

Respiratory System
Chapter 37: Section 37-3
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The function of the respiratory system is to bring about the exchange of oxygen and carbon dioxide between the blood, the air and tissues.

Cilia and Mucus

Air entering the respiratory system must be warmed, moistened and filtered.

In the nasal cavity, air is warmed by blood in capillaries, moistened by mucus membranes and filtered by cilia.

Cilia sweep the trapped particles and mucus away from the lungs and toward the pharynx.

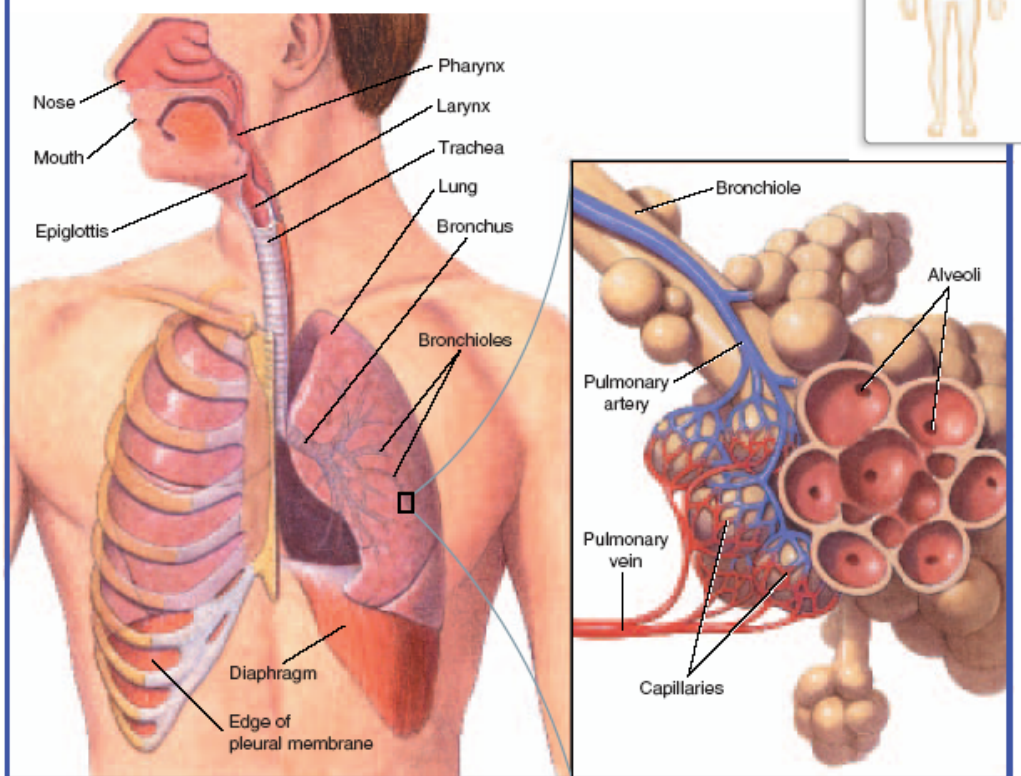
The mucus and trapped particles are either swallowed or spit out.

These measures keep the lungs clean and open for the important work of gas exchange.

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FIGURE 37-13 THE RESPIRATORY SYSTEM

The respiratory system is responsible for the exchange of oxygen and carbon dioxide. Air moves through the nose, pharynx, larynx, trachea, and lungs. After reaching the lungs, the trachea branches into smaller and smaller tubes called bronchioles, which end in alveoli, or air sacs.



Link



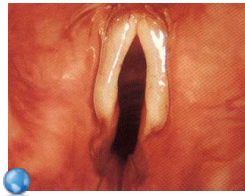
The respiratory system consists of the nose, pharynx, larynx, trachea, bronchi, bronchioles, alveoli and lungs.

pharynx - a tube that serves as a passageway for both air and food (throat)

epiglottis - a flap of tissue that covers the entrance to the trachea when you swallow

larynx (voice box) - located at the top of the trachea

- contains two highly elastic folds of tissue known as the vocal cords
- when muscles pull the vocal cords together, the air moving between them causes the cords to vibrate and produce sounds



laryngitis - the severe inflammation of the vocal cords
- loss of voice may occur

trachea (windpipe) - air moves from the pharynx to the trachea

The trachea subdivides into two bronchi (singular: bronchus), two large passageways in the chest cavity. Each leads into one of the lungs.

Within each lung, the bronchus subdivides into smaller passageways called bronchioles.

The bronchioles continue to subdivide until they reach a series of dead ends - millions of tiny air sacs called alveoli (singular: alveolus).

Alveoli are grouped in little clusters, like bunches of grapes. A delicate network of thin-walled capillaries surrounds each alveolus.

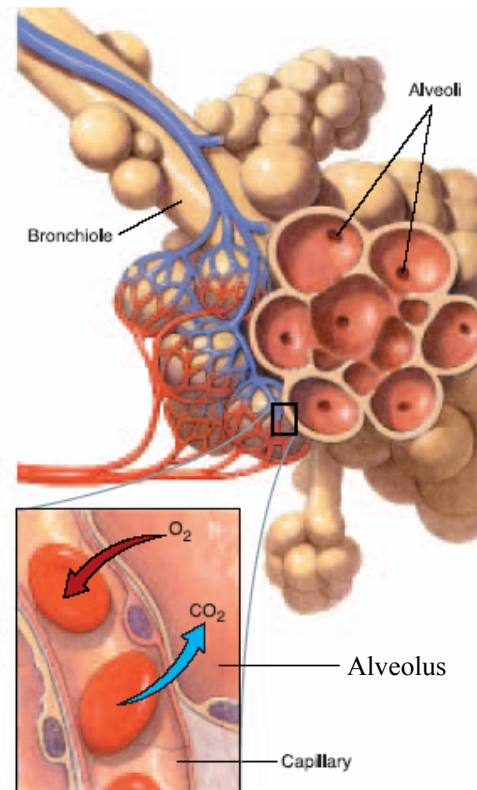
Gas Exchange

The alveoli provide an enormous surface area for gas exchange.

Oxygen dissolves in the moisture on the inner surface of the alveoli and then diffuses across the thin-walled capillaries into the blood.

Carbon dioxide in the blood stream diffuses in the opposite direction, across the membrane of an alveolus and into the air within it.

Figure 37-14
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Breathing

Breathing is the movement of air into and out of the lungs. The force that drives air into the lungs comes from air pressure.

The lungs are sealed in two sacs, called the pleural membranes in the chest cavity. At the bottom of the cavity is a large, flat muscle known as the diaphragm.

pleurisy - the inflammation of the pleural membranes

Inhalation

When you breathe in the diaphragm contracts (moves downward) and the rib cage rises up. This expands the volume of the chest cavity. This creates a partial vacuum inside the cavity. Atmospheric pressure fills the lungs as air rushes into the breathing passages.

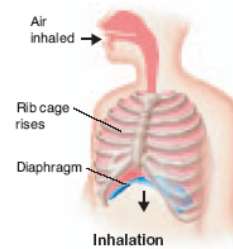
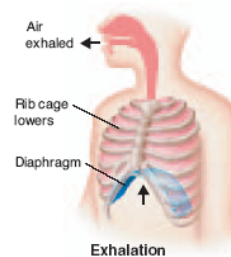


Figure 37-15
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Exhalation

When the rib cage lowers and the diaphragm muscle relaxes, the pressure in the chest cavity becomes greater than the atmospheric pressure and air rushes out of the lungs.



Link



The system works only because the chest cavity is sealed. A puncture wound to the chest may allow air to leak into the chest cavity and make breathing impossible.

Controlling Breathing

Breathing is so important that your nervous system will not let you have complete control over it.

The part of your brain that controls breathing is the medulla oblongata. Autonomic nerves from the medulla oblongata to the diaphragm and chest muscles produce the cycles of contraction that bring air into the lungs.

The Respiratory System and Tobacco

Three of the most dangerous chemicals in tobacco are nicotine, carbon monoxide and tar.

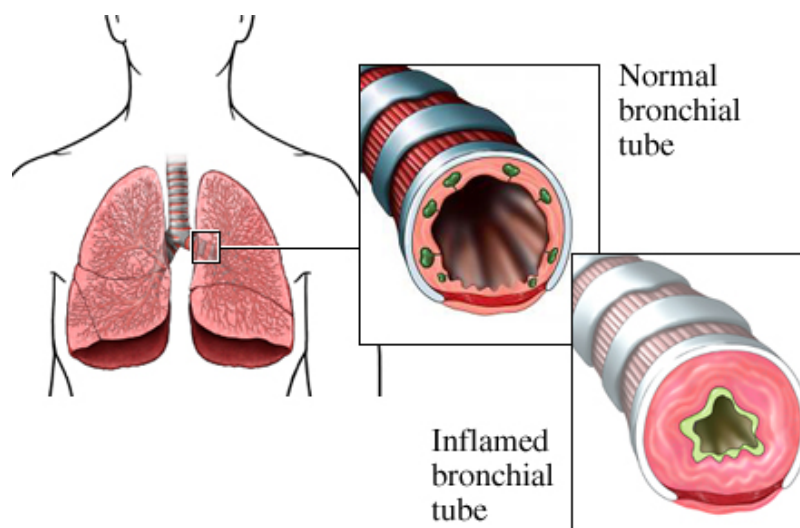
Nicotine is a stimulant drug that increases the heart rate and blood pressure.

Carbon monoxide is a poisonous gas that blocks the transport of oxygen by hemoglobin in the blood. This deprives the heart and other organs of the oxygen they need to function.

Tar contains a number of compounds that have been shown to cause cancer.

Smoking can cause respiratory diseases such as chronic bronchitis, emphysema and lung cancer.

In chronic bronchitis, the bronchi become swollen and clogged with mucus.



Emphysema is related to chronic bronchitis. Air pressure builds up in the lungs and stretches the alveoli. As the alveoli rupture, capillaries are destroyed and scar tissue forms. This makes the lungs less elastic and breathing more difficult. Heart rate may also increase to accommodate low oxygen levels.

Smoking is a preventable cause of **lung cancer**. Cancer cells reduce the surface area for diffusion of gases. Tumors may block airways and eventually the lung will collapse.

Lung cancer is particularly dangerous because its cells can spread to other locations.

► **Figure 37-17** Smoking can cause respiratory diseases such as chronic bronchitis, emphysema, and lung cancer. The lung on the left is from a smoker. The lung on the right is from a nonsmoker.

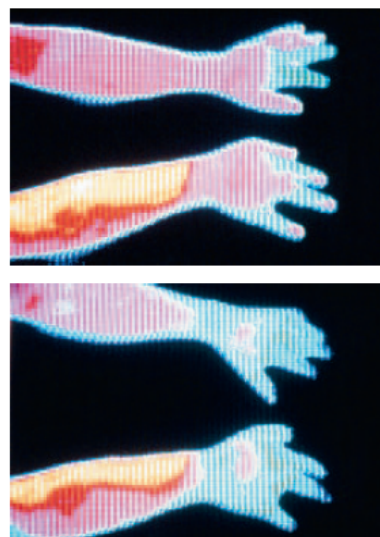


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Smoking is also a major cause of heart disease. Smoking narrows blood vessels. This causes blood pressure to rise and makes the heart work harder.

There is a drastic change in body temperature and in circulation immediately after smoking a cigarette.

▲ **Figure 37-18** These thermograms provide a color-coded map of temperature distribution over the body surface (blue = cold; pink = hot). The top thermogram shows the forearm and hand area prior to smoking a cigarette. The bottom thermogram shows the same area after smoking. **Interpreting Graphics** Do you think circulation is increased or decreased after smoking?



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What You Need To Know

- function of the respiratory system
- air must be warmed (blood in capillaries), moistened (mucus membranes) and filtered (cilia)
- structure/function of the parts of the respiratory system (nose, pharynx, larynx, trachea, bronchi, bronchioles, alveoli)
- role of epiglottis
- how sound is produced (vibration of vocal cords as air moves between them)
- location and method of gas exchange
- importance of pleural membranes
- breathing: inhalation and exhalation (how it works - rib cage/diaphragm, air pressure)
- affect of nicotine, carbon monoxide and tar on the respiratory system
- laryngitis, pleurisy, chronic bronchitis, emphysema, lung cancer, heart disease

