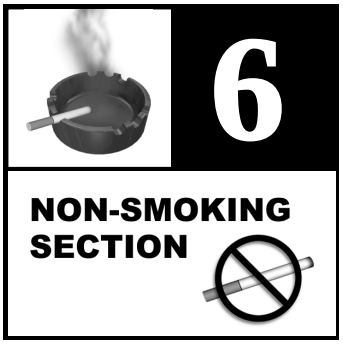
# MODULE 6
## environmental tobacco smoke



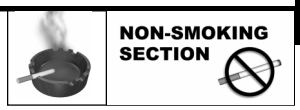

### INTRODUCTION

The purpose of this module is for students to learn what environmental tobacco smoke is and to understand the effects of environmental tobacco smoke on their bodies. By extending what students have already discovered in previous activities and by expanding their ideas about how smoking affects the body, these activities help students make connections between the structures and functions of the body and secondary effects of tobacco use.

> Two activities make up this module:
> Activity 15: The Pocket Game
> Activity 16: Making Sense of Taste and Smell

Each of the activities in this package has at least one Extension related to historical events, inventions, or people that relate to the circulatory and respiratory systems. These Extensions are indicated with a ❤. Encourage students to use a variety of media to complete and present their research projects.

# ACTIVITY 15




## the pocket game

### TEACHER BACKGROUND

THIS ACTIVITY REQUIRES ADVANCE PLANNING. SEE "OVERVIEW" FOR DETAILS.

People who do not smoke but are around others who are smoking are exposed to the same chemicals found in the smoke. This smoke is called environmental tobacco smoke, which is harmful to your body and to your health.

Environmental tobacco smoke has been shown to be a cause of lung cancer in adults who don't smoke. The United States Environmental Protection Agency estimates that environmental tobacco smoke is responsible for about 3,000 lung cancer deaths each year among non-smokers. Environmental tobacco smoke causes 37,000 heart disease deaths in the United States every year.

Every year, environmental tobacco smoke causes 150,000 to 300,000 cases of breathing infections (pneumonia or bronchitis) in babies. In children under 18 years of age, environmental tobacco smoke exposure causes more coughing and wheezing. It also causes a small decrease in lung function and an increase in fluid in the middle ear, which could cause ear problems. Children who have asthma have more frequent and more severe asthma attacks when they are exposed to environmental tobacco smoke.

According to a July, 1997 issue of Archives of Pediatric and Adolescent Medicine, past studies estimated that parental smoking accounts for the following in the United States every year: Low birth weight - 46,000 infant and 2,800 perinatal deaths; SIDS - 2,000 deaths; Severe lower respiratory infections - 22,000 hospitalizations and 1,100 deaths; Ear infections - 3.4 million visits to the health care provider and 110,000 treatments for insertion of ear tubes; Asthma - 1.8 million visits to the health care provider and 14 deaths; and Fire-related Injuries - 10,000 visits to the health care provider, 590 hospitalizations, and 250 deaths.

## ACTIVITY INSTRUCTIONS

### Materials

Tokens
Pouch
Science Notebooks
Activity Center for calculations
(see "Overview")

### Overview

You will need to recruit as many people throughout the school as you can to serve as distributors of tokens. Make sure the hall monitors, classroom teachers, cafeteria workers, and custodians have the tokens to give out. Each person who gives out tokens represents a place where students are or could be exposed to environmental tobacco smoke. For example, if a student went into a restaurant, they would automatically be exposed to environmental tobacco smoke, even if they were in the designated nonsmoking area.

As they pass each of your volunteer "smoke spots," students receive a token. Each token represents an average of 1.5 mg of tar and nicotine that is given off from a burning cigarette. Students will accumulate tokens in the pouches to be counted when they return to the classroom.

You will need to have a designated spot in the room where the students can make their calculations at the end of the day and again in the morning. You could extend the activity to continue for as long as a week, but multiplying the amount of tar and nicotine by 7 would probably work just as well. However, that would eliminate exposure at home, in restaurants, etc.

**1.** Students will be traveling throughout the school wearing their pouches and collecting tokens when they come in contact with areas designated as smoking areas.

**2.** At the end of the day they deposit their tokens in the collection area and they make an entry in their Science Notebook. At their choice they either make the calculations daily or at the end of the week. Each token represents 1.5 mg of nicotine and tar.

If you do not wish to do this as a schoolwide activity, you could use a large area and designate different areas as various community locations where students may encounter smokers. For example, one area could be a restaurant, a convenience store, the home of a friend, etc.

This activity presents a good opportunity to review measurement with the students. It would be more meaningful to students if they had a concrete idea of what a milligram of a substance looks like.

### Homework, Assessment, and Standards

**Homework**
Have students write a list of what they think the effects of environmental tobacco smoke might be.

**Assessment**

Have students generate lists of questions related to environmental tobacco smoke. Students could compare these questions with questions they have about other air pollutants.

Research air pollution in general with a focus on parts per million generated by car exhausts and compare these figures with environmental tobacco smoke. Create a way to share the information with others in the class or with another class.

Write a persuasive letter to a restaurant or restaurant chain that provides "no smoking" areas. Convince them that there is no such thing, and that the harmful effects of environmental tobacco smoke is well-documented. Students could use research results (above) to support their claims.

Have students explore the CD-ROM and Website including statistics for additional information on environmental tobacco smoke and the affects on the body. Encourage them to log on to the Virtual You to see how environmental tobacco smoke affects them personally.

**Standards**

Florida Sunshine State Standards:

Science: SC.F.1.2.1, SC.F.1.2.3, SC.H.1.2.2, SC.H.1.2.3, SC.H.1.2.4, SC.H.1.2.5, SC.H.2.2.1, SC.H.3.2.2, SC.H.3.2.4

Health: HE.A.1.2.1, HE. A.1.2.2, HE.A.1.2.4, HE.A.1.2.5, HE.A.1.2.6, HE.A.1.2.8, HE.A.2.2.2, HE.B.1.2.1, HE.B.1.2.2, HE.B.1.2.4, HE.C.1.2.1, HE.C.1.2.2, HE.C.1.2.3, HE.C.2.2.1, HE.C.2.2.4, HE.C.2.2.5, HE.C.2.2.6

Language Arts: LA.A.2.2.8, LA.B.1.2.1, LA.B.2.2.1, LAB.2.2.2, LA.B.2.2.3, LA.B.2.2.4, LA.B.2.2.5, LA.B.2.2.6,

Mathematics: MA.A.3.2.1, MA.A.3.2.2, MA.A.3.2.3, MA.E.1.2.1, MA.E.1.2.3, MA.E.3.2.1, MA.E.3.2.2

Social Studies: SS.A.2.2.1, SS.A.3.2.1

National Science Content Standards: A, C, F, & G

## Extensions

Provide the following prompt to which students will react by writing an essay. *People who have pets love them as if they were members of the family. Some people who love their pets smoke. Before you begin writing, think about how environmental tobacco smoke might affect pets. Now write a story about what might happen to a pet who lives with a person who smokes.* This is similar to the prompts found in Florida Writes!

Have students use the CD-ROM's Virtual Body Lab to explore the effects of environmental tobacco smoke on each of the body's systems that they have studied in the Structures and Function activities. Either using the database of questions, or forming their own questions, students should identify an area in which they have a special interest or are curious about, and create a mini-report to be shared with the class.

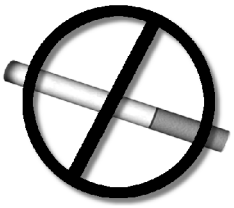
Students can study air pollution by creating their own slides and placing them in locations around their homes. By using a piece of posterboard, punching holes in it, and placing a piece of tape underneath the "slide," students can collect particles in the air. Look at the slides under a microscope to investigate the "pollution" that students collected. Brainstorm reasons why some students have more pollution on their slides than others. For example, did the student place the slide indoors or outdoors? Are students' homes near industrial plants? Is the student living with smokers? Have students create questions that can be answered by their studies.

This activity could be further expanded by using different color tokens to represent carbon monoxide.

❤ Have students research the study done by Evarts A. Graham and Ernest L. Wydner (1953). They were the first to demonstrate that tar from tobacco smoke causes cancer in mice.

Read aloud Sticks by Joan Bauer (ISBN 0-440-41387-7) about a boy who uses the family's pool hall to perfect his nine-ball game. You could discuss the fact that most pool halls allow smoking. A pool hall in Tallahassee, FL, experimented with a glassed-in area for non-smokers but removed the glass when the owners determined that non-smokers did not buy as much as smokers. You may wish to explore the economic ramifications of tobacco, smoking, etc.

# THE POCKET GAME

People who do not smoke but are around others who are smoking are exposed to the same chemicals found in the smoke. This smoke is called environmental tobacco smoke (secondhand smoke), which is harmful to your body and to your health.

In this activity you will be collecting tokens that represent environmental tobacco smoke. As you move around the school throughout the day (in the halls, to the cafeteria, to PE, etc.), some people will give you tokens as you pass by. These tokens represent an average of 1.5 mg of tar and nicotine that you are exposed to when you pass by someone who is smoking, when you are in a room with a smoker, or when you go to a restaurant that allows smoking.

**Collect Your Materials**

- **Tokens**
- **Pouch**
- **Science Notebook**

**1.** Pick up a pouch from your teacher. You will put all tokens that you collect in the pouch.

**2.** Set up a page in your Science Notebook where you will record numbers of tokens and the calculations that you will make when you are done.

**3.** Follow your normal schedule and collect the tokens as you pass by the "smokers."

**4.** At the end of the day, count your tokens and record the amount in your Science Notebook.

**5.** Write two paragraphs in your Notebook that describes what happened as you went through your day.

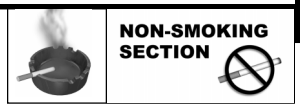
- Who did you get tokens from?
- Where in the school were the "smokers?"
- How many other children would be affected by the "smokers?"

**6.** Now, complete your calculations. Using a calculator, multiply the number of tokens by the amount of tar and nicotine (1.5 mg) that you were exposed to. Record your work in the Science Notebook.

**7.** At home, or if you go out after school, pay attention to, and record, the times that you are in a room with a smoker or are exposed to environmental tobacco smoke. Each time will represent one token. Then, when you get to school, add this number to your total number of tokens and figure out how much more tar and nicotine to which you were exposed.

**8.** Write about the experience. Include as many details as you can remember and be sure to include opinions, your ideas, and reactions.

# ACTIVITY 16




## making sense of taste and smell

### TEACHER BACKGROUND

THIS ACTIVITY HAS TWO PARTS: ONE THAT DEALS WITH SMELL AND ONE THAT ADDRESSES TASTE.

The senses of taste and smell are a result of stimuli that are interpreted by the nervous system. These senses have distinct receptor cells located within the mouth and nasal cavity. These receptors are classified as chemoreceptors because they respond to chemicals in liquid solutions. The taste receptors are excited by food chemicals dissolved in saliva. The smell receptors are excited by airborne chemicals that dissolve in fluids produced on nasal membranes. The receptors for taste and smell complement each other and respond to many of the same stimuli. Actually, taste is 80% smell. The smell of food combined with taste messages from the mouth provide a full sense of taste.

Taste buds are the sensory receptors for taste. Taste buds are located primarily in the mouth. Of the approximately 10,000 taste buds, most are on the tongue. A few are on the soft palate, inner surface of the cheeks, pharynx, and epiglottis. Different parts of the tongue are used for different kinds of taste. For example, sweet and salty foods are mostly tasted on the tip of the tongue, sour on the sides, and bitter foods are tasted at the back of the tongue. However these differences are not absolute. Most taste buds respond to two, three, and even four types of tastes.

One taste bud contains about a dozen taste cells, each about four-thousandths of an inch long, packed into the bud like the petals of an unopened flower. At the top of each bud is a pore. Poking up through the pore are tiny hairs called gustatory or taste hairs. Food dissolved in saliva makes contact with the taste hairs of the taste buds. It is in the taste cells that the chemical stimuli of taste is converted into nerve impulses. At the base of the bud are nerve fibers that carry the taste information through the nervous system to the brain. Your sense of smell plays a very important part in how you taste food. The smell of food combined with taste

messages from taste buds give you a full sense of taste.

A significant factor contributing to why smokers and nonsmokers differ in food choices may be that tobacco has been found to cause damage to the membranes of the tongue and nasal passages, which detrimentally affects the ability to taste and smell. This may reduce the palatability of fruits and vegetables, making them less appealing to smokers.

Smoking also suppresses appetite. When smokers are hungry they tend to smoke and postpone nutrient intake. As a result, smokers tend to weigh less than nonsmokers. Suppression of appetite may have a significant negative impact on growth during childhood, especially during the rapid growth phase of the teen years. The busy lifestyles of today's children make it difficult enough to ensure meeting nutritional needs. Appetite suppression associated with smoking compounds the problems of meeting nutritional needs.

## ACTIVITY INSTRUCTIONS

### Materials

How Our Body Works
Science Notebooks
Construction paper
cardboard
posterboard (or cut up corrugated cardboard from packing boxes)
Scissors
Dessert recipes (either you supply or students bring from home)

### Overview for Part I

The students will be designing puzzle pieces that model the "Lock and Key Theory" that some scientists believe explains the manner in which we are able to smell. Scientists believe that molecules of odor have a specific shape that fits into the cells of chemoreceptors inside our noses. This is similar to the way that a key fits into a lock. For this activity students design puzzle pieces that will fit into each other.

1. In pairs, students create matching puzzle pieces.

2. Take all puzzle pieces and put them in one central location. Students will each choose a piece.

3. Now, students will try to find the matching piece. Once they have found it, they will answer questions on the Student Page.

### Overview for Part II

This section deals with the sense of taste. Students will be adjusting a dessert recipe to make allowance for a smoker whose ability to taste has been altered. Based upon the information above, a discussion of how smoking and tobacco products affect taste will help students determine how they will change their recipes. You may want to cook in class, have parents cook up batches of different recipes, or ask some students to bake at home.

Food is bland, tasteless, less sweet, and in general, tastes different for smokers than

nonsmokers. Students will mimic this, for example, by changing amounts of flour, sugar, other sweeteners, etc. Then, they should compare the taste of one recipe with another. You may want to have them discuss ways that they could take a brownie recipe, for example, and change it for a smoker.

**NOTE:** Adding more flavoring to brownies to make them more flavorful for a smoker may send the wrong message. In doing a taste comparison, the students may mistakenly think that a smoker's diet is more tasty and flavorful. To avoid this, you could change the activity by making brownies using less flavoring to simulate what they would taste like to a smoker. Students could then describe how smoking affects their sense of taste and smell.

## Homework, Assessment, and Standards

### Homework

Have students select a dessert recipe and bring it to share with the class.

Find a book in the public library or school media center on bloodhounds or other animals that are known for their sense of smell. Students could use these books for "sustained silent reading" and could then find a way to present what they have discovered to their classmates.

Students list what they eat in one day beginning at breakfast time and ending with dinner or snacks that they have while watching television. This list will be used for an assessment activity below.

### Assessment

Students diagram the tongue in the Science Notebook or on construction paper labeling the different places on the tongue that represent how we taste certain foods. (Refer to How Your Body Works, "Sensational Saliva" and "Tired, Tired, Taste Buds".) Using the lists generated for homework, students place each food in its appropriate place on the tongue. Have students, either individually or in groups, share their diagrams and compare.

In groups, have students brainstorm a potpourri recipe. If possible, have them gather the ingredients and actually make the potpourri. In addition, have students

### Standards

Florida Sunshine State Standards

Science: SC.F.1.2.1, SC.F.1.2.3, SC.H.1.2.1, SC.H.1.2.2, SC.H.1.2.3, SC.H.1.2.4, SC.H.1.2.5, SC.H.3.2.2, SC.H.3.2.3, SC.H.3.2.4,

Health: HE.A.1.2.1, HE. A.1.2.2

Language Arts: LA.A.2.2.1, LA.A.2.2.5, LA.A.2.2.8, LA.B.1.2.1, LA.B.2.2.1, LA.B.2.2.2, LA.B.2.2.3, LA.B.2.2.4, LA.B.2.2.5, LA.C.3.2.2, LA.C.3.2.5

Social Studies: SS.A.3.2.1

Visual Arts: VA.A.1.2.1, VA.A.1.2.2, VA.A.1.2.3, VA.A.1.2.4, VA.B.1.2.1, VA.B.1.2.4

National Science Content Standards: A, B, C, F, & G

research (call stores, visit stores, etc.) why some potpourri are heated and others are not. Have students write a description of how they asked a question and found an answer.

Check student notebooks for taste test plans. Make sure that they have changed only one variable at a time. If they did not, check to see that they realized that their results are not replicable or usable in the "cookbook for a smoker" because they do not know which ingredient to change!

## Extensions

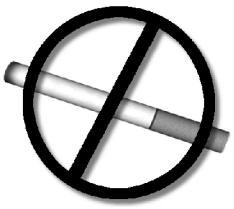
❤ Have students research Carolus Linnaeus, a Swedish naturalist who proposed a classification system for smell. Students can begin at the web timeline.

Have students research the process of breathing and sniffing in certain animals by asking questions. For example, why does a bloodhound have such a good sense of smell? Why does a rabbit sniff the air rapidly? (Other animals such as moths, crabs, and insects rely on their senses of smell.) Can differences be explained by nose shape? Encourage students to use a variety of resources such as print, CD-ROM, web sites, interviews, phone calls, etc.

Students can "experiment" at home with parents and other family members to compare how each person tastes certain foods. Encourage students to keep a chart or table of results so that they can draw conclusions and make comparisons with other students' results.

Read aloud Life's a Funny Proposition, Horatio by Barbara Garland Polikoff (ISBN 0-14-03664-X). Having lost his father to lung cancer, Horatio forms a bond with his grandfather. There are frequent mentions of how smoking reduces a person's enjoyment of certain foods.

# MAKING SENSE OF TASTE AND SMELL Part I

The senses of taste and smell are the result of signals to our nervous system. They work because of certain cells, called receptors. These receptors are called chemoreceptors because they are affected by chemicals. Taste receptors are affected by food chemicals dissolved in saliva. Smell receptors are affected by chemicals in air. The receptors for taste and smell go together like pieces of a puzzle. Actually, taste is 80% smell. The smell of food combined with taste messages from the mouth provide a full sense of taste.

1. With a partner, design and make two puzzle pieces that exactly fit together. These pieces represent the taste or smell and the chemoreceptor.

2. When you are finished, place your pieces at a place that your teacher has chosen.

3. Choose a puzzle piece. Try to find the person with the matching piece so that the two of you have a "sense of smell."

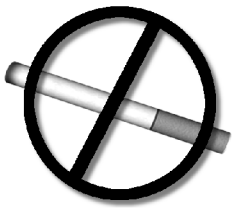
4. In your Science Notebook, describe how your puzzle pieces model smelling. When you have a cold, your receptors are blocked. How could you change your model to show this?

5. With your new partner, change your pieces to show how they might look if you had a cold or if tobacco interfered with your sense of smell.

- How would your model be different?
- How could you use this to explain the sense of smell to another person?

6. List in your Science Notebook any questions you have about the sense of smell in humans and other animals. Also list things that you buy that rely on your sense of smell. For example, potpourri.

# MAKING SENSE OF TASTE AND SMELL Part II

Smokers and nonsmokers sometimes differ in food choices because tobacco has been found to cause damage to the tongue and nasal passages. This may make some foods less appealing to smokers because they seem less flavorful. Ingredients that contribute most to flavor are: fats (butter, margerine, shortening, oils), sugar (or other sweetener like artificial sweeteners, honey, molasses), salt, or spices (vanilla, cinnamon, nutmeg). For example, when you bake brownies, you may find them very sweet and chocolatey. A smoker might not taste them in the same way.

1. Use a recipe that you have brought from home or that your teacher has given you. Identify the ingredients that you think give it flavor. Think about how you would need to change it so that it would be flavorful for a smoker.

2. When you change the recipe, don't forget that changes are small. A little more salt or a little less sugar will greatly change how something tastes. Write the changed recipe for a smoker in your Science Notebook.

3. Ask your parent to help you try the original recipe and the one you have changed. Write in your notebook how they are different and how the changed recipe tastes.

4. Imagine that you are going to conduct a taste test to find the best recipe for a smoker. In your Science Notebook, write a plan for how you will conduct your tests. Remember, to get reliable results, you need to test recipes where all the ingredients are exactly the same except one. You will be changing one variable at a time and testing the results.

5. How could you use the results from the taste tests to help you write a cookbook for a smoker? What kinds of foods would you include and how would you use them in the recipes? Write your ideas in your Science Notebook and share them with the class.