TITLE: THE MANIPULATION OF BENEFICIAL MICROORGANISMS CAN PROTECT DIFFERENT CORAL SPECIES AND INCREASE THEIR RECOVERY FROM THERMAL PULSE STRESS

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ABSTRACT:

Seawater warming, and consequent massive coral bleaching events, are already a current reality and an inevitable scenario for the next years. In this regard, we have been developing an innovative approach to protect corals against heat stress, through the manipulation of Beneficial Microorganisms for Corals (BMC). Fragments of the Brazilian endemic coral *Mussismilia hispida*, including natural thermal resistant colonies, were used to isolate BMCs. Out of 127 bacteria, 6 of them were selected and assembled a BMC consortium, based in the presence of nitrogen fixation, nitrification, Dimethylsulfoniopropionate (DMSP) - degradation genes, reactive oxygen species scavenging and antagonistic activity against the coral pathogen *Vibrio coralliilyticus*. Coral fragments of *M. hispida* were exposed to high temperature in a 45-day mesocosm experiment, where part of them received the BMC consortium and the others received saline solution as a control treatment. After 30 days of acclimatization at 26°C, the temperature was increased (0.5°C per day) up to 30.5°C for 10 days, and then decreased back to 26°C for 25 days of recovery. Coral nubbins were sampled before the stress (T0), at the peak of temperature (T1), at the last day of high temperature (T2) and after the recovery period (T3). Maximum quantum yield of the zooxanthellae-associated Photosystem II (*Fv/Fm*) and morphologic changes were measured, as well as DMSP and lipid content from the coral tissue. Coral nubbins from both treatments bleached or paled under the pulsed thermal stress. Two out of five replicates of the control-treatment died after 20 and 38 days of the beginning of the experiment. On the other hand, all coral nubbins treated with BMCs survived and presented increases of *Fv/Fm*'s values (showing no significant difference between T0 and T3 measurement). The higher lipid content

in T2 and T3 samples (compared to the control) may indicate higher presence of symbiotic algae and advantages on the coral algae-uptake. In addition, higher amounts of DMSP were detected in BMC treatment samples, which may indicate pathogen inhibition activity promoted by the BMC members. Based on our findings, it is possible to conclude that the manipulation of BMCs during a thermal pulse stress increases the ability of the coral *Mussismilia hispida* recover from a bleaching event, being a potential approach to be applied in the field to minimize massive coral death.