

### Title

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Breastfeeding as an Exposure Pathway for Perfluorinated Alkylates

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### Abstract

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#### *Background*

Perfluorinated alkylated substances (PFASs) are a widely used large group of chemicals resulting in worldwide human exposures. PFASs have many valuable properties including resistance to fire and the ability to repel oil, grease, stain, and water. PFASs are used in many industrial settings to produce a wide range of household products such as: nonstick pans, paints, and breathable clothing. PFASs, which can accumulate and persist in the bodies of exposed individuals for several years, can lead to adverse health consequences including: low birth weight, delayed puberty, elevated cholesterol levels, and reduced immunologic responses to vaccinations<sup>1</sup>. The U.S. Environmental Protection Agency's Science Advisory Panel deemed at least one class of PFASs, PFOA, a "likely" human carcinogen in 2006. PFASs occur in breast milk, but previous studies of children's exposure to PFASs had not closely examined breastfeeding as an exposure pathway.

#### *Objective*

To determine whether breastfeeding serves as a dominant exposure pathway of five major PFASs in young children.

#### *Methods*

A birth cohort of 656 children born in the Faroe Islands was formed during 1997–2000 and followed and observed for several years. Prenatal exposure for each participant was assessed from the mother's blood serum-PFAS concentrations at pregnancy week 32. To determine the time-dependent impact of the breastmilk exposure pathway, blood samples were taken from the children at ages 11, 18, and 60 months, and the serum concentrations of five major PFASs were assessed: perfluorohexanesulfonate (PFHxS), perfluorooctanoate (PFOA), perfluorooctanesulfonate (PFOS), perfluorononanoate (PFNA), and perfluorodecanoate (PFDA).

#### *Results*

The duration of exclusive breastfeeding was associated with increases of most PFAS concentrations in children by up to 30% per month, with lower increases during partial breastfeeding. In contrast to this main observed pattern, concentrations of one PFAS, PFHxS, was not affected by breastfeeding. After cessation of breastfeeding, all serum concentrations decreased.

#### *Conclusion*

The findings from this study support the evidence that breastfeeding is an important exposure pathway for some PFASs in young children.

### Policy Implications

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Breastfeeding has many documented health benefits for both the mother and child, and public health experts such as the World Health Organization (WHO) agree that it is the preferred, exclusive feeding method for infants under 6 months of age. Mothers concerned about the possibility of passing harmful chemicals to their children via breastfeeding should consult with their physicians before determining a course of action.

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<sup>1</sup> Perfluorinated Chemical (PFC) Research. (2015, October 26). Accessed on January 13, 2016, from <http://www.epa.gov/chemical-research/perfluorinated-chemical-pfc-research>

EPA has not yet established legal limits for PFOS or PFOA, citing a need for more research on human health effects of exposure. However, Minnesota, New Jersey, and North Carolina have established guidelines and limits for the compounds' concentration in drinking water at the state level. In the absence of regulations, EPA's Office of Water established provisional health advisories for PFOS and PFOA in 2009, and EPA Region 4 recommended residential soil screening levels.

Pregnant and lactating women may be exposed to PFASs in the workplace, but the Occupational Safety and Health Administration (OSHA) has not established limits for workplace exposure.

Certain PFASs can leach into food from food packaging. Last month the Food and Drug Administration issued a new rule to ban the use of 3 PFAS-related compounds in food packaging, specifically for use as oil and water repellants for paper and paperboard for use in contact with aqueous and fatty foods. This action is in response to a petition filed in October 2014 by leading environmental and public health advocates including the Children's Environmental Health Network (CEHN).

In 2006, the U.S. Environmental Protection Agency (EPA), along with the eight major fluoropolymer and telomer manufacturers launched the voluntary 2010/15 PFOA Stewardship program. These companies committed to work toward elimination of PFOA, precursor chemicals, and related chemicals from emissions and products by 2015. Progress reports (as of 2014) for the companies can be found here: <http://www.epa.gov/oppt/pfoa/pubs/stewardship/>. A final status update is needed, as well as an action plan for companies to fully achieve this elimination if the 2015 goal has not been met.

It is important that EPA continue to evaluate PFAS alternatives under its New Chemicals Program. The replacement chemicals (which are very similar to PFOA and PFOS) marketed by the Stewardship program's participating companies should be thoroughly tested for human health effects, especially for effects on the most vulnerable populations. For more information on alternatives to PFASs, visit <http://www.epa.gov/assessing-and-managing-chemicals-under-tsca>.

Continued research (such as that highlighted in this article) on breastmilk as a potential pathway for exposure to harmful chemicals is important in understanding cumulative exposure and risk in pediatric environmental health.

## Reference

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Article available in [Environmental Science and Technology](#).

## Keyword(s)

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[Breastfeeding](#), [Perfluorinated alkylated substances](#)