Are the Microbial populations of the deep anoxic hypersaline basins of the eastern Mediterranean adapted to ambient pressure conditions?

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Deep hypersaline anoxic basins (DHABs) in the eastern Mediterranean are characterized by hypersalinity (between 160 and 300), anoxic conditions and high hydrostatic pressure (~35 MPa). Although microscopic observations have shown that prokaryotic cells are present in these brines, little is know about the physiological status of these cells. In order to estimate whether prokaryotes are active cells, we measured aminopeptidase and phosphatase activities, ^{14}C-glutamic acid uptake (assimilation + respiration) and microbial biomass production. All these independent assays resulted positive in all the samples studied. Maximum rates of ectoenzymatic hydrolysis ranged from 0.23 to 2.96 nmol l^{-1} h^{-1} for aminopeptidase and from 0.92 to 2.91 nmol l^{-1} h^{-1} for phosphatase activities. These rates were clearly higher than those we measured in the immediately overlaying deep oxic water and at least the same order of magnitude as those measured in the productive photic layer. Conversely, metabolic processes based on the utilization of low-molecular weight compounds (^{14}C-glutamic acid uptake and microbial biomass production) were always irrefutably detected, but the rates measured were slowed down when compared to those observed in the oxic seawater. Conventional studies don't allow to determine if these prokaryotes are marine organisms coming from the overlying seawater column that only survive in the brines, or if they are autochthonous populations adapted to such extreme conditions for life, and so able to actually grow in the DAHBs. To answer this question, we measured the metabolic rates of diverse microbial activities using specific equipment that maintain all the characteristics of DAHBs, including high-pressure conditions, during sample retrieval and incubation. All the metabolic rates measured under ambient conditions (ectoenzymatic hydrolysis processes, like aminopeptidase and phosphatase; assimilation and respiration of ^{14}C-glutamate; bacterial biomass production) were always higher (mean = 12.5 ± 23.6; n = 6) than those got on the concomitantly studied decompressed subsamples. Hence we demonstrate that in the DAHBs microbial populations are adapted to the ambient conditions, and so that microbial growth and microbial activities are presently possible in these extreme environments, which encourage biotechnological interest studies. Furthermore, microorganisms adapted to such particular extreme conditions for life might provide insights about the origin of life.