Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19843

What would metabolic versatility among mercury methylators signify for mercury cycling in a changing climate?

JOHN W MOREAU

University of Glasgow

Presenting Author: john.moreau@glasgow.ac.uk

Challenging the paradigm that only anaerobic microorganisms can methylate mercury, recent studies support a role for metabolic versatility across a range of environmental redox conditions [1-4]. If microbes can significantly methylate Hg under suboxic or oxic conditions, then we face new questions about 1) the complexity of the biogeochemical mercury cycle, 2) links between Hg methylation and other biogeochemical cycles (e.g., nitrogen and sulphur), and 3) potential responses of Hg methylators to environmental pressures resulting from climate change.

Here we present metagenomic and geochemical evidence for metabolic versatility among marine microbial mercury methylators, and consider how links between Hg and other biogeochemical cycles may be impacted by climate change. Production of methylmercury in marine water columns would likely be enhanced by increased particulate organic matter loading but also by the resulting amplification of the effects of microenvironmental redox gradients.

We also examine the potential for terrestrial Hg methylation under varying redox conditions, and the implications of climate change for Hg mobility and MeHg formation across catchment ecosystems. Changes in terrestrial nutrient cycling, particularly with regards to nitrogen, may subsequently influence Hg bioavailability for methylation in soil and sediment. Peatlands accumulating centuries of historical atmospheric Hg deposition in particular should be a focus of future study.

[1] Gionfriddo et al. (2016), *Nature microbiology* 1, 1-12.

[2] McDaniel et al. (2020), *Msystems* 5, e00299-20.

[3] Lin et al. (2021), *The ISME journal* 15, 1810-1825.

[4] Vigneron et al. (2021), *npj Biofilms and Microbiomes* 7, 83.