



# Overview of Food Safety Hazards and Control Measures

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# Outlines

- Introduction
- Microbial hazards vs. chemical hazards
- Principles of control measures
- Government roles on food safety control
- Industry roles on food safety control

# Hazard vs. Risk

- **HAZARD:** A biological, chemical, or physical agent in food that may have an adverse health effect.
- **RISK:** A function of the probability of an adverse effect and the magnitude of that effect, consequential to a hazard(s) in food.
- **RISK MANAGEMENT:** The process of weighing policy alternatives to accept, minimize or reduce assessed risks and to select and implement appropriate options.

(FAO/WHO. 1995. Application of risk analysis to food standards issues. Report of the Joint FAO/WHO Expert Consultation. Geneva, 13-17 March 1995. p-6 ([ftp://ftp.fao.org/es/esn/food/Risk\\_Analysis.pdf](ftp://ftp.fao.org/es/esn/food/Risk_Analysis.pdf) ).

# Challenges of food safety issues to developing countries

- Weakness in national food control system;
- Outstanding agricultural product contamination due to numerous small farms;
- Large number of small food producers.

**A picture that could not be changed in a short period.**

# Different nature of microbial hazards vs. chemical hazards

## Microbial Hazard

- Hazards can enter foods at many points from production to consumption.
- The prevalence and concentration of hazard changes markedly at different points along the food production chain.
- Health risks are usually acute and result from a single edible portion of food.
- Individuals show a wide variability in health response to different levels of hazard.

## Chemical Hazard

- Hazards usually enter foods in the raw food or ingredients, or through certain processing steps (e.g. acrylamide or packaging migrants).
- The level of hazard present in a food after the point of introduction often does not significantly change.
- Health risks may be acute but are generally chronic.
- Types of toxic effects are generally similar from person to person, but individual sensitivity may differ.

*Food safety risk analysis – A guide for national food safety authorities, FAO Food and Nutrition Paper 87, 2006, Rome.*

# Important microbial hazards

- Bacteria – *Salmonella*, *Campylobacter*, *Listeria*, *Clostridium botulinum*, *Escherichia coli* O157:H7;
- Virus - *Calicivirus* (including norovirus), *Rotavirus*, *Hepatitis A virus*;
- Parasites – *Trichinella*, *Giardia*, *Sarcocystis* *Cryptosporidium*;
- Zoonosis – BSE, *Campylobacteriosis*, *Salmonellosis*, ;
- Natural toxins – *Mycotoxins* (*aflatoxins*, *ochratoxin A*), *Shellfish toxins*, *Glycoalkaloids*, *Lectins*.

# Important chemical hazards

- Heavy metals – Pb, Cd, Hg;
- Pesticide residues;
- Veterinary drug residues;
- Environmental pollutants – POPs, e.g. dioxins;
- Hazardous chemicals generated during cooking process – acrylamide, 3-MCPD, PAHs, HCAs, etc.
- Radionuclides.

# **Different views on the importance of microbial hazards vs. chemical hazards**

- **Impact on health – microbial > chemical;**
- **Consumer perception – chemical > microbial, even food additives;**
- **Government (developing countries) – almost same as consumer;**
- **Industry – subject to government regulations.**



# Principles of control measures

- Whole food chain management;
- Major challenge - numerous small suppliers;
- Mainly rely on industry self control, not mainly rely on government inspection, in particular not rely on sampling and testing, although necessary.

# **Government roles on food safety control**

- **To develop science based policies, laws, regulations, standards, with emphasis on code of practice;**
- **To carry out well planned capacity building activities;**
- **To carry out transparent and sustainable risk communication;**
- **Encourage third part inspection, certification and accreditation.**

# Industry roles on food safety control

- To be honest and credible;
- To comply with government regulations and standards;
- To active participate in risk communication;
- To develop industry/private food safety standards, e.g. GFSI.

# General control measures

- In compliance with WTO agreements and international/national standards;
- Emphasis on Code of Practice, including GAP, GMP, HACCP, etc.;
- Risk based import/export control;
- Strengthen role of industry association.

# Conclusions

- **The major challenge on supply chain food safety to developing countries is the numerous small producers and suppliers.**
- **Control should move from end product inspection and testing to the whole food chain process control.**
- **Capacity building should be the priority of national regulatory control system. It is also necessary for facilitating fair international food trade.**