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Neuro 430
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Kids Judge Proposal Topic: Why Does My Mouth Feel Numb?

Purpose:

To demonstrate a simplified mechanism of pain sensation at the cellular level focusing on how sodium plays a role in pain perception and how local anesthetics block pain by acting on sodium channels and produce feelings of numbness.

Materials:

- Students
- 5 or 6 wiffle balls
- Box of candy
- umbrella
- Plywood
- Scrap wood
- Wood glue
- Nails
- Paint
- marbles
- Hot pepper sauce
- Table salt

Procedure:

Following an explanation* of pain and what our model demonstrates, the kids will be allowed to taste table salt to grasp what sodium really is and be given the opportunity to taste hot pepper sauce to experience the "pain" in which we speak.

The model will be constructed as shown in Figure 1 attached. A long section of wood will cover the opening of the sodium channels and the balls (representing sodium) will rest on top of the slide. The kids will pull the slide, aligning the notches in the wood with the sodium channels below, therefore dumping the sodium into the cell. The model will be propped up to allow the "sodium" to roll through the sodium channels and into a hole in the board covered with tissue paper (stapled on). A representation of an action potential will be demonstrated when the tissue paper tears due to the accumulating marbles on top of it, thus collecting in a receptacle below.

Next, focusing on just a single sodium channel, four kids will join hands in a circle to represent an ion channel, and whiffle balls will be tossed between them to represent sodium entering the inside of the neuron. Then, it will be stated that after a certain amount of "sodium" ions enters into the cell, a signal is sent throughout the cell, which will be explained previously in the model created, and helps to show how sensations such as pain are sent throughout the body. Then a student will enter into the middle of the circle, open up an umbrella, thereby

representing a local anesthetic binding to and blocking the "ion channel". Whiffle balls will then be thrown through the "channel", but will be unable to due to the anesthetic binding. That will help to illustrate how a signal can't be sent through a neuronal cell, and how you wouldn't be able to feel something such as pain.

*The explanation will include a cartoon of a person, zooming in on their mouth, and progressively zooming in on a few sodium channels. We will relate pain to dental surgery and briefly describe the numbing effects of anesthetics.

Issues:

The main issue is that a local anesthetic would need to block many ion channels on an axon to suppress an action potential, as well as work on many axons in order to produce feeling of numbness instead of working on just a few ion channels on one axon. However, that will be mentioned to the students. Also to be mentioned is why local anesthetics would only seem to affect the feeling of pain or sensation, and not something like motor movement. The final issue will be to make sure students understand that many more neurons are involved, and that the blockage of one ion channel on one neuron will not block all neuronal signaling and blockage of sensations like pain. One final issue is that this model represents sodium "waiting" to enter the cell without synaptic release from another cell.