

Environmental and health implications of chemical food contaminants, with emphasis on chemicals associated with plastics and microplastics

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ABSTRACT

A wide range of persistent and toxic chemicals (PTS) is generated through industrial activities, and the use of various consumer products, such as pharmaceuticals and personal care products (PCPPs), detergents, disinfectants, plasticizers, preservatives, and microplastics. These chemicals and their metabolites can be found in different environmental media, including wastewater, agricultural and urban runoff, rivers, ground and drinking water. Unfortunately, the conventional wastewater and (drinking) water treatment processes are not always efficient in removing some of these chemicals. They may enter the food chain, posing health threats, mainly through consumption of contaminated crops and seafood. It is noted that the autism spectrum disorders in children are related to exposure to mercury, lead, and other various environmental pollutants, including phthalates (additives), and bisphenol A (constituent) associated with plastics. The major objectives of this presentation are to review the current status of the sources, exposure pathways of some major food contaminants, their potential associations with body loadings and subsequent health effects, with emphasis on those associated with plastics and microplastics, citing examples observed in the Pearl River Delta, the most developed region in China. These endocrine disrupting chemicals (associated with plastics and microplastics) are widely detected in indoor dust (the use of plastic film in farming), food items (uptake by crops and fish, and food contact materials), and blood plasma of local residents. There seems to be an urgent need to study the potential toxic effects of microplastics, including those derived from PCPPs, as they are now widely distributed throughout the coastal environment, and their uptake mechanisms by aquatic living organisms (such as bivalves and fish), and health impacts on consumers are largely unknown. It is encouraging to learn that the Basel and Stockholm Conventions have recently taken action on a number of substances (flame retardants, perfluorinated chemicals, phthalates, bisphenols, and nonylphenols), through listing or through issuing technical guidance. The priority sectors included (1) children's products, (2) packaging: food and beverage contact materials, (3) electrical and electronic equipment and related waste, (4) textile, upholstery and furniture, and (5) construction sectors, where a wide range of PTS is commonly used. It is understood that the presence of these toxic chemicals poses a serious limitation on the recycling of plastics, and the move to a circular economy. Nevertheless, it seems essential to manage this emerging issue more effectively, through national and international efforts.

Key words: phthalates, bisphenol A, exposure pathways, toxicity.