

Can Agricultural Runoff Cause HABs: Effect of Nitrate Concentration on Algal Growth

A Classroom Activity for Ocean Gazing Episode #10: Of bonds and blooms

Written by: Barbara Harrell, Colleen Walsh, Ashley Hollis Spencer, MBARI EARTH Workshop 2009

Grade Level: 9-12

Lesson Time: depends on how quickly the algae grows

Materials Required

Non-toxic blue-green algae, liquid Miracle Grow fertilizer, beakers, de-ionized water, syringes with filter tips, LaMotte nitrate test kits

Summary

Students will compare nitrate concentrations and rate of algae growth.

Objectives

- ✓ Review algae characteristics
- ✓ Learn about HABs
- ✓ Hypothesize how nitrate concentrations will affect the growth of blue-green algae
- ✓ Conduct an experiment using a nitrate test kit and blue-green algae cultures
- ✓ Graph results using Excel and write a lab report
- ✓ Research HABs in the Gulf of Mexico and report on the “Dead Zone” in the Gulf

Key Concepts

HABs, importance of nitrates and problems with excess nitrates, effects of nitrates on HABs, excess nutrients in the Gulf of Mexico

Data Activity

1. Create a class set of control group solutions by adding 250 mL of de-ionized water to each of 4 500-mL beakers. One beaker will have only water. To the other beakers, add separately 2.0 mL Miracle grow fertilizer in the following concentrations: 75%, 50%, and 25%.
2. Create a class set of algal colonies by repeating step 1 then adding 5.0 mL of Blue-green algae culture to each beaker.
3. Using the Nitrate Test kit, test the nitrate concentration of each of the 8 beakers and record in a data table. Use the filtering syringe to extract the fertilizer solution.
4. Repeat the nitrate test on each algae sample for 5 consecutive days, recording the nitrate concentration each time. Include in your observations the appearance of the contents of the beakers each day. Be sure to note any



- major changes.
5. Using excel, prepare a graph of the data with *days* on the x-axis and *nitrate concentration* on the y-axis. There should be four graphs with 2 lines each; the control and its partner algae colony.

Assessment

Students will generate a formal lab report with organized data and conclusions and will report on current problems with algae in the Gulf of Mexico.

Additional Resources

- ✓ [The Gulf of Mexico Dead Zone](#)
- ✓ [Red Tides and NASA](#)
- ✓ [Definition of Nitrate](#)
- ✓ [News Article: New Report Examines Causes and Impacts of HABs in US Waters](#)

Sources

To access an online version of this activity, you can go to the following URL:

http://www.mbari.org/earth/rough_grid.html

The related podcast episode for this activity can be found by going to the podcast section of www.oceangazing.org