frontiers in Environmental Science

EDITORIAL
published: 14 March 2022
doi: 10.3389/fenvs.2022.881334

Editorial: Exposure Pathways, Characterization and Risk Assessment of Chemical Contaminants in the Food Chain

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Keywords: food contamination, health risk assessment, contaminants, exposure pathway, risk assessement

Editorial on the Research Topic

Exposure Pathways, Characterization and Risk Assessment of Chemical Contaminants in the Food Chain

Anthropogenic activities have led to the increase in environmental contaminants. These pollutants are persistent in the environment and pose substantial threats to human health. The problem is critical despite drawing enormous attention of the scientific community. Food component is one of the major exposure pathways when crops are grown in contaminated farmlands. One of the biggest threats to the safety of our food is the unintentional and undesirable presence of chemical contaminants. Accumulation and uptake of pollutants are now well recognized, which constitute major risk to all living organisms. Both inorganic and organic pollutants enter the food chain due to various reasons including human led contamination of naturally occurring elements, like the presence of arsenic in soil and irrigation water resulting in accumulation in crops, and anthropogenic contamination, like pesticide or rodenticide accumulation in crops due to its widespread use. Thus, understanding the impact of contaminants exposure from food components, is crucial and research on reducing exposure from food is vital. With increasing global food demand, it is an important responsibility of all producers, distributors, consumers, and regulators to ensure food safety. Apart from contamination during primary production, contaminates can also enter the food chain during storage, transportation, handling, and most importantly during cooking and processing.

Chemical contaminants present in food may be harmful to health at certain levels. To manage the human health risks from these contaminants it is important to determine the exposure pathways and undertake exposure and risk assessments to help determine regulatory controls. This Research Topic aimed to explore new approaches and findings that have evolved around exposure and risk assessment of chemical contaminants in the food chain.

Addressing the objective on characterization of exposure pathways and estimation of exposure concentrations of chemical contaminants in the food chain both Alsafran et al. and Gupta et al. investigated heavy metal contamination in vegetables. Cultivated in Qatar and specific area of India respectively, both studies have indicated significant accumulation of certain metals like vanadium, chromium, arsenic, cadmium, and lead in rocca, coriander, and parsley in Qatar and zinc and manganese in coriander in India indicating health risks. Similarly, De et al. investigated fluoride exposure in endemic areas of West Bengal, India and have found higher contribution from vegetables compared to cereals. These studies elucidate risk of exposure to contaminants is not limited to staples

Edited and reviewed by:
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Specialty section:
This article was submitted to Toxicology, Pollution and the Environment, a section of the journal Frontiers in Environmental Science

Received: *22 February 2022*
Accepted: *28 February 2022*
Published: *14 March 2022*

Citation:
Mondal D and Rahman MM (2022) Editorial: Exposure Pathways, Characterization and Risk Assessment of Chemical Contaminants in the Food Chain. Front. Environ. Sci. 10:881334. doi: 10.3389/fenvs.2022.881334

like rice and or wheat (Mondal et al., 2021; Suman et al., 2020) and vegetables can be a significant route of exposure. That said, rice followed by wheat remains the most significant route of exposure to contaminants like arsenic and cadmium.

We invited articles on innovative methods and/or techniques to determine bioavailability and factors contributing to bioaccessibility of contaminants in specific food matrices and Siddique et al. informed that iron application to agricultural soil at the rate of 1 and 2 g kg^{-1} can reduce the cadmium uptake in rice by 23 and 46%, respectively in two different rice cultivars. Furthermore, toxin accumulation potential of food crops depends on other factors. For example, Halim et al. explored the cadmium bioaccumulation in wheat looking at the tolerance levels in two different cultivars and found that the tolerant variety not only have better survival and adaptability under cadmium stress but also accumulate more macro- and micro-nutrients in the grains resulting in lowering of health hazards when consumed by the people. Considering the importance of translation of the current knowledge on exposure to a chemical contaminant in food into basic principles for regulatory control, the meta-analysis by Mandal et al. depicted that arsenic concentrations greater than 14 mg kg^{-1} in Asian paddy soil may result in rice grains exceeding the Codex recommended maximum allowable inorganic arsenic concentrations of 0.2 mg kg^{-1} for polished rice and 0. 35 mg kg^{-1} for husked rice.

All most all contribution to this Research Topic provided with the health risk estimation due to exposure to food-based contaminant/s and many used probabilistic methods to account for uncertainty in different parameters like magnitude, duration, and frequency of exposure. Wang et al. conducted multi-year survey to determine the levels of arsenic in clam species cultivated in eight production areas of Jiangsu Province in China. Hence, most of the studies illustrated innovative methods and techniques for human health risk estimations.

We hope that all articles included in this special Research topic covering a wide range of exposure pathways of contaminants from food and the corresponding risks would be useful to the wider scientific community and advance knowledge and improve our understanding towards minimizing the exposure of pollutants and protect the environment and the public health.

AUTHOR CONTRIBUTIONS

MR was a guest associate editor of the research topic and wrote the editorial with DM, Associate Editor in Toxicology, Pollution and the Environment.

ACKNOWLEDGMENTS

We would extend our sincere thanks to the Editor-in-chief and other editorial board members of the "Frontiers in Environmental Science" for providing us the opportunity to assemble this Research topic on "Exposure Pathways, Characterization and Risk Assessment of Chemical Contaminants in the Food Chain". Special thanks to the Submissions Team, for their interest and willingness to support, without which this research topic would never have been possible. We would like to thank the St George's University of London and The University of Newcastle, Australia for their support during editorial handling process.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.