FY 2018 Ex Situ Disease Treatment Trials

Final Report

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Since 2014, the Florida Reef Tract has been experiencing an outbreak of Stony Coral Tissue Loss Disease (SCTLD), a coral die-off that has affected numerous scleractinian species and been unprecedented in its geographic and temporal scope. In efforts to develop potential management tools, treatment options are being explored to address infections at a colony level. Prior efforts at field treatments for other coral diseases have included aspiration/shading, barriers via epoxy bands or chiseled trenches, and barriers with the addition of chlorine powder; efforts in previous laboratory environments to treat other coral diseases have also included the use of antibiotics. Past laboratory and ongoing field trials to treat corals infected with SCTLD have focused primarily on chlorinated epoxies and amoxicillin compounds. A continued series of laboratory trials to refine those tools and to experiment with new ideas and techniques was proposed for July – December 2018.

As a result of committee discussions about the efficacy of lab trials for representing field conditions, the majority of the trials were allocated to field-based *in situ* trials in lieu of laboratory studies. Other conditions that limited field trials were time appropriated for a split coral spawn, extensive challenges to finding colonies within the Middle Keys as a result of the die-offs of many of the susceptible species, and a slowing/cessation of disease progression on remaining Middle Keys diseased colonies.

However, one of the proposed trials was conducted, and field trials have suggested further experimentation within the laboratory to better refine existing methodology for treatments.

In September, a total of six diseased colonies were collected from three Marathon sites and used to test the effectiveness of a single vs. double dose of topical amoxicillin. Two *Dichocoenia stokesii*, two *Pseudodiploria strigosa*, one *Diploria labyrinthiformes*, and one *Orbicella faveolata* were placed in flow-through tanks at Keys Marine Lab. Within 24 hours, some colonies were cut to make a total of nine samples, and all were applied with treatments for disease.

The two treatments were a mixture of amoxicillin into a silicone base (Base 2b) developed specifically by CoreRx for delivery of antibiotic to coral. Direct application has shown short-term success in field applications in a standard dosage. This laboratory trial treated half of the experimental corals with the standard 1:16 by weight dosage and half with a doubled 1:8 by weight dosage.

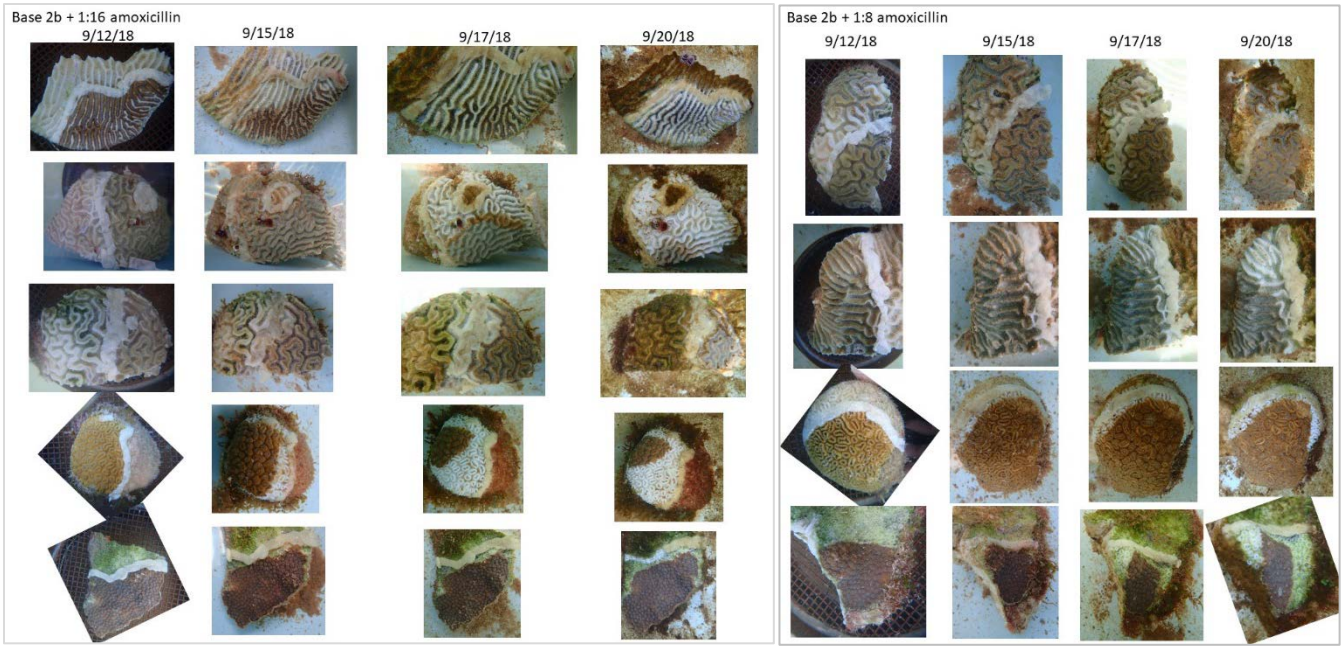

Fig 1: Time series photos of treated corals. Treatments were initiated on 9/12/18; five corals were treated with a 1:16 dosage of amoxicillin to base, and four corals were treated with a 1:8 dosage.

Within three days of treatment, disease progression showed little variation between treatments. Disease had appeared on the inside of the treatment margin in 80% (4 out of 5) of the single-dose colonies, and on 75% (3 out of 4) margins in the double-dose colonies (Fig 1, 2). However, after five and eight days, single-dose colonies showed an overall more rapid rate of disease progression and mortality than colonies that received a double-dose. Though initially showing disease inside the treatment band, the margins on the double-dosed *Dichocoenia stokesii* and *Diploria labyrinthiformes* appears to have slowed or halted after eight days. Further observations will determine whether this slowing results in a

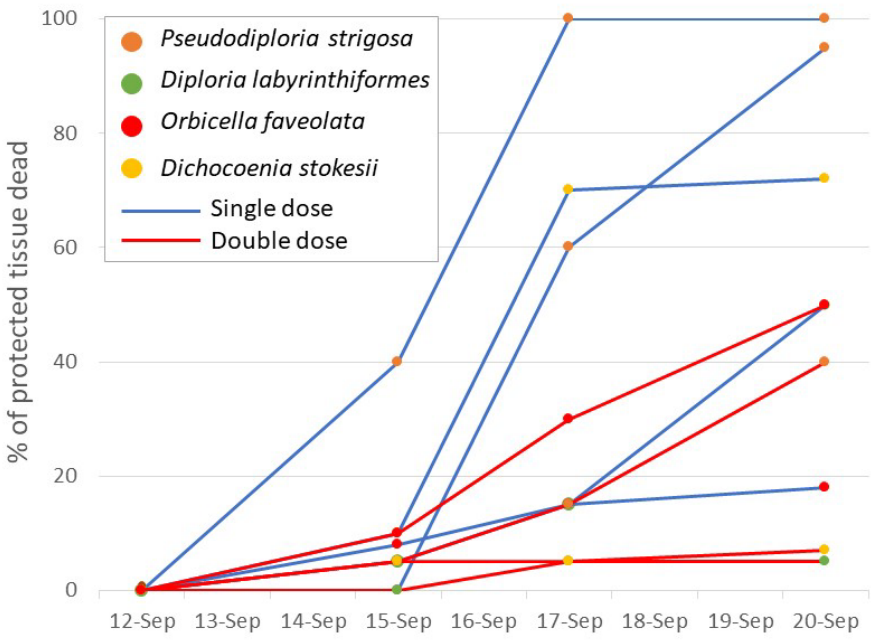

Fig 2: Proportion of dead tissue within the treatment margin of corals within eight days of application. Within five days, all corals from both treatments had disease past the treatment line. Three of the five standard dosage (blue line - 1:16) corals had rapid disease progression that had led to more than 60% mortality of the colony. None of the four double-treated (red line - 1:8) corals had mortality exceeding 30%.

cessation of disease on the colony, or continues to contribute to colony mortality.

If the disease remains stalled on double-dose treatments, this may be a consideration for increasing dosages on wild treated colonies. Wild colonies with a standard dose have generally shown a “halo” effect in which areas within 2-5 cm of the treatment line are protected for up to two months from lesion mortality. If increased dosage can widen this halo, this may be a useful technique for protecting additional tissue without needing to add additional treatments.

Future laboratory trials could include the following experimental treatments as proposed by the intervention committee and other partners:

- Amoxicillin bone cement
- Chloramine-T as an alternative to chlorine
- Silicone putty with chlorine and/or chloramine-T
- Heat, either at a localized lesion level or to promote bleaching

Field based experiments suggest that improvement to treatment success may be affected by the following variables, which could be tested in the lab:

- Application of clay over amoxicillin lesion treatments
- Comparison of amoxicillin treatments with and without trenching