CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
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Project Number
J1414

Project Title
Effectively Using Iron and Phytoplankton to Sequester Carbon

Abstract

Objectives/Goals
The objective of this experiment is to determine the optimal amount of iron to give to phytoplankton in order to produce the most growth in a set period of time for practical use in the process of carbon sequestration via photosynthesis.

Methods/Materials
Utilizing the navicula incerta species as the test subject, counted samples of plankton were placed into six pairs of flasks, each set of two containing a different dilution - a control group with no extra nutrients, and 1nM/5nM/10nM/50nM/100nM concentrations - of iron-enhanced seawater solution. Over a period of eleven days, well-mixed samples would be taken from each of the dozen containers and placed on a specialized counting chamber slide beneath a compound microscope. This grid-marked slide allowed only a small fraction of visible plankton to be counted then multiplied by a specific number in order to find an approximation of the total cells per milliliter in the flask. The data were later converted into overall percent increases.

Results
After repeating the process three times, it was found that a 5nM concentration of iron caused the most growth, increasing organism population by a total of 174% on average. Both the 10nM and 50nM solutions also proved fairly effective by creating 161% increases themselves, and the 100nM solution was the least useful with an increase of 137%. Neither the control group nor the 1nM flask caused excessive growth, with 149% and 152% increases respectively.

Conclusions/Discussion
Previous research done by marine biologists suggests that plankton can react to small amounts of iron in their environment, and this is reflected by the effectiveness of the slight 5nM solution. The lack of consequence in the 100nM flask, holding the greatest addition of iron, may support this knowledge in that it hindered the development of the navicula. These results imply that tinier additions of iron to seawater will be most effective at helping navicula plankton multiply and retain their numbers over a longer period of time, showing that the best possible concentration to remove the most carbon dioxide from the atmosphere will be around 5 to 10nM.

Summary Statement
Various amounts of iron were added to phytoplankton in order to determine which addition produced the optimal, most economical growth for carbon sequestration purposes.

Help Received
Drs. Chapman and Brzezinski for plankton, chemicals, and feedback; Peggy Lynch for supplies, feedback, and effective concept teaching; Chris Broomell for lab usage; Kim Miller for support, feedback, and material storage; and parents for transport, supplies, etc.