The Effects of Magnesium Hydroxide on Photosynthesis, Respiration, Growth and Survival Rates of Three Caribbean Coral Species

UNIVERSITY OF MIAMI
ROSENSTIEL SCHOOL of MARINE, ATMOSPHERIC & EARTH SCIENCE

Jeanette Betke, Riley Palmer, Chris Langdon

Langdon Lab

BACKGROUND

- The ocean absorbs mass amounts of CO_2 from the atmosphere and stores it in deep sea sediments through a process known as the carbon cycle.
- Human interference with this cycle has resulted in the over-absorption of carbon by the ocean.
- This results in a decline of the ocean's ability to function as a major carbon sink, resulting in a variety of negative climatic effects.
- Ocean Alkalinity Enhancement is a potential method that could be utilized to mitigate acidification through the addition of alkaline to the ocean.

METHODS

- Three coral species were tested: *Acropora cervicornis, Sideraea sidera,* and *Pseudodiploria strigosa.*
- Corals of each species were randomly distributed between the control (n=2) and treatment tanks (n=2).
- Control tanks received untreated seawater and treatment tanks received seawater plus alkalinity in the form of magnesium hydroxide. Temperature was maintained at 30 °C.
- After 30 days of exposure to control and treatment conditions measurements of photosynthesis, respiration and calcification rates were made.
- At the end of 30 days temperature was ramped up 32 °C to simulate a heatwave event to see if alkalinity enhancement affected the response of the corals to heat stress and % mortality was recorded.

ACKNOWLEDGMENTS

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RESULTS

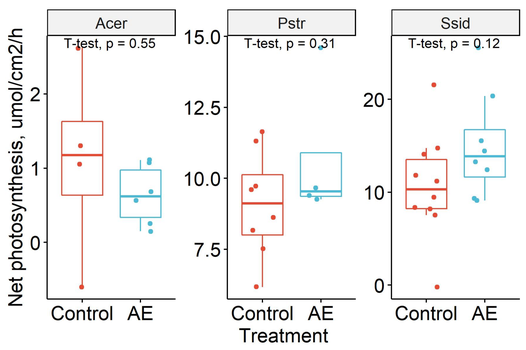

Figure 1: Photosynthesis ANOVA test showing that alkalinity had no significant effect on the photosynthetic rates of the three species under heat stress.

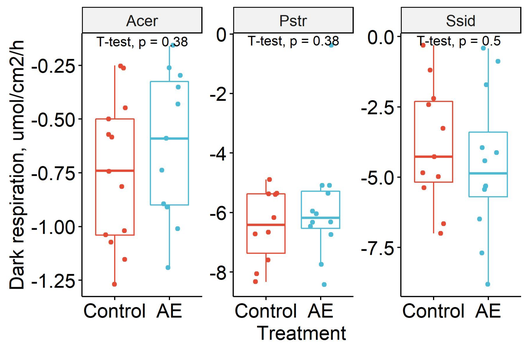

Figure 2: Respiration ANOVA test showing that alkalinity had no significant effect on the respiration rates of the three species under heat stress.

CONCLUSIONS

- Treatment was not found to have any significant effect on the photosynthesis, respiration, growth or mortality rates of the three coral species tested.
- This demonstrates that the magnesium hydroxide treatment may be a safe method of carbon dioxide removal and a means of mitigating the effects of ocean acidification.
- The addition of magnesium hydroxide needs to be tested next within a natural setting, such as a coral reef, in order to ensure the safety of the introduction of alkalinity to the organisms and the ecosystem.

RESULTS

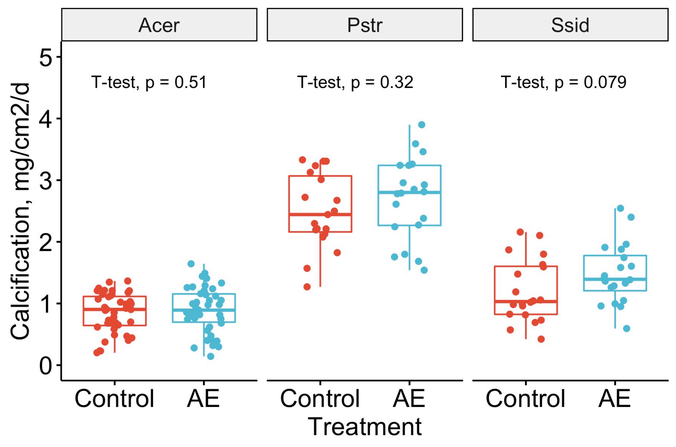

Figure 3: Growth rate ANOVA test showing that alkalinity had no significant effect on the growth rates of the three species.

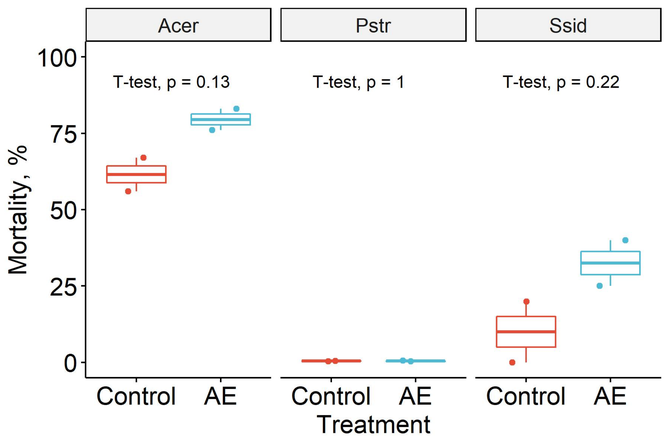

Figure 4: Mortality ANOVA test showing that alkalinity had no significant effect on the mortality rates of the three species.