Application of geomicrobial techniques to constrain mechanisms of arsenic mobilisation in anoxic aquifers

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Abstract

Geogenic arsenic contamination of groundwater in South and South-East Asia poses a significant human health threat, causing a range of health conditions including but not limited to cardio-vascular disease, cancer and skin lesions (Argos et al. 2010, Pienkowska et al. 2021). Arsenic contamination also hosts a range of dire socioeconomic implications for the affected areas. A variety of mechanisms for arsenic release in anoxic aquifers have been proposed, however, the most widely accepted mechanism is the microbial reduction of As-bearing Fe(III) (oxyhydr)oxide minerals coupled with the oxidation of organic carbon (Glodowska et al. 2020, Gnanaprakasam et al. 2017). Recent research has implicated methane as a possible carbon source in the reduction of Fe(III) (oxyhydr)oxide minerals and the subsequent release of arsenic into the groundwater (Gnanaprakasam et al. 2017, Pienkowska et al. 2021). The research suggests that methanotrophs have the ability to drive anaerobic oxidation of methane, AOM, coupled to Fe(III) (oxyhydr)oxide reduction. In this study, we aim to provide unequivocal evidence for the occurrence of AOM coupled to Fe(III) (oxyhydr)oxide as well to further explore the exact mechanism(s) involved which is yet to be characterised. Here we present an overview of our work so far.

Keywords

Fe(III) (oxyhydr)oxides, Arsenic, Methane

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Conflicts of interest

The authors have declared that no competing interests exist.

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