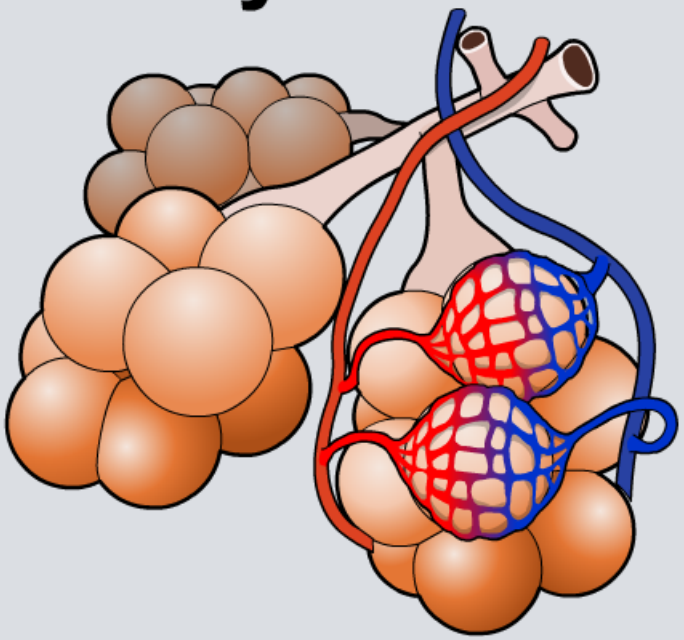
The Respiratory System



Exchange surfaces

All organisms require nutrients and the ability to excrete waste. Many simple organisms, such as bacteria and sea anemones, can exchange substances directly across their external surfaces.

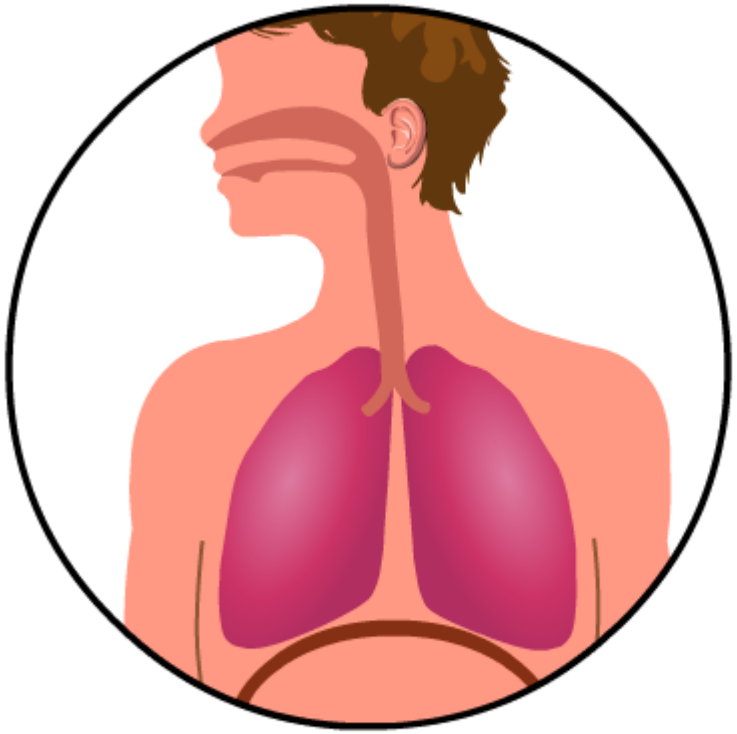
Larger organisms require specialized **gas exchange** and **transport systems** to transport substances such as oxygen and nutrients to their cells efficiently.

Fish exchange these substances across gills, while insects have openings called **spiracles** on their surfaces.

In mammals, gas exchange occurs in the lungs, and in particular the **alveoli**.

Structure of the lungs

What is the structure of the human gas exchange system?



In all mammals, gas exchange takes place in the **lungs**. These are adapted to have a very large surface area in close contact with the bloodstream, so that oxygen can diffuse into the blood, and carbon dioxide diffuse out.

lungs

trachea

bronchi

bronchioles

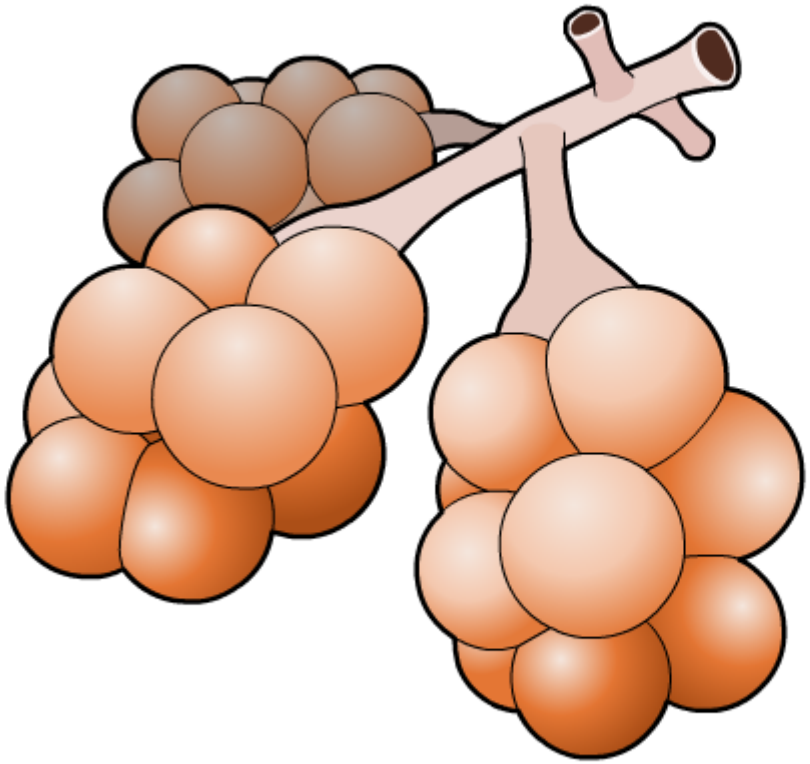
alveoli

Gas exchange in the alveoli

How does gas exchange occur in the alveoli?

Alveoli are the tiny air sacs that are the main site of gas exchange in the lungs.

Click "**play**" or the alveoli to find out what happens during gas exchange.

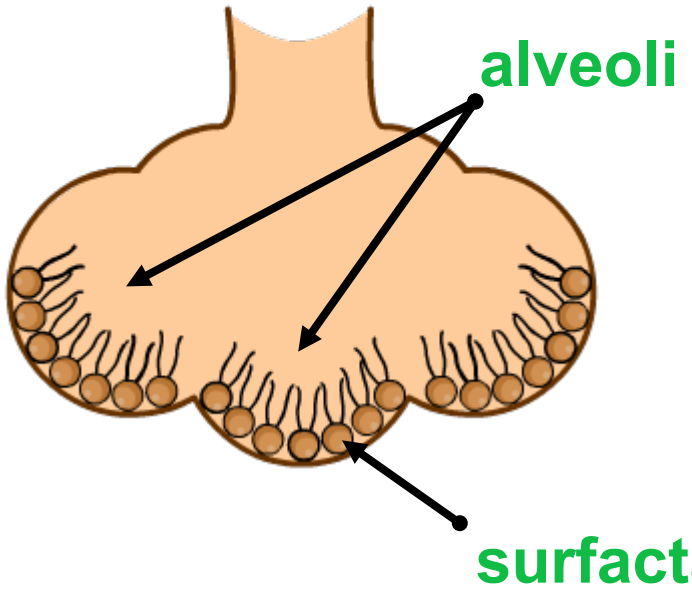


Maintaining the structure of the alveoli

During inhalation, the chest cavity increases in volume, lowering the pressure in the lungs to draw in fresh air.

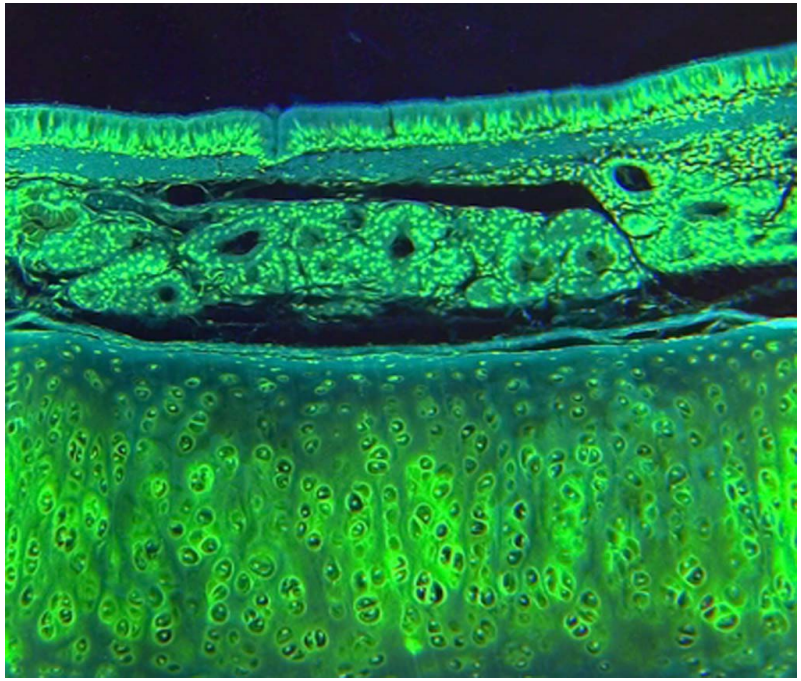
This decrease in pressure leads to a tendency for the lungs to collapse. **Cartilage** keeps the trachea and bronchi open, but the alveoli lack this structural support.

Lung surfactant is a phospholipid that coats the surfaces of the lungs. Without it, the watery lining of the alveoli would create a surface tension, which would cause them to collapse.



Keeping the airways clear

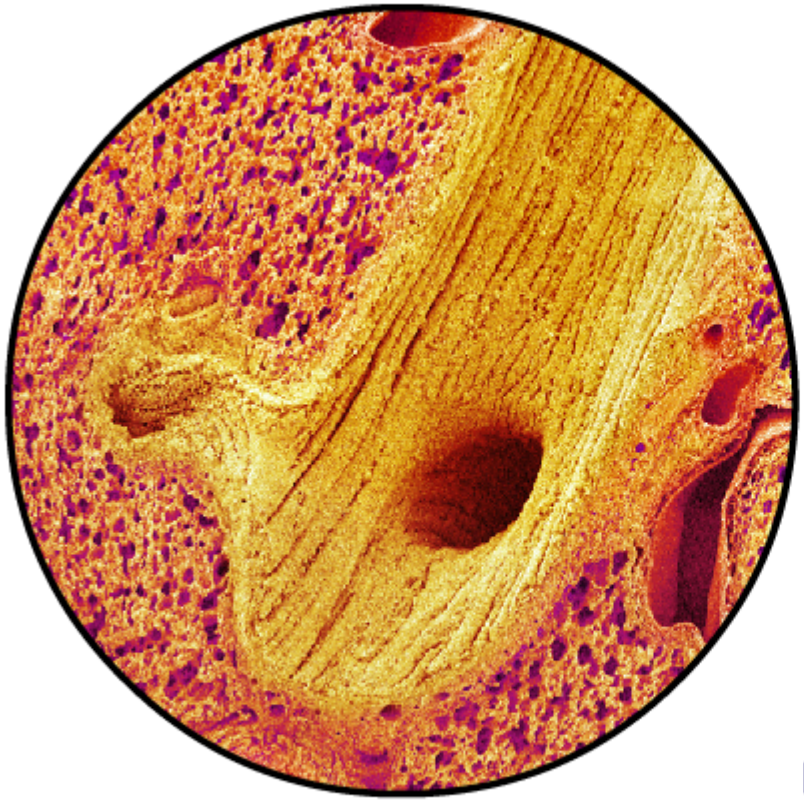
The walls of the trachea and bronchus contain **goblet cells**, which secrete mucus made of **mucin**. This traps micro-organisms and debris, helping to keep the airways clear.



The walls also contain **ciliated epithelial cells**, which are covered on one surface with **cilia**. These beat regularly to move microorganisms and dust particles along with the mucus. They contain many mitochondria to provide energy for the beating cilia.

Structures of the human lung

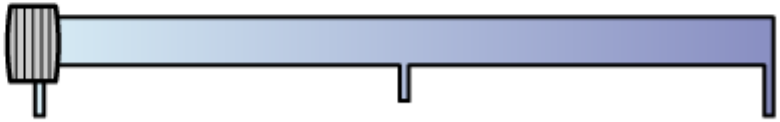
Structures of the human respiratory system



Susumu Nishinaga / SPL

Part of a human lung

What structures can you see that are associated with gas exchange?



micrograph diagram

show