CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
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Project Number
S1303

Project Title
The Effects of Upwelling, Eutrophication, and Trace Metals on the Bloom Dynamics of Pseudo-nitzschia

Abstract

Objectives/Goals
In Santa Barbara County there were countless pinniped and cetacean deaths off the coast, occurring from domoic acid producing diatom Pseudo-nitzschia. My goal was to not only identify what was triggering the bloom dynamics and domoic acid productionof Pseudo-nitzschia, but propose an environmental solution for the county of Santa Barbara as well.

Methods/Materials
The experimentation involved isolating Pseudo-nitzschia for three separate tests that helped identify what triggered cell growth and domoic acid toxicity. These included: upwelling, eutrophication, and trace metals dialysis. For the tests I needed a collection of nutrients and trace metals. In the lab I used: beakers, plankton net, Petri dishes, DNA probes, and a microscope. I also utilized the Watershed Center to restore native plants, so that I could help minimize eutrophication at Coal Oil Point, hence reducing harmful algal blooms. In addition, the City helped me get materials such as PVC pipe and containers to test a filter containing magnesium carbonate which I had tested to bind to phosphate).

Results
After several tests, I had found that eutrophication resulted in the most cell growth. However, the iron and copper in the trace metal experiment induced enough physiological stress on the diatom to create the most amount of domoic acid. Counter to my hypothesis, I thought upwelling would have the strongest correlation with Harmful Algal Blooms however, it produced substantially less daughter cells than the eutrophication experiment.

Conclusions/Discussion
The project was successful in that it identified the problem, and it even inspired me to propose a new solution for the county. Since eutrophication is such an unaddressed issue in the county of Santa Barbara, I was motivated to reduce phosphate emissions in Santa Barbara by at least half. I had found that magnesium carbonate was an excellent phosphate binder, and decreased phosphate by almost 62%. I presented my findings to the city, and they agreed to help me make filters that could incorporate the binder and implement them in to storm drains. This is still an ongoing project, and I hope to have something substantial by the end of August. In light of my findings, I got ocean club (I created at school) to restore native plants (best bio filters) at Coal Oil Point with the Watershed, and the rangers reported that we were able to cut off runoff to the wet lands by almost 20%.

Summary Statement
This project enabled me to identify what triggers Pseudo-nitzschia to bloom and produce domoic acid off the coast of Santa Barbara, and begin a eutrophication filtrate system to decrease phosphate emissions in storm drains by at least 60%

Help Received
Marine Science Institute gave me lab space, microscopes, DNA probes etc... Mother/ Father drove me to UCSB, wharf, and Coal Oil Point for plant restorations etc..