PUBLIC EMPLOYEES FOR ENVIRONMENTAL RESPONSIBILITY
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PFAS Fact Sheet
Public Employees for Environmental Responsibility (PEER)
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What are PFAS?

"PFAS" refer to a family of human-made chemicals called per- and polyfluoroalkyl substances. PFAS have an incredibly strong carbon-fluorine bond that forms the backbone of each molecule, and the chemicals have valuable heat, stain, and water resistance qualities. Because of this strong carbon-fluorine bond, PFAS do not easily break down in the environment and are called "forever chemicals."

The U.S. Environmental Protection Agency's (EPA's) inventory[1] shows there are currently 9,252 PFAS. Perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) are termed "C8" or "long-chain" PFAS due to their eight carbon atoms. PFOA and PFOS were voluntarily phased out of production by major manufacturers in the U.S. between 2002 and 2015; however, importation and use of these chemicals continued.[2] During this time, the chemical industry began moving to "short-chain" alternatives, based on six or fewer linked carbon atoms. These short-chain PFAS are being used more frequently by industry.

How are PFAS used?

PFAS are used as non-stick coatings, firefighting foams, stain and water protection for fabrics, and protective coatings;[3] more recently, they have been used in food packaging, cosmetics, medical devices, and other commercial products, like artificial turf.

Are PFAS toxic?

PFAS are associated with a variety of ailments, including suppressed immune function, thyroid disease, testicular and kidney disease, cancers, and liver damage. There have been numerous studies on the toxicity of the older PFAS, such as PFOS and PFOA, but far fewer studies on the newer generation PFAS.[4] As scientists study these newer short-chain PFAS, they are finding that all have similar toxicology to long chain PFAS.[5]

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[1] https://comptox.epa.gov/dashboard/chemical_lists/pfasmaster
[2] https://www.epa.gov/sites/production/files/2017-12/documents/ffrrofactsheet_contaminants_pfos_pfoa_11-20-17_508_0.pdf
[3] https://pfas-1.itrcweb.org/fact_sheets_page/PFAS_Fact_Sheet_History_and_Use_April2020.pdf
[4] http://www.c8sciencepanel.org/publications.html
[5] https://cen.acs.org/environment/persistent-pollutants/Short-chain-long-chain-PFAS/97/i33

How are humans and wildlife exposed to PFAS?

Humans and wildlife are exposed to PFAS through three exposure pathways: ingestion, inhalation, and dermal absorption. PFAS enter the environment through the production and use of PFAS, and through waste streams. Because PFAS do not easily break down in the environment, and there are no production, use and waste standards in the United States, PFAS eventually accumulate in our food chain and blood stream.

How widespread is PFAS contamination?

PFAS are found virtually everywhere on earth.[6] A recent peer-reviewed study estimates that more than 200 million Americans could have these toxic fluorinated chemicals in their drinking water at a concentration of 1 part per trillion (ppt) or more,[7] a level that some scientists recommend as a safe level for PFAS in drinking water.[8]

Can you test for PFAS in water and food?

Most laboratories are only able to test for approximately 40 specific PFAS. It is possible to test water or solids for total organic fluorine, and a high result will be *indicative* of PFAS, but not determinative.[9]

Are PFAS regulated in the United States?

The EPA does not regulate PFAS. Instead, EPA issued a Lifetime Health Advisory (LHA) of 70 ppt for two PFAS - PFOA and PFOS – in drinking water. Because EPA has failed to regulate any of these toxic chemicals, states are filling the void by issuing regulatory limits on various PFAS in drinking water, groundwater, and soils.[10] Five European Union Member States have proposed to ban all but essential uses of PFAS and continue setting strict standards for PFAS in drinking water and the environment.[11] In addition, in the European Union, two standards currently regulate PFAS that come into contact with food,[12] and limit PFAS in food itself.[13]

Many scientists are calling for all PFAS to be regulated as a class of chemicals.[14] When PEER reports PFAS levels in water, fish, or a commercial product, we assume that all are similarly

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[6] https://www.sciencedaily.com/releases/2020/07/200729114838.htm
[7] https://pubs.acs.org/doi/10.1021/acs.estlett.0c00713
[8] https://www.ewg.org/research/ewg-proposes-pfas-standards-fully-protect-children-s-health
[9] See https://www.greenscreenchemicals.org/certified/fff-standard, which states " PFAS-free is defined as zero intentionally added PFAS to the product and PFAS contamination in the product must be less than 0.0001 percent by weight of the product (1 part per million) total organic fluorine as measured by combustion ion chromatography."
[10] https://www.asdwa.org/pfas/
[11] https://www.rivm.nl/qas-pfas-restriction-proposal; https://www.reach-clp-biozid-helpdesk.de/SharedDocs/Meldungen/DE/REACH/2020-05-08-RMOA-PFAS.html
[12] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:338:0004:0017:en:PDF
[13] https://www.efsa.europa.eu/en/news/pfas-food-efsa-assesses-risks-and-sets-tolerable-intake; https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2020.6223

[14] https://pubs.acs.org/doi/full/10.1021/acs.estlett.0c00255

toxic rather than solely reporting levels of PFAS regulated by EPA or any particular state. PEER believes that the precautionary principle - taking preventative action in the face of scientific uncertainty - is warranted given the potential public health consequences of PFAS contamination.[15]

What Do We Know About PFAS in Pesticides?

Pesticides include insecticides, herbicides, fungicides, and rodenticides. Some pesticides are known to include PFAS, either as active ingredients or as "inert" ingredients.[16] "Inert" ingredients are "any substance (or group of similar substances) other than an active ingredient that is intentionally included in a pesticide product. Examples of inert ingredients include emulsifiers, solvents, carriers, aerosol propellants, fragrances and dyes."[17] PEER has also found several instances where companies sought or obtained patents for the use of PFAS in both herbicides and insecticides.[18] The Federal Insecticide Fungicide and Rodenticide Act (FIFRA) generally prevents the disclosure by EPA of inert ingredients in pesticides as "trade secrets."[19]

PFAS are useful in pesticides as surfactants, dispersants, preservatives, and anti-foaming agents. EPA's "InertFinder" lists several PFAS as approved inerts for pesticides (see Figure 1).[20] Note that the second PFAS on this list is actually a group of PFAS, and not just one compound. Therefore, it is possible that a number of pesticides contain PFAS.

Figure 1

NF Nonfood Use Only

CAS Reg. No.	Ingredient
-	Perfluoroalkylsulfonate,quaternary salt
-	2-{Methyl[(perfluoroalkyl)alkyl(C2-C8)sulfonyl]amino}alkyl(C2-C8)acrylate-alkyl(C2-C8)methacrylates-N-methylolacrylamide copolymer

What do we know about PFAS in Anvil 10+10?

This fall, PEER conducted several tests for PFAS of a 2.5 gallon jug of Anvil 10+10, the pesticide used in the aerial spraying programs of Massachusetts and many other states.[21] Our tests revealed that Anvil 10+10 contains roughly 250 ppt of PFOA, and 260 – 500 ppt of

[15] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1446778/
[16] https://www.sciencedirect.com/science/article/pii/S2589004220306593
[17] https://www.epa.gov/pesticide-registration/inert-ingredients-overview-and-guidance
[18] See one example of a patent: https://patents.google.com/patent/US9695117B2/en
[19] 7 USC § 136h
[20] https://iaspub.epa.gov/apex/pesticides/f?p=INERTFINDER:2:::::: (accessed on November 18, 2020)
[21] At least 28 states have sprayed Anvil 10+10, most within the past two years.

hexafluoropropylene oxide dimer acid (HFPO-DA), a "GenX" replacement for PFOA. Both these results are hovering around the detection limits of the laboratory's equipment, but there is no doubt that these PFAS are in the insecticide that was tested. In fact, after PEER alerted Massachusetts Department of Environmental Protection (MADEP) to its results, MADEP independently tested nine samples of Anvil 10+10 from five different containers, and found eight different PFAS, including PFOA and PFOS. Some PFAS levels were over 700 ppt. Other PFAS levels were - consistent with PEER's analyses - hovering around the detection limits.

It is unclear whether the PFAS found in Anvil 10+10 is an ingredient added by the manufacturer, contained in one of the ingredients supplied to Anvil's manufacturer by other companies, or whether it is a contaminant from the manufacturing/storage process. Moreover, since we were only able to test for 36 PFAS, it is impossible to know how many other PFAS might be in Anvil 10+10.

PFAS are not listed as active ingredients in Anvil 10+10.

The difficulty with testing for PFAS in pesticides. It is difficult to test pesticides for PFAS, and although we cannot determine the *precise* amounts of PFAS in Anvil 10+10, we do know that PFAS is in the formulation we tested. The Method Detection Limit (MDL) for PFAS in pesticides is often high (in our case, the MDL is 250 ppt). Given the extreme toxicity of PFAS in incredibly small doses, any amount in pesticides is of concern. Some scientists believe that the safety limit for PFOA should be 0.1 ppt,[22] a much lower threshold than that recommended by EPA or the Commonwealth of Massachusetts.[23] In addition, it is important to note that because we only tested for 36 individual PFAS, it is possible that other PFAS exist in pesticide formulations that we simply cannot measure.

PFAS in pesticides is likely contributing to contamination in Massachusetts and elsewhere. PEER has not run tests to determine the amount of PFAS from pesticides entering our ecosystem, nor should it be our burden to do so. Given that PFAS from biosolids enters soil, groundwater, and is taken up by crops,[24] PFAS sprayed on land and vegetation will likely enter groundwater and surface waters. Given the widespread aerial and ground spraying conducted in Massachusetts, the potential for PFAS from Anvil 10+10 reaching our waters is high.[25] Massachusetts and other states are spending vast amounts of money to test and filter water contaminated with PFAS, and it is counter-intuitive to simultaneously spray the state with pesticides containing PFAS.

[22] https://theintercept.com/2019/06/18/pfoa-pfas-teflon-epa-limit/
[23] The EPA has a Life Time Health Advisory of 70 ppt for PFOA and PFOS. Massachusetts has a Maximun Contaminant Level of 20 ppt for PFOA and five other PFAS.
[24] https://www.mi-wea.org/docs/4_Schilling-PFAS_Fate_and_Plant_Uptake_from_Biosolids_Ammended_soil.pdf
[25] For example, in 2019, Massachusetts aerially sprayed 2.2 million acres with Anvil 10+10, and used even more in truck-based sprays throughout the state.