

Marine mycomineralization: The role of fungi in coral mineralization

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Coral reefs play vital roles in a variety of eco-systems and support around 25 % of all marine species, as well as having ecological and economic significance for tourism, fisheries and shoreline protection.^{1,2} Our work focuses on the potential of marine fungi playing beneficial or symbiotic, rather than detrimental roles in coral formation and ecological support. This idea takes into account that only a fraction of marine fungi have been identified and studied, and that terrestrial fungi have great geochemical influence in terrestrial environments. Electron microscopy reveals a network of organic fibers within the coral skeleton supported by data obtained from X-ray tomography analysis. These organic fibers are alike to fungal hyphae according to the size and morphology structure. ITS-rDNA analysis from different healthy coral skeleton materials revealed the presence of distinct fungal strains. A culturable *Penicillium sp.* fungal strain was isolated from the skeleton of healthy *Pocillopora damicornis*. Transmission electron microscopy (TEM) of hyphae-like fibers found at the polyp/skeleton interface show attachment of aragonite calcium carbonate to the fiber surfaces. A detailed TEM analysis of the crystal morphology around fibers embedded in the skeleton matrix at the centers of calcification shows a distinct evolution of the crystal structure from nanocrystalline to acicular. On the basis of these findings the potential role of fungi in the control of coral mineralization is discussed.

[1] Olson, J.B., Kellogg, C.A., 2010: Microbial ecology of corals, sponges, and algae in mesophotic coral environments. *FEMS Microbiol Ecol.*, **73**, 17-30. [2] van de Locht, R., Verch, A., Saunders, M., Dissard, D., Moya, A., Rixen, T. & Kröger, R., 2013: Microstructural evolution and nanoscale crystallography in scleractinian coral spherulites. *Struct Biol J.*, **183**, 57-65.