

# ISSUE BRIEF



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## Per- and Polyfluoroalkyl Substances (PFAS)

### Introduction

The common path to exposure to per- and polyfluoroalkyl substances (PFAS) is from drinking water that was contaminated by firefighting foam or industrial facilities; or through contact with consumer products that contain PFAS such as food packaging, carpeting or personal care products. Subtitle D municipal solid waste landfills may contain low levels of PFAS, depending upon receipt of common household products. Landfill leachate is collected and treated, often at a wastewater treatment plant, prior to discharge. Moreover, PFAS mass from leachate represents a relatively minor proportion of the influent at most wastewater treatment plants (MWRA 2019).

### General information about PFAS

PFAS are a group of man-made chemicals that includes Perfluorooctanoic acid (PFOA), Perfluorooctanesulfonic acid (PFOS), GenX, and many other chemicals. Since the 1940s, PFAS have been used in a variety of industries and products. PFOA and PFOS have been the most extensively produced and studied of these chemicals.

Certain PFAS chemicals are no longer manufactured in the United States. This includes PFOA and PFOS, the two most researched compounds. However, they are still produced internationally and are imported into the United States in consumer goods such as carpet, leather and apparel, textiles, paper and packaging, coatings, rubber and plastics.

We are all exposed to PFAS in our daily lives through indoor dust, consumption of food or water, and through use of consumer products like soap, toothpaste and dental floss; stain-resistant upholstery cleaners and furniture; and clothing like rain jackets and polyester shirts. Some studies have shown that more than 95% of tested adults have detectable PFAS concentrations in their blood due to the widespread use of these chemicals in our lives. Based on data collected by the Agency for Toxic Substances and Disease Registry (ATSDR), levels of PFOA and PFOS are generally decreasing in the blood of the general population over time (ATSDR 2018).

Consistent with the ATSDR study, the American Red Cross found that PFAS in plasma declined by 88% (PFOS) and

77% (PFOA) between when measurements were first taken in 2000-2001 and last taken in 2015 (Olsen 2017).

### Where do PFAS come from?

Landfill operators generally do not utilize PFAS in their operations, but may receive them in the form of discarded everyday products such as cosmetics, food packaging, carpeting, outdoor clothing, paper products as well as many other commonly utilized residential, commercial and industrial products. According to the ATSDR, the following consumer products, among many others, can be sources of PFAS (ATSDR 2018):

- Some grease-resistant paper, fast food wrappers, microwave popcorn bags, pizza boxes, and candy wrappers
- Nonstick cookware such as coated pots and pans
- Stain- and water-resistant coatings
- Water resistant clothing
- Cleaning products
- Personal care products including some shampoo, dental floss and cosmetics
- Paints, varnishes and sealants

**EPA established a drinking water health advisory in 2016 for PFOA and PFOS of 70 parts per trillion (ppt), individually or combined. The health advisory is not an enforceable standard, is applicable only to water used for drinking and is based upon conservative assumptions. These advisories are to be used as guidance values considered protective of the most sensitive parts of the public. What is one part per trillion?**

1 ppt = 1 second in 31,700 years

OR

1 ppt = 1 drop of water in 20 Olympic-sized pools

OR

1 ppt = 6 inches in the distance from here to the sun



### What concentration levels can be found in common items?

- Foundation cosmetic: up to 2,370,000 ppt PFOA (Denmark 2018)
- Pork liver in Taiwan: up to 283,000 ppt PFOA (Chen 2018)
- Dust in indoor air: 142,000 ppt PFOA median (Strynar & Lindstrom 2008)
- Household food waste: 6,000 ppt mean for total PFAS mean (Brändli 2007)
- Outdoor textiles: up to 41,000 ppt PFOA (Kotthoff 2015)
- Ski waxes: up to 2,000,000 ppt PFOA (Kotthoff 2015)

### Are PFAS in landfills?

PFAS are commonly used in the many different products we encounter in our daily lives mentioned above, which then get thrown away and ultimately end up in landfills. PFAS may then appear in landfill leachate because they filter out of the deposited waste materials as they naturally degrade. As indicated above, landfill leachate is collected and treated to remove contaminants.

Fortunately, PFOA and PFOS, the most concerning and most-researched PFAS, have been phased out of products manufactured in the US, reducing potential risk. Such source reduction is the most efficient action to reduce risk.

However, products manufactured outside of the US continue to contain PFAS and will continue to be landfilled at the end of their use absent import restrictions.

### If landfills are not a source of exposure to PFAS, what are the main exposure pathways?

According to the ATSDR, the main sources of PFAS exposure for the general population are the following:

- Drinking contaminated water with PFAS
- Eating food contaminated with PFAS
- Food packaged in materials containing PFAS (e.g., pizza boxes, fast food containers, popcorn bags). However, the ATSDR states that PFAS compounds have recently been phased out of most food packaging materials
- Hand-to-mouth transfer from PFAS treated surfaces such as carpets, which is particularly significant for toddlers and infants

Other exposure can occur from breathing air that has dust contaminated with PFAS. The dust could be from soil, carpeting, upholstery, clothing etc. Most sites under investigation by ATSDR for drinking water contamination are the result of proximity to PFAS production facilities or areas where aqueous film forming foam (AFFF) or firefighting foam was regularly used (ATSDR 2019) such as military bases, fire training areas, and airports.

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