An Examination of the Release of Mercury and Methylmercury from River Sediment and Bank Soils, and the Potential for Mercury Net Methylation During Sediment Resuspension Typical of High River Flow Conditions.

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It has been hypothesized that the source of methylmercury (MeHg) to fish in the river could be either due to methylation of mercury (Hg) input from external sources or due to physical processes that disturb the Hg and MeHg that is contained in sediment and floodplain soils and result in its release and/or methylation. Elevated Hg concentrations have been measured downstream of the plant and a variety of samples were collected to study, in the laboratory, the impact of physical disturbance on the release of Hg and MeHg from these sediments, and the potential for Hg methylation. The specific objectives of the study were to: 1) examine the mobility and bioavailability of Hg found in various surficial sediments and soils, of varying Hg content; and 2) investigate the potential for Hg methylation within these sediments/soils after resuspension/disturbance and the role of the disturbance period and/or the availability of organic carbon in influencing the rate of methylation and of MeHg release into the water column.

Sediment samples were analyzed for Hg and MeHg prior to the study and showed varying total Hg concentration but generally relatively low %MeHg compared to other ecosystems. Upon resuspension, samples were collected over 96 hours from twelve treatments of four sediment site locations, with varying resuspension time and analyzed for total and dissolved Hg and MeHg. In addition, the sediment was also analyzed at the end of the experiment, and ancillary parameters were also measured. Total Hg concentrations increased dramatically with increasing suspended sediment load (TSS) but rapidly decreased in concentration after the cessation of resuspension. Dissolved Hg increased accordingly with disturbance but also decreased in concentration rapidly after the stirring stopped, and by the end of the experiments dissolved concentrations were generally <5 ng/L for the Dooms and GS site samples, but were higher for the soil samples (10-30 ng/L). Such high concentrations may reflect the presence of “colloidal” material in the water column at the end of the experiment. For these sediments, Hg on TSS in the water column at the end of the experiment, on a mass basis, appeared to be higher than that of the bulk sediment suggesting that the fines remaining suspended at the end of the experiment had higher Hg concentrations. In contrast, for the Dooms site, the TSS Hg concentration per gram was lower at the end of the experiment than that of the bulk sediment.

For MeHg, water column concentrations also increased with resuspension. At the end of the 96 hours, dissolved MeHg concentrations were <0.5 ng/L for essentially all the treatments, and concentrations appeared to be little related to treatment conditions, resuspension time or sediment MeHg concentration. DOC was added to some treatments in an effort to stimulate methylation. The results in terms of MeHg in the water column and MeHg in the sediment at the end of the experiment were inconclusive as the variability between treatments was relatively high and the DOC-treated samples were not substantially different from the other treatments. The %MeHg in the final sediments was similar to that of the initial sediments, giving further proof that little net methylation

occurred during the experiments. In addition, for MeHg, the TSS MeHg concentration (mass basis) at the end of the experiment was comparable to that of the bulk sediment.