Fe biomineralization in the meromictic Lake Pavin

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Among the few modern settings that share similarities with ancient ferruginous water bodies, Lake Pavin offers an invaluable window on the past. We studied the mineralogical diversity with depth in the water column of this ferruginous meromictic lake, especially across the oxycline. This revealed the omnipresence of Fe minerals, including some that display typical biomineralization patterns. These results suggest that a combination of both abiotic and biotic processes contributes to mineral formation in the water column[1]. Among the diverse biomineralization patterns, we observed bacteria encrusted by Fe phosphate in their cell wall. Knowing the crucial role of the periplasm in regulating traffic between intracellular and extracellular environments, this questions the viability of such mineral-encrusted microorganisms. We explored this issue using *Acidovorax* sp. BoFeN1, a model strain of nitrate-reducing Fe(III)-precipitating bacteria. We performed pulse chase experiments with isotopically labelled organic carbon sources and followed their incorporation by encrusted *vs*. non-encrusted cells by NanoSIMS. Our results shed light on the mechanisms of survival developed by these Fe-biomineralizing bacteria, which differ strongly from previously described adaptations[2].

1. J. Miot et al., *Minerals*, **6**, 24 (2016); 2. J. Miot et al., *Frontiers in Microbiology*, **6** (2015)