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September 6, 2019

Roxanne Chronert
Wisconsin Department of Natural Resources
NR Region Program Manager

Dear Ms. Chronert,

This letter is in response to the Wisconsin Department of Natural Resources (DNR) request for general information regarding how to avoid exposure if groundwater contaminated with per- and polyfluoroalkyl substances (PFAS) enter a home. It would be reasonable to expect water entering a home, specifically in areas within the Town of Peshtigo and City of Marinette where PFAS has been detected in shallow groundwater, that water entering the home would contain PFAS. **Overall, while we can't say that there is no exposure to PFAS, the expected exposure from floodwater is very low and this exposure is unlikely to harm residents' health. However, PFAS-containing water from groundwater flooding coming into a home is an additional source of PFAS exposure to the household and we recommend action is taken to reduce these exposures.**

We heard concerns from residents about several potential routes of exposure when PFAS-contaminated water entered a home from flooding: touching (dermal), swallowing (ingestion), and breathing the air (inhalation). Overall, the amount of PFAS that enters our bodies in these situations is relatively low.¹ The below information shares how people could come in contact with PFAS-contaminated water that enters their basement and general recommendations for reducing exposure.

Touching (dermal) exposure

In general, studies have shown that PFAS do not get into the body through the skin easily.^{2,3} Neither the EPA nor any other agency has established a reference dose or exposure concentration limit for foam specifically or for dermal contact with PFAS substances generally. All health advisories to-date are for the consumption of PFAS via contaminated water sources, and the Agency for Toxic Substances and Disease Registry (ATSDR)⁴ has stated that "studies have shown that only a small amount of PFAS can get into your body through your skin. Therefore, showering and bathing in water containing PFAS should not increase exposure. Washing dishes in water containing PFAS should not increase exposure." Applying this logic to the present scenario, touching PFAS-contaminated floodwaters should not increase a person's exposure.

Swallowing (ingestion) exposure

While it is possible that people can accidentally ingest a small amount of water while cleaning or wading through the water, the amount of ingested water would be very small compared to water ingested during activities involving greater submersion in water, such as swimming. The amount of water coming into the home would also affect the chance of unintentionally ingesting small amounts of water. Therefore, DHS

¹DHS estimated the total amount of PFAS exposure based on the available data that was taken from remaining standing water in a resident's basement. DHS applied a very conservative approach that considered the worst-case scenario that may overestimate the actual exposure. The evaluation result indicated that the PFAS residuals from standing water in the basement are unlikely to cause adverse health effects to the residents.

²<https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf>

³ITRC, *Fate and Transport*

⁴<https://www.atsdr.cdc.gov/pfas/pfas-exposure.html>, webpage last reviewed April 25, 2019.

recommends that people wear gloves when cleaning floodwaters to reduce accidentally getting the water on ones hands and then ingesting water.

Breathing (inhalation) exposure

Both PFOS and PFOA have a very low vapor pressure⁵ (0.002 mmHg for PFOS and 0.525 mmHg for PFOA at 25 °C), which indicates PFOS and PFOA are unlikely to volatilize into air while in an aqueous solution. When PFAS-contaminated water evaporates, there may be PFAS residue left on the floor, which could end up in the dust in the house. However, these PFAS residues are a small fraction of the overall amount of PFAS that is generally found in house dust. This is because PFAS have been used in various consumer products³ and studies have found that PFAS are present in every home with various ranges.⁶ People can take action to reduce their contact with PFAS through dust and hand-to-mouth activity by wearing gloves while cleaning.

Conclusions

Overall, these pathways (i.e. ways PFAS can enter our bodies) are low sources of exposure (i.e. contact). **DHS concludes that exposure to PFAS in standing waters through dermal contact, ingestion, or inhalation is unlikely to harm resident's health. However, action should be taken to reduce the additional exposure people are experiencing.**

It should be noted that because PFAS are prevalent in our environment, it is not reasonable to completely eliminate our exposure to PFAS from the other potential exposure pathways.

Recommendations

DHS recommends the following precautions to reduce exposure to PFAS-contaminated floodwaters entering homes.

- Reduce water entering people's homes due to potential health concerns of mold, bacteria, and additional PFAS exposure.
- Standing water should be cleaned up properly.
 - We recommend following DHS' guidelines on cleaning up after a flood, which include keeping children and pets out of the affected area, wearing protective equipment like rubber gloves and face mask, and removing items that cannot be cleaned or salvaged. You can find these guidelines on our website: <https://www.dhs.wisconsin.gov/flood/cleaning.htm>
- Any dust or residue from water that dries up should be cleaned following the same process.

If you have any questions regarding this, please contact me at 608-267-2949 or clara.jeong@dhs.wisconsin.gov.

Sincerely,



Clara Jeong, PhD
Toxicologist
Division of Public Health

cc: Dave Neste, DNR Project Manager

⁵ https://www.epa.gov/sites/production/files/2017-12/documents/ffrrofactsheet_contaminants_pfos_pfoa_11-20-17_508_0.pdf

⁶ <https://www.ncbi.nlm.nih.gov/pubmed/22542201>