CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
S1327

Project Title
The Effect of Varying Amounts of Calcium on the Bioluminescence Mechanisms of Marine Dinoflagellates

Abstract

Objectives/Goals
My study is on the bioluminescence of Pyrocystis fusiformis. P. fusiformis is a bioluminescent dinoflagellate capable of using chemical reactions to produce a brilliant blue light after receiving a mechanical stimulus. My objective was to find a chemical that when introduced to the dinoflagellate cell would hinder the bioluminescence.

Methods/Materials
In order for the chemical reactions to occur several ions are needed. The most important is calcium. In order for me to hinder the bioluminescence I decided to use a calcium chelator to tie up the calcium in the media. After researching many different chelators, I found that EGTA was the most efficient as well as the least harmful to the dinoflagellates. I used different concentrations of EGTA to vary the amounts of calcium removed. After supplying the EGTA to the dinoflagellates I mechanically tested their bioluminescence.

Results
I noticed that concentrations ranging from .1M up to 1M were capable of reducing the level of bioluminescence produced. In order to make sure that the dinoflagellates were not affected pathologically by the EGTA I observed them under a microscope. I noticed something different between the cells with different concentrations of EGTA. The chemical reactions are housed in specialized structures called scintillons. What I noticed was that higher concentrations of EGTA caused the scintillons to remain around the nucleus instead of throughout the cell.

Conclusions/Discussion
After reviewing my results I noticed that EGTA concentrations of .1M and higher began to hinder the bioluminescence of the dinoflagellates. I also noticed that the specialized bioluminescence structures varied their positions within the cell depending on the amount of EGTA the cells were given. This may be due to a conservation of energy or that calcium is required for these structures to move about the cell (via microtubules).

Summary Statement
I found a way to deprive dinoflagellates of calcium ion and therefore hindering their ability to produce bioluminescence.

Help Received
Sunnyside Sea Farms answered any dinoflagellate culturing questions.