European Commission

Science for Environment Policy

Global variation in persistent organic pollutants in breast milk

Persistent organic pollutants (POPs) are priority pollutants that pose a risk to human health, and can be passed on to children via breast milk. This study investigated how concentrations of POPs in breast milk vary worldwide by reviewing studies published between 1995 and 2011. They found that levels of polychlorinated biphenyls (PCBs) and dioxins in breast milk are higher in Europe and North America, whereas pesticides are more prevalent in Africa and Asia. The authors call for harmonisation of methodologies to enable high quality comparisons between studies.

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Source: Fång, J., Nyberg, E., Winnberg, U., Bignert, A. & Bergman, Å. (2015). Spatial and temporal trends of the Stockholm Convention POPs in mothers' milk — a global review. *Environ Sci Pollut Res* 22(12), pp.8989-9041. DOI: 0.1007/s11356-015-4080-z. This study is freely available at: http://link.springer.com/article/10.1007%2Fs11356-015-4080-z

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As their name suggests, POPs are organic compounds which are resistant to degradation in the environment. They include pesticides, solvents, pharmaceuticals and by-products of industrial processes, which can bioaccumulate up the food chain. POPs can have negative impacts on human health, from endocrine disruption to inducing mutations in DNA.

To protect humans and the environment from POPs, the Stockholm Convention was launched in 2001, a global treaty with the backing of the European Union. The Convention regulates on pollutants, including polybrominated diphenyl ethers or PBDEs (flame retardants), dichlorodiphenyltrichloroethane (DDT), an insecticide; polychlorinated biphenyls (PCBs), previously used in products such as electrical equipment, sealants and paint before being banned in most countries; and dioxins, toxic by-products in some chemical manufacturing processes such as the production of 'Agent Orange' but which can also form during incomplete combustion.

Of particular concern is childhood exposure to POPs, via breast milk. After entering the body, many environmental pollutants such as POPs bind to fat. As fat is an important component of breast milk, nursing infants can be exposed to particularly high levels of pollutants. This can disrupt normal development and lead to health issues later on in life.

This study conducted a review of studies on POPs in breast milk, assessing spatial distributions worldwide and trends over time. The researchers investigated 24 different POPs, based on a literature search using the Web of Science database. For inclusion, studies needed to have been peer-reviewed, published in the years 1995–2011, reported and have quantified one of the 24 listed POPs, and provided information about location and year of sampling. As well as the literature search, the researchers included data from a Swedish environmental monitoring programme.

A total of 253 articles were identified. The vast majority (80%) related to seven POPs: the pesticides chlordane and hexachlorocyclohexane (HCH), the insecticide DDT, the fungicide hexachlorobenzene (HCB), PCBs, polychlorinated dibenzodioxin/polychlorinated dibenzofuran (dioxins) and PBDE.

Analysis by region confirmed global differences in exposure. Pesticides were found in higher concentrations in Africa, Asia and Central America, presumably due to their agricultural economies. African mothers also had higher concentrations of DDT compared to most samples from other regions.

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By contrast, PCBs and dioxins were reported to a higher extent in industrialised regions, such as Europe and North America, as these chemicals are related to industrial processes. In general HCB concentrations were highest in Europe. HCH also showed higher concentrations in Europe than Africa and America, but in general HCH concentrations were highest in Asia, Australasia and the Pacific. Breast milk from the USA was found to contain more PBDEs that the rest of the world, due to the greater use of flame retardants.

Studies from only two countries fulfilled the criteria for temporal analysis: Sweden and Japan. The authors used these studies to analyse changes to contaminants over time. They found decreasing concentrations of most POPs in breast milk, while the flame retardant hexabromocyclododecane (HBCDD) increased over time (from 1972–2011) in both countries.

The review also found differences in reporting methods, which made comparing data difficult, and the authors say more detailed instructions are needed for scientists reporting POPs. The authors make recommendations for how POP concentrations are recorded, such as recording POP levels in molar terms rather than weight, and say common guidelines are needed for reporting exposure data.

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