



Log Book

Topic: Does Button Battery Size Affect Esophageal Burn Risk ?

December 2 - 6 :

Deciding of these three options (Picked Underlined One) :

Does a high watt bulb produce more heat than a low watt bulb ?

How do different drinks affect tooth decay ?

Does Button Battery Size Increase Esophageal Burn Risk ?

December 8 - 12 :

Basic Background Research :

If a child swallows a button battery and it gets stuck in their esophagus it can cause serious harm. The battery's acid can create a chemical reaction that burns the tissue in the throat leading to severe injuries. It may also cause electrical burns, swelling, or even holes in the esophagus which could result in infection , life long issues, excessive bleeding or even death. Symptoms include pain, difficulty swallowing, coughing, vomiting, and trouble breathing. Researchers say that the chances of the button battery getting stuck in a child's esophagus when swallowed are around 50% - 65%. Sodium hydroxide (also known as NaOH) is a chemical found in button batteries that is responsible for the burning and damage in the esophagus. It is commonly found in alkaline batteries, which are normally button batteries. NaOH is very corrosive and toxic, meaning it can cause serious harm. When a button battery gets stuck in the esophagus, NaOH reacts with the acids and water in the mouth and throat. This reaction releases heat. The heat causes burns and the chemical reaction can corrode the tissue in the esophagus. This damage can be severe and life threatening if not treated quickly.

December 8 - 12 :

Variables and Hypothesis :

Hypothesis : If the size of a button battery increases, then the burning in a child's esophagus will be more severe, because the increased surface area and larger acid capacity in the button battery will result in worse burns.

Variables :

Manipulated : The manipulated variable or the stuff that was purposely changed were the sizes of the button batteries. The drops of saliva were also changed because they were placed according to the size of the battery in the esophagus.

Responding : The responding variable in this experiment was to see the severity of the burn from different button battery sizes. To measure the severity of the burns I got the diameter of each burn and found the area and circumference of the burn. I made graphs comparing the burns for different button battery sizes. All of the measurements were made with a classic ruler and they were noted down at correct times. They were all written down in Centimeters and Centimeters squared.

Controlled :

- The brand / type of containers were all purchased from Dollarama.
- The size, type, and brand of chicken strip were all Zabiha Halal.
- The voltage of the button batteries were all 3V.
- The place/ environment of where the experiment was done in the same house and area.
- The brand of the button battery were all Powerfist.
- All the batteries were brand new having their max capacity of energy.

LEVELS OF MANIPULATED VARIABLE

Large Battery (2450)	Medium Battery (2032)	Small Battery (1620)
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December 15 - 20 :

Materials and Procedure :

Materials :

- 3 Equal Pieces of Thin Zabiha Halal Chicken Strips
- Syringe
- Water in tube
- 3 Same Containers Large
- 3V button battery (2450)
- Medium 3V button battery (2032)
- Small 3V button battery (1620)
- Calculator
- Notepad
- Ruler Big tweezers
- Small tweezer
- Ring Light
- Mini FlashLight

Procedure :

1. Get 3 equal pieces of any thin slices of meat (Preferably Bacon or Salami).
2. Place each piece of meat into a separate container.
3. Place a button battery of a different size (ranging from largest to smallest) in each container, with the negative side facing down, on top of each piece of meat.
4. Squirt a drop of saliva on each piece using a pipette or syringe.
5. Fold each chicken strip over and make sure the container is tightly closed.
6. Check on the experiment at different times ranging from 20 minutes - 3 hours.

7. Measure the diameter of the burn mark each time you check, using a ruler. Be sure to measure it at least three times for accuracy.
8. With the information of the diameter of the burn find the area of it and create a graph and table stating the area.
9. When you're done with the experiment, clean the area nicely and properly while disposing everything in the right ways. Do the experiment 3 times in total for accuracy

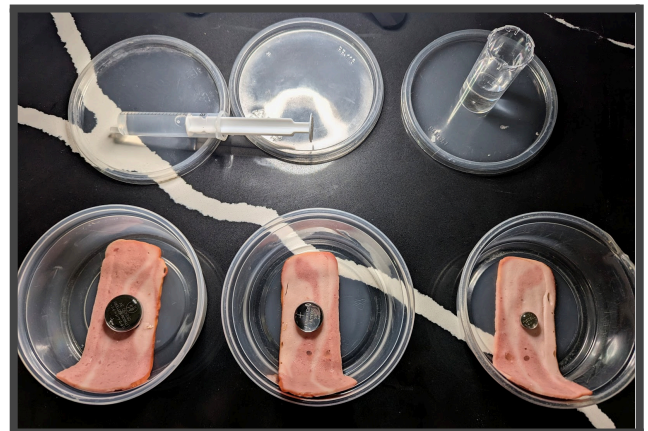
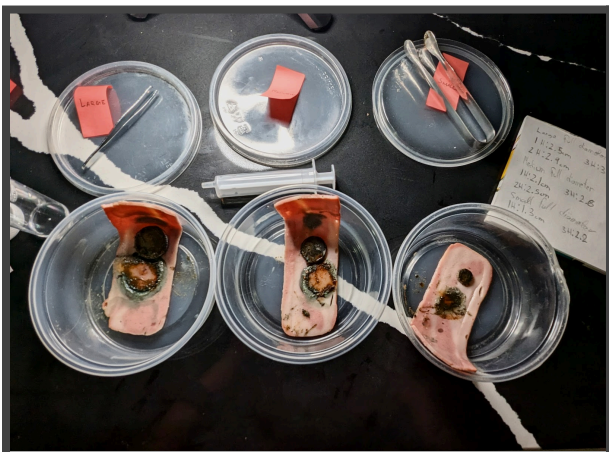
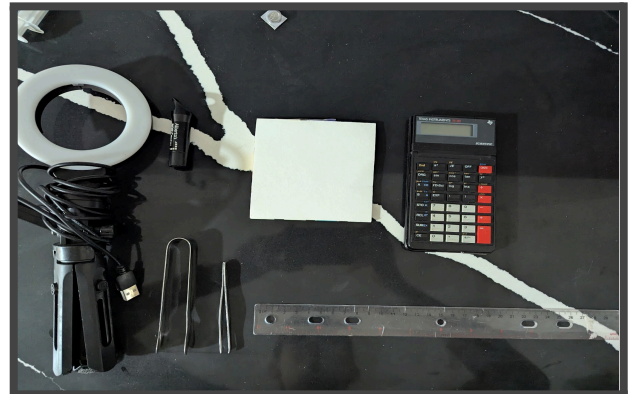
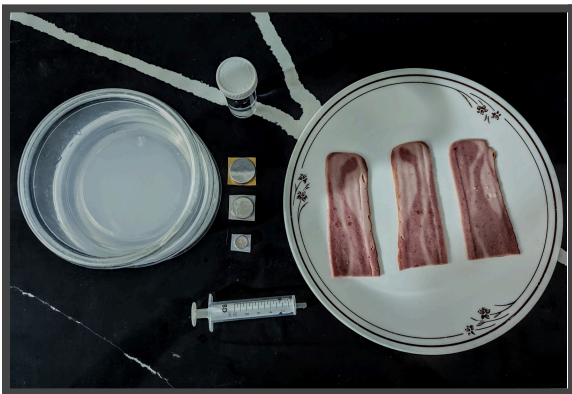
December 21 : Done all of the calculations for the surface area, diameter, area, and the circumference.

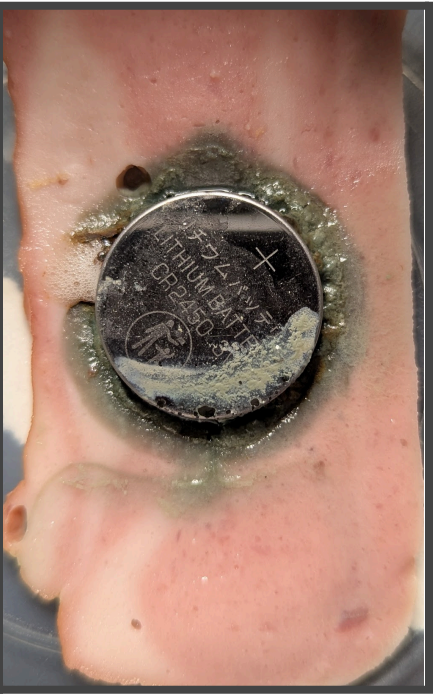
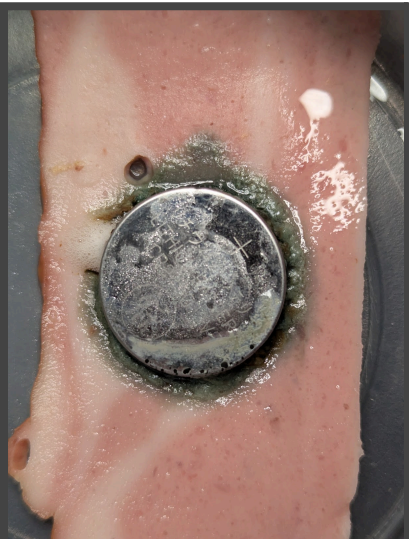
December 22 : Created the Canva and started to work on it.

December 22 - 25 :

Data And Pictures :

Pictures :





Graphs :

First Trial

Hour 1		Area	Circumference	Diameter
Large Button Battery		4.91cm ²	7.85cm	2.5cm
Medium Button Battery		3.46cm ²	3.46cm	2.1cm
Small Button Battery		1.33cm ²	1.33cm	1.3cm
Hour 2				
Large Button Battery		6.6cm ²	9.02cm	2.9cm
Medium Button Battery		4.91cm ²	4.91cm	2.5cm
Small Button Battery		1.77cm ²	1.77cm	1.5cm
Hour 3				
Large Button Battery		11.95cm ²	12.19cm	3.9cm
Medium Button Battery		5.31cm ²	5.31cm	2.6cm
Small Button Battery		3.85cm ²	3.85cm	2.2cm
Average				
Large Button Battery		7.82cm ²	9.69cm	3.10cm
Medium Button Battery		4.56cm ²	7.50cm	2.40cm
Small Button Battery		2.30cm ²	4.62cm	1.67cm

Second Trial

HOUR 1	Area	Circumference	Diameter
Large Button Battery	4.52cm ²	7.54cm	2.4cm
Medium Button Battery	3.80cm ²	6.92cm	2.2cm
Small Button Battery	0.95cm ²	3.46cm	1.1cm
HOUR 2			
Large Button Battery	5.73cm ²	8.49cm	2.7cm
Medium Button Battery	4.91cm ²	7.85cm	2.5cm
Small Button Battery	2.01cm ²	5.03cm	1.6cm
HOUR 3			
Large Button Battery	10.18cm ²	11.31cm	3.6cm
Medium Button Battery	5.50cm ²	8.32cm	2.65cm
Small Button Battery	3.14cm ²	6.28cm	2.0cm
AVERAGE			
Large Button Battery	6.81cm ²	9.13cm	3.10cm
Medium Button Battery	4.73cm ²	7.71cm	2.45cm
Small Button Battery	2.03cm ²	4.43cm	1.50m

Third Trial

HOUR 1	Area	Circumference	Diameter
Large Button Battery	4.70cm ²	7.70cm	2.45cm
Medium Button Battery	3.14cm ²	6.28cm	2.0cm
Small Button Battery	1.13cm ²	3.77cm	1.2cm
HOUR 2			
Large Button Battery	5.73cm ²	8.49cm	2.7cm
Medium Button Battery	4.16cm ²	7.23cm	2.3cm
Small Button Battery	1.77cm ²	4.71cm	1.5cm
HOUR 3			
Large Button Battery	10.80cm ²	11.62cm	3.7cm
Medium Button Battery	4.91cm ²	7.85cm	2.5cm
Small Button Battery	2.84cm ²	5.97cm	1.9cm
AVERAGE			
Large Button Battery	7.08cm ²	9.27cm	2.82cm
Medium Button Battery	4.07cm ²	7.12cm	2.27cm
Small Button Battery	1.91cm ²	4.87cm	1.53cm

Calculated Averages

HOUR 1	Area	Circumference	Diameter
Large Button Battery	4.84cm ²	7.80cm	2.48cm
Medium Button Battery	3.47cm ²	6.60cm	2.1cm
Small Button Battery	1.01cm ²	3.56cm	1.13cm
HOUR 2			
Large Button Battery	6.02cm ²	8.69cm	2.77cm
Medium Button Battery	4.99cm ²	7.98cm	2.43cm
Small Button Battery	1.85cm ²	4.82cm	1.53cm
HOUR 3			
Large Button Battery	10.98cm ²	11.71cm	3.73cm
Medium Button Battery	5.24cm ²	8.11cm	2.58cm
Small Button Battery	3.29cm ²	6.38cm	2.2cm

December 28 - January 9 :

Teacher Made Template (All other Information):

R Recall the purpose	The purpose of this experiment is to show the dangers of swallowing button batteries and how to show parents a visual representation of what can happen to your Child's esophagus. Reports say that between 2016 and 2021, there were 27 deaths, and at least 10,000 kids ended up in the emergency room after swallowing these small batteries. This shows how serious the problem can be, and why it's so important to keep dangerous items like these away from young children. By learning about these risks, parents can be more careful and protect their kids from these accidents. By finding out the measurements for the burns across each size and keeping some of our materials the same like the chicken strips this project just may show parents the danger. This type of experiment can also make medical experts have a visual representation of what they need a cure for.
E Explain	Some major findings or observations was that the smell of the work area was very bad and left a meaty, acrid smell. The chemical reaction was very severe between the esophagus (chicken strip) and the button battery acid. I also noticed how on the first trial the small battery had significant growth in burns. The medium battery on the second trial wasn't big but it let out lots of acid compared to the other trials. There was also a light burn hole between the large button battery and the chicken strip on the third trial.
R Restate Hypothesis	I would not need to restate it but is :If the size of a button battery increases, then the burning in a child's esophagus will be more severe because the increased surface area and larger acid capacity in the battery will result in worse burns.
U Uncertainty	In the future I can make several changes or additions to my project. I can add a larger variety of button battery sizes and I can also extend the experiment time. I could also use different liquids, like honey, instead of saliva to see if it helps prevent the button battery from burning the esophagus. Another improvement I could make is using pH strips to measure the acidity, instead of only looking at the size of the burn. I could also find a quicker way to measure the burn mark, since figuring out the area and circumference was too time consuming.

N New	In the future, I can make several changes or additions to my project. First I could add more types of button battery sizes to see how each one affects the burn. I could also extend the experiment for a longer period of time to observe how the burns change or grow over time. Another change I could make is using different liquids like honey instead of saliva, to see if it might prevent the button battery from burning the esophagus. I could also use pH strips to measure the acidity instead of the dimensions which would give me more accurate data than just looking at the size of the burn. This information can be very useful in real life whether you are a parent, doctor, or a scientist. For parents it can help them understand the dangers of button batteries and keep them out of a child's reach. It's also important for parents to make sure their child isn't chewing on harmful objects which might contain these batteries. For doctors the findings can help them understand how button batteries affect the inside of a patient's body. For scientists this research can help them learn more about how the esophagus reacts to burns from batteries. and helping them to create better treatments. By finding consumable ingredients the scientist can make a honey-like fluid protecting the child esophagus so it can coat the layer of the esophagus and also be resistant to the chemical reaction.

March 20 : Done Handing in everything on the CYSF platform.