

## **Understanding Mercury Dynamics in Aquatic Ecosystems and its Importance in Protecting the Health of Resident Biota and Humans**

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Since the industrial revolution, mercury (Hg) concentrations in the atmosphere have increased substantially, largely from anthropogenic inputs. Due to the ease of atmospheric transport and long residence time, mercury contamination in freshwater and marine ecosystems has become a global problem. This issue is certainly a concern in North Carolina, where citizens in the southeastern portion of the state, in particular, face exposure to methylmercury (MeHg) at levels among the highest documented in the United States. Methylmercury is the organic, highly toxic form of mercury that enters the food web following chemical transformation of inorganic mercury by bacteria, where it becomes a threat to fish, wildlife and ultimately, human health. Indeed, human exposure to mercury is almost entirely from the consumption of fish contaminated with MeHg; nearly all (95-99%) of the mercury in fish tissue exists in the form of MeHg. Because of the importance of MeHg exposure to ecological and human health, a number of investigators have attempted to determine the physical, chemical, and biological factors that facilitate the transformation of inorganic Hg into the organic, bioaccumulative, and toxicologically significant form. There is clear evidence that certain environmental variables are correlated with high MeHg concentrations in biota. For example, in freshwater systems, water temperature, alkalinity, pH, and dissolved oxygen levels have all been shown to be important predictors of MeHg formation. However, our ability to address MeHg contamination problems is still severely limited by lack of a comprehensive understanding of system- and location-specific variation in characteristics and mechanisms that lead to the conversion, uptake, and bioaccumulation of Hg. Mechanisms governing MeHg production and movement through the food web are complex, as evidenced by the extreme variation in mercury concentrations among systems, species, and populations. This situation is no less so in North Carolina waterways.