COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF ALASKA FAIRBANKS
HCM-04952

PFAS contaminants in Alaska's water: A healthy homes concern

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Think of the many products and materials used in daily life that repel water. The water-repellent nature for many of these items are often derived from the application of synthetic chemicals. A common group of chemicals used for this purpose are called per- and polyfluoroalkyls (PFAS). Perfluorosulfonates (PFOS) and perfluorooctanoic acids (PFOA) are two PFAS derivatives commonly talked about in the news, though there are over 5,000 other derivatives of PFAS as well. They are made up of complex chemical chains of hydrogen, oxygen, carbon, fluorine and other chemicals. For decades, PFAS have been used in everything from food containers, water-repellent clothes, nonstick pans, cosmetics and fire retardants to cleaning products.

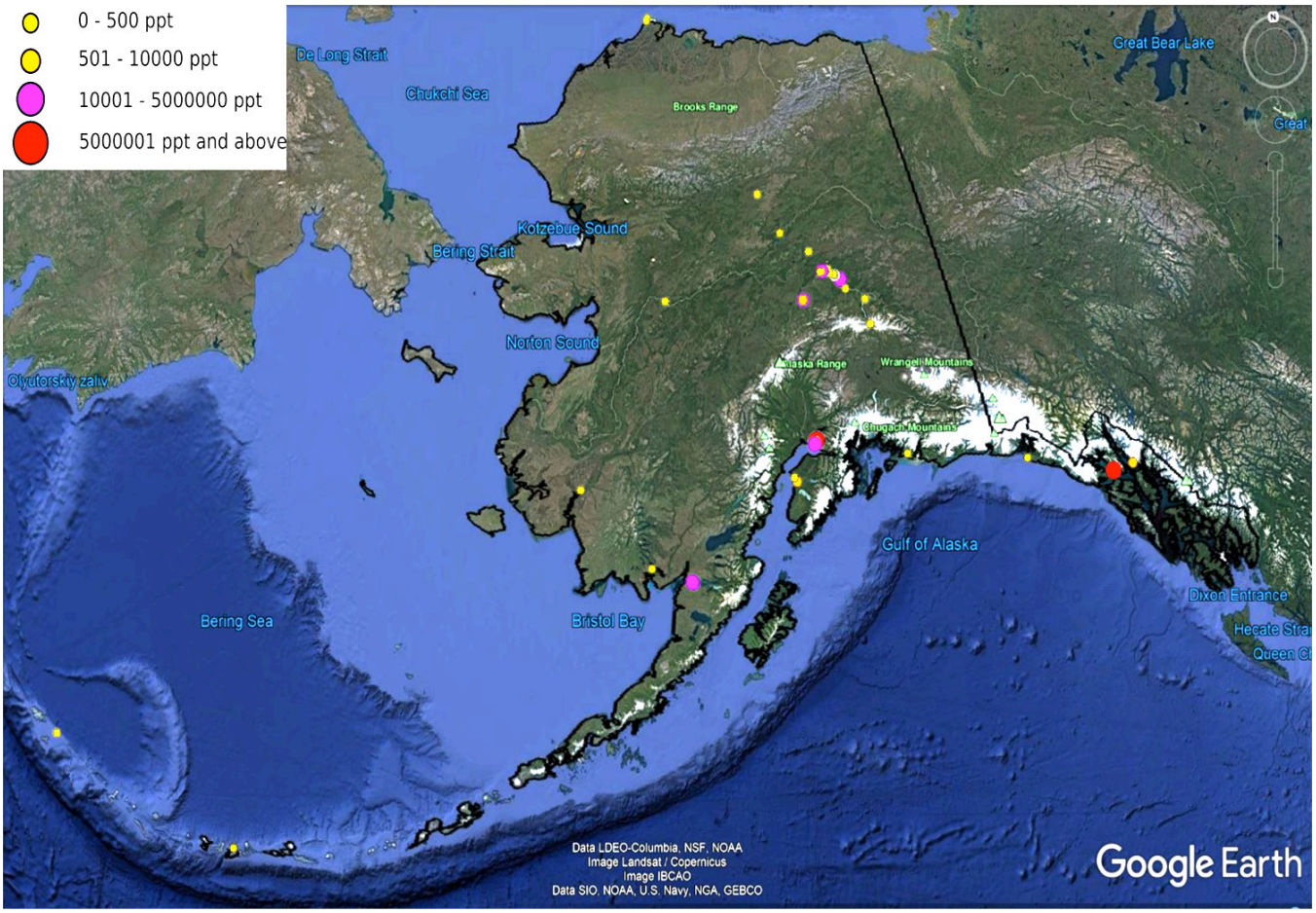
PFAS do not break down easily in the environment. Over time, these chemicals can be released into the air, dust, food, soil and surface water bodies, eventually contaminating groundwater in some cases. PFAS have been commonly used for over half a century, and exposure has led to detection of these chemicals, which bioaccumulate in fish, wildlife, livestock and even people. Since the beginning of the 21st century, there are indications via the U.S. Centers for Disease Control and Prevention that some PFAS chemicals in studied blood samples are declining. It remains to be seen if other PFAS chemicals that have not been as readily tracked are supplanting the decreasing compounds.

In Alaska, highly concentrated test samples have been found in drinking water wells near the Fairbanks International Airport, Eielson Air Force Base and in Gustavus. Here, the presence of PFAS in the drinking water is primarily due to the use of aqueous film-forming foams (AFFF) used particularly at airports during firefighting or fire training activities. It is also present in household items that contaminate home sewer output.

Two water samples to be tested for PFAS are taken from Portage Creek, in the Kalamazoo River watershed. Photo by Michigan Department of Great Lakes, Environment and Energy

Dr. M. Sahoo, a postdoctoral Fulbright Scholar with the University of Alaska Fairbanks Institute of Northern Engineering, created the following map in 2019 that shows PFAS contamination around Alaska. She used information from the Alaska Department of Environmental Conservation.

PFAS contamination in Alaska



Exposure and health concerns

While several PFAS chemicals have been phased out of use in the United States, the risk of exposure persists with many new ones being put into use. The public is exposed to PFAS primarily through drinking contaminated water, eating contaminated food, eating food packaged with materials containing PFAS or hand-to-mouth transfer from touching items treated with PFAS-containing stain protectants, such as carpets. A secondary and lower risk of exposure is by breathing air that contains dust contaminated with PFAS from soil, upholstery, clothing, carpets, etc., or from PFAS-containing fabric sprays. Absorption of PFAS through skin does not result in significant exposure.

Once PFAS are ingested, they take years to expel from the body. PFAS contaminant levels are measured in parts per trillion (ppt), and regardless of the quantity present, it will take approximately 5-6 years to expel half of PFOS from the body or 3-4 years for PFOA.

PFAS can be ingested by livestock or pets via contaminated drinking water or accumulated in crops via contaminated surface water, soil, compost or groundwater. If you are growing crops, keep in mind that fruits and leafy vegetables tend to accumulate more PFAS than cereal grains, potatoes, and other root crops. Peeling root crops and potatoes is recommended by several states' agriculture or health departments to reduce the risk of ingesting PFAS where contaminants may be present. Likewise, PFAS can accumulate in leafy forages for livestock and horses. PFAS may

exist in compost, especially when biosolids such as manure are spread on growing fields or used in the composting process.

The Environmental Protection Agency has established maximum contaminant level guidelines. Certain states are working toward putting out regulatory levels on their own. The State of Alaska suggests restricting the use of wells contaminated by PFAS when using water greater than 100 ppt in gardens. These restrictions are being implemented to avoid further contamination of groundwater. The State of Alaska's suggestion is to reduce the sum of PFOS and PFOA levels to below 70 ppt, which is also the current federal recommendation.

Contaminated water and feed can lead to accumulation of PFAS in dairy animals and their milk, and contaminated milk should not be consumed. Research presented at the Society of Environmental Toxicology and Chemistry annual meeting in 2019 suggests that just 30 days of consuming contaminated feed and water would require 18 months for the cow to rid their system of those chemicals. When consuming contaminant-affected livestock or wild game, avoid eating the liver and avoid harvesting animals in areas that are known to be contaminated.

You can go to a health provider and get a lab test to determine the presence of PFAS in your body, but currently these tests may not specify which PFAS chemicals are in your blood and there is no treatment for it. At this time, no guidelines support use of laboratory testing to monitor PFAS health concerns. The tests are not easily interpreted or indicative of potential health risks, and they may also not be covered by your health insurance.

The health risks of exposure to PFAS, like most other chemicals, are dependent on the route of exposure, duration of exposure and concentration of the contaminant. A person's genetics and health status at the time of exposure also affect the risk.

The possible health effects that may result over time from PFAS exposure are believed to be wide-ranging, but the Centers for Disease Control and Prevention says that more research is needed on long-term effects. Health concerns associated with PFAS can be caused by other factors.

In significant amounts, health professionals suggest that PFAS can affect infant development, suppress immunity and damage internal organs. Exposure to PFAS prior to pregnancy may be associated with pregnancy-induced hypertension and preeclampsia.

If nursing infants are exposed to contaminated milk from the mother, it is recommended that the mother discontinue drinking contaminated water and avoid eating contaminated food. The CDC and the Agency for Toxic Substances and Disease Registry advise nursing mothers to continue to breastfeed because the benefits of breastfeeding outweigh those of not breastfeeding.

Exposure to PFAS can affect the thyroid gland, which can be very harmful to growth and development. At high levels, PFAS may induce elevated cholesterol rates. Liver damage, decreased fertility, increased obesity, hormone suppression and an increased risk of cancer have also been linked to PFAS.

Mitigating exposure

The best way to reduce PFAS exposure is to minimize the possibility of consuming it. The Environmental Protection Agency recommends that the potable water in the home not exceed concentrations of 70 ppt of PFAS, in order to minimize health risks. Boiling water will not remove PFAS. The best way to cut that risk by regulating the source and amount of water that you use to cook, clean, and drink.

There are ways to treat water to bring it within acceptable levels. Some of these treatments include using carbon adsorption through granulated activated carbon (GAC) filters, ion exchange resins and high-pressure membranes. Such filters can be installed in homes at the point of entry at your pressure tank when there is a well or even at the point of use like the kitchen sink or a shower. Filters alone may not reduce significant amount of PFAS concentration. The concentration of PFAS in the water prior to filtration and the regular

maintenance of the filter used will govern the quantity of PFAS that can be removed.

Conclusion

PFAS are prevalent in the environment throughout the United States. Alaska is working systematically to reduce the risk of PFAS to the public. The first facility in the nation permitted to burn soils tainted by PFAS is now operating near North Pole, and the only utility in the state to voluntarily pull biosolids from compost that is sold is located in Fairbanks. Alaskans are introduced to the fluoride molecule combinations through the products we buy, the water we drink and even in some of the food that we eat. At the moment, it is hard to say what is the best way to sequester or destroy PFAS, but it will be more evident in the future as more samples are analyzed, and investigations and research progress.

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04-21/AN-CM-DM/08-24

Revised July 2024