

IS GM SAFE?

Michael Burnet from Zeneca Agrochemicals at Jealott's Hill, UK, comments on a recently televised documentary

Introduction

As part of its HORIZON series of science programmes, BBC 2 transmitted a programme entitled "Is GM Safe?" on 9 March 2000. Although genetic engineering goes back to the early 1970s the public debate over its safety has really only taken off as the science has become more applied. Nowhere is this more apparent than in agriculture. The GM debate has intensified in the last year or two, especially in the UK and Europe, opinions being formed on the basis of the "outrage factor", rather than any consideration of science following the introduction of genetically modified grains in bulk commodities.

Against this background the HORIZON programme set out to debate the issues around GM safety by interviewing representatives from the main interested parties: GM opponents and environmental groups, the regulators and the biotechnology industry. The positions they took are familiar. The regulators in the person of Tom Sanders (UK Committee on Novel Foods) explained how known hazards to health and the environment are quantified and assessed, while industry representatives explained how well their products conform to the requirements of the regulators. In reply, GM opponents like Doug Parr, the chief scientist at Greenpeace, pointed out that it is the unknown consequences that worry them most. Although no advance can be made on these positions, the programme compensated by describing the science behind the work of the regulators and the industry, doing so with flair and production values rarely seen in documentaries of this type – more on that later.

Is protein from GM plants safe?

In essence, a genetically modified plant can be considered as an otherwise ordinary plant with the addition of one small fragment of DNA. Within this fragment is the wherewithal for a plant to express a new gene and thus make a new protein. In attempting to quantify any hazards associated with this plant it is logical to ask first if the protein presents any particular problems. Is it, for example, allergenic or indigestible? Roy Fuchs of Monsanto described work that demonstrated that the novel protein produced in Monsanto's Roundup Ready Soybean lasts only a few seconds in solution that simulates the digestive juices of a human stomach thus making it an unlikely allergen.

Is the GM plant altered?

As the programme pointed out clearly, this highlights one of

the differences between genetic modification and conventional breeding. In normal crop breeding the goal is usually to introduce a maximum of variation to allow the selection of disease tolerant varieties, or those that make more of a desired product (*e.g.* higher oils). In contrast, the biotechnologist takes an established variety and sets out to alter none of its fundamental characteristics save the introduction of a novel gene. This is done with the goal of satisfying the regulatory criterion of so-called "substantial equivalence". That is to say, a GM crop variety must be substantially equivalent to its non-GM counterpart in order to gain regulatory approval. Monsanto scientists claimed that, in the case of RoundUp Ready Soybean, they quantified 1500 different biochemical components of their varieties in order to demonstrate conclusively, in their view, that no new hazard could be found in their variety – a level of diligence far exceeding the norm in plant breeding.

Are GM plants safe to the environment?

The environmental issues are clouded by complexity, but the HORIZON team managed to distil the essence of the anti-GM case, notably, that a GM trait might one day escape to a weed relative, giving it some advantage in the wild and thus reducing biodiversity. The latter is considered to have a low probability, but, as an unknown, it looms unresolved and weighs heavily on the debate. The viewer was probably left a little confused as industry representatives and farmers waxed lyrical about reduced pesticide use following the application of cotton expressing the insecticidal Bt toxin, while environmental campaigners lamented the risks of resistance developing in insects. The apparent contradiction was probably enough to leave the viewer wondering if the issues are not more complex than they seem.

More complicated is the issue of interspecies gene transfer – *e.g.* the use of a bacterial gene in a plant. The HORIZON team presented this as a moral and ethical issue for which there is no obvious answer apart from free debate and exchange of information.

What's in it for the consumer

Behind much of the debate lingered the questions, "What's in it for the consumer", "Do we need it?" For the last century increasing efficiency in food production has benefited consumers by making food a diminishing expense relative to the other essentials of life. However, the use of

biotechnology to further these productivity gains is apparently less acceptable. While the industrialised world has the luxury of choice, some believe that biotech will be essential to providing food security to the developing world. The Horizon team visited the laboratory of Luis Herrera-Estrella, a Mexican public sector researcher attempting to overcome the fundamental limits of poor soils using engineered maize. Dr. Herrera displayed encouraging results and lamented the campaigns against GM launched in his country. A similarly positive account was provided of the work of Dr. Ingo Potrykus and the Swiss Federal Institute who has sought to develop rice containing provitamin A. The work of Drs Herrera and Potrykus is an elegant display of the power of biotechnology but just as impressive is the strength of their conviction in the utility of their labour.

Was the programme fair and balanced

Overall the content of the production was informative and impartial with all sides having about equal airtime, although, as is often the case, the communication skills of the anti lobby and their use of the fear of the unknown fared well against the attempts of the pro lobby to convince the viewers of the safety of GM crops.

The content was made all the more digestible by lavish production and design with the incorporation of wonderful scientific imaging. The risk in this attention to production is that the mood developed by the music and images may be more influential than the spoken arguments. I felt that the images of Monsanto's research centre with its sombre lighting, brooding music, low angle glass house shots and typed datelines recalled a military mystery documentary style – unfortunate in the context. In fairness, images of crop destruction by GM opponents were accompanied by a rumbling beat that may have evoked negative sentiments for

some viewers. Nonetheless, this example serves as a reminder that the agrochemical and biotechnology industry will continue to be viewed with suspicion if its public portrayal, even through mood and music, perpetuates an outdated image.

The focus on Monsanto as the representative of the biotechnology industry was predictable but perhaps too limiting. Exposure to smaller firms such as prodigen with their ingestible vaccines would have given the viewers a more balanced view of commercial plant biotechnology. However, it is clear that, for some time to come, agricultural biotechnology will be associated with Monsanto's products in the public perception of the field.

Postscript

Ultimately the debate hinges on unknowns and public opinion. The closing comments perhaps say it all.

- Jeremy Rifkin, an environmental campaigner closed with: "Is it worth the risk of bypassing 1000s of years of conventional breeding, of putting new GMOs into the environment with genes from unrelated species and only afterwards finding out if it is safe or not – that is the question".
- Rob Fraley, a senior Monsanto scientist concluded: "I don't think any science is inherently good or bad, safe or unsafe, it is what we do with it and how we use it, and I believe that biotechnology if used appropriately and appropriately regulated, has tremendous benefit".

Further information on the programme can be found on <http://www.bbc.co.uk/horizon/gmfood.html>, which also includes further reading on the subject and a selection of website links.

“THE RISE AND FALL OF GM”

A week or so after the BBC HORIZON programme reviewed here, Channel 4 broadcast another GM documentary entitled “The Rise and Fall of GM”.

This programme also traced the history of GM from the initial excitement in the 1980s to the strong anti-GMO backlash in the late 1990s, but this documentary was presented in a way that clearly put forward the pro-GM case, emphasising the great benefits which could follow from GM technology—in terms of food security and improved nutrition, especially in the Third World. Although the case *against* GM was strongly expressed, the way that the programme was put together and the imagery used left the viewer feeling that the case *for* GM was a stronger one, and that the call for a return to organic and sustainable agriculture was a backward, negative reaction.

The programme made the point from time to time that the anti-GM lobby based their case on ideology, in that they were at the same time against the power of multinationals, and had a general dislike of modern food production and distribution. One speaker said it was easy for people in the developed world to be romantic about these things, but in Africa and other parts of the developing world the choice is between life and death.

The bias in the programme will itself be hotly debated by those who either felt that it distorted the arguments, or felt that the case for GM had at last been expressed.

The programme, however, ended pessimistically as to the future of GM. Whatever the strengths of the case *for* GM, the campaigning skills of those ranged against it are likely to be too strong. Will the GM story be looked on in the future as a victory for the consumer over the multinational, or a sad case of who shouts the loudest wins? It depends on your point of view.

Further information on the programme can be found at <http://www.channel4.com/equinox>

The Editor