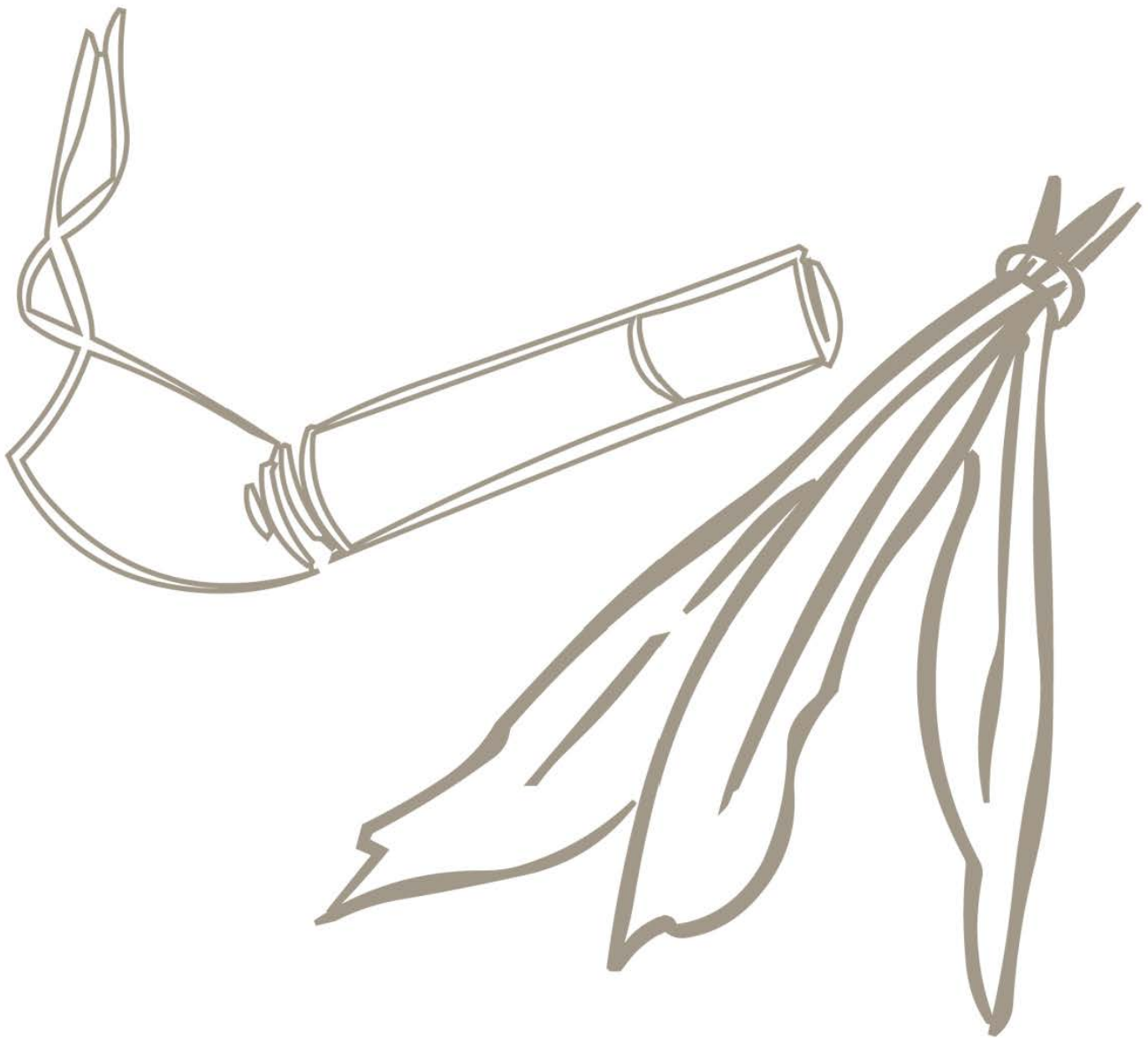


# THE SCIENCE BEHIND SMOKING



## Module 5

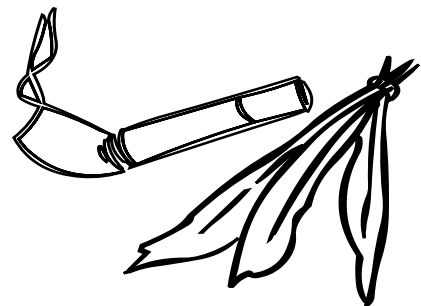
**Guide to Module 5:**  
**The Science Behind Smoking**

**Introduction**

In module 4, students were introduced to a wide range of medicines and drugs. They learned about the importance of taking the proper dosage of medicine given by a parent or a health care professional. They also learned about some substances that are harmful. In this module, students focus on tobacco, which causes harm to the body, and nicotine, a drug found in the leaves of the tobacco plant. By performing a controlled experiment, students see for themselves the unhealthy residue that tobacco leaves. They also learn about nicotine and how it can cause addiction.

**Learning Objectives**

- Students perform a controlled experiment to discover the effect that tobacco has on the body.
- Students discuss the effect that nicotine has on the body.
- Students gain experience developing a hypothesis, performing a controlled experiment, and drawing conclusions from the experiment.



**Relationship to the National Science Education Standards**

This mission aligns with two standards identified in the NSES: science as inquiry and science in personal and social perspectives. The chart below identifies how the mission aligns with each of these standards.

<b>SCIENCE AS INQUIRY</b>	
<b>Levels K–4</b>	<b>How Mission is Aligned</b>
Abilities necessary to do scientific inquiry	Students go through a series of steps in the process of scientific inquiry: developing a hypothesis, completing an experiment to test their hypothesis, and drawing conclusions.
<b>SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES</b>	
<b>Levels K–4</b>	<b>How Mission is Aligned</b>
Personal health	Students observe the unhealthy residue that tobacco leaves. They discuss how this residue is left in the lungs and other parts of the respiratory system and the impact it has on the health of smokers. In the future, students can refer back to this information to make wise decisions about the personal habits that affect their health.

**Background**

Tobacco is a very potent substance. It contains more than 4,000 chemicals, many of which are released during smoking. Tar and carbon monoxide are two particularly dangerous chemicals in cigarette smoke. Tar can cause lung cancer, emphysema, and bronchial diseases, while carbon monoxide can cause heart problems. Other serious health problems linked to smoking include digestive cancers, gastric ulcers, and cancers of the throat, tongue, lip, esophagus, and pancreas.

In addition to dangerous substances like tar and carbon monoxide, the leaves of the tobacco plant contain a drug called nicotine. Nicotine is found in all tobacco products: cigarettes, cigars, pipe tobacco, chewing tobacco, and snuff. It is a strong drug that acts on the nervous system. It also causes an increase in blood pressure, heart rate, and respiration. Nicotine is very addictive. It is what causes people to continue to smoke, even though they know the health consequences of doing so.

Different drugs have various effects on the body. People take drugs because of the feeling of euphoria they experience as the drugs change the way the brain normally works. Some of the changes that happen in the brain following drug use are short-term, while other changes can last a long time.

Prolonged drug use can change the brain in such a way that addiction results. Addiction is a disease that is characterized by changes in the structure and functioning of the brain. Addiction results in:

- A strong compulsion or need to use drugs despite negative consequences (someone keeps using drugs even though he or she is having problems);
- Loss of control over the amount of the drug used (someone uses more than he or she plans) and other drug-related behavior (someone does or says things he or she would not ordinarily say or do);
- Intense craving for the drug when it is not available. This craving is due to changes in the brain. Once a person is addicted, he or she must have the drug just to keep from feeling bad. This is because drugs can cause changes in the functioning of neurotransmitters in the brain.

When a person stops using a drug, it takes a while for the brain to get back to normal. During that time, the person may feel bad and have an intense craving for the drug. Research in animals and some humans is beginning to suggest that some drugs may

## NIDA Junior Scientists Program

cause changes that are permanent. Addiction is considered a disease because the drugs have changed the normal functioning of the brain. Addiction can be successfully treated. However, the best way to avoid addiction is to never start using drugs.

The nicotine molecule is shaped like a neurotransmitter, acetylcholine. Acetylcholine and its receptors are involved in many functions, including muscle movement, breathing, heart rate, and learning. Acetylcholine also causes the release of other neurotransmitters and hormones that affect mood, appetite, and memory. When nicotine gets into the brain, it attaches to acetylcholine receptors and mimics its actions, overstimulating the brain.

Nicotine also activates areas of the brain that are involved in producing feelings of pleasure and reward by raising the levels of another neurotransmitter, dopamine. Increased levels of dopamine produce the strong, pleasurable feelings that lead to nicotine addiction. In fact, nicotine is so addictive that it is usually very hard for people to quit using tobacco products. When smokers do try to stop, they often experience cravings for cigarettes, anger, frustration, irritability, restlessness, anxiety, fatigue, headaches, and depression.

Nicotine enters the body very rapidly. After the smoke is inhaled, it takes only 8 seconds to reach the brain. Within about 40 minutes, half of the effect of nicotine is lost. This is the reason people feel the need to smoke another cigarette. Therefore, many smokers light up a cigarette about every 40 minutes. These smokers almost always have measurable amounts of nicotine and carbon monoxide in their bodies.

There are 1.1 billion smokers in the world, and they smoke 6 trillion (6,000,000,000,000) cigarettes each year, according to the World Health Organization. According to the National Survey on Drug Use and Health, there are about 58.3 million cigarette smokers over the age of 12 and 8.9 million tobacco “chewers,” or users of smokeless tobacco, in this country. More than 440,000 people die each year from tobacco use. Because people *do* have control over whether they begin to smoke, smoking can be viewed as the most preventable cause of death in the United States.

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## **Materials**

NIDA Junior Scientists DVD

Newsprint

For each group (four students per group):

- three clear cups
- one cigarette
- one small bunch of green leaves (gathered from outside)

Water

Bucket (if you don't have a sink in the class)

Log sheets

Instruction sheets

Trading cards

Paper and pencils

Labels

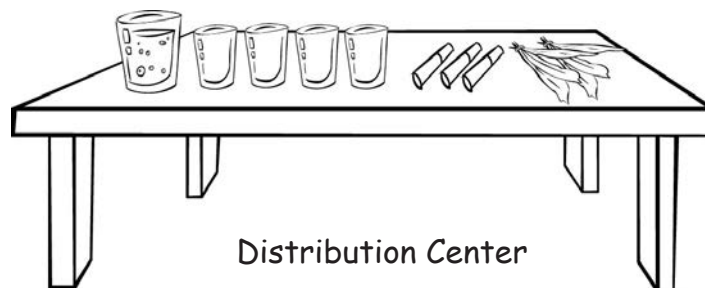
Markers

Neurotransmission poster or overlay from module 3 (page 3-5)

Poster: The Effects of Nicotine on Neurotransmission (page 5-23)

## Preparation

1. Divide the class into groups of four students. Each group of students will get three cups, one cigarette, and one leaf.
2. Decide how to distribute the materials for the experiment. One approach is to set up a materials center and have one student from each group collect the materials needed. A sample distribution center is shown below.



3. Make one copy of the log sheet and one copy of the student instruction sheet for each student.
4. If you don't have a sink in your classroom, decide how you will bring water into the class. One possibility is for two students to fill up a bucket and bring it into the class. Another approach would be for a parent volunteer or an instructional assistant to bring in the water.
5. Make a poster or an overlay of the neurotransmission diagram from module 3 (page 3-5) and a copy showing how nicotine acts, which is found on page 5-23. You will use them during the Discussion Questions part of the mission.

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**You may want to have parent volunteers  
or instructional assistants help set up the  
classroom for this activity.**

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**Try to have at least one other adult in the room while the children are doing this activity.**

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## Procedure

1. Conduct a brainstorming session about smoking. Have the students make a chart of what they know, what they want to know, and what they have learned. Ask students what they know about smoking. Do they know that it is harmful? Do they know why it is harmful? Have they heard of nicotine? Have they heard of the concept of addiction? Write down their responses on a sheet of newsprint. You will refer to it after students complete the experiment.
2. To introduce the experiment, show the first segment of the DVD. Then discuss the experiment with the class. By the end of the discussion, students should understand that they will be doing an experiment to test the effect that tobacco has on a cup of water. After observing that the water turns yellow, students will have a better understanding of what effect tar and nicotine have on the body. The lungs, for example, become blackened from excessive smoking.
3. Hand out the instruction sheet and go over the procedure with the class. Tell students that they will be working in groups to perform the experiment. Each group will begin with three cups of water. Students should put a cigarette in one cup, a leaf in the second cup, and nothing in the third. The cups should be labeled "Cigarette," "Leaf," and "Water." Explain to the students that the third cup is a control, a standard against which to judge the other two cups. Help students understand that a control is an integral part of a scientific experiment because it provides a baseline against which to compare results.



Cigarette



Leaf



Water



## NIDA Junior Scientists Program

4. Have students go to their groups. Give each student a log sheet. Before setting up the experiment, ask the groups to develop a hypothesis about what is going to happen to the cups of water. Have each student record his or her group's hypothesis on the log sheet.
5. Using the instruction sheet as a guide, each group should set up the experiment. Students should label their cups and leave them in a safe place in the classroom. Have students observe the cups over a week's time and write down their observations on their log sheets. Suggest that students include the following:
  - a. The color of each cup of water on the first day;
  - b. Changes in color in each cup over time;
  - c. The odor of each cup of water on the first day;
  - d. Changes in odor over time.
6. After they have completed the experiment and recorded their observations, have the students discuss the following questions in their groups:
  - a. Which cup changed the most? Which cup changed the least? Why?
  - b. Now that you've seen what the cigarette did to the water, what effect do you think it might have on your body? You may have to guide students a bit on this question. Explain to them that what happens to a cup of water and what may happen in our bodies is quite different.

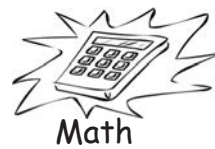
7. After students have completed the experiment and filled out their log sheets, have them work in their groups to develop conclusions. Ask them what this experiment made them think about cigarette smoking. Have each group present its findings and conclusions to the class by creating posters or writing a report.
  8. As a class, write a summary describing the results of the experiment. To reinforce their ideas, show the final segment of the DVD.
  9. **CONGRATULATIONS! YOUR STUDENTS HAVE JUST COMPLETED MISSION 5 OF *BRAIN POWER!***
-

### **Discussion Questions**

1. Take out the list of ideas about tobacco and nicotine that students developed before they did the experiment. Ask if their ideas have changed. If so, how? Then ask if they have additional ideas about tobacco that they would like to add to the list.
2. Show the students a poster or an overlay of the neurotransmission model from module 3. Ask the students if they remember what neurotransmitters do. Discuss the role neurotransmitters play in receiving and processing messages sent throughout the body.
3. Bring out the poster showing the effect of nicotine on neurotransmission (page 5-23). Ask students what they think it means if nicotine takes the place of a neurotransmitter. Explain that when nicotine takes over the functions of a neurotransmitter, it is the beginning of addiction.
4. Tell students that nicotine affects the body in another way. It makes people feel as though they need nicotine to feel good. This is another important fact about addiction, and it helps explain why being addicted to nicotine means that it is very difficult to stop smoking. In addition, because the body has become used to nicotine, it has a physical reaction when nicotine is taken away. These reactions include restlessness, hunger, depression, and headaches. Point out that the best way to avoid addiction to nicotine is to never start smoking in the first place.

## Extensions

The activities listed below provide links to other areas in the curriculum. These activities also make use of the trading cards included in the module.



1. While being careful not to touch it, take the “cigarette” water from the experiment and put it in a spray bottle. Put clear water in a second spray bottle. Place two house plants in the same spot outside. Spray one with the cigarette water and the other with the clear water. Observe the two plants for a week. Are bugs staying away from the plant sprayed with cigarette water? If so, that is not a surprise. The chemicals in tobacco are pesticides. (*Note: Be very careful when conducting this experiment. The students may be disturbed by the thought of killing bugs.*)



2. Discuss with the class what an advertisement is. What are the elements of an ad? What are ads designed to do? Then ask students to design an ad for kids with the purpose of convincing them to never start smoking. Students can use pictures from magazines, drawings, or computer art to create an attractive and convincing ad.



3. Using the neurotransmission model from module 3, have students simulate what happens when nicotine replaces the neurotransmitter in the synapse. Have students discuss what functions nicotine affects. (*Nicotine changes heart rate, blood pressure, and respiratory functions.*)

## **Assessment**

1. Students used a variety of skills during this mission: developing a hypothesis, performing an experiment, drawing conclusions from the experiment, and developing a basic understanding of addiction. In assessing students' performance, look for the following indicators of understanding of key concepts:
  - Is each group able to develop a hypothesis before beginning the experiment?
  - Are students able to work together in a group to perform the experiment?
  - Are students able to figure out how to set up the experiment?
  - Are students able to write clear, precise observations in scientific language? For example, are they writing, "By the second day, the water is beginning to turn yellow" instead of "The water looks weird"?
  - Are students able to explain what addiction is? Do they have a basic understanding of how nicotine affects the process of neurotransmission?
2. Put each student's log sheet in his or her student portfolio.

### Additional Activities

Below are some activities that can be used after completion of the fifth mission. These activities are extensions to many other areas of the curriculum.



1. You may want to perform the following demonstration to illustrate how dangerous smoking can be.
  - a. Take a plastic soda bottle with a top. Puncture a hole in the top just big enough for a cigarette.
  - b. Light the cigarette and place the lit end on the outside of the bottle, with the filter end inside. Make sure the bottle is sealed tightly.
  - c. Squeeze the bottle 25 times, simulating smoking. Try to keep the squeezes as uniform as possible. Have the students watch as smoke fills the bottle.
  - d. After you are done squeezing, let the bottle sit for about 20 minutes. Then have students observe the bottom of the bottle. They will see dark residue, which is similar to what builds up in the lungs of smokers.
  - e. Discuss with the class what this demonstration illustrates about cigarette smoking.

*Note: During this demonstration, smoke and its odor fill the room. To minimize the deleterious effects, you might want to do this activity outside.*



2. Have each student create a new trading card to go with this module. The card can be on any aspect of smoking or addiction.

## NIDA Junior Scientists Program



3. Go to the Library/Media Center and do some research about the effects of smoking on people's health. Students may look in books, in magazines, or on Web sites. Have students write a paragraph describing the research they found.



4. Have students go to another second- or third-grade class in the school and teach this lesson to those students. Have the students take the lead in helping the students from the other class set up the experiment, perform the experiment, and draw conclusions from it. Discuss whether the second class reached the same conclusions as the first one did.



## **Resources**

The lists below include resources for teachers and students.

### **Resources for Teachers**

#### **National Institute on Drug Abuse (NIDA)**

[www.drugabuse.gov](http://www.drugabuse.gov), 301-443-1124

This Web site contains information about drug abuse and a section designed specifically for parents, teachers, and students.

#### **NIDA Drug Pubs**

[drugpubs.drugabuse.gov](http://drugpubs.drugabuse.gov), 1-877-NIDA-NIH (1-877-643-2644)

Drug Pubs is NIDA's research dissemination center. Visitors can order hard copies of NIDA publications or download electronic versions in multiple formats.

#### **Sara's Quest**

This site from NIDA contains a multiple choice game on a variety of drug related categories.  
[teens.drugabuse.gov/sarasquest/index.php](http://teens.drugabuse.gov/sarasquest/index.php)

#### **National Clearinghouse for Alcohol and Drug Information (NCADI)**

<http://store.samhsa.gov>, 1-800-729-6686

NCADI provides information and materials on substance abuse. Many free publications are available here.

#### **Eisenhower National Clearinghouse (ENC)**

[www.goenc.com](http://www.goenc.com), 1-800-471-1045

This Web site provides useful information and products to improve mathematics and science teaching and learning.



## NIDA Junior Scientists Program

Lynch, B.S. *Growing Up Tobacco Free: Preventing Nicotine Addiction in Children and Youth*. Washington, DC: National Academy Press, 1994. Addresses tobacco prevention programs for youth, the effect of tobacco advertising, controls and bans on tobacco sales, and taxation as a prevention strategy; also explains nicotine's effects on the brain and body and the process of addiction.

### Scientists Find How Nicotine Affects the Brain

[www.columbia.edu/cu/record/archives/vol21/vol21\\_iss4/record2104.14.html](http://www.columbia.edu/cu/record/archives/vol21/vol21_iss4/record2104.14.html)

A brief discussion of scientists' discovery of how nicotine affects the brain.

### Neuroscience Resources for Kids—Nicotine

<http://faculty.washington.edu/chudler/nic.html>

A discussion of the history of tobacco and effects of nicotine on the body.

### Tobacco-Free Sports Playbook

[www.cdc.gov/tobacco/youth/sports/playbook/](http://www.cdc.gov/tobacco/youth/sports/playbook/)

Designed for school administrators and others who work with children; includes information on smoking and how to develop smoke-free sports activities for youth.

## Resources for Students

### **National Institute on Drug Abuse (NIDA)**

[www.drugabuse.gov](http://www.drugabuse.gov), 301-443-1124

This Web site contains information about drug abuse, with sections designed specifically for students.

**National Institute on Drug Abuse.** *Mind Over Matter: The Brain's Response to Nicotine*, 2007. Part of the NIDA's "Mind Over Matter" series on drugs for middle school students; focuses on nicotine and nicotine addiction. (Also available at [www.drugabuse.gov](http://www.drugabuse.gov))

Friedman, David. *Focus on Drugs and the Brain*. Frederick, MD: Twenty-First Century Books, 1990. Part of the "Drug-Alert Book" series; includes a section on nicotine and addiction.

Neuroscience for Kids

<http://faculty.washington.edu/chudler/nic.html>

Presents the history of tobacco and cigarette smoking, nicotine addiction, and the effect of nicotine on the brain.

## Student Instruction Sheet

### **Module 5: A Look at Tobacco and Nicotine**

1. Talk with your class about smoking. What do you know about it? What effect does smoking have on your health?
2. You will be working in a group of four students to do an experiment. The teacher will assign the groups. Find your group now and decide who is going to collect the materials from the distribution center.
3. Take a minute to read over the instruction sheet. With your group, write a hypothesis. What do you think the experiment is going to show? Write down your group's hypothesis on your log sheet. A good hypothesis might start with the words, "We predict that..."
4. Take the cups and fill them with water. Label one "Cigarette," a second one "Leaf," and the third one "Water." Put a cigarette in the first cup, and a leaf in the second cup. Don't put anything but water in the third cup. The third cup is called the control. The control is used to show what happens to plain water over time. In this way, by comparing all three cups with each other, we learn that changes are from the leaf or the tobacco, not just the water.
5. Observe the cups over a week. Compare them to each other. Be sure to include the following ideas in your observations:
  - a. The color of each cup on the first day;
  - b. Changes in color over time;
  - c. The smell of each cup on the first day;
  - d. Changes in smell over time.

6. After completing the experiment, discuss the following questions in your groups:
  - a. Which cup changed the most? Which cup changed the least? Why?
  - b. What do you think the experiment tells you about the effect of cigarette smoking on the body?
7. Work with others in your group to develop conclusions about the experiment. Share your ideas with the class, then work with your class to develop class conclusions.
8. **CONGRATULATIONS! YOU HAVE JUST COMPLETED MISSION 5 OF *BRAIN POWER!***

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**If you do not have a DVD player, read this story to  
your class to introduce the mission.**

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### **Introductory Story for Module 5**

“Oh, gosh,” gasped Kevin. “I feel like I’m choking.”

“What’s wrong?” asked Ami. “Do you have a bad cold?”

“No,” said Kevin. “I just ate in the smoking section of a restaurant.”

“Now that you mention it,” said Ami, “you do smell kind of funny.”

“You know, you’re right—however much I hate to admit that,” said Kevin. “I had no idea that just being *around* smokers could affect me so much.”

Just then, Ami and Kevin heard a dinging noise coming from the computer. It was Corty; who else?

“Hi, gang,” said Corty. “I heard you talking about smoking. You probably didn’t know this, but being around smoke is almost like smoking yourself.”

“It is?” exclaimed Ami and Kevin in unison. “How can that be?”

“I’m glad you asked,” said Corty, “because you’re about to find out all about it during the fifth mission of *Brain Power!*”

“How are we supposed to do that?” asked Kevin.

“Come right this way and you’ll find out,” said Corty. “Over here, you’ll find water, three cups, cigarettes, and leaves. Using the steps of scientific inquiry, you’re going to do an experiment to find out why smoking affected poor Kevin over here so much.”

“Let me see,” said Ami. “I think the first step is to observe. We should probably take a look at all that stuff over there.”

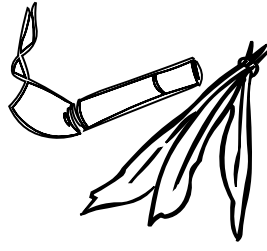
“And I think the second step is to make a prediction, or a hypothesis,” said Kevin. “So maybe the point is to see what happens to the water when we put a cigarette in it for a few days.”

“If we put leaves in a second cup and nothing in the third cup, we can compare the cigarette water with two other cups,” finished Ami.

“Let’s try it,” said Kevin. “Hey, kids. Why don’t you do it, too? I’ll bet you’ll learn some things that you’ll find very useful.”

“That’s right,” said Ami. “I think we all have a chance to get to the bottom of this smoking thing once and for all.”

# Log Sheet for Tobacco Experiment



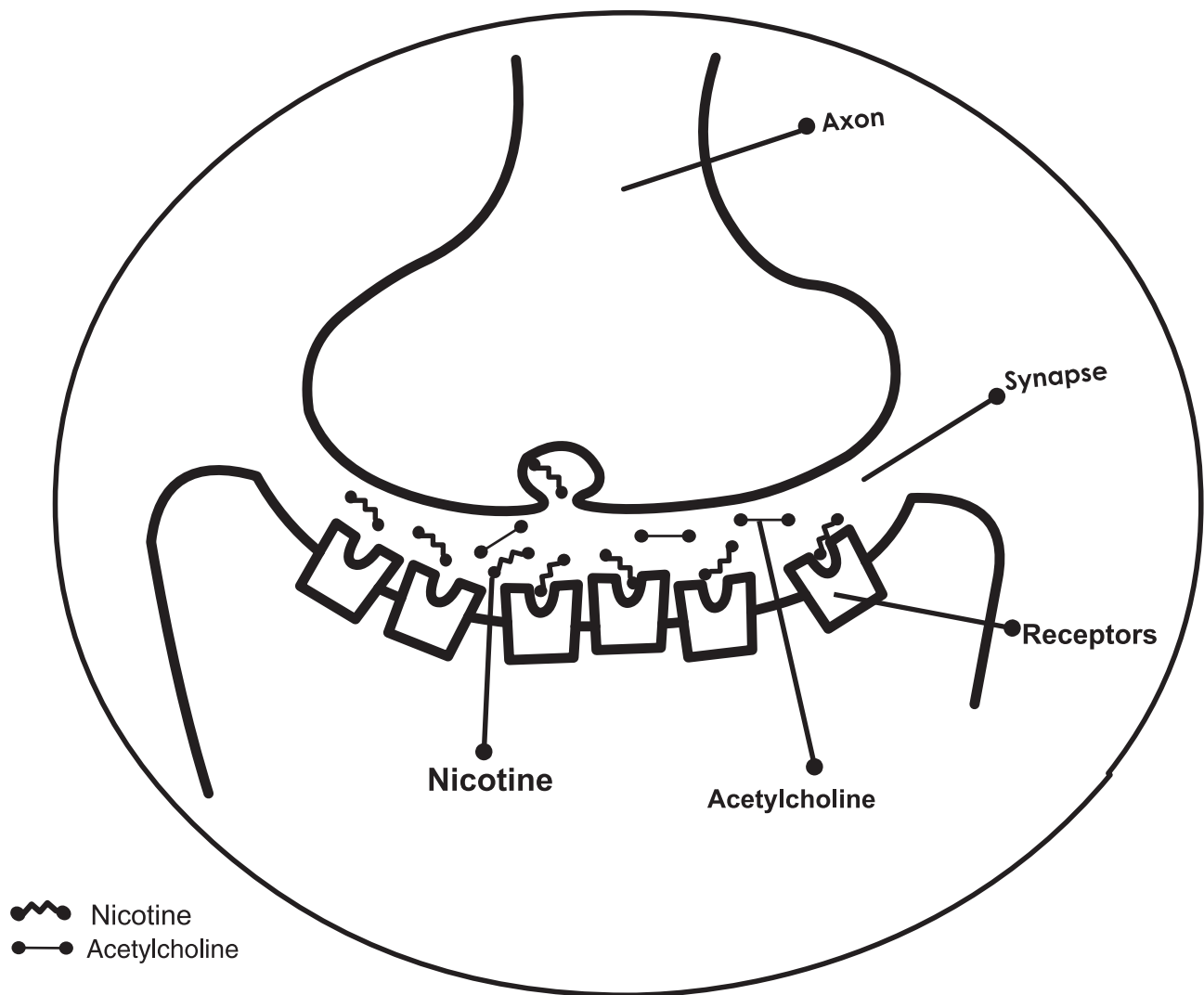
Name: \_\_\_\_\_

Cups	Days				
	Day 1	Day 2	Day 3	Day 4	Day 5
Cup 1 Cigarette					
Cup 2 Leaf					
Cup 3 Control					

Draw three cups for each day and color them to show the changes you are observing.

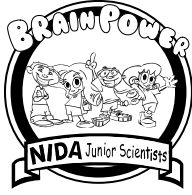
**Conclusions**

## The Effects of Nicotine on Neurotransmission



Nicotine mimics the action of acetylcholine, a neurotransmitter. Nicotine binds to these receptors and overexcites the brain.





# BRAIN POWER NEWS

## Parent Newsletter

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Volume 1, Number 5

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### The Science Behind Smoking

Most adults have known for years about the dangers of smoking. Nonetheless, smoking is still portrayed in the media as something glamorous and sophisticated, and many young people are still starting to smoke. While cigarette smoking among youth has declined, it still remains at unacceptably high levels. Furthermore, studies have shown that the younger a child starts smoking, the more likely they are to become daily smokers. In fact, those teenagers who smoke typically start at age 14 and become daily smokers by age 18.

Clearly, there is a strong need to keep adolescents from starting to smoke. Module 5 of the *Brain Power!* program addresses this issue by having students perform an experiment that illustrates the unhealthy residue that tobacco leaves behind. Students begin with three cups of water. They put a cigarette in one cup, a leaf in a second cup, and nothing in the third cup. The third cup serves as a control against which to compare changes in the other two cups. Students will observe that the water with the cigarette turns yellow, mimicking what happens inside the lungs after smoking.

Students also discuss nicotine, the highly addictive drug found in the leaves of the tobacco plant. The nicotine molecule is shaped like the neurotransmitter acetylcholine (remember from module 3 that neurotransmitters are chemicals in the brain that carry messages), which is involved in functions such as muscle movement, breathing, heart rate, and learning. Acetylcholine also causes the release of other neurotransmitters and hormones that affect mood, appetite, and memory. When nicotine gets into the brain, it attaches to acetylcholine receptors and causes them to become active. Nicotine is addictive; it changes the way the brain works so that the brain and body don't feel normal without it.

Nicotine also stimulates areas of the brain that are involved in producing feelings of pleasure and reward by raising the levels of another neurotransmitter, dopamine. Increased levels of dopamine produce the strong, pleasurable feelings

continued

that lead to addiction. Because nicotine is so addictive, once people start smoking, it is hard for them to quit. When smokers do try to stop, they often experience craving for cigarettes, anger and frustration, irritability, restlessness, difficulty sleeping, difficulty concentrating, hunger and weight gain, anxiety, fatigue, and depression.

We encourage you to ask your child about this learning experience. What were his or her reactions to the results of the experiment? Was your child surprised by the results? Did the experiments raise questions for your child? Our hope is that the experiment will lead to lively discussion that will reinforce the message that smoking is not healthy.



### Science at Home

Discuss choices about smoking made by family members. Do you or does anyone in your extended family smoke? If so, would that person be willing to discuss with your child when he or she started, whether he or she has tried to stop? If the smoker is older, discuss whether the scientific information about smoking was available when he or she started smoking. If not, ask about his or her reaction to the news when it first appeared in the 1960s. Social influences on smoking (for example, parent, sibling, peer, neighborhood, and school influences) have an enormous impact on adolescent smoking. By discussing these issues with your child now, while he or she is still young, you are preparing him or her to make wise decisions in the future.



### What Does Your Child Think?

Have your child draw or write something about tobacco or nicotine.

## Additional Resources

The books and Web sites listed below have more information about tobacco and nicotine.

#### National Institute on Drug Abuse (NIDA)

[www.drugabuse.gov](http://www.drugabuse.gov), 301-443-1124

This Web site contains information about drug abuse and a section designed specifically for parents, teachers, and students.

#### NIDA Drug Pubs

[drugpubs.drugabuse.gov](http://drugpubs.drugabuse.gov), 1-877-NIDA-NIH (1-877-643-2644)

Drug Pubs is NIDA's research dissemination center. Visitors can order hard copies of NIDA publications or download electronic versions in multiple formats.

#### National Institute on Drug Abuse (NIDA)—Mind Over Matter

<http://teens.drugabuse.gov/mom/index.asp>

This educational series, developed by NIDA, includes a section that focuses specifically on tobacco and its effects.

#### National Clearinghouse for Alcohol and Drug Information (NCADI)

<http://store.samhsa.gov>, 1-800-729-6686

NCADI provides information and materials on substance abuse.

Many free publications are available here.

Friedman, D. *Focus on Drugs and the Brain*. Frederick, MD: Twenty-First Century Books, 1990. Part of the "Drug-Alert Book" series; includes a section on nicotine and addiction.

Lynch, B.S. *Growing Up Tobacco Free: Preventing Nicotine Addiction in Children and Youths*. Washington, DC: National Academy Press, 1994. Addresses tobacco prevention programs for youth, the effect of tobacco advertising, controls and bans on tobacco sales, and taxation as a prevention strategy; also explains nicotine's effects on the brain and body and the process of addiction.

#### Neuroscience for Kids

<http://faculty.washington.edu/chudler/neurok.html>

This site includes a section on the history of tobacco, cigarette smoking, nicotine addiction, and the effect of nicotine on the brain.

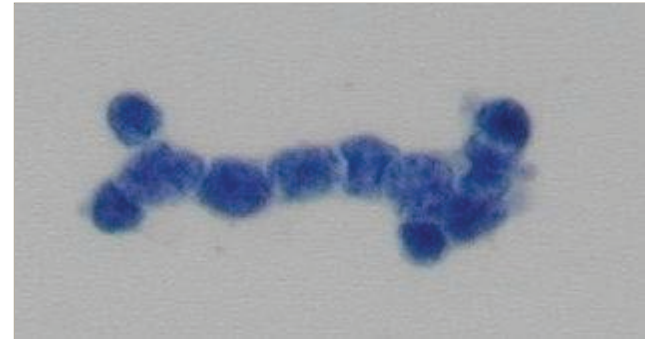
# NIDA ADDICTION



Addiction is one of the most dangerous parts of smoking. When someone becomes addicted, his or her brain has been changed by the drug so that it no longer feels right without it. When a person who is addicted to nicotine tries to quit using it, he or she can worry a lot, be very sad, get headaches, and be really tired. Drugs that cause addiction affect a certain part of the brain called the limbic system.



# NIDA CANCER

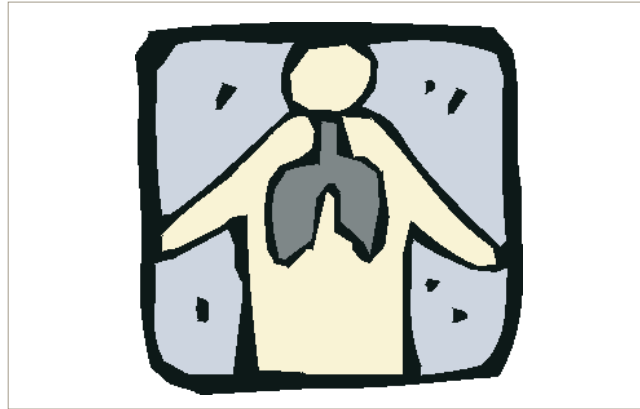


**Lung Cancer Cells**

There are many types of cancer that can show up in all parts of the body. Lung, lip, and throat cancers can all be caused by using tobacco. All cancers are bad, and they are all very difficult to cure. Lung cancer is the number one cause of death by cancer in the U.S.—but many cases can be prevented by not smoking!



# NIDA BLACK LUNGS



There is something in cigarettes called tar. When a person smokes, the tar goes into the lungs. The lungs then turn black from the tar, and it gets harder and harder for them to breathe. If people smoke for a long time, they can get diseases that can eventually stop them from breathing.



# NIDA TOBACCO



Tobacco comes from the leaves and stems of the tobacco plant. It can be smoked or chewed. Tobacco smoke contains more than 4,000 chemicals. Tobacco can cause lung cancer, lip cancer, throat cancer, respiratory problems, heart disease, and bad breath. All smokers in the entire world smoke about 6 trillion cigarettes each year.



# NIDA QUITTING

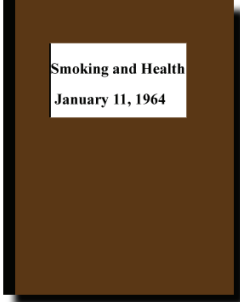


It is very hard to quit smoking. The addiction from nicotine is so strong that many people who smoke can't quit without help. Doctors can do different things to help people stop smoking. When a person quits smoking, the lungs start healing, the senses of smell and taste get better, and heart rate and blood pressure go down. It's always a good idea to quit.



# NIDA SURGEON GENERAL'S REPORT

Quitting Smoking Now Greatly Reduces Serious Risks to Your Health. \*  
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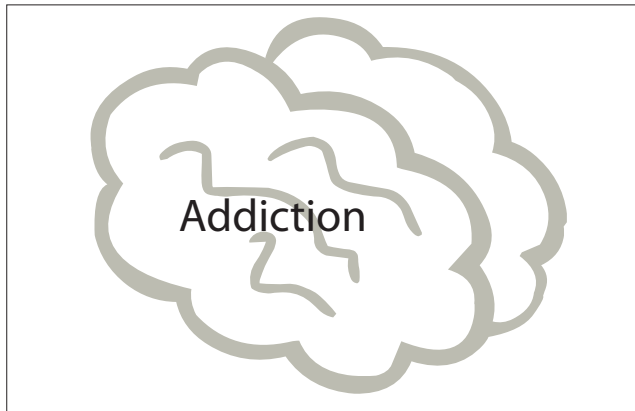
The Surgeon General is in charge of the health of the United States. She tells the people in the U.S. what they can do to improve their health. More than 30 years ago, the Surgeon General of the U.S. released a report called the Surgeon General's Report on Smoking and Health. This report told people that cigarette smoking is a cause of cancer and other serious diseases.

It is the reason there are labels on cigarettes warning people of the harmful effects.





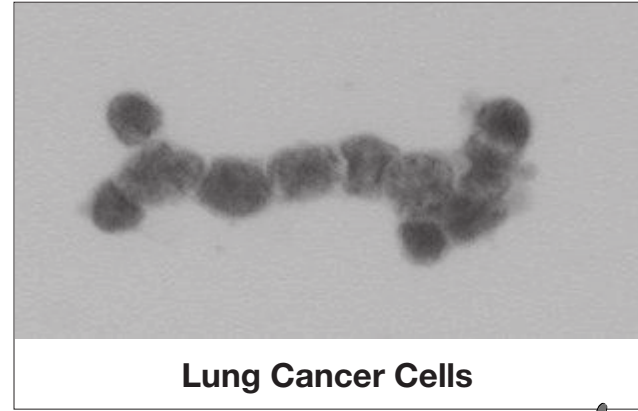
## ADDICTION



Addiction is one of the most dangerous parts of smoking. When someone becomes addicted, his or her brain has been changed by the drug so that it no longer feels right without it. When a person who is addicted to nicotine tries to quit using it, he or she can worry a lot, be very sad, get headaches, and be really tired. Drugs that cause addiction affect a certain part of the brain called the limbic system.



## CANCER



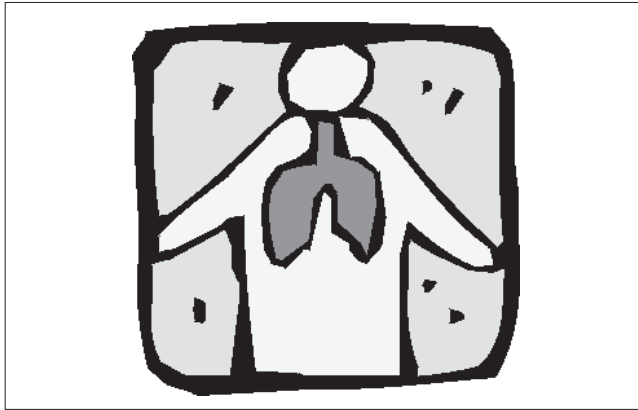
Lung Cancer Cells

There are many types of cancer that can show up in all parts of the body. Lung, lip, and throat cancers can all be caused by using tobacco. All cancers are bad, and they are all very difficult to cure. Lung cancer is the number one cause of death by cancer in the U.S.—but many cases can be prevented by not smoking!





## BLACK LUNGS



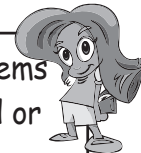
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## TOBACCO

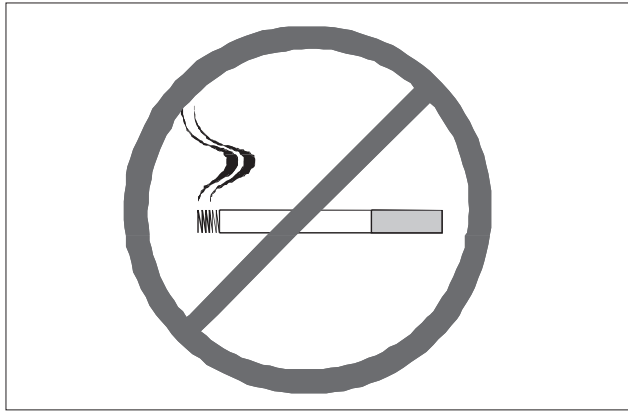


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## QUITTING

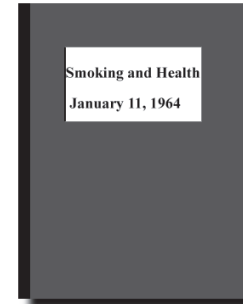


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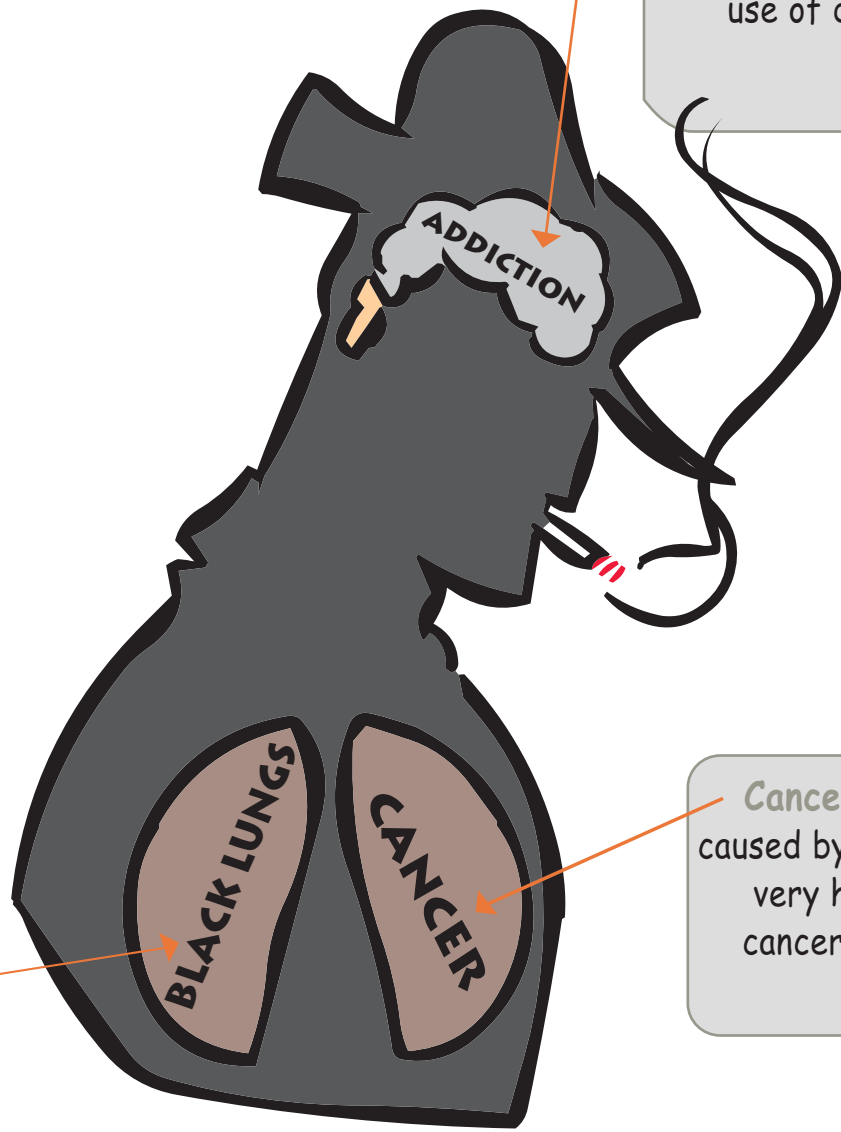
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# THE SCIENCE BEHIND SMOKING

**Addiction:** Addiction is a brain disease that causes compulsive use of drugs despite harmful consequences.



**Cancer:** Lung cancer can be caused by using tobacco. Cancer is very hard to cure, but some cancers can be prevented by not smoking.

**Black Lungs:** There is something in cigarettes called tar. When a person smokes, the tar turns lungs black and makes it harder to breathe.