Assessing the significance of PFAS precursors to overall exposures and potential health implications

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Many adverse health effects have been associated with exposures to per- and polyfluoroalkyl substances (PFAS). Well-established health outcomes include immunotoxicity such as decreased antibody response, elevated cholesterol levels, developmental effects such as decreased birthweight, liver and thyroid disease, and increased risk of kidney and testicular cancer. Robust health information is presently only available for a few well-studied PFAS such as perfluorooctane sulfonate (PFOS) and perfluorooctanoate (PFOA), but the PFAS family includes many other chemicals including numerous precursors. Precursors are fluorinated chemicals that can degrade into persistent terminal PFAS. The relative toxicity of PFAS precursors compared to terminal compounds, as well as mixtures of PFAS associated with different exposure sources is poorly understood. Contamination of soil from use of aqueous film-forming foams (AFFF), biosolids used as fertilizer, or reclaimed water irrigation, have led to high PFAS concentrations detected in some produce, dairy, seafood, and meat. Soil contamination usually consists of PFAS mixtures that include diverse precursors. But uptake studies of PFAS into plants or accumulation into livestock or fish has mostly focused on PFOS or other terminal PFAS. My recent research on PFAS precursors shows that perfluoroalkyl sulfonamides (FASA) have significant bioaccumulation potential in fish near AFFF contaminated sites and fluorotelomer sulfonates (FTSA) are taken up into crops used as feed at biosolid-contaminated farms. This results in both direct exposure to PFAS precursors in food products and, as those precursors degrade over time, an increase in exposures to terminal PFAS, while simultaneously reducing the rate at which terminal PFAS decrease in the environment. Understanding which precursors accumulate and the rates at which precursors degrade in different food products is essential for effective exposure mitigation strategies and for identifying compounds that should be prioritized in toxicity assessments. This presentation will highlight ongoing research in Massachusetts and Maine, exploring the significance of PFAS precursors in overall exposures and the challenges ahead.