PFAS and Agriculture: The Calm Before the Storm

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Introduction

Per- and polyfluoroalkyl substances (PFAS) comprise a group of highly fluorinated manmade compounds that are resistant to heat, water and oil, and chemical breakdown. Because of these properties, PFAS have been used for decades as surface protection in a wide range of consumer products including carpets, clothing, cookware and food industry paper products such as pizza boxes and sandwich wrappers. Commercially, PFAS are a key component of foam used for fighting fires involving flammable or combustible liquids, and mist suppressants for metal plating operations. While the class of chemicals have been on the market for nearly 80 years, only recently have their environmental persistence and bioaccumulation ability become the focal point of public health queries.

PFOA and PFOS are the most studied PFAS chemicals and have been voluntarily phased out by industry, though they are still persistent in the environment. There are many other PFAS, including GenX chemicals and PFBS in use throughout our economy. GenX is a trade name for a technology that is used to make high performance fluoropolymers (e.g., some nonstick coatings) without the use of perfluorooctanoic acid (PFOA). HFPO dimer acid and its ammonium salt are the major chemicals associated with the GenX technology. GenX chemicals have been found in surface water, groundwater, finished drinking water, rainwater, and air emissions in some areas.

History

Processes to commercially produce PFAS were first developed in the 1940s. In the 1950s, 3M began manufacturing various PFAS, including PFOA and PFOS, for product applications. In the 1950s, 3M launched several products based on PFAS, including Scotchgard™.

In the 1960s, the United States Navy used certain PFAS to develop life-saving firefighting foams with support from 3M. Aqueous Film Forming Foam (AFFF) was created to address life-threatening challenges facing the military in live combat missions and training exercises. To meet these challenges and the need for fast and effective tools to fight complex liquid fuel fires, the military sought to develop a completely new product using the unique properties of PFAS. The Navy patented the technology and required its vessels carry AFFF to protect the lives of U.S. sailors, airmen, and flight officers after 134 sailors died in a fire aboard the USS Forrestal in 1967—one of the worst naval disasters in American history. To this day, the military specification governing AFFF can only be met by the use of PFAS-based surfactants, given their unique properties.

PFAS in the Environment

While PFAS have a long list of unique benefits, their continuous use also creates significant environmental and public health concerns. PFAS are frequently found at industrial sites where the chemicals were manufactured or used. Not only does this include industrial manufacturing facilities, but also military bases, civilian airfields, and petroleum product facilities where firefighting foam is used or stored. Due to their widespread use, relatively high solubility, and resistance to standard treatment technologies, PFAS may be present in wastewater treatment plant effluent, sludge and bio-solids. PFAS may be present in landfill leachate as well.

Agricultural producers, while not producers or users of PFAS, may unknowingly come into contact with PFAS on their operations through either land application of biosolids or groundwater contamination. Each instance brings with it unique challenges.

Public Health Impacts of PFAS

A large number of studies have examined possible relationships between levels of per- and polyfluoroalkyl substances (PFAS) in blood and harmful health effects in people. However, not all of these studies involved the same groups of people, the same type of exposure, or the same PFAS. These different studies therefore reported a variety of health outcomes. Research involving humans suggests that high levels of certain PFAS may contribute to increased cholesterol levels, decreased vaccine response in children, changes in liver enzymes, increase risk of pre-eclampsia in pregnant women, decreases in infant birth weights, kidney cancer, or testicular cancer.

Research

According to an August 2016 Harvard University study analyzing drinking water sampled between January 2013 and December 2015, 66 public water supplies serving 6 million people had at least one sample at or above EPA's 70 ppt health advisory level, with PFOA concentrations as high as 349 ppt and PFOS concentrations as high as 1800 ppt. The study also found that 75 percent of the PFAS detected in drinking water come from 13 states – Alabama, Arizona, California, Florida, Georgia, Illinois, Massachusetts, Minnesota, New Jersey, New York, North Carolina, Pennsylvania and Ohio.

In addition to research on human impacts, studies have considered PFAS accumulation in food products including milk, meat, and produce. This ranges from survey testing – picking up items in a grocery store and testing PFAS levels – to testing milk straight from the farm and animal carcasses at processing facilities.

In 2019, FDA collected 91 food samples as part of a total diet study and tested each sample for 16 unique PFAS, including PFOS and PFOA. Results shows that two of the 91 samples (tilapia and ground turkey) had detectable levels of one type of PFAS.[1]

In 2012, FDA sampled raw and retail milks from across the countries and found detectable PFAS levels in only one of 12 raw milk samples (none of the 49 retail samples had detectable levels).

[1]U.S. Food and Drug Administration, Per and Polyfluoroalkyl Substances (PFAS) (*https://www.fda.gov/food/chemicals/and-polyfluoroalkyl-substances-pfas*)

The one raw milk sample with detectable PFAS was obtained from a dairy farm where PFAS-containing biosolids were land applied.[2]

In 2019, USDA's Food Safety and Inspection Service announced its intent to test condemned beef carcasses for PFAS. Research demonstrates bioaccumulation potential for PFOS in beef cattle organs (including the liver and kidneys), but little accumulation in muscle.[3]

Application to Agricultural Producers

Farmers and ranchers face significant PFAS-related risk, especially if their operations neighbor a manufacturing facility or military base. Agricultural PFAS contamination is highly concentrated to the industrial Midwest and Northeast, with outlier occurrences around the country. Agricultural producers face two specific risks of contamination – from groundwater contamination and biosolid application.

On-Farm Groundwater Contamination. Farms that neighbor manufacturing facilities of military bases may be at risk of PFAS groundwater contamination. Not only does this pose a threat for humans, but also their agricultural products. Perhaps the most publicized example of this issue is Highland Dairy located in Clovis, New Mexico. The 4,000 head dairy neighbors Cannon U.S. Air Force Base, where firefighting foams are utilized for training. The dairy has been forced to dump nearly 15,000 gallons of milk per day after the Food and Drug Administration found the milk adulterated. Like humans, animals quickly excrete about half of the PFAS they consume. This means that when dairy cows consume PFAS, then milk, a significant percentage of the consumed PFAS is excreted through milk production. In this scenario, farmers fall victim to neighboring users of PFAS, but have few options for remedy because PFAS is not regulated. While livestock present a unique concern, PFAS groundwater contamination can impact any type of farm. Chemical uptake presents crop producers with similar challenges when it comes to irrigating with groundwater.

On-Farm Biosolid Application. As stated above, PFAS can accumulate at wastewater treatment facilities where household waste, industrial waste, and municipal waste are collected, treated, and returned to the environment. Often, wastewater treatment facilities contract with farmers to land apply sludge from wastewater, also known as biosolids. Biosolids are solid organic matter recovered from a sewage treatment process and used as fertilizer.

Under statutes that regulate hazardous substances, like the Comprehensive Environmental Response, Clean-up, and Liability Act (CERCLA), all potentially responsible parties (PPPs) are responsible liable for environmental contamination. PPPs include owners, operators, transporters, and arrangers. Farms, as both landowners and arrangers of disposal, even if unintentionally, are potentially at risk of CERCLA liability if PFAS are designated hazardous substances by EPA.

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[2] *Id.*
[3] FSIS Enhances Residue Testing, Constituent Update – August 30, 2019; USDA-FSIS Office of Public Health Science Screening, Determination, and Confirmation of PFAS by UPLC-MS-MS (*https://www.fsis.usda.gov/wps/wcm/connect/365c4eb9-cab2-4ef4-b9f3-b8d1cdb87241/CLG-PFAS 2.01.pdf?MOD=AJPERES*).

As federal agencies move forward with regulating PFAS, it must distinguish between creators of the chemical class, those responsible for managing chemical accumulation, and those who unknowingly distribute the chemical.

Regulation

Until recently, PFAS have not been widely regulated. This is changing at both the federal and state levels. In fact, during his confirmation hearing, previous EPA Administrator Scott Pruitt stated that PFAS “needs to be addressed quickly.”

PFOA and PFOS (perfluorooctane sulfonic acid) are the two most well-known PFAS and are the primary focus of regulatory attention. These compounds have been found in fish and other wildlife. PFOA and PFOS have also been detected in human blood samples. The manufacture of PFOA and PFOS has been phased out in the United States, but stockpiled materials containing the chemicals remain in use. Other PFAS compounds continue to be manufactured and used.

EPA PFAS Action Plan. In February 2019, EPA released its comprehensive PFAS Action Plan, including goals to regulate PFAS under the Safe Drinking Water Act (SDWA), CERCLA, Toxic Substances Control Act (TSCA), Resource Conservation and Recovery Act (RCRA), and the Clean Water Act (CWA).[4] Before the agency can regulate the use of PFAS, it must first determine the toxicity level of each chemical. As stated above, PFAS is a class of chemicals. Each PFAS has a different chemical makeup, different bioaccumulation potential, and different toxicity. In determining the risk of PFAS, EPA will conduct dose-response assessments, exposure assessments, and risk characterization, before finally working to manage risks through remediation and treatment.

In May 2016, EPA issued a non-binding drinking water health advisory level of 70 parts per trillion (ppt) for PFOA and PFOS, either singly or combined.[5] EPA defines this as the concentration of PFOA and PFOS in drinking water below which adverse health effects are not anticipated to occur over a lifetime of exposure. EPA’s 2016 health advisory level is a decrease from its 2009 provisional drinking water health advisories for PFOA (400 ppt) and PFOS (200 ppt), and follows EPA’s 2012 addition of PFOA and PFOS to the list of unregulated contaminants for which public water systems were required to test between January 2013 and December 2015 (i.e., EPA’s third Unregulated Contaminant Monitoring Rule or UCMR 3).

A number of states have incorporated EPA’s 2016 drinking water advisory level, while others have adopted their own more stringent (e.g., Vermont < 20 ppt) or less stringent (e.g., Minnesota 300 ppt) advisory levels. In addition, states such as Alaska, Delaware, Iowa, Maine, Michigan, New Hampshire, Texas and Vermont have proposed or adopted soil, groundwater and/or surface water cleanup levels for PFOA and PFOS. Vermont regulates waste with > 20 ppt PFOA and PFOS as hazardous. New Jersey is considering a 14 ppt PFOA drinking water maximum contaminant level.

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[4] EPA’s Per- and Polyfluoroalkyl Substances (PFAS) Action Plan, EPA 823R18004 (February 2019).
[5] Lifetime Health Advisories and Health Effects Support Documents for Perfluorooctanoic Acid and Perfluorooctane Sulfonate, FR Doc. 2016–12361.

In California, PFOA and PFOS are proposed for listing under Proposition 65 as developmental or reproductive toxicants. Likewise, PFAS in carpets and indoor upholstery are being evaluated as a possible Priority Product under California's Safer Consumer Products law. Washington state's Children's Safe Products Act Reporting Rule requires manufacturer notification if a children's product sold in the state contains PFOS. Rulemaking to add PFOA to the list of chemicals covered under the rule is ongoing.

In February 2020, EPA released a list of 172 PFAS chemicals that are subject to reporting under the Toxic Release Inventory (TRI).[6] The TRI tracks the management of over 650 toxic chemicals that pose a threat to human health and the environment. U.S. facilities in certain industry sectors that manufacture, process, or otherwise use these chemicals in amounts above established levels must report how each chemical is managed through recycling, energy recovery, treatment, and releases to the environment. A "release" of a chemical means that it is emitted to the air or water or placed in some type of land disposal.

In June 2020, EPA issued a final rule defining the agency's authority to regulate PFAS under TSCA.[7] Under this action, EPA is prohibiting the companies from manufacturing, processing, or importing products containing certain long-chain PFAS chemicals. The rule additionally requires EPA review before the use of long-chain PFAS chemicals that have been previously phased out. This action will primarily apply to the production of ski wax, carpets, furniture, electronics, and household appliances.

Litigation

There have already been several high-profile PFAS groundwater and drinking water contamination cases. In February 2017, a PFOA manufacturer agreed to a $670 million settlement, the largest known payment to date related to this chemical.[8] The payment settled all indemnification obligations between Chemours and DuPont for approximately 3,500 claims brought in Ohio and West Virginia.

In 2019, a wave of litigation related to per- and polyfluoroalkyl substances (PFAS) emerged in the United States, as several states filed lawsuits against PFAS manufacturers and the Department of Defense.[9] This legal action accompanies increased regulatory scrutiny of this potentially risky class of chemicals. In this article, we will focus on the risks chemical companies face related to PFAS contamination of drinking water in the United States and the ESG risks posed to chemical companies and their investors. Given the chemical class' increasing regulatory scrutiny, drinking water providers as well as all parties associated with the generation, use and disposal of PFAS should anticipate hearing more about them in the months and years ahead.

Conclusion

[6] 40 CFR § 372.
[7] 40 CFR § 721.
[8] *In re E.I. Du Pont De Nemours and Company C-8 Personal Injury Litigation*, U.S. District Court for Southern Ohio, No. 13-2433.
[9] *Save Our County, et al. v. United States Department of Defense, et al.,* 3:20-cv-01267 (N.D. Cal. Feb. 20, 2020).

As discussed above, farmers and ranchers face risk of PFAS contamination through multiple vehicles. As federal and state agencies focus more on PFAS regulation, protecting the agricultural liability from increased regulatory burden, while ensuring that producers have the necessary resources to be made whole will be key.