CODEX ALIMENTARIUS COMMISSION

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Food and Agriculture Organization of the United Nations

World Health Organization

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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

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KEYNOTE ADDRESS

CHEMICALS IN FOOD - THE INVISIBLE CHALLENGE, WHEN DO WE NEED TO BE WORRIED AND WHAT DO WE NEED TO KNOW?

1. INTRODUCTION

1.1. Foodborne chemicals, both natural and anthropogenic, have been a worldwide source of concern with respect to international food trade. Various articles in the scientific literature have also reported the health risks associated with chemical contaminants in food.

1.2. In September 2006, the World Health Organization (WHO) organized a consultation to develop a strategy to estimate the global burden of foodborne disease. This led to the formation of the WHO Foodborne Disease Burden Epidemiology Reference Group (FERG). For chemicals, the burden of disease for selected compounds (i.e. aflatoxin, cyanide in cassava, peanut allergen, dioxin and dioxin-like compounds, arsenic, lead, methylmercury and cadmium) was estimated to represent over 73 000 deaths annually and more than ten million disability-adjusted life years (DALYs) worldwide.

1.3. Beyond its direct impact on public health, foodborne diseases also affect economic development, particularly challenging the tourist, agricultural and food (export) industries. Developing countries' access to food export markets will depend on their capacity to meet the international regulatory requirements determined by the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) of the World Trade Organization (WTO). Unsafe food exports can lead to significant economic losses.

2. WHAT SHOULD FOOD BE?

2.1. The foods we eat, and the nutrients they should provide, are the most important continuing environmental factors influencing our growth, development, functional abilities, and health. However, foods are also a source of exposure to multiple chemicals, intentionally added to the food chain (agricultural chemicals, food additives, processing aids etc.) or contaminating food from the environment (mycotoxins, industrial chemicals, etc.). The level of extraneous toxic chemical substances in food depends on their occurrence in the environment and practices of their use in agri-food production.

2.2. FAO and WHO are providing scientific advice to the *Codex Alimentarius* to develop food safety standards to protect human health. In particular, the Joint FAO/WHO Expert Committee on Food Additives (JECFA) performs the scientific risk assessment/safety evaluation of food contaminants, natural toxins, residues of veterinary drugs in animal products, food additives, flavoring agents and intentionally added processing aids. JECFA is also performing exposure assessments. It has produced the principles for safety assessment of chemicals in foods that are consistent with current thinking on risk assessment and take account of developments in toxicology and other relevant sciences.

2.3. The FAO/WHO Joint Meeting on Pesticides Residues (JMPR) performs the risk assessment of pesticides residues. These assessments are used by Codex in establishing international standards such as Maximum Residue Levels (MRLs) and Maximum Limits (MLs) and governments are encouraged to use the available risk assessments on chemicals in food for setting national food safety standards. However, the implementation and the enforcement of standards harmonized with international requirements are far from complete, particularly in developing countries resulting in discrepancies between countries in terms of chemical contamination of food.

3. CHEMICALS IN FOOD

3.1 Of most concern for health are naturally occurring toxins and environmental pollutants. Naturally occurring toxins include mycotoxins, marine biotoxins, cyanogenic glycosides and toxins occurring in poisonous mushrooms. Staple foods like corn or cereals can contain high levels of mycotoxins, such as aflatoxin, produced by mold on grain. A long-term exposure can affect the immune system and normal development, or cause cancer.

3.2 Persistent organic pollutants (POPs) are compounds that accumulate in the environment and human body. Known examples are dioxins and polychlorinated biphenyls (PCBs), which are unwanted by-products of industrial processes and waste incineration. They are found worldwide in the environment and accumulate in animal food chains. Dioxins are highly toxic and can cause reproductive and developmental problems, damage the immune system, interfere with hormones and cause cancer.

3.3 Heavy metals such as lead, cadmium and mercury cause neurological and kidney damage. Contamination by heavy metal in food occurs mainly through pollution of air, water and soil.

4. ASSESSING CHEMICAL FOOD SAFETY

4.1. Risk analysis has been defined by the Codex Alimentarius Commission (CAC) as "*a process consisting of three components: risk assessment, risk management and risk communication*". Risk assessment of chemical substances used on or present in food is one of the key components of the work of JECFA and JMPR. Risk assessment provides the scientific basis for the risk management executed by CAC and its Member Countries.

4.2. Chemical risk assessment is a structured process, a framework for organizing data, information and knowledge for better understanding the linkages between chemical substances in food and human illness. Chemical food safety risk assessment considers the level of food contamination, dietary patterns and level of various foods consumption by different population groups. Countries' capacity to monitor chemical hazards along the food chain and to analyze jointly the results with public health surveillance data is critical for identifying the areas of focus for corrective risk management actions.

4.3. When applying the chemical risk assessment at national level, some of the data and components of the international risk assessments may be used directly by countries with appropriate guidance. For example, hazard characterization can be used directly, this being the most easily adaptable component, however consideration should be given to susceptible and vulnerable groups in the population, such as young children, pregnant women, immunocompromised persons, and the elderly, in the country it is to be applied. Exposure assessments are highly specific to the environmental background, production, processing and consumption patterns within a country thus requiring national data. These include data on hazard levels in food, hazard control measures and food consumption data. In the absence of food consumption data at national level, with some degree of approximation estimates can be obtained from the WHO GEMS/Food Consumption Cluster Diets[1] and from the FAO Food Balance Sheets that contain country-level data on the production and trade of food commodities available on the FAOSTAT database[2]. Predictive modelling can be used with adjustments for national/regional conditions.

4.4. Mapping the research, scientific capacities and expertise at national level is critical for setting risk assessment task groups, linking them with the food safety authorities to address specific issues and provide sounds assessments and advice for effective risk management.

4.5. Although it is desirable to separate the functional activities of risk assessment from those of risk management in order to ensure scientific independence, it is acknowledged that risk managers should communicate and interact with risk assessors during the process.

5. EXAMPLES OF RECENT CHEMICAL CONTAMINANT ASSESSMENTS

Aflatoxins

5.1. Aflatoxins are secondary metabolites of fungi. They can be found in maize, peanuts (groundnuts), oilseeds, sorghum, and tree nuts in tropical and subtropical regions. Aflatoxins are among the most potent mutagenic and carcinogenic substances known and hepatitis B virus (HBV) infection is a critical contributor to the potency of aflatoxins in inducing liver cancer.

5.2. In 2010, the FERG initiative estimated the burden of disease for aflatoxins[3] for the Eastern Mediterranean Region to 687 (275-2,750) deaths per year and 27,500 (6,870-89,310) DALYs. In 2016, JECFA

[1] WHO database which provides an overview of the food consumption patterns worldwide, through 13 dietary patterns routinely used by international risk assessment bodies, covering 183 countries
[2] http://www.fao.org/faostat/en/#data/FBSU
[3] Mean (95% confidence interval)

estimated that 0.3 additional cancer cases per 100 000 for HBsAg+[4] populations resulted from exposure to aflatoxin B1 at 1 ng/kg bw per day. The *Codex Alimentarius* developed MLs for aflatoxins in nuts and dried fruits as well as Codes of Practice to prevent and reduce aflatoxin contamination in many food commodities.

Arsenic (inorganic)

5.3. Arsenic is a metalloid that occurs in different inorganic and organic forms, which are found in the environment both from natural occurrence and from anthropogenic activity. From epidemiological studies measuring arsenic levels in drinking-water, inorganic arsenic has been identified as a human carcinogen.

5.4. The FERG initiative estimated the burden of disease for arsenic to more than 45 000 deaths annually. For the Eastern Mediterranean Region, the median number of DALYs attributable to arsenic is about 137 000. In 2011, JECFA concluded that an exposure of 3.0 µg/kg bw per day would lead to a 0.5 percent increased incidence of lung cancer. The Codex Alimentarius Commission developed MLs for arsenic in rice as well as a Code of Practice to prevent and reduce arsenic in rice.

6. CONCLUSIONS

6.1. The risk of chemicals in food is preventable by promoting the use of Codex Codes of Practices and implementing and enforcing Codex food safety standards.

6.2. A risk-based food safety policy should start with monitoring of chemical hazards in food and environment (soil, water), estimating food consumption in order to assess the exposure of consumers and its related risk.

6.3. Strengthening public health surveillance and joint analysis of monitoring data for chemicals in food is necessary for understanding if linkages exist with illness.

6.4. Strengthening multi-disciplinary and inter-sectoral collaboration at national and regional levels for data collection to feed into chemical risk assessment and management shall be considered when devising the regional tasks within the Codex Strategic Plan 2020-2025.

[4] HBsAg+ - *Hepatitis B surface Antigen positive*, serologic marker for Hepatitis B