Effects of mercury-microbial cell surface interactions on mercury redox transformation

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For ACS meeting April 7-11, 2013, New Orleans, Louisiana

For the session: Biogeochemical Transformation of Transition Elements in Aquatic Systems: A Symposium in Honor of George W. Luther's Accomplishments in Geochemistry

Mercury (Hg) is a persistent pollutant and its transformation to the neurotoxic methylmercury is a particular health concern. Anaerobic bacteria are known to catalyze Hg methylation, but mechanisms of biological Hg methylation and surface interactions remain unclear. We examined cell surface interactions with Hg and effects of metal ions (i.e., Cu^{2+} and Zn^{2+}) and complexing ligands (i.e. EDTA and cysteine) on the adsorption and redox transformation of Hg by two known methylators, *Geobacter sulfurreducens* and *Desulfovibrio desulfuricans* ND132. In the presence of 25-nM Hg(II/0), Cu^{2+} or Zn^{2+} (as low as 10 µM) significantly inhibited Hg redox transformation by *D. desulfuricans*. In contrast, Hg(II) reduction by *G. sulfurreducens* was enhanced by Zn^{2+}, likely due to decreased Hg(II) binding to cellular surfaces by the competing metal, Zn(II). Complexing organic ligands also decreased the surface sorption of Hg(II). These findings may have important implications to Hg(II) bioavailability and ultimately methylation in the environment.