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Bacteria-mediated Metal Deposition within the Byssal Threads of the Deep-sea Hydrothermal Mussel *Bathymodiolus azoricus*

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This study describes for the first time a potentially new group of bacterial flora within the byssus threads of the deep sea hydrothermal mussel Bathymodiolus azoricus, with putative role in metal sequestration and deposition. This prokaryote's morphology closely resembles a widely studied Mn-oxidiser, i.e. the undientified filamentous Leptotrix sp.

Using simultaneous classical histology, electron microscopy and EDAX analysis together with analytical chemistry, we provide evidence for the frequently assumed, but rarely proven influence of prokaryotes on the biogeochemical cycling of metals at deep sea hydrothermal vents. Our results indicate that in spite of its antibacterial protective sheath, byssus gives access to prokaryotic organisms which may be responsible for the extreme concentrations of metallic elements (Fe, Cu, Zn, Mn, Co, Mo, Cd, Pb and Hg) measured in this attachment organ as a putative effect of their metabolic activities. We propose a succession sequence to the biomineralisation process rendered by the microorganism.

These unprecedented metal levels in byssus, jointly with its frequent renewal rate rendered by the dynamic nature of the habitat, suggest that intra-byssal bacteria may have a great influence on biomineralisation/deposition of Mn, which in turn act as scavenger for other metals. The implications of the biogenic manganese oxides in the overall biogeochemical cycling of metals at vents are discussed.