UNIVERSITY OF MIAMI
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Antibiotic-Induced Shifts in Coral Cell Populations

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10 Second Summary

Antibiotics are commonly used to treat **Stony Coral Tissue Loss Disease (SCTLD)** but can compromise the coral's long-term resilience. The goal of this study was to evaluate the side effects of antibiotic treatment at the **cellular level**. This study identified 10 distinct coral cell populations and showed that **6 populations were significantly impacted by antibiotic treatment.** These results empahsize the need to identify SCTLD's causitive agent and develop alternative treatments.

Introduction

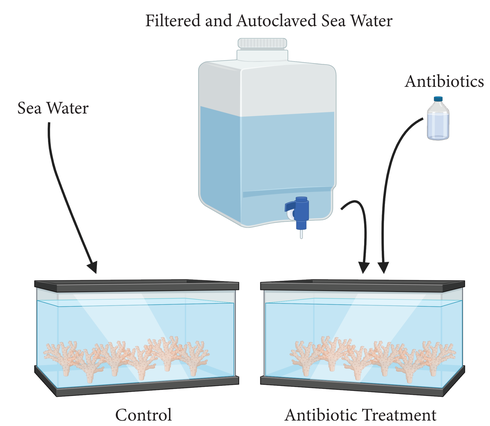
- Coral reefs are biological hotspots and provide many ecosystem services.
- Stony Coral Tissue Loss Disease (SCTLD) has decimated Caribbean reefs.
- Treatment with antibiotics is 95% effective[1] but reduces coral microbiome diversity which can lower host resilience[2].
- **Motivation:** Little is known about the impact at the cellular level.

Goals

To identify distinct coral cell populations and determine whether their abundances are impacted by the addition of antibiotics.

Methods

Treatment with Antibiotics

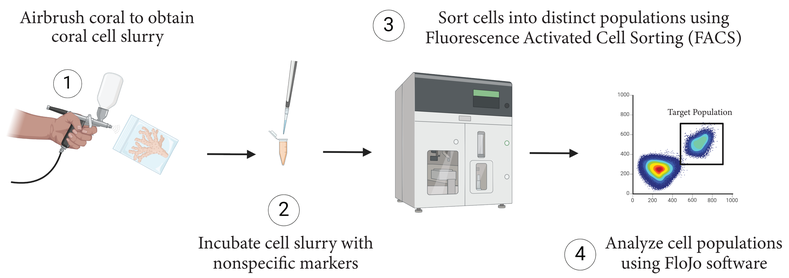


1" x 2" fragments of *Pocillopora damicornis*

Antibiotics mix: ampicillin, streptomycin and ciproflaxin

Exposure time: half of the corals removed after 2.5 days. Remaindersampled after 4.5 days.

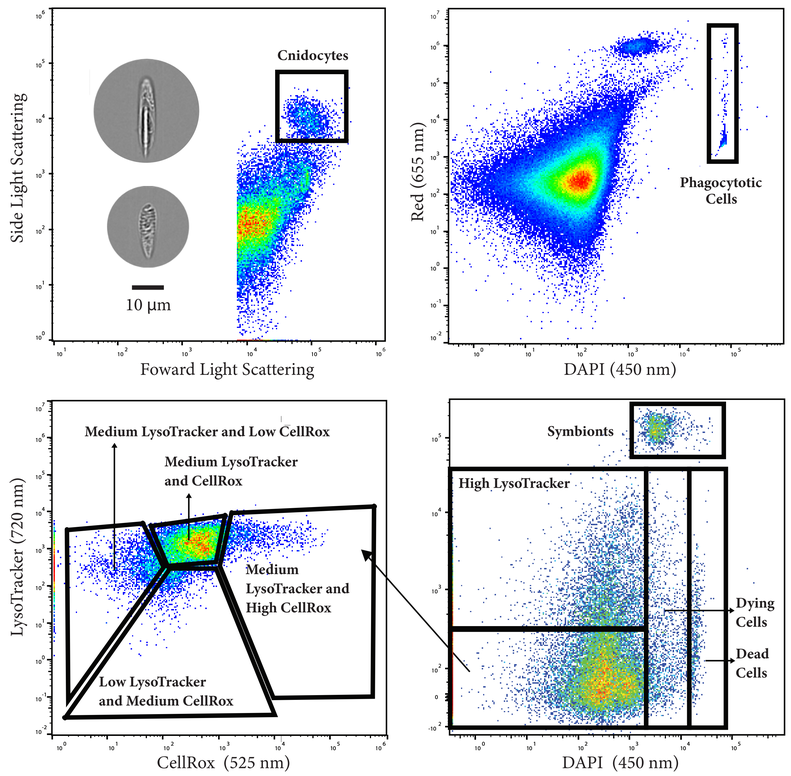
Coral Cell Population Identification, Sorting and Analysis



Results

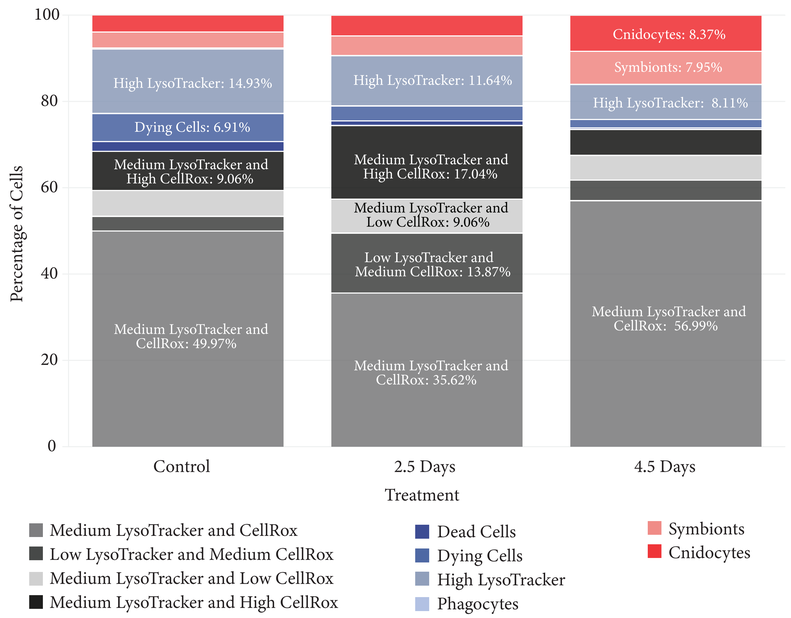
10 Cell Populations Identified using FACS

Cell populations are identified based on inherent cell properties or the intensity of the non-specific cell markers DAPI, LysoTracker and CellRox[3]. Target populations are enclosed by a black box.



Antibiotic Treatment Alters Cell Population Distribution

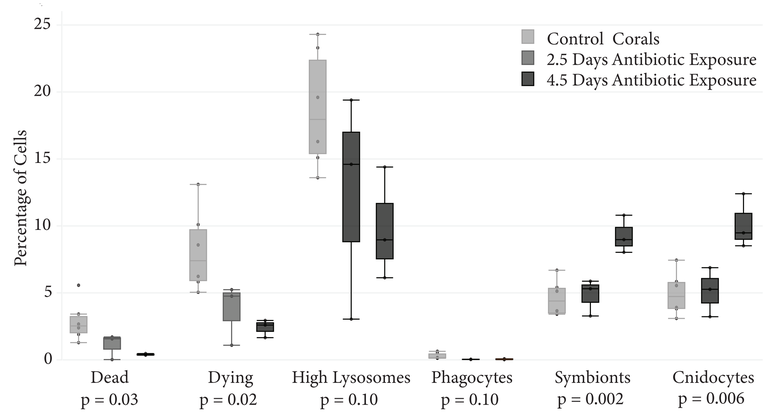
Unaltered populations are shown in grey, decreased populations are shown in blue and resilient populations are shown in red.



Results

6 Cell Populations are Significantly Affected by Antibiotics

The boxplots show the change in each significantly affected cell population due to antibiotic exposure. p values are given for ANOVAs.

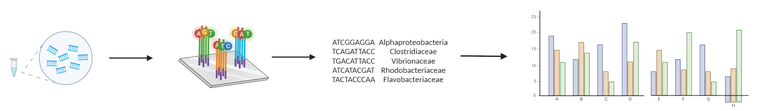


Implications

- Reduction in dead and dying cells likely due to premature death and degradation; these cells have already become debris.
- Decrease in high lysosome and phagocytotic cell populations due to death; altered gene expression under stress[2].
- Increase in symbiont and cnidocyte populations suggests that these cells are resilient to antibiotic treatment.
- **Implications for SCTLD:** Since coral cell distributions are significantly altered by antibiotic treatment, alternative treatments should be identified.

Future Studies

- Test mechanism hypothesis: the microbiomes of cell populations were differentially impacted by antibiotics, leading to varying levels of cellular stress and death



Extract DNA from each cell population

Sequence V4 region of 16S gene

Match sequences to bacterial families

Visualise bacterial populations in coral cell poulations for control and antibiotic treated corals

- Follow up antibiotic treatment with probiotics
- Repeat the experiment with different genotypes and coral species

References

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2. Connelly, M. T., Snyder, G., Palacio-Castro, A. M., Gillette, P. R., Baker, A. C., & Traylor-Knowles, N. (2023). Antibiotics reduce Pocillopora coral-associated bacteria diversity, decrease holobiont oxygen consumption and activate immune gene expression. Molecular ecology, 32(16), 4677–4694. https://doi.org/10.1111/mec.17049
3. Rosental, B., Kozhekbaeva, Z., Fernhoff, N. et al. (2017). Coral cell separation and isolation by fluorescence-activated cell sorting (FACS). BMC Cell Biol 18, 30. https://doi.org/10.1186/s12860-017-0146-8bacteria

Images created using BioRender

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