

 **STUDENT**

THE BOLOGNA TEST

CASE STUDY OF SCIENCE AND ENGINEERING

SCIENTISTS ASK WHY. ENGINEERS ASK HOW.

YOUR NAME

QUESTIONS TO XPLORE

HOW DO SAFETY SCIENTISTS AND ENGINEERS SOLVE PROBLEMS?

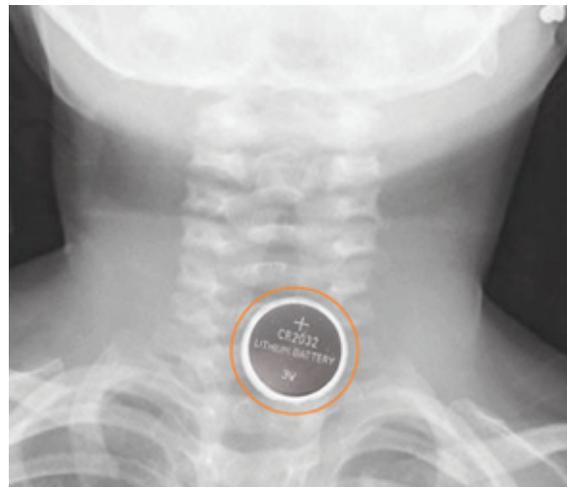
CAN WE SEE THE ENERGY IN A SINGLE BUTTON CELL BATTERY?

Safety scientists ask why a phenomenon happens. Safety engineers ask how they can solve the problem and keep people safe. Both ask how they can design and communicate solutions. The button cell battery is a case study in science and engineering for safety.

PROBLEM TO BE SOLVED

LITHIUM-ION BUTTON BATTERIES CAN CAUSE SEVERE INJURIES WHEN SWALLOWED.

Electronic devices are a part of daily life. And they're getting smaller, slimmer, and sleeker. But inside the battery compartment of mini remote controls, small calculators, watches, remote keyless entry, flameless candles, singing greeting cards, and other electronics, may be a very powerful coin-sized button cell battery. When swallowed, these button cell batteries can get stuck in the throat and cause severe burns. Small children often have easy access to these devices, and many parents do not know there is a risk.



thebatterycontrolled.com.au • September, 2016

PROBLEM TO BE SOLVED

CAN THE ENERGY IN A BUTTON CELL BATTERY BE SEEN?

It can. In this investigation, you will set up a demonstration of a button cell battery's ability to burn through bologna. This test was developed as a way to demonstrate what happens when a child swallows a button cell battery and gives us the ability to see the energy stored inside a battery expressed as heat. We'll use a button cell battery, that is typical in a remote control or garage door opener, some saline that acts like saliva, and the bologna, that acts like esophagus tissue.

The need and desire to “be portable and on the go” affects every part of our lives. We want to be able to go anywhere at any time and still stay

connected! This need for portable electronics has significantly increased the demand for smaller and more powerful sources of energy in dozens of household products. To mitigate (or reduce) risks associated with button cell batteries, specifically children swallowing them, think about questions that focus on getting rid of the hazard and what engineering solutions are possible. For instance, how can engineers begin to solve the problem of the button cell batteries? What solutions do you propose? How can you help design a way to keep young children from getting access to these small button cell batteries now that you have observed what happens when they swallow them?

SUMMARY OF LAB

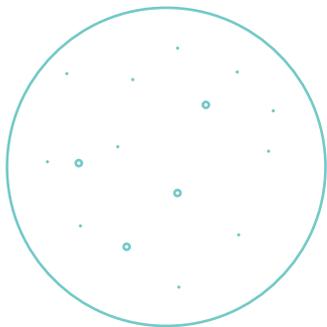
In small groups, students will place a piece of bologna on a noncombustible surface. They will place one dropper full of saline in the center of the meat slice, then place a button cell lithium-ion battery in the pool of saline on the bologna. Using a timer, they will observe what happens each minute for 10 minutes.

XPLORING THE ISSUE

From your reading, class discussion, and/or video, what do you know about the problem?

XPLORATION

In this investigation, you will use bologna to represent the tissue in the throat, saline to represent saliva, and a button cell ion battery to demonstrate what happens when a child swallows a button cell battery and it gets stuck in her/his throat.



BOLOGNA



SALINE



BUTTON CELL BATTERY

MATERIALS CHECKLIST

- 1 piece of bologna
- 5 ml saline solution
- CR2032 button cell battery
- Stopwatch
- Dropper for saline
- Noncombustible surface for placing bologna on (not a paper plate)
- Disposable gloves for cleanup/battery disposal
- Student lab notebooks or student XplorLabs pages

NOTES

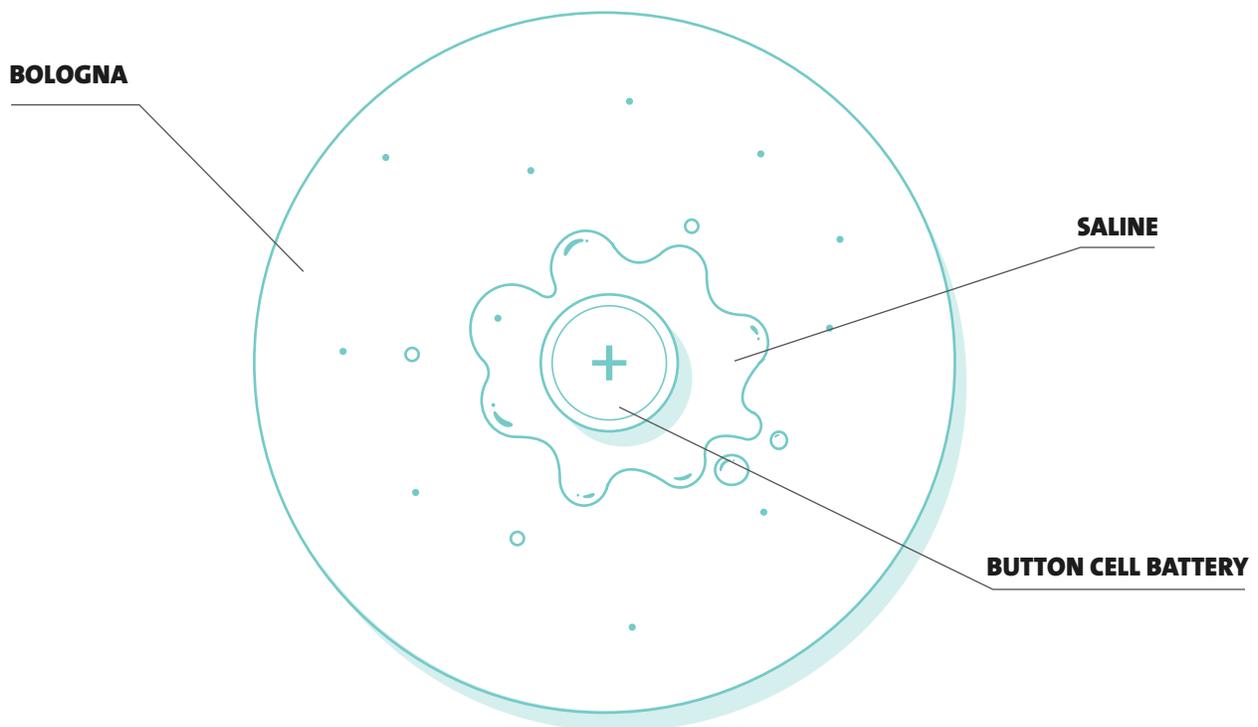
Once the button cell battery is placed on the bologna, do not touch it until it is time to clean up. The person handling the battery must wear gloves.

Batteries cannot go into the trash can in your classroom. Make sure you know how to dispose of your battery. Please ask your teacher.

PROCEDURE

- Choose or assign roles for group work
- Collect all of the materials for the group
- Place bologna slice on noncombustible surface
- The button cell battery has a sticker on one side, remove it
- Place one dropper full of saline in the middle of the bologna
- Place button cell battery directly on top of the saline in the middle of the bologna
- Begin the stopwatch
- Write or draw and label detailed observations every minute for 10 minutes
- Clean up according to safety protocols (wear gloves, dispose of battery properly)

EXAMPLE SETUP



ROLES



THE STUFF SUPERVISOR

Gathers and cleans up materials



THE EXPERIMENT EXEC

Runs the experiment



THE DIRECTOR OF DOCUMENTS

Reads the procedure to the group and helps the group members with data collection



THE PRINCIPAL PRESENTER

Shares the group's work with the rest of the class

SCIENTISTS ASK

WHAT HAPPENS?

WHY DOES IT HAPPEN?

HOW DO WE KNOW WHEN IT HAPPENS?

Be the safety scientist and construct an explanation for why button cell batteries are so harmful to young children.

OBSERVATIONS

Time (minutes) Observation (draw and label or write descriptions of what is happening)

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

