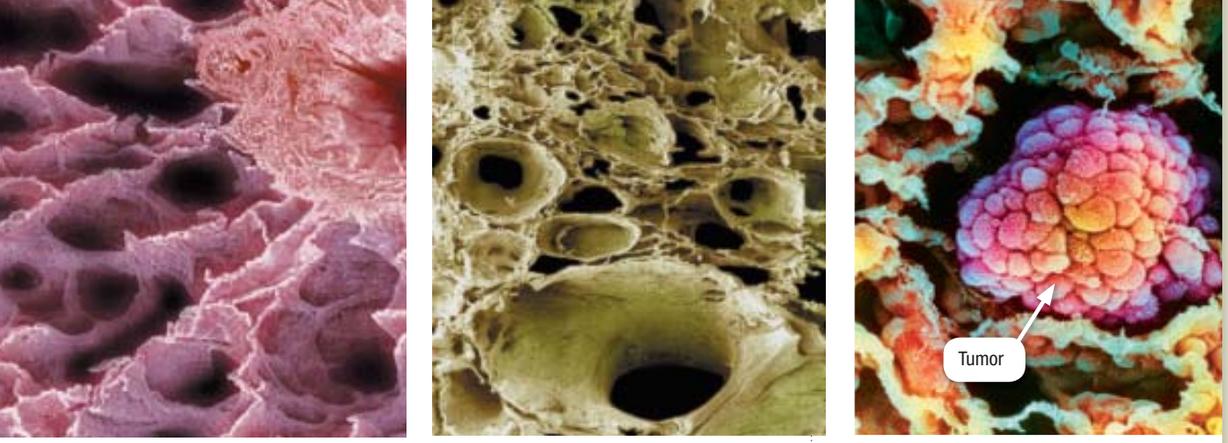


Figure 16 The lung tissue on the far left is healthy. The lung tissue in the center came from a person who suffered from emphysema. The lung tissue on the right is cancerous. **How do the alveoli in a healthy lung compare with the alveoli in a lung with emphysema?**

Emphysema Emphysema is a chronic respiratory disease resulting from destruction of elastic fibers in the lungs. Smoking is the cause of up to 90% of emphysema cases. Normally, the lungs' elastic fibers allow them to expand and contract. Emphysema causes a loss of flexibility in the alveoli's walls. Over time, these walls break, and larger, less efficient air sacs are created that do not function properly in the exchange of O_2 and CO_2. Damage to the alveoli, shown in **Figure 16,** is irreversible. The damage leads to constant fatigue and breathlessness. Severely affected individuals must breathe from oxygen tanks.

Lung Cancer Lung cancer is a leading cause of death in the world today. *Cancer* is a disease characterized by abnormal cell growth. In the United States, about 28%—158,000—of all cancer deaths each year are attributed to lung cancer. Smoking is the cause of about 90% of lung cancer cases. Once cancer is found, the affected lung is sometimes removed surgically. Even with such drastic measures, lung cancer usually is not curable. Only about 15% of lung cancer victims live more than 5 years after diagnosis.

Reading Check ***Which lung diseases could be caused by smoking?***

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Section 3 Review

KEY IDEAS

1. **Name** the structures of the respiratory system through which air flows.
2. **Identify** the muscles that enable breathing, and explain how the actions of these muscles accomplish this task.
3. **Compare** the transport of oxygen in the blood with that of carbon dioxide.
4. **State** the causes of bronchitis, tuberculosis, and lung cancer.

CRITICAL THINKING

5. **Analyzing Information** Red blood cells are the only functioning cells in your body that lack a nucleus. How does the lack of a nucleus relate to the function and formation of a red blood cell?
6. **Comparing and Contrasting** Describe the similarities and differences between bronchitis and pneumonia.

MATH SKILLS

7. **Ratios and Percents** The world's population is roughly 6.6 billion. If one out of every three people is infected with *Mycobacterium tuberculosis* and about 10% of those infected develop tuberculosis, about how many people in the world have tuberculosis?

Why It Matters

Deaths from Lung Disease Nearly 335,000 Americans die each year from lung disease, which is the third leading cause of death in the United States. Most lung diseases are caused by smoking. However, air pollution also contributes to lung disease, including respiratory tract infections, asthma, emphysema, and lung cancer. The major types of air pollution include excess ozone, particulate matter, nitrogen dioxide, and sulfur dioxide. These substances result from fuel combustion by motor vehicles, electric utilities, and other industries.

Close

Formative Assessment

Gases are exchanged between the blood and inhaled air in the _____.

A. larynx (Incorrect. This is where sound is made.)
B. trachea (Incorrect. The trachea transports air to the bronchi.)
C. alveoli (Correct! The alveoli are air sacs where gas exchange occurs.)
D. bronchi (Incorrect. The bronchi are tubes that lead to the lungs.)

Answers to Caption Questions

Figure 16: The alveoli of healthy lungs are uniform in size with smooth edges. The alveoli in lungs with emphysema are irregular and look as though they have been torn.

Answers to Section Review

1. nose or mouth, pharynx, larynx, trachea, bronchus, bronchiole, alveolus of lung
2. The diaphragm moves downward when it contracts. The ribs move up and out when the rib muscles contract. The size of the chest cavity increases, reducing air pressure within. Air moves into the lungs. When the diaphragm relaxes, it moves upward. When the rib muscles relax, the ribs move down and in. The size of the chest cavity decreases, increasing air pressure within. Air moves out of the lungs.
3. Oxygen is transported inside red blood cells. Carbon dioxide is transported in the plasma.
4. bronchitis: virus (acute), smoking (chronic); tuberculosis: a bacterium; lung cancer: 90 percent of cases caused by smoking
5. Without nuclei they can fill entirely with hemoglobin molecules, to which oxygen binds.
6. Similarities: Inflammatory conditions caused by infectious and noninfectious agents, restrict air flow, involve a cough; Differences: Bronchitis affects bronchioles, pneumonia affects alveoli.
7. 6.6 billion ÷ 3 = 2.2 billion;
   2.2 billion × 10% = 220 million people