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Transfer and recycling of biomass in the most extreme sediments of the Dead Sea

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The Dead Sea sediment is an extreme environment where only few prokaryotic organisms manage to survive. Deep drilling in the Dead Sea sediment has allowed to investigate further the identity, occurrence and metabolic potential of the subsurface biosphere of the Dead Sea. In this environment, the origin of carbon rather than its quantity seems to make the difference (Ariztegui et al., 2015). Archaeal communities that dominate the deep sediments are relatively similar to those that currently live and have lived in the past in the Dead Sea water column. This has been revealed by 16S rRNA gene sequences analyzed from bulk halite (Thomas et al., 2015) and from the fluid inclusions trapped inside halite during the process of precipitation of the minerals. Comparing sequences of modern and ancient DNA allows to support the seeding of the subsurface biosphere by biomass living in the water column. The subsurface biosphere is hence strongly influenced by water column physico-chemical characteristics and communities in the Dead Sea. These sedimentary organisms remain active in the subsurface where carbon recycling occurs. Since primary production is low during arid periods, fresh organic matter consists mainly of planktonic to benthic micro-organisms surviving in hypersaline conditions. The study of lipid biomarkers in halite layers showed that sedimentary microorganisms rely on these sources. In particular, bacteria that are relatively absent in the water column take advantage of the available organic carbon, such as dead halophilic archaea, in the sediment. Isotopic and structural data show that isoprenoid chains derived from halophilic archaea membranes are broken down in the sediment and transformed by yet unknown bacterial actors into storage lipids (wax esters). This esterification process permits the production of intracellular carbon stocks together with the release of molecular water, which is a rare resource in the hypersaline Dead Sea sediment. This survival strategy of some bacteria from the deep biosphere is observed for the first time and shows how the subsurface biosphere makes use of the available necromass to adapt to such extreme environments.

Ariztegui, D., Thomas, C., and Vuillemin, A., 2015, Present and future of subsurface biosphere studies in lacustrine sediments through scientific drilling: International Journal of Earth Sciences, v. 104, no. 6, p. 1655–1665.

Thomas, C., Ionescu, D., and Ariztegui, D., 2015, Impact of paleoclimate on the distribution of microbial communities in the subsurface sediment of the Dead Sea: Geobiology, v. 13, no. 6, p. 546–561, doi: 10.1111/gbi.12151.