

“TONGUE MAPPING” (specificity of neuron receptors)

Target audience: 9-12

Background and Notes: The receptors for taste in the tongue are specific for sweet, sour, bitter and tart. There are specific locations for these taste receptors that can be mapped. These patterns in the tongue model patterns in the brain. This activity relates the specificity of nerve receptors to the student since the student can clearly identify taste receptors in specific areas of the tongue.

Knowledge and skills:

- Students should be able to relate specific nerve receptors to specific functions.
- Students should be able to identify the regions of their tongue that are specific to particular tastes and connect to nerve receptor specificity.

Fundamental understanding:

- Brains, nerve and nerve receptors have specific functions related to shapes and characteristics of molecules.

Essential Questions:

- Why are different areas of the tongue only able to identify one type of taste i.e. how does taste relate to the function of nerves and the brain?

National standard

- National content standard C: As a result of activities students should develop an understanding of the cell, molecular basis of heredity, biological evolution, interdependence of organisms, matter, energy and organization in living systems and behavior of organisms.

State standard(s):

- 1.02 and 1.07 Objectives for North Carolina Chemistry Standard Course of Study Objective: Bond Polarity and molecular polarity, including intermolecular forces in order to explain polarity
- Biology 1.01a Chemical processes and regulatory mechanisms of cells
- 1.01b Objectives for North Carolina Biology Standard Course of Study Objective: Bonding patterns.

Purpose: To demonstrate how the specificity of sensory receptors in the tongue are able to model the specificity of neuroreceptors in the brain.

afety Precautions:

Do not reuse cotton swabs

Materials:

- **Equipment:**

1. Cotton swabs
2. Small disposable paper cups

- **Reagents:**

1. Cocoa (5 g in 25 ml of distilled water)
2. Salt (5 g in 25 ml of distilled water)
3. Sugar (5 g in 25 ml of distilled water)
4. Lemon juice (use straight from bottle or fresh squeezed lemon)
- 5.

Procedure:

1. Mix separately the following solutions with 5 g in 25 ml of distilled water: (can be done by students or teacher)
 - a. Cocoa - bitter
 - b. Salt - salty
 - c. Sugar - sweet
 - d. Lemon juice - no need to mix
2. Label each taste by color: pink, yellow, green, blue
3. Have each group of students draw a tongue; have a class model in the front of the room. (Draw on a large sheet of paper or on the board)
4. Dip a cotton swab in the first solution and rub it completely over the tongue. (can pair students and have each touch the parts of the tongue for the other)
5. Have students try to decide which area of the tongue is the most intense for each taste.
6. **DO NOT REUSE THE COTTON SWAB!**
7. Wash hands between each solution, rinse mouth between each solution. (Discard the water cup).
8. At the end, have each group label the class model of the tongue.

Data & Results: Draw the tongue and place the responses in the observed location on the tongue. Locate general area of the tongue that registers each taste.

Conclusion:

1. Restate Purpose
2. Is there a pattern of taste?
3. If there are variations, why is this?
4. How many neuroreceptors did you detect?
5. Are there any foods that would affect more than one receptor?

EXTENSION:

1. Will the neuroreceptors recognize all neurotransmitters or show specific location?
2. Is there a relationship between smell and taste?
3. Trace the sensory pathway from the tongue to the brain.
4. Research what part of the brain that receives which taste.

References and Resources:

College or High School Biology Textbook
Schwarz-Bloom, Rochelle, Pharmacology Education Project,
<http://www.duke.edu/~schwa001/scienceeducation.htm>

Teacher Notes:

Lab Set up: on each table for 4 students set out clean supplies of each

1. Approximately 5 g in 25 ml of distilled water:
 - a. Cocoa - bitter
 - b. Salt - salty
 - c. Sugar - sweet
 - d. Lemon juice - no need to mix
3. Clean cotton swaps
4. Beakers for used cotton swaps