



Introduction to the Special Issue on Safe food for infants: the importance of pursuing integrated approaches to monitor and reduce the risks of biological, chemical, and physical hazards in infant food during the key developmental years

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ABSTRACT

Owing to increasing populations and global threats, the integrity and safety of global food chains are at risk. In many countries, simply getting enough to eat can be an issue, with poor quality food often contaminated with hazardous agents, whereas in developed countries the pressure to deliver cheap, affordable food may affect quality and safety. The purpose of this Special issue on Safe food for infants is to emphasize the importance of pursuing integrated approaches to monitor and reduce the risks of biological, chemical, and physical hazards in infant food. A careful integrated approach is proposed to be instrumental in order to minimize the hazards to infant health during the key developmental years and protect children from penalizing nutritional disorders and gastrointestinal diseases.

1. Introduction

The World Food Summit in 1996 defined food security as the situation in which all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and preferences for leading active and healthy lives.¹ The concept of food security encompasses both physical and economic access to food that meets people's dietary needs and food preferences.

The European Union has made food security one of the top priorities of its policy agenda. Food security has now become a cross-cutting objective to be integrated into various areas of Community competence, including the Common Agricultural Policy and its rural development pillar, the environment, public health, consumer protection and the completion of the internal market. In response to the food crises of the 1990s, in January 2000 the European Commission published a white

paper on food safety which marks an important step in the transformation of European legislation on the subject,² in which a legal framework is described which covers the entire food chain - "from farm to table" - according to a global and integrated approach. According to this logic, food safety concerns animal nutrition and health, animal protection and welfare, veterinary controls, animal health measures, phytosanitary controls, food preparation and hygiene. Finally, the white paper of the European Commission indicates the important need to interact permanently with consumers in order to provide adequate information and education on consumption.

Biological, chemical, and physical hazards in infant food owing to national and international control programs, have significantly decreased during recent years.³ However, despite such decrease the risks of hazards in infant food remain a global concern.⁴ Raising consumer awareness on the consequences of unhealthy food consumption, and a

Abbreviations: World Health Organization, (WHO); European Union, (EU); European Food Safety Authority, (EFSA); Food and Agriculture Organization, (FAO); International Standards Organisation, (ISO); Good Manufacturing Practices, (GMP); Hazard Analysis Critical Control Points, (HACCP); International Standards Organisation, (ISO 9000); European Standard, (ES 29000).

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growing attention by the food industry about the importance of ensuring protection against contaminants in commercially available products, have limited the risk of food contaminants.^{5,6} However, interventions adopted across the food supply chain to inspect the presence of food contaminants and help to ensure a sustainable supply of nutritious safe food, are currently considered insufficient in providing an extensive and comprehensive protection.⁶ In the economically advanced Western world infant food safety is currently monitored by increasingly strict legal regulations, however, some countries still use banned substances in industrial food production owing to their poor economy and insufficient regulation.⁷ Furthermore, the export and import exchange of commercial, often low-cost, infant food products, may raise serious risks for children's health despite the presence of standard control procedures and techniques, which may be insufficient or inadequate to detect a large variety of contaminants in food products.^{7,8}

Owing to increasing populations and global threats, the integrity and safety of global food chains are at risk. In many countries, simply getting enough to eat can be an issue, with poor quality food often contaminated with hazardous agents, whereas in developed countries the pressure to deliver cheap, affordable food may affect quality and safety.⁹ The purpose of this Special issue on Safe food for infants is to emphasize the importance of pursuing integrated approaches to monitor and reduce the risks of biological, chemical, and physical hazards in infant food. A careful integrated approach is in fact instrumental to minimize the hazards to infant health during the key developmental years and protect children from penalizing nutritional disorders and gastrointestinal diseases.

1.1. The European food safety system: a shared responsibility for a safe food management

Today's lifestyles are vastly different than in the past. Lifestyle changes and the increase in single-parent families and working women have led to changes in food preparation and consumption habits. One positive consequence is undoubtedly the rapid advancement of food technology and processing and packaging techniques to help ensure the safety of the food chain, as well as greater convenience of food. However, despite these advances, contamination in the food chain is still possible, due to naturally occurring or accidentally introduced agents or due to improper procedures. Ultimately, the quality and safety of food depends on the efforts of everyone involved in the complex chain of agricultural production, processing, transportation, preparation and consumption. The European Union and the World Health Organization (WHO), consider food safety to be a shared responsibility from field to table. Therefore, maintaining food quality and safety throughout the food chain requires operating procedures to ensure food safety and monitoring systems to ensure that operations are carried out correctly.

1.2. Legal and regulatory frames in the UE

EU food safety procedures cover the entire production chain of food for animal and human consumption. The European Union has adopted comprehensive legislation and outlines the responsibilities of producers and suppliers to help ensure the quality and safety of the food chain. EU regulations are among the strictest in the world. However, in order to make the food regulatory sector more transparent and scientific, a review of the EU regulatory framework was initiated in the late 1990s. In 1997, a new system of scientific advice was developed. In addition to the Scientific Steering Committee, eight new scientific committees were established. In 2002 the European Food Safety Authority (EFSA) was created, an independent body that works in close collaboration with various scientific bodies and institutes of the member states, offering independent scientific advice on all matters that directly or indirectly affect food safety. The body supervises all stages of food production and supply, from the primary sector to distribution to consumers. EFSA also

deals with risks linked to the food chain and carries out scientific assessment on any issue that has a direct or indirect effect on the safety of the food supply, including issues related to animal and plant health and welfare.

1.3. Agriculture, transport and food industry

The quality of raw materials is critical to the safety and quality of the final product. Therefore, a systematic approach from field to table is necessary to avoid contamination of food products and to identify potential risks. From the farm or wholesaler, agricultural products are transported to the food industry. This link in the food chain is covered by European legislation on quality standards, hygiene and food safety, which also applies to transport and storage. In fact, the standards of the International Standards Organization (ISO) also include a chapter dedicated to the storage and delivery of food products. In this regard, the Codex Alimentarius was drawn up in 1962 by the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) and includes global recommendations for the protection of foodstuffs as well as issues relating to transport and storage. It is therefore up to the food industry to meet consumer expectations in terms of safety and to comply with legal requirements. Food industries rely on modern quality control systems to ensure the quality and safety of the products they manufacture. The three main systems currently in place include: a) Good Manufacturing Practices (GMP), which include the processing conditions and procedures that, based on long experience, have been proven to deliver consistent quality and safety, b) Hazard Analysis Critical Control Points (HACCP), which has not only complemented but replaced them. While traditional quality assurance programs focused on detecting problems in the finished product, HACCP is a proactive technique that focuses on identifying potential problems and controlling them during the design and production process; c) Quality Assurance Standards, which are developed in accordance with the standards established by the International Standards Organisation (ISO 9000) and the European Standard (ES 29000). They are aimed at ensuring that food industries, catering companies and food industries, catering companies and other companies related to the sector respect and document the procedures established in order to comply with the norms that guarantee adequate food safety. The effectiveness of these programs, which is regularly analyzed by external experts, directly monitors that the adoption of quality assurance procedures at every level, quality management systems are used by the food industry also the collaboration with suppliers (individual farmers and wholesalers of raw materials), transporters and wholesale and retail traders thus ensuring a full sharing of responsibility concerning the entire cycle of food safety at all levels of the production cycle and up to distribution.

1.4. SAFFI: the European commission safe food for infants project

Within the frame of the Horizon 2020 program The EU launched the program safe food for infants (SAFFI). The SAFFI project is one of the 3 projects selected within the framework of the European Horizon 2020 call for projects SFS-37-2019 "Integrated approaches for food safety along the food chain" concerning research and innovation actions. This project, aims to develop an integrated approach to improve the identification, assessment, detection and mitigation of risks linked to microbiological and chemical hazards throughout the food chain in Europe and China SFS-37-2019 "Integrated approaches for food safety along the food chain" concerning research and innovation actions. This project, coordinated by the INRAE QuaPA Quality Research Unit for Animal Products, aims to develop an integrated approach to improve the identification, assessment, detection and mitigation of risks linked to microbiological and chemical hazards throughout the food chain in Europe and China.

1.5. The SAFFI partner centers

Coordinated by the French National Research Institute for Agriculture, Food and Environment (INRAE), SAFFI brings together 14 partners from seven countries across Europe and 6 partners from two Chinese provinces gathering the required expertise in food safety control, infant food production, analytical and data sciences to achieve the project goal. This multi-actor and Sino-European consortium led by INRAE, the Europe's top agricultural research institute and the world's number two centre for the agricultural sciences, involves as full partners five international infant food companies (Friesland Campina, HiPP, YIOTIS, Beingmate, YFFC), two food safety authority institutions (ZAIQ and ANSES who published in 2016 the first total diet study worldwide dedicated to infant), three dynamic European technological SMEs (CremaGlobal, Computomics and BDS) who are specialists in data science for industry decision making, omics data analysis and bio-based technologies, respectively), specialists in infant health and nutrition, EPA-UNEPSA, the Union of National European Pediatric Societies and Association, INRAE Transfert (a company specialized in project management and technology transfer) and several leading European and Chinese academic institutions (Wageningen University, Holland; University of Turin, Italy; Institut de Recerca I Tecnologia Agroalimentaries, Spain; Fraunhofer-Gesellschaft zue Foerderung der Angewandten Forschung E.V., Germany; Zhejiang Academy of Science & Technology for Inspection & Quarantine, China; Jiangsu Academy of Agricultural Sciences, China; Zhejiang Academy of Agricultural Science, China).

2. Conclusions

This EU-China multi-actor consortium of 20 partners involving academia, food safety authorities, infant food companies, pediatric organizations and technological and data-science SMEs contributed to this special issue dedicated to the important topic of ensuring safe food for infants. The fate of nations is determined by what they eat, and all the stakeholders involved are on the front line to contain the risks of food hazards^{3,9,10}. They can play a key role if they will actively cooperate and

integrate their efforts with governments and local, state, federal, and global public health institutions and agencies, to ensure that infants and children have access to good and safe food³.

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