

# GENETICALLY MODIFIED ORGANISMS

## A BRIEFING PAPER

### 1. Introduction

The Church of England encourages its members to think through issues themselves in the light of the Christian faith and in dialogue with the wider Christian tradition. Nationally and locally, the Church of England seeks to support its members in their explorations in discipleship through encouraging participation in social institutions where moral and ethical issues arise. As an established Church, the Church of England seeks to develop debate and dialogue with a wide range of social institutions in order to explore the contribution which Christian ethics can make to the life of the nation. This paper is offered as a resource for these purposes.

The public has expressed enormous concern at the prospect of genetically modified organisms, and this needs to be taken seriously. Much of this concern, more or less well articulated, arises from a sense that genetically modified foods are radically unnatural. This paper attempts to clarify the scientific facts and the theological and ethical issues arising from them in order to assist clear thinking in this area.

### 2. Genetic Modification

Foodstuffs have been derived from genetically modified plants and animals ever since the time when agriculture began and selective breeding turned wild cereals into cultivated crops and wild animals into domesticated herds. However, the use of the phrase 'Genetically Modified Organisms' (GMOs) is usually reserved for plants, animals and micro-organisms that have been modified by genetic engineering in ways that could never be achieved by natural breeding. For example, a gene from a fish could be inserted into a tomato. Present and foreseeable uses of these techniques are limited, in that:

- a) they involve only small transfers of genetic material, often just a single gene which is correlated with the production of a specific protein;
- b) for the purposes connected with foods, the transfers envisaged are principally into plants. GM of animals is a more difficult procedure and current uses concentrate on medical applications, employed for the production of therapeutically valuable proteins. However, in due course GM animals may be introduced into the human food chain.

### 3. The Nature of Genes

Although it is common parlance to talk of genes as carrying 'information', it is important to recognise that the genetic code is only meaningful in the context of the whole cell within which a gene is operating. Some have, therefore, suggested that genes in themselves are simply complex chemicals and that their biological significance derives from their cellular host. On this view, a gene derived from a human being but transferred to a plant would be a 'gene of human origin' but functionally, and ethically, a gene of the plant that contained it.

A MAFF Committee that considered ethical issues arising from GM foods took this view, though it recognised that it would not be shared by everyone. Some perceive genes as still being

endowed with an ethical significance derived from the organism of origin, so that for them genes of human origin are still 'human genes', and genes of porcine origin are still pig genes (a worry to Moslems but not to Jews, according to evidence given to the Committee).

#### **4. Purposes Served by GM Foods**

A number of different purposes might be served by introducing GM organisms into food use:

- a) Marketing convenience and consumer preference. One of the first GM products marketed in the UK was a tomato modified to prolong its shelf life. This brought some benefit to the consumer in a reduced price of tomato paste because of reduction of losses in transportation of the raw material.
- b) Improving fertility and viability in hostile environments, such as very arid or salty domains. The world population is predicted to rise from its present 6 billion to 8 billion by 2020. Present resources, even if evenly distributed, could provide an adequate diet for only about 6.4 billion people. There is, therefore, a clear need to improve agricultural productivity. GM offers one promising way of achieving this end, though coping with drought and salty conditions will probably require the transfer of small gene clusters, rather than single genes.
- c) Conferring herbicide resistance, so that crops could be sprayed against weeds without being themselves destroyed.
- d) Improving the resistance of crops to virus and insect predators. For example, a GM plant might produce a specific toxin hostile to its principal insect predator. Not only would this be valuable protection, but it would also be expected to reduce the use of general insecticide sprays, an environmentally friendly outcome.

#### **5. Theological Issues**

Perhaps the most widely articulated opposition to GM foods is based on the belief that they are radically unnatural and that to produce them is for human beings to be guilty of the hubris of 'Playing God'. Certainly, they represent possibilities that could not come about without direct human action upon nature. However, much technology and most medicine is based on human intervention into natural processes. Human beings are themselves part of nature, creatures within creation. Human discovery and invention can be thought of as resulting from the exercise of God-given powers of mind and reason. Many have thought that the possession of these powers is part of what it means for humans to be 'in the image of God'.

It does not seem that radical 'unnaturalness' can of itself be the source of an ethical prohibition. It by no means follows, however, that everything that can be done, should be done. There is a reverence due to the goodness of nature, seen as being God's creation. Major scientific discoveries confer knowledge, and the power that comes from knowledge, but if we are to choose the right and refuse the bad, we shall have to add wisdom to knowledge in order to make that discrimination. Here the religious traditions, which are reservoirs of wisdom accumulated and sifted over the centuries, have a vital role to play in helping society to reach the right conclusions. Wisdom is unlikely to lie either in an unrestricted exploitation or in a total prohibition, but in a careful consideration of individual proposals. In this respect, genetic engineering does not seem very different from other forms of scientific advance.

## 6. Labelling

The MAFF Committee referred to in section 3 concluded that foods containing ethically sensitive genes (eg of human origin) should be labelled in the interests of affording consumers a legitimate degree of informed choice. The present public mood in the UK seems to be supportive of the labelling of **all** GM foods, on the grounds that people may have ethical or safety concerns about them.

In terms of primary foodstuff (such as GM tomato) this might seem reasonably straightforward. However, there are greater difficulties in relation to crops that are shipped around the world in huge amounts. In the United States, Monsanto has declined to segregate GM and unmodified soya beans, an action that has given rise to protest in Europe, not least because of the considerable power and influence multi-national companies such as Monsanto appear to be able to wield. Brazil is still a source of unmodified soya but it is uncertain how long this will continue to be so.

Processed foods present greater difficulties. As some stage a *de minimis* principle must surely operate for products with long lists of ingredients, some at the trace level. It must also be remembered that processing in general breaks down the DNA in the raw materials, so that the genes themselves are unlikely to be present in the final product.

Refined products derived from GM plants will be identical to those of unmodified origin. For example, sugar will be the same whether it comes from a GM or an unmodified sugar beet. There seems to be no scientific case for labelling such products.

## 7. Possible Problems with GM Food

- a) Safety It is clear that currently GM foods are perceived by many of the public as posing serious safety problems. All novel foods and processes are subject to a well-established and respected system of independent assessment by the Advisory Committee on Novel Foods and Processes. This ensures that issues such as toxicity and allergenic properties are carefully investigated for all new entries into the human food chain in the UK. Complex chemicals, such as genes, are broken up in the digestive system and there is no evidence to suggest transfers of any genes from GMOs into the human body. After all, we have been ingesting 'foreign' genes for millennia in our food, without take-up from ordinary plants and animals.

There is, however, one matter for concern about which ACNFP, the Royal Society, and other bodies have spoken. It relates to the *antibiotic resistance markers* in genetic engineering. These are genes conferring resistance to a specific antibiotic which are linked to the gene that it is wished to implant. The process of transfer is relatively inefficient and subsequent treatment with the specified antibiotic can then be used to eliminate the majority of cells in which it has not taken place. If these resistance genes were to transfer into the bacteria in the human gut there might be health implications, though the antibiotics employed are not those commonly used in contemporary medical practice. There is a widely supported view that antibiotic resistance genes should not be allowed to remain present in GM crops.

- b) Gene transfers to other species Concern has been expressed particularly at the possibility of genetic transfers from GM crops into other crops or wild species. One way in which this might happen would be through the carrying of transgenic pollen by the wind, bees or other insects. The spectre has been raised of the development of a 'superweed', incorporating genes that gave it resistance to a variety of herbicides. Not enough is currently known to enable full evaluation of the risks that might arise in this way, but an appropriate degree of isolation of GM crops from possible unintended recipients, and a careful monitoring of such crops and their effects over several years, are clearly important measures that should be undertaken.
  
- c) Environmental Consequences Some of these were dealt with in (b). Others could result from effects arising from the toxins that generate insect resistance, since they could affect non-targeted species and also upset natural balances. These are considerations that need careful evaluation but they are not unique to GMO but may arise with any new form of pest control. We have already noted that herbicide resistant genes might have beneficial environmental effects in reducing the use of general herbicides, but some take the view that overall their effects may be detrimental. If a moratorium were to be imposed on the commercial-scale growing of GM crops, it would be essential to use the pause induced to mount a carefully thought out programme of research to evaluate these issues..
  
- d) International Issues While GM developments may be of particular value for developing two-thirds world countries, through enabling the productive use of currently marginal land, there are concerns that this technology should be made available to them in a way that does not increase their dependence and indebtedness to the technologically advanced countries, nor to the powerful multi-national companies on whose products they will have to come to depend. Some imaginative generosity from governments and multinational corporations will be needed to achieve this. Here is an issue on which the Church might well wish to exert influence.

## **8. Postscript**

From time to time, public thinking about the use of new scientific techniques can be unduly influenced by slogan words that are unreflectively taken to carry sinister meanings. A striking example of this happening has been with irradiated food. This carefully controlled process is effective in making food safer by killing harmful bacteria. However, public fear inspired by the word 'radiation' (perceived as invariably signifying an invisible menace) led to demands for labelling, which in turn proved to be the kiss of death for this food safety measure because of unjustified public fear. It would be regrettable if a similar story repeated itself in relation to GM foods.

As with almost all scientific and technical developments, GMOs offer opportunities for good use and for bad use. As with almost all scientific and technical developments, careful review and monitoring of their use is important, particularly in the early years of development. It would be unwise, either to ban GMOs from foods, or to fail to keep their use under scrutiny.

**This Briefing Paper has been prepared by the General Synod Board for Social Responsibility**