DETERMINATION OF MERCURY IN WATER, SEDIMENTS AND FISH SAMPLES FROM NATIONAL ESTUARINE RESEARCH RESERVE (NERR)

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Abstract: Mercury compounds including elemental mercury, inorganic mercury and organic mercury transfer among the soil, atmosphere, and surface waters during the cycle of mercury in the environment. Aquatic species such as fish, mussel, lobster and shrimp accumulate Hg from water in their tissues. Thus, consumption of seafood is the main route of exposure of humans to mercury compounds, especially to methylmercury. Sediments are also repositories for Hg compounds that affect the sediment pollution and availability of inorganic Hg in water. Consumption advisories are based on consumption patterns and contaminant levels for lakes and rivers. The Grand Bay National Estuarine Research Reserve (NERR) is a biologically diverse area that is a popular recreational site. The population and recreational activities have increased over the last years, which raise questions about the exposure of public to Hg. In an attempt to determine the distribution of Hg and Hg species in NERR, we have developed a cold vapor generation atomic absorption method to elucidate possible health risks associated with Hg due to the utilization of NERR. Total mercury and methyl mercury levels in sediment, fish and water samples collected from NERR were measured by cold vapor generation AAS method. Experimental conditions were optimized to achieve detection of total Hg and CH₃Hg levels. Mercury was extracted from the samples by 20% HCl. The final acidity level was adjusted to 5% HCl by dilution. For total Hg determination, sample was online mixed with 0.2% KMnO₄ followed by reduction to Hg vapor by reaction with 0.5% NaBH₄. For inorganic Hg detection, samples in 5% HCl were reacted with 2% SnCl₂. This scheme provided a detection limit of less than 50 ng/l (ppt) for Hg. Preliminary data from analysis of sediment, fish tissue and water samples have shown that levels of Hg was the lowest in water ranging from 40 ppt to 67 ppt that are significantly below 2 ppb MCL set by EPA for drinking water. For sediment, the dry weight mercury concentration ranged from 64 to 181 μg/g. The mercury concentrations in fish tissue ranged from 14.0 to 126 μg/g.

Key words: Mercury, Methyl mercury, Cold Vapor Generation AAS, Grand Bay National Estuarine Research Reserve (NERR)