THE INSIDE ON RED TIDE

OBJECTIVES

The student will do the following:

1. Identify the cause of red tide.

2. Construct a bulletin board showing how red tide poison passes from animal to animal.

SUBJECT:
Science

TIME:
60-90 minutes

MATERIALS:
2 clear glass jars or 2 liter bottles with the tops cut off
red food coloring
coffee
algae (directions for growing algae can be found in extension activity)
fishbowl or aquarium
water
sponge animals
trays with sides
reference books on marine life
student sheet (included)

BACKGROUND INFORMATION

Algae can be found in most waters in the world. Certain microscopic algae in our coastal waters, known as dinoflagellates, are red-pigmented; when these algae flourish, the water turns reddish. This is commonly referred to as a "red tide." These algae produce a toxin. When there is an abundance of the algae, great amounts of this toxin are produced.

At times, this toxin can become concentrated in marine animals such as clams and mussels. Clams and mussels are filter feeders. As they filter the water to obtain their food, the toxin is taken in by these animals. Sometimes red tide toxin kills shellfish (and other fish); sometimes it does not. If toxin-loaded clams and mussels are eaten, the toxin can fatally poison the consumer. Also, ocean spray containing the toxin can cause respiratory problems in humans.

Algae that can produce red tides multiply rapidly in water which has been enriched by nutrients from treated sewage or by runoff from fertilized soil. The algae can become so thick that it can actually damage or destroy the marine environment. The multitude of tiny algae may even block the sunlight needed by many coastal plants and animals.

Terms

algae: a major group of single-celled or multicellular plants, chiefly aquatic, having no roots or stems.

red tide: a term which applies to water tinted red due to a heavy growth of red-pigmented algae called dinoflagellates.

toxin: a poisonous substance that is secreted by certain organisms.

ADVANCE PREPARATION

A. Make copies of the student sheet.

B. Begin growing algae four or five days before doing the lesson (see extension).

C. Animal-shaped sponges can be purchased at most toy stores.

D. A disposable pie or cake pan can be used as the tray.

E. Make sure red food coloring does not stain. (You might use very thin red tempera paint.)

F. Add water and red food coloring to a jar. Mix in a little coffee for a brownish tint.

G. Collect a supply of reference books like field guides or topical books (like those for coastal animals and plants).

PROCEDURE

I. Setting the stage

A. Hold up the jar with clear water and show the jar to the class. Next, hold up the jar that has been colored brownish red with red food coloring and coffee. Ask the students which water would probably be safer for marine animals to live in. Explain to the students that there is a certain type of microscopic algae that produces a reddish pigment and that this algae colors the water just as the dye colored the water in the jar. This algae also produces a toxin which is released in the water, making the water toxic or poisonous. This algae is found in our oceans.

B. (NOTE: You may show the students the algae you have grown in an aquarium or fishbowl.) Stress to the students that algae are lower plants. Algae are found in most waters. Many kinds of algae have large forms, such as kelp or seaweed. Some form "pond scum." Some algae, like those responsible for red tides, are microscopic; they become noticeable only when there are so many of them that there are literally hundreds of thousands (even up to two million) of them per liter of water. Emphasize that not <u>all</u> algae produce toxins, only certain types.

II. Activity

A. Pass out trays to each student or team of students. Fill each tray with water. Give each student a foam or sponge animal. Instruct the students to put his/her sponge animal in the water. Point out to the students that the animal has absorbed some of the water. (NOTE: If you have studied tidal pools, let each group make a model of a tidal pool.)

B. Repeat the activity above, but color the water with the red food coloring. (NOTE: Make sure the amount of food coloring is sufficient to remain noticeable when the sponges are squeezed.) Tell the students to put the sponge animals in the water again.

1. Have the students remove the animals and gently squeeze out the water. Ask them what color the water is that came from the sponge animals.

2. Review the term "toxin." Explain to the students that animals in the ocean can absorb the poison from the "red tide" similar to the way the sponge animals absorbed the dye.

C. Pass out the student sheet. Have the students use marine life reference books and encyclopedias to identify the plants and animals. They should write the names of the plants or animals in the boxes on the sheet. (The answers vertically down the left, then the right column are as follows: Blue Crab, Salt Marsh Cord Grass, Atlantic Ribbed Mussel, Northern Puffin, Horseshoe Crab, Lined Seahorse,

Sting Ray, Brown Pelican, Fiddler Crab, Sea Lavender, Shrimp, and Eel Grass.) Which of them could be affected (i.e., are shellfish and are likely to be of special concern) when a red tide occurs? (mussels, crabs, and shrimp) Emphasize that when other animals eat animals that have accumulated the poison, they consume the poison.

III. Follow-Up

A. Have the class make a list of ocean animals that might be poisoned by "red tide."

B. As a class project, construct a bulletin board showing how poison can travel from animal to animal in the ocean, ultimately ending with humans.

C. Have the students draw an ocean food chain and ask each student to share with the class their individual food chain. Relate this to the previous item showing how the toxin can be passed from one organism to another.

IV. Extension

Grow your own algae! In a glass fishbowl or an aquarium, simply add tap water which has been dechlorinated, or better yet, water from a local pond. Keep it in a sunny location. Have the students monitor it each day to observe the algae growing. Add about a teaspoon of detergent with phosphate to the water to encourage faster algae growth.

RESOURCES

Goodman, H. D., et al., Biology Today, Holt-Rinehart-Winston, New York, 1990.

Oram, R. F., Biology-Living Systems, Merrill Publishing, Columbus, Ohio, 1989.

"Water Education Lesson Plans (K-12)," Water and Man, Inc., Salt Lake City, Utah, 1987. (Address: 220 South Second East, Salt Lake City, Utah 84111.)

MARINE LIFE

Look these coastal creatures up to find out what their names are. Write their names in the boxes with their pictures.