Chemosynthesis at the expense of thiosulfate in the mangrove clam Polymesoda erosa and the major bacterial contributors

Tresa Thomas[1], Vijayakumar Kanojia[2], LokaBharathi PA[1]

[1]Academy of Scientific and Innovative Research (ACSIR), CSIR-National Institute of Oceanography, Dona Paula, Goa; tresa2812@gmail.com
[2]CSIR-National Institute of Oceanography, Dona Paula, Goa

Polymesoda erosa, the bivalve found at high tide region in the mangrove swamps thrives by immersing 75-90% of its body in sub-oxic to anoxic sediments dominated by reduced sulfur compounds. We therefore, hypothesized that these clams could have an adaptive mechanism like microbialy mediated sulfide utilization coupled to inorganic carbon uptake. We have used the model compound thiosulfate to test for the sulfide utilizing potential. Most probable number of thiosulfate utilizing bacteria in the tissues was in the order of 104 to 105 g-1 dry wt. Average thiosulfate uptake rates could be ranked as gill (408µM g-1 dry wt. hr-1) > foot (229) > mantle (72) with significant variation between tissues and reproductive phases where, pre-spawning (389) was > post spawning (183) > spawning (76). Experiments with 14C uptake at the expense of thiosulfate showed significant variation with tissues with maximum uptake by gill (115nMC g-1 dry wt. hr) followed by foot (98.66) and mantle (14.52) and with season where spawning (173.96) > pre-spawning (49.34) > post-spawning (6.30). Thiosulfate uptake rate switched from sulfide driven during pre-spawning to ammonia driven during post spawning. Examination of microbial community in triplicates by NGS (Next Generation Sequencing) revealed that Thiothrix of ɤ-Proteobacteria was the dominating known chemoautotroph. Presence of this genus in the sediment suggests its horizontal acquisition by the clam. Reverse pattern of CO2 profile was observed in the presence of clam in sediment with net release of CO2 at the surface layer and uptake at 8-10 cm depth. Our study thus suggests that inorganic carbon can be fixed at the expense of sulfide by bacterial associates of the clam P. erosa and γ-Protoebacteria could be the plausible major contributors.