE: P.O. Box 9656, London N4 4JY, UK Tel: 0181 374 9516, or see their web site:
<http://home.rednet.co.uk/homepages/davestee/gen.html>
4. Women's Environmental Network, 87 Worship Street, London EC2A 2BE, UK.
5. Green Network, 9 Clairmont Road, Lexden, Colchester, Essex CO3 5BE, UK. Tel: 01206 546902

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