

Emerging Contaminants and Environmental Health

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The term “contaminant of emerging concern,” or CEC, has been used by the US Environmental Protection Agency (EPA) to describe a variety of chemical compounds that have been found in surface water and drinking water sources in recent years, and which have the potential to cause adverse effects to human health and aquatic life. “Emerging” can mean both new chemicals and existing chemicals that are only now being detected in the environment as analytical chemistry precision has improved. Compounds can now be detected at levels down to parts per quadrillion, the equivalent of a postage stamp on a letter the size of California and Oregon combined. Even a small amount of some of these chemicals can have the potential to be present in the environment on a global scale and can persist for decades.

There are different types of CECs. Some are released into the environment directly, and some are formed as a by-product of the interaction of chemicals such as chlorine with the environment. Some CECs are pharmaceuticals or personal care products that enter the environment through improper disposal of unused prescription drugs, or as residuals in human and animal waste. Others are industrial by-products: 2 examples are 1,4-Dioxane, used in commercial solvents and the manufacture of plastics and polyester, and polyflouroalkyl substances (PFASs), used in the manufacture of non-stick coatings such as Teflon® and in products as diverse as food packaging, clothing, and airport fire-fighting foam [1].

The compound known as GenX is one of these PFASs.

It was developed as one of many substitutes for perflouroctanoic acid (PFOA). PFOA was voluntarily phased out of production between 2000 and 2015 due to concerns about potential developmental effects in infants and young children, cancer, thyroid disease, and other health effects (unpublished data). GenX is a shorter chain molecule believed to be less likely to bioaccumulate in the body, but there is also concern that it may cause health effects similar to those associated with other PFASs [1].

When a manufacturer wants to introduce a new chemical into commerce, or use an existing chemical in a new way, the Toxic Substances Control Act (TSCA) requires that they notify EPA. EPA can choose to approve the new chemical or use, request additional information, or deny permission to the manufacturer. These choices are complex: toxicology at low doses can be inconclusive, and rarely is reliable long-term low dose data available from human studies. Historically, data comes from animal or *in vitro* studies or comparison to previously studied similar chemicals, but computational toxicology is changing this field rapidly.

Most information comes from prospective manufacturers, and they can claim portions of it as confidential business information (CBI). EPA can use Section 5(e) of TSCA to impose additional requirements on the manufacturer, and under Section 8(e) manufacturers must report to EPA any studies that show evidence of threat to health or the environment. There is tension among the desire of manufacturers to bring new products to market quickly, the time

frames the law gives EPA to make decisions, and the inevitable judgments required in the face of incomplete scientific information.

In the case of GenX, The Chemours Company (formerly a part of DuPont) received approval from EPA to begin producing the chemical in 2009 at its facility in Fayetteville. Sampling beginning in 2012 detected GenX in surface water in the Cape Fear River (unpublished data). More extensive sampling by the North Carolina Department of Environmental Quality (NCDEQ) has now detected GenX in groundwater and well water in the area surrounding the Fayetteville facility; the degree and extent of its presence, and how it moves in the environment, is still being determined [2].

EPA has not established national primary drinking water regulations for PFASs, though in 2016 EPA did issue health advisories for PFOA and a related compound, perfluorotanesulfonic acid (PFOS). To regulate a contaminant under the Safe Drinking Water Act, EPA must find that it: (1) may have adverse health effects; (2) occurs frequently (or there is a substantial likelihood that it occurs frequently) at levels of public health concern; and (3) there is a meaningful opportunity for health risk reduction for people served by public water systems. Since EPA required water systems to monitor for PFOA and PFOS in 2012, there is now a more robust data set to make these judgments [3]. In the meantime, EPA works with state and local agencies, such as NCDEQ, to assist in responding, for example, when there is evidence that PFASs may be present in public or private drinking water supplies.

Emerging contaminants promise to be a focus of atten-

tion for years to come. They result from products that we depend on, yet there is much we do not know about their effects or their ultimate persistence and fate. They require us to answer an extraordinarily difficult question about our health and environment: how much risk, in exchange for what benefits and under conditions of uncertainty, are we willing to tolerate? **NCMJ**

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References

1. US Environmental Protection Agency. Basic Information on PFAS. US Environmental Protection Agency website. www.epa.gov/pfas/basic-information-pfas. Accessed June 21, 2018.
2. North Carolina Department of Environmental Quality. GenX Investigation. North Carolina Department of Environmental Quality website. <https://deq.nc.gov/news/hot-topics/genx-investigation>. Accessed June 21, 2018.
3. Occurrence Data for the Unregulated Contaminant Monitoring Rule. Washington, DC: US Environmental Protection Agency; 2012; www.epa.gov/dwucmr/occurrence-data-unregulated-contaminant-monitoring-rule#3. Published May 2, 2012. Accessed June 21, 2018.

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