

# GM FOOD and its safety

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# GMOs? GM Food?

GMOs → organisms (i.e. plants, animals or microorganisms) in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating and/or natural recombination.

The technology → “modern biotechnology” or “gene technology”, or “recombinant DNA technology” or “genetic engineering”. → It allows selected individual genes to be transferred from one organism into another, also between nonrelated species.

Foods produced from or using GM organisms are often referred to as GM foods.

# Why are GM foods produced?

- a lower price
- greater benefit (in terms of durability or nutritional value)

# How is a safety assessment of GM food conducted?

- (a) direct health effects (toxicity)
- (b) potential to provoke allergic reaction (allergenicity)
- (c) specific components thought to have nutritional or toxic properties;
- (d) the stability of the inserted gene
- (e) nutritional effects associated with genetic modification
- (f) any unintended effects which could result from the gene insertion.

# What are the main issues of concern for human health?

- **Allergenicity**

- No allergic effects have been found relative to GM foods currently on the market.

- **Gene transfer**

- from GM foods to cells of the body or to bacteria in the gastrointestinal tract would cause concern if the transferred genetic material adversely affects human health.
- antibiotic resistance genes

- **Outcrossing**

- The migration of genes from GM plants into conventional crops or related species in the wild (referred to as “outcrossing”), as well as the mixing of crops derived from conventional seeds with GM crops, may have an indirect effect on food safety and food security.

# Are GM foods safe?

- Different GM organisms include different genes inserted in different ways → individual GM foods and their safety should be assessed on a case-by-case basis.
- GM foods currently available on the international market have **passed safety assessments** and **are not likely to present risks for human health**.
- No effects on human health have been shown as a result of the consumption of such foods by the general population in the countries where they have been approved.

**Table 1.** List of approved GMO for safety to use for human consumption and the countries that gave the approval.

Commodity	Introduced trait	No. of Event*	Countries that approved safe for human consumption
Alfalfa	Herbicide tolerant	1	Canada, Mexico, Phillipine
Argentine canola	Herbicide tolerant	15	USA, Canada, Japan, China, European Union, Australia
Poland canola	Herbicide tolerant	2	Canada
Cotton	Pest resistant, herbicide tolerant	15	USA, Canada, Australia, Argentine, China, India, Japan, Mexico, Phillipine, South Africa, Brazil
Linseed	Herbicide tolerant	1	USA, Canada
Lentil	Herbicide tolerant	1	Canada
Maize	Herbicide tolerant, pest resistant, fertility recover, male sterility, lysine-content intensifier	32	USA, Japan, Canada, Phillipine, Taiwan, China, Argentine, Australia, European Union, South Africa, Netherland, UK, Switzerland, South Korea, Rusia, Uruguay
Melon	Delay ripening	1	USA
Potato	Pest resistant, herbicide tolerant	4	Australia, Canada, Japan, Phillipine, USA
Rice	Herbicide tolerant	3	Canada, USA
Soybean	Herbicide tolerant, oil content	7	Australia, USA, Argentine, Brazil, Rusia, UK, Taiwan, Japan, South Africa, Uruguay, Mexico, European Union, Switzerland, South Korea, China
Squash pumpkin	Virus resistant	2	Canada, USA
Papaya	Virus resistant	1	Canada, USA
Sugar beet	Herbicide tolerant	3	Canada, USA, Phillipine, Australia, Japan
Sunflower	Herbicide tolerant	1	Canada
Tomato	Delay ripening, pest resistant	6	Canada, USA, Japan, Mexico
Wheat	Herbicide tolerant	5	Canada, USA

\* Approved safe for human consumption.

Source: Agbios (2006).

# What kind of GM foods are on the market internationally?

- resistance to insect damage
  - resistance to viral infections
  - tolerance towards certain herbicides.
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- GM crops with higher nutrient content (e.g. soybeans increased oleic acid) have been also studied recently.



# What happens when GM foods are traded internationally?

- The Codex Alimentarius Commission (Codex)
- the joint FAO/WHO intergovernmental body responsible for developing the standards, codes of practice, guidelines and recommendations that constitute the **Codex Alimentarius**, meaning the international food code.

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## PRINCIPLES FOR THE RISK ANALYSIS OF FOODS DERIVED FROM MODERN BIOTECHNOLOGY

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*CAC/GL 44-2003*

- [Guideline for the conduct of food safety assessment of foods derived from recombinant-DNA plants](#) 
- [Guideline for the conduct of food safety assessment of foods produced using recombinant-DNA microorganisms](#) 
- [Guideline for the conduct of food safety assessment of foods derived from recombinant-DNA animals](#)  [diamantika.staff.ugm.ac.id](mailto:diamantika.staff.ugm.ac.id)

# REGULATION FOR GM FOOD IN INDONESIA?

PERATURAN BADAN PENGAWAS OBAT DAN MAKANAN  
NOMOR 6 TAHUN 2018  
TENTANG  
PENGAWASAN PANGAN PRODUK REKAYASA GENETIK

## Pasal 6

5. Komisi Keamanan Hayati Produk Rekayasa Genetik yang selanjutnya disingkat KKH PRG adalah komisi yang mempunyai tugas memberi rekomendasi kepada Menteri berwenang dan Kepala Lembaga Pemerintah Non Kementerian (LPNK) berwenang dalam menyusun dan menetapkan kebijakan serta menerbitkan sertifikat keamanan hayati PRG.

Pelaku Usaha Pangan yang memproduksi dan/atau mengimpor Pangan Olahan yang menggunakan Pangan PRG, wajib menggunakan Pangan PRG yang telah mendapatkan persetujuan keamanan Pangan PRG.

BAB III  
PERSYARATAN KEAMANAN PANGAN PRG

Pasal 4

- (1) Selain memenuhi persyaratan Keamanan, Mutu, dan Gizi Pangan sebagaimana dimaksud dalam Pasal 3, Pelaku Usaha Pangan yang memproduksi dan/atau mengimpor Pangan PRG untuk diedarkan di wilayah Indonesia wajib mendapatkan persetujuan keamanan Pangan PRG.
- (2) Persetujuan keamanan Pangan PRG sebagaimana dimaksud pada ayat (1) diberikan oleh Kepala Badan setelah mendapat rekomendasi dari KKH PRG.
- (3) Persetujuan keamanan Pangan PRG sebagaimana dimaksud pada ayat (2) dinyatakan sebagai sertifikat keamanan Pangan PRG.

BAB IV  
LABEL PANGAN PRG

Pasal 8

- (1) Pelaku Usaha Pangan yang memproduksi Pangan PRG di dalam negeri dan/atau mengimpor Pangan PRG untuk diperdagangkan dalam kemasan eceran wajib mencantumkan Label sesuai dengan ketentuan peraturan perundang-undangan.
- (2) Selain wajib mencantumkan Label sebagaimana dimaksud pada ayat (1), Pelaku Usaha Pangan wajib mencantumkan keterangan tentang Pangan PRG pada Label.
- (3) Keterangan tentang Pangan PRG sebagaimana dimaksud pada ayat (2) berupa tulisan “PRODUK REKAYASA GENETIK”.
- (4) Tulisan sebagaimana dimaksud pada ayat (3) untuk Pangan PRG yang mengandung bahan baku tunggal dicantumkan pada nama jenis Pangan pada bagian utama label.
- (5) Dalam hal Pangan PRG merupakan bahan baku yang digunakan dalam Pangan Olahan, tulisan sebagaimana dimaksud pada ayat (3) dicantumkan setelah nama Pangan PRG pada daftar bahan yang digunakan.
- (6) Ketentuan sebagaimana dimaksud pada ayat (2) tidak berlaku untuk minyak, lemak, gula, pati, atau Pangan PRG lain yang telah mengalami proses pemurnian lebih lanjut dan tidak teridentifikasi mengandung protein PRG.