Touchy Feely

Overview

This activity engages students in an investigation of touch receptor cells in the skin. Students are asked to propose an explanation for the frequency of touch receptors in the skin and then design an experiment that would validate their explanation.

Background

Receptor cells are specialized nervous system cells that are responsible for collecting information from the external and the internal environment and passing that information along to the Central Nervous System. These cells can be grouped in specialized organs like the retina of the eye or single neurons like pain receptors in the skin. There are many kinds of receptor cells, each programmed to respond to a particular stimulus. The skin has pressure receptors, pain receptors, hot temperature receptors, and cold temperature receptors to name just a few. The number of touch receptors in the skin varies with the location on the body. Receptors are packed more closely in areas where touch is critical.

Materials

Materials for pairs of students
- 1 foam piece, 1"x 3"
- Toothpicks
- Alcohol wipes
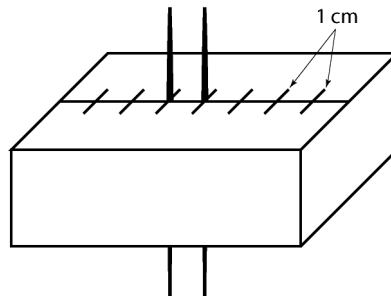- 1 ruler

Materials for individual students
- Science notebook

Preparation

- Cut the large foam piece into 1"x 3" strips.

Procedure

- Start by telling students that during this experiment a gentle touch with the toothpicks of the "Receptor Probe" is all that is required and desired to elicit a response from the touch receptors.
- Ask students to work in pairs. They should mark a line on their foam piece and then divide the line into centimeter sections. Next, they should poke two toothpicks along the centerline about 1 cm apart and protruding about 1 cm from the bottom of the foam piece.

- Ask the students to gently touch the Receptor Probe to the end of their fingers and record how many contact points they feel. They can either do this to themselves or to each other, working as partners.
- Ask the students to touch the upper part of their forearm with the same probe and record how many contact points they feel.
- Most people will easily feel two points of contact on their fingertips and just one point on their forearm. Ask the students to share their results and to generate a possible explanation for what they observed.
- Ask the students to pick 3 other body areas that are exposed when wearing normal school clothing and to predict how many contact points they will feel in each of these spots and to write an explanation of why they think their skin will respond in this way. Students should be advised to change toothpicks in the probe whenever a different person is tested. The foam piece can also be cleaned with an alcohol wipe between students and certainly between classes.
- Ask students to report back their results and have a discussion about these results in light of students' explanations.
- Have students go to the textbook and find readings on the nervous system to see if they can find explanations that match their results.
- At this point students can be allowed to design experiments on their own or they can be given a series of challenges to investigate. These could include:
  1. On a sensitive part of your body (fingertip), how close can the two toothpicks be and still be felt as two contact points?
  2. On another less sensitive body part (calf), how far apart do the toothpicks have to be before one feels two contact points?
  3. Students could test various regions for sensitivity by having one partner touch either one or two toothpicks to certain regions while the tested partner has their eyes closed.
  4. There are many different ways to go with this safe and interesting experimental system.

Reflection/Discussion

Ask students to list what types of signals they can pick up from the environment and why these signals are important. This is also a time to discuss the textbook reading on what the nervous system is and how it is set up.

Assessment

Ask students to list other sensory or receptor types and to list what kinds of signals these specialized cells react to.