Part VIII
BIOSAFETY AND REGULATION

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8.1. Risks of Genetically Modified Foods

Some people argue that along with the benefits of genetically modifying food come risks. Such risks may include: exposure to possible allergens and toxins, harm to the environment, antibiotic resistance, and the spread of introduced genes to non-target plants by out-crossing and pollen drift. In November 2000 the Food and Drug Administration recalled 300 supermarket and restaurant products made with StarLink™ corn.

StarLink™, produced by Aventis, Research Triangle Park, N.C., contains the gene Cry9C, which protects the plants against insect pests. The EPA had approved StarLink™ corn in 1998 with the stipulation that it was not for human consumption.

Studies had shown that the Cry9C protein produced in the modified corn was heat stable and resistant to stomach acids and enzymes, all characteristics of human allergens, hence the restriction on human use. Aventis failed to keep StarLink™ corn separate from approved and nongenetically modified corn so the unapproved corn entered the market, initiating the massive recall (USDA 2000).

Starlink corn, a GM corn expressing Bt delta endotoxin, is approved for use as livestock feed.
In 2000, Starlink was detected in Taco Bell taco shells.

Source: *www.amazon.com*

A different problem arose for the Terra Prima organic corn chip company in Hudson, Wisconsin, in 1995. Despite strict practices by its organic corn growers, it was discovered that some of Terra Prima's Apache Tortilla chips showed traces of *Bt corn. Genetic testing revealed that* pollen from a crop of Novartis *Bt corn planted more than a quarter-mile away had contaminated an* organic corn field of one of Terra Prima's suppliers. Because of the contamination by pollen drift, Terra Prima recalled and destroyed 90,000 bags of chips, a significant monetary loss to the small company.

Risk factors

- ✓ Bt insect-resistant genes in crops put stress on the insect pests → mutations → emergence of Bt-resistant insects
- ✓ It is recommended that refuge crop is grown along with Bt crops, so that insects may multiply on this refuge crop
- ✓ GM crops can cause allergenic reaction in human beings
- ✓ GM soybean carrying the Brazil nut gene
- ✓ GM potatoes containing a transgene for a toxic lectin caused suppression of immune systems and damage to internal organs of rats when fed on these potatoes
- ✓ Are antibiotic resistance marker genes safe?
- ✓ Used marker genes are normal components of bacteria that live on many of our foods or in our intestines
- ✓ Development of novel viruses through viral recombination

Arguments

Various arguments against herbicide-tolerant transgenics in crop plants have come up:

- use of herbicide-tolerant transgenic crops can lead to transfer of herbicide tolerance genes to sexually compatible wild relatives or weeds, which can be major potential threat to environment → "superweeds", problems with weed control

- it would actually increase the dependence on a few herbicide rather than reducing herbicide usage

However, according to a 10-year study on oilseed rape, potato, maize and sugar beet, genetically improved crops show no signs of turning into superweeds → conventional crops actually outlived the biotech ones

8.2. GM labeling

GM labeling

Not require for GM labeling

- Two recent events with implications for human health have emphasized the importance of being able to detect GM foods and feeds
- USA

Require for GM labeling

- Monitoring the presence of GM plants in a wide variety of food and feed matrices. Extended regulations concerning GM foods to include animal feeds and feed additives
- EU

According to Regulation (EC) No. 1829/2003 (EC, 2003a), all foods and feeds containing or derived from approved GM products in amounts greater than a 0.9% threshold are subject to labeling rules. In addition, a 0.5% labeling threshold has been mandated for GM crops that have been given a favorable risk assessment but are not yet approved within the EU. Unapproved varieties are managed with zero tolerance. This differs from previous legislation by which foods only had to be labeled if GM plant material, namely recombinant DNA or proteins, could be detected above the threshold (EC, 2000).

In compliance with Regulation (EC) No. 1830/2003 (EC, 2003b) and in order to help implement the labeling legislation of Regulation (EC) No. 1829/2003, any feed product containing more than the allowable thresholds of GM plant content must be accompanied by proper documentation stating that it consists of GM constituents within the EU.

The thresholds account for the adventitious or technically unavoidable presence of GM organisms in foods/feeds. Labeling of feeds containing GM ingredients informs farmers and gives them the choice of using such feed for their livestock.

Table 1
Regulations concerning the labeling of GM food or feed products in select countries[a]

Country	Labeling status	Threshold (percent)	Date of implementing threshold regulation
Australia and New Zealand	Mandatory	1	December 2001
Brazil	Mandatory	4	December 2001
Canada	Voluntary[b]	–	November 1994
China	Mandatory	0	July 2001
Czech Republic	Mandatory	1	Not available
European Union	Mandatory[c]	0.9, 0.5 food and feed	July 2003
Hong Kong	Voluntary	5	February 2001
Israel	Mandatory[d]	1	Not available
Japan	Mandatory for selected products	5	April 2001
Korea	Mandatory for selected products[d]	3	13 June 2001
Malaysia	Mandatory	3	Proposal
Russia	Mandatory for selected products	5	1 September 2002
Switzerland	Mandatory	2 or 3 (feed[e]), 0.5 (imported seeds)	Not available
Taiwan	Mandatory	5	Proposal
Thailand	Mandatory for selected products	5	Proposal
United States	Voluntary		January 2001

Data have been converted to SI units.

[a] Data from Jia (2003) and ISAAA (2005).

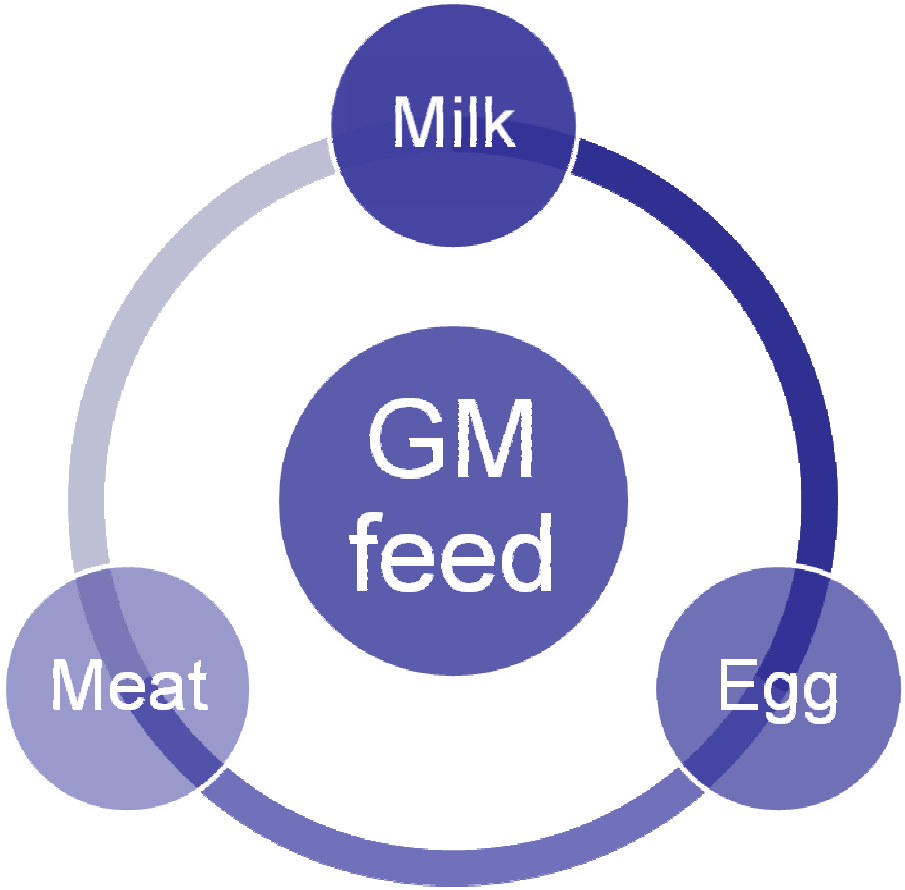
[b] Labeling required if safety concerns (allergenic, change in nutritional composition) exist.

[c] Labeling required at a 0.9% threshold for approved GM organisms or 0.5% for GM organisms given a favorable risk assessment but not yet approved. Includes both feed and food products.

[d] Labeling required only if recombinant DNA or proteins are detected.

[e] Threshold for feeds containing raw material of a single source is 3%. For mixed feeds, a threshold of 2% exists.

Is it safe enough for us to eat??



Currently, only the EU and Switzerland have labeling regulations pertaining to GM feed (ISAAA, 2005).