Basic Information on PFAS

What are PFAS?

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that includes PFOA, PFOS, and many other chemicals. PFAS have been manufactured and used in a variety of industries around the globe, including in the United States since the 1940s. PFOA and PFOS have been the most extensively produced and studied of these chemicals. Both chemicals are very persistent in the environment and in the human body – meaning they don't break down and they can accumulate over time. There is evidence that exposure to PFAS can lead to adverse human health effects.

PFAS can be found in:

- **Food** packaged in PFAS-containing materials, processed with equipment that used PFAS, or grown in PFAS-contaminated soil or water.
- **Commercial household products**, including stain- and water-repellent fabrics, nonstick products (e.g., Teflon), polishes, waxes, paints, cleaning products, and fire-fighting foams (a major source of groundwater contamination at airports and military bases where firefighting training occurs).
- **Workplace**, including production facilities or industries (e.g., chrome plating, electronics manufacturing or oil recovery) that use PFAS.
- **Drinking water**, typically localized and associated with a specific facility (e.g., manufacturer, landfill, wastewater treatment plant, firefighter training facility).
- **Living organisms**, including fish, animals and humans, where PFAS have the ability to build up and persist over time.

How are people exposed to PFAS?

There are a variety of ways that people can be exposed to these chemicals and at different levels of exposure. For example, people can be exposed to low levels of PFAS through *food*, which can become contaminated through:

- Contaminated soil and water used to grow the food,
- Food packaging containing PFAS, and
- Equipment that used PFAS during food processing.

Are there health effects from PFAS?

There is evidence that exposure to PFAS can lead to adverse health outcomes in humans. If humans, or animals, ingest PFAS (by eating or drinking food or water than contain PFAS), the PFAS are absorbed, and can accumulate in the body. PFAS stay in the human body for long periods of time. As a result, as people get exposed to PFAS from different sources over time, the level of PFAS in their bodies may increase to the point where they suffer from adverse health effects.

Are there health effects from PFAS? (con't)

Studies indicate that PFOS can cause reproductive and developmental, liver and kidney, and immunological effects in laboratory animals. Both chemicals have caused tumors in animal studies. The most consistent findings from human epidemiology studies are increased cholesterol levels among exposed populations, with more limited findings related to:

- infant birth weights,
- effects on the immune system, and
- thyroid hormone disruption.

Summary of the Analysis of Per/Polyfluoroalkyl Substances in Water

Introduction

The analysis of per/polyfluoroalkyl substances (PFASs) or perfluorinated compounds (PFCs), in particular the perfluorinated alkyl acids (PFAAs), is currently a hot topic in water analysis. The unique chemical properties of these compounds make them components used in a variety of applications such as nonstick cookware, fire resistant clothing, fire-fighting foams, and others. However, these compounds are considered toxic, persistent, and bioaccumulative in wildlife and the environment. Consequently, the United States Environmental Protection Agency (USEPA) has recently issued drinking water health advisories for two PFASs, perfluorooctanoic acid (PFOA) and perfluorosulfonic acid (PFOS) at 70ng/L (combined). Several states such as New Jersey, New York, and North Carolina already have public health guideline values varying from 20–400ng/L for several PFAS including PFOA, PFOS, perfluorohexanoic acid (PFHxA), and perfluorononanoic acid (PFNA) in water. USEPA Method 537 highlights a method for the analysis of 14 PFASs in drinking water with solid phase extraction (SPE) and LC/MS/MS. However, several other classes of PFASs are also currently in use and need to be monitored in the environment. This application note describes the analysis of 30 PFASs in eight different classes, including all 14 PFASs in EPA Method 537.

Background contamination

System contamination can be a major hurdle in PFAS analysis. For this work, a delay column was installed after the mixing valve, and before the autosampler to trap PFASs in the pump system**.** **Another major source of contamination came from the PTFE septa, more specifically, pierced septa. To resolve this issue, and avoid possible problems with PFAS adherence to glass vials, polyethylene or polypropylene vials and caps were used.**