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.

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.

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 actively 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.