Food Safety: The European Union's Food Safety Initiative and Its Impact on Risks from Microbial and Chemical Hazards in Infant Food Chains

Donjeta Bali, MD[1,2,3], Mehmet Vural, MD[1,2,4], Ida Giardino, MD[1,2,5], Leyla Namazova-Baranova, MD, PhD[1,2], Flavia Indrio, MD[1,2,5], and Massimo Pettoello-Mantovani, MD, PhD[1,2,6]

Food security is understood in its broadest sense as the ability to ensure consistently and satisfactorily food and water to meet the energy requirements the body needs for survival and life under adequate hygienic conditions. The commonly accepted international definition is the one developed at the World Food Summit in 1996 according to which all people, at all times, must have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences to lead an active and healthy life.[1] From a purely health perspective, food safety is also understood as food and feed hygiene safety from the perspective of integrated environmental supply chain. In the legal understanding, food is defined as any processed, partially processed, or unprocessed substance or product intended to be ingested, or reasonably expected to be ingested, by human beings.[2] In any case, the precise definition of food safety is still not so unambiguous, and in the countries of the European Union (EU), the closest notion is that of "food at risk," which is found to be covered in Article 14 of European Regulation EC 178/2002.[2,3] This regulation is a key reference for the evolution of food law in Europe, as the rule introduces the general principles and requirements of food law, which are monitored by the European Food Safety Authority,[4] also establishing procedures in the field of food safety. The European Food Safety Authority is responsible for the scientific assessment of risks, whereas decisions regarding their management are the responsibility of European Union experts.[4] The regulations issued by the European Union[3,4] play a priority role in food legislation, which must be followed locally by the EU countries, and provide some specific principles including risk analysis. Risk analysis is a systematic methodology for assessing the likelihood of occurrence of undesirable effects on human health, associated with a specific type of food, in order to provide for the adoption of effective and targeted measures with the aim of increasing the safety of food use in adults and children.

The EU pays close attention to the certification of foods and their contents, both in terms of allergenic agents and as contaminants.[2,5] In particular, the EU has recently made an effort in the area of infant food safety, sponsoring a project[6] called Safe Food for Infants (SAFFI), developed by a consortium of 14 partners from 7 EU countries, whose goal is to provide solutions to develop a most efficient multi-stakeholder surveillance system in the infant food sector.[7] The project will serve the object to integrate the tools and methods for detecting and managing infant food chain risks from primary production to the consumer. The European Pediatric Association-Union of National European Pediatric Societies and Associations is part of the consortium. The aim of this commentary, authored by board members of European Pediatric Association-Union of National European Pediatric Societies and Associations, is to raise further awareness of decision and policy-makers, including government and legislators, and end-users, including consumers and health care professionals involved in childcare and nutrition, on the impact of the food chain risks on food safety. A second objective is to inform the scientific community of the EU's efforts in this field by supporting a project that aims to develop an extensive and coordinated food risk identification system.

The Problem of Infant Food Contaminants in the EU

The EU's focus on child food safety is due to numerous studies that have reported health risks to children aged 0-3 years old due to the presence of food contaminants.[8] A recent study, published by the French Food Safety Agency, analyzed during a 6-year period 97% of the products that were part of the diets of a study group of children up to 3 years of age.[9] The French Food Safety Agency researchers selected about 5500 products and performed 457 samplings, totaling more than 200 thousand analytical results and analyzed 670 substances belonging to different families of contaminants: metals and minerals, persistent organic pollutants, additives, substances released from food contact materials, newly formed compounds, mycotoxins, natural steroids, phytoestrogens, and pesticide residues, and

DSS	Decision support system
EU	European Union
SAFFI	Safe Food for Infants

calculated the risk associated with the food products. The results showed that exposure levels and associated risk are considered acceptable or tolerable for only 90% of the substances considered, and for 9 substances and families of compounds the researchers rate the situation as worrisome. The list includes arsenic, lead, nickel, polychlorinated dibenzo-dioxins and polychlorinated dibenzofurans, polychlorinated biphenyls, mycotoxins T2 and HT2, acrylamide, deoxyniva-lenol, and furan. In particular, rice and rice products were found to be the main source of arsenic exposure. As for heavy metals, children are exposed to inorganic-toxic arsenic, mainly through rice, rice cereals, and homogenized fish, and vegetables, that must be closely monitored in order to limit their contamination.

Prevention Food Contamination by an Effective Integrated Monitoring System

In a food context, a hazard implies a potential impact on consumers. Pathogenic micro-organisms, chemical contaminants, or physical agents can all pose a threat to food, but hazard is instead defined as a biological, chemical, or physical agent that makes a food unhealthy and exists when its ingestion causes harm. Despite efforts to minimize the presence of hazards, food safety is not absolute, and hazards are frequent. They can be unintentional or intentional,[10] and risk depends on both the likelihood of an adverse health effect and the severity of that effect resulting from a hazard in a food. The research centers involved in the European project SAFFI have adopted an integrated, multitask approach that can be applied to different areas of clinical relevance to food safety. Their integrated research program aims to develop an extensive and coordinated food hazard identification system based on multiple data sources and a risk classification procedure. The project's multitasks and their objectives are summarized herein.

Hazard Identification and Risk Classification

One project working group focuses on hazard identification and risk classification within the infant food chain. The goal of this group is to develop a prototype decision support system (DSS) for hazard identification and a prototype DSS for risk classification. Specific objectives include creating databases for potential microbiological and chemical hazards and risk estimates, as well as developing selection procedures for hazard identification and risk classification. The final goal is integrating these databases and procedures into developed DSS prototypes for both hazard identification and risk classification.

Hazard Control and Mitigation

Research centers working on this task are engaged in the development of a prototype Hazard Control DSS and to set conservation technologies and mitigation strategies to improve food safety management using 4 child food chain models, chosen as case studies from raw materials to consumer. The objective of his task is to define and validate emerging processing and preservation technologies in order to control key contaminants and pathogens as efficiently as classical technologies and to define efficient monitoring and sampling strategies at the operational and governmental levels to improve the effectiveness of food safety management options.

Identification and Discovery of Chemical Hazards

This task focuses on the development of new methods based on analytical chemistry and bioassays for the detection, monitoring, and discovery of chemical hazards. The goal is to develop new innovative approaches by combining the latest innovations in molecular biology and analytical chemistry for chemical hazard detection, monitoring, and discovery and to establish all the elements of a DSS module for chemical hazard detection. Specific goals include developing high-throughput, cost-effective, and robust targeted approaches for detection and monitoring of known priority contaminants to promote self-monitoring by baby food companies and improve safety surveillance coverage by European regulators. An additional key outcome of the Research Centers involved in this task is the development and integration of nontargeted approaches based on analytical chemistry and bioassays for the discovery of unknown or unsuspected contaminants and hazard characterization. The result of this task will be the integration of databases, procedures, and tools into the DSS module dedicated to the identification of hazards related to baby food.

Identification of Microbial Hazards

The involved centers focus their research on the implementation of new omics methods for microbial hazard detection, including the application of a biotyping method to improve the targeted detection of microbial hazards. The objective of this research activity is to determine the presence, distribution (in time and space), and prevalence of target food pathogens in food chains and to update predictive models by implementing and integrating databases, procedures, and tools for microbiological risk detection at critical control points into the DSS module dedicated to risk detection.

Integration of DSS, Cost–Benefit Analysis

The key element of the project is the full integration of DSS prototypes designed by the project tasks dedicated to the identification, risk classification, control, and mitigation of chemical and biological hazards. The reliability, cost–benefit analysis, and use of the final integrated prototype developed by the EU project will be tested on food chains by European end users in order to make it suitable for use by public food authorities or private organizations.

Conclusions

Good and safe nutrition is the key to ensuring the growth and healthy development of children.[11] The European SAFFI project will contribute to the protection of children from unforeseen contaminants through predictive toxicology and improved risk-based food safety management of biohazards and will provide stakeholders with a DSS to improve safety monitoring throughout the food chain. ■

Declaration of Competing Interest

The authors declare no conflicts of interest.

Reprint requests: Massimo Pettoello-Mantovani, MD, PhD, Department of Pediatrics, Scientific Institute "Casa Sollievo della Sofferenza", University of Foggia, Foggia, Italy. E-mail: mpm@unifg.it

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