CHAPTER 22 RESPIRATORY

respiration processes

• pulmonary ventilation
  • move air in / out lungs
• external respiration
  • exchange gases air - blood
• transportation of gases
• internal respiration
  • exchange gases blood - cells
• cell respiration
  • glucose \( \rightarrow \) ATP use \( \text{O}_2 \) make \( \text{CO}_2 \)

Respiratory system

• pulmonary ventilation

• external respiration

functions of respiratory system

• gas exchange
  • move air
  • filter air
  • warm air
  • exchange gases

• temperature regulation

• acid – base regulation

• vocal production

• smell

parts of respiratory system

• conducting zone
  • move air
    • nose , nasal cavities
    • pharynx
    • larynx
    • trachea
    • bronchus and its branches

• respiratory zone
  • exchange gases
    • respiratory bronchioles
    • alveoli and alveolar ducts

parts of conducting zone

• upper respiratory tract
  • above thoracic cavity
    • nose
    • pharynx

• lower respiratory tract
  • within thoracic cavity
    • larynx
    • trachea
    • lung
nose

- external nares = nostril
- nasal septum = ??
- nasal conchae and meatus = superior, middle, inferior
  - function ??
- vestibule
- posterior nasal aperture = internal nares
- olfactory epithelium = superior
  pseudostrat ciliated + neurons
- paranasal sinuses = air filled
  lined with same mucosa
  - which bones ??

respiratory mucosa

- what kind of tissue ??
  - also goblet cells = secrete mucus
- functions:
  - mucus traps dust, bacteria, other small particles
  - cilia moves contaminated mucus to pharynx
  - moistens and warms the air

pharynx

- nasopharynx
  - pharyngeal and tubal tonsils
  - pharyngotympanic tube
  - respiratory mucosa
  - uvula
- oropharynx
  - stratified squamous epit = friction from food
  - palatine, lingual tonsils
- laryngopharynx
  - divides to esophagus (food)
    - larynx (air)

larynx

- = voice box
- hyoid bone to trachea

function:
- air passage = cartilages
- vocal production = vocal cords

larynx - cartilages

- thyroid cartilage
  - laryngeal prominence = Adam’s apple
- cricoid cartilage = inferior, ring of cartilage
- epiglottis = closes during swallowing
  - vestibular ligament
• internal
  – arytenoid (2) anchor the vocal cords
  – corniculate (2)
  – cuneiform (2)
  larynx – vocal structures

• vocal cords = vocal folds elastic ct
  simple squamous epith

• rima glottidis - opening
• glottis = rima glottidis + vocal cords
• intrinsic muscles
  – cricoarytenoid muscles
  trachea

• = windpipe
• job = move air fast

• 16 – 20 cartilage rings keep trachea open
  incomplete posteriorly
• trachealis muscle posterior wall
  contracts during cough
• carina
• pseudostratified ciliated epithelium
  bronchial tree

• primary (main) bronchus R & L
• secondary (lobar) bronchi 3 right ; 2 left
• tertiary (segmental) bronchi 10 each lung
• bronchioles < 1mm diameter
  – elastic c.t replaces cartilage
  – simple cuboid or columnar w/o cilia
  – smooth muscle
• terminal bronchioles respiratory zone

• respiratory bronchioles lead into alveolar ducts
• alveolar ducts lead into alveoli
• alveolar sacs cluster of alveoli
• alveoli

• = functional units of gas exchange

• alveolar type I cells tissue?
• capillaries tissue?

• respiratory membrane
  – = alveolar + capillary epithelium + basal lamina

alveoli
• alveolar type II cells = septal cells
  — pulmonary surfactant

• elastic c.t.
• macrophages

respiratory histology

• stratified squamous epithelium
  — nasal cavity
  — oro – and laryngopharynx
  — larynx above vocal cords

• respiratory epithelium
  — nasopharynx
  — larynx below vocal cords
  — trachea, bronchi and bronchioles

• simple cuboidal epithelium
• simple squamous epithelium

alveoli

lungs

• apex
• base

surfaces
  — costal
  — vertebral
  — mediastinal
    • cardiac notch
    • hilus
      — pulmonary art and veins
      — bronchus
      — nerves
      — lymph vessels

lobes of the lung

• right: superior lobe
• middle lobe
• inferior lobe

left: superior lobe

lobes of the lung

fissures: divide lobes
  — left
    — oblique fissure
  — right
    — oblique fissure
    — horizontal fissure

Pleura

• pleura
  — parietal
  — visceral

• pleural cavity
  — between 2 pleura

• pleural fluid
  — prevent friction
  — sticky
    — allows easy movement of lungs
    — holds lung close to thoracic wall during inhalation
blood supply

• for gas exchange
  — pulmonary arteries
  — pulmonary veins

• for lung tissue
  — bronchial arteries
  — bronchial veins

nerve supply

• parasympathetic  bronchoconstriction

• sympathetic  bronchodilation
  vasodilation , vasoconstriction

• sensory

breathing muscles

• diaphragm
  — action  flattens  - increases thoracic volume

• intercostal muscles
  — external ICM  pull up and out  increase volume
  — internal ICM  pull down and in  decrease volume

neural control

• medulla  rhythmicity area

• pons

• hypothalamus, limbic  emotions

• cerebrum  conscious control

• sensory  $O_2$, $CO_2$, pH changes
  — central chemoreceptors
    • medulla, hypothalamus
  — peripheral chemoreceptors
    • carotid and aortic bodies

diseases

• asthma

• COPD
  — emphysema
  — chronic bronchitis

• pneumonia

• cystic fibrosis

• atelectasis

• cancer