

Dimethylmercury Degradation in the Presence of Sulfide

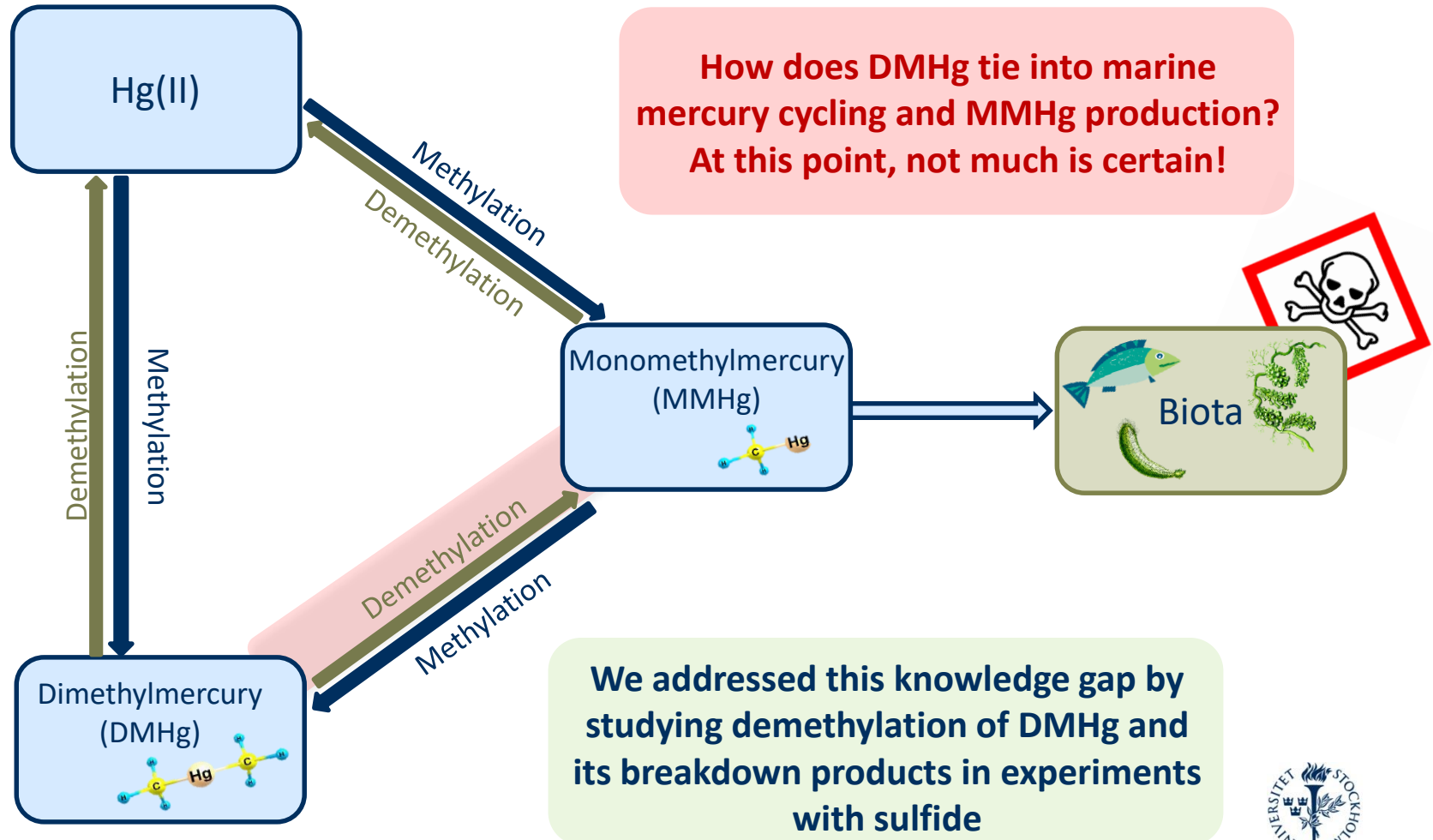
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Hg in Marine Waters



Experimental design

Here, we have conducted incubations experiments where the stability of DMHg was tested in the presence of dissolved sulfide and sulfide minerals (FeS , CdS).

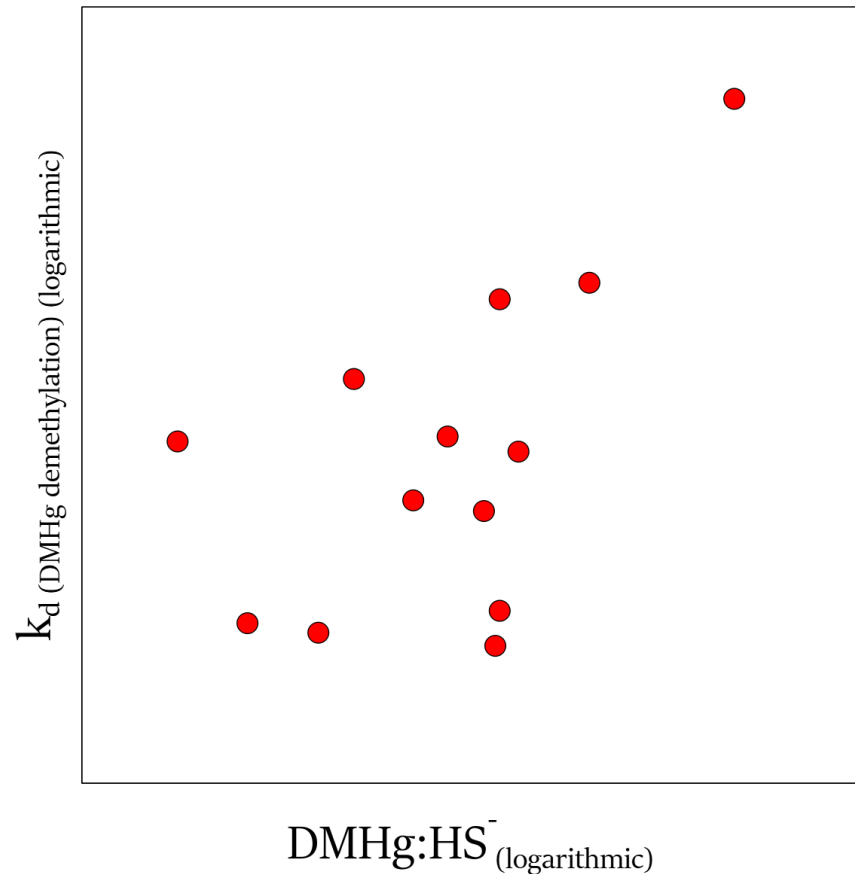
All experiments were done under anoxic conditions and under varying pH ranges and temperatures.



- Dimethylmercury is **EXTREMELY TOXIC!**
- Safety measures taken
 - Sample concentrations in the ng L^{-1} range

Results: Dissolved sulfide

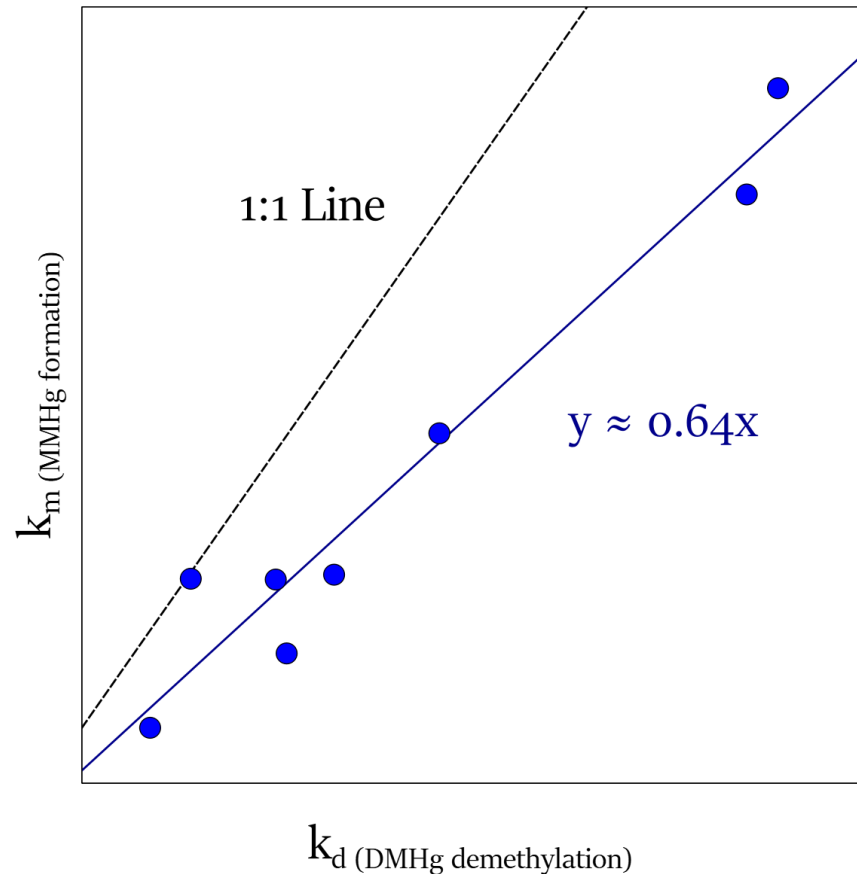
- DMHg decomposes faster in samples with $\text{H}_2\text{S}/\text{HS}^-$ compared to control samples without sulfide
- An inverse relationship is found between $[\text{HS}^-]$ concentrations and DMHg demethylation rates
- DMHg degradation rates are pH-dependent



Measured DMHg demethylation rate constants plotted against DMHg to HS⁻ ratios. All samples were buffered to the same pH and incubated at the same temperature.

Results: Dissolved sulfide (continued)

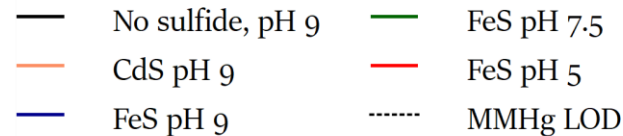
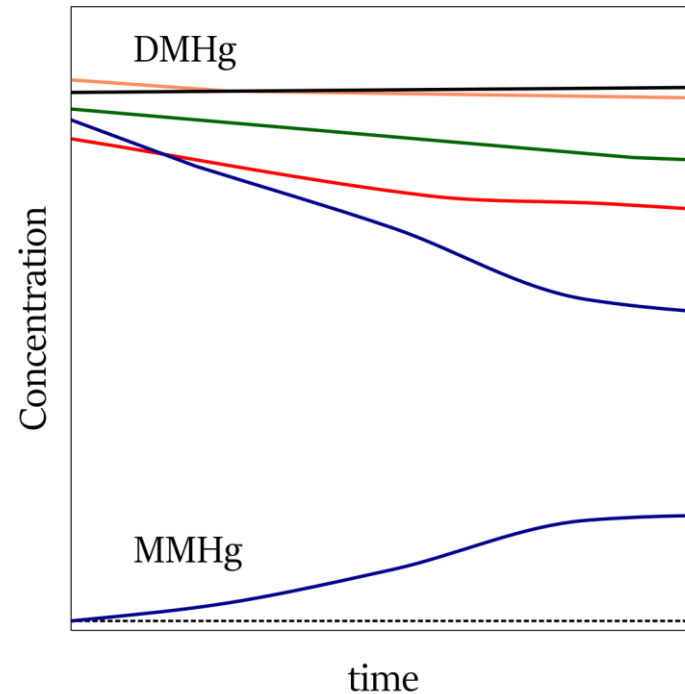
- MMHg is identified as the main degradation product. With time, formed MMHg is further degraded to Hg(II)



Measured MMHg formation rate constants plotted against DMHg demethylation rate constants. All samples were buffered to the same pH and incubated at the same temperature.

Results: Particulate sulfide

- DMHg decomposes faster in samples with FeS compared to control samples without FeS
- MMHg is identified as the breakdown product
- The pathway is pH-dependent
- No DMHg decomposition is observed for CdS, a more thermodynamically stable sulfide mineral



Loss of DMHg (top) and increase in MMHg (bottom) with time . All groups were incubated at the same temperature and with comparable ratios of DMHg to mineral surface area.

Summary and Conclusions

We show the first experimental support of DMHg degradation mediated by dissolved sulfide, supporting earlier theoretical work (*Ni et al, 2006, J. Phys. Chem.*)

We demonstrate demethylation of DMHg mediated by interaction with FeS(s) surfaces

Reactions appear to depend on pH and thermodynamic stability of sulfide minerals



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