Updates on microbial Iodine Cycling in snotty Biofilms of a prealpine Mineral Spring Cavern

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Abstract

We have previously described the massive, methane-oxidizing microbial biofilms discovered in the cavern of an iodine-rich former medicinal spring in prealpine southern Germany (Karwautz et al. 2017). Next to up to 3000 ppm of methane in the cavern atmosphere, the mineral spring water can contain up to 23 mM of iodine, ~thousand-fold higher than in natural freshwaters. Since reactive iodine species can be toxic for microbes, the massive microbial growth in this cave is a fascinating phenomenon. We postulate that microbes capable of utilizing different iodine species should be prevalent in the cavern. Here, we present our recent work investigating the possible involvement of biofilm microbiota in either oxidative or reductive iodine cycling. Gradient tubes set up with iodide and oxygen as redox partners showed ample microbial growth and the formation of elemental iodine. Amplicon sequencing suggested different *Alpha*- (*Magnetospirillum* spp.) and *Gammaproteobacteria* (*Aeromonas* spp.) to be capable of iodide oxidation. Moreover, we address a possible iodate-dependent methane oxidation hosted within biofilm microbiota. Metagenomes allowed to assemble the MAGs of a novel member of the recently discovered anaerobic *Methylomirabilota* methanotrophs, Candidatus *Methylomirabilis iodofontis*. Its genetic repertoire included not only known markers of oxygenic denitrification and aerobic methane oxidation, but also of iodate respiration (Zhu et al. 2022). Our ongoing work will provide further evidence of the still largely uncharted iodine-cycling ecophysiologies of the biofilm microbiota of this unique microbe-dominated subsurface ecosystem.

Keywords

subsurface biofilms, methanotrophs, iodine cycling

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Possible session topics: Cave, karst, and fractured rock; Extreme environments; Freshwater, groundwater, and rivers

Conflicts of interest

The authors have declared that no competing interests exist.

References

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