ABSTRACT
TOPIC ≠5: Effects of abiotic factors and environmental extremes on microorganisms

Bacterial methane-production and sulfate-reduction activities in four Mediterranean deep hypersaline anoxic basins (DHABs)

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During BIODEEP-2 cruise (R/V Urania, August-September 2001) and BIODEEP-3 cruise (R/V Urania, June 2002), anaerobic bacterial activities, such as methanogenesis and sulfate-reduction, were measured in four DHABs from the eastern Mediterranean: L'Atalante, Discovery, Urania, and Bannock. Samples were collected at the seawater/brine interface (upper and lower interface), in the body brine, and sediments (overlying brine and sediment). Methanogenic activity was estimated by quantifying the methane produced in headspace of anoxic serum flasks containing samples of brine or sediment, with or without amendment of methanogenic precursors. Sulfate reduction was estimated by measuring the production of S35 radiolabeled sulfide from S35 radiolabeled sulfate. In contrast with the open ocean, where the maximal concentration of dissolved methane averages 2-4 nM in surface seawater, in the DHABs important amounts of methane are present, from some tens µM in Discovery, several hundreds µM in Bannock and L'Atalante, and up to some thousands µM in Urania. Except in oxic sediment collected out of the brines, where no methane production was detected, methanogenic activity has been evidenced in all the studied samples, with production varying from less than one µM of methane produced, at the interface of Discovery and Bannock, to several hundred µM in Urania. Methane production was minimal in natural seawater, then increased from upper to lower interface, and was maximal in the body brine. Methanogenesis decreased in brine overlying sediment and reached the highest values in sediment. Sulfate reduction was evidenced in the majority of studied samples, including in the in the oxic sediment (out of DHABs). In Discovery and L'Atalante, in contrast with methane production, the highest sulfate reduction rates were measured at the seawater/brine interface. Sulfate-reduction rates decreased from upper to lower interface in Bannock, and, inversely increased from upper to lower interface in the other DHABs. Similar low rates of sulfate reduction were measured in Bannock and Discovery, whereas rates were 2- and 3-fold higher in Urania and L'Atalante, respectively. Maximal methane production was registered in Urania basin, coinciding with the highest concentrations of dissolved methane, and maximal sulfate reduction was found in L'Atalante basin, coinciding with the highest sulfate concentration, and in Urania, where the highest sulfide concentrations were found.