CURRENT AWARENESS OF ISSUES RELATED TO GENETICALLY MODIFIED FOOD AND FOOD FROM CLONED ANIMALS

January – June 2006

Prepared as part of a New Zealand Food Safety Authority contract for scientific services

by

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AND FOOD FROM CLONED ANIMALS

July – December 2005

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SUMMARY

This report is one of a series intended to provide the New Zealand Food Safety Authority with an independent source of current information on issues related to genetically modified foods and foods from cloned animals. This report covers developments in the period January to June 2006 and it is noted that during this period:

Approvals, Legislative and General Issues

- The global planting area of GM crops continues to increase, with an annual growth rate of 11% to the end of 2005.

- The WTO ruled against the EU in the long awaited decision on the complaint brought by the US and co-complainants that the EU's moratorium on GMOs violated international trade rules. While the decision is unlikely to effect current EU regulations it is hailed by the US as signalling that countries must abide by international trade laws when dealing with GM as well as non-GM crops.

- Countries continue to adopt regulations governing the import and the labelling of GM products. During this period India has approved new regulations while Hong Kong has agreed to develop a set of voluntary labelling guidelines.

- New authorisations by the EU, approved since the 2004 lifting of the moratorium on GMOs, now stand at five. All new approvals are corn crops, engineered for either herbicide tolerance or insect resistance.

- Results of surveillance surveys to assess compliance with product labelling regulations have been published by the UKFSA and the FSAI. In both surveys a portion of tested products were positive for GM material, however, none contravened the labelling regulations as the amount of GM in the products was less than the 0.9% threshold allowed for inadvertent contamination.

- The International Organization for Standardization (ISO) has released Standard 24276:2006, *Foodstuffs – Methods of analysis for the detection of genetically modified organisms and derived products – General requirements and definitions.*

GM Crop Research

- International research continues to identify and engineer improved traits into a variety of crop plants. Whilst some of this work is directed at more traits to improve the existing GM crops like canola and corn, there is continued development of secondary crops which target third-world consumers eg: cassava with greater productivity.

- The focus of at lot of research is on developing methodologies for minimising the flow of transgenes from transgenic crops into the general environment. Two major bodies of work were reported during this period. One describes a system for generating transgenic crops that are fertile but produce non-GM pollen. This system could have implications for definitions in regulations for labelling of GM foods. The other report developed a strategy to mitigate the effect of 'escape' transgenes by generation of GM-non GM hybrids with reduced ecological fitness.

Food from Cloned Animals

- During the reporting period no major issues have arisen related to safety of food from cloned animals

TABLE OF CONTENTS

1 INTRODUCTION

This project is intended to provide the New Zealand Food Safety Authority with an independent source of current information on genetically modified foods (GMFs) and foods from cloned animals. It is intended to include:

- scientific issues concerning safety, detection, and nutritional quality of genetically modified foods and foods from cloned animals;
- the legislative situation overseas.

The aim of the project is to condense this material into a useful form so that the Authority can respond to issues and enquiries from other government agencies, industry and the general public. The project also aims to provide information to support the enhancement of New Zealand's enforcement strategy on standards for genetically modified foods.

This is the second report for the 2005/2006 year and covers events from January to June 2006.

Wider issues concerned with environmental or social effects of genetic modification and genetically modified organisms (GMOs), biodiversity, gene transfer, insect resistance, etc., are only covered peripherally in this report. This reflects the division of responsibility for genetically modified material, between the New Zealand Food Safety Authority and Food Standards Australia New Zealand (FSANZ) for GMFs on one hand, and the Environmental Risk Management Authority (ERMA) for GMOs on the other.

For consistency, some alternative terms have been standardised in this report. "Corn" and "maize" are interchangeable; in this document "corn" is used throughout. Canola is a genetic variation of rapeseed (or oilseed rape) developed by traditional plant breeding to be low in both erucic acid and glucosinolates ("double low" variety). In this document "canola" is used for this "double low" variety of rapeseed.

Again, for consistency the names of genes appear in this document in lowercase italics and the names of proteins in uppercase. This may not reflect usage in the original referenced document.

An important source of information for this project is the AgNet email newsletter produced by staff at the University of Guelph. Information and archives of the newsletter can be found at: http://www.plant.uoguelph.ca/safefood/

Abbreviations used throughout this document:

WTO: World Trade Organization
WHO: World Health Organization
FAO: Food and Agricultural Organization of the United Nations
FDA: Food and Drug Administration (US)
FSANZ: Food Standards Australia New Zealand

2 FOODS FROM GENETICALLY MODIFIED ORGANISMS

2.1 STATUS OF GM CROPS WORLDWIDE

2.1.1 Global status of commercialized biotech crops

The International Service for the Acquisition of Agri-biotech Applications (ISAAA) released Brief No. 34 on 11 January 2006. This brief presents a consolidated set of data to characterize the commercialization of biotech crops worldwide, and summarizes the 2005 period. During 2005 the global area planted in commercial biotech crops continued to increase. In summary:

- The global area of approved biotech crops was 90 million hectares in 2005. This was an increase of 9 million hectares over the 2004 period, equivalent to an annual growth rate of 11%.
- The number of countries growing biotech crops increased from 17 in the 2004 period to 21 in 2005. Three of the four new countries, Portugal, France and the Czech Republic were EU countries. This brings the total number of EU countries now growing commercialized biotech crops to five. The fourth new country to begin commercial planting of biotech crops in 2005 was Iran.
- Biotech soybean continued to be the principal biotech crop in 2005, occupying 60% of global biotech area. Following were maize (24%), cotton (11%) and canola (5%).
- Herbicide tolerance (in soybean, maize, cotton and canola) was the most dominant trait employed (occupying 71% of crop area). Bt insect resistance was 18% and stacked genes for both herbicide tolerance and insect resistance accounted for 11% of crop plantings.
- Of note was that the first stacked triple-gene product, a corn line, was commercialized in 2005.

Summary Figures from the Brief can be found in Annex 1.

Source: CropBioTech Update Special Edition, 11 January, 2006. http://www.isaaa.org/

2.1.2 Database of articles on GM crops

The Union of German Academies of Science and Humanities has compiled a database of approximately 240 publications on various aspects of genetically modified crops. The collection contains original publications, reviews by organisations such as the Royal Society and FAO, and introductions to the Cartagena Protocol on Biosafety. Also included are the Global Reviews of Commercialized Transgenic Crops published by ISAAA. A main focus of this database appears to be reports about the application of Green Biotechnology in developing countries.

The database can be found at:
http://www.akademienunion.de/publikationen/literatursammlung_gentechnik/english.html
This is a downloaded database requiring Microsoft Access 2000 or higher.

2.2 LEGISLATIVE AND JUDICIAL ISSUES

2.2.1 EU to Improve Implementation of Legislative Framework for GMOs

In 2004 the EU put in place stringent systems to regulate the marketing and production of GM food, feed and crops. This system is one of the strictest in the world, however, the implementation of it has been hampered by practical difficulties. In particular, this has often meant long delays in the decision –making process for new authorisations. The European Commission has announced that it proposes to implement a number of measures to (i) bring about practical improvements in the decision-making process, and (ii) improve the scientific consistency and transparency for decisions on GMOs. These measures will be undertaken within the existing legal framework, in compliance with EC and WTO law, and will aim to avoid any undue delays in authorisation procedures.

Source: Europa Press Release 12 April, 2006.
Details of the proposed practices for implementation can be found in the press release at:
http://europa.eu/rapid/pressReleasesAction.do?reference=IP/06/498&format=HTML&aged=1&language=EN&guiLanguage=en

2.2.2 Continuation of the Moratorium on Terminator Technology

Terminator technology (TT) is a proprietary form of genetic modification that is designed to make the seeds of GM crops sterile. While this methodology has the potential to contain the adventitious spread of GM crops, TT has been criticised as threatening the livelihood of small-scale farmers by preventing the on-going collection of seeds for future planting.

A global moratorium on the testing and commercialization of TT crops was established in 2000 under the United Nations Convention on Biodiversity (CBD). A meeting of the CBD was held in Spain in January 2006 and whilst the meeting reaffirmed the moratorium on TT, recommendations were made by several countries to allow 'case-by case' risk assessment of TT crops. Having engendered a lot of international public controversy this issue was re-addressed at a further meeting of the CBD in Brazil in March 2006, where the precautionary approach to approval of release of TT crops was unanimously upheld.

Source: AgNet, 3 February and 31 March, 2006

2.2.3 WTO rules in US/EU row over EU GMO policy

In 2003 the US, Canada and Argentina filed a complaint with the WTO against the EU, claiming that a moratorium on approvals of GM crops that was adopted by Europe in 1998 violated international trade rules. Specifically, violation of a food trade treaty that requires regulatory decisions to be made without "undue delay" and to be based on science. A decision on the complaint has been expected from the WTO for some time, and was finally reported in February 2006. In the confidential report, leaked to the media in February 2006 and confirmed by WTO officials in May 2006, the WTO three-person panel concluded that the EU had an effective ban on biotech foods for six years between 1998 and 2004 while it considered regulatory issues. This ban broke trade rules by amounting to "undue delay". The verdict also condemned six EU member states for applying individual bans, without providing sound scientific evidence to support them, on a number of GMO products previously approved by the European Commission.

In 2004 the EU approved new regulations to cover the use of GMOs as food and feed, opening the European market to GM products once more. The EU has reacted to the WTO ruling by saying that the decision will not have an impact on its current regulations on GM crops as these fully comply with WTO requirements and it would not anticipate that the ruling would significantly influence the number of GM products entering the EU. The US and its co-complainants maintain that a clear message has been sent to the International Community to adhere to trade rules when making decisions relating to GM crops.

Source: AgNet, 8 February and 11 May, 2006.

2.2.4 International Trade Rules Adopted for GMOs

The 3rd meeting of the Parties to the Cartagena Protocol on Biosafety was held in Brazil in March 2006. At this meeting of the 132 Parties to the Protocol a landmark decision was reached on detailed documentation of the requirements for genetically modified organisms in the international trade of agricultural commodities. The Catagena Protocol on Biosafety is the only international treaty governing the cross-border transport of GMOs. The protocol establishes a framework for nations to require that any GMO contamination in a shipment is identified and labelled in accordance with an importing country's minimum standards.

More information on the decision can be found at http://www.biodiv.org/ and at http://www.iisd.ca/vol09/enb09351e.html

2.2.5 India Introduces New Regulations on GM Imports

India's Ministry of Commerce and Industry has approved new rules governing the import of GM products. The country's Genetic Engineering Approval Committee (GEAC) of the Ministry of Environment and Forest has also been tasked to approve or reject all applications for bulk import of GM food, raw or processed feed, or any ingredients of food, food additives, or any products that contain GM materials.

The new regulations include a requirement that at the time of import, all consignments containing GM materials must carry a declaration that the import is genetically modified. Failure to do so and subsequent demonstration that a consignment contains GM material will render the importer liable for prosecution.

The complete document on the regulations can be found at:
http://www.isaaa.org/kc/CBTNews/files/India_FTP.pdf

2.2.6 Hong Kong Sets Voluntary Labelling Guidelines

The Hong Kong government has responded to allegations that food available locally contained GM components by reiterating that all food for sale in Hong Kong must be wholesome, safe and fit for human consumption. The government has agreed to develop, in consultation with the trade, a set of voluntary guidelines to help the trade make proper claims about GM food. Ongoing engagement with the trade and other stakeholders will be undertaken before any decision is made on mandatory labelling requirements for GM food.

Source: AgNet, 7 April, 2006.

2.3 GMF APPROVALS

2.3.1 EU Authorizations

- MON863 and GA21: Proposals to place maize lines MON863 and GA21 on the market as food and food ingredients were submitted to the EU Agricultural Council in late July/early August 2005. However, the Council failed to reach a qualified majority decision in October 2005 and so the proposals were sent back to the EU Commission to make a decision. In January 2006 the EU Commission authorized GM maize lines GA21 and MON863 for use in food and feed. GA21 is a Roundup Ready™ maize line while MON863 is engineered for insect resistance.

- DAS1507: Insect resistant GM maize line DAS1507 (Herculex (R) I) was approved for all food uses in March 2006.

This takes the number of products authorized by the EU for food use since the release of new regulations in 2004 to five. A summary of these authorizations is shown in Table 1.

Table 1: Summary of GM crops authorized for food since 2004 under new EU regulations

Transformation event	Authorisation holder	Date of authorisation	Designation	Unique ID	More info...
Bt11	Syngenta Seeds BV	19-05-2004	Sweet maize, fresh or canned	SYN-BT Ø11-1	
NK603	Monsanto Europe S.A.	26-10-2004	Foods and food ingredients derived from genetically modified maize	MON-ØØ6Ø3-6	
MON863	Monsanto Europe S.A.	13-01-2006	Foods and food ingredients derived from genetically modified maize	MON-ØØ863-5	
GA21	Monsanto Europe S.A.	13-01-2006	Foods and food ingredients derived from genetically modified maize	MON-ØØØ21-9	
DAS1507	Pioneer Overseas Corporation	03-03-2006	Foods and food ingredients containing, consisting, or produced from genetically modified maize	DAS-Ø15Ø7-1	

The online EU Community Register of GM Food and Feed can be found at:
http://europa.eu.int/comm/food/dyna/gm_register/index_en.cfm

2.4 SURVEILLANCE AND POST-MARKET MONITORING

2.4.1 Monitoring for GM ingredients in food products

2.4.1.1 United Kingdom

Results have been released of a UK Foods Standards Agency survey conducted in 2005. Food samples containing soya were tested to determine if they were correctly labelled to indicate if they contained ingredients produced from GM material. Samples were tested for the presence of Roundup Ready™ soya. All products tested complied with the current law. Out of 60 samples, 54 (90%) were either negative in a screening test or did not contain quantifiable levels of GM soya. The remaining six samples had very low levels of GM soya, all substantially less than the 0.9% allowable level for inadvertent GM contamination. The companies whose products contained the low levels of quantifiable GM soya all provided evidence of their efforts to obtain GM-free soya and therefore comply with the law.

Source: Food Standards Agency, 30 March, 2006.
http://www.foodstandards.gov.uk/news/newsarchive/2006/mar/survgm

2.4.1.2 Ireland

Ireland has been testing food products for GM ingredients since 2000. Testing by the Food Safety Authority of Ireland (FSAI) has focussed on foods containing maize and soya beans. Over this period 236 samples of food on sale in Irish shops have been tested, with 58 positive for GM ingredients. However, labelling of these positive samples has not been required as they contained less than the 0.9% legal threshold for inadvertent contamination with GM ingredients.

The Irish Department of Agriculture has also tested some consignments of soya, maize, canola and cotton coming into Ireland. Some 43 consignments claiming to be GM-free or not labelled either way have been tested and six found to contain GM material.

Source: Checkbiotech, 20 April, 2006. http://www.checkbiotech.org

2.4.1.3 Japan

In order to investigate the validity of labelling regarding GM food products, the Tokyo Metropolitan Institute of Public Health has monitored a range of foreign-made processed food. Foods made from processed corn and potato, and purchased in the Tokyo area and in the US, were tested. In summary, 12 out of 32 processed corn samples tested positive for GM ingredients. Most frequently detected were GM events MON810 and Bt11, for which safety reviews have been completed in Japan. Roundup Ready™ soya was detected in one of the corn products and one of the 21 samples of processed potato foods. No GM potato was detected in any sample, nor was the corn event CBH351 (Starlink) for which the safety assessment was withdrawn in Japan.

Source: Monma, K., Araki, R., Sagi, N., Satoh, M., Ichikawa, H., Satoh, K., Tobe, T., Kamata, K., Hino, A. and Saito, K. (2005). Detection of genetically modified organisms in foreign-made processed foods containing corn and potato. *Shokuhin Eiseigaku Zasshi* 46(3): 79-85.
Abstract available at http://www.ncbi.nlm.nih.gov/entrez/query/

2.5 BIOTECH RESEARCH

2.5.1 New Crops and Traits in Development

2.5.1.1 Omega-3 oils in transgenic crops

Omega-3 oils are traditionally sourced from fish, however, a global decline in wild fish stocks has prompted research into other potential sources. Scientists at CSIRO, Hobart, have identified five genes from omega-3 producing algae. The omega-3 oils found in fish actually originate from the algae, at the start of the food chain. The algae genes are to be inserted into crops such as canola and linseed. CSIRO predicts commercialization of the omega-3 producing oilseed crops in about seven years. However, concern has been expressed that this potentially lucrative initiative could be lost if Australia states continue to ban commercial genetically modified crops.

Source: ABC News Online, 24 April, 2006, via AgNet

2.5.1.2 Use of glucosinolate metabolism to engineer disease resistance

Susceptibility of plants to a variety of bacterial and fungal diseases continues to be a major concern to crop production worldwide. Glucosinolates are natural plant products that function in some plants as defense against pathogens. Attack by a specific pathogen will elicit a complex molecular response in a plant, ultimately leading to the production and accumulation of a specific set of glucosinolates. A group of Scandinavian researchers have been studying the ability to elicit defense mechanism in plants by engineering glucosinolate metabolism. The glucosinolate metabolic pathway involves a range of biosynthetic genes of the CYP family. Expression of CYP79D2 from cassava in *Arabidopsis sp*. plants was shown to confer increased resistance to the bacterial soft-rot pathogen *Erwinia carotova*. Likewise, over-expression of the sorgum CYP79A1 and of the endogenous CYP79A2 in *Arabidopsis sp.* increased protection against the bacterial pathogen *Pseudomonas syringae*. These studies have demonstrated the ability to engineer disease resistance by modifying the profile of natural plant protective chemicals. This system could provide a means of engineering tailor-made, disease resistant crops, using transgenes of plant origin.

Source: Brader, G, Mikkelsen, M.D., Halkier, B.A. and Palva, E.T. (2006). Altering glucosinolate profiles modulates disease resistance in plants. *The Plant Journal* 46: 758.
Abstract available at:

http://www.blackwell-synergy.com/doi/abs/10.111/j.1365-313X.2006.02743.x

2.5.1.3 Cassava plants with larger root systems

The starchy roots of the cassava plant are the staple food for about 600 million people in parts of Africa, Asia, and Latin America. Scientists from Ohio State University in the US engineered cassava plants to produce dramatically bigger roots. A bacterial gene that affects starch production was inserted into the plants, resulting in roots that were more numerous, and up to 2.6 times bigger than the roots on non-transgenic cassava plants. The modified plants also had more leaves, which are also eaten in Africa as a source of protein, minerals and vitamins.

Source: Ihemere, U., Arias-Garzon, D., Lawrence, S and Sayre, R. (2006). Genetic modification of cassava for enhanced starch production. *Plant Biotechnology Journal* 4(4): 453.
Abstract available at:
http://www.blackwell-synergy.com/doi/abs/10.1111/j.1467-7652.2006.00195.x

2.5.1.4 Cooking-proof GM cereals for enhanced nutrition

Dietary mineral deficiency affects 2-3 billion people worldwide, primarily in developing countries. One of the issues with cereal crops is that they loose a portion of their nutritional value after cooking. This is due to the loss of the enzyme phytase. Phytase helps in the absorption of zinc and iron. Deficiencies in both of these minerals cause significant health problems in third world populations where a single cereal crop is often the staple food.

Danish investigators have succeeded in producing a GM wheat variety containing a fungal phytase enzyme that is stable up to 89^{o}C. The enzyme, sourced from *Aspergillus fumigatus* was active in the wheat seeds even after boiling for 20 minutes, and seeds contained enough phytase to enable people to absorb a significant amount of minerals. Flour from the GM wheat contained up to six-times more phytase than non-GM wheat. The researchers have also developed GM barley plants containing heat-stable phytase, and are planning to do the same for rice.

Source: Brinch-Pedersen, H.; Hatzack, F.; Stoger, E.; Arcalis, E.; Pontopidan, K.; Holm, P. B**.** (2006). Heat-Stable Phytases in Transgenic Wheat (*Triticum aestivum* L.): Deposition Pattern, Thermostability, and Phytate Hydrolysis. *J. Agric. Food Chem*. 54(13): 4624-4632. DOI: 10.1021/jf0600152

2.5.2 New Systems for Generating Transgenic Plants

2.5.2.1 Systems to regulate transgene flow

Aside from direct implications on human health, one of the major concerns with GM crops is the potential for adventitious contamination of the environment. This contamination could be either by escape of GM crops directly into the wild, or by hybridisation of GM crops with neighbouring non-GM crops or wild species. A significant amount of international research is directed at refining strategies to reduce transgene flow into the general environment.

Research seems to be largely directed in two general areas:

1. <u>Containment of the transgene within the transgenic crop</u>

Several molecular mechanisms have been proposed to contain transgenes by preventing hybridisation of the transgenic with non-transgenic species. This can be either by suppression of gene flow out of the GM crop or by protecting the GM crop from inflow from wild or weedy relatives.

Methods have been proposed and developed to contain transgenes in mitochondrial or chloroplast organelle genomes within the plant. These organelles are predominantly maternally inherited so are not present in the pollen of the plant. This can provide a mechanism for containment of the transgene within the GM crop. However, not all plants display obligate maternal inheritance of organelle DNA, so this mechanism is unlikely to be 100% effective at containing transgenes. Similarly this mechanism does not prevent the pollination of the GM crop by a non-GM relative, resulting in hybrid generation.

The use of Genetic Use Restriction Technologies (GURTs) is a means of developing sterile plants and regulating the expression of the transgene by the application of chemicals or by a specific set of environmental conditions. Terminator Technology is an example of a GURT. Whilst effective at limiting transgene flow to the environment these technologies have met with considerable consumer/public opposition.

Is it then possible to develop a biotech crop that produces GM-free pollen whilst still being fertile? Researchers at the Wageningen University in the Netherlands have developed such a system. The group has generated transgenic tobacco plants that carry, in addition to the gene of interest, a second gene that will excise the first transgene. Use of a pollen specific promoter ensures that the ‘excision’ gene (a Cre-lox recombinase system) is only active during reproduction. Transgene removal therefore becomes an integral part of the biology of pollen maturation and does not require the application of any external stimulus or chemical. Highly efficient excision of the primary transgene was demonstrated, with a potential failure rate of 0.024% (2 out of 16,800 seeds).

The researchers claim that ‘Such biological containment may help the deployment and management of coexistence practices to support consumer choice and will promote clean molecular farming for the production of high-value compounds in plants.’ An example of where this technology would be valuable would be in the production of seed crops where the GM trait was not required in the seed, but only in the parent plant; eg: herbicide tolerance in an oilseed crop. However, the methodology does not overcome opposition to the general GURT system that is claimed would prevent poor farmers from having the opportunity to collect seed from elite GM lines for planting in subsequent seasons.

Implications of this technology for labelling of GM foods and testing for GMO content in foods would be the inability to determine if the parent plant-line used to generate a seed derived food product was GM (eg: flour from GM corn). This would need to be accounted for in definitions of GM food.

Source: CropBioTech Net, 16 June, 2006, via AgNet
Mlynárová, L. Conner, A.J., and Nap, J-P. (2006). Directed microspore-specific recombination of transgenic alleles to prevent pollen-mediated transmission of transgenes. *Plant Biotechnology Journal* 4(4): 445.
Abstract available at:
http://www.blackwell-synergy.com/doi/abs/10.1111/j.1467-7652.2006.00194.x

2. Mitigation strategies for 'leaked' transgenes

In the situation where a transgene is potentially able to 'escape' into the general environment it is possible to mitigate this spread by maintaining the fitness of the 'recipients' below the fitness of the wild relative. The concept of "transgenic mitigation" (TM) has been proposed, whereby a mitigator gene(s) are tandemly linked to the desired primary transgene. The mitigator(s) would act to reduce the fitness of hybrids and their rare progeny. This TM approach relies on several premises: (i) that tandem construct act as tightly linked genes and rarely undergo segregation from each other, (ii) the TM traits chosen are neutral or favourable to the chosen GM crops but deleterious to non-crop hybrid progeny, (iii) hybrid individuals carrying even mildly harmful TM traits will remain at low frequency in weed/wild populations as these populations typically show high seed set capability and strong selective pressures for fitness. A primary transgene of agricultural importance could be flanked by constructs for TM genes conferring such characteristics as dwarfing, non-bolting, uniform seed ripening or non-shattering seed. These characteristics would reduce the competitive ability of any transgenic hybrids within an agroecosystem.

Researchers at the Weizmann Institute in Israel have tested this TM system in several plants. A tobacco model was used to test the concept. The primary transgene was acetolactate synthase that confers herbicide tolerance, flanked by TM constructs for dwarfing. Dwarfing is a trait that is desirable in many crop plants but would be expected to be disadvantageous to any rare weed hybrids, as they could no longer compete with other crops or fellow weeds. The herbicide resistant transgenic plants were more productive than wild type plants when the two were cultivated separately, producing many more flowers than wild type. Conversely the tobacco transgenics were weak competitors and highly unfit when co-cultivated with the wild type plants. In this situation none of the transgenics set seed at close spacing, even when 75% of plants were TM and 25% wild type. The same primary transgene/TM construct was inserted into oilseed rape. When the TM plants were co-cultivated with the wild type they were suppressed, unable to grow normally and hardly set seed. Hybrids of the transgenic oilseed rape were tested and were also seen to be highly unfit and unable to compete with wild type relatives.

This work has demonstrated that transgene mitigation is a technique that could be successfully employed to provide advantageous traits to transgenic crops but conversely to be deleterious to any wild-relative hybrids. As such it could become a tool in the containment of transgene flow to the environment.

Source: ISB New Report, 1 February, 2006, via AgNet
Al-Ahmed, H., Dwyer, J., Maloney, M. and Gressel, J. (2006). Mitigation of establishment of *Brassica napus* transgenes in volunteers using a tandem contruct containing a selectively unfit gene. *Plant Biotechnology Journal* 4(1): 7-21.
Abstract available at:
http://www.blackwell-synergy.com/doi/abs/10.1111/j.1467-7652.2005.00152.x

2.5.3 Methods for Detection of GM foods

2.5.3.1 Release of ISO document 24276:2006

Foodstuffs – Methods of analysis for the detection of genetically modified organisms and derived products – General requirements and definitions.

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies. Adherence to the standards set by ISO for various analytical tests allows laboratories worldwide to produce standardized and therefore comparable testing results.

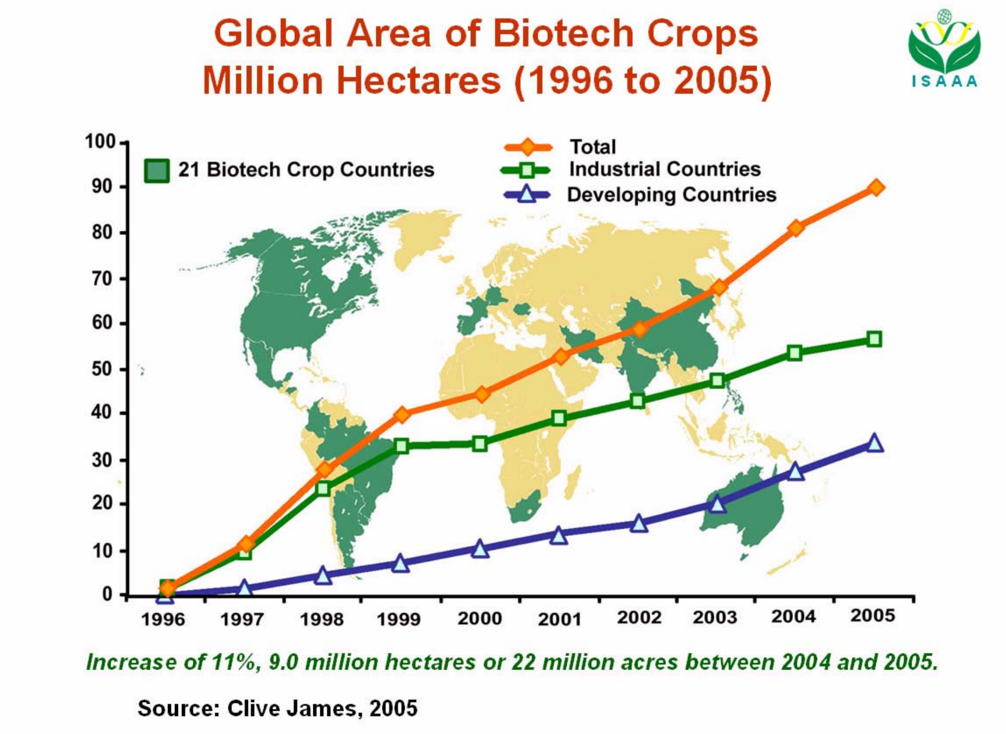
ISO document 24276:2006 specifies how to use standards for sampling strategies, nucleic acid extraction, qualitative and quantitative nucleic acid analysis and their relationship in the analysis of GMOs in foodstuffs. It contains general definitions, requirements and guidelines for laboratory set up, method validation requirements, description of methods and test reports.

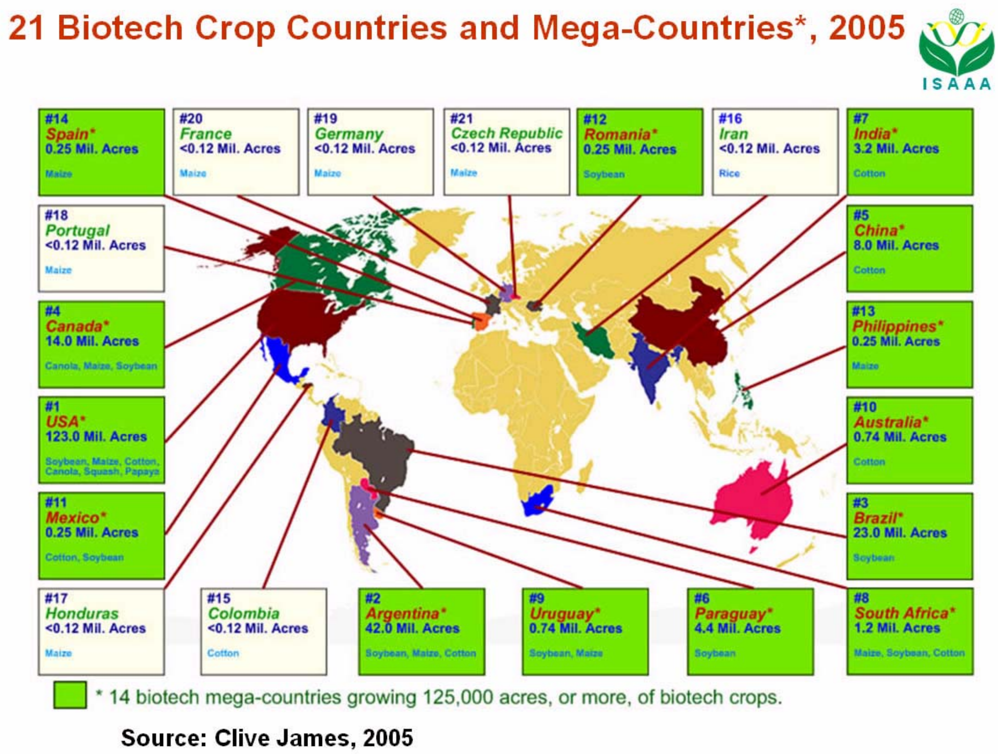
The main focus of this International Standard is polymerase chain reaction (PCR) based methodologies. However, due to the rapid rate of technology change in the area of testing for GMOs, other methodologies may be considered in the future.

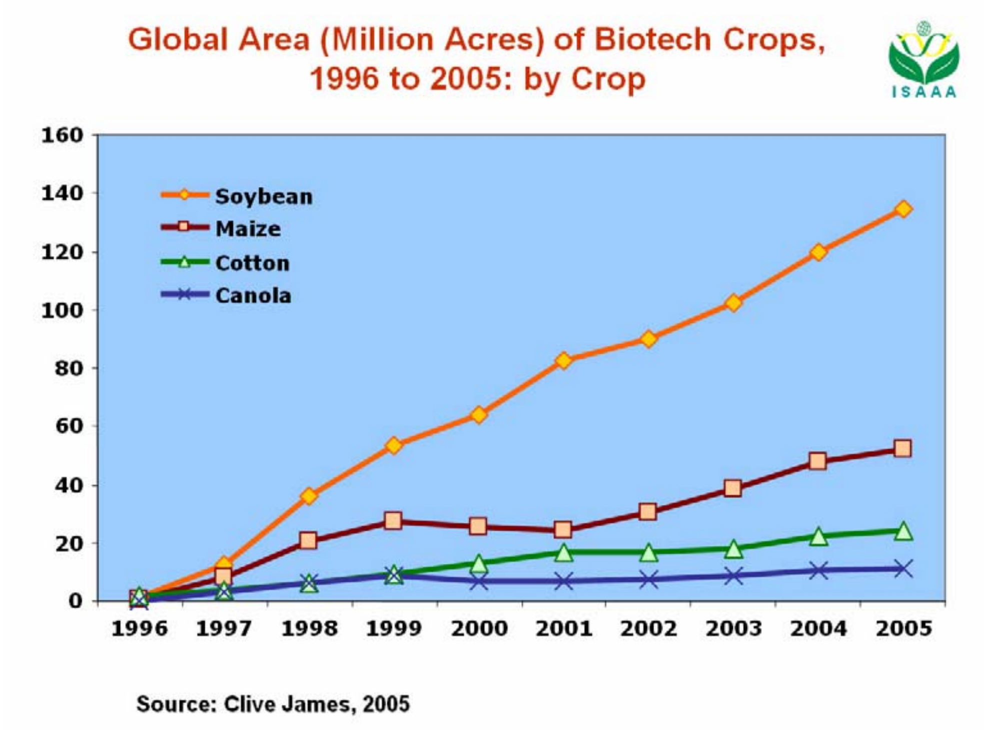
The Standard can be downloaded from the ISO website at: http://www.iso.ch

3 ANNEX 1: GLOBAL STATUS OF COMMERCIALIZED BIOTECH/GM CROPS

Figures by Clive James and taken from the ISAAA Brief No. 34, 2005.






Global Area (Million Acres) of Biotech Crops,
1996 to 2005: by Crop
ISAAA
160
140
120
100
80
60
40
20
0
Soybean
Maize
Cotton
Canola
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
Source: Clive James, 2005