DEBATE

# Persistent organic pollutants: potential health effects?

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It is not a point of debate that the Stockholm Convention for the prevention of further accumulation of persistent organic pollutants (POPs) should be ratified and implemented by all countries. However, in their article, Schafer and Kegley present an unbalanced "worst case scenario". Approximately 20% of the food supply of the US is contaminated with POPs at extremely low levels; these levels are comparable to those found in many other countries. Furthermore, there is no scientific consensus that these levels are hazardous to most humans. More information is needed to determine the actual risks of extremely low levels of POPs to human health.

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There is universal scientific consensus that persistent organic pollutants (POPs) occur globally, are hazardous, and that implementation of the Stockholm Convention should be a high priority for all countries. However, in their article[1] Schafer and Kegley present an unbalanced "worst case scenario". The data indicate that approximately 20% of the food supply of the US is contaminated with POPs at extremely low levels. These levels are comparable to those found in many other countries. However, there is no scientific consensus that such levels are hazardous to most humans. Fortunately, levels of POPs have generally declined worldwide, except in certain populations that rely on fish and marine mammals for subsistence foods, and in localised geographical areas (hot spots—usually attributable to accidental release of POPs).[2] Schafer and Kegley[1] rightly point out that children may be particularly susceptible during critical stages of development, but the foods included in these surveys are mainly adult foods. Valid scientific justification is not given for extrapolating these data to children, as was done in deriving figure 1. From the description in the text,[1] it is difficult to understand how the maximum exposure levels in figure 1 were derived. Intake of POPs through consumption of breast milk and baby food is not addressed. As most studies have been carried out in adults, additional studies focusing on infants and children are needed. The authors state that there is "strong evidence that exposure to even miniscule amounts of POPs at critical periods of development . . . can cause irreversible damage".[1] The animal and wildlife data support the biological plausibility of this statement, but doses are generally much higher than "minuscule". Similarly, the authors state that POPs have been linked to cancer, impaired neurobehavioural and immune function, reduced sperm count, diabetes, etc, because certain POPs are also potential endocrine disrupting chemicals (EDCs). Endocrine disruption is not a toxicological end point, in itself, but a functional change that may or may not lead to adverse effects. Therefore, table 2 in their paper is misleading, as it does not include criteria to support this categorisation of chemicals. For most of the chemicals listed in this table, there is no firm evidence that low level exposure to EDCs have adversely affected human populations, as noted below.[3] In response to continuing concerns and uncertainties regarding EDCs, the International Programme on Chemical Safety (IPCS) was requested by the Intergovernmental Forum on Chemical Safety to review this issue. A draft assessment was recently released.[3] A unique feature of the IPCS assessment was the development of a weight of evidence approach, using objective criteria, to evaluate the diverse sets of data on EDC exposures and specific biological outcomes. Analysis of the human data for most chemicals, while raising concerns, did not provide firm evidence of direct causal associations between low level EDC exposure and adverse health effects. For example, the current scientific evidence does not support a direct association between exposure to POPs and increased risk of breast cancer. Although the paper by Schafer and Kegley cites only three smaller studies that were positive or inconclusive, over 40 larger studies as well as meta-analyses show no association.[4] Similarly, while there are clearly variations in human sperm count, both within and between countries, there are no conclusive human data that directly address the cause and effect relations between declining sperm quality and exposure to POPs.[5] Again, the authors are very selective in their citations. Except for in utero and early postnatal PCB exposure and subsequent impaired neurobehavioural and immune development in children, the evidence that low level exposure to POPs is causally associated with these effects is extremely limited.[6] Our points are not meant to downplay the potential effects of EDCs and POPs, particularly during early development stages, but they highlight the need for more rigorous studies. The lack of adequate exposure data during infancy and childhood is of particular concern. The extrapolation of laboratory animal studies at high doses to human environmental exposure at low doses is usually complicated by the existence of protective mechanisms.[7] Clearly, better epidemiological data on dose-response relations of specific environmental exposures are needed. The control of chemicals in food is being tackled internationally and by many national governments

**Abbreviations:** POPs, persistent organic pollutants; EDCs, endocrine disrupting chemicals

using the risk analysis paradigm of science based risk assessment, risk management, and risk communication. The Codex Alimentarius Commission (Codex), which is responsible for developing international food standards, uses this approach. Risk assessments for the Codex are performed by independent international panels of scientific experts (Joint FAO/WHO Expert Committee on Food Additives (JECFA) and Joint FAO/WHO Meeting on Pesticide Residues (JMPR)), which are sponsored by the Food and Agriculture Organisation of the United Nations and the World Health Organisation. These panels have periodically reviewed the scientific information on POPs in food. A priority of the Codex and JMPR is the scientific review of new, safer pesticides to replace more toxic and persistent pesticides currently in use. As risk managers, Codex and regional and national food safety organisations weigh policy alternatives, in consultation with interested parties, consider risk assessment and other factors relevant for the health protection of consumers and for the promotion of fair trade practices, and if needed, select appropriate prevention and control programmes. Removal of all foods contaminated with "minuscule" levels of POPs would severely compromise food security by restricting the availability of food supplies. In addition to the rapid implementation of the Stockholm Convention, prudence dictates that contamination by POPs be reduced to levels as low as reasonably achievable. Critical to this effort is assisting developing countries in the management and replacement of POPs. Improved international monitoring data for use in risk assessments and to measure progress and identity problems are also needed. Increased participation in the WHO GEMS/Food Programme[8] could accomplish this objective.

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