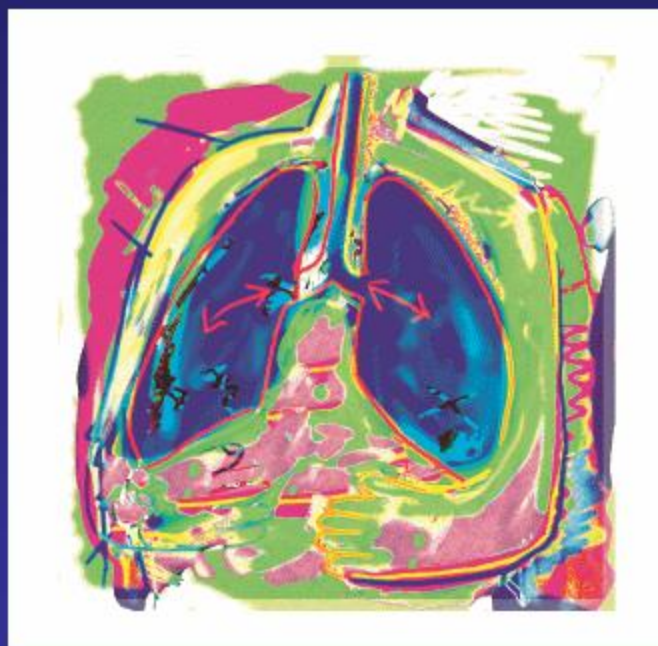


C.O.P.D.

CHRONIC OBSTRUCTIVE PULMONARY DISEASE



An Educational Module
on the
Preventive Aspects of Respiratory Diseases
for High School

THE RESPIRATORY SYSTEM

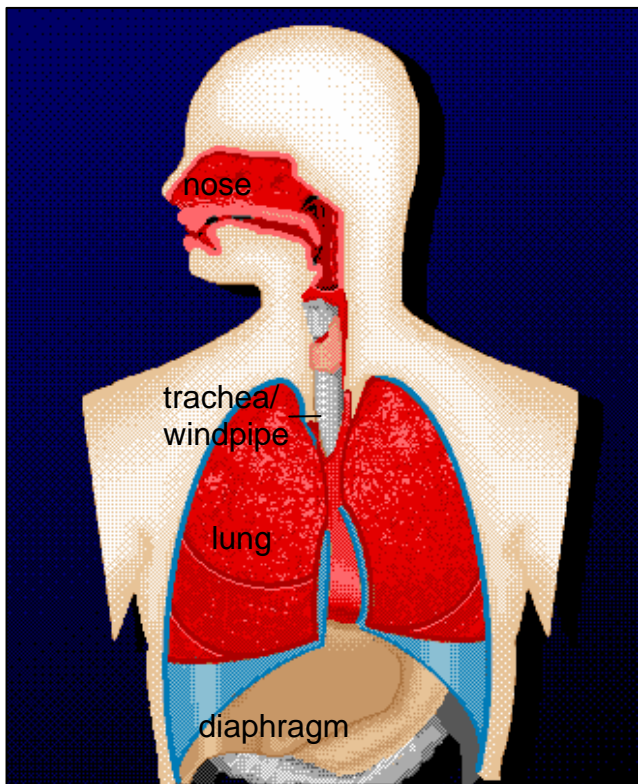
Learning Objectives:

- Discuss the function of the respiratory system
- Enumerate the parts of the respiratory system and discuss how they are involved in the breathing process and gas exchange
- Discuss how the respiratory system protects itself from harmful substances in the environment

What is the function of the respiratory system?

The function of the respiratory system is to bring oxygen (O_2) into the body and to remove carbon dioxide (CO_2).

Oxygen is a gas that provides us energy while carbon dioxide is a waste product or “exhaust” of the body.



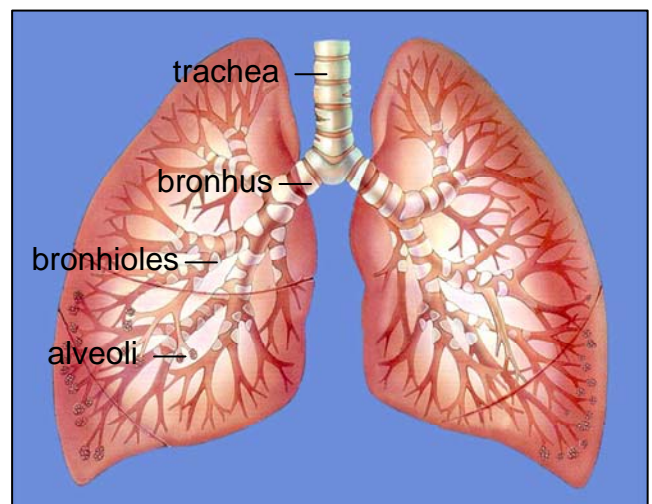
The Respiratory System

What are the parts of the respiratory system?

The respiratory system includes the nose, trachea (“windpipe”), main bronchi, lungs and some parts of the musculoskeletal system (these are the muscles of the rib cage and the diaphragm) that are used for breathing.

How does air get into the body?

To deliver oxygen to the body, air is breathed in through the nose, mouth or both. The nose serves as a filter for unwanted particles in the air like dust and smoke. The nose also heats and adds moisture into the air that is breathed in. When large amounts of air are needed, the nose is not the most efficient way of getting air into the lungs and therefore mouth breathing may be used. Mouth breathing is commonly needed when exercising.

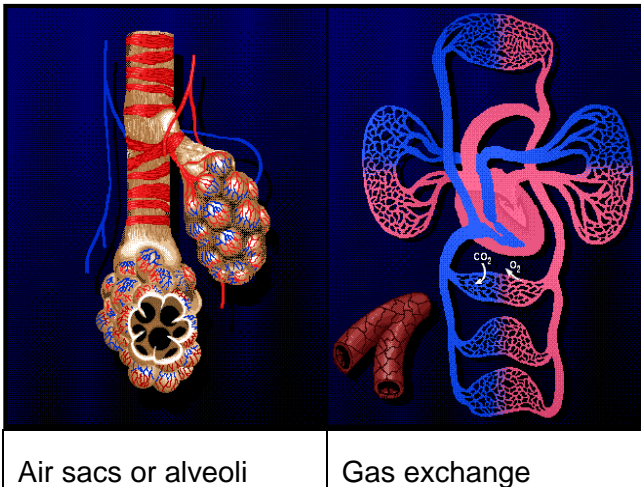


The Lung Airways

The airways in the lungs look like an upside-down tree with many branches. After entering the nose or mouth, air travels down the trachea or “windpipe”. The trachea is the large tube lying closest to the neck. The trachea divides into two smaller breathing tubes that are called bronchi. The left bronchus leads to the left lung and the right bronchus leads to the right lung. The

bronchi further divide into smaller tubes called *bronchioles*. The bronchioles end in tiny *air sacs* called *alveoli*.

The alveoli or air sacs are surrounded by a network of blood vessels called *capillaries*. Oxygen from the alveoli diffuses into the capillaries then circulates to the rest of the body. Carbon dioxide diffuses from the capillaries to the alveoli and is eventually expelled from the body when people exhale. This process is called *gas exchange*.



There are over 300 million alveoli in normal lungs. If the alveoli were opened and laid out flat, they would cover the area of a tennis court. This large surface area makes gas exchange easier or efficient.

Which muscles help in the breathing process?

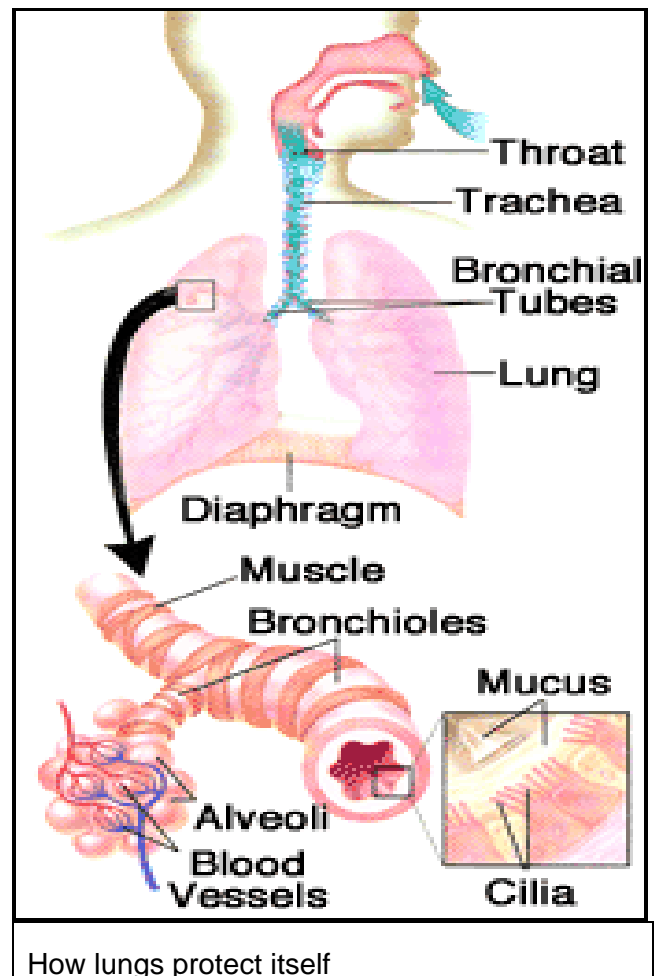
Many different muscles are used in breathing. The largest and most important muscle for breathing is the *diaphragm*. The diaphragm lies under the lungs and separates the chest cavity from the organs below, such as the stomach, intestines, liver, etc. As the diaphragm moves down or flattens, the ribs flare outward, the lungs expand and air is drawn in. This process is called *inhalation* or *inspiration*. As the diaphragm relaxes, air leaves the lungs and they spring back to their original position.

This is called *exhalation* or *expiration*. The lungs, like balloons, require energy to blow up but no energy is needed to get air out.

The other muscles used in breathing are located between the ribs and certain muscles extending from the neck to the upper ribs. The *diaphragm*, *muscles between the ribs* and one of the muscles on the neck called *scalene muscle* are involved in almost every breath that is taken. If more help is needed in expanding the lungs, other muscles in the neck and shoulders can also be used.

How does the lung protect itself?

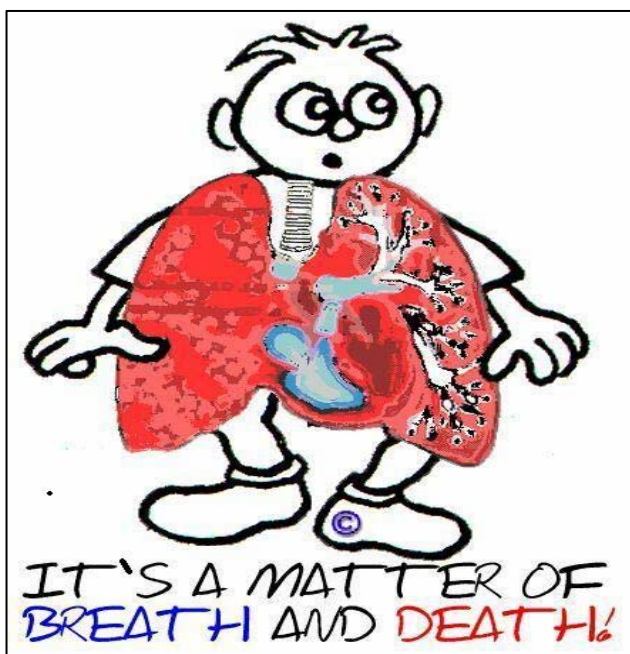
The lung has several ways of protecting itself from irritants. First, the *nose* acts as a filter when breathing in,



preventing large particles of pollutants from entering the lungs. If an irritant does enter the lung, it will get stuck in the thin layer of *mucus* (also called *sputum* or *phlegm*) that lines the inside of the breathing tubes. An average of 3 ounces of mucus is “swept up” toward the mouth by little hairs called *cilia* that line the breathing tubes. Cilia moves mucus from the lungs upward toward the throat to the epiglottis. The epiglottis is the gate, which opens allowing the mucus to be swallowed. This occurs even without thinking about it.

Another protective mechanism for the lungs is the *cough*. A cough, while a common event, is also not a normal event and is the result of irritation to the bronchial tubes. A cough can expel mucus from the lungs faster than the cilia.

The last of the common methods used by the lungs to protect themselves can also create problems. The airways in the lungs are surrounded by bands of muscle. When the lungs are irritated, these muscle bands tighten, making the breathing tube narrower as the lungs try to keep the irritant out. The rapid tightening of these muscles is called *bronchospasm* or *bronchoconstriction*.



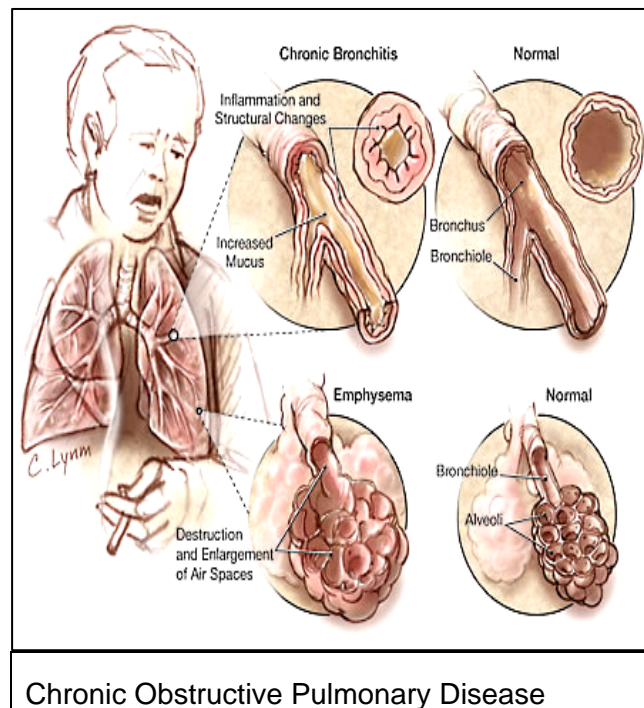
CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Learning Objectives:

- Define chronic obstructive pulmonary disease (COPD)
- Recognize that smoking is the most common cause of COPD
- Explain how COPD develops and discuss the signs and symptoms of the disease
- Discuss that COPD is progressive, irreversible and is one of the leading causes of death
- Recognize that the most important strategy to prevent COPD is not to start smoking

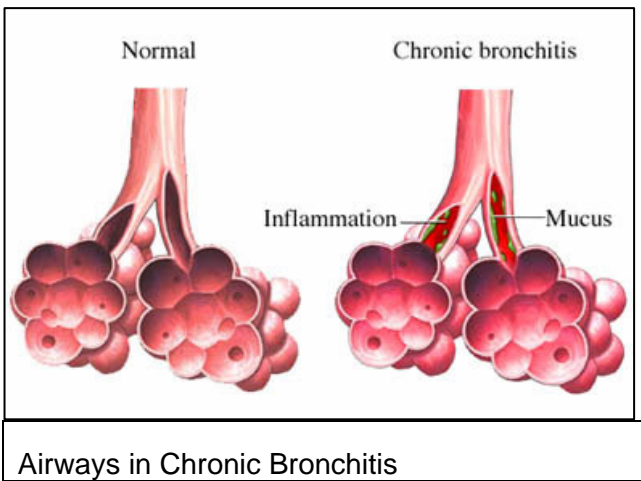
What is Chronic Obstructive Pulmonary Disease (COPD)?

Chronic obstructive pulmonary disease (COPD) is a condition in which the airways are damaged permanently making it hard for air to get in and out of the lungs. The most common cause of COPD is cigarette smoking.



COPD is a disease that includes both *chronic bronchitis* and *emphysema*. A person may have one or the other or more commonly, a combination of the two.

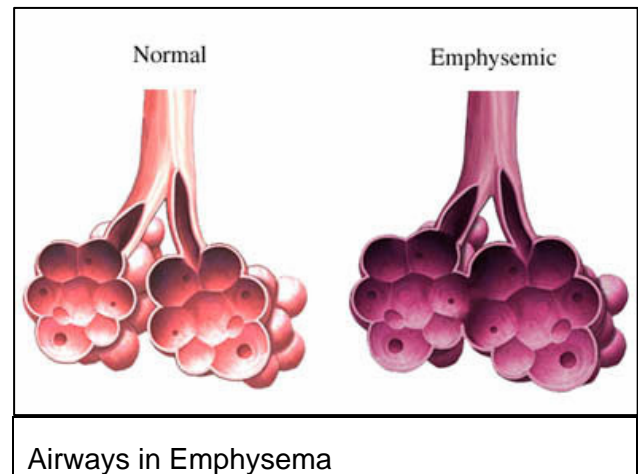
Chronic bronchitis involves chronic inflammation or swelling and narrowing or tightening of the large and small airways. The protective layer of the lungs and the system of tiny hairs or cilia lining the airways that clears the lungs of mucus are damaged. Also, there is increase in mucus production. The airways thus become clogged with mucus. The narrowing of the airways and accumulation of mucus prevents the normal amount of air from reaching the lungs.



Airways in Chronic Bronchitis

Emphysema involves damage of the air sacs or alveoli. The walls of the air sacs are destroyed making the lungs lose their elasticity. In normal individuals, the air sacs are stretchy and springy, like little balloons. It takes effort to blow up the normal air sacs while it takes no energy to empty them because they spring back to their original size. In emphysema, the air sacs act more like paper bags. A paper bag is easy to blow up, but more effort is needed to squeeze the bag to get the air out. It becomes difficult to push all of the air out of the lungs. The lungs do not empty efficiently and therefore contain more air than normal. This is called *hyperinflation* or *air trapping*. The combination of constantly having extra air in the lungs and the extra effort needed

to breathe, results in the feeling of shortness of breath.



Airways in Emphysema

What causes COPD?

Inhaling irritating particles, such as *smoke* or *air pollutants*, can cause the mucus glands that line the bronchial tubes (bronchi) to produce more mucus than normal, and can cause the walls of the bronchi to thicken and swell (inflammation). COPD can develop if small amounts of these irritants are inhaled over a long period of time or if large amounts are inhaled over a short period of time.

Cigarette smoking is the most common cause of COPD. Pipe, cigar and other types of tobacco smoking have also been strongly linked to COPD.

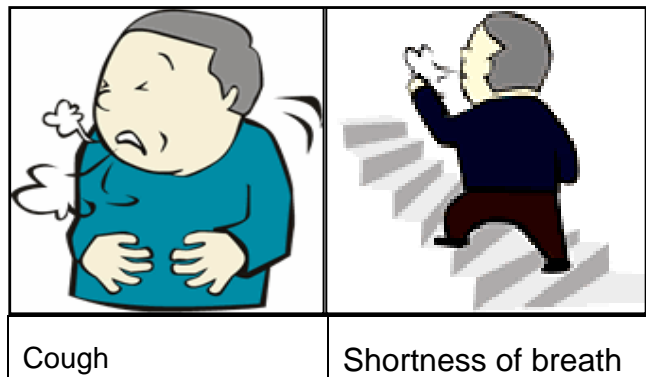
Second hand smoke also plays a role in causing COPD. This means that even non-smokers may develop COPD if they are constantly exposed to cigarette smoke from people who smoke around them. Household members of people who smoke are also at risk of developing COPD.

Environmental factors and *genetics* or *heredity* may also cause COPD. For example, heavy exposure to certain dusts at work, chemicals and indoor or outdoor air pollution can contribute to COPD. The reason why some smokers never develop

COPD and why some never-smokers get COPD is not fully understood. Family genes or heredity probably play a major role on who develops COPD.

What are the signs and symptoms of COPD?

The symptoms of COPD include cough, sputum (phlegm) production, shortness of breath, wheezing (whistling sound when breathing), tiredness (fatigue) and chest tightness. Cough that is persistent or does not go away, and increased sputum or phlegm production are the most common symptoms of COPD. These often occur years before a person develops shortness of breath. These symptoms eventually limit the person's activities and sometimes make them unable to do simple things by themselves like eating, going to the bathroom or grooming. Patients often feel helpless and depressed as the symptoms progress.



COPD develops slowly, and it may take many years before shortness of breath is noticed. Most of the time, COPD is diagnosed among middle-aged people of 40 years old and above.

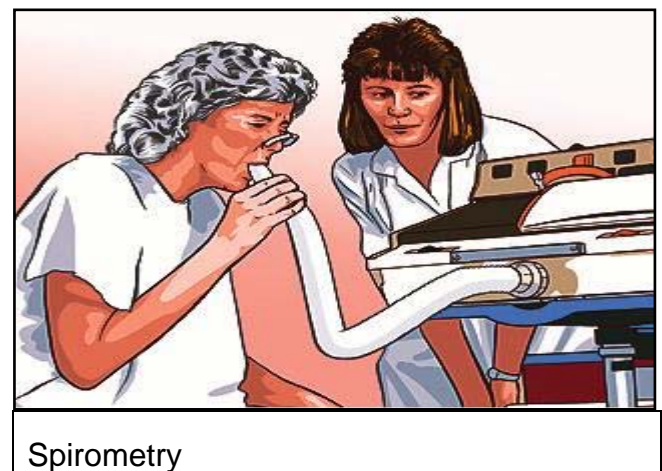
Will COPD ever go away?

The severity of symptoms depends on how much of the lung has been destroyed. The more a person smokes, the

faster is the destruction of the lungs. The damage in the lungs cannot be reversed. There is no cure for COPD. Once COPD develops, a person will have it for life. Stopping smoking is the only thing that can slow down the progression of the disease, but even this will not make the lungs normal again.

How is COPD diagnosed?

Doctors consider COPD if a person presents with typical symptoms and a significant history of exposure to cigarette smoking and irritants. A medical history, physical examination and breathing tests are the most important tests to determine if a person has COPD.



The breathing test used to diagnose COPD is called spirometry. Spirometry is easy and painless and shows how well the lungs work. The person being tested is asked to breathe in and out through a machine that measures how much and how air can be inhaled and exhaled in the lungs. Spirometry can detect COPD even before a person develops severe symptoms.

Why is it important to learn more about COPD?

COPD is a widespread health problem. It is the 4th leading cause of death

and disability in worldwide statistics. In the Philippines, COPD is the 7th leading cause of death according to the Department of Health. Aside from death, COPD significantly decreases the functional capacity and eventually the quality of life of afflicted individuals. Learning more about this condition is important in order to prevent it.

How is COPD prevented and treated?

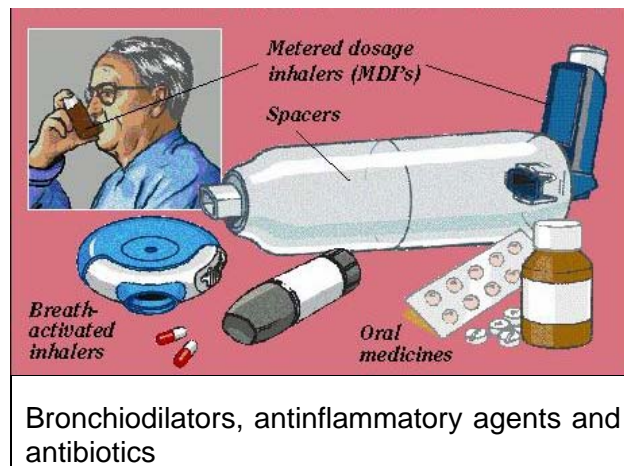
Quitting smoking is the single most important thing that can prevent or reduce the risk of developing COPD and slow the progress of the disease. It is significant to stay away from places where one can be exposed to second hand smoke. Avoiding lung irritants such as pollution, dust, and certain cooking and heating fumes is likewise essential. In the workplace, special protective gear and precautions should be practiced to prevent exposure.



Stop Smoking

As well as helping patients quit smoking, the doctor may prescribe medicines that widen the breathing tubes (bronchodilators), reduce swelling in the breathing tubes (anti-inflammatory drugs) or treat infection (antibiotics). Medications have been shown to help stabilize the breathing passages and decrease swelling. In order to provide control of COPD, these

medications must be taken everyday, probably for the rest of the patient's life. In severe cases, patients are given extra inhaled oxygen to improve levels in the blood and to decrease symptoms.



Bronchodilators, anti-inflammatory agents and antibiotics

Currently, there is no treatment available to restore damaged bronchi from bronchitis or alveoli affected by a large amount of emphysema. Unfortunately, the damage that has been done to the alveoli is permanent. In some parts of the world, surgery (lung volume reduction) can be performed as a way of removing some (but not all) areas of the lungs with large amounts of emphysema.

Support groups are important in dealing with a debilitating disease such as COPD. Pulmonary Rehabilitation Programs are helpful in teaching patients use their lung power more efficiently. Such programs also provide emotional and psychological support. Patients are assisted in smoking cessation.



