

Respiratory system

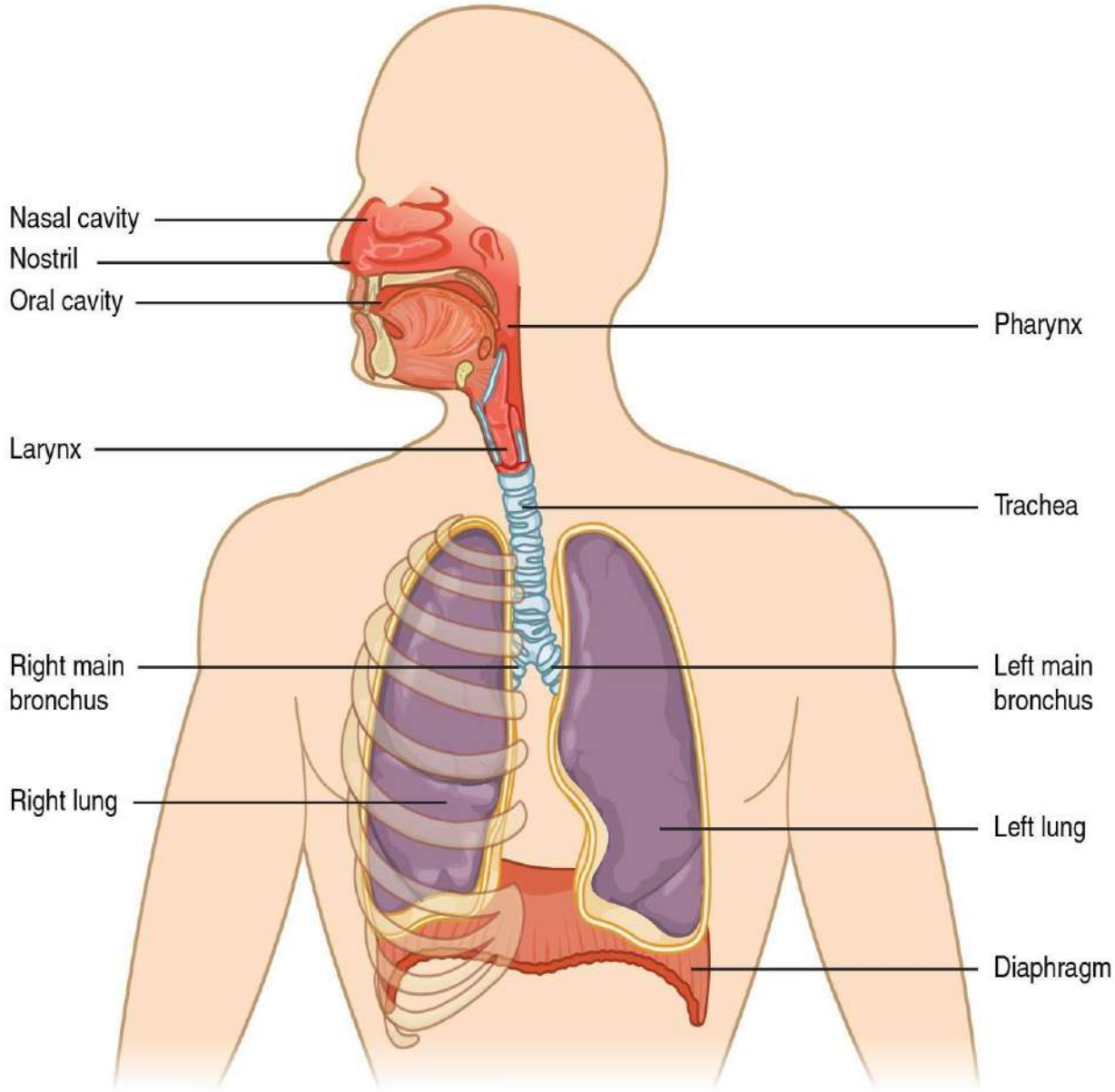
Learning objectives

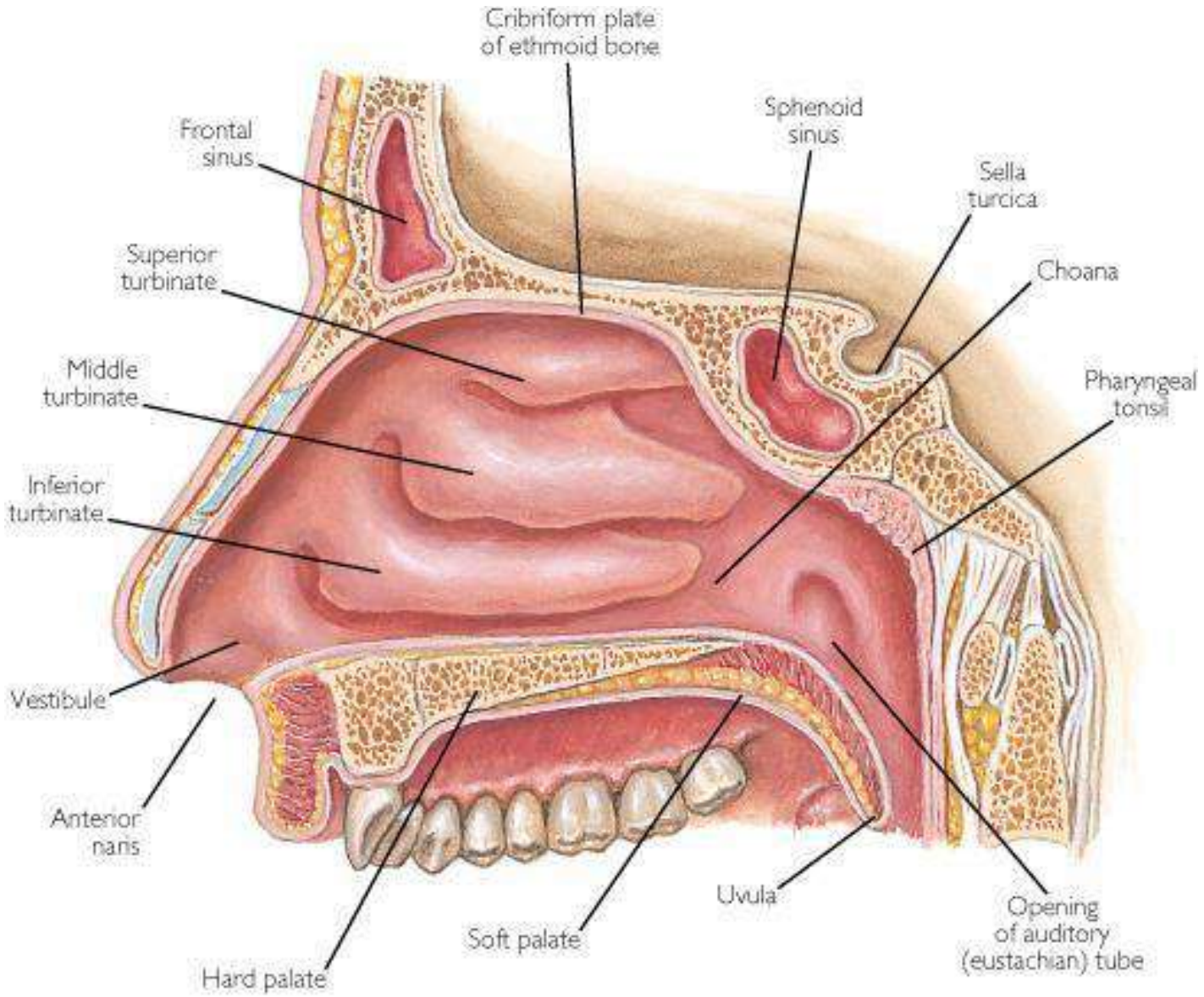
- The structure of the respiratory system
- The function of the respiratory system
- What is external respration
- What is internal respiration
- How the nervous system controls breathing
- Pathology of the respiratory system

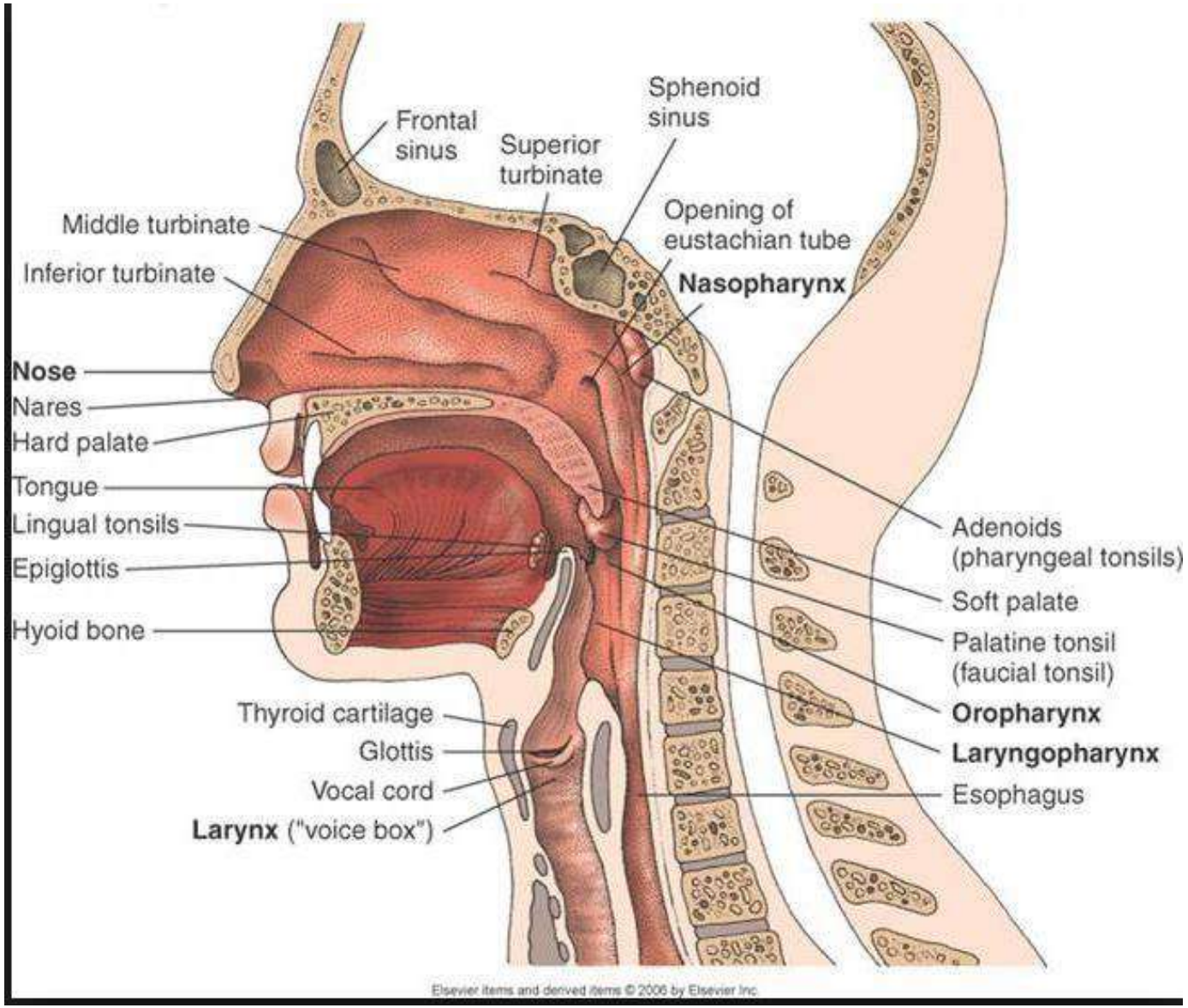
Function

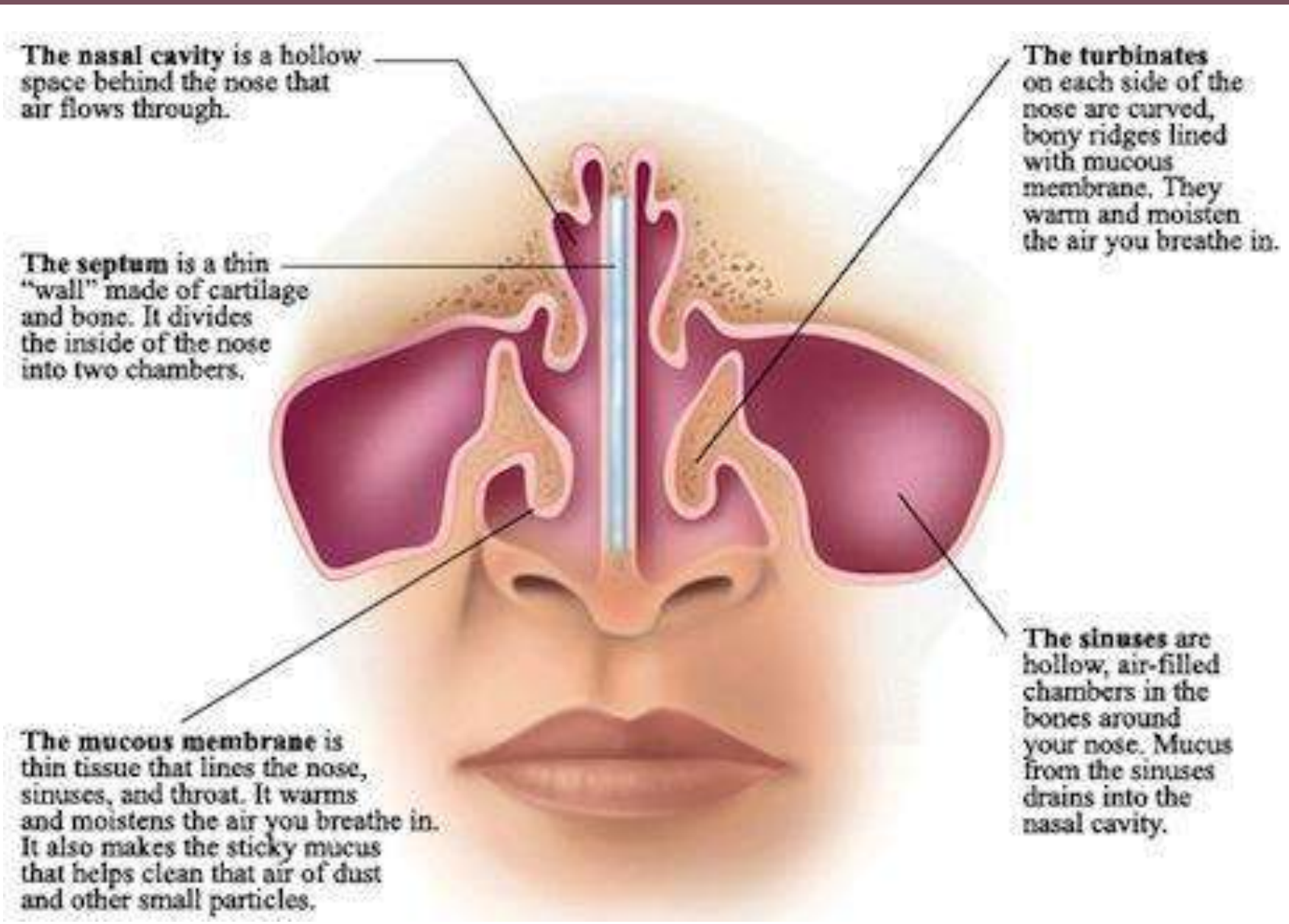
- Provides oxygen to the cells and the tissues
- Excretes carbon dioxide as a waste

- Breathing (external respiration)
  - Inhalation
  - exhalation




Cribriform plate of ethmoid bone
Frontal sinus
Sphenoid sinus
Sella turcica
Superior turbinate
Choana
Middle turbinate
Pharyngeal tonsil
Inferior turbinate
Vestibule
Anterior naris
Uvula
Opening of auditory (eustachian) tube
Soft palate
Hard palate

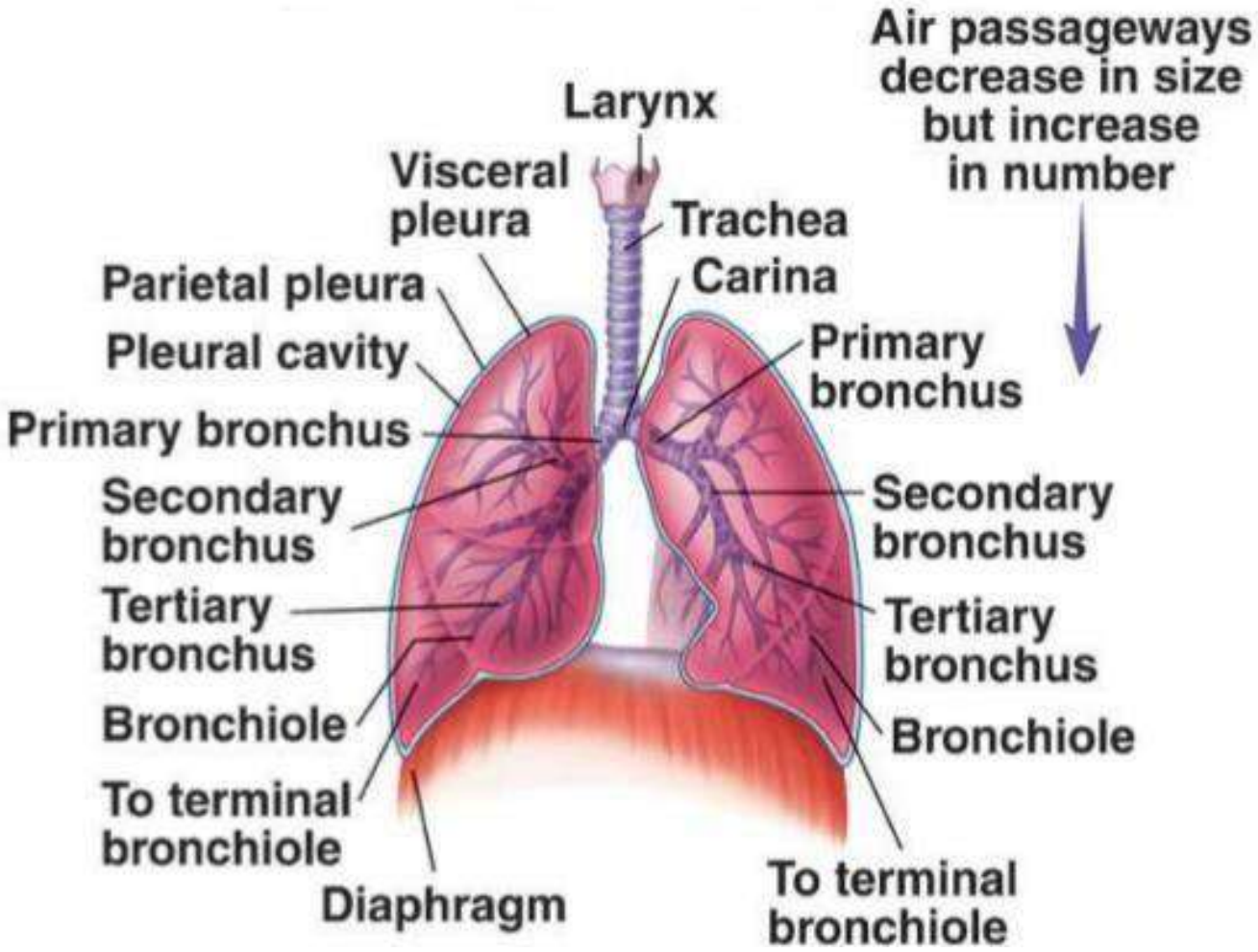

Frontal sinus
Superior turbinate
Sphenoid sinus
Middle turbinate
Opening of eustachian tube
Inferior turbinate
Nasopharynx
Nose
Nares
Hard palate
Tongue
Lingual tonsils
Epiglottis
Hyoid bone
Adenoids (pharyngeal tonsils)
Soft palate
Palatine tonsil (faucial tonsil)
Oropharynx
Laryngopharynx
Esophagus
Thyroid cartilage
Glottis
Vocal cord
Larynx ("voice box")
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The nasal cavity is a hollow space behind the nose that air flows through.
The septum is a thin "wall" made of cartilage and bone. It divides the inside of the nose into two chambers.
The mucous membrane is thin tissue that lines the nose, sinuses, and throat. It warms and moistens the air you breathe in. It also makes the sticky mucus that helps clean that air of dust and other small particles.
The turbinates on each side of the nose are curved, bony ridges lined with mucous membrane. They warm and moisten the air you breathe in.
The sinuses are hollow, air-filled chambers in the bones around your nose. Mucus from the sinuses drains into the nasal cavity.

Passageway of the air

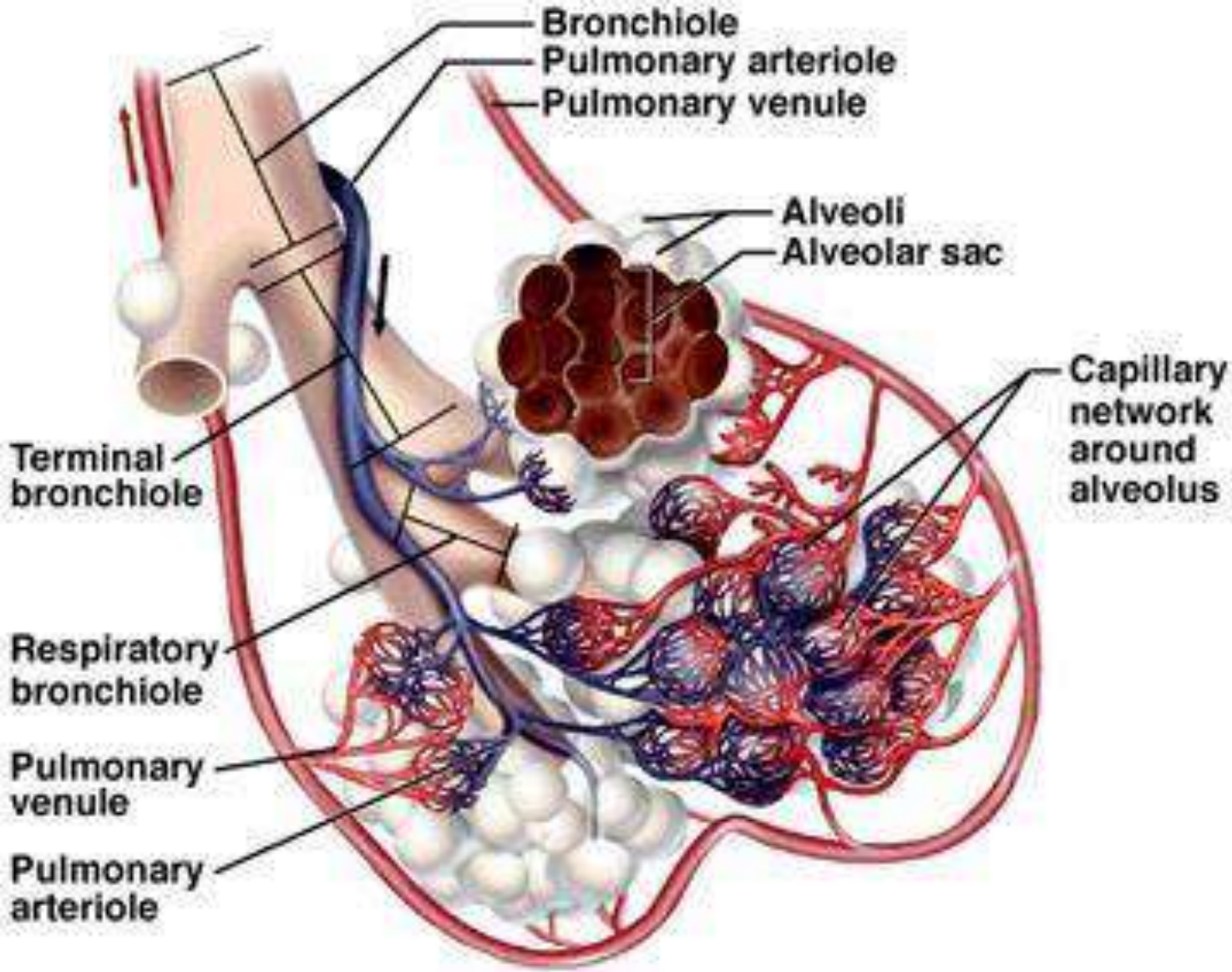
- Nose-mouth where the air enters
  - Moistening, warming the air
  - Filtering dust, bacteria
  - Nose lined with siliated mucous memrane
- Pharynx(throat): divides oesophagus and larynx
  - Directs the air to the larynx
  - 12,5cm long, muscular and fibrous tissue
- Larynx (voice box): directs the air to the trachea
  - Made of ring of cartilage
  - Muscle contraction helps to evacuate the irritants (coughing)

Bronchial Tree



Passageway of the air

- Trachea: directs air to the left and right lungs
  - splits into left and right bronchial tubes
  - 10 cm long tube
  - Made of incomplete hyaline cartilage
  - Muscle, connective tissue
- Bronchi : bronchial tree
  - Trachea divides into two bronchi
  - Similar structure like trachea
  - Incomplete cartilage rings
  - Mucous membrane
- Bronchioles
  - Final tube of the passageway
  - Muscular, fibrous and elastic tissue


Bronchiole
Pulmonary arteriole
Pulmonary venule
Alveoli
Alveolar sac
Capillary network around alveolus
Terminal bronchiole
Respiratory bronchiole
Pulmonary venule
Pulmonary arteriole

Passageway of the air

Alveoli :

- End of the bronchioles
- Tiny sacks, squamous epithelial cells
- Approximately 300 million alveoli, 70m^2
- Gases exchange takes place
- Large surface
- surrounded by numerous capillaries
- Oxygen from the inhaled air diffuses through the walls of the alveoli and adjacent capillaries into the red blood cells (internal respiration)

Lungs/pulmo-/pneumo

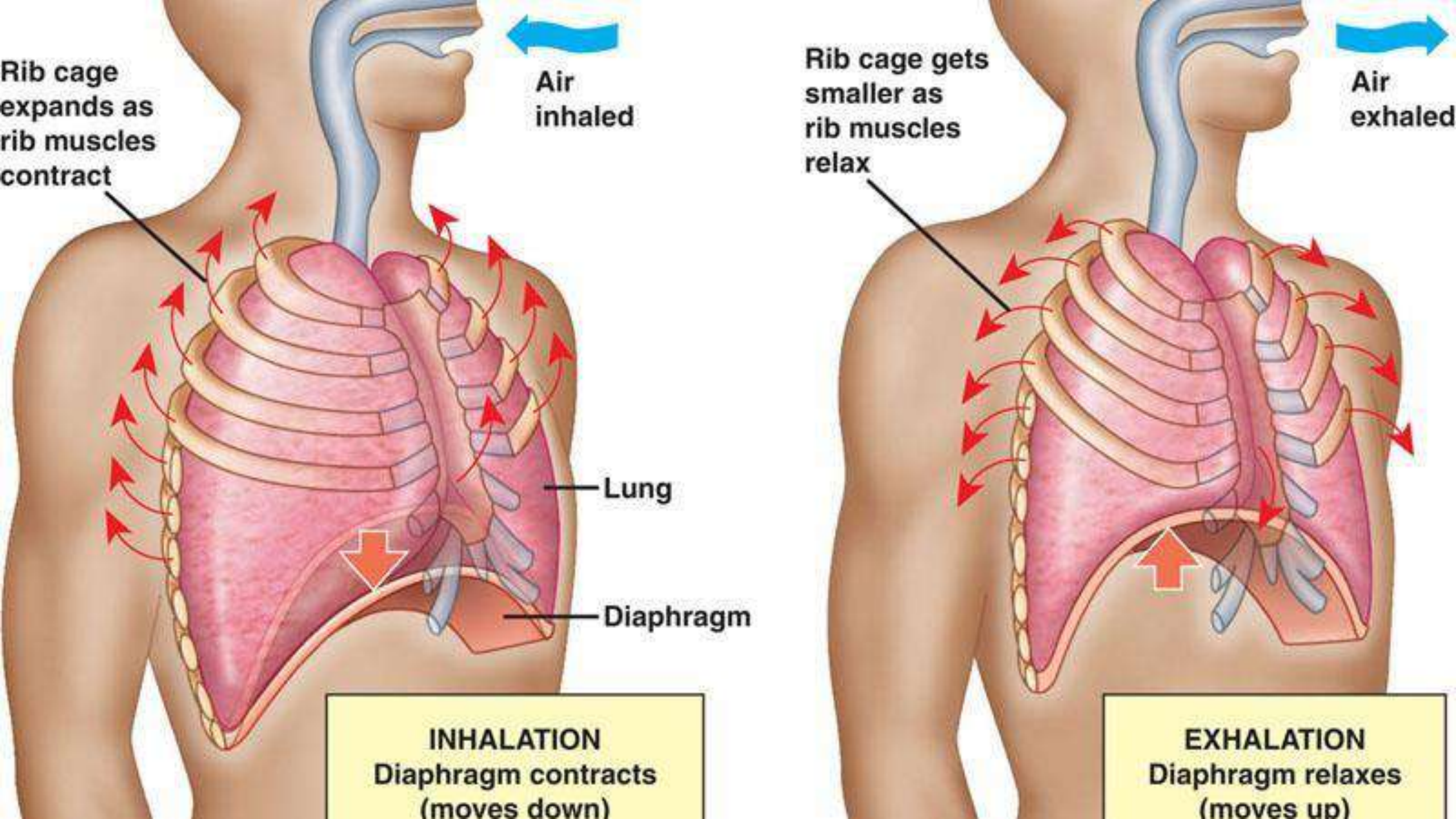
- Organ of the respiratory system in the chest cavity
- Left side: two lobes
- Right side: three lobes
- Spongy structure, 1.3 kg
- Lungs are surrounded by a two-layered membrane with the serous fluid between them called: **pleura**

Breathing mechanism

- Muscles to play rules:
  - Diaphragm (separates the chest cavity and abdominal region)
  - Intercostals muscles

Controlling:

- Autonomic nervous system:
  - brain stem: medulla oblongata and Pons Varolii
- Other factors:
  - Oxygen-carbon dioxide level
  - Hormones-emotions-hypothalamus
  - Chemical irritants- coughing, sneezing


Rib cage expands as rib muscles contract
Air inhaled
Lung
Diaphragm
INHALATION
Diaphragm contracts
(moves down)
Rib cage gets smaller as rib muscles relax
Air exhaled
EXHALATION
Diaphragm relaxes
(moves up)

Diseases

- Bronchitis:
  - Inflammation of the bronchial tube
  - Viral or bacterial
- Pneumonia:
  - Inflammation of the lung tissue
  - Viral or bacterial
- Emphysema :
  - the air sacs in the lungs (alveoli) are damaged.
  - the surface area of the lungs reduced, shortness of breath
- Hay fever (rhinitis):
  - Allergy to certain pollen
- Cystic fibrosis:
  - Congenital, effects the lung and digestive system
  - High rate in Ireland, test for new born baby
  - Life expectancy 37 years

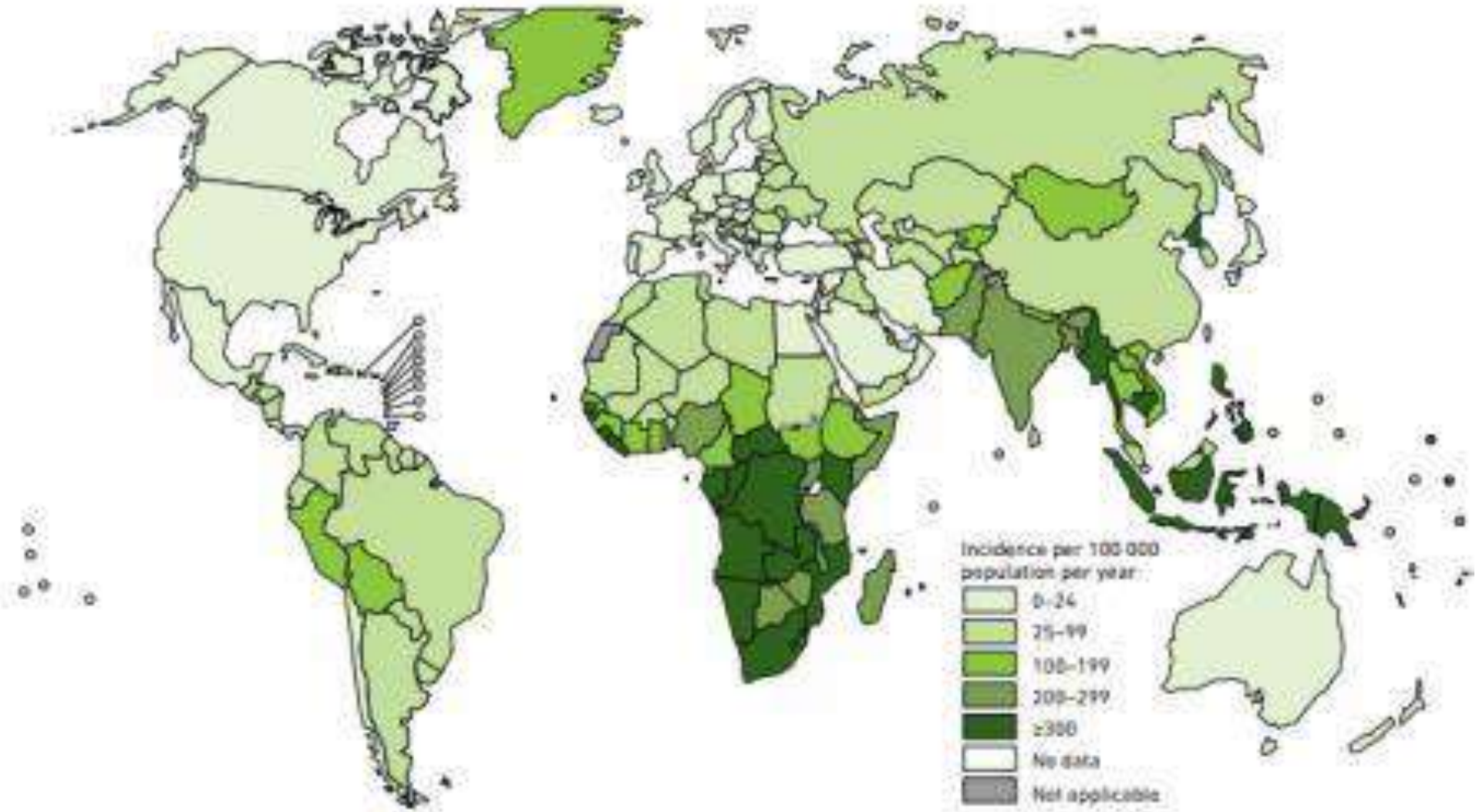
Diseases

- Pneumothorax (PTX):
  - Abnormal air collection in the pleural cavity
  - Lungs can collapse
  - Sudden chest pain, shortness of breath
- Lung cancer:
  - No signs in the early stage

  Symptoms:
  - cough that doesn't go away
  - Losing weight without trying
  - Shortness of breath
  - Chest pain
  - Leading cancer, 1.8 million death/year

- **Tuberculosis:**
- caused by a bacterium (Mycobacterium tuberculosis)
- contagious
- Can effect any part of the body (bones, nervous system)
- Numbers increasing since 1980
- 1.5 million death/year
- Can be inactive for years
- Many times resistant to antibiotic

Estimated TB incidence rates, 2017




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