

College Guild

PO Box 696, Brunswick, Maine 04011

Health and Disease

Unit 2 of 5

The Respiratory System & Smoking

In the last unit, you learned about the **cardiovascular system**, but you might have noticed it cannot function without the **respiratory system** — the system that gets the oxygen to our blood in the first place. This unit will focus on the respiratory system: reviewing how it functions, what can go wrong within it, and how smoking cigarettes will compromise it.

DISCLAIMER: Under many prison regulations and restrictions, inmates are *not* allowed to provide medical care under the direction of organizations or educational resources such as College Guild. This curriculum therefore serves as a purely educational resource to those interested in learning (a) more about their health and (b) some of the interventions that medical professionals use, NOT as instructions to provide that medical care or directions to make treatment decisions.

Glossary of Terms

1. **Cardiovascular system:** The network (including the heart, blood, and blood vessels) that transports oxygen and nutrients to the body.
2. **Respiratory system:** The system that facilitates breathing (airways and lungs) and the exchange of oxygen and carbon dioxide.
3. **Diaphragm:** The main muscle we use to breath, located below the lungs.
4. **Heimlich maneuver:** The first-aid technique used to dislodge foreign objects from someone's airway.
5. **Symbiotic:** A mutually beneficial relationship between two different species or groups.
6. **Asthma:** A chronic respiratory disease characterized by the inflammation and tightening of the airways.
 - a. **Asthma attack:** A sudden severe onset of asthmatic symptoms requiring medical attention.
 - b. **Inhaler:** A device which allows the user to breath in medication that relieves asthmatic symptoms. Crucial to treat **asthma attacks**.
7. **Chronic obstructive pulmonary disease (COPD):** A progressive, permanent disease caused by damage to respiratory structures, often caused by smoking cigarettes.
8. **Risk Factor:** Factors or habits that increase the likelihood of developing a disease or other health problem.
9. **Secondhand smoke (SHS):** The smoke that smokers exhale. Dangerous to anyone, but especially infants and children.

Anatomy of the respiratory system

10. **Trachea (or windpipe):** The tube in your throat that carries air in and out of the lungs.
11. **Bronchi:** Large tubes that carry air from your **trachea** to each of your lungs.
12. **Bronchioles:** Small tree branch-like tubes that carry air to and from your **alveoli**.
13. **Alveoli:** Tiny sac-like structures in the lungs where the exchange of oxygen and carbon dioxide occurs.

Part One: Function and Disease of the Respiratory System

Take a big deep breath of air. Can you notice where the air is traveling? What muscles are you using to breathe? When you inhale, you are contracting a muscle called the **diaphragm**, located below the lungs. When it contracts, it flattens and moves downward, creating more room in your chest for air. This creates a vacuum, pulling air into your lungs. It is the most important muscle of your **respiratory system**.

1. Why might it be important for athletes to have a strong diaphragm?

As you previously learned, oxygen is necessary for all the cells in our bodies to produce energy, which is why we can't go long without breathing. Our brains can only go *four minutes* without oxygen! After that, brain cells start to die. This is why choking can be so dangerous. If someone has an obstructed airway (food stuck, preventing breathing), the **Heimlich maneuver** should be performed (see A).¹ If you are choking, perform the universal sign for choking (see B), so that someone may help you.

A: Doing the Heimlich maneuver¹

- A. Stand behind the choking person and wrap your arms around their torso.
- B. Make a fist with one hand, and grasp it with the other.
- C. Place your hand above the belly button and below the rib cage.
- D. Pull forcefully upward to expel the blockage; repeat.



Via Wikimedia/Thomas Shafee¹⁰

B: The universal sign for choking



Via Clipart Library¹¹

2. What is happening during the Heimlich maneuver? Why does it work? *Think*: where are you pushing?
3. The Heimlich maneuver should NOT be performed on someone who can still talk or cough.¹ Why do you think this is?

When air travels through to your lungs, it first goes down your **trachea** (or windpipe), to your **bronchi** (tubes in your lungs), and then to structures called **bronchioles** which branch out inside your lungs, like a tree (see picture on first page). At the end of these tree branch-like tubes, there are tiny air sacs called **alveoli** — which you learned about in the last unit. **Alveoli** are where the oxygen you breathed in (which enters your bloodstream) is exchanged with the carbon dioxide you breathe out.

4. Inversely to us, plants “breathe” (absorb) carbon dioxide, and release oxygen. For this reason, why is the preservation of our environment necessary for humanity’s survival?

Another important function of the respiratory system is to get the air you breathe in “ready” for your body. Your sinuses and nasal cavity work together to moisturize and warm up the air that comes through your nose. The hairs in your nose (called cilia) help to filter out dust and germs, stopping them from entering your airways. This is a reason why under normal circumstances, breathing through your nose is considered better.

- 5. Blow air onto your hand: first with your mouth, as if you were blowing out a candle — and then with your nose. How does the temperature of each differ? Why do you think this is?**

There are countless diseases that impact the respiratory system, and must be treated. One of the most common is **asthma** — nearly 1 in 10 people in the United States have it! **Asthma** is a lifelong condition that is characterized by a narrowing of **bronchi** airways caused by certain triggers, such as dust, pollen, exercise, or even stress. This narrowing of the airways produces a wheezing sound when breathing — an indication that someone with asthma is struggling to breathe normally. While symptoms can range from mild to severe, someone having an **asthma attack** — a sudden worsening of symptoms — will need an **inhaler** to relieve symptoms. Inhalers are devices that allow the user to inhale medicine that relaxes the muscles around their airways, allowing them to open up. In an emergency, getting someone suffering from an **asthma attack** an **inhaler** is the *first thing* that should be done to ensure their recovery.

- 6. Use everything you know about the respiratory system to describe why inhalers can make someone with asthma breathe easier. Go into as much detail as you can.**
- 7. Brainstorm ways someone with asthma could reduce symptoms *without* medication.**
- 8. Do you think someone with asthma who lives next to a coal power plant would have worse symptoms? Why?**

Part Two: Smoking

More than 10 times as many U.S. citizens have died prematurely from cigarette smoking than have died in all the wars fought by the United States.⁵

It should be no surprise that smoking — especially smoking cigarettes — is bad for your lungs. In discussing smoking, we are NOT trying to shame anybody for making their own choices, but instead are focused on educating about these dangerous and addictive substances so that informed decisions can be made. Whether you decide to smoke or not is up to you — but you should know the consequences for you *and those around you*. While you can “know” about the harmful effects of smoking, it can be hard to truly “believe” how unhealthy smoking is because not all of the severe effects are immediate.

- 9. With this fact in mind, why do you believe a lot of people turn to smoking even if they know it has long-term consequences?**

Note: while vaping or using e-cigarettes is less toxic than cigarettes, it is still proven to be harmful to the heart and lungs, especially when the vaping device is modified. It is also equally addictive!¹³

10. What are some visible signs of smoking on someone's appearance?

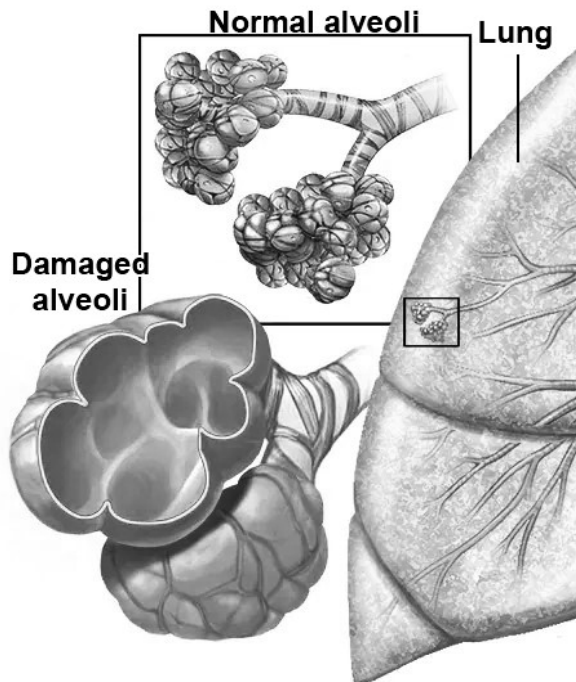
What does it do to your lungs?

Smoking cigarettes will permanently damage your **respiratory system**. Smokers are 13 times as likely to die from **COPD** — or **chronic obstructive pulmonary disease** — than nonsmokers.² **COPD** is caused by long term exposure to irritating gasses, most often in the form of cigarette smoke.³ Victims will experience a wide range of symptoms from trouble breathing, a chronic cough that produces mucus, wheezing, or swelling in their legs. The destruction in your lungs happens in two places: **(A)** the **alveoli** are severely damaged, eventually causing them to burst; and **(B)** your **bronchi** become inflamed and produce more mucus — which further blocks the narrowed tubes.³



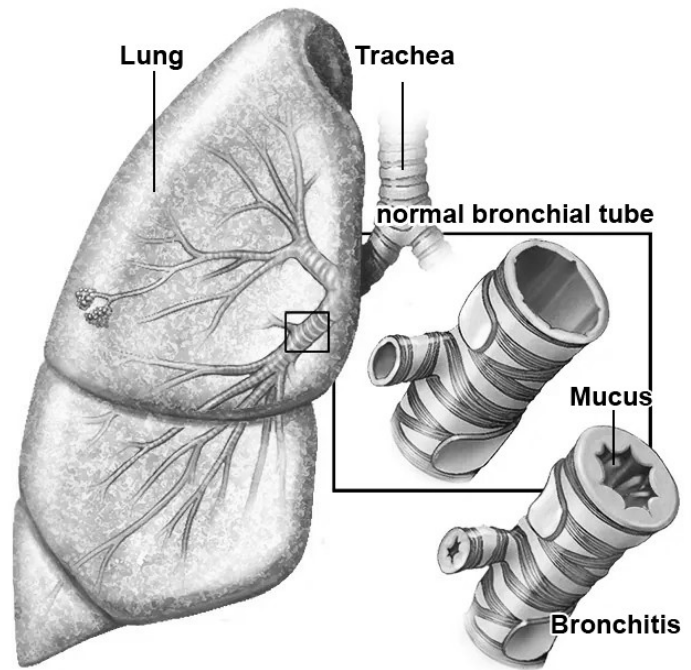
Smoker's lungs, stained black from the inhalation of smoke
Via Flickr/David Jackmanson¹²

(A)



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(B)



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A & B Reprinted from the MayoClinic.org article: COPD⁶

In fact, while habitual smokers (10-15+ cigarettes a day) are at the greatest risk, studies have shown that even smoking only one cigarette a day greatly increases your risk for adverse health conditions ranging from extremely uncomfortable to fatal.⁴

11. What might be the effects of permanently damaged alveoli and narrowed airways due to smoking?

12. COPD isn't curable; once you get it, you have it for the rest of your life. However, certain lifestyle changes can be made to better your health and possibly reduce symptoms. Brainstorm a few.

13. What other environments (or types of jobs) do you think could lead to developing COPD?

How does smoking affect your life?

It is extremely important to realize that smoking impacts nearly *every system in the body*. Smoking cigarettes makes you four times more likely to have a stroke or get a heart disease and 25 times more likely to be diagnosed with lung cancer than non-smokers.⁴ In fact, smoking is such a large **risk factor** for lung cancer that it has *almost* become synonymous with it: 90% of all cases of lung cancer are caused by smoking. But if it's not killing you, it will impact your quality of life. Smoking can damage sperm, eggs, reproductive DNA, and cause related issues such as erectile dysfunction for men and early menopause in women. This not only means that (a) it will be harder to conceive a child, but (b) smokers' children's health may be negatively impacted. This is especially true for adolescent boys: a 2023 study found that the children of men who smoked during their teenage years were found to have damaged genes, causing their children to be predisposed to asthma, obesity, or low lung function.⁷

14. Why do you think that smoking during adolescence (age 10 to 19) has the most severe effects on the reproductive system?

15. Nicotine, the main psychoactive ingredient in cigarettes, is very addictive. How do you think educating smokers on the impacts it might have on their *children* might be useful if they are struggling to quit for the sake of their own health?

Secondhand Smoke: A Form of Child Abuse?

Smoking is not only dangerous for the user, but for all the people around them — *especially* children. Research shows that **secondhand smoke (SHS)** — the smoke that smokers exhale — is especially damaging to infants' and children's lungs, because they are still developing. In fact, inhaling this **secondhand smoke** as a child can mean their lungs will never fully develop. They will also be likely to develop ear infections and are more predisposed to other smoking-associated diseases, such as lung cancer and heart disease.

There is debate to whether parents' secondhand smoke should be noted as child abuse. Of course, both sides see it as a serious issue, but there are disagreements about how to respond. Read some of the main points made by two academics who don't share the same opinion:

Yes, it is child abuse (Goldstein) ⁸	No, it is not child abuse (Lindhorst) ⁹
<ul style="list-style-type: none"> ● Secondhand smoke (SHS) is <u>preventable</u>: simply don't smoke if you have kids! ● There are countless warnings about the dangers of cigarettes. It's hard to argue that parents "don't know" about their harm. ● Child abuse is defined by "<i>an act or failure to act which presents an imminent risk of serious harm</i>" — why would 	<ul style="list-style-type: none"> ● While SHS is harmful, taking action against parents may result in more harm for the child. ● It may cause individuals to hide information from healthcare providers or even avoid health care altogether. ● Smoking is extremely addictive; is there "fault" to those who can't quit?

secondhand smoking not count?

- It disproportionately affects marginalized groups (fewer highly-educated or high-income people smoke).

16. Referencing the points made above, do you think second-hand smoke should be considered a form of child abuse? Explain why you picked your stance.

RESOURCES TO QUIT SMOKING

There are countless free resources available to you to help quit smoking:

- Dial: 1-800-QUIT-NOW or text: QUITNOW to 333888
 - Speak confidentially with a professional
 - Can provide similar services to a stop-smoking class
 - Available in a variety of languages
- Website: Smokefree.gov
 - A website designed to help you quit smoking.
 - Includes tailored resources for women, teens, people over 60, and Spanish speakers
- Your facility may also have its own program(s) to help quit smoking.

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