Food Safety & Genetically Modified Food (GM Food)

Peter Karim Ben Embarek

Department of Food Safety, Zoonosis and Foodborne Diseases
World Health Organization (WHO), Geneva, Switzerland
Content

I) Genetically modified foods: A short overview

II) Assessing the safety of food

III) GM foods: Balancing science, fears and uncertainty
### Global transgenic crop area

<table>
<thead>
<tr>
<th>Country</th>
<th>Global area transgenic crops (million ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2001</td>
</tr>
<tr>
<td>USA</td>
<td>35.7</td>
</tr>
<tr>
<td>Argentina</td>
<td>11.8</td>
</tr>
<tr>
<td>Canada</td>
<td>3.2</td>
</tr>
<tr>
<td>Brazil</td>
<td>-</td>
</tr>
<tr>
<td>China</td>
<td>1.5</td>
</tr>
<tr>
<td>Paraguay</td>
<td>-</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>52.6</td>
</tr>
</tbody>
</table>
Global transgenic crop growth (million hectares) 1996-2004

GLOBAL AREA OF BIOTECH CROPS
Million Hectares (1996 to 2004)

- Total
- Industrial Countries
- Developing Countries

Increase of 20%, 13.3 million hectares or 32.9 million acres between 2003 and 2004.

Source: Clive James, 2004
GM crops

In 2004:

- herbicide tolerant soybean, maize and cotton: 72% of global GM plantings

- Insect resistant BT crops: 20%

- “stacked genes” with both features: 8%

- virus resistant fruits and vegetables still very small.
Food safety - An international concern

Developing countries (WHO, 2004)
- Diarrhoea (foodborne or waterborne): 1.8 million deaths per year

Industrialized countries
- up to 30% of the population gets diseased
- up to 20 per million die

World wide (draft WHO, 2005)
- 1.8 - 3.1 billions cases of foodborne diarrhea
- 53 - 124 million cases of foodborne salmonellosis
Net exports by developing countries (US$ million) 2000

- Rice
- Meat
- Tea
- Banana
- Rubber
- Coffee
- Fish

Source: GLOBEFISH
Globalisation of Trade: “The World on your Plate”

**Herb Butter**
- Salted butter - Ireland
- Garlic puree - China, USA, Spain
- Garlic salt - USA
- Lemon - France, UK
- Parsley - Indonesia
- Pepper - Ireland
- Water

**Chicken Breast:**
- Chicken - Ireland, Belgium
- UK, France etc.

**Batter:**
- Flour
- Water
- Ireland

**Bread Crumb:**
- Bread crumb
- Rape-seed oil
- Ireland, UK
- EU, Australia
- Eastern Europe

Courtesy A. Reilly, FSAI, Ireland
Science  Consumer Confidence

Trade  Politics

Public Health  Communication

Handling food risk
Risk Analysis

Risk Assessment
* Science based

WHO + FAO

Risk Management
* Policy based

Codex

Risk Communication
* Interactive exchange of information and opinions
Everything you wanted to know about Codex but was afraid to ask

- International food standards organization, established in 1962 by FAO and WHO
- Codex Secretariat located in Rome, hosted by FAO
- 169 countries are member
- Active participation of NGOs without voting rights
- Codex standards formally recognized by WTO (SPS and TBT Agreements)
Establishment of international food safety standards
- protect the health of consumers
- ensure fair practices in trade

Based on risk assessments from FAO/WHO (JECFA, JMPR, JEMRA, Ad hoc Consultations)
Use of Precaution in food safety standards

Codex principles for risk analysis…..

– Precaution is an inherent element of risk analysis. Many sources of uncertainty exist in the process of risk assessment and risk management of food hazards.

– The degree of uncertainty and variability in the available scientific information should be explicitly considered in the risk analysis. Where there is sufficient scientific evidence to allow Codex to proceed to elaborate a standard, the assumptions should reflect the degree of uncertainty and the characteristics of the hazard.
– Acrylamide: New hazard in a wide range of foods (French fries, coffee, bread, baked foods, …)
Within 2 months, Expert consultation provided a rapid assessment and interim guidance on use of a balanced diet and limited consumption of high risk foods.

Large uncertainty, use of precaution in a rationale and balanced way
– Avian influenza-food safety aspects:
  Within 2 weeks, provided rapid assessment and guidance on food safety measures available.

Potential Large scale health impact, use of precaution by Governments based on a “gambling” analysis.
public health could benefit from the potential of biotechnology,
- increase in nutrient content of foods,
- decreased allergenicity and
- more efficient food production;

need to examine potential negative effects on human health of consumption of GM food.
Risk perception: Public GM food perception

- Although health risk has often taken center-stage, public attitudes towards GM foods is not solely based on health risk considerations.

- The differences between peoples perception of the use of gene-technology in medicine and in GM foods seem to indicate other factors at play.
GM food perception

- The public is not for or against GMOs
  - Arguments both for and against
  - Aware of contradictions within these arguments

- People **do not demand ‘zero risk’**
  - aware that life is full of risks
  - aware of the need to balance risk and benefit

- The public react to the context in which GMOs are developed
The legal framework

The WTO / SPS agreement

The SPS (Sanitary and PhytoSanitary) agreement provides international agreement on how sanitary rules should be applied in food trade
SPS Agreement
Annex A

Sanitary/Phytosanitary Measures include all laws, decrees, regulations, requirements and procedures related to

- end product criteria
- processes
- production methods
- testing
- inspection
- certification
- approval procedures
- quarantine treatments
- statistical methods
- sampling procedures
- risk assessment
- packaging
- labelling
Risk Assessment

SPS Measures are to be based on an assessment of the risks to Human, Animal and Plant life and health using internationally accepted Risk Assessment Techniques
The legal framework: FAO/WHO work

Joint FAO/WHO Expert Consultations

- Safety Assessment of foods derived from genetically modified plants, June 2000
- Allergenicity of GM Foods, January 2001
- Safety Assessment of foods derived from genetically modified microorganisms, September 2001
- Safety Assessment of Foods derived from GM animals, including fish, November 2003
Codex - GM foods: Principles for Risk Analysis

- direct effects (related to insert)
  Premarket, case-by-case analysis
- unintended effects
  use of, where appropriate, post-market monitoring

These principles were adopted by Codex June 2003

Codex referred to specifically in SPS/WTO agreement
Codex - GM foods : Principles for Risk analysis

- direct effects (related to insert)
  Premarket, case-by-case analysis
- unintended effects
  use of, where appropriate, post-market monitoring

These principles were adopted by Codex June 2003

Codex referred to specifically in SPS/WTO agreement
Case by case - Pre and Post

- Different GM foods have different genes inserted in different ways, should be pre-market assessed on a case-by-case basis.
- Statements on safety of all GM foods do not reflect reality.
- Continuous use of risk assessments and, where appropriate, including post market monitoring, should form the basis for evaluating the safety of GM foods.
- In general, Codex risk analysis accepts the importance of other legitimate factors.
Codex - GM foods: Principles for Risk analysis

- direct effects (related to insert)
  Premarket, case-by-case analysis
- unintended effects
  use of, where appropriate, post-market monitoring

These principles were adopted by Codex June 2003

Codex referred to specifically in SPS/WTO agreement
Occurrence of Unintended Effects

- “Predictable” effects based on information of the DNA insert

- “Unexpected” effects can stem from changes at insertion site
  - Statistically significant differences should be assessed for their biological significance
  - Potential occurrence of unintended effects is not specific to the use of GM techniques
Scope for Post-Market Monitoring

- Control of presence of GM organisms or GM foods
- Surveillance of issues identified in the risk assessment
- Surveillance of nutritional issues detection of risks not identified in the risk assessment
- Tracing of detrimental environmental developments
- Enforcement of labelling regulations
Uncertainties in Risk assessment

- The debate on safety of GM foods includes the consideration of scientific uncertainties in the risk assessment.

- To reduce uncertainty, and to gain insights in potential benefits (e.g. related to nutrition), long term surveillance of consumer health in specific situations or post-market monitoring of food could be used.

- It is widely recognised that little is known about the long term effects of any food, making the identification of effects that might be unique to GM foods problematic.
Conclusions:

- “GM foods currently available on the international market have passed risk assessments and are not likely to present risks for human health.”

- “It is clear that modern technologies must be thoroughly evaluated if they are to constitute a true improvement in the way food is produced. Such evaluations must be holistic and all-inclusive…”
Biotech food Assessment traditionally covering only two areas

- Human health / safety  
  *(International: Codex Alimentarius)*

- Environmental safety  
  *(International: Cartagena Protocol)*
**Beyond safety assessments**
- *the case for holistic evaluations:*

- modern technologies must be thoroughly evaluated to constitute a true improvement of food production and life
- evaluations should be holistic, i.e. not stop at the previously segmented systems of evaluation focusing solely on **human health** and **environmental effects**
What would holistic evaluations include:

In addition to health and environmental safety, holistic evaluations of GM food would consider:

- benefits
- nutrition
- socio-economic aspects
- ethical aspects
- access and equity
- property rights
For further information:

Internet:
http://www.who.int/foodsafety

E.mail:
benembrekp@who.int