Fungal-prokaryotic consortia in oceanic igneous crust

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The oceanic crust makes up the largest potential habitat for microbial life on Earth, yet next to nothing is known about the abundance, diversity and ecology of its biosphere. Because of issues involved in sampling live specimens, paleontological material has been proven central in the exploration of the subseafloor biosphere. Studies of two drill cores from Nintoku and Koko Seamounts, respectively, belonging to the Emperor Seamounts in the Pacific Ocean have revealed fungal-prokaryotic consortia in subseafloor basalts to a depth of ~300 mbsf. At Koko Seamount fungal colonization was initiated by a biofilm lining the interior of vesicle basalt from which hyphae protruded and formed complex mycelia-like networks. Between the hyphae minute cells were suspended in a cobweb-like fashion; interpreted as prokaryotes involved in iron oxidation. Microstromatolitic *Frutexites* representing remains of iron oxidizing bacterial communities also used the fungal mycelia as basis for their growth. At Nintoku Seamount microstromatolitic bacteria predated fungal colonization, which was initiated by the formation of a biofilm from which hyphae and yeast-like growth structures protruded. Both studies show that the microbial colonization of subseafloor basalts is an early event that predates substantial rock alteration and coeval with the precipitation of secondary minerals like carbonates and zeolites. A symbiotic relationship with chemoautotrophs may be a prerequisite for the eukaryotic colonization of crustal rocks and enables fungi to expand their ecological niches. In fact, fungi appear to play an important ecological role in subseafloor crust being involved in mineral weathering and precipitation, mobilization of elements and engaging in symbiotic relationships; a geobiological agent not yet accounted for in the oceanic igneous crust.