

High levels of PFOA found in mid-Ohio River Valley residents from 1991 to 2013

May 26 2017

New research from the University of Cincinnati (UC) reveals that residents of the Mid-Ohio River Valley (from Evansville, Indiana, north to Huntington, West Virginia) had higher than normal levels of perfluorooctanoic acid (PFOA) based on blood samples collected over a 22-year span. The exposure source was likely from drinking water contaminated by industrial discharges upriver.

The study, appearing in the latest publication of *Environmental Pollution*, looked at levels of PFOA and 10 other per- and polyfluoroalkyl substances (PFAS) in 931 Mid-Ohio River Valley residents, testing blood serum samples collected between 1991 and 2013, to determine whether the Ohio River and Ohio River Aquifer were sources of exposure. This is the first study of PFOA serum concentrations in U.S. residents in the 1990s.

"These Mid-Ohio River Valley residents appear to have had concentrations of PFOA in their bloodstream at higher than average U.S. levels," says Susan Pinney, PhD, professor in the Department of Environmental Health at the UC College of Medicine, a member of both the Cincinnati Cancer Consortium and UC Cancer Institute and senior author of the study.

Ohio River PFOA concentrations downstream were elevated, suggesting Mid-Ohio River Valley residents were exposed through drinking water, primarily contaminated by industrial discharges as far as 666 kilometers (413 miles) upstream. Industrial discharges of PFOA to the Ohio River,

contaminating water systems near Parkersburg, West Virginia, were previously associated with nearby residents' serum PFOA concentrations above U.S. general population medians.

The article notes that use of granular activated carbon filtration (GAC) by [water treatment](#) facilities reduced PFOA exposure by as much as 60 percent.

"Where GAC has been used, the blood level concentration of PFOA was decreased significantly," says co-author Robert Herrick, a UC doctoral student in the Department of Environmental Health.

Nearly all of the samples tested positive for some level of PFOA (99.9%) but 47 percent of the samples had PFOA levels higher than the 95th national percentile.

The study additionally looked at information about municipal water distribution systems and the zones that were serviced by each of the [water treatment plants](#).

"We conducted statistical analyses to determine if factors such as location and years of residence, drinking water source and breast feeding were predictors of the person's serum PFC concentration," says Herrick.

PFCs have had wide consumer use and industrial applications. They are surfactants used in fire-fighting foams and in the manufacture of stain and water resistant coatings, on cookware, furniture and carpeting. PFOA, or C-8, can be found as a residual impurity in some paper coatings used on containers for processed food. As a byproduct of commercial production, PFCs/PFOA are released into the environment and, although no longer used in manufacturing in the U.S., are considered persistent in the environment.

Pinney points out that the primary concern with PFCs/PFOA is that they take a very long time to leave the human body, and studies indicate that exposure to PFOA and PFOS over certain levels may result in adverse health effects, including developmental effects, liver and tissue damage and immune and thyroid impacts.

"Because the elimination time could be several years, it is hard to determine what impact these environmental exposures may have on our health and children's health," says Pinney. "These data from the 1990s demonstrate that that the contaminants have been in our water a long time, at unchecked levels, before anyone was paying attention to it."

Pinney cites projects like this one as having the translational potential to make improvements in public health. "Studies like these provide evidence to support changes in [water](#) treatment practices." An earlier study looking at samples from girls and young women from Northern Kentucky showed that about half of the samples from the girls were much higher than the national average for U.S. children (the 95th percentile) concentration. The Northern Kentucky Water department has since then implemented the use of GAC at their plants to meet new federal regulations, and Cincinnati Water Works used the study's findings to check their treatment regulations and filtration usage.

More information: Robert L. Herrick et al, Polyfluoroalkyl substance exposure in the Mid-Ohio River Valley, 1991–2012, *Environmental Pollution* (2017). [DOI: 10.1016/j.envpol.2017.04.092](https://doi.org/10.1016/j.envpol.2017.04.092)

Provided by University of Cincinnati Academic Health Center

Citation: High levels of PFOA found in mid-Ohio River Valley residents from 1991 to 2013 (2017, May 26) retrieved 23 April 2024 from <https://phys.org/news/2017-05-high-pfoa-mid-ohio->

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