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Towards a broader view of the consumer chemical exposome – Strategies and Technical solutions

Bruno Le Bizec

Oniris, INRAE, LABERCA, France

Long-term management of human health requires a comprehensive understanding of the environmental influences that affect it. To achieve this, there is a need for comprehensive, high-quality data on exposure in order to study the causes of certain diseases in humans and thus manage situations more effectively. Food is one of the major routes by which humans are exposed to chemical substances; whether they are of natural or synthetic origin, intentionally produced or not, they are hazards that can enter the food chain at different levels and, depending on their toxicity and levels of exposure, pose a risk to consumers.

While some substances have been well known for decades (e.g. mycotoxins, heavy metals or dioxins), others have been identified more recently as presenting a food-related risk, such as perfluorinated compounds or chloroparaffins. It is therefore accepted that a considerable number of additional substances likely to present a risk to human health are present in the food chain, even though they have not yet been described. The total number of substances of concern of human or natural origin already assessed, regulated or monitored is small compared to the 10^5 industrial chemicals described as being in use.

In addition, several hundred new chemical substances are produced each year due to rapid innovation in the chemical industry or new processing trends. This facet of the human chemical exposome has stimulated methodological research capable of revealing these substances. Several strategies are being deployed by laboratories to solve the particular problem of detecting emerging contaminants in the food chain.

The first focuses on substances that are already known or have recently been described, and aims to develop effective analytical approaches for objectively identifying the presence of these contaminants in foodstuffs and measuring their concentration levels in order to help characterise consumer exposure.

The second of these approaches explores emerging issues in a more global way, using research strategies based on particular chemical motifs (e.g. halogen-driven data processing), specific effects (e.g. involving metabolomics) or the modelling of probable structures. The innovative analytical strategies implemented as part of these two approaches will be detailed in order to illustrate the identification of emerging hazards in the food chain with the aim of broadening knowledge of consumer chemical exposure.

* E-mail: bruno.lebizec@oniris-nantes.fr