Physiology 101

Human Respiratory System

- trachea
- bronchial tubes
- alveoli
- bronchioles
- bronchial tube

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VENTILATION: The process of moving air in & out of the lungs

- Tidal Volume: Volume of air entering or leaving the lungs during a single breath

- Vital Capacity: Tidal volume + Inhalation reserve + Expiration reserve

- Residual Volume: What’s left after forced exhalation
Lung Function Testing

A method for evaluating whether the respiratory system has been impaired
Spirometry

- Tidal Volume
- Vital Capacity
- FEV1 (Volume of air expired in 1 second)
- FVC (Forced Vital Capacity)
- PEF (Peak Expiratory Flow)
Protective Functions of the Respiratory System

- Filtration and Preconditioning
- Impaction and Mucus-Transport
- Pulmonary Clearing
Regions of the Respiratory System

- Pharynx
- Larynx
- Trachea
- Bronchus
- Alveoli
- Bronchiole

Nasopharynx
Tracheobronchial
Pulmonary
Filtration

- Nasal hair and warm, humid conditions of nasal passages act together to remove particles & soluble gases.
  - **Particles** absorb moisture as they move through moist air of upper respiratory region, making them larger and causing them to strike walls of throat, nose, etc.
  - **Gases** that are very soluble can be absorbed before reaching the lower lung.
Impaction
Removal of Smaller Particulate

- Branching of the bronchopulmonary tree provides opportunity of impaction
Pulmonary Clearance

- Ultra-fine Particulate & Less Soluble Gases
  - Collect in the most remote portions of lungs - the alveoli
  - In the alveoli they may float and then be expelled with the next breath or two; or
  - They might be captured by phagocytes and eliminated
Particle Deposition

![Graph showing particle deposition fractions across different particle diameters. The graph indicates three regions: Pulmonary, Nasopharyngeal, and Tracheobronchial, each with distinct deposition curves.](image)

- **Deposition Fraction** axis ranges from 0.10 to 1.00.
- **Mass Median Diameter (μm)** axis ranges from 0.01 to 100.

The graph illustrates how particle deposition varies with diameter, with different regions indicating where particles deposit in the respiratory tract.
Defense Mechanisms

- Mucus Membrane
- Cilia
- Phagocytes
- Macrophages
GAS EXCHANGE

Exchange of oxygen and carbon dioxide between alveolar air & lung capillaries is by diffusion.
Beyond the Lungs: Some Examples

- **DIRECT EFFECTS**
  - Chemical Interactions
  - Neurological Impacts

- **INDIRECT EFFECTS**
  - Liver Metabolism
  - Kidney Metabolism