

Bruno the Elephant's Toothpaste

*Contributed by the Elizabethtown College Student Affiliates
of the American Chemical Society*

Main Science Idea for Kids

In this activity, students will see that new substances are created during chemical reactions. In this case, students will notice that a gas is produced and responsible for the foamy "toothpaste". Students will be introduced to the idea that scientists can use special chemicals called *catalysts* to help make reactions happen a little bit faster than they normally do.

Grade Level

We have done this activity with 1st through 5th graders.

How We Introduce this Activity

We begin by introducing our chapter's pet elephant, Bruno. We explain to the students while Bruno is still asleep, we have to make his toothpaste. He doesn't like to wait for it to be made. Usually, it takes a long time to make elephant toothpaste. They are big animals with big teeth so they need a lot of toothpaste! We then tell the students that we have found a new way to make a lot of elephant toothpaste a lot faster. We show the ingredients to them and let them choose the color stripes they would like Bruno's toothpaste to have. While we add dish soap to make the visualization of the reaction more exciting, we tell the students that the dish soap is really what will clean Bruno's teeth.

Materials

- 20 ounce soda bottles for each student or group
- Dishpan for each student or group
- 3% hydrogen peroxide (grocery store strength)
About 120 mL per trial
- Yeast (fast-rising works best)
Expect 8-12 reactions per $\frac{1}{4}$ oz. yeast packet
- Dawn dish detergent
- Food coloring
- 3 ounce Dixie cups
- Safety glasses



Procedure

1. Fill a Dixie cup about $\frac{3}{4}$ of the way with warm water (warm water is important!).
2. Add $\frac{1}{8}$ teaspoon of yeast and stir. Allow the yeast to dissolve in the warm water for at least 5 minutes.
3. Place a clean, empty soda bottle in a dishpan.
4. Add about 100 mL of hydrogen peroxide to the soda bottle. This should fill about $\frac{1}{5}$ of the soda bottle.
5. Add in a few drops of the food coloring of choice. You can get creative here--make stripes down the sides of the bottle, mix colors, or color all of the toothpaste the same color!
6. Add a big squirt of the dish detergent to the soda bottle.
7. Add the contents of the Dixie cup of the yeast solution to the soda bottle. Don't get too close to the bottle!



The Chemistry Explanation

The main concept this activity introduces is how chemists use catalysts in reactions. Sometimes reactions will happen very quickly without any outside encouragement, but other times the reactions need a little boost. If this is the case, chemists will try to find a good catalyst. Catalysts help the starting materials, or reactants, find a better pathway to make the products. Better paths usually need less energy to follow.

In yeast, there are enzymes present whose job is to catalyze a variety of reactions. In this demonstration, the enzyme called “peroxidase” has the job of breaking hydrogen peroxide down into water and oxygen. Peroxidase in the yeast makes the reaction happen a lot faster than if we just left the hydrogen peroxide sitting in the room.

This activity also shows that gases can be a product of a reaction. We usually can't see gases being produced, but the dish soap we add to our container traps oxygen as it is released from hydrogen peroxide. The dish soap is responsible for the “wow” factor we see. The students can make predictions of how the reaction will change with different conditions (more yeast, less peroxide, etc.).

Why We Like this Activity

We really like telling the story to the kids. Some of them get really excited at the prospect of us having a pet elephant whose teeth need brushing! We are also able to do this activity as a demonstration (using reagents from our stock room) or as a hands-on activity (using household chemicals). This is the kind of activity that can really get kids excited about science; they love to see things that change colors or seem to “explode.” This reaction produces a lot of colored foam that seems to come out of nowhere. Their reactions are always really fun to watch! It’s also a pretty inexpensive demo for us to do multiple times with the students.



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of the American Chemical Society
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About Us

We participate in our campus-wide day of service called "Into the Streets." The Activities Fun Fair is a part of that day of service. Each child selects 4 or 5 activities in different disciplines (i.e. music, dance, art, science, business). In the past, we have also hosted guest speakers whose presentations were open to the public. We also celebrate NCW and Earth Day in the campus community each year.