# GENETIC TECHNOLOGIES:

## a review of developments in 2004

GeneWatch UK

**Briefing Number 30**
**February 2005**

In 2004, it became clear that genetically modified (GM) crops would not be grown in the UK until 2008 at the earliest. However, both in the UK and the rest of Europe discussions are taking place about how GM and non-GM crops can coexist and about the arrangements that are needed for compensation if there is economic or environmental harm arising from their use. The European Commission has given approval for the marketing of two GM maize varieties in food and animal feed, despite the lack of agreement of Member States. Rumbling controversy has continued globally.

In relation to human genetics, the UK gave its first approval to Newcastle University for the therapeutic cloning of human embryos. International negotiations for a ban on reproductive cloning failed to be agreed and there continues to be no regulation of genetic testing or safeguards against genetic discrimination in the UK, despite continuing commitment to the development of genetic tests for common disorders. The Government also extended the powers of the police in the collection of DNA from people arrested but not charged.

This briefing reviews how GM technologies have fared during 2004 and identifies the key issues for 2005.

## AGRICULTURAL BIOTECHNOLOGY

### Commercial growing of GM crops

During 2004, seventeen countries (one fewer than in 2003) grew GM crops commercially on 81 million hectares, an almost 20% increase on 2003 (see Table 1). Most of the increase came from a greater acreage in the five major GM-crop-producing countries: the USA, Argentina, Canada, Brazil and China. Romania, Spain and Germany were the three European countries growing small amounts of GM crops commercially.

Once again, the only GM traits in commercial use (except for some GM disease-resistant papaya in Hawaii) were herbicide tolerance and insect resistance using Bt genes (see Table 2). The herbicide tolerance and insect resistance traits have also both been included in some varieties of cotton and maize, which is known as gene 'stacking'.

The main use of GM crops in the UK is in animal feed because food producers and supermarkets have removed GM ingredients from the majority of their products. In 2003 (figures for 2004 are not yet available), the UK imported approximately 21.3 million tonnes of soya, from the USA, Canada, Brazil and Argentina, a proportion of which would have been GM.[1] Some of the three quarters of a million tonnes of maize gluten feed imported from the USA is the other main product which could be GM. New labelling rules mean all food products have to be labelled if they contain GM crops or their derivatives. Animal feed also has to be labelled but products from animals fed on GM feed do not have to be labelled and neither does GM cotton used to make clothes or other products.

During 2004, there was only one field trial with GM crops in the UK, which was with GM peas at the John Innes Centre in Norwich. Of the other European Union (EU) countries, Spain (16), Sweden (14), Germany (10) and France (11) conducted the most field trials.[2]

**Table 1: Commercial cultivation of GM crops worldwide in 2004** (in millions of hectares)[3]

| COUNTRY | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|---|---|
| **USA** | 20.5 | 28.7 | 30.3 | 35.7 | 39.0 | 42.8 | 47.6 |
| **Argentina** | 4.3 | 6.7 | 10.0 | 11.8 | 13.5 | 13.9 | 16.2 |
| **Canada** | 2.8 | 4.0 | 3.0 | 3.2 | 3.5 | 4.4 | 5.4 |
| **Brazil** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 5.0 |
| **China** | <0.1 | 0.3 | 0.50 | 1.5 | 2.1 | 2.8 | 3.7 |
| **Australia** | 0.1 | 0.1 | 0.15 | 0.21 | 0.1 | 0.1 | 0.2 |
| **South Africa** | <0.1 | 0.1 | 0.20 | 0.27 | 0.3 | 0.4 | 0.5 |
| **Mexico** | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | 0.1 |
| **Spain** | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | 0.1 |
| **France** | <0.1 | <0.1 | <0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Germany** | 0.0 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 |
| **Bulgaria** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | <0.05 | 0.0 |
| **Columbia** | 0.0 | 0.0 | 0.0 | 0.0 | <0.05 | <0.05 | <0.05 |
| **Honduras** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | <0.05 | <0.05 |
| **India** | 0.0 | 0.0 | 0.0 | 0.0 | <0.1 | 0.1 | 0.5 |
| **Indonesia** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | <0.05 | 0.0 |
| **Philippines** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | <0.05 | 0.1 |
| **Portugal** | 0.0 | <0.1 | <0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Romania** | 0.0 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | 0.1 |
| **Uruguay** | 0.0 | 0.0 | <0.1 | <0.1 | <0.1 | <0.05 | 0.3 |
| **Ukraine** | 0.0 | <0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **27.8** | **39.9** | **44.2** | **52.6** | **58.7** | **67.7** | **81.0** |

**Table 2: Commercial cultivation of GM crops worldwide in 2004 by trait** (% of total GM crops grown)

| | HERBICIDE TOLERANT | Bt INSECT RESISTANT | BOTH TRAITS | Total % by Crop |
|---|---|---|---|---|
| **Soybean** | 60 | | | 60 (48.4 million hectares) |
| **Oilseed Rape** | 6 | | | 6 (4.3 million hectares) |
| **Maize** | 5 | 14 | 5 | 23 (19.3 million hectares) |
| **Cotton** | 3 | 5 | 3 | 11 (9 million (hectares) |
| **Total % of GM Crops by Trait** | 72 (58.6 million hectares) | 19 (15.6 million hectares) | 9 (6.8 million hectares) | |

## GM crops – policy developments in the UK

*Coexistence and liability*

The Government set out its new GM policy in March 2004.[4] Following the 'GM Nation?' public debate and its science and economics reviews, the Government decided that GM crops should continue to be assessed on a case-by-case basis and that there was no scientific case for a ban on cultivation. However, following advice from the Agriculture and Environment Biotechnology Commission (AEBC),[5] the Government considers there is a need to have a system to limit contamination from GM crops if they are grown, because this might affect the economic interests of non-GM farmers. The Government wants rules in place before any commercial growing of GM crops is allowed and, in a welcome move, has said that the industry, not the taxpayer, should carry the cost of any economic liability, if a neighbouring farmer's crops become contaminated and lose value, for example.

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Having held a series of workshops,[6] a consultation on the system to be put in place for coexistence and liability was originally planned for autumn 2004, but is now expected sometime in 2005, probably after the general election. Because it does not expect GM crops to be grown here before 2008, the Government sees no need to proceed with haste. One area where the Government still seems completely unwilling to take action is in relation to environmental liability. European rules will protect only certain species and habitats, leaving most of the UK's flora and fauna unprotected. For more information on the coexistence and liability issues, see GeneWatch UK briefing No. 29 (available at www.genewatch.org/CropsAndFood/briefs.htm#Brief29).

## European policy and regulation

*Marketing approvals*

The European Commission made two significant decisions by approving marketing consents for two types of GM maize:

- Syngenta's Bt 11 maize, resistant to certain insect pests, was approved for importation for use in food (not cultivation) under the Novel Food Regulation on 19 May 2004.[7]
- Monsanto's Roundup Ready maize, NK603, tolerant to the herbicide glyphosate, was approved for importation and processing (not cultivation) under the Deliberate Release Directive on 19 July 2004.[8] This still requires approval under food safety regulations before it can be used.

In taking these decisions, the Commission effectively ended the moratorium that had been in place on new GM crop and food approvals since 1999. The Commission used procedures allowed for in the regulations when the Council of Ministers has not come to agreement within a certain amount of time. Effectively, the bureaucracy steps in and forces through a particular outcome despite political disagreement. It is likely that the Commission will use this mechanism with increasing frequency in 2005. The Commission is also trying to overturn bans by some Member States (Austria, Germany, Luxembourg, France and Greece) on certain GM crops approved before the moratorium. Although the regulatory committee did not vote in favour, the bans will now be considered by the Council. If agreement is not reached, the Commission could step in again and force these Member States to accept the GM crops.

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The Commission's actions, which are unlikely to increase public confidence in either the European Union or GM food, have been driven by its wish to appease the USA and the World Trade Organisation about the European moratorium

(see below). Whether the US case is ultimately judged to have merit, its bullying intentions have already been extremely effective.

*Seed contamination*

***The highly contentious issue of what level of GM contamination of non-GM seed should be allowed remains unresolved in Europe.***

The highly contentious issue of what level of GM contamination of non-GM seed should be allowed remains unresolved in Europe. The levels established are of critical importance because they will determine the extent to which non-GM can be provided. The Commission has put in place a new process by which it will set the legal thresholds.[9] Previously it was to be decided by a scientific committee with no other scrutiny, but now the regulatory committee of the Deliberate Release Directive (2001/18) will consider the Commission's draft proposals. If there is no agreement by qualified majority vote, it will be referred to the Council of Ministers. The Standing Committee on Seeds will also have to consider the issue. However, the Commission has been unable even to agree a proposal, so the situation is unlikely to be resolved until well into 2005. Because the new Agriculture Commissioner, Mariann Fischer Boel, indicated that she was not in favour of allowing for any contamination of non-GM seed before she was appointed, earlier draft proposals for thresholds of 0.3-0.7%, depending on the crop, may be revised downwards.

*Coexistence*

In 2003, the European Commission published guidelines on the coexistence of GM and non-GM farming based on the 'rights' of all farmers to be able to grow the crops they wish, GM or non-GM, if these have European approval.[10] The guidelines allow Member States to make their own rules for how GM crops are grown and managed to limit the economic impacts of contamination. During 2004, several Member States began to develop their rules.

Under German rules,[11] which take effect in January 2005, growers of GM crops will be liable for any damage to surrounding land and will have to follow strict rules to reduce gene flow. A register of experimental and commercial growing is to be established.

The Netherlands' coexistence rules[12] also include a register and specified separation distances for GM and non-GM crops. Farmers will not be held liable for any harm if they have followed these rules.

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Because GM crops and foods have been very unpopular in many parts of Europe, there has been a move to establish GM-free zones. Ten regions in Europe – Aquitaine, the Basque Country, Limousin, Marche, Salzburg, Schleswig-Holstein, Thrace-Rodopi, Tuscany, Upper Austria and Wales – have expressed their wish to be GM-free and have been supported by the Assembly of European Regions to preserve their 'local, traditional and organic produce'.[13] In the UK, over 80 councils have passed GM-free resolutions.[14]

**WTO dispute**

In 2003, the USA, Canada and Argentina challenged the European Union at the World Trade Organisation (WTO), over its de facto moratorium on the approval of GM foods and crops. A three-person Panel of trade experts was appointed in March 2004 to adjudicate the dispute. Since that time, the parties have filed submissions and an oral hearing has been held. The outcome will be crucial for determining the extent to which countries are allowed to design rules appropriate to their own environments and cultures.

The general argument of the USA, Canada and Argentina is that:

- The 'suspension' and 'failure' by the EU to consider applications for approval of GM products (the 'de facto moratorium'), and the national bans in Austria, France, Germany, Greece, Italy and Luxembourg on some GM products which had been approved in the European Union before October 1998, have adversely affected imports of agricultural and food products from the USA, Argentina and Canada.
- The de facto moratorium and national bans violate the WTO rules because they have not been scientifically justified, they were not published and there has been 'undue delay' in assessing applications for release and marketing.
- The EU delays have hindered development of GM technology, which is of proven safety and brings great benefits, including reducing hunger and improving health and crop productivity worldwide.
- Canada has also argued that GM products should be treated no differently from non-GM products.

Europe's response is that:

- Genetically modified organisms (GMOs) have characteristics which are recognised to pose potential threats to human health and the environment, and they cannot be treated as 'like' or 'equivalent to' their non-GMO counterparts.
- The EU has operated on a case-by-case basis, and there has been no formal or informal moratorium in respect of the authorisation process or any part of it.
- Europe has taken a prudent and precautionary approach.
- There has been no undue delay and Europe's actions are justified on the basis of the insufficiency of scientific evidence.

Civil society groups have tried to ensure that the public's views are taken into account, although this is difficult given the secretive nature of the WTO. A petition with over 100,000 signatures has been handed in and a coalition of fourteen public interest groups, including from the USA, Canada and Argentina, has filed an 'amicus curiae' (friend of the court) submission. GeneWatch UK is a member of this coalition which is arguing that:

- The WTO should reject the challenge and recognise the legitimate role of the EU and individual countries in establishing appropriate mechanisms to make decisions about the desirability of GMOs.
- This must involve the public and be informed by their concerns.
- The impatience of certain biotechnology corporations to sell their products should not be allowed to overrule these principles.

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The Dispute Panel has now decided that it will require scientific advice in making its decision. The USA, Canada and Argentina had argued that there is no need for scientific advice and that the dispute was about procedural matters. Europe argued that, in a complex matter which relates to the risks of GMOs, the Dispute Panel has to take wider advice. The Panel's decision on this point indicates that it sees strength in the European case. A four-person scientific advisory panel has been appointed, although details of the membership have not been made public. It is unlikely that a decision will be made before summer 2005 at the earliest. GeneWatch UK has a section of its website dedicated to following the dispute: www.genewatch.org/WTO/WTO_default.htm. Links to the submissions and other information are available.

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**Developments in the rest of the world**

Around the world, GM crops and plants continued to cause controversy despite their widespread adoption in North America. Below are some examples of

current issues in other countries. On an international level, in November, the World Conservation Union (IUCN), made up of over 1,000 governments and non-governmental organisations, voted for a moratorium to be placed on the release of GMOs to the environment.[15]

*Hawaii*
GM papaya, engineered to be resistant to a viral disease, has been grown widely in Hawaii since 1998.[16] In 2004, it was discovered that GM papaya trees have contaminated both organic and conventional non-GM papaya on a wide scale.[17] Local farmers fear that their markets will now be lost,[18] as they may be in Thailand as a result of contamination (see below). Fifty percent of Big Island papaya seed samples showed GM contamination, including those taken from organic farms and people's gardens.

*Thailand*
The Thai government has reported that at least nine farms have been discovered to be growing GM-contaminated papaya trees.[19] It is taking action to destroy the contaminated trees which can only have arisen from GM papaya trees being grown experimentally at the Government station breeding the trees. GM papaya is not grown commercially in Thailand. Exports of papaya to Europe have been hit because of fears that contamination could have spread.[20]

*China*
Recent reports suggest that soon China will be considering whether to allow commercial growing of GM rice.[21] If approved, this would be the first GM crop to be allowed which is a staple food and so it will require a robust safety assessment. Rice is widely grown, on around 30 million hectares in China,[22] about one-quarter of the agricultural land, so environmental impacts will also demand special attention. The following modifications of rice are likely to be the first for consideration:

- insect resistance based on the Cry toxin genes from *Bacillus thuringiensis* (Bt);
- insect resistance based on the cowpea trypsin inhibitor gene rice;
- and bacterial blight disease resistance based on an introduced *Xa21* rice gene.

Rice varieties with a combination of these introduced traits (known as 'pyramiding' or 'stacking') are also likely to be considered for approval. Decisions are likely to be made in 2005 although the Chinese government has said that undertaking the assessment does not mean approval is automatic.[23]

*Brazil*
Brazil has been a key country in providing non-GM soya to Europe as approval for commercial cultivation of GM crops had not been given. However, there was a considerable amount of illegal planting using seed smuggled into the country from Argentina. This meant that some of Brazil's soy exports were essentially illegal. However, President Lula signed a decree in October, legalising GM soya plantings for the 2004-05 growing season only.[24] This may be followed by full commercial approval which could make sourcing non-GM soya more difficult.

*Mexico*
A scientific panel appointed by the Commission for Environmental Cooperation (CEC), a body formed between Mexico, Canada and the USA, considered the issue of GM maize in Mexico.[25] Because maize originated in Central America, there are many landraces with which it can cross. Contamination has already been detected even though GM maize is not allowed to be grown legally; it is thought to have been introduced via maize imported for food which was then planted. The panel's report called for more research and recommended that the moratorium on commercial growing of GM maize be reinforced and that it might

be wise to require the milling of imported maize. The panel took a very broad view of the issues, including the cultural importance of maize in the country and the economic and political history of the region – issues which are often neglected. However, it caused a furore in Washington which felt it necessary to attack the report because of the threat it might pose for the biotech and farming industries in the USA.

**GM science 'highlights' of 2004**

- Long-distance pollen movement is discovered. Pollen from GM grass was reported to pollinate grass 21 km away – much further than previously recorded.[26]
- Scientists from Nashville, Tennessee, hope to use a human gene involved in liver metabolism of drugs to develop the elusive blue rose.[27] The chance finding that bacteria become blue following transfer of the gene is now the subject of a patent application. In the rose, there have been blue thorns, stems and flowers so the technique is being refined.
- Scientists develop a GM mouse which can eat vast amounts of food without getting fat to help develop methods of 'treating' obesity.[28]
- A leading horse fertility expert in the UK is outraged when he is not allowed to clone horses.[29] The application was rejected on animal welfare grounds, but Professor Allen wanted to be able to reproduce race-winning horses which had been castrated, '... in crude terms to recreate his testicles'.
- A Californian company starts to take orders for non-allergenic GM cats.[30] Deposits of $350 are being taken for the cats which have yet to be developed. Many kittens will inevitably suffer and die as a result of the desire of allergic 'cat lovers' to have a pet.
- The first cloned pet cat, Little Nicky, is produced for a Texan 'cat lover' at a cost of $50,000.[31] The cloned kitten was reported to look and behave just like its older clone. Its owner, Julie, said she couldn't be happier,[32] but between 15 and 45% of Little Nicky's litter-mate clones will have paid the price and died before 30 days of age, according to the US company Genetics Savings and Clone which 'made' the pet.

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## HUMAN GENETICS

In February 2004, the Treasury's report into public health concluded that there is an imbalance in medical research funding, with too much emphasis on genetics and preventive medication and too little on public health interventions.[33] In November, an academic assessment described the biotech health revolution as a 'myth', based on an assessment of published research papers and new treatments reaching the market.[34]

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However, the Government's new ten-year science and innovation framework continued to encourage universities to make links with businesses and commercialise discoveries, as part of the 'knowledge-based economy'.[35] Although the framework included proposals for more public involvement in decisions about science it failed to consider moving involvement 'upstream' to include decisions about research priorities.

### Human genetic tests

The pharmaceutical company Roche lobbied to weaken US regulation of genetic tests during 2004, so that tests could be marketed without any

assessment of the evidence linking the gene to risk of disease – which is already the case in Europe.[36,37,38] Roche plans to market a genetic test for risk of heart attack within two to three years.[39,40] However, the published evidence for this test was strongly criticised by other scientists following its publication in February 2004.[41]

In December, a genetic test claimed to be linked to nicotine addiction was launched for sale on the internet by g-Nostics Ltd, a 'spin out' company from Oxford University. The company was strongly criticised by many scientists for misrepresenting the scientific evidence relating to the 'NicoTest' genetic test.[42] The NicoTest highlights the continued lack of regulation of genetic tests and the pressure on universities to commercialise genetic discoveries as part of the knowledge-based economy. Most studies linking genes to common diseases or behaviour (such as addiction) later turn out to be wrong,[43] and conflicts of interest can arise if further scientific research does not back the original marketing plan or patent claim.

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In November, the Human Fertilisation and Embryology Authority (HFEA) gave permission for the Assisted Conception Unit, University College Hospital, London, to select embryos based on a test for the presence of genetic mutations which lead to familial adenomatous polyposis (FAP).[44] This was a controversial decision because although FAP, a rare but very serious disease, leads to colon cancer from the age of about 30 to 60, affected people or those identified at risk can be screened at regular intervals and have surgery to prevent progression of the disease. Therefore, it is not inevitably fatal. In pushing back the boundaries of embryo selection to include non-fatal disorders, the HFEA did not hold a public consultation or await the outcome of the Human Genetics Commission's on-going consultation on reproductive decision-making. The lack of wider public debate caused unease even among those doctors involved.[45]

**Genetic discrimination**

No progress was made in formulating a policy regarding access to genetic test results by insurance companies. The current voluntary agreement between the insurance industry and the Government, not to use most genetic test results, runs out in 2006. New applications by the insurance industry to use some genetic test results to set premiums or refuse insurance (initially for high-value policies only) are expected to be made in 2005.[46] No new legislation was put in place to prevent employers using genetic test results to refuse someone a job or pension.

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**Cloning**

*Developments in cloning*
In February, the development of the first cloned human embryos was reported in South Korea.[47] This work has not been reproduced elsewhere, but it has raised fears of human reproductive cloning, although this is banned in South Korea and many other countries.

There were also the first reports of cloning and isolation of embryonic stem cell lines from rhesus macaque monkeys.[48] Researchers created 135 cloned embryos and implanted them into 25 monkeys, but failed to get a single pregnancy. They did, however, succeed in growing the macaque embryos until they formed balls of about 200 cells, called blastocysts, from which stem cells could be extracted.

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*Therapeutic cloning in the UK*

In the UK, the first approval for therapeutic cloning of human embryos was given by the Human Fertilisation and Embryology Authority (HFEA) to the University of Newcastle in August 2004.[49] A five-person licensing committee reviewed the proposal to develop embryonic stem cell cultures. These will use eggs donated by women undergoing fertility treatment or having their ovaries removed. The nucleus of each egg will be removed; it will be replaced with a nucleus from a skin cell and stimulated to divide and produce an embryo from which stem cells will be taken to maintain in culture. Originally, the researchers also intended to use nuclei from cells from a person with diabetes, but this was later removed from the application.

The minutes of the licensing committee meetings at which the proposal was discussed, disclosed to GeneWatch UK under the Government's Code of Conduct on Access to Government Information, reveal that the Newcastle centre has previously used 898 (non-cloned) 'spare' embryos (donated by people undergoing fertility treatment) to produce one embryonic stem cell line. Cloning may reduce the success rate further. In its evaluation, the HFEA considers alternative approaches to decide if the research is justified. Because the intention of the research is to create human embryonic stem cells, this restricts the scope of the alternatives so, for example, the use of adult stem cells is not considered.

The HFEA is now considering a second application for human therapeutic cloning from the Roslin Institute in Scotland which originally produced Dolly the sheep, the first cloned mammal.[50]

As a result of GeneWatch UK's efforts to increase the amount of public information available on these cloning applications, the HFEA has now published its decision on the Newcastle application and an extended summary.[51] However, before the HFEA takes its decision, only a short summary is available, which in the case of the Roslin application runs to only five paragraphs.[52]

***There have been efforts to see a global ban which it was hoped would be agreed in 2004.***

*Regulating cloning*

In many countries, reproductive cloning (where a cloned embryo would be placed in a woman's womb with the intention of producing a baby) is banned. However, this is not true in all countries and there have been efforts to see a global ban which it was hoped would be agreed in 2004.

In 2001, the United Nations established a working group to consider the establishment of an international convention against the reproductive cloning of human beings.[53] This issue has also been debated at the UN at the 57th, 58th and 59th sessions of the General Assembly. However, the situation is in stalemate because of differences of opinion over whether therapeutic cloning (where the cloned embryo is not implanted in a womb, but is intended to be used to produce cell lines for treatments) should be included in any ban. One group, including notably the USA, is calling for a ban on all forms of cloning. The other group, including the UK and Japan, supports the proposal which seeks to ban reproductive but not therapeutic cloning. This group includes countries such as Germany, who also oppose therapeutic cloning, but see this as an issue which should be dealt with separately. After failure to reach agreement in November, the issue has been pushed back to February 2005 when the working group hopes to have produced a new text that will gain agreement.

**Police National DNA Database**

In April 2004, changes in the law came into force to allow the police to take DNA samples without consent from anyone arrested for any recordable offence[54] –

which includes all but the most minor offences. The DNA profiles obtained from these samples are now kept on the National DNA Database until after the individual's death. The DNA samples are kept in storage, even if the person is never charged with an offence or is acquitted. The database contains DNA profiles from more than 2 million people and is set to expand rapidly to include some 5 million people as a result of the recent changes in the law.[55]

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The police also secured the first criminal conviction using 'familial searching' of the database. This technique seeks to find relatives of a suspect on the database when no match has been found for the actual suspect. Although potentially powerful in helping to solve crimes, this approach can inadvertently reveal family relationships (such as non-paternity) to investigating officers. There are, therefore, concerns about the privacy implications of expanding its use.[56]

The police also reported that for the first time they had used DNA profiling to try to predict a serial rapist's ethnic origins. They announced that they were looking for a suspect from the Caribbean and that over 200 police officers with Caribbean backgrounds were being asked to volunteer for DNA tests to try to determine which island the suspect might have come from. However, the company that carried out the DNA analysis denied that its test could predict Caribbean origin, pointing out that geneticists can only determine broad ethnic ancestry from DNA.[57]

**The UK Biobank**

During 2004, the UK Biobank appointed an Ethics and Governance Council to oversee its Ethics and Governance Framework.[58] Pilot studies are planned for early 2005 and the collection of DNA samples from half a million volunteers is expected to begin later in 2005 and to take until 2010 to complete. However, many criticisms of the Framework have not been addressed,[59] and there is still no published policy on patenting and the Biobank's relationship with commercial companies. The project has continued to ignore a request from the Science and Technology Committee to publish the peer reviewers' comments on the Biobank's much criticised scientific protocol.[60]

**Barcoding babies**

The Human Genetics Commission delayed its report on the Government's controversial proposal to screen babies at birth 'to produce a comprehensive map of their key genetic markers, or even their entire genome'.[61] The report is now expected to be published in March 2005.

**CONCLUSIONS**

Although GM crops are unlikely to be grown in the UK for at least three years, the UK has to take decisions in Europe which will also affect the availability of non-GM food in Britain in the future. If GM contamination of seed is allowed, those food companies working to levels of 0.1%, or effectively zero as this is the limit to detection, are unlikely to be able to continue to achieve this. When the Government publishes its coexistence and liability consultation later in the year, the extent to which it is willing to protect non-GM interests will become evident. The most neglected question so far is that of environmental liability.

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In Europe, the actions of the Commission in giving approvals when agreement by Member States has not been reached will continue to cause division in Europe but will please the GM-exporting countries. The USA is still considering

bringing another complaint to the WTO about Europe's labelling laws, which could give the Commission further justification for taking a pro-GM decision, despite the scepticism of the public.

***In relation to human genetics, it is becoming increasingly obvious that safeguards are limited and patchy, with important issues falling through the gaps.***

In relation to human genetics, it is becoming increasingly obvious that safeguards are limited and patchy, with important issues falling through the gaps. Despite evidence that the benefits will be limited, the Government is still investing heavily in promoting a gene-based approach to health without safeguards against misleading tests being marketed or genetic discrimination. Decisions about when to allow therapeutic cloning and extend genetic screening and selection in reproduction are far too secretive and narrow in their scope. A overhaul of the system is required with a new overarching regulator established which can also consider cases of genetic discrimination and misleading marketing.

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Printed by Interlith (Derby) Ltd, Unit 4 Dinting Lane Industrial Estate, Glossop SK13 7NU