Transport Of Methylmercury Enriched Hypolimnetic Water From A Stratified Reservoir

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The development of an anoxic hypolimnion in many lakes and reservoirs following summer stratification is a common phenomenon, and may lead to elevated levels of hydrogen sulfide (H_2S). The H_2S is produced by sulfate reducing bacteria which have also been shown to be the principal methylators of mercury (Hg) to methylmercury (MHg). Methylmercury is one of the more toxic forms of Hg, and is also the form bioaccumulated in aquatic ecosystems. Surface water concentration of MHg is generally much lower than in anoxic hypolimnetic water, and since water discharged from most lakes is surface water, it is also generally low in MHg. However, water discharged from reservoirs frequently comes from lower in the water column. In some cases, this includes water coming directly off the bottom where there is a greater potential for MHg to exist. The MHg enriched discharge water can then be transported downstream where it would be bioavailable to accumulate in the aquatic food web below the reservoir.

A study was conducted which examined the transport of MHg enriched hypolimnetic water from a seasonally stratified reservoir in south central New Mexico. In July 1996, as anoxia developed in the hypolimnion, surface water concentrations in the reservoir were 0.015 ng/L MHg while water discharged through the dam was 0.149 ng/L MHg. By September 1996, when the hypolimnion spanned 60% of the total reservoir depth, surface water was 0.014 ng/L MHg while discharge water had increased to 1.144 ng/L MHg. Following reservoir turnover in November 1996, the surface water increased to 0.264 ng/L MHg while discharge water decreased to 0.420 ng/L MHg. By January 1997, MHg in the discharge water decreased to pre-stratification levels, and both surface water and discharge water reached similar levels until the onset of anoxic conditions in the hypolimnion in July 1997. The trend was repeated when MHg levels discharged through the dam increased 2400% from 0.049 ng/L MHg in July 1997 to 1.240 ng/L MHg in September 1997. In addition, profile sampling of the reservoir from July 1997 to September 1997 showed a buildup of MHg in the anoxic hypolimnion which correlated with the increases in MHg discharged through the dam.