

Occurrence, Distribution, and Bioaccumulation of Per- and Polyfluoroalkyl Substances (PFAS) in Minnesotan Freshwater Environments

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Background/Objectives. Per- and polyfluoroalkyl substances (PFAS) are a class of man-made compounds that do not occur naturally in the environment. The structure of these PFAS results in multiple useful properties, which vary depending on the particular chemical formula. PFAS have been found to persist in the environment and to bioaccumulate in certain organisms. Nonetheless, the presence of PFAS in the environment or in living organisms does not indicate that adverse effects are occurring or are likely to occur. We used measured surface water, sediment, and fish data from freshwater environments to explore bioaccumulation of PFAS in fish and impacts of fish consumption on human health.

Approach/Activities. We reviewed publicly available surface water, sediment, and fish data for PFAS collected from freshwater environments in Southern Minnesota and described the occurrence and distribution of these compounds across the environmental media. We used typical bioaccumulation models to estimate PFAS concentrations in fish based on measured PFAS concentrations in sediment and surface water. We then compared model-predicted PFAS concentrations to measured concentrations in fish tissue to evaluate the reliability of typical bioaccumulation models in predicting the bioaccumulation of PFAS in fish tissue. In addition, we calculated PFAS-related human health risks associated with consumption of fish from freshwater systems in Southern Minnesota and compared human exposure levels to levels used to derive promulgated regulatory values.

Results/Lessons Learned. The data indicate that waterborne and sediment concentrations of PFAS are not bioaccumulating in Minnesotan freshwater fish at levels that would result in human consumption of PFAS in fish meals in excess of levels used to derive regulatory guidelines. While some environmental concentrations of PFAS exceed health-based criteria, hypothetical exposures to PFAS in surface water, sediments, and fish in these Southern Minnesota locations are below levels used to derive MDH regulatory guidelines. In this study, we demonstrate that the use of bioaccumulation factors for PFAS overestimates measured fish data from freshwater, and that concentrations of PFAS identified in surface water, sediment, and fish are not expected to adversely affect human health for individuals in contact with or consuming fish caught in these waterbodies.