

College of Saint Benedict and Saint John's University

DigitalCommons@CSB/SJU

Celebrating Scholarship and Creativity Day

Undergraduate Research

4-24-2020

The Impact of Coral Reef Acidification on the Medical Development of Cancer Treatments

Connor Mullen

College of Saint Benedict/Saint John's University, CMULLEN001@CSBSJU.EDU

Kylie Rosenquist

College of Saint Benedict/Saint John's University, KROSENQUI001@CSBSJU.EDU

Cynthia Stewart

College of Saint Benedict/Saint John's University, CSTEWARD001@CSBSJU.EDU

Follow this and additional works at: https://digitalcommons.csbsju.edu/ur_cseday

Recommended Citation

Mullen, Connor; Rosenquist, Kylie; and Stewart, Cynthia, "The Impact of Coral Reef Acidification on the Medical Development of Cancer Treatments" (2020). *Celebrating Scholarship and Creativity Day*. 128. https://digitalcommons.csbsju.edu/ur_cseday/128

This Poster is brought to you for free and open access by DigitalCommons@CSB/SJU. It has been accepted for inclusion in Celebrating Scholarship and Creativity Day by an authorized administrator of DigitalCommons@CSB/SJU. For more information, please contact digitalcommons@csbsju.edu.

The Impact of Coral Reef Acidification on the Medical Development of Cancer Treatments

Connor Mullen, Kylie Rosenquist, Cynthia Stewart

College of Saint Benedict and Saint John's University, Biology Department, Collegeville, MN



Introduction

- Oceans absorb 10x as much human-made CO₂ than they had previously for millions of years (mostly from burning fossil fuels)
- If high CO₂ emissions continue, ocean acidification is projected to grow 144% by the year 2100
- Ocean acidification disrupts the ability of corals to build skeletal structures due to a reduction of calcium carbonate
- As of 2018, up to 30% of coral reefs have already degraded worldwide due to ocean acidification which has taken a major toll on the organisms that depend upon this ecosystem to survive
- Coral reefs have been proven to be an important resource to humans for natural products such as pharmaceuticals, nutritional supplements, enzymes, pesticides, cosmetics and more

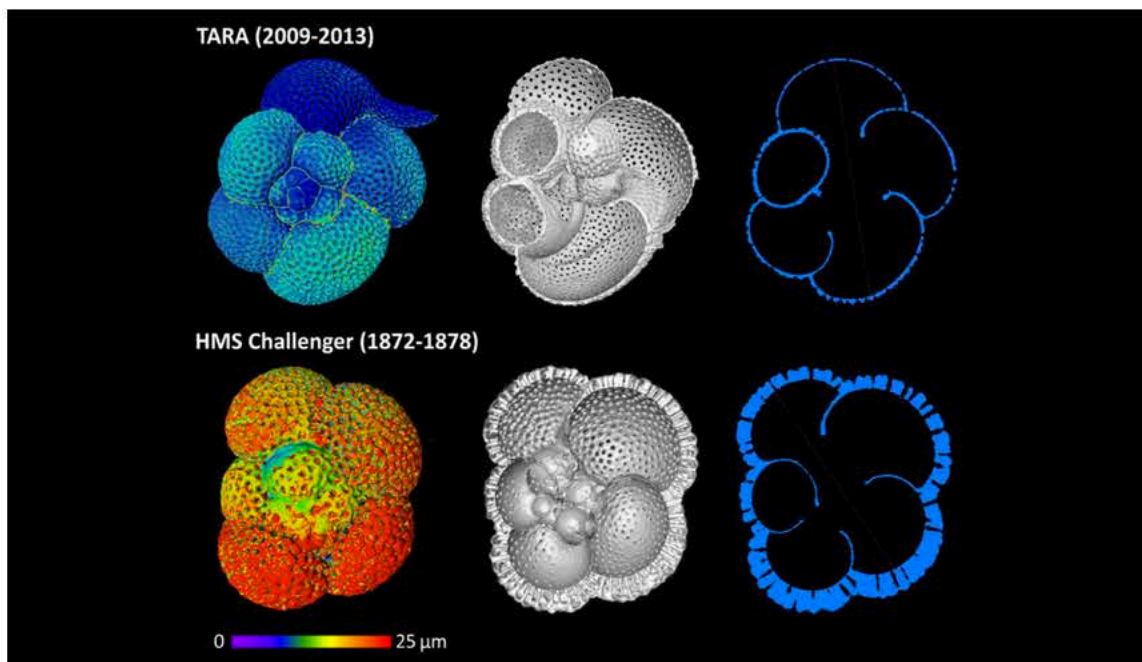


Figure 2. Computerized tomography suggests that ocean acidification may be making it harder for organisms like *Neogloboquadrina dutertrei* to build robust skeletal structures due to a reduction of calcium carbonate. By courtesy of Springer Nature Ltd., copyright 2020; used with permission..

Impacts

- In 2020, the National Cancer Institute estimated that in the United States alone, there were 1.8 million new cases of cancer diagnosed and 606,520 resulting deaths
- Scientists have been able to extrapolate various chemically derived compounds from coral reef dwelling organisms in order to develop treatments for cardiovascular diseases, ulcers, leukemia, lymphoma and skin cancer
- If CO₂ emissions continue unabated, the 'medical cabinet of the sea' will lose its proven potential to help scientists discover and replicate chemical compounds that may be used for cancer treatments
- Research suggests there will be minimal impact on the coral reef environment from harvesting marine organisms for pharmaceutical research compared to other more extreme environmental pressures on the reefs due to climate change

Adaptation and Mitigation

- There is a dire need to reduce carbon emissions while improving energy efficiency
- Utilize investment incentives to further local research, coral reef restorations/preservations, identify specific stressors and reduce overfishing
- The medical industry needs to settle on an efficient way to synthesize coral compounds and conduct sustainable collection with novel screening technologies while harvesting low numbers over a broad area of coral reefs as well as work to find alternative sources for compounds of value
- Balance among the needs of human health, economics, and the health of the coral reefs for human gain should not override the health of coral reefs and its surrounding environment

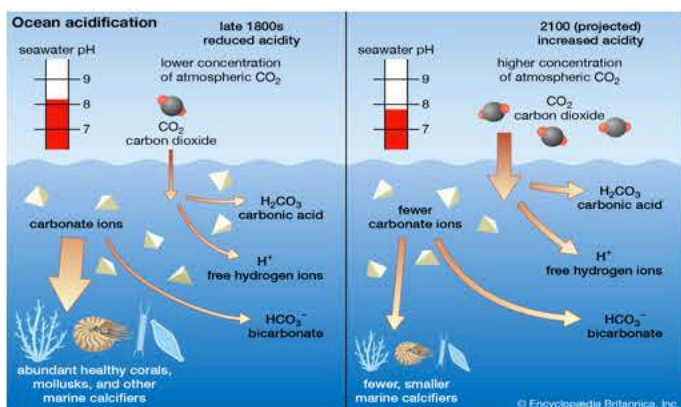


Figure 1. An explanation of the general process of ocean acidification and the breakdown of CO₂ as it affects the structure of coral reefs. By courtesy of Encyclopaedia Britannica, Inc., copyright 2020; used with permission.

Bioactive Chemicals	Coral Species
Briaranes	<i>Briareum excavatum</i>
Cembranes	<i>Cladiella krempfi</i> <i>Pachyclavularia violacea</i>
Cladiellane	<i>Cladiella sphaeroides</i> <i>Cladiella australis</i>
Eleutherobin	<i>Erythropodium caribaeorum</i>
Eunicellin	<i>Cladiella pachyclados</i> <i>Cladiella kashmani</i> <i>Cladiella krempfi</i> <i>Klyxum simplex</i> <i>Klyxum flaccidum</i> <i>Vigularia juncea</i>
Dolabellane	<i>Eunicea laciniata</i> <i>Eunicea asperula</i>
Narcembranes	<i>Simularia leptoclados</i>
Sacrodietynins	<i>Circumduction roseum</i>
Xeniaenes	<i>Simularia nanolobata</i>

Table 1. Non-exhaustive list of bioactive chemicals found in coral species currently being used for different cancer cell lines.

Acknowledgements

We would like to thank the CSB/SJU Biology Department as well as Dr. Gordon Brown for his feedback throughout our research.