

Per- and Polyfluoroalkyl Substances in Human Serum and Urine Samples from a Residentially Exposed Community

Rachel Rogers Worley (Agency for Toxic Substance and Disease Registry, Atlanta, GA, USA and University of Georgia, Athens, GA, USA)
Susan McAfee Moore and Bruce C. Tierney (Agency for Toxic Substance and Disease Registry, Atlanta, GA, USA)
Xiaoyun Ye and Antonia M. Calafat (National Center for Environmental Health, Atlanta, GA, USA)
Sean Campbell and Million B. Woudneh (AXYS Analytical, Sidney, BC, Canada)
Jeffrey Fisher (University of Georgia, Athens, GA, USA and National Center for Toxicological Research, Jefferson, AR, USA)

Background/ Objectives. In 2007, a per- and polyfluoroalkyl substances (PFAS) manufacturer near Decatur, Alabama notified the United States Environmental Protection Agency (EPA) that it had discharged PFAS into a wastewater treatment plant, resulting in contamination of the drinking water supply. The affected municipal water authority has recently taken steps to reduce PFAS concentrations in drinking water; however, all biological sampling was conducted prior to exposure mitigation.

To characterize PFAS serum concentrations over time, the Agency for Toxic Substances and Disease Registry (ATSDR) collected biological samples from local residents.

Approach/Activities. Eight PFAS were measured in serum in 2010 ($n=153$). Eleven PFAS were measured in serum, and five PFAS were measured in urine ($n=45$) from some of the same residents in 2016. Serum concentrations were compared to nationally representative data, and change in serum concentration over time was evaluated. Biological half-lives were estimated for perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), and perfluorohexane sulfonic acid (PFHxS) using a one-compartment model.

Results/Lessons Learned. In 2010 and 2016, geometric mean PFOA and PFOS serum concentrations were elevated in participants compared to concentrations in the general U.S. population as reported in the National Health and Nutrition Examination Survey (NHANES). In 2016, the geometric mean PFHxS serum concentration was elevated compared to the general U.S. population. Geometric mean serum concentrations of PFOA, PFOS, and perfluorononanoic acid (PFNA) were significantly lower (49%, 53%, and 58%, respectively) in 2016 compared to 2010. Half-lives for PFOA, PFOS, and PFHxS were estimated to be 3.9, 3.3, and 15.5 years, respectively. Concentrations of PFOA in serum and urine were highly correlated ($r = 0.75$) in males, but not in females ($r = 0.35$).

Serum concentrations of PFOA, PFOS, and other PFAS are decreasing in this residentially exposed community but remain elevated compared to the U.S. general population. The observed decreases suggest that nation-wide efforts to reduce exposure to long-chain PFAS have resulted in declines in the environment and in some drinking water supplies.