The importance of different sources of particulate organic matter in the transfer of methylmercury to biota in an oligotrophic lake using carbon and nitrogen stable isotopes

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Abstract: The transformation of inorganic Hg into toxic MeHg has been studied in some detail; however it is still not possible to fully explain the bioaccumulation of this contaminant in food chain. In this study, stable carbon and nitrogen isotopes were used to determine the relative importance of different organic matter sources in the diet of zooplankton and to evaluate the importance of the sources of particulate organic matter (POM) in the transfer of MeHg to biota.

Zooplankton from Lake 658 at the Experimental Lakes Area in Ontario, Canada was depleted in ^{13}C relative to POM. This depletion could not be explained only by a higher contribution of carbon derived from phytoplankton. $\delta^{13}C$ of POM at the bottom of the water column ranged between –36.4 ‰ and –46.3 ‰ while $\delta^{15}N$ values ranged between –1.1 ‰ and –5.3 ‰. These low values were associated with intensive bacteria activity, probably methane-oxidizing bacteria. Additionally, they may indicate that bacteria constitute, directly or indirectly (through the microbial loop) a ^{13}C-depleted food source for the zooplankton in the lake during winter and early spring. This could also be a pathway for the transfer of particulate MeHg to zooplankton, since the highest concentrations of particulate MeHg were always associated with the lowest $\delta^{13}C$ and $\delta^{15}N$ values.