

Residues of POP in the milk of small children

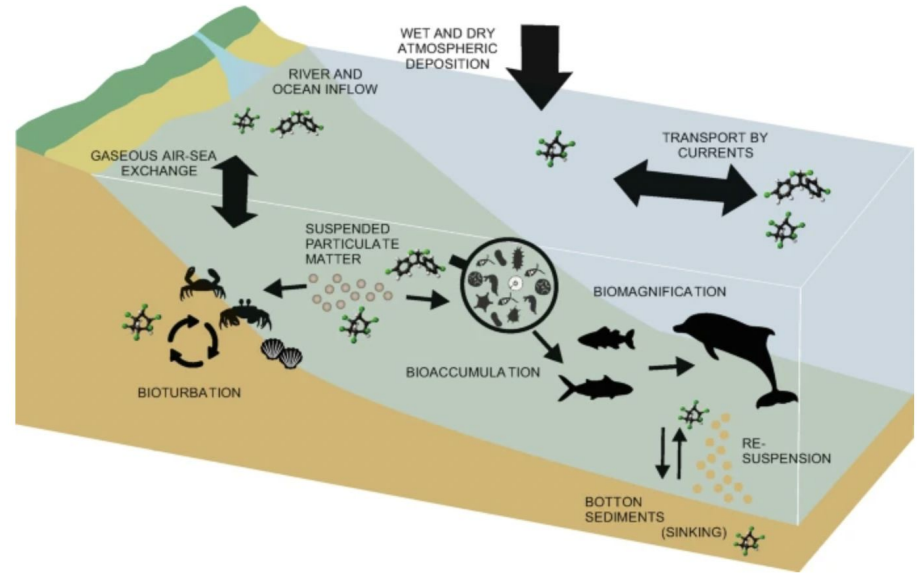
Zeineb Fourati and Fatima Azahraa El-Zein



1. POPs - Persistent Organic Pollutants

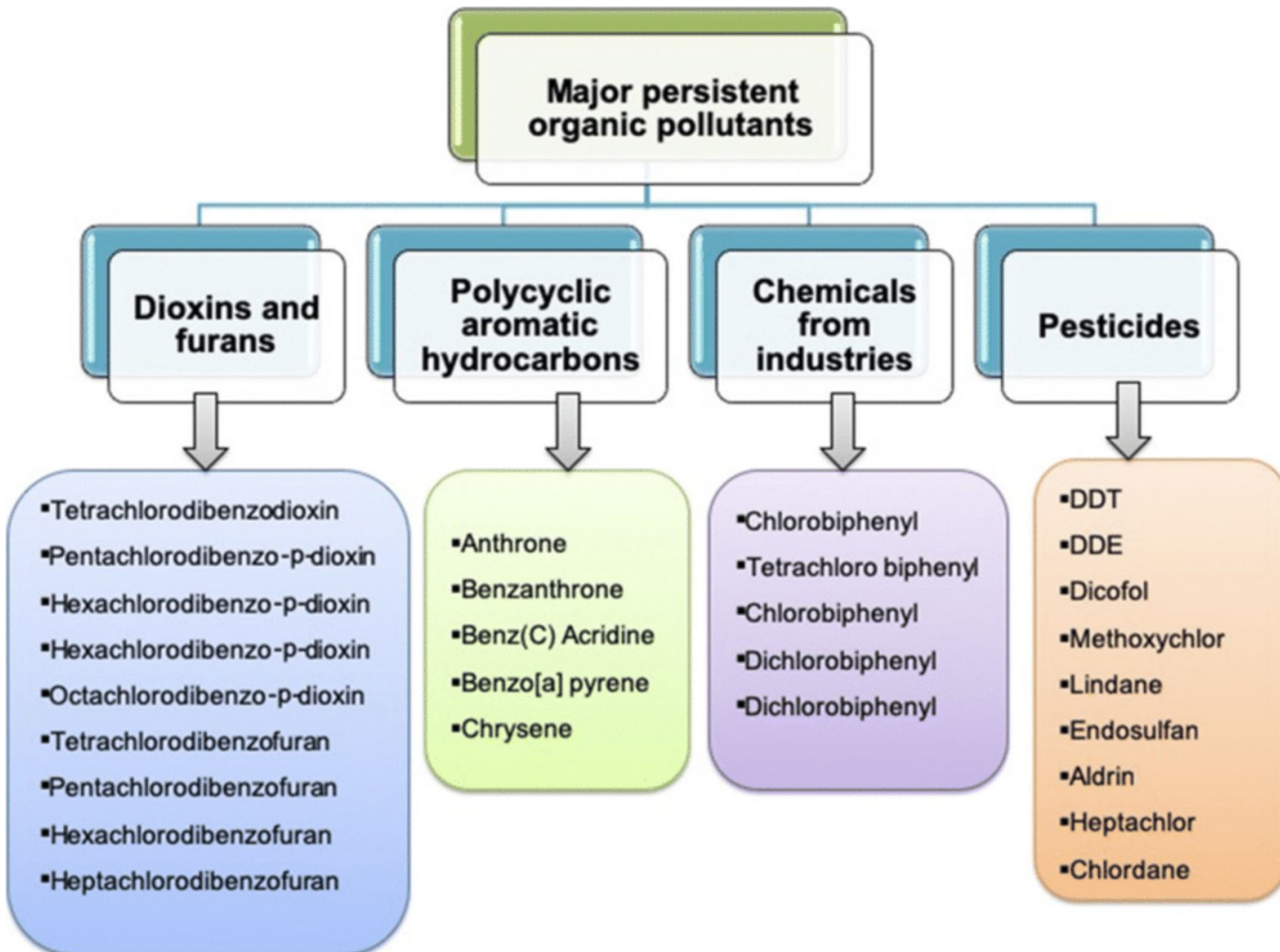
- **persist** in the environment,
- **accumulate and magnify** in living organisms through the food chain (fatty tissues)
- **toxic** for the human health and wildlife
- can be transported by air, water or migratory species across borders

Fig. 5.10



Processes involved in the fate of POPs in the marine environment

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Mishra, Bishwambhar & Varjani, Sunita & Iragavarapu, Gayathri & Ngo, Huu & Guo, Wenshan & Vishal, Bhushan. (2019). Microbial Fingerprinting of Potential Biodegrading Organisms. Current Pollution Reports. 5. 10.1007/s40726-019-00116-5.



Foodstuff	POPs	Reference
Egg	Dioxins/furans, PCBs, OCPs, PFCs and HBCDs	[15,20,23,28,29,52,70]
Dairy product (milk, butter, cheese, cream, yogurt, ice cream, etc.)	Dioxins/furans, PCBs, OCPs and PAHs	[13,15,20,29,42,71,72]
Meat and meat product (pork, chicken, beef, sausage, etc.)	Dioxins/furans, PCBs, OCPs, HCBD and PCN	[15,20,28,31,32,52,70]
Grain, flour and bran	PAHs	[71]
Rice, Fruit and vegetable (cabbage, carrot, potato, etc.)	OCPs, PCBs and PAHs	[3,42,73,74]
Honey	OCPs	[71]
Oil (vegetable oil, olive oil, etc.)	Dioxins/furans, PCBs, OCPs and HBCDs	[18,31,52]
Fish	OCPs, PCBs, PBDEs, PFOS, Dioxins/furans and HBCDs	[20–23,25–29,59,72,75]
Mussel	OCPs, PCBs and PBDEs	[26,30,76]
Oyster	PAHs	[71]
Water	PFOS, OCPs, PCBs and PAHs	[3,26]

Guo, Wenjing & Pan, Bohu & Sakkiah, Sugunadevi & Yavas, Gokhan & Ge, Weigong & Zou, Wen & Tong, Weida & Hong, Huixiao. (2019). Persistent Organic Pollutants in Food: Contamination Sources, Health Effects and Detection Methods. International Journal of Environmental Research and Public Health. 16. 4361. 10.3390/ijerph16224361.

2. Hazard identification

[potential harm due to inherent properties of POPs]

Bioaccumulation in mothers/infant formula

- **Accumulation** in **breast-milk** fat (if the mother has been exposed through food or industrial products)
- **Infant formula contamination** : water, raw product (milk/soy), production process
- Most POPs found : dioxins and furans / PCBs / DDT /...

degree of evidence ?
→ Risk assessment

Impact on infants health

- Neurological development : cognitive deficits, delayed mental development
- Immune system : more prone to infections, allergies and autoimmune disease
- Respiratory problems : asthma or chronic bronchitis in children
- Cancer risk: long-term exposure to carcinogenic POPs



3. Background information

POP food contamination - dermatological effects

The Yusho poisoning incident, which occurred in 1968 in western Japan was caused by **rice bran oil contaminated with PCBs**, PCQs and PCDFs generated by heat denaturation of PCB.

- In the early days of the incident, babies with dermatological abnormalities, or so-called "black babies," were born.
- Today, the **offspring of patients** are complaining of **symptoms similar to those of their parents** in 1968.
- Higher carcinogenic risk for Yusho patients

3. Background information

Breastmilk POP monitoring in Switzerland

- Since 1987 : the World Health Organization (WHO) coordinates measurement campaigns aimed at monitoring the contamination of breast milk by “class POPs”,
- So far these concentrations were generally on the decline
- Switzerland participated in the 5th campaign (2008/2009), identifying :
 - (i) polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F),
 - (ii) biphenyls polychlorinated (PCB)
 - (iii) POP pesticides
- SWIFS – Swiss Infant Feeding Study (2014)

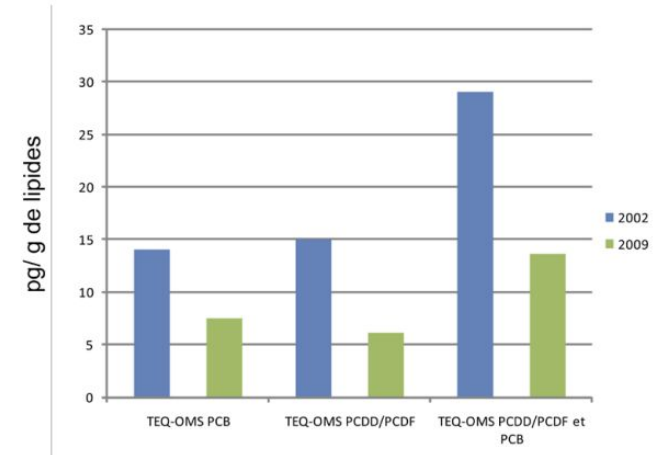


Figure 1. TEQ-OMS pour les PCB de type dioxine, les dioxines et les furanes ainsi que TEQ-OMS totaux dans le lait maternel en Suisse. Les résultats (valeurs moyennes) pour 2002 (en bleu) ont été obtenus dans le cadre d'une étude coordonnée par l'OFSP (OFSP/EMPA 2003). Les résultats de la 5^e campagne (échantillon groupé) sont présentés en vert. On constate une diminution sensible d'environ 50 %.

Conclusion : similar results to european neighbourhood, no particular risk of breast-feeding (for 6 consecutive months recommended in Switzerland)



4. Relevant regulations

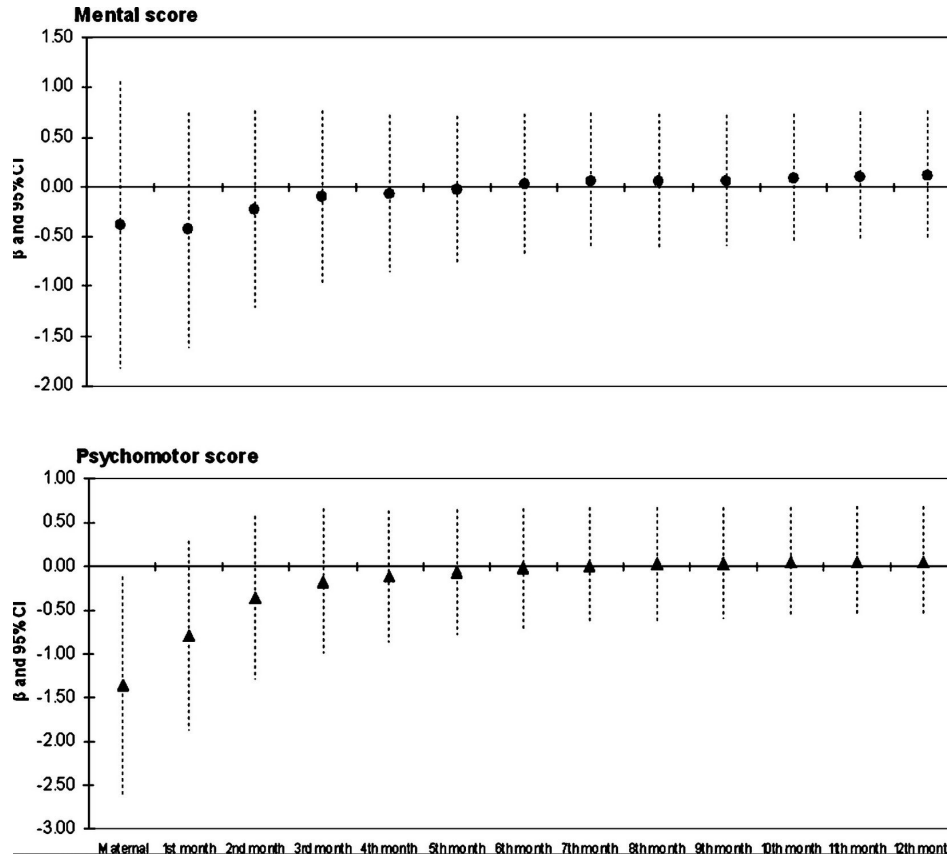
- **The Stockholm convention** on Persistent Organic Pollutants: was adopted in 2001 and entered into force in 2004. It is a global treaty whose purpose is to safeguard human health and the environment from POPs.
 - The Convention requires Parties to eliminate or restrict the production and use of intentionally produced POPs, subject to specified exemptions, with special provisions for DDT and PCBs.
 - DDT is placed in the restriction annex, which means that its production and use is restricted to disease-vector control.
 - The Convention calls upon Parties to take certain specified measures to reduce releases of unintentionally produced POPs with the goal of their continuing minimization and, where feasible, ultimate elimination.
-
- **The WHO/UNEP human milk survey** is both the largest and longest-running global study on human exposure to POPs. In total, 82 countries from all UN regions participated between 2000 and 2019.



5. Risk assessment

- Monitoring of POPs in breastmilk serves to calculate the bioaccumulation of the contaminants in humans.
- High risk of exposure in industrial zones and in regions with a history of pesticide use.
- In regions with stricter regulations and lower environmental levels of POPs, the risk may be reduced, but not eliminated.

Some countries are granted exemptions under the convention to use DDT for malaria control. These include: **India, Ethiopia, South Africa, Uganda, Zambia, Zimbabwe, Mozambique**



- 1175 children
- Effect of prenatal and postnatal PCB-153
- Breastfeeding increases the concentration of PCB-153 in children blood however it's impact on neurological development is statistically insignificant

Evaluating the neurotoxic effects of lactational exposure to persistent organic pollutants (POPs) in Spanish children, NeuroToxicology, Volume 34, 2013.

6. Recommendations

- Although breast milk is one of several means of infant exposure to POPs, breastfeeding should always be encouraged.
- Encourage women in high-risk areas to avoid foods known to be high in POPs (e.g., certain fatty fish, dairy products, or animal fats), as these pollutants accumulate in fat. Instead, opt for foods lower in the food chain, like vegetables, fruits, and grains.
- Continue to phase out POPs and monitor POP concentration in infant milk.





Links

<https://www.gifa.org/wp-content/uploads/2021/12/22836.pdf>

<https://www.unep.org/topics/chemicals-and-pollution-action/pollution-and-health/persistent-organic-pollutants-pops/why>

<https://echa.europa.eu/understanding-pops>

https://link.springer.com/chapter/10.1007/978-3-031-14486-8_5#citeas

<https://mainichi.jp/english/articles/20220506/p2a/00m/0li/035000c>

<https://www.sciencedirect.com/science/article/pii/S0161813X12002495>