Oral reference dose for GenX

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Video Abstract

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Abstract

In June of 2017, public concern grew after traces of the fluorochemical GenX were detected in the Cape Fear River, a source of drinking water for several communities in North Carolina. Up to that point, regulators had not defined an acceptable level for drinking water. Now, a team of researchers has shed much-needed light on the matter. Based on data gathered from numerous toxicity studies in laboratory animals, they've established a drinking water guideline of 70 parts per billion. That figure could help regulators and citizens gauge safe from unsafe levels of the chemical. GenX is a processing aid used in the manufacture of fluoropolymers, compounds found in a variety of consumer and industrial products, including medical devices, tank and pipe linings, packaging for lithium-ion batteries, and cookware coatings. While important to the manufacture of fluoropolymers, GenX itself is not a component of these products. To determine how much GenX is safe in drinking water, the team first developed an oral toxicity value called a reference dose, or RfD. This value represents an estimate of the daily oral exposure that is unlikely to present an appreciable risk of noncancer effects on health throughout a lifetime. The researchers accomplished this by reviewing all available toxicity studies that involved longer-term exposures, modeling the data from those studies using the EPA's benchmark dose modeling software, factoring in knowledge concerning the underlying cause of some of the effects (termed mode of action), and applying safety factors. The team used a combination of deterministic and probabilistic approaches to develop their RfD. Effects in the livers of male rats were ultimately determined to be the most sensitive relevant endpoint and served as the basis for the RfD of 0.01 mg/kg/day established by the researchers. Using this dose and the EPA's process for developing Maximum Contaminant Level Goals for drinking water, the team estimated the safe level of GenX in drinking water to be 70 parts per billion. For perspective, one part per billion is roughly equivalent to a single drop of water in an Olympic-size swimming pool (or 1 second in 32 years). The values established by the research team should be informative for risk assessors and regulators interested in addressing GenX levels in drinking water.