# Lecture-4

## Topics to be discussed here;

**-Importance of Food Safety in Public Health**

**-Global Strategic plan for food safety**

**-Food Safety Risk Assessment in Developing Countries**

## Food Safety: A Public Health Priority!

Nutrition is the practice of consuming and utilizing foods for the growth, maintenance, and repair of the cells in the human body. Public health can be protected when the health of all people/communities is improved and/or protected. Nutrition and public health cannot be improved without food safety.

Safe and nutritious food is the source of human energy and the first defense against diseases.

Infants need a combination between breast milk and diverse and nutrient-rich diets including plant and animal source foods (highly perishable food) such as milk products, fruits, vegetables, eggs, fish, and meat.
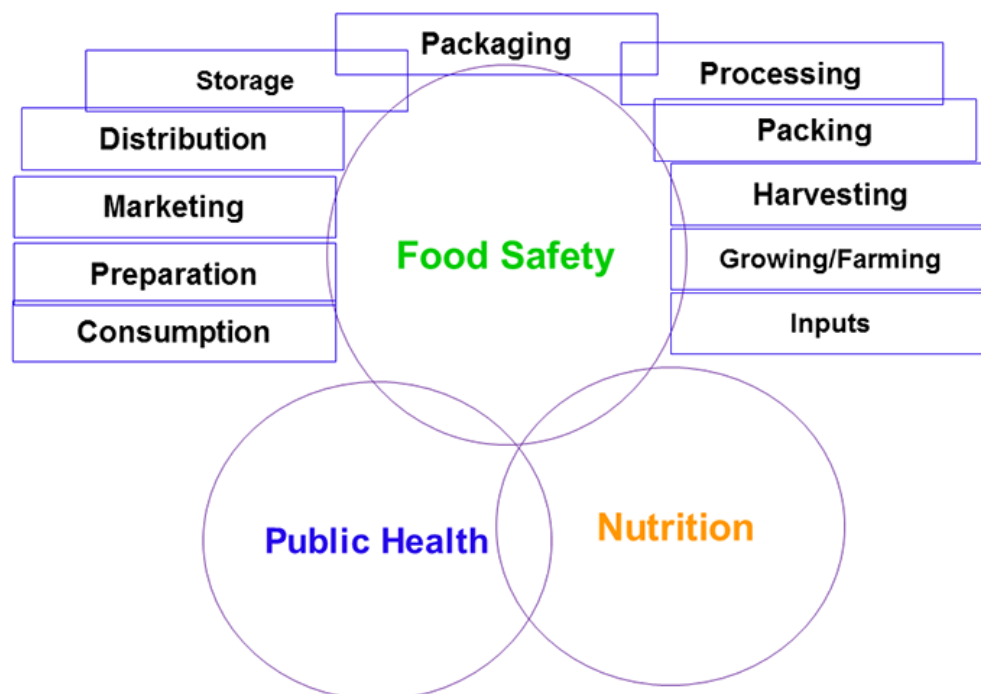


**Fig.1.** Relation between food safety, nutrition and public health.

**Food safety management systems** must ensure that food, at every stage of the food chain from farm to table [production (growing/farming), harvesting, packing, processing, storage, distribution, marketing, preparation, and consumption (**Fig. 1**)], is safe.

Over 200 diseases are caused by eating food contaminated with bacteria, viruses, parasites or chemical substances such as heavy metals.

This growing public health problem causes considerable socioeconomic impact though strains on health-care systems lost productivity, and harming tourism and trade. These diseases contribute significantly to the global burden of disease and mortality.

Foodborne diseases are caused by contamination of food and occur at any stage of the food production, delivery and consumption chain. They can result from several forms of environmental contamination including pollution in water, soil or air, as well as unsafe food storage and processing.
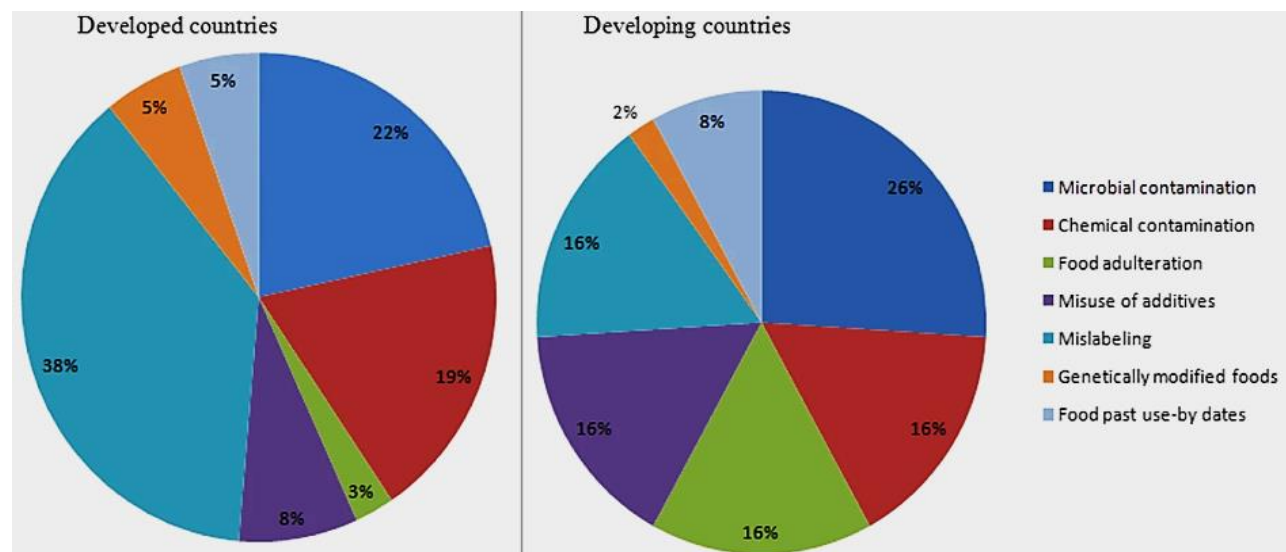


**Fig.2.** Comparison of food safety issues in developed and developing countries. Ref. https://doi.org/10.1186/s12199-019-0825-5.

## Impact:

- Every year, nearly one in 10 people around the world fall ill after eating contaminated food, leading to over 420 000 deaths.
- Children are disproportionately affected, with 125,000 deaths every year in people under 5 years of age.
- The majority of these cases are caused by diarrhoeal diseases.
- Other serious consequences of foodborne diseases include kidney and liver failure, brain and neural disorders, reactive arthritis, cancer, and death.

Foodborne diseases are closely linked to poverty in low- and middle-income countries but are a growing public health issue around the world. Increasing international trade and

longer, more complex food chains increase the risk of food contamination and the transport of infected food products across national borders. Growing cities, climate change, migration and growing international travel compound these issues and expose people to new hazards.
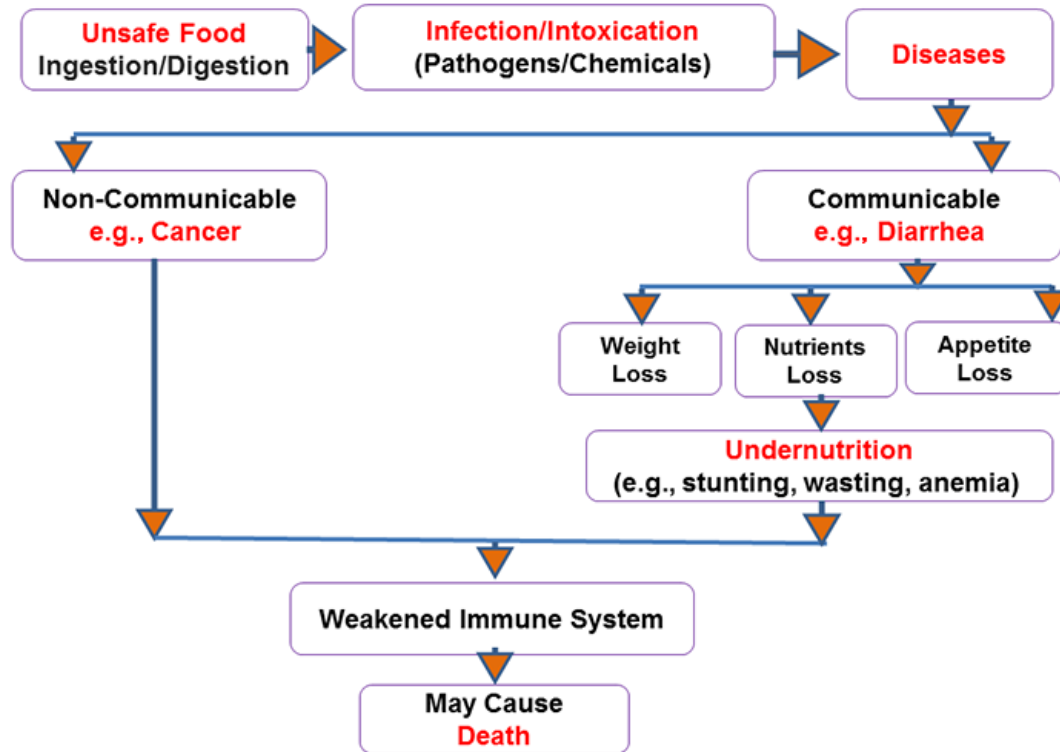


**Fig.3.** The negative effects of unsafe food on nutrition and public health.

# Who can contribute to making food safe?

**1.Policy-makers can:**

- Build and maintain adequate food systems and infrastructures to respond to and manage food safety risks along the entire food chain, including during emergencies.
- Foster multi-sectoral collaboration among public health, animal health, agriculture and other sectors for better communication and joint action.
- Integrate food safety into broader food policies and programs (e.g. nutrition and food security).
- Think globally and act locally to ensure that food produced domestically remains safe when imported internationally.

**2.Food handlers and consumers can:**

- Know the food they use (read labels on food packages, make informed choices, become familiar with common food hazards);

- Handle and prepare food safely, at home, or when selling at restaurants or at local markets;
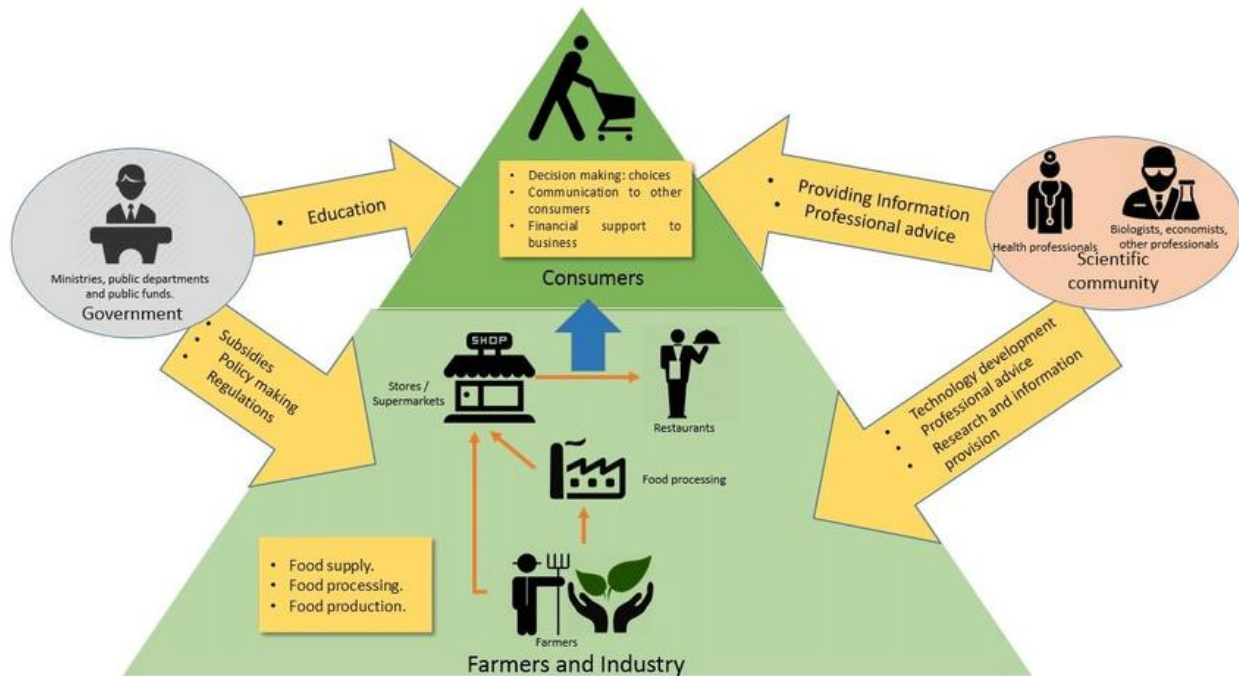- Grow fruits and vegetables to decrease microbial contamination.



**Fig.** Main stakeholders of the food supply chain and their participative roles and influences.

# Global Strategic plan for food safety

At the meeting of the 73rd World Health Assembly in May 2020, Member States requested WHO to update the WHO Global Strategy for Food Safety to address current and emerging challenges, incorporate new technologies and include innovative approaches for strengthening food safety systems. Member States also recognized the need to integrate food safety into national and regional policies on health, agriculture, trade, environment and development.

In response, WHO has developed this Global Strategy for Food Safety with the advice of the Technical Advisory Group (TAG) for Food Safety, WHO regional advisers in food safety, international partners, nongovernmental organizations (NGO) and WHO Collaborating Centres.

This new strategy will contribute to the achievement of the **SDG** (Sustainable Development Goals) and will be reviewed in 2030 when the world will reflect upon the progress made towards the SDG.

**Target audience and timeframe**
The target audience for this strategy includes policy-makers (national governments), technical authorities/agencies responsible for food safety, academia in public health and food safety, food business operators and private sectors, consumers, civil societies, and other international organizations in the field of food safety.

**Aim and vision**
The Global Food Safety Strategy has been developed to guide and support Member States in their efforts to prioritize, plan, implement, monitor and regularly evaluate actions towards the reduction of the incidence of foodborne diseases by continuously strengthening food safety systems and promoting global cooperation.
The strategy's vision is all people, everywhere, consume safe and healthy food to reduce the burden of foodborne diseases.
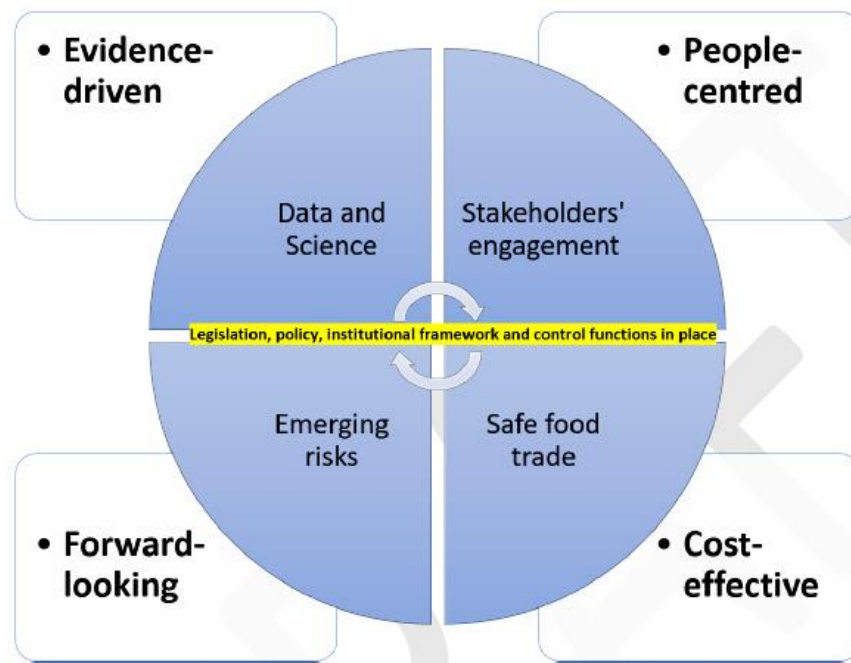


**Fig.4.** Conceptual framework for strategic priorities.

## Scope (Conceptual framework):

Strengthening national food safety systems begins with establishing or improving infrastructure and components of food control systems.
Member States need to consider and adopt four important characteristics/principles for the system to be fully operational:

1) **Forward-looking.** This principle is reflected as identifying and responding to food safety challenges resulting from global changes and transformations in food systems. Therefore, food safety systems should be equipped to identify, evaluate and respond to existing and emerging issues. The food safety systems must be transformed from reactive to proactive systems, especially when addressing health risks emerging at human-animal-ecosystems interface.

2) **Evidence-based.** This principle is reflected in increasing the use of food chain information, scientific evidence, and risk assessment in making risk management decisions. Food safety risk management is based on science. The collection, utilization and interpretation of data lay the foundation for building evidence-based food safety systems.

3) **People-centered.** This principle is reflected as strengthening stakeholder engagement and risk communication. Food safety is a shared responsibility, and it requires a joint effort by all stakeholders in food systems. Successfully ensuring food safety from farm to fork requires a more inclusive approach with all stakeholders, including empowered consumers.

4) **Cost-effective.** This principle is reflected as promoting food safety as an essential component in domestic and international food trade. Food safety is a complex issue that is influenced by socioeconomic status. With the globalization of food trade, foodborne pathogens and diseases can travel across borders and cause significant health and economic impacts. To ensure increased access to safe food in both domestic markets and international trade, food safety systems should be more cost-effective for both importing and exporting countries while enhancing food safety in domestic market.

## How can Member States implement the strategy?

Member States should modify, redesign or strengthen their national food safety systems upon the strategic priority areas and objectives identified by WHO strategy. The prioritization of strategic actions should be tailored to the country situation.

The general guidance for Member States to implement the strategy comprises four steps (Figure 5):

1. Conduct a situation analysis

2. Develop a national strategy and action plan on food safety

3. Implement the strategy and national action plan

4. Conduct regular review of the implementation and adjust the plan and strategy as appropriate



**Fig.5.** General guideline for member states for the implementation of the strategy.

-For the **situation analysis**, FAO and WHO developed an assessment tool to assist Member States in evaluating the effectiveness of their food safety systems. This tool can be used to evaluate the status of the national food control system, to identify strengths and weaknesses, and to identify priority areas for action.

When evaluating national food safety systems, each of the core components should be assessed and benchmarked against the strategic priorities outlined in this Global Food Safety Strategy.

The situation analysis should be followed by an **implementation plan**, including the different elements of the restructured food safety system to be applied. This will require engagement and analysis by a variety of experts, disciplines, and all relevant stakeholders. Once the plan is agreed and communicated, the implementation phase can begin.

The plan should comprise activities designed to meet the strategic priorities, aims and objectives. It should also include timeframes and deliverables and should be properly resourced. Regular progress checks and reports should form a part of implementation to ensure the plan remains on course.

## Food Safety Risk Assessment in Developing Countries

Risk assessment (quantitative and qualitative) is a process for estimating the probability and severity of associated risks to a human health resulting from exposure to biological, chemical, or physical hazards in food.

Developing countries have limited resources and high competing priorities. Therefore, to protect public health and achieve food and nutrition security, food safety must be clearly identified as a high priority.

Not all food safety hazards pose the same risks/threats; there is a level where the presence of a hazard can be considered tolerable or acceptable. Therefore, a risk-based food safety approach is needed to prioritize the riskiest food safety hazards/food and allocate resources to control them at a country level.

The development of a **risk-based food safety management** system would be greatly enhanced if all responsible agencies (agriculture, health, trade, industry, economy, etc.) work together.

Developing countries need aid to establish such a system. In a survey conducted among 10 developed and developing countries, including Australia, Canada, China, Hong Kong, Indonesia, Japan, Philippines, Russia, Thailand and Vietnam, the **lack of technical expertise and infrastructure** to conduct risk assessment were reported to be the main constraints to the development of risk-based food safety management systems.
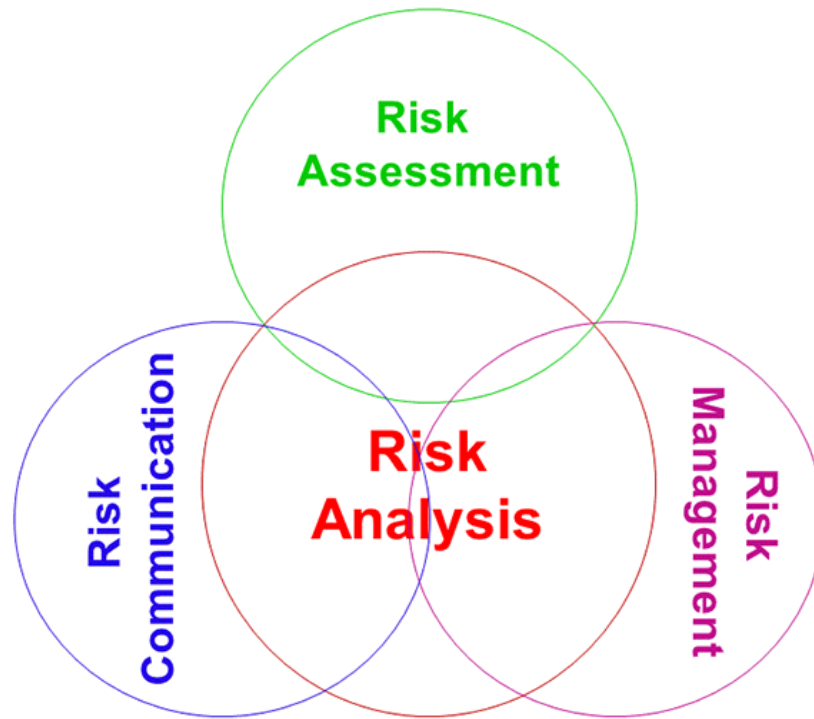
**Fig.6.** The main components of risk analysis.

Risk assessment is one of the main three components (risk assessment, risk management, and risk communication) of the risk analysis (**Fig. 6**).

Risk assessment requires recognition of uncertainties, limitation available data or the interpretation of actual data.

Risk assessment results are important for making **risk management** decisions (policy, standards, legislation, etc.), monitoring the effectiveness of risk management measures, and conducting risk communication.

Conducting risk assessment requires the effort of multidisciplinary experts in food science (including food safety, food microbiology, food chemistry, food processing, etc.), environmental science, public health, statistics, etc.

**An effective risk assessment should be:**

a) based on best available scientific evidence/data,

b) transparent,

c) unbiased,

d) inclusive of adequate resources,

e) able to identify and address uncertainty,

f) able to consider all interrelated risks,

 g) evaluated regularly (or as needed), and

h) well documented.

A food safety risk assessment can be conducted for a particular, or all, potential chemical and microbial hazards in a particular or group of food.

However, conducting risk assessments of foodborne microbial hazards is more complex than those of chemical hazards because of their virulence and pathogenicity depend on their origins (animal, environmental, etc.), life cycles, etc.
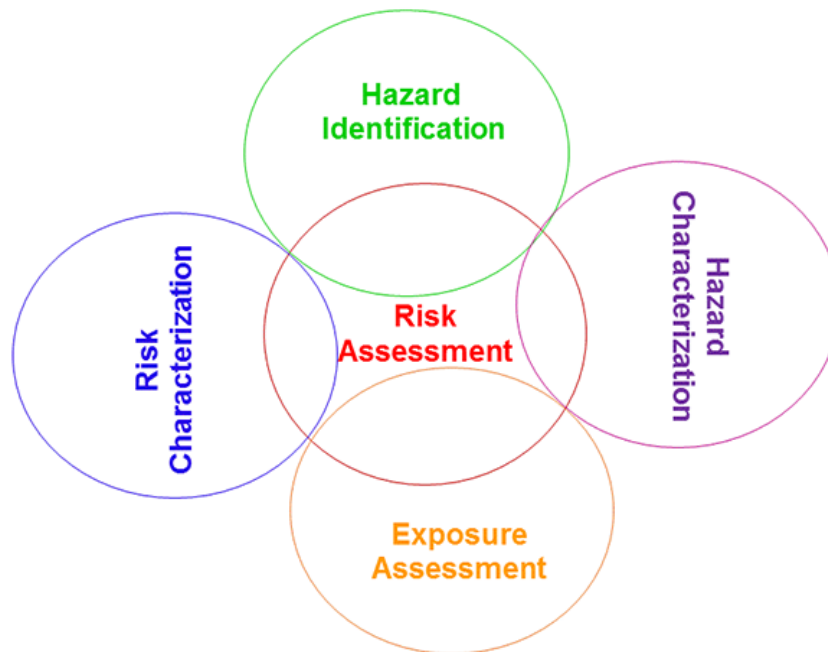


Fig. 7-steps of risk assessment.

Risk assessment consists of four components, as shown in **Figure7**. These include the following:

• *Hazard identification:* In this step, data on hazards (biological, chemical, or physical) that might be present in a particular food or group of foods and capable of causing adverse health effects should be collected and evaluated.

• *Hazard characterization:* In this step, risk assessors develop complete qualitative and/or quantitative evaluation of the nature of the adverse health effects associated with particular level of exposure to a hazard.

• *Exposure assessment:* This step provides scientific insight on the presence of the hazard in the food consumed. It also provides information on the potential effects of a hazard in specific populations, as well as the qualitative and/or quantitative evaluation of the likely intake of a hazard via food. It combines information on the prevalence and concentration of the hazard(s) in food and the likelihood that the consumer will be exposed to this hazard.

• *Risk characterization:* This step is the result of the integration of hazard identification, hazard characterization, and exposure assessment to estimate the probability and severity of an adverse health effect.

Risk management normally starts before risk assessment starts. The risk management team works closely with others teams/experts including the risk assessment team, risk communication team, food science experts, public health experts, nutritionists, economists, etc. Risk managers, through available information and dialogues with risk assessors and stakeholders, must first determine the current situation/issues, identify the food health and safety issue, and determine the availability of resources to address these issues. This will help to decide if a risk assessment is required.

Risk communication (the third component of the risk analysis) is defined as the interactive exchange of information and opinions throughout the risk analysis process concerning hazards and risks, risk-related factors, and risk perceptions among risk assessors, risk managers, consumers, industry, the academic community, and other interested parties, including the explanation of risk assessment findings and the basis of risk management decisions.

Governmental and regulatory organizations use risk ranking for the prioritization of the allocation of resources to mitigate food-related hazards and their anticipated public health impacts. Risk ranking is a risk assessment tool (decided by risk assessment team). Several ranking methods can be used for ranking food hazards including risk assessment (most widely used method), cost of illness, expert judgment, flow charts, health adjusted life years, risk matrix, risk ratio, scoring, etc. Risk prioritization is a risk management tool (decided by the risk management team) to determine the importance of one risk over another, considering a wide range of factors (in addition to public health such as economic constraints, the environmental impacts, the food industry, etc.) that might influence prioritization or decision making.

Developed countries/donors should assist developing countries in establishing food safety risk assessment centers (similar to the center in China) to be able to conduct their own risk assessments and develop risk-based food safety systems.

**References**
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3. https://www.food-safety.com/articles/6273-improving-capacity-building-for-food-safety-risk-assessment-in-developing-countries