Respiratory System

- Nose
- Nasal cavity
- Nasal sinuses
- Pharynx
- Larynx
- Trachea
  - Respiratory tree
- Lungs
- Alveoli
Functions

• Surface area for gas exchange
• Ventilation
• Protection of respiratory surfaces
  – Dehydration
  – Environmental changes
• Immune functions
• Vocalization
• Aids in regulation internal parameters
  – Blood volume
  – Blood pressure
  – Body fluid pH
Respiratory Epithelium

- PCCE
- Mucus cells
- Lines respiratory tract
  - Except pharynx
  - Except alveoli
Nose

- Dorsum
- Apex
- External nares
- Nasal septum
- Nasal vestibule
- Nasal cavity
Paranasal Sinuses

- Frontal
- Maxillary
- Sphenoid
- Ethmoidal
Nasal Cavity

- Olfactory epithelium
- Internal nares (choanae)
- Nasal concha
  - Superior
  - Middle
  - Inferior
- Hard palate
- Soft palate
Pharynx

- Nasopharynx
  - posterior to nasal cavities
- Oropharynx
  - posterior to oral cavity
- Laryngopharynx
  - posterior/superior to the larynx
Larynx

- Thyroid Cartilage
- Cricoid Cartilage
- Artenoid Cartilage
- Corniculate Cartilage
Vocal Cords

- Glottis
- Vocal folds (vocal cords)
  - cords of fibrous CT
  - vibrate during speech
- True vocal cords
- Vestibular folds (false vocal cords)
- Laryngeal muscles involved in speech and swallowing
Vocalization

Adduction of vocal cords
- Thyroid cartilage
- Cricoid cartilage
- Vocal cord
- Lateral cricoarytenoid muscle
- Arytenoid cartilage
- Corniculate cartilage
- Posterior cricoarytenoid muscle

Abduction of vocal cords

Anterior

Posterior

(a)

(b)

(c)

(d)

Base of tongue
- Epiglottis
- Vestibular fold
- Vocal cord
- Glottis
- Corniculate cartilage
Trachea and Primary Bronchi

- **Windpipe**
- **Trachial cartilages**
  - hyaline cartilage rings
  - 16-20
  - Prevents collapse of tube
- **Trachealis muscle**
  - Smooth muscle support for C-rings
  - Closes the circle of C ring by forming bridge
  - Helps adjust air flow to lungs
Histology of the Trachea

(a) Larynx
- Thyroid cartilage
- Cricoid cartilage
- Primary bronchi
- Secondary bronchi
- Tertiary bronchi

(b) Trachea
- Mucus
- Mucociliary escalator
- Particles of debris
- Epithelium
- Goblet cell
- Ciliated cell
- Mucous gland
- Cartilage
- Chondrocytes

(c) Trachealis muscle
- Hyaline cartilage ring
- Mucosa
- Mucous gland
- Perichondrium
Bronchial Tree

- $1^\circ$ bronchi
  - 1st branches off trachea
- $2^\circ$ bronchi
  - 1 per lobe of lung
- $3^\circ$ bronchi
  - branch off secondary
- Bronchioles
- Terminal bronchii
- Respiratory bronchioles
- Alveolar ducts
Gradual Changes in the Bronchial Tree

- Decrease in diameter
- Decrease in hyaline cartilage support
- Decrease in smooth muscle
- Gradual thinning of epithelium
- In larger bronchioles
  - hyaline cartilage in plates
  - smooth muscle still present
Lungs

- Apex
- Base
- Hilum
- Right lung
  - Superior lobe
  - Middle lobe
  - Inferior lobe
- Left lung
  - Superior lobe
  - Inferior lobe
  - Cardiac notch
Alveoli

- Number: ~300,000,000
- Size (individual) ~ 60-100 microns diameter
- Surface area (collective) = 1500 square feet
- Type I alveolar cells
  - simple squamous epithelium
- Type II alveolar cells
  - septal cells
  - secrete surfactant
Respiratory Membrane

Capillary endothelial cell
Respiratory membrane
Fluid with surfactant
Great alveolar cell
Lymphocyte

Squamous alveolar cell
Alveolar macrophage

(b)