CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)

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Project Number

S1717

Project Title

The Effect of Ocean Acidification on the Coccolithophore Species Emiliania huxleyi

Abstract

Objectives/Goals

Ocean acidification is driven by increased amounts of carbon dioxide (CO2) in the atmosphere, which has been shown to have various effects on marine life. This project aims to investigate the possible future effects of increased atmospheric concentrations of CO2 on the productivity and calcification of coccolithophores, a type of calcifying phytoplankton crucial to oceanic carbonate cycling. It was hypothesized that increasing the concentration of CO2 in the growth chambers of the coccolithophores would decrease both cell counts and calcification.

Methods/Materials

A strain of the coccolithophore species Emiliania huxleyi (widely used in lab studies) was grown in f/50 seawater nutrient media on a 12h light/dark cycle. Three trials of three different experimental conditions were set up in sealed 70 ml glass jars: 1. Control, containing current atmospheric concentration of CO2 (about 389 parts per million (ppm)), 2. Plus 250ppm above current atmospheric CO2 concentration (created by injecting .25ml of 5% CO2 into the 50ml headspace of the jar with a syringe through the rubber stopper) and 3. Plus 500ppm above current, made by injecting .5ml of 5% CO2. Cell counts were taken after 14 days. Calcification readings were taken by filtering and drying the samples to calculate total dry mass.

Results

Clear differences in cell counts and calcification were observed between the three conditions. Cell counts were 75% lower in the +250ppm CO2 condition than in the control and about 80% lower in the +500ppm CO2 condition than control. Calcification recordings showed similar variations by conditions, although the differences between the three conditions were less dramatic. The hypothesis was proven correct- increased CO2 concentration led to decreased productivity and calcification.

Conclusions/Discussion

The results show that increasing [CO2] in the growing environment of E.huxleyi has an effect on the population growth and calcification of this species. This means that if current CO2 emission trends continue, the productivity of a major ocean carbonate cycler could be inhibited significantly, upsetting the balance of the carbonate cycle in the open ocean. The world is at a threshold- just another 250ppm of CO2 in the next few decades could spell disaster. This research highlights the importance of awareness and planning in terms of both managing CO2 emissions and predicting future ecosystem changes in the ocean.

Summary Statement

This project investigates the effect of ocean acidification, driven by increased atmospheric concentrations of CO2, on the productivity and calcification of the coccolithophore Emiliana huxleyi, an import type of calcifying phytoplankton.

Help Received

Used lab equipment under the supervision of Dr. Douglas Nelson in the UC Davis Department of Microbiology