Respiration

The main function of the lung is gas exchange (external respiration)

4 processes

- pulmonary ventilation
- exchange of $O_2$ & $CO_2$ between lung & blood
- transport of $O_2$ & $CO_2$ by blood
- exchange of $O_2$ & $CO_2$ between blood & tissues

**The airways**

**upper airways:** (nose (or mouth) $\Rightarrow$ pharynx $\Rightarrow$ larynx)

**lower airways:** (larynx $\Rightarrow$ trachea $\Rightarrow$ 2 bronchi $\Rightarrow$ bronchioles) $\Rightarrow$ alveoli (grape-like clusters)

**The airways below the larynx are divided into:**

<table>
<thead>
<tr>
<th>(1) Conducting zone</th>
<th>(2) Respiratory zone</th>
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<tbody>
<tr>
<td><strong>Site</strong></td>
<td>From the top of trachea $\Rightarrow$ beginning of respiratory bronchioles. <strong>no alveoli (no gas exchange with blood)</strong></td>
</tr>
<tr>
<td><strong>Functions</strong></td>
<td>From the respiratory bronchioles on down contains alveoli (the area of gas exchange)</td>
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<tr>
<td>1 – Warming &amp; humidifying inspired air</td>
<td>It is the site of gas exchange with blood. arrangement of structures of respiratory zone; respiratory bronchioles $\Rightarrow$ alveolar ducts $\Rightarrow$ alveoli (gas exchange) this $\uparrow\uparrow$ rate of gases diffusion.</td>
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<tr>
<td>2 – Distributing air to the gas exchange areas of the lung.</td>
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<tr>
<td>3 – A part of the body defense system: (as it has a mucociliary system)</td>
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<td>All 3 functions = air conditioning</td>
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</tbody>
</table>

The epithelial surfaces of the airways contain:

1. Cilia $\Rightarrow$ beat towards the pharynx.
2. Glands & Goblet cells $\Rightarrow$ secrete mucus.
3. Macrophages $\Rightarrow$ engulf inhaled particles & bacteria.

Alveolar wall consists of:

**Type I cells**

*Type I pneumocytes*

A single layer of flat epithelial cells laying on a basement membrane.

**Type II cells**

*Type II pneumocytes*

secrete pulmonary surfactant.

The alveolar walls are surrounded by capillaries (their walls consist of one layer of endothelial cells & underlying B.M.)

The respiratory membrane: (0.2 microns thick)

Fused alveolar & capillary walls that separate air from blood.

- In the lungs: 300 million alveoli (total surface area 100 mm$^2$) $\Rightarrow$ rapid & great gas exchange.

- Alveolar macrophages: engulf inhaled foreign particles..

The pleural sac

Each lung is surrounded by a completely closed sac,

1. **Visceral pleura** attached to the lung

   Intrapleural space: between 2 layers of pleura filled with "15ml." water

2. **Parietal pleura** attached to the interior thoracic wall & diaphragm

(1)