

PFAS and infant feeding

Adriano Cattaneo and Alison Linnecar, IBFAN, February 3, 2025

A report recently published by Greenpeace Italy shows that 79% of 260 samples of potable drinking water obtained between September and October 2024 in 235 towns spread all over the country (Figure 1) contain PFAS.¹ The findings refer to 58 PFAS substances, many more than the 20 ones for which monitoring is compulsory according to the European Union (EU).² A similar situation can be assumed worldwide in countries and territories with high population and industry density (Figure 2).³ Data comes from 45,000 samples of surface and ground water; in 31% of them PFAS were detected, the average obviously hiding higher rates of contaminations in many places. In 11 EU countries, PFAS were detected in most drinking waters, including some bottled mineral waters.⁴

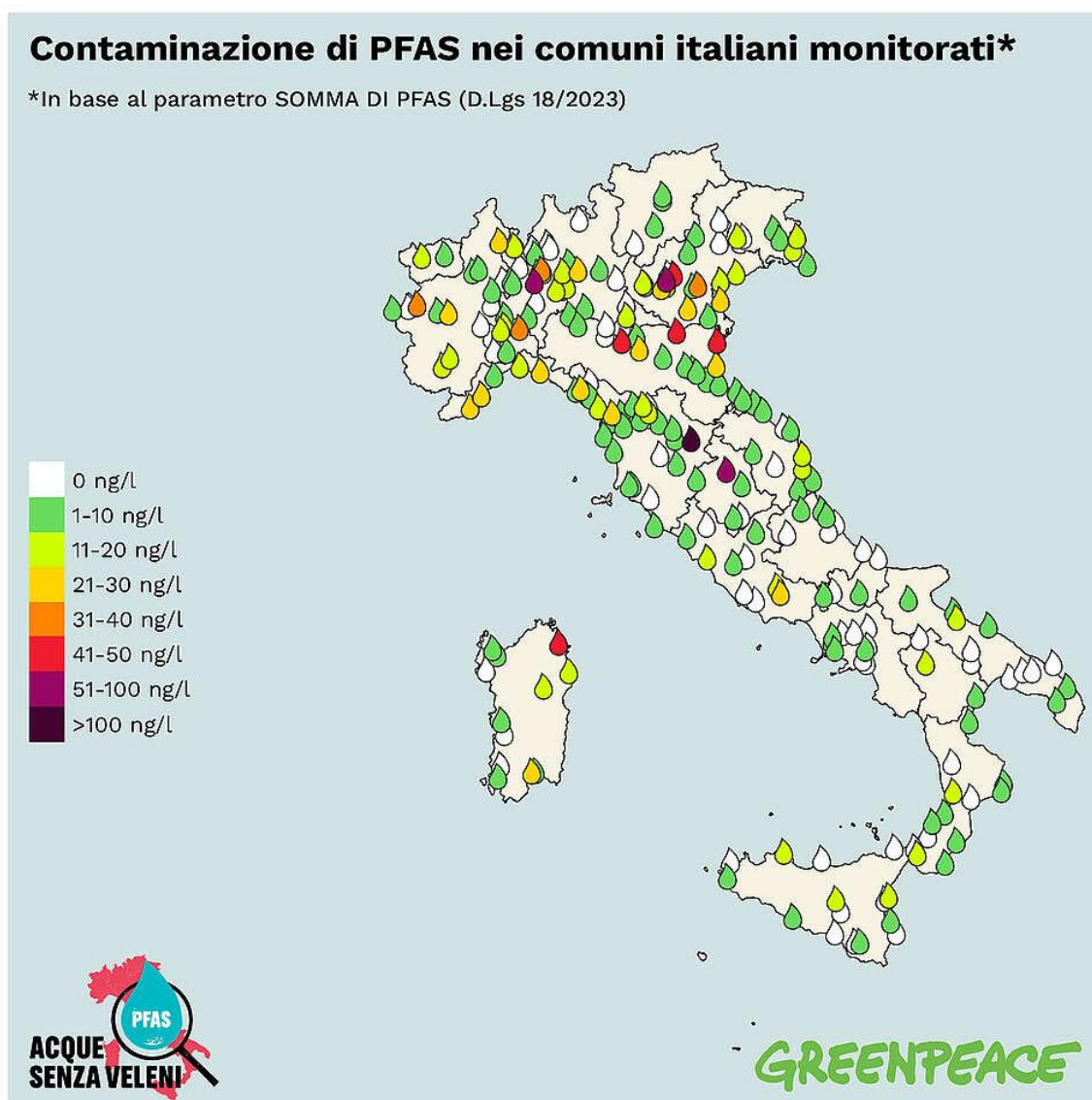


Figure 1. PFAS concentration in drinking water of 235 Italian towns.

¹ <https://www.greenpeace.org/italy/rapporto/26152/la-prima-mappa-della-contaminazione-da-pfas-in-italia/>

² Commission Notice – Technical guidelines regarding methods of analysis for monitoring of per- and polyfluoroalkyl substances (PFAS) in water intended for human consumption <https://tinyurl.com/mrx56rfe>

³ <https://www.nature.com/articles/s41561-024-01402-8>

⁴ <https://www.pan-europe.info/resources/reports/2024/07/tfa-forever-chemical-water-we-drink>

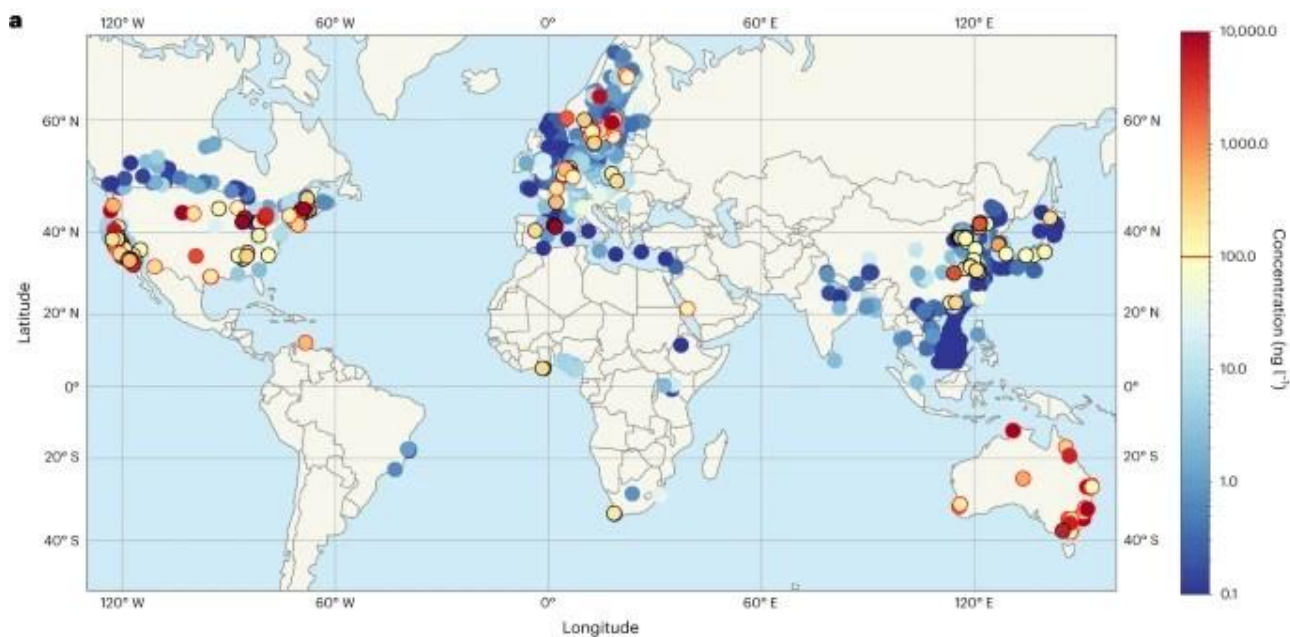


Figure 2. PFAS concentration in surface and ground water worldwide (45,000 samples).

It is not difficult to conclude that PFAS are everywhere, and forever. If there are PFAS in all water sources, there will be PFAS in soils, plants, vegetables, insects, animals, and human beings. If water is contaminated, all bodies are contaminated.

The problem

PFAS (polyfluoroalkyl substances) is a group of thousands of “forever chemicals”, so called because they are not bio-degraded and persist therefore in the environment. The first PFAS were used by the industry and were released in the environment in the mid ‘50s of last century; they are still with us. Their number can be increased almost indefinitely because the original molecule can be easily manipulated to obtain new ones, with longer or shorter chemical chains. If some PFAS, such as PFOS and PFOA, are banned because they are shown to cause cancer or other harms to health and the planet (and it can take ages before the evidence is put together), the chemical industry will easily replace them with new ones. All the other industries (plastic, garment, furniture, transport, food packaging, cookware, cosmetics, electronics, etc.) need PFAS for their products, to make them resistant to water, stains and heat, so that demand for the chemical industry is constant.

PFAS act as endocrine disruptors. By interfering with hormones, they cause harm to thyroid, liver, and immune system. Among others, they interfere with hormones related with our reproductive systems. Exposure to PFAS may have lifelong impact because they bio-accumulate in our bodies and act during pregnancy, early childhood, and adolescence when cells divide and multiply rapidly.^{5,6,7} This may be the reason why some PFAS (PFOS and PFOA, for example) have already been shown to be associated with cancers of reproductive and related organs, such as the breast.⁸

⁵ Carlsen Bach C et al. Perfluoroalkyl and polyfluoroalkyl substances and human fetal growth: A systematic review. *Critical Reviews in Toxicology* 2015; <https://www.tandfonline.com/doi/full/10.3109/10408444.2014.952400>

⁶ Carlsen Bach C et al. Perfluoroalkyl and polyfluoroalkyl substances and measures of human fertility: a systematic review. *Critical Reviews in Toxicology* 2016; <https://www.tandfonline.com/doi/full/10.1080/10408444.2016.1182117>

⁷ Manca S et al. Exposure to PFAS and small for gestational age new-borns: A birth records study in Veneto Region (Italy). *Environmental Research* 2020; <https://doi.org/10.1016/j.envres.2020.109282>

⁸ <https://www.mdpi.com/2305-6304/10/6/318>

When an association with cancer or cardiovascular disease is ascertained,⁹ one or more PFAS may be banned by national and supranational authorities (the EU, for example). Unfortunately, banned PFAS are quickly replaced by similar and untested molecules.

PFAS are present in the food chain. They are lipophiles; therefore, their concentration is higher in fat-rich food, such as fish, meat, eggs, milk, and milk products. When they reach human beings, who are at the top of the food chain, their levels are higher in fat-rich tissues, such as the breast, than in blood and urine, for example. PFAS can be detected in breastmilk, but also in cow milk and cow milk-based formula. Their concentration is proportional to the concentration of PFAS in the diet; carnivorous animals and human beings ingest more PFAS than vegetarian ones. It is also proportional to the concentration of PFAS in drinking water. For example, in the female population of an area in Northeastern Italy where water has been heavily polluted by a PFAS industry for years,¹⁰ mothers have on average a high concentration of PFAS in breastmilk, but those drinking water from polluted wells and with a mostly animal diet have much higher than average concentrations.

PFAS and infant feeding

As for any other chemical contaminant in breastmilk, several points must be considered before recommending replacement of breastmilk with formula.

First, the infant born to a mother with PFAS in breastmilk has already been exposed to the same substance in utero. It is well known that chemical substances cause more harm when cells divide rapidly, i.e. early more than late in pregnancy, in pregnancy more than in the newborn period, in the newborn period more than later in infancy, and so on. This means that if PFAS cause harm, that harm has already been caused before birth. Any harm caused will depend on the type of PFAS (some are more harmful than others) and its concentration. If concentrations are low, breastfeeding is in any case recommended.¹¹

Second, it is well known that breastmilk and breastfeeding are beneficial to health, nutrition, growth, and development. In most cases, these benefits will be higher than any harm caused by PFAS. Once again, it will depend on the type of PFAS and its concentration in breastmilk. At very high concentrations, such as those found in a minority of mothers in the already mentioned area of Northeastern Italy, it may be advisable to avoid or interrupt breastfeeding and turn to formula feeding. In all the other cases breastfeeding continues to be the right choice, especially for its positive effects on the immune system.¹²

Third, most formulae are cow milk-based. Before switching to formula feeding, it would be wise to ensure that formula is PFAS-free. Also, powder formula needs to be reconstituted with water, and if drinking water contains PFAS we are back to square zero.¹³ The alternative may be to use bottled

⁹ Biggeri A et al. All-cause, cardiovascular disease and cancer mortality in the population of a large Italian area contaminated by perfluoroalkyl and polyfluoroalkyl substances (1980–2018). *Environmental Health* 2024;42 <https://ehjournal.biomedcentral.com/articles/10.1186/s12940-024-01074-2>

¹⁰ Giglioli S, Colombo L, Azzellino A. Cluster and multivariate analysis to study the diffuse contamination of emerging per- and polyfluoroalkyl substances (PFAS) in the Veneto Region plain (North-eastern Italy). *Chemosphere* 2023; <https://doi.org/10.1016/j.chemosphere.2023.137916>

¹¹ WHO Regional Office for Europe. Keeping our water clean: the case of water contamination in the Veneto Region, Italy. WHO, Copenhagen, 2017 <https://www.who.int/europe/publications/i/item/9789289052467>

¹² <https://www.gifa.org/wp-content/uploads/2023/05/IBFAN2023-Breastfeeding-and-Immune-system.pdf>

¹³ LaKind JS et al. Per- and polyfluoroalkyl substances (PFAS) in breast milk and infant formula: A global issue. *Environmental Research* 2023; <https://doi.org/10.1016/j.envres.2022.115042>

water; but unfortunately, this may also contain PFAS.¹⁴¹⁵ Note that well-known manufacturers of formula, who are engaged in the production of bottled water, are accused of practices to keep hiding the low quality of their water sources for years.¹⁶ In addition, at around six months of age infants will be introduced to complementary foods and drinking water. If these foods and waters are the same that led mothers to have PFAS in their blood, womb and breastmilk, avoiding breastfeeding in the first six months of life will have little effect.

The solution

As already mentioned, when a PFAS is shown to cause harm to people, it may be banned. Unfortunately, bans of single PFAS are only partly effective, because the banned molecules are quickly replaced by new ones and it will take years before the harmful effect of the new molecules are detected. The final solution would be a total ban of all PFAS (Figure 3), as advocated by a network of 138 civil society organizations in Europe.¹⁷ However, this would mean a total change in our way of life: the way we prepare food, the cookware we use, the furniture and garments we buy, etc. In summary, most industrial processes would need to be changed if it becomes impossible to use PFAS.



Figure 3. Several European associations rallied in front of the European Commission headquarters in Brussels on January 29, 2025, to call for a ban on PFAS.

¹⁴ <https://pubs.acs.org/doi/10.1021/acsestwater.4c00533>

¹⁵ <https://www.pan-europe.info/resources/briefings/2024/12/tfa-%E2%80%98forever-chemical%E2%80%99-european-mineral-waters>

¹⁶ https://www.francetvinfo.fr/enquetes-franceinfo/enquete-franceinfo-plusieurs-producteurs-d-eau-en-bouteille-ont-filtre-illegalement-leur-eau-pour-masquer-une-contamination_6333046.html

¹⁷ <https://banpfasmanifesto.org/en/>

A total ban of PFAS may also be ineffective if the chemical industry devised non-PFAS chemicals to replace PFAS. There is no guarantee that the new non-PFAS chemicals with PFAS properties would be safe. History tells us that the harms of any chemical become visible only ages after the new product is introduced in our environment.

Meanwhile, corporate lobbies “are targeting the European Commission to protect their PFAS substances, products, equipment, and profits, despite the overwhelming evidence of the disastrous human health and environmental consequences of the pollution that they cause.”¹⁸ To protect all human and non-human bodies, and the environment in which they live, we should not allow these corporate interests to prevail.

¹⁸ Corporate Europe Observatory. Chemical reaction: Inside the corporate fight against the EU’s PFAS restriction. 2025 <https://corporateeurope.org/en/2025/01/corporate-fight-against-pfas-restriction>