



Cow Eye Demonstration

Safety Demonstration

Introduction

What is the definition of corrosive? This unforgettable demonstration will imprint forever the definition of corrosive in the students' minds. Adding acid to a cow eye and then quickly rinsing it off shows students the immediate and irreversible damage that occurs to eye tissue when a strong acid is splashed in the eyes. Students will observe the deterioration of the eye tissue after just a few seconds of exposure to the acid. Teachers often have a difficult time getting students to wear their goggles—this demo is an effective way of solving this problem!

Concepts

- Chemical safety
- Corrosive
- Concentrated acids

Materials

Sulfuric acid, concentrated, H_2SO_4 , 18 M	Cow eyes, fresh*, 5
Beaker, 100-mL (to hold the acid)	Medicine dropper or Beral-type pipet
Beakers, 250-mL, 5	Sink with running water
Clock with second hand	Wax marking pencil

*Preserved eyes will not work. Other fresh mammalian eyes, such as sheep or pig can be used.

Safety Precautions

Sulfuric acid is severely corrosive to eyes, skin and other tissue and highly toxic by ingestion. Considerable heat of dilution produced when sulfuric acid is mixed with water—mixing with water may cause spraying and splattering. Even very dilute solutions are harmful to eyes and skin. Work in a well-ventilated area. Wear chemical splash goggles, chemical-resistant gloves, and a chemical-resistant apron. Please review current Material Safety Data Sheets for additional safety, handling, and disposal information.

Procedure

1. Set a good example for your students and wear your safety goggles, gloves, and apron.
2. Rinse the cow eyes, if necessary, and place them in separate 250-mL beakers.
3. Using a wax pencil, label the beakers as follows: (1) Control, (2) 30 Seconds, (3) 15 Seconds, (4) 5 Seconds, (5) Rinse immediately.
4. Pass a beaker containing a cow eye around to the students. Tell the students to observe the color and clarity of the eye.
5. Starting with beaker 2 (labeled 30 seconds), add two or three dropperfuls (5–10 mL) of concentrated sulfuric acid quickly but carefully to the cow eye. Leave the acid on the eye for 30 seconds (or longer) then thoroughly rinse the eye under cold running water. Rinse for about 10 seconds.
6. Dry off the beaker and pass it around for students to observe the damage to the cow eye.
7. Repeat steps 5 and 6 for the remaining cow eyes, leaving the acid on the eyes for the amount of time indicated on the beaker.
8. Have the students compare the amount of deterioration to each eye. The 30-second and 15-second eyes should show signs of severe damage. The 5-second eye should have substantial damage and the "rinse immediately" eye should have noticeable damage.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. Place all cow eyes (after a thorough rinsing) in a plastic bag. Seal the bag and place the bag in a dumpster. Do not place the cow eyes in a garbage can to which students have access.

Tips

- Cow eyes or other mammalian eyes may be obtained from local butcher shops, slaughterhouses, meat packing companies and meat markets. They are easier to find than you may think—look in the yellow pages.
- The cow eyes (or mammalian eyes) must be fresh. Preserved eyes will not yield good results.
- Keep the cow eyes cold (refrigerated) until use. For the best results, do not freeze the eyes. Use fresh eyes.
- Other acids (e.g., hydrochloric acid) may be used in place of sulfuric acid; however, sulfuric acid yields the most dramatic results.

Discussion

Do your students understand the definition of corrosive? The term corrosion is usually associated with the conversion of metals to metal oxides, e.g., iron to iron oxide or rust. The broader definition of corrosion is the slow destruction of any material by chemical agents or electrochemical reactions. Corrosion is also used in connection with the destruction of body tissues by strong acids and bases.

Strong acids are corrosive because they cause the destruction of many materials, including metals and biological tissues. Sulfuric acid is a triple threat to body tissue. It reacts with proteins and destroys their three-dimensional structures. Concentrated sulfuric acid is also a strong dehydrating agent and will literally “suck” the water out of living tissue. Lastly, the reaction of concentrated sulfuric acid with water is very exothermic and the heat that is generated causes further destruction of body tissue. Strong bases and the other strong acids are equally as corrosive and destructive to body tissues.

After the demonstration, discuss with students the importance of wearing chemical splash goggles and other personal protective equipment, such as chemical-resistant gloves and aprons. A good rule is to wear chemical splash goggles any time heat, glassware or chemicals are used. Point out that even the cow eye rinsed immediately after exposure to acid showed some signs of damage. This would also be a good time to demonstrate how the eyewash and safety shower work. Reiterate their importance and why they must be in good operating order at all times. Make sure all students know what to do in the event of a chemical splash.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12

Evidence, models, and explanation

Content Standards: Grades 5–8

Content Standard B: Physical Science, properties and changes of properties in matter

Content Standard C: Life Science, structure and function in living systems

Content Standards: Grades 9–12

Content Standard B: Physical Science, structure of atoms, structure and properties of matter, chemical reactions

Content Standard C: Life Science, the cell

Acknowledgment

Special thanks to John Brodemus, Richards H. S., District 218, Oak Lawn, IL for bringing this demonstration to our attention.

Materials for the Cow Eye Demonstration are available from Flinn Scientific, Inc.

Catalog No.	Description
S0228	Sulfuric Acid, 18 M, 100 mL
S0145	Sulfuric Acid, 18 M, 2.5 L
AP8739	Chemical Splash Goggles, Instructor's
AP3306	Standard Vented Chemical Splash Goggles
AP1362	Visor Goggles
AP3259	Acid-Resistant Nitrile Gloves, Size 9

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.