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Chippewa Nation, PFAS

Forever Chemicals' Infestation in Native American Populations' Water Sources

As of right now, Native American reservations are being infected by a dangerous, yet seemingly unknown enemy. Forever chemicals, or PFAS, are harmful chemicals to both the environment and human health. First produced in large numbers in the early 1950s, they spread rapidly throughout the environment. Because they are not readily biodegradable, they continue to proliferate in the environment (NCBI 2021). Infiltrating our food and water sources, PFAS can be found in 98% of Americans (CDC 2003). Luckily, for most Americans, modern water filters are enough to remove nearly all PFAS running through them. However, this presents a problem for Native Americans living on reservations, where 48% of homes do not have clean water or adequate sanitation (Natural Resources Policy, 2021). These homes on Native American reservations are 19 times more likely to not have indoor plumbing than white homes (Natural Resources Policy, 2021). Without indoor plumbing and proper water sanitation and filtration, PFAS are much more likely to be consumed by Native Americans through water than the general population.

First mass produced in the 1950s by DuPont and 3M, PFAS were in almost every product. From firefighting foam, called aqueous film-forming foam (AFFF), to aerospace technologies and consumer products, PFAS were unavoidable. By the time adverse effects of PFAS were being realized and talked about by the U.S. Environmental Protection Agency in 1998 (EPA 1998), the problem had already advanced too far. PFAS were useful in so many common products that 41,828 factories in the United States (EWG, 2020) produced them. Products weren't the only way PFAS spread, though. Once produced, many PFAS were discarded into both the air and water then dispersed throughout the environment. This became an immense problem because, chemically, PFAS are chains of carbon atoms surrounded by fluorine atoms. According to Professor Matt Simcik at the University of Minnesota, "The carbon-fluorine bond is the strongest covalent bond we know." Because of their longevity, they are able to spread throughout every corner of the environment. Today, they are found in over 45% of the nation's tap water (USGS, 2023).

PFAS are not only a problem in water, though. According to a study by Consumer Reports in which they tested over 100 fast food packages for PFAS, "PFAS were in some packaging from

every retailer we looked at” (2022). These tests included packages from multiple of the most popular fast food chains in the US, including McDonald’s, Burger King, and Chick-fil-A. According to a 2021 Environmental Health Perspectives study, PFAS are found more commonly in people who eat more regularly at fast food chains than people who cook for themselves. For Native Americans who often are discriminated against by the wage gap, fast food is both affordable and easily accessible, which can lead to an even higher PFAS consumption.

Furthermore, for Woodland Indian tribes such as Chippewa tribes, wild rice, nuts, berries, fruits, and fish have all been popular traditional Native American foods that are still harvested today. All five of these traditional foods are harvested wild, which for Chippewyan people living on the Fond du Lac reservation, means much more PFAS consumption. According to a Minnesota Pollution Control study, three landfills near this reservation have been found to have PFAS in them, two of which exceed the health standard level of PFAS, and one of which exceeds the health standard by 10x. The PFAS from these landfills are able to spread quickly to local water sources which are drunk from, and then which also end up in these traditional food sources of this Chippewa tribe.

As much as PFAS are a problem, there are currently many research and developmental efforts to subdue PFAS. Although, because of the relative newness of PFAS being widely considered a problem, there is no completely sustainable, cheap, and effective solution yet. However, startup company Claros Technologies claims that they have found a solution that is both sustainable and effective. Their “Elemental™ PFAS Destruction System” says it is able to work at room temperature and atmospheric pressure while simultaneously causing “total destruction of toxic persistent chemicals into their natural basic elements and harmless byproducts.” It also claims that it is the most energy and cost efficient solution right now. Unfortunately, though, the system has many flaws preventing it in its current state from being the correct solution. Firstly, the highest volume of water the system could remove PFAS from is 2,000L, which cannot get close to being able to clear one lake. Multiple systems could be used to keep lakes cleaner; however, even many of these systems would not be enough to clean rivers and producing enough of these systems would create a new set of production problems. So, they would not be able to provide as much help to the Native American populations as needed. The systems, though, do have promising technological capabilities and could eventually play a role in the permanent solution to PFAS.

Besides Claros, there are many other companies pursuing ways to destroy PFAS as well. Aclarity is one of them. They are currently developing electrochemical oxidation for destroying PFAS. This technology works by applying an electric current through a conductive liquid from an anode to a cathode. The current is then used to create hydroxyl radicals, which are a type of highly reactive molecule and are able to break PFAS apart. This technique is able to destroy over 99%

of long-chain PFAS (PFAS that contain 6 or more carbons). However, according to Claros Technologies, electrochemical solutions are almost completely ineffective against ultra-short-chain or short-chain PFAS. This makes it a useful solution to prevent some PFAS, but solitarily does not make it a complete solution, especially for destroying PFAS in the environment which would be needed for it to have a noticeable effect on Native American tribes.

Another company working on the destruction of PFAS is called Onvector. Onvector is using Plasma Vortex technology to strip electrons from the PFAS, which causes the destruction of PFAS molecules. This process works by applying a voltage gradient to an electrode, which creates an electric field. This field is then able to strip electrons from inflowing gas molecules. By stripping these electrons, charged ions and a plasma discharge are created. The highly reactive ions are then able to break down the PFAS and turn them into their harmless byproducts, fluoride, sulfate, carbon dioxide, and water. However, similarly to Claros Technologies' system, Onvector's Plasma Vortex system isn't easily applicable to environmental situations, which would be necessary to remove them from Native Americans traditional food sources.

Individual people are also working to help solve the PFAS problem. By doing things such as writing emails to the local government, informing people of what PFAS are and why they're a problem, and getting involved with local organizations working to prevent factory runoff, many individuals are able to make a change. However, even still, not enough people are working on preventing the spread of PFAS for their work to have a noticeable impact. Though, that doesn't mean that any individual person can't make a difference. Even by informing one new person about the impacts of PFAS, we are one step closer to solving the problem.

Although these solutions all have results, they also all have major flaws preventing them from being the "correct" solution. So, as a country, the United States' next move should be using what we already know to find ways to conduct more research on the subject. The new research will lead to new discoveries on better ways to sustainably and efficiently remove PFAS from every type of environment. By finding new technologies, the United States could completely free the environment of PFAS while simultaneously helping stop the contamination of traditional Native American food. Individually, United States residents could help by becoming educated on the topic of PFAS and spreading the word about it. If educated or a curiosity, residents could also help with active PFAS research to directly contribute to the gaining of knowledge and developmental progress.

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