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Dark CO₂ fixation by chemolithoautrophic prokaryotes in the deep-water masses of the north-west coast of the Iberian Peninsula

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Abstract

Recent studies suggest that the prokaryotes inhabiting the dark ocean present higher chemoautotrophic activity than assumed previously. These chemoautotrophic microbes incorporate dissolved inorganic carbon (DIC) as carbon source for biomass production and use reduced inorganic compound as an energy source. We have quantified DIC fixation in the meso- and bathypelagic waters of the northwestern coast of the Iberian Peninsula, ranging from 1.04 to 46.83 mmol C m⁻² d⁻¹. Combining microautoradiography and fluorescence in situ hybridization (MICRO-CARD-FISH), we confirmed that both *Thaumarchaeota* and some bacterial groups such as SAR-11, SAR-202, SAR-406, *Alteromonas* take up bicarbonate uptake, particularly in the mesopelagic waters. Quantitative PCR analyses clearly showed a higher abundance of thaumarchaeal 16S and low ammonia concentration (LAC)-*amoA* genes in meso- and lower bathypelagic waters than in surface waters. In contrast, low ammonia concentration (HAC)-*amoA* genes dominated the subsurface samples. Taken together, both genomic and physiological evidences indicate that some archaeal and bacterial groups may be significant contributors to dark ocean chemoautotrophy.