Exploring the microbiology of quiescence in the coral *Astrangia poculata* as a model for understanding microbiome interaction with environmental disturbance

Meriel McGovern[1], Alicia Schickle[1], Anya Brown[2], Casidhe Hughes[1], Emma Place[1], Nikki Rosa[1], Amy Apprill[3] & Koty Sharp[1]

[1]Marine & Natural Sciences, Roger Williams University, Bristol, RI
[2]Evolution & Ecology, University of California, Davis, CA
[3]Marine Chemistry & Geochemistry, Woods Hole Oceanographic Institution, Woods Hole, MA

Coral microbiomes mediate the health of tropical corals and their survival of environmental disturbance. The local temperate coral *Astrangia poculata* is a valuable experimental organism for studying the dynamics and diversity of coral microbiomes because its microbiome composition is similar to that of many tropical corals and shifts predictably across seasons. During winter months, *A. poculata* undergoes a period of dormancy, or quiescence, likely triggered by cold temperatures (<5^{o}C), in which the polyps fully retract, become unresponsive to stimuli, and cease feeding. We propose that changes in the *A. poculata* microbiome during the winter-spring transition may be a model for coral microbiome recovery from environmental stress and/or disturbance. Here we designed an aquarium system to induce quiescence in *A. poculata*. Replicate aposymbiotic *A. poculata* colonies from Rhode Island and Massachusetts were held in individual tri-pour beakers with independent seawater flow and divided into two tanks (n=10 per geographic origin, per tank). The ambient (control) treatment was held at 19^{o}C. The quiescent treatment started at 19^{o}C, ramped down to 5^{o}C over 1 week, held at 5^{o}C for 4 weeks, and then ramped up to 19^{o}C over 1 week. Replicate seawater and coral mucus samples were collected during the ramp-down and ramp-up; during quiescence; and for two weeks post-quiescence. These samples were processed for 16S rRNA gene sequencing. Results suggest that the community composition of the mucus microbiome shifted depending on the quiescence vs ambient treatments, on the population, as well as during, and emergence from quiescence. Dispersion (inter-individual variability) of microbiome composition in *A. poculata* colonies is similar before and during quiescence but decreases during emergence from quiescence. *A. poculata* microbiome diversity decreased during quiescence but increased after emergence from quiescence. These patterns were consistent with previously reported results from wild *A. poculata* colonies sampled around quiescence. However, the taxonomic composition differed between tank and wild colonies with at least one exception: a *Sulfitobacter* sp., increased in proportional abundance in *A. poculata* colonies as they emerged from tank-induced and wild quiescence. This study highlights the community composition changes associated with quiescence and provides clues to the patterns and taxa that may play a role in recovery from an environmental disturbance.

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