How corals adapt to day and night

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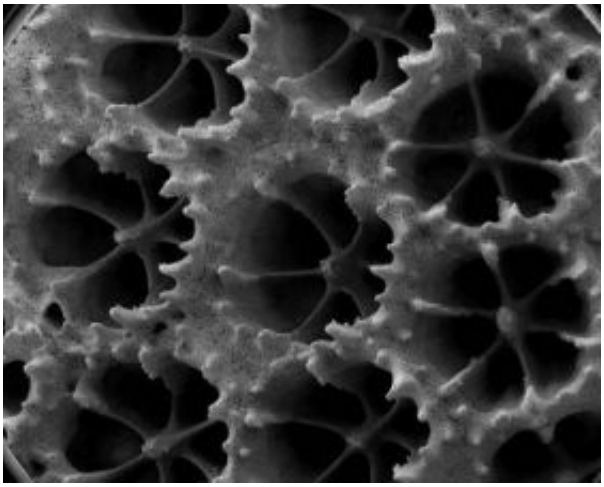

Skeletal calice of the symbiotic coral, Stylophora pistillata. Credit: Didier Zoccola, Centre Scientifique de Monaco

Researchers have uncovered a gene in corals that responds to day/night cycles, which provides some tantalizing clues into how symbiotic corals work together with their plankton partners.

Corals are fascinating animals that form the largest biological constructions in the world, sprawling coral reefs that cover less than 0.2 % of the seafloor yet provide habitats for more than 30% of marine life. In shallow waters that don't have abundant food, corals have developed a close relationship with small photosynthetic critters called dinoflagellates.

The dinoflagellates use sunlight to produce energy for the coral, which in turn use that energy to construct mineralized skeletons for protection. The mineral production, known as coral calcification, is closely tied with the day/night cycle, though the molecular mechanism behind this synchronization is mysterious.

Aurelie Moya and colleagues have now characterized the first coral gene that responds to the light cycle; this gene, called STPCA, makes an enzyme that converts carbon dioxide to bicarbonate (baking soda) and is twice as active at night compared to daytime. The researchers found that the enzyme concentrates in the watery layer right under the calcified skeleton, which combined with studies showing that STPCA inhibitors lower calcification rates, confirms a direct role for STPCA in this process.

Moya and colleagues propose that STPCA becomes more active at night to cope with acid buildup. The calcification process requires many hydrogen atoms, which during the day can be removed by photosynthesis; at night, however, hydrogen accumulates which increases the acidity of the coral, and therefore STPCA creates extra bicarbonate as a buffer to prevent acid damage.

Citation: "Carbonic Anhydrase in the Scleractinian Coral Stylophora pistillata" by Aurélie Moya, Sylvie Tambutté, Anthony Bertucci, Eric Tambutté, Séverine Lotto, Daniela Vullo, Claudiu T. Supuran, Denis Allemand, and Didier Zoccola

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