Microbial communities of methane seeps and mud volcanoes, Black Sea

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Anoxic environment of submarine gas seeps is a specific type of marine habitats where microbial life is based on anaerobic oxidation of methane (AOM) as a source of energy and carbon. For over 20 years, hundreds of active methane seeps including actively gas-emitting mud volcanoes have been identified in the Northern Black Sea at depths from 30 to 2000 m [1,2]. A striking example of a methane-driven microbial habitat is the large gas seepage area in the anoxic part of the northwestern slope of the Crimean Peninsula. At depths from 180 m, giant reef-like structures composed of porous carbonates and microbial mats growing vertically or horizontally are found on the seafloor. The 1:1 ratio of the rates of AMO and sulfate reduction suggested methane as the main or only electron donor responsible for the development of microbial mats and carbonate structures [3,4]. Application of molecular biological techniques and lipid biomarkers resulted in a significant progress in the study of microbial communities responsible for AMO. Uncultured archaea of the ANME-I and ANME-II types in association with sulfate-reducing δ-proteobacteria of the *Desulfosarcina/Desulfococcus* group are presently known to predominate in the microbial community of Black Sea methane seeps, which is responsible for AOM.

The data concerning the structure of microbial communities of deep-water mud volcanoes and associated gas hydrates are scarcer. Research involving lipid biomarkers and 16S rDNA sequencing suggested that formation of carbonate crusts in the sediments of mud volcanoes is a consequence of activity of anaerobic methanotrophic archaea and sulfate-reducing bacteria, with the ANME-I group as the major archaeal component [5].

References

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