

Where There's Smoke: The Effects of Smoking on the Human Body (50 minutes, plus homework)

Sections

Diseases, Your Body, Your Life

Investigative Questions

What is the effect of tobacco use on the various organs in the human body? What diseases affect smokers? How do the organs appear after they have been affected by tobacco use? What long- and short-term health risks does tobacco use cause?

Description of Content

In this lesson, students conduct an experiment that demonstrates what goes into a person's lungs with each puff of a cigarette. Then, students will view an interactive Web animation that gives a 360-degree view of the organs in the human body and an explanation of how tobacco use affects each organ.

The 2004 Surgeon General's report, *The Health Consequences of Smoking on the Human Body*, provides the scientific background for this lesson. The report shows the effects of smoking on the brain; the eyes; the mouth and throat; the lungs; the heart; the stomach; the kidneys; the bladder; the pancreas; and, pregnant women and their babies. On this Web animation, students will see pictures of healthy organs and organs affected by diseases caused by tobacco use, including: cataracts, periodontitis (gum disease), pneumonia, stroke, and cancers of the bladder, lungs, kidneys, mouth, pancreas, and stomach.

Students then will discuss the relationship between smoking and disease, and create a presentation that persuades other students to reject tobacco.

In addition to demonstrating the risks of smoking, this lesson provides an excellent way for students to review human anatomy. View this web page to allow students to see the effects of cigarette smoking http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/ .

Once your students have seen for themselves how smoking can affect their organs, they then can visit the *BAM!* Web site. The site includes information to help kids make informed choices about tobacco use.

Relevant Standards

This activity fulfills science and health education standards.

Objectives

Students will:

- Simulate/describe/estimate the impact of smoking on the lungs
- Identify the functions of major organs of the human body
- Identify the specific ways tobacco use affects these major organs
- Develop a persuasive presentation designed to discourage their peers from using tobacco

Ideas and Behaviors Common Among Students

This activity offers information from the literature on ways your students may already think and act with regard to tobacco use.

Teacher Background

The Centers for Disease Control and Prevention (CDC) estimates that each day in the United States, nearly 4,400 young people between the ages of 12 and 17 initiate cigarette smoking. In this age group, an estimated 2,000 young people become daily cigarette smokers. Nearly 80 percent of adult smokers started smoking before they left high school.

Since 1964, 28 Surgeon General's reports on smoking and health have concluded that tobacco use is the single most avoidable cause of disease, disability, and death in the United States. Yet, despite a wealth of scientific data and a major effort by both public health organizations and schools, too many teens still start smoking.

According to a study published in *Preventive Medicine*, some students believe that so-called "light" cigarettes are less of a health risk than other tobacco products. In fact, the National Center for Disease Prevention and Health Promotion (NCDPHP) reports that light cigarettes have the same ingredients and degree of risk as regular cigarettes. (Cigarette ingredients include lead, ammonia, benzene, DDT, butane gas, carbon monoxide, arsenic, and polonium 210.) Students also believe light cigarettes are less addictive, which is false.

In recent years, sales of cigars have increased dramatically. A study published in the *Journal of Substance Abuse* found that many teenage boys believe that smoking a cigar is safer than smoking a cigarette; however, regular cigar smoking is associated with an increased risk for cancers of the lung, oral cavity, larynx, and esophagus.

In addition to the health risks of smoking tobacco, educators should be concerned about other issues associated with tobacco use. For example, the NCDPHP also reports that tobacco use in adolescence is associated with many other health risk behaviors, including high-risk sexual behavior, and use of alcohol or other drugs.

Materials

Engagement Option 1

- A pack of cigarettes
- 1/2" flexible plastic tubing, such as Tygon® tubing (available at most hardware stores)
- 60cc syringe (available at farm or medical supply stores or online)
- Cotton

Other

- Computer with Internet access
- Student Reproducible: *The Effects of Smoking*

Safety

Normal classroom safety procedures should be observed in this lesson. Before using Engagement Option 1, check school policies about whether or not a lit cigarette is allowed in your classroom or on school grounds.

Procedure

Engagement

There are two alternatives from which teachers can choose. The first is an experiment that

dramatically demonstrates what goes into a person’s lungs with each puff of a cigarette. However, some schools or districts may have policies that prevent a cigarette being “smoked” in a classroom or on school grounds. If that is the case, use the second alternative.

Before using either engagement, give students some basic facts about smoking, which are included in the Teacher Background.

Engagement Option 1 (10 minutes) This activity is best completed outside.

1. Place cotton in the plastic tube. Then attach the tube to the syringe. Push the plunger end of the syringe all the way in.
2. Put the cigarette in the other end of the tube.
3. Light the cigarette. Ask students what they think will happen to the cotton.
4. Slowly, pull out the plunger and draw the smoke through the cigarette.
5. Repeat several times. Then put out the cigarette and remove the cotton from the tube.
6. Have students examine the cotton.
7. Ask students if they have heard of emphysema. Tell them that emphysema is the breakdown of

Organ	Function	Effects of Smoking
Lungs	Bring air into body Get oxygen into blood	Lung cancer Shortness of breath Emphysema Bad colds (?)
Heart	Move blood through the body	Heart attack Stroke (?)
Tongue	Help eat food	Bad breath

alveoli (the tiny sacs inside the lungs where the oxygen from the air enters the blood) that results from smoking. The material left inside the lungs from smoking damages the alveoli and reduces the lungs’ ability to get oxygen into the blood. The experiment they just completed shows just how much material smoking leaves behind in the lungs.

Engagement Option 2 (10 minutes)

1. Ask students which organs in the body are affected by smoking.
2. List these one at a time, along with what the students know about:
 - a. What that organ does
 - b. The effects of smoking on that organ
3. Most students will be aware of some the effects of smoking on the lungs. For example, they may be aware that smoking causes lung cancer, shortness of breath, and emphysema. Probe to discover what students know about other organs and what the effect of smoking is on each. Tell them it’s OK to make an educated guess—but place a question mark next to the statements students are unsure about.
4. Your list on the board might look like this:

Organ	Function	Effects of Smoking
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Lungs	Bring air into body Get oxygen into blood	Lung cancer Shortness of breath Emphysema Bad colds (?)
Heart	Move blood through the body	Heart attack Stroke (?)
Tongue	Help eat food	Bad breath

Exploration (20 minutes)

1. Pass out the student reproducible: *Effects of Smoking*. Have students work alone or in pairs for this activity.
2. Have students access the *BAM!* Web site.
3. As they look at the Web site, students should fill in the student reproducible with two key facts about the function of each organ mentioned, and up to three key facts about the effect of tobacco on that organ.

Explanation (20 minutes)

1. When students have completed their sheets, bring the class back together and review each of the organs and the diseases caused by smoking that affect them. Again, you may want to display the animation on a large-screen projector or monitor.
2. Talk with students about “risk” for disease. During any discussion of smoking and disease, one student will inevitably say, “My grandpa smoked two packs a day and he’s 80 and never got lung cancer.” Or, “My mom’s friend died of lung cancer at 50 and she never smoked a day in her life.” Point out to students that it is true some heavy smokers will not get lung cancer, and some people who never smoked will. However, it’s the odds that count. Smokers have a much higher risk for getting all the diseases your class discussed than non-smokers. For example, compared to non-smokers, men who smoke are 23 times more likely to get lung cancer and women who smoke are 13 times more likely to get lung cancer. Smoking causes 90 percent of lung cancer deaths in men and about 80 percent of lung cancer deaths in women. (This data is from the animation; more data on other health consequences, including other cancers, is available there as well.)
3. Students may say that it doesn’t matter if they smoke now, because they can always quit later. Tell them that scientific evidence shows that is unlikely. Most teens who smoke want to stop. Nearly half of the high school seniors who participated in the National Youth Tobacco Survey said they’d like to quit smoking. But they can’t because, according to the Surgeon General’s Report, “most young people who smoke daily are addicted to nicotine.” In the same survey, 54 percent of high school smokers said they had tried to quit in the last year.
4. Some students may say that while their friends don’t smoke, they do use smokeless tobacco. They may think that “chew” or “dip,” as it is sometimes called, is safer (in fact, some 40 percent of students believe this). The Surgeon General’s Report shows this is not true. Smokeless tobacco is still tobacco, and a major health risk. Twelve million Americans use smokeless tobacco; most are men, and 25 percent are teenagers. Smokeless tobacco includes chewing tobacco, tobacco powder, and snuff. These products allow tobacco to be absorbed by the digestive system or through mucous membranes. According to the CDC, chewing smokeless tobacco 8 to 10 times per day may be equivalent to smoking 30 to 40 cigarettes per day. It produces a 50-fold increase in the risk of oral cancer, gingivitis, and tooth loss. Most users also become addicted.

Elaboration (several days – use as homework)

1. Now your students have learned how smoking affects all the organs in the body. Ask them whether they think most kids their age are aware of what they know.
2. Talk about the importance of keeping kids from starting to smoke. The Surgeon General found that most smokers start before they finish high school. So if students make it to graduation day without starting to smoke, chances are they never will!
3. Have students work in small groups to create a PowerPoint presentation designed for kids their age. It should incorporate the experiences they have had through this activity (engagement experiment, interactive activity, worksheet), demonstrate the effects of smoking on the human body, and aim to persuade their peers not to use tobacco. If your students are not familiar with PowerPoint, have them use another communications method: a poster, a story for the school newspaper, a radio interview/show, or a short homemade video. The “Benefits of Quitting” section of the animation provides much scientific content. Students can also use any of the content in the rest of the interactive animation or any of the information available on the CDC site, *BAM!*, and other sites recommend in the Web resources section of this lesson.
4. Or, alternatively, if you do not want to have students develop a presentation, have students pursue further research on any of the diseases caused by smoking and share that information with classmates.

Evaluation

Complete the following rubric for each student.

Performance Descriptors

Performance Descriptor	Possible Score	Student Score
Based on the information in the engagement activity, student described (or estimated) the impact of smoking on the lungs.	up to 5 points	_____
Student participated in the class discussion that explored the effects of smoking on the human body.	up to 5 points	_____
Student listed at least two functions from the Surgeon General’s report for most human organs listed on the student reproducible.	up to 5 points	_____
Student listed up to three effects of tobacco smoke from the Surgeon General’s report for each of the organs listed on the student reproducible.	up to 10 points	_____
Student presented information learned in a way designed to discourage peers from starting to smoke or did further research on a disease caused by smoking and presented it.	up to 25 points	_____
	Total Possible Points 50	Student Score _____

Extension

1. Have students explore the *BAM!* Web site feature “Operation Flame Out”. This site provides students with the opportunity to examine the process that CDC uses to tackle public health problems such as smoking.

Web Resources

Centers for Disease Control and Prevention (CDC): www.cdc.gov

Tobacco Information and Prevention Source (TIPS): <http://www.cdc.gov/tobacco/index.htm>

CDC Division of Adolescent and School Health (DASH) Tobacco Use:
<http://www.cdc.gov/HealthyYouth/tobacco/index.htm>

This site provides data and statistics on youth tobacco use, science-based strategies to reduce it, and information on DASH-supported programs, publications, and links. It also offers a two-page fact sheet on tobacco use and the health of young people.

CDC *BAM! Body and Mind*TM :

BAM! Body and Mind is brought to you by the Centers for Disease Control and Prevention (CDC), an agency of the U.S. Department of Health and Human Services (DHHS). *BAM!* was created to answer kids' questions on health issues and recommend ways to make their bodies and minds healthier, stronger, and safer. *BAM!* also serves as an aid to teachers, providing them with interactive activities to support their health and science curriculums that are educational and fun.

American Lung Association: <http://www.lung.org/>

Adolescent Smoking Statistics:

<http://www.lung.org/finding-cures/our-research/trend-reports/Tobacco-Trend-Report.pdf>

This is a fact sheet that includes current research information on adolescents and smoking.

Campaign for Tobacco-Free Kids: <http://www.tobaccofreekids.org/>

The Campaign for Tobacco-Free Kids is one of the nation's largest nongovernmental initiatives ever launched to protect children from tobacco addiction and exposure to secondhand smoke. The site includes current information about state legislation designed to deter teen smoking.

National Institute on Drug Abuse (NIDA): <http://www.drugabuse.gov/>

NIDA for Teens: <http://www.drugabuse.gov/students-young-adults>

This Web site presents scientific information about drug abuse in a way that is easy for teens to understand and use. In addition to nicotine, the site also features information on marijuana, inhalants, opiates, hallucinogens, methamphetamines, stimulants, and steroids.

Text Correlations

Centre Point Learning, *Science III: Essential Interactions*, Chapter 8, The Human Embryo

Glencoe, *Teen Health, Level 1*, Chapter 8, Tobacco

Glencoe, *Teen Health, Level 2*, Chapter 10, Tobacco

Glencoe, *Teen Health, Level 3*, Chapter 12, Tobacco

Relevant Standards

National Science Education Standards

Content Standard F, Grade 5-8: Science in Social & Personal Perspectives

Personal Health

- The potential for accidents and the existence of hazards imposes the need for injury prevention. Safe living involves the development and use of safety precautions and the recognition of risk in personal decisions. Injury prevention has personal and social dimensions.
- The use of tobacco increases the risk of illness. Students should understand the influence of short-term social and psychological factors that lead to tobacco use, and the possible long-term detrimental effects of smoking and chewing tobacco.

Risks and Benefits

- Risk analysis considers the type of hazard and estimates the number of people that might be exposed and the number likely to suffer consequences. The results are used to determine the options for reducing or eliminating risks.
- Individuals can use a systematic approach to thinking critically about risks and benefits. Examples include applying probability estimates to risks and comparing them to estimated personal and social benefits.
- Important personal and social decisions are made based on perceptions of benefits and risks.

Benchmarks for Science Literacy

Chapter 6, Benchmark E, Grade 6-8, Idea 2 – Personal Health

Students should extend their study of the healthy functioning of the human body and ways it may be promoted or disrupted by diet, lifestyle, bacteria, and viruses. Students should consider the effects of tobacco, alcohol, and other drugs on the way the body functions. They should start reading the labels on food products and considering what healthful diets could be like.

Idea 2. Toxic substances, some dietary habits, and some personal behavior may be bad for one's health. Some effects show up right away, others may not show up for many years. Avoiding toxic substances, such as tobacco, and changing dietary habits to reduce the intake of such things as animal fat increases the chances of living longer.

National Health Education Standards

Standard 1

Students will comprehend concepts related to health promotion and disease prevention.

Relevant performance indicators for grades 5-8:

- Explain the relationship between positive health behaviors and the prevention of injury, illness, disease, and premature death.

- Describe ways to reduce risks related to adolescent health problems.

Standard 3

Students will demonstrate the ability to practice health-enhancing behaviors and reduce health risks.

Relevant performance indicators for grades 5-8:

- Explain the importance of assuming responsibility for personal health behaviors.
- Analyze a personal health assessment to determine health strengths and risks.

Standard 6

Students will demonstrate the ability to use goal-setting and decision-making skills to enhance health.

Relevant performance indicators for grades 5-8:

- Demonstrate the ability to apply a decision-making process to health issues and problems individually and collaboratively.
- Predict how decisions regarding health behaviors have consequences for self and others.

Ideas and Behaviors Common Among Students

- In a large national survey, middle school students were asked about their beliefs about the health effects of smoking. Girls' responses were slightly different than boys. While the majority of students believed that smoking one or two packs a day is harmful and that tobacco is addictive, girls were more likely than boys to acknowledge these risks of smoking. Responses also differed by race. White middle school students were much more likely than their African-American or Hispanic peers to believe that smoking one or two packs a day is harmful, and that tobacco is addictive (Evans et al., 2000).
- When asked about the various physical risks of smoking, adolescents were most likely to rate (in order) having bad breath; developing wrinkles on your face; getting lung cancer; having a bad cough; and, experiencing trouble in catching your breath as being tobacco's main health risks. However, adolescents who smoked were less likely to say these were risks than their non-smoking peers. Having a heart attack and getting bad colds were the physical risks from smoking that adolescents were least likely to report (Halpern-Felsher et al., 2004).
- In a different study, both smoking and non-smoking adolescents actually overestimated the likelihood of smokers contracting lung cancer. However, upon further analysis, it appears these participants actually underestimated the likelihood that lung cancer will be fatal. When taking both of these factors into account, it seems that adolescents believe smoking is less fatal than it actually is (Romer & Jamieson, 2001).
- In a survey of middle school-aged girls and boys, about three-quarters said they believed smoking cigarettes may cause heart disease. Interestingly, their perception of disease risk did not differ by whether or not they smoked (Smalley, Wittler, & Oliverson, 2004).
- While research has shown that adolescents who smoke are less likely than their nonsmoking counterparts to believe the number of disease risks related to smoking, there are differences among non-smokers as well. Non-smoking adolescents who have one or more friends who

smoke have less knowledge about tobacco's harmful effects than non-smokers who have no friends who smoke (Tyc et al., 2004).

- A study that followed a group of children for 25 years—from middle school to their mid-30s—shows that children's perceptions of the risks of smoking change over time. In this study, participants' beliefs about the harms of smoking increased during their middle school and adolescent years. Results from this study also showed that participants' middle school years were when they had the lowest perception of personal risk from smoking. During this age, many middle-schoolers believed smoking would not be harmful to their own health (Chassin et al., 2001).
- Adolescents perceive light cigarettes as less harmful to the body than regular cigarettes. When asked about the cigarette differences in a survey on youth and tobacco, adolescents' responses showed they believed to be less likely to get lung cancer; have a heart attack; die from a smoking-related disease; get a bad cough; have trouble breathing; and, get wrinkles when smoking light cigarettes for the rest of their lives, compared to smoking regular cigarettes. Furthermore, when asked how long it would take to become addicted to the two cigarette types, adolescents thought it would take significantly longer to become addicted to light cigarettes versus regular ones (Kropp & Halpern-Felsher, 2004).
- In addition to light cigarettes, adolescents also believe that cigars are less harmful to your health than cigarettes. In a focus group study with African-American boys, many participants considered cigars more "natural," "fresh," or less addictive than cigarettes. They believed cigars did not contain the nicotine or other chemical additives that cigarettes do. Therefore, the boys equated this sense of "naturalness" to cigars being less harmful to your health than cigarettes (Malone, Yerger, & Pearson, 2001).
- Adolescents also considered second-hand smoke harmful to physical health, but perceptions differed by smoking status. Adolescents who were smokers were less likely than those who were non-smokers to think second-hand smoke was harmful. They were less likely than their non-smoking peers to believe that a 14-year-old child of a one-pack-per-day smoker could get asthma, lung cancer, a heart attack, or have breathing trouble. Questions about other scenarios revealed that participants believed exposure to second-hand smoke from a parent was more harmful to an adolescent than second-hand smoke from a co-worker or from a friend. However, in all scenarios, adolescents who smoked still had lower risk perceptions than adolescents who did not smoke (Halpern-Felsher & Rubinstein, 2005).
- The Surgeon General's report found that 40 percent of teens think smokeless tobacco is safe. However, smokeless tobacco contains 28 carcinogens and increases the likelihood of cancer in the oral cavity (Surgeon General, 2004).
- The National Youth Tobacco Survey showed that teens often believe they can easily quit if they start smoking. The Surgeon General's Report found that "most young people who smoke daily are addicted to nicotine." In the same survey, nearly 54 percent of current high school cigarette smokers in the United States tried to quit smoking within the preceding year (Surgeon General, 2004).

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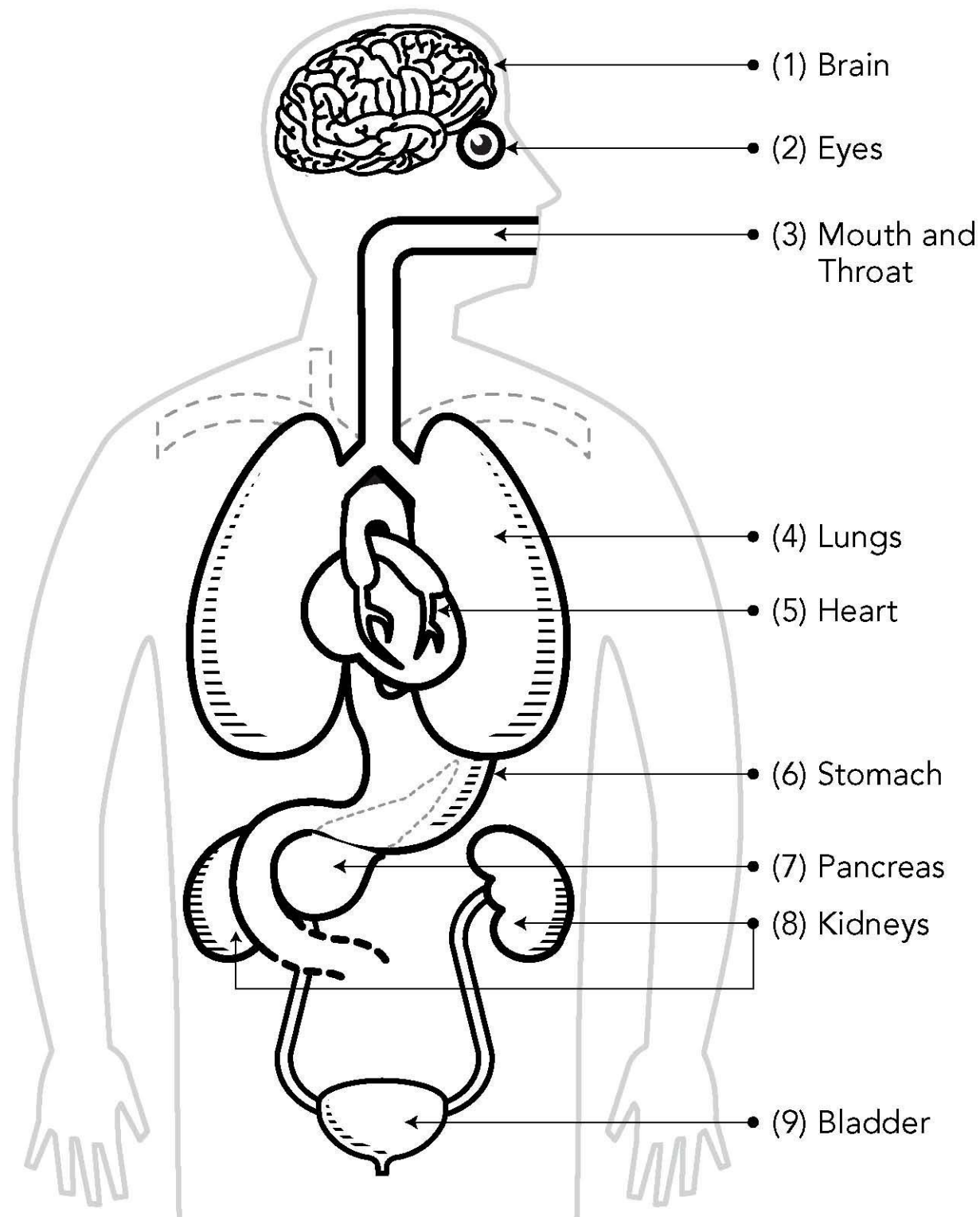
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STUDENT REPRODUCIBLE
The Effects of Smoking



STUDENT REPRODUCIBLE

The Effects of Smoking

Body Part	Function	Effects of Smoking
(1) Brain		
(2) Eyes		
(3) Mouth and Throat		
(4) Lungs		
(5) Heart		
(6) Stomach		
(7) Pancreas		
(8) Kidneys		
(9) Bladder		

EFFECTS OF SMOKING

Pregnancy	
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Made possible by the U.S. Department of Health and Human Services' Centers for Disease Control and Prevention. 2005.

Answer Key, Student Reproducible: The Effect of Smoking on the Human Body

	FUNCTION	EFFECTS OF SMOKING
BRAIN	The brain is the center for mood and conscious thought. The brain controls voluntary movement. The brain makes thinking and feeling possible. The brain regulates body processes.	Nicotine affects a smoker's brain chemistry. Nicotine affects a smoker's mood. Tobacco smoke is a major cause of stroke.
EYES	Eyes work like a camera. Eyes enable people to see. Light that enters the eye is focused by the lens onto the retina.	Smokers have a two to three times greater chance of developing cataracts, a leading cause of blindness. A cataract causes the cells around the lens to turn white.
MOUTH AND THROAT	The mouth and throat are the body's entry point for food. The mouth and throat are the body's entry point for air. The larynx is sometimes called the voice box, and is used to create the sounds of speech.	Smokers are more likely to get periodontitis (gum disease). Smoking causes mouth cancer. Smoking causes cancer of the larynx. Smoking causes cancer of the esophagus. Smokers are more likely to have upper respiratory tract infections—sore throat and colds.
LUNGS	Lungs move air in and out of the body. Lungs move carbon dioxide out of the body. The air moves through a system of branching airways (bronchi and alveoli) that looks like an upside-down tree.	Smokers are at greater risk of lung cancer. Smokers have more respiratory illnesses, including pneumonia, bronchitis, and colds. Smoking causes emphysema and other chronic obstructive pulmonary diseases (COPD). Smoking is related to asthma among children and teens.
HEART	Heart pumps blood throughout the body.	Smoking is a leading cause of coronary heart disease. Smoking causes atherosclerosis, or hardening of the arteries. Most cases of stroke, coronary heart disease, and artery disease are caused by atherosclerosis. Smoking causes abdominal aortic aneurism, a bulge in the wall of the aorta near the stomach, the 13 th leading cause of death in the U.S.

STOMACH	Stomach is lined with three layers of powerful muscles. Inside the stomach, acids and other gastric juices liquefy food before it goes into the small intestine. The hydrochloric acid that the stomach produces is so strong it can liquefy iron nails.	Smokers are more likely to get peptic ulcers than nonsmokers. Smoking causes stomach cancer.
PANCREAS	The pancreas is a gland that regulates digestion by releasing enzymes into the small intestine. The pancreas also regulates glucose levels in the blood. The pancreas releases insulin	Smoking causes pancreatic cancer.
KIDNEYS	Kidneys are about the size of a fist. Kidneys purify the blood. Kidneys remove waste products from the body.	Smoking causes kidney cancer.
BLADDER	The bladder can expand and contract. The bladder holds urine that comes from the kidneys. Urine passes from the kidney to the bladder through a narrow tube called the urethra.	Smoking causes bladder cancer.

		EFFECTS OF SMOKING
PREGNANCY		Smoking can cause babies to be born prematurely, and have lower birth weight, respiratory diseases, and other illnesses. Low birth weight is the leading cause of infant death. Nicotine in the bloodstream can restrict the amount of oxygen the baby receives. Smoking can cause cervical cancer. Secondhand smoke can cause sudden infant death syndrome (SIDS) in babies.