

Investigating the microbiome of the world's largest bacterium *Thiomargarita* spp.

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“Microbiome” is a term often gives to the microbiota associated with multicellular organisms. We are exploring the possibility that the still uncultivable large sulfur bacteria may also have distinct microbiota attached to their outer surfaces and that these host-epibiont interactions comprise a complex amalgam of antagonistic, protagonistic and potentially syntrophic interactions much like those associated with microbiomes of eukaryotes. Our study combines 16S iTag sequencing, Live/Dead staining, FISH, and metagenomics on individual *Thiomargarita* spp. cells and chains collected from Benguela upwelling sediments, collected offshore Namibia. *Thiomargarita* spp. are mixotrophs that couple the oxidation of reduced sulfur species with the respiration of O₂ and NO₃ under hypoxic conditions. Surprisingly, other bacteria that would presumably fill a very similar ecological niche to that of *Thiomargarita* spp., e.g. *Sulfurimonas* spp. and unclassified Gammaproteobacteria, are commonly attached to *Thiomargarita* spp. in high abundances. In addition, sulfate-reducing bacteria within the Desulfobacteraceae are also commonly found attached to *Thiomargarita* spp. These finding suggest that complete sulfur cycling may be occurring at the microscale within the sediments, where perhaps sulfur cycle intermediates, in addition to carbon preferences, select for colonization and niche partitioning. iTag results show that the abundance of OTUs attached to *Thiomargarita* spp. that are associated with sulfur cycling increases when sediment containing *Thiomargarita* spp. is stored for future analyses. This “bottle effect” also results in a significant reduction of other OTUs, in particular an unclassified Alcaligenaceae. Future metagenomics analyses will illuminate these and other complex microbe-microbe interactions, such as the ecological niche of the Alcaligenaceae, that we will use to guide future incubation and expression studies, as well as strategies for cultivating *Thiomargarita* spp.