

Gas exchange

Aerobic cell respiration needs oxygen and produces carbon dioxide. Two processes are needed to support this:

1. **Ventilation** (breathing in and out) maintains concentration gradients of oxygen and carbon dioxide between the air in the alveoli and blood flowing in adjacent capillaries.

2. **Gas exchange** involves exchanging inhaled oxygen for waste carbon dioxide in the **alveoli** of the lungs; each alveolus is adapted for gas exchange (diffusion) as follows:

- The walls of the alveoli are made of **Type I** and **Type II pneumocytes** and are only one cell thick so gases have a short diffusion path:
 - **Type I pneumocytes** - thin and permeable alveolar cells.
 - **Type II pneumocytes** – secrete a liquid that makes a moist surface inside the alveoli for gases to dissolve in; the liquid also contains **surfactant** to reduce surface tension and stop the sides of each alveolus sticking together.
- The alveoli have a **very large total surface area** for gas exchange (300 million alveoli in each human lung have a total surface area of about 70m^2).
- Each alveolus is surrounded by a **dense network of capillaries** – the blood has low oxygen and high carbon dioxide concentrations so oxygen diffuses from the alveoli into the blood and carbon dioxide diffuses from the blood into the alveoli.
- Ventilation and the constant circulation of the blood round the alveoli maintain a **steep concentration gradient** for diffusion.

