TITLE: THE DEEP-SEA MICROBIAL COMMUNITY FROM THE AMAZONIAN BASIN ASSOCIATED WITH OIL DEGRADATION

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ABSTRACT:

One outcome of oil production is the possibility of spills, therefore, it is important to evaluate the potential of indigenous microorganisms (both prokaryotes and eukaryotes) from different oceanic basins to degrade oil. The goal of this study was characterize the microbial diversity during the process of oil degradation, with and without the addition of the dispersant Corexit 9500, using deep-sea water samples from the Amazon equatorial margin basins, Foz do Amazonas and Barreirinhas, in the dark and at low temperatures (4°C). We collected deep-sea samples in the field (about 2570 m below the sea surface), transported the samples back to the laboratory under controlled environmental conditions (4°C in the dark) and subsequently performed two laboratory biodegradation experiments that used metagenomics supported by classical microbiological methods and chemical analysis to elucidate both taxonomic and functional microbial diversity. We also analyzed several physical–chemical and biological parameters related to oil biodegradation. The microbial communities disclosed in deep-sea water of both locations analyzed here included several oil-degrading taxa.The decrease of dissolved oxygen levels, oil droplets density and BTEX concentration associated with the increase of microbial counts suggest that seabed microbial communities can degrade oil. Bacteria (e.g. Alteromonadaceae, Colwelliaceae e Alcanivoracaceae), arquéias (e.g. Halobacteraceae, Desulfurococcaceae e Methanobacteraceae), and eukaryotic microbes (e.g. Microsporidia, Ascomycota e Basidiomycota) from the Amazonian margin deep-sea water were involved in biodegradation of Brazilian crude oil within less than 48-days in both treatments, with and without dispersant, possibly transforming oil into microbial biomass that may fuel the marine food web. We observed that chemolithotrophy, methanogenesis, nitrogen metabolism, and utilization of sulfur compounds are coupled to oil biodegradation (with and without addition of dispersants).This study hints at possible roles for bacteria, archaea, fungi, and other microscopic eukaryotes in the Amazonas/Barreirinhas deep-sea water in oil biodegradation

Keywords: Microorganisms, Petroleum, Dispersant, Bioremediation.

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