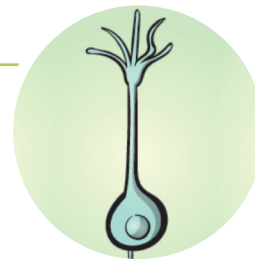


Sense of Smell and Olfactory Fatigue

A Carolina Essentials™ Investigation

Student Worksheet



Overview

In the human body, specialized nerve cells respond to conditions in the environment and send a signal through nerve cells to the brain. These specialized nerve cells have structures called sensory receptors, structures that will only respond to a specific kind of stimulus. There are many types of receptors in the human body sending signals to the brain that enable our senses of sight, hearing, taste, touch, and smell. There are numerous smell responses, stimulated by many types of chemicals. This results in a great number and variety of odors.

The organs of human smell, the olfactory epithelium, are in the upper portion of each nasal cavity. The region consists of olfactory receptor cells found in tiny, hair-like cilia that are bathed in a layer of mucus. Gaseous odor molecules dissolve in the mucus layer and bind to the membranes of the receptor cells. Axons from the receptor cells carry impulses to the olfactory bulb, which lies under the frontal lobe of the brain. In time, sensitivity to continuous odors may diminish or even become nonexistent, while the response to other odors is unimpaired. This phenomenon is known as olfactory fatigue.

Essential Question

How do structures in the body enable human beings to sense their environment?

Investigation Objectives

1. Investigate the time for the onset of olfactory fatigue.
2. Determine if odors trigger memories.

Safety Precautions

Wear safety glasses during the investigation. Waft the odor towards your nose.

Procedure

Place a cotton swab in an Erlenmeyer flask vertically. The head of the swab should be above the rim of the flask.

1. Place the flask and swab on a level surface approximately 30 cm (1 ft) away from and just below the nose of the test subject.
2. Have the test subject close his or her left nostril by pressing on it with the left index finger.
3. Place two drops of clove oil on the head of the cotton swab.
4. Start the timer and have the subject gently waft the odor toward his or her nose, gently fanning with the right hand and inhaling through the right nostril, then exhaling through the mouth.
5. The subject will continue to sniff the odor and exhale through the mouth at a normal rate until the smell is no longer detectable or has greatly diminished.
6. Record the elapsed time in minutes and seconds in the data table below.
7. The subject should release the left nostril, close the right nostril with the right index finger, and waft the odor of the clove oil toward his or her nose with the left hand.
8. Start the timer.
9. The subject should continue to sniff the odor and exhale through the mouth at a normal rate until the smell is no longer detectable or has greatly diminished.
10. Record the elapsed time for the left nostril in minutes and seconds in the data table.

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SAFETY REQUIREMENTS



MATERIALS

- Peppermint oil, 2–3 drops
- Clove oil, 2–3 drops
- 2 cotton swabs
- 2 125-mL Erlenmeyer flasks
- 1 1-gal resealable plastic bag
- Timer or smartphone



- Places the used swab in a resealable plastic bag and seal the bag completely.
- Repeat the procedure using the peppermint oil and record the results in the data table.
- Switch roles and repeat the process until everyone in the group has been tested.

Disposal

Leave the swabs in the resealable bag, and return the other materials to their original location.

Data and Observations

Fragrance	Right Nostril Fatigue (min and sec)	Left Nostril Fatigue (min and sec)
Clove Oil		
Peppermint Oil		

Analysis and Discussion

- Was the peppermint oil smelled immediately after the odor of the clove oil diminished? How is the nose able to detect new or different odors?
- How do the fatigue times of the clove oil and peppermint oil compare when sniffed in succession with the right nostril?
- Is the fatigue time for the left nostril significantly different from that of the right nostril?
- When you smelled the cloves and the peppermint, did you recall any memories associated with those odors? If so, briefly describe them.
- Diagram the process of smelling the peppermint oil.