

Bachelor's Essay
Biology 499
3 Credit hour
Fall, 2017

Student: Kirk McIntosh (ID# 20060517)

Faculty Supervisor: Giacomo DiTullio

Project Title; Dimethylsulfide lyase activity in *Emiliana huxleyi*

Project Description: Biogenic sulfur compounds such as dimethylsulfoniopropionate (DMSP) are produced by several groups of marine phytoplankton, most notably the haptophytes. DMSP can serve various physiological cellular functions including acting as an antioxidant to relieve oxidative stress. This project will investigate the potential of two strains (EH 373 and 374) of the marine haptophyte, *Emiliana huxleyi* to produce DMSP under growth rate limiting conditions imposed by Nitrogen and Vitamin B₁₂ limitation. These strains are markedly different in their ability to breakdown DMSP to produce dimethylsulfide (DMS) via the DMS lyase enzyme. This project will compare the DMS lyase activity in these two strains under growth limiting conditions. Experiments will be conducted under nitrogen and Vitamin B₁₂ limitation to determine the impacts on the production of both DMSP and DMS using a proton transfer reaction mass spectrometer (PTR-MS).

Student Learning Outcomes:

- Student will grow several strains of the marine coccolithophorid, *Emiliana huxleyi* under various physiological states including Nitrogen and Vitamin B₁₂ limitation.
- Student will then measure dimethylsulfide (DMS) using a membrane inlet mass spectrometer (MIMS) and PTR-MS.
- Student will then quantify the DMS lyase activity using headspace sampling techniques.
- Student will write a proposal and perform experiments in the first semester (Fall, 2017).
- Student will analyze the data and write the Bachelor's Essay in the second semester (Spring, 2018).
- Student will also present the results at the SSM Poster Day in April 2018.

Grading:

- A: Student is able to master all six of the Learning Outcomes and the research was deemed to be of *superior* quality.
- B: Student is able to perform the six outcomes and the quality of research was rated as *very good*.
- C: Student is able to perform the six outcomes but the quality of research was only rated as *average* in quality.
- D: Student is able to perform the six outcomes but the quality of research was rated as *below average* in quality
- F: Student does not meet the six learning outcomes and goals of the project.