Adequate gas diffusion demands that the respiratory membrane be as thin as possible. However, sometimes the nembrane can be damaged, leading to less efficient gas diffusion. In the disease **pneumonia**, the alveolar wall thickens is a result of fluid accumulation and the lumens of the alveoli become filled with white blood cells. Destruction of the espiratory membrane from smoking can result in emphysema, a form of **chronic obstructive pulmonary disease** (COPD). n emphysema, the simple squamous cells of the alveolar membranes are gradually destroyed, leading to loss of respiratory nembrane and a decrease in the amount of gas exchanged.

Examine Figure 7-7A and 7-7B. Label each slide with the health conditions described above.

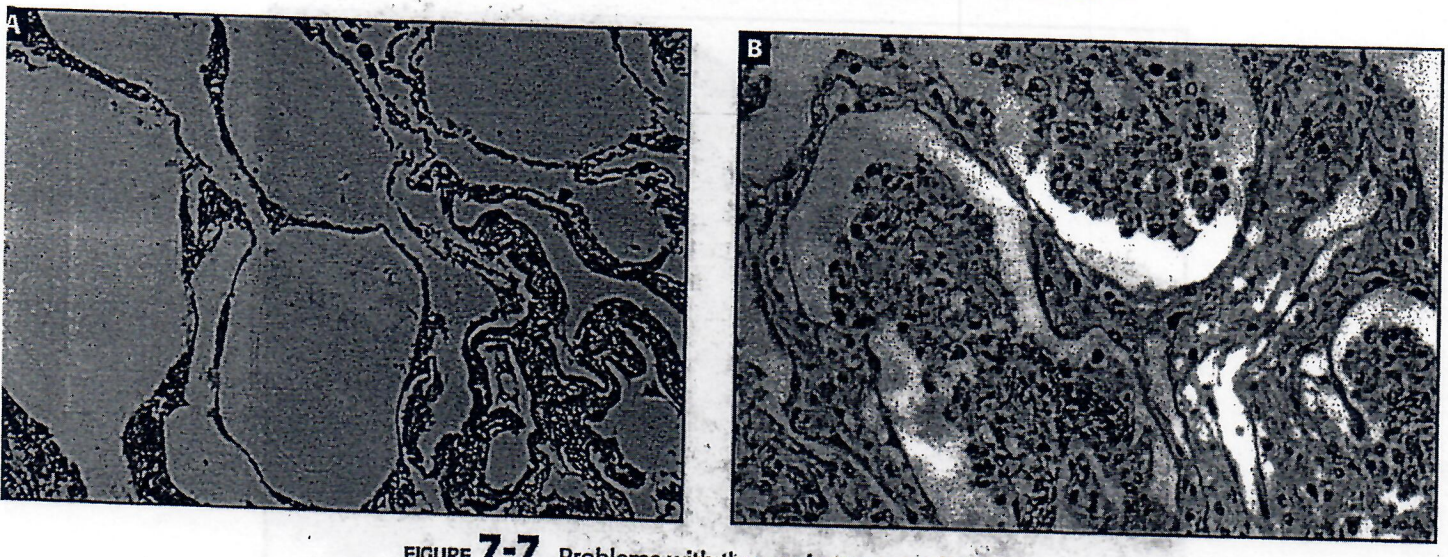

FIGURE 7-7 Problems with the respiratory membrane.

Alveoli contain two other important types of cells. **Type II pneumocytes** (also known as great alveolar cells) are round r cube-shaped cells that produce **surfactant**. Surfactant contains lipid molecules that reduce surface tension in the lungs nd prevent the walls of the alveoli from sticking together when you exhale. Type II pneumoctyes are embedded in the veolar wall.

Alveolar macrophages, or dust cells, are important immune cells that phagocytize foreign material that has made it rough the mucus defense of the conducting division. These cells are larger than the type II pneumocytes, are round, and e free to move in the alveolar space.

Label Figure 7-8 with the provided terms. Note: IS indicates the interalveolar septa that separates two alveoli. C dicates a capillary.

RMS FOR FIGURE 7-8
pe I pneumocyte
pe II pneumocyte
eolar macrophage

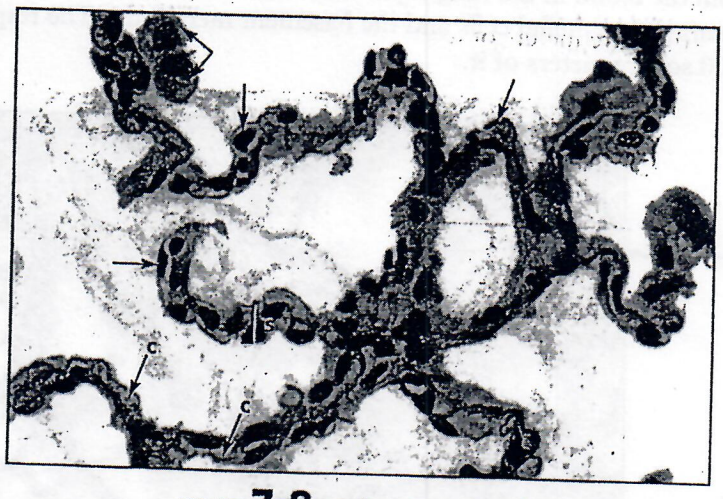

FIGURE 7-8 Cells of the alveoli.

Part D: Post-Lab Questions

1. List all the mechanisms and cells involved in preventing foreign material from getting into or damaging the alveol

2. Why do you have two primary bronchi?

3. What is the mucociliary escalator?

4. What is the function of the epiglottis?

5. In the right lung, which lobes are separated by the oblique fissure?

6. In the left lung, which lobes are separated by the oblique fissure?

7. Why does the respiratory membrane need to be as thin as possible?

Part B: Respiratory Tract Histology

As previously mentioned, the conducting division is characterized by the presence of cartilage and a ciliated mucous membrane. Figure 7-5 shows a section through the trachea.

Label the pseudostratified ciliated columnar epithelial tissue, cilia, and cartilage. Find and circle the mucus gland that has an opening onto the epithelial tissue.

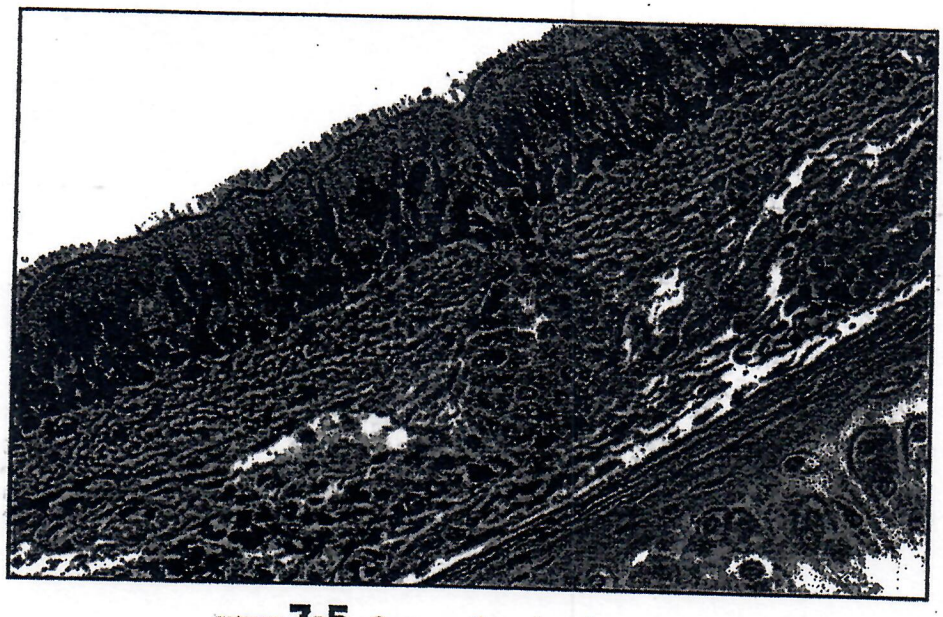

FIGURE 7-5 Cross section of trachea. (400×)

Alveoli

Alveoli are small sacs in the lung where gas (O_2 and CO_2) exchange occurs. Their walls are composed of simple squamou epithelial cells, called type I pneumocytes; remember that squamous epithelial cells are very flat, so the gases can easily diffuse from the air space of the alveoli through these cells to the bloodstream.

Examine Figure 7-6. The round clear spaces are the open areas of alveoli and are surrounded by squamous cells. Labe several alveoli and the squamous epithelial tissue that makes up the alveolar walls.

During gas exchange in the lung, O_2 and CO_2 must pass through the respiratory membrane that separates the air in the alveoli from the blood in the lung capillaries. This membrane includes the alveolar and the capillary walls, both composed of squamous epithelial cells and the basement membrane. The respiratory membrane is very thin, and a health lung has about 70 square meters of it.

TERMS FOR FIGURE 7-6

Alveoli

Simple squamous epithelial cells

FIGURE 7-6 Lung. (400×)

Part C: Application

1. Asthma causes constriction of the airway and a buildup of mucus. Would you expect this to be more of a problem in a secondary bronchi or a respiratory bronchiole? Give at least two reasons to defend your answer.

2. Epiglottitis is a serious, potentially life-threatening bacterial infection.
   a. What structure is infected?

   b. How do you think it might kill someone?

   c. Epiglottitis killed many children before the 1990s. Why do you think so few children die from epiglottitis today? (The answer is not antibiotics.)

3. A procedure known as a cricothyrotomy is sometimes performed when a person's airway has been damaged. What specific part of the conducting division is cut to create a temporary airway?

4. Do you think emphysema or pneumonia is more serious? Explain your reasoning.

Sometimes when you swallow wrong or cough, liquid from the beverage you are drinking can come out of your nose. List the passageways the liquid has to travel through for this to happen.

The lower respiratory tract is also called the bronchial tree. Why is this anatomy likened to a tree? *Hint:* Turn Figure 7-3 upside down.