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Searching for a Solution to Coral Bleaching [1]

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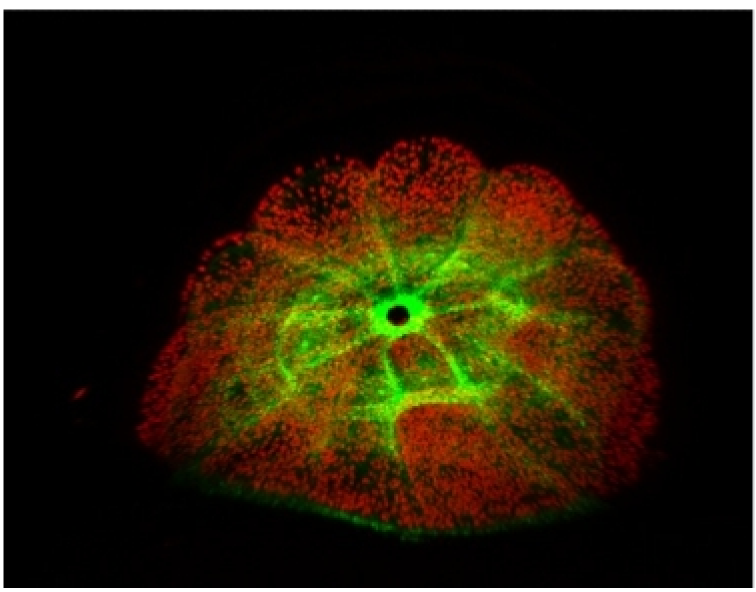

Top view of a day-old spawned Porites spp. sea anemone larvae. Composite image seen under a fluorescent microscope. Symbiotic zooxanthellae autofluorescence in red, larvae epidermis autofluorescence in green. Courtesy of Guillermo Yudowski.

Visiting scientist Guillermo Yudowski wants to make sea anemones happy.

Every morning, he arrives at his MBL laboratory and looks into a group of plastic tanks. Inside are samples of *Aiptasia pallida*, a hardy strain of anemone found in abundance near the University of Puerto Rico, where Yudowski conducts neurobiological research. Happy *A. pallida*, he says, are “colorful and open”; sad ones are closed and white. The white samples are near death and will only last three to four days in their containers.

Turning white—becoming, in Yudowski’s words, “sad”—is called bleaching. The anemone’s tissues are home to zooxanthellae, vibrant photosynthetic algae that produce food for the anemone and give it a characteristic brown color. Bleaching expels this algae from their home. The bleaching process is thought to be triggered by stress: a decrease in light availability, for example, or changes in the water’s temperature or pH. And these changes don’t need to be dramatic. A difference of a couple degrees Celsius can be enough to effectively bleach an anemone.

Yodowski and his colleagues hope their research will point to a cost-effective treatment for bleaching, which poses a serious threat not only to anemones, but to the world’s coral reefs. Though anemones and corals are different, strategies that work for the one organism may be effective for another. The changing climate has already led to mass bleaching events in the Great Barrier Reef, as well as coral reefs in the Indian Sea, the Caribbean Sea, and the Florida Keys.

“If you read the literature, some say that all the coral is going to die in 50 years. Others say, maybe 50 to 100,” says Yudowski. “It doesn’t make a big difference.”

To move toward a solution, Yudowski wants to understand what’s happening to the anemones on a microscopic level. If we figure out why bleaching occurs on a cellular level, then perhaps we can discover how to stop it from happening altogether.

“We don’t really know much about the basic molecular mechanics of the process,” explains Yudowski. “We are trying to understand how stresses like increased ocean temperature and acidification induce the expulsion of the algae.”

Yudowski and his student, Michael Marty-Rivera, are treating anemones with antioxidant compounds found in red wine and green tea. Previous research shows that reactive oxygen species, a kind of chemically reactive molecule, can trigger the bleaching process. Yudowski and Marty-Rivera think that these antioxidants might be able to counteract the effects of these trigger molecules. They will test the efficacy of their treatments by measuring the amount of photosynthetic activity in the anemones, as well as the number of zooxanthellae present.

Yudowski and Marty-Rivera will spend two months at the MBL this summer before returning to the University of Puerto Rico where, in close collaboration with Professors Loretta Roberson and Joshua Rosenthal, they run several different coral research projects. They want to understand the mechanism of calcification in corals and how environmental variables, such as temperature and pH, impact corals’ ability to form reefs and maintain a healthy symbiosis with their zooxanthellae partners.

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