Post Activity – What is a Concussion?

Cross Curricular	Art, circuitry
Safety Notes	Do not make a short circuit or battery will heat up. Do not attach LEDs directly to the battery. Always put the LEDs into the conductive dough.

Big Ideas

Healthy cells contribute to healthy organisms. (Grade 8)

Cells organize into tissues, tissues into organs, organs into organ systems, organ systems into organisms. (Grade 8)

Specific Expectations

Identify structures in neurons.

Describe the organization of cells into tissues, organs, and systems.

Description

Students will make a circuit with playdough, and use it as a metaphor for how a concussion can affect our neurons and slow the transmission of nerve impulses. Adapted from Brainfacts.org – Squishy Neuron Activity.

Materials

Conductive playdough – Play-doh
Insulating dough – modelling clay
9-volt battery
Battery clip
LEDs
Tool for cutting clay and playdough.

Accommodations/Modifications

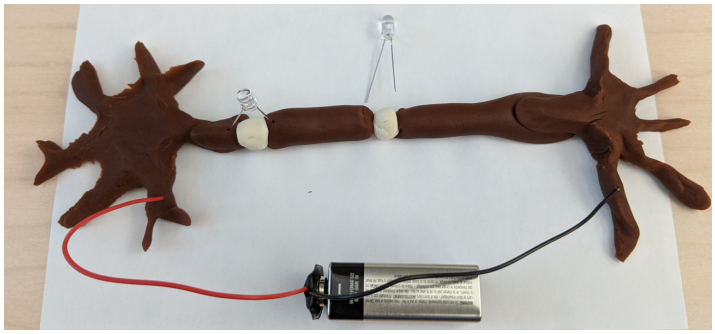
If you have a battery holder for AA batteries, you can use this as well. Works best with at least 4-AA batteries.

Introduction

In our school program "What is a Concussion?" students learn about the effects of a concussion on the brain. Concussions have a direct impact on the function of neurons in the brain. People who have experienced a concussion might have difficulty with motor and cognitive functions. This is due to a disruption in how nerve impulses are transmitted from one cell to another. In this post activity, students will make a neuron out of conductive dough, and show how electricity travels from one end of the neuron to the other. This is a metaphor for how nerve impulses travel along nerve cells and between nerve cells in the brain.

Action

1. Print a copy of the neuron template and have students label the parts of the cell, or provide the class with a labelled diagram of a neuron.
2. Divide Play-doh into three parts.
3. Make a ball with one part, and flatten it. Cut out crescents to make a star- or flower-like shape to create the dendrites of the cell body. Add the nucleus (it can be a different colour if your wish).
4. Roll the second part into a long cylinder to create the axon.
5. Make a ball with the last piece, flatten it, and remove Play-doh to create the branches of the axon terminal.
6. Attach the three pieces together, putting the axon in the middle. Your model should look like a diagram of a neuron.
7. Cut out two short sections from your axon, and replace the gaps with modelling clay (insulating dough). Make sure there are no spaces between all the pieces of dough.
8. Insert the legs of your LEDs in the conductive dough, bridging the gap created by the insulating dough. Make sure the longer legs are on the side closest to the dendrites. The longer legs will always go on the side where you attach your positive terminal.
9. If you have not already, attach the battery clip to your 9-V battery.
10. Attach the red (positive) wire to the dendrites, and the black (negative) wire to the axon terminal.



11. Your LEDs, should light up. Remember to never attach the LED legs directly to the battery. Always put the legs in conductive dough.

Consolidation/Extension

In actual neurons, the axon is covered in myelin. This is a fatty substance that insulates nerve fibres and accelerates the transmission of electrical signals along the axon. Also, electrical signals in neurons travel in one direction. LEDs are a great way to show this because they only work in one direction. They have polarity. If you turn the LED around, it will not light up.

If you move the black wire to between the two LEDs, you will notice only one LED lights up. This can be used to show how a concussion slows, or inhibits, the electrical signal from reaching the axon, and therefore passing to the next neuron.

Place several neuron models one after another, and see if you can use an LED to bridge the gap between each neuron model. First, try with two neurons and one battery. Connect the red wire to the dendrites of one neuron and the black wire to the axon terminal of the second neuron. There might not be enough power from one battery to light up five LEDs. Next, use two batteries, connected as above in Action, and use an LED to attach the two neurons together. Use caution when working with 9-V batteries, and make sure you do not create a short circuit. The batteries heat up quickly and intensely.

Assessment

Students have labelled the neuron correctly, and are able to have the LEDs in the circuit light up.

Questions:

How is the model neuron similar to an actual neuron?

How is the model neuron different from an actual neuron?

Explain why LEDs are useful in making the model resemble a real neuron.

How do actual neurons pass signals from one cell to another?