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From Breath to Movement— Your Respiratory System

You take in oxygen as you breathe air. But how does the oxygen get to your blood, so it can be delivered to the cells that need it? And how does the blood get rid of the waste (carbon dioxide) it carries away from the cells? Your lungs, and the rest of your respiratory system, handle this job.

Word Connection

The word **respiratory** is a form of the word *respire*. *Respire* means “to breathe again.”

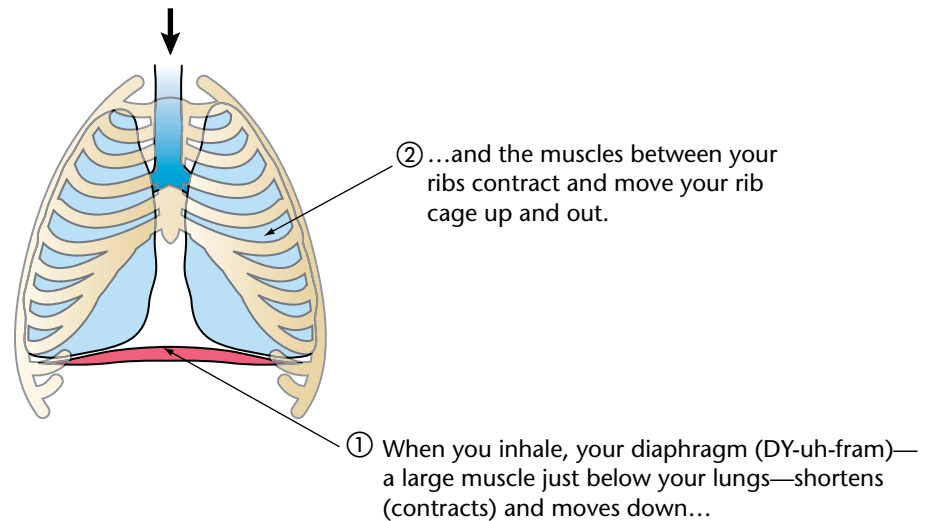
How We Breathe

The lungs are the main organs of the respiratory system. They are so large they take up most of the space inside your rib cage. (Your rib cage protects your lungs and your heart.)

Your lungs inflate (puff up) like a balloon when you **inhale** (breathe in). They deflate (shrink down) when you **exhale** (breathe out). Since lungs have no muscles themselves,

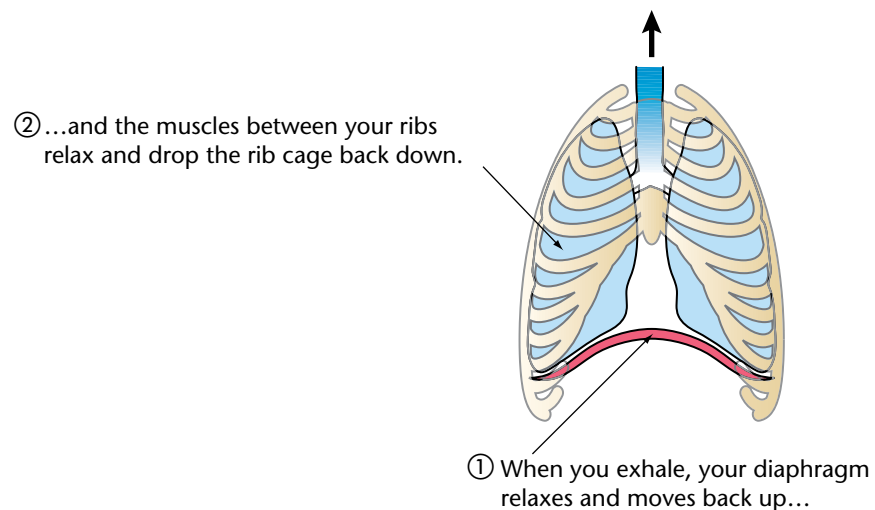
muscles around and below your lungs do the work of inflating and deflating them.

Inhalation



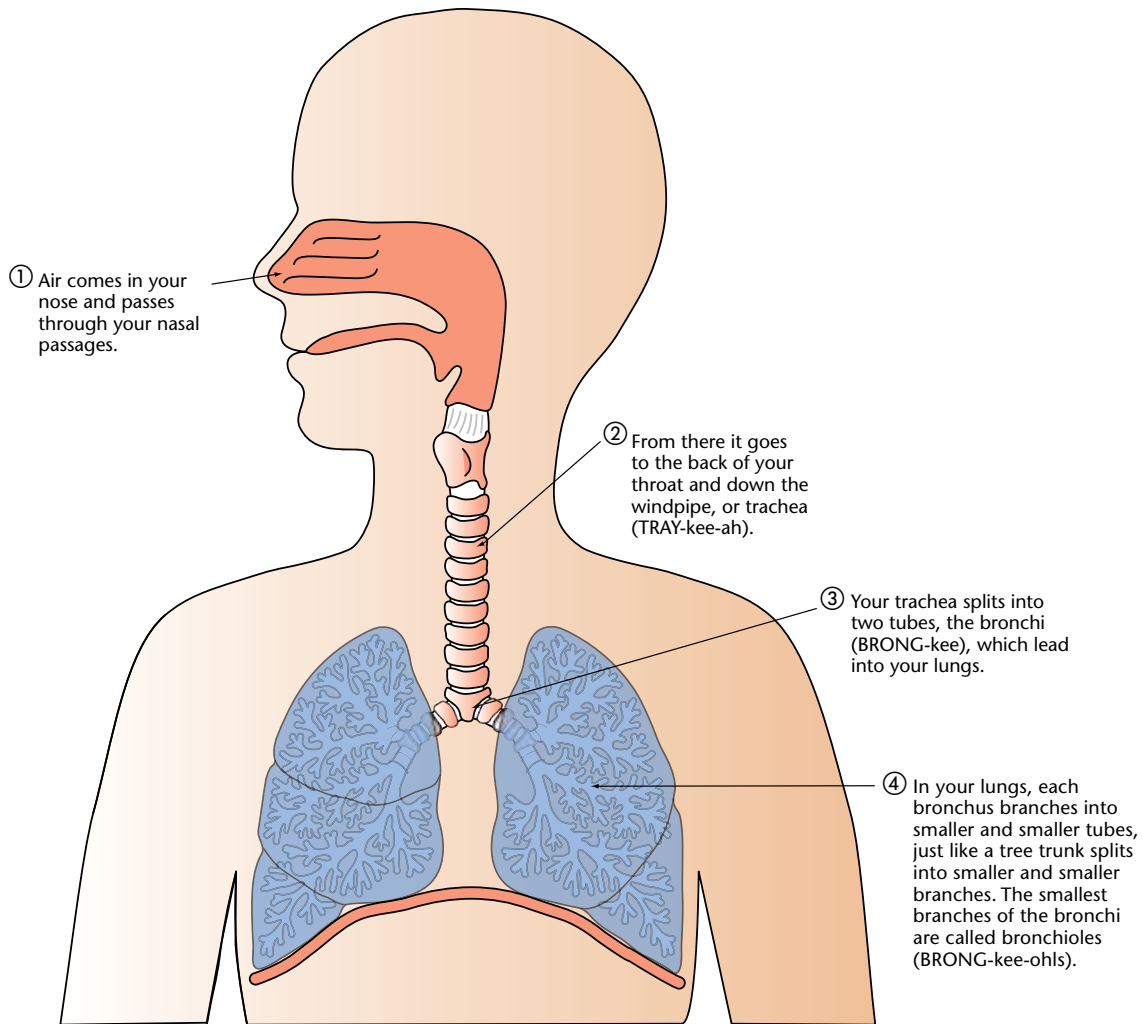
These movements make more space in your lungs. When there's more space, air moves in to fill the space.

Exhalation



When there is less space in your lungs the air moves out.

Where the Air Goes



Human Body Facts

Without your voice box, or larynx (LAIR-inks), which is located at the top of the trachea, you couldn't speak.

Inside your larynx are two elastic-like bands called vocal cords. When air passes over the larynx, the vocal cords vibrate. This is what makes the sound of your voice. You can feel these vibrations when you put your hand on your throat and talk.

Word Connection

Bronchus is the singular form (when you're talking about just one) of bronchi.

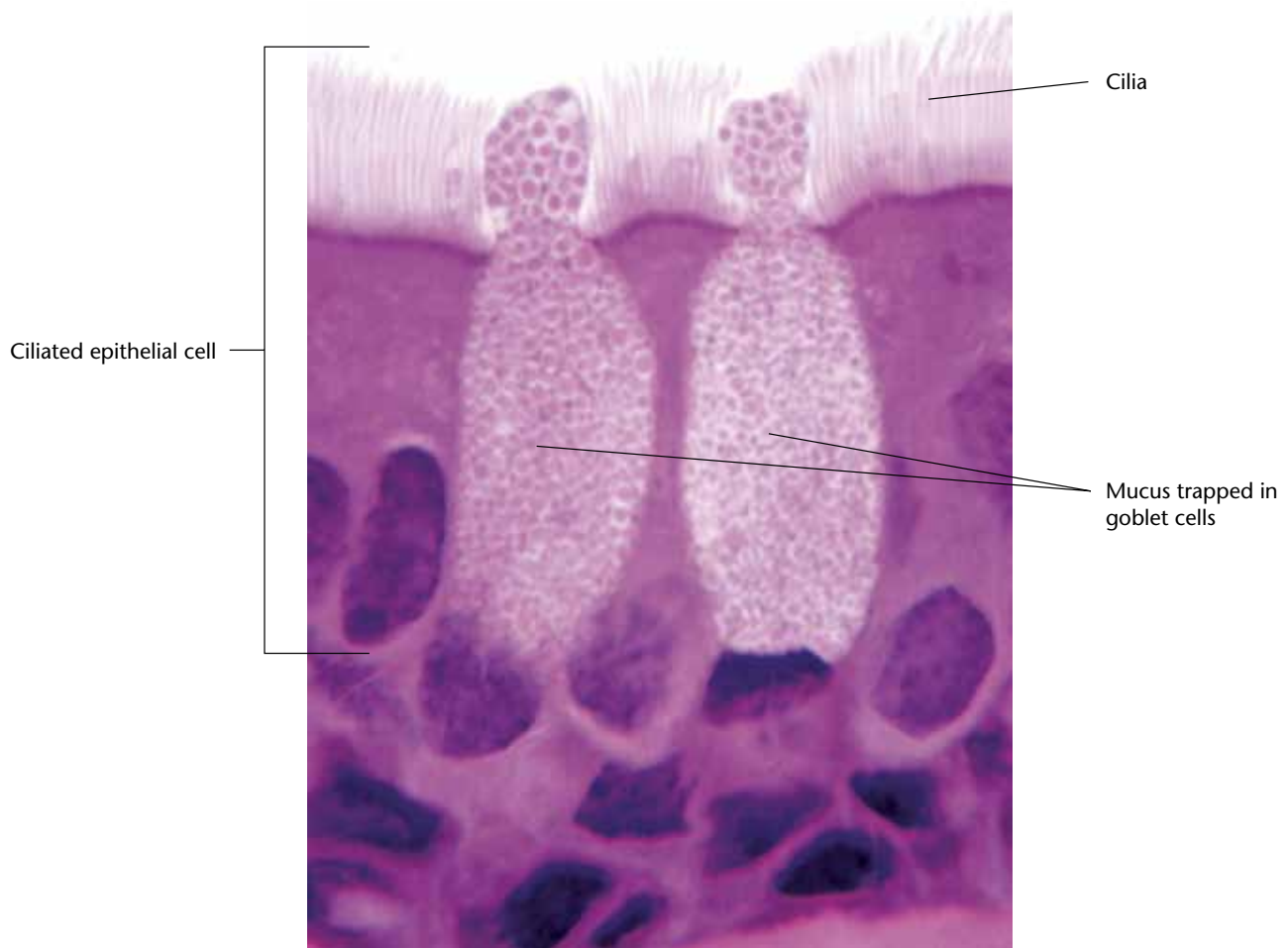
Human Body Fact

Sneezing helps you clear your nose of irritating particles. A good strong sneeze can reach a speed of between 60 and 160 km (37 and 100 mi) per hour!

Your Air Cleaning System

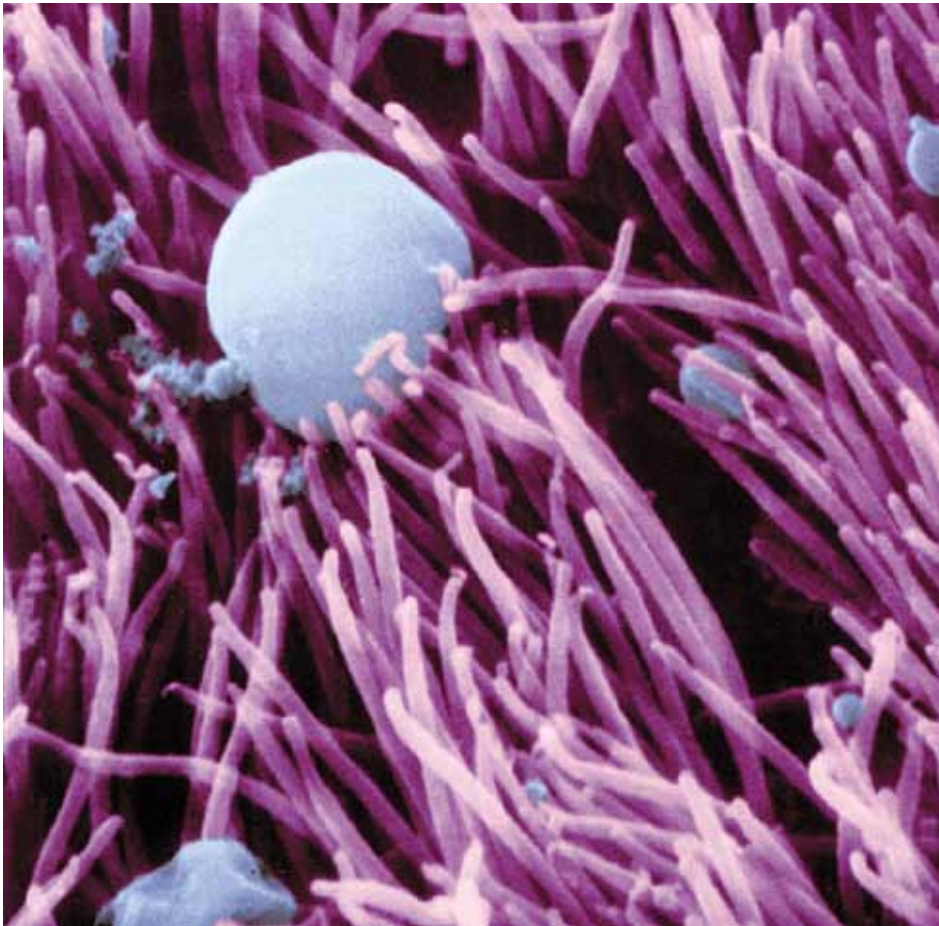
The lungs can't deliver oxygen and remove waste if they are dirty. Fortunately, the respiratory system has built-in mechanisms to keep the lungs clean:

- Small hairs inside your nose filter the dust, dirt, and other tiny particles out of the air you breathe.
- Goblet cells, present in your nose and airways, release a sticky mucus that also helps trap these particles and keeps the air moist.



Goblet cells and ciliated epithelial cells in the trachea.

- Tiny hair-like structures, called cilia, cover the inside of your airways. They sweep the “dirty” mucus up towards your throat so you can cough it out. The cilia are part of a type of a cell, called ciliated epithelial cells.



Cilia (shown in purple) moving mucus (shown in blue) up and out of the trachea.

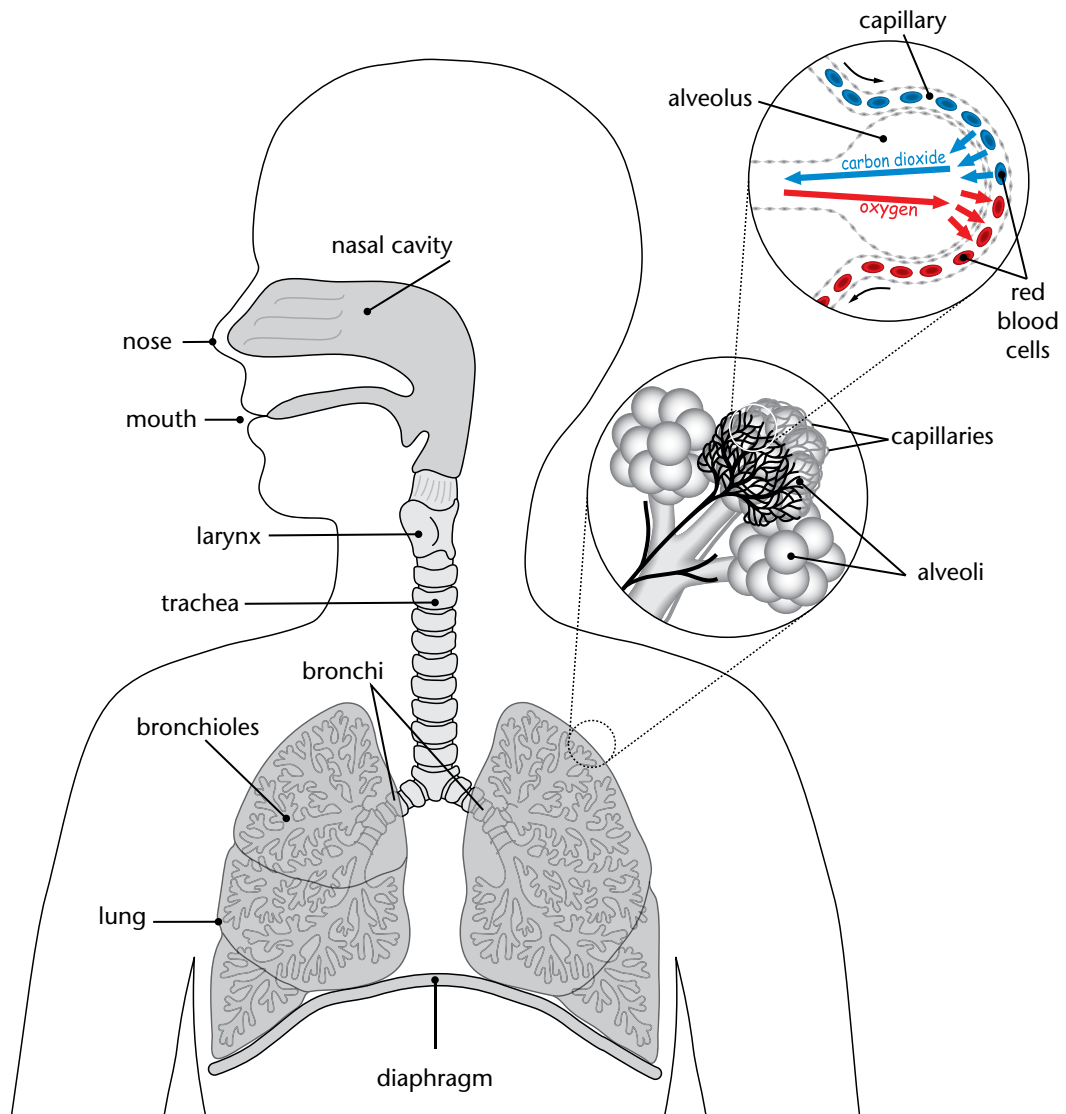
From Your Lungs to Your Blood and Back Again

Moving Oxygen into the Blood

Human Body Fact

Each lung has hundreds of millions of alveoli.

At the ends of your bronchioles are tiny sacs (little pouches or sacks) containing air called alveoli (al-VEE-oh-ly). The alveoli are surrounded by a network of capillaries. They are so close to these capillaries and have such thin walls that oxygen can move through them and into your blood.



Once in your blood, the oxygen you breathed into your body can finally be picked up by your red blood cells and carried to your heart. Your heart pumps this blood, filled with oxygen, to the rest of your body. When the blood reaches the capillaries that supply your body's tissues, the red blood cells release their oxygen, so your cells can use it.

Removing Waste from Your Blood

Carbon dioxide, a waste product made by your cells, also passes through the thin walls of capillaries. However, carbon dioxide moves in the opposite direction—from your cells to your blood. When you take in oxygen, it moves from the air you breathe into your blood and then the cells that need it. When you get rid of carbon dioxide waste, it moves from your cells to your blood and then to the air you breathe out.

Here's how it works: Carbon dioxide moves from your cells into the capillaries that surround them. From there it is carried in the blood through your veins and on to the heart. The heart pumps this blood into the lungs. Eventually the blood enters the capillaries surrounding the alveoli. Once there, the carbon dioxide moves from the capillaries into the air inside the alveoli. When you exhale, you breathe out this carbon dioxide.

Human Body Fact

A yawn is really just a deep breath. It's your body's way of quickly getting rid of carbon dioxide.



Think About It!

Do you think the walls of the capillaries are thick or thin? What needs to pass through them?

How Your Respiratory System Works When You Exercise

Why Do You Breathe Harder When You Exercise?

You probably have noticed that when you exercise you breathe faster and deeper. You may even “get out of breath.” Your body is working hard to bring in enough oxygen for your muscle cells and get rid of the extra carbon dioxide they are producing. By breathing faster and deeper, your body is able to bring in more oxygen, so your muscles can continue working.

How Do the Muscles That Control Breathing “Know” to Work Faster?

When the level of oxygen in the blood becomes too low (or the level of carbon dioxide becomes too high), a special part of the brain is triggered. It sends out a message to the muscles that control breathing. It “tells” them to work harder and faster so your body’s cells get enough oxygen (and get rid of their carbon dioxide waste).

Diseases and Conditions of the Respiratory System

When you breathed through straws in class, you found out how difficult it can be to walk or run when your breathing is restricted. Some people have health problems that make it hard for them to take in enough air when they breathe. For some, every breath they take may feel like breathing through a small straw and never getting enough air.

Health Tip

Here’s how you can help if you’re ever with someone when they have an asthma attack:

- Stay calm.
- Sit the person down. (Lying down can make it even harder to breathe.)
- Get the person’s medicine.
- Get help from an adult.

Asthma

More kids in the United States and Canada have asthma (AZ-muh) than any other respiratory problem. In fact, there’s a good chance you or someone you know has asthma.

When you have asthma, the lining of your bronchi get swollen and the muscles around them tighten, making it hard to breathe. Cigarette smoke, pollution, pollen from certain plants, animal fur, dust, and even stress can trigger an asthma “attack.” A person with asthma may cough or make a wheezing sound. (This sound is caused by air trying to pass through the narrowed airways.) They may feel like they can’t breathe at all.

There are medicines people with asthma can take to control it. Exercise, if it doesn't make it harder for someone to breathe, can also help. And kids sometimes “grow out” of their asthma—they stop having asthma attacks when they get older. Most kids with asthma can play sports and do everything else other kids do.

Cystic Fibrosis

Cystic fibrosis (SIS-tick fi-BRO-ses) is a disease which is passed on (inherited) from your parents. People with cystic fibrosis have frequent coughs, shortness of breath, and may wheeze when they breathe. Their lungs and airways make mucus that is much thicker than normal. This mucus is too thick for the cilia to sweep out. Eventually, the thick mucus blocks the airways. This makes it difficult to breathe. It also makes it much easier to catch infections like colds that could damage the lungs. Cystic fibrosis patients must take medicines and have their chests pounded on frequently to break up the thick mucus since it can lead to further infections.

Bronchitis

People with bronchitis (BRONG-kiy-tes) often have bad coughs, difficulty breathing, and raspy throats. They may cough up lots of mucus. When you have bronchitis, the bronchi leading to the lungs become swollen and covered with thick mucus. Kids and adults sometimes get bronchitis after a very bad cold. This type of bronchitis doesn't last long. Sometimes, though, people get bronchitis because they've been around cigarette smoke, air pollution, and other harmful substances that irritate the bronchi for a long period of time. This type of bronchitis does not clear up quickly. People with bronchitis also get respiratory infections much more easily than people with healthier airways.

**Think About It!**

Which of these conditions can you take steps to avoid? What can you do to avoid them?

Emphysema

People with emphysema (em-fi-SEE-muh) are out of breath even when they are resting. They may also have a slight cough. Like bronchitis, emphysema happens when the airways have been irritated for a long period of time. This is usually a result of smoking cigarettes. Most people with emphysema are smokers or ex-smokers. Cigarette smoke damages the alveoli, so less oxygen is delivered to the blood. With less oxygen available, muscle cells cannot make the energy they need to move your body. Imagine becoming out of breath just walking across a room!

Your Body in Motion—An Owner’s Guide

Health Connection

Cigarettes have substances in them that are carcinogenic, meaning they can cause cancer. Carcinogenic substances change normal cells into cancer cells. When these cells grow and multiply, they kill the normal cells your body needs to live. This process is called cancer.

Smoking—Say “No” for Your Lungs

The warning shown below—or a similar message—must be printed on every package of cigarettes sold in the United States. Why? Because more people in the United States die from smoking cigarettes than from anything else.

SURGEON GENERAL’S WARNING:
Quitting Smoking Now
Greatly Reduces Serious
Risks to Your Health.

The best thing you can do to keep your respiratory system healthy is to stay away from cigarette smoke! Smoking makes it harder to breathe. It damages the cilia so they can't sweep out the mucus that traps dust, bacteria, and other particles. As the mucus builds up, it blocks the airways, making it harder to breathe.

Once people start smoking, it's very hard to quit. This is because one of the substances in cigarettes—nicotine—is very addictive. "Addictive" means your body gets used to getting nicotine regularly and wants it badly. Smokers can actually feel sick when they don't get nicotine.

Most people who smoke want to quit. They may try to stop smoking many times before they are successful. If you know someone who has quit smoking, let them know you're proud of them.

What Happens When People Quit Smoking—Some Good News!

- Within 8 hours of quitting smoking, a person's blood will get the normal amount of oxygen again.
- Within 10 years of quitting, a person's risk of lung cancer will be half as much as a smoker's (but still much higher than someone who has never smoked).
- Within 15 years, their risk of heart disease will be almost the same as someone who has never smoked.

Keeping Your Respiratory System Healthy

You can keep your lungs healthy and make them stronger by exercising regularly. When you exercise, you have to breathe deeper and more often so that your muscle cells get enough oxygen. If

you exercise regularly, your body actually gets better at exchanging oxygen and carbon dioxide. So ride your bike, go for a jog, swim some laps, or do some other physical activity that you like to do. You'll have fun and make your lungs stronger too!

