Newer PFAS Have Many of the Same Problems as Old

There is general agreement, even from the chemical industry, that older PFAS chemicals, typified by PFOA and PFOS, are dangerous to health and the environment. However, some of the same companies that promoted these older chemicals claim newer PFAS do not warrant concern. This claim does not hold up to scrutiny.

The industry refers to the older compounds as "long-chain," a reference to the number of carbon atoms forming their backbone. Following increased scientific and regulatory attention to the hazards posed by them, the industry shifted to "short-chain" compounds with fewer carbon atoms.

Older "Long-Chain" PFAS	Newer "Short-Chain" PFAS
Persistent – the carbon-fluorine bond which helps define the chemistry is extremely strong; natural and biological systems can't break it down.	**Persistent** – the same carbon-fluorine bond is a central feature, and the new chemicals are similarly persistent.[1]
The newer formulations don't change one of the most concerning facts of PFAS chemistry: these chemicals are so difficult to breakdown or destroy, they become a nearly permanent part of the environment once released.	
Builds up in tissue - biological systems, including humans, have a hard time excreting or removing these chemicals. They have a very long half-life in the human body.	**Builds up in tissue -** the shorter chains are excreted more rapidly, but still have a relatively long half-life.[2] FDA's scientists recently identified longer human biopersistence of some short chains.[3]
There remain strong concerns for bioaccumulation and build-up in tissue, especially as research continues to find short-chain PFAS chemicals appearing in different tissues, including in the brains of animals.[4]	
Mobile in the Environment - The movement of some long-chain PFAS through soil as well as by air and water transport is well established.[5] This results in ground water contamination, and PFAS has been found in remote corners of the globe.[6]	**More Mobile in the Environment** – The lighter molecules of the newer PFAS are, in many cases, more mobile when introduced to the environment.[7] Many are also more difficult to filter out of water.[8]
The newer PFAS have the potential to disperse more rapidly in the environment, and many are more difficult to remove from drinking water using widely available treatments such as activated charcoal that are effective on the older PFAS.	

Older "Long-Chain" PFAS	Newer "Short-Chain" PFAS
Approved by the FDA - The FDA approved many long-chain PFAS as food contact materials. As safety concerns intensified, the FDA agreed to let industry use up their supply and promise to stop making them. They have never formally withdrew approval.	**Approved by the FDA** - The same minimal process to approve the long-chains that didn't flag significant health concerns resulted in FDA approval of short-chains.
FDA's approval process for food contact materials relies heavily on review of industry submitted data and does not require collection of data necessary to identify subtle health outcomes, particularly for endocrine disruption or reproductive effects. The PFAS industry has been caught withholding data from the agency.[9]	
Health Impacts Well Studied – Independent researchers have documented health impacts, including increased cholesterol, kidney and testicular cancers, and potential learning and behavioral impacts in children.	**Health Impacts Emerging** – Years of study will be needed to catch up to the level of detail of the older PFAS. Animal and *in vitro* studies of several short-chain show similar hazards as the long-chain counterparts.[10]
Decades of research has shown the health and environmental impacts of the older PFAS. Newer ones have not yet been subject to this scrutiny, but researchers are highlighting similarities. Over 200 scientists signed onto a statement calling for restrictions on the production and use of PFAS.[11]	

[1] Brendel, et al. "Short-chain perfluoroalkyl acids: environmental concerns and a regulatory strategy under REACH." Environ Sci Eur. 2018; 30(1): 9.

[2] *Ibid.*

[3] Kabadi, et al. "Internal exposure-based pharmacokinetic evaluation of potential for biopersistence of 6:2 fluorotelomer alcohol (FTOH) and its metabolites." Food and Chemical Toxicology 112 (2018) 375–382.

[4] Burkemper et al., "Radiosynthesis and Biological Distribution of 18F-Labeled Perfluorinated Alkyl Substances." Environ. Sci. Technol. Lett., 2017, 4 (6), pp 211–215

[5] Summarized in Chapter 5: Agency for Toxic Substances and Disease Registry (ATSDR). 2018. Toxicological profile for Perfluoroalkyls. (Draft for Public Comment). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[6] Wong, et al. "Assessing temporal trends and source regions of per- and polyfluoroalkyl substances (PFASs) in air under the Arctic Monitoring and Assessment Programme (AMAP)." Atmospheric Environment 172 (2018): 65-73.

[7] Kotthoff, M & M Bücking. "Four Chemical Trends Will Shape the Next Decade's Directions in Perfluoroalkyl and Polyfluoroalkyl Substances Research." Front Chem. 2018; 6: 103.

[8] US EPA. "Reducing PFAS in Drinking Water with Treatment Technologies." 2018.

[9] Neltner, TG & Maricel Maffini. "FDA-approved PFAS: A serious breakdown in assessing food additive safety." Environmental Defense Fund. 2018.

[10] Gormis, et al. "Comparing the toxic potency in vivo of long-chain perfluoroalkyl acids and fluorinated alternatives." Environ. Int. 113 (2018): 1-9.
Rosenmai, et al. "Fluorinated alkyl substances and technical mixtures used in food paper-packaging exhibit endocrine-related activity in vitro." Andrology. 2016 Jul;4(4):662-72

[11] Blum, et al. "The Madrid Statement on Poly- and Perfluoroalkyl Substances (PFASs)." Environ. Health Perspect. 123.5 (2015): A107-A111.