

# **Ch16: Respiratory System**

# Function:

- O<sub>2</sub> in and CO<sub>2</sub> out of the blood vessels in the lungs
- O<sub>2</sub> out and CO<sub>2</sub> into the blood vessels around the cells
  
- Gas exchange happens in \_\_\_\_\_
- Other organs purify, humidify, and warm the incoming air
  - also act as conducting passageways

# Cells, Tissues, and Membranes

- **Cells**
  - Surfactant secreting cells
  - Macrophage
- **Connective**
  - Hyaline cartilage in the larynx and nose
  - Elastic cartilage in the larynx
- **Epithelial**
  - Simple squamous – alveoli
  - Pseudostratified columnar – respiratory passageway
- **Membranes**
  - Mediastinum
  - Pleural – visceral and parietal

# Development

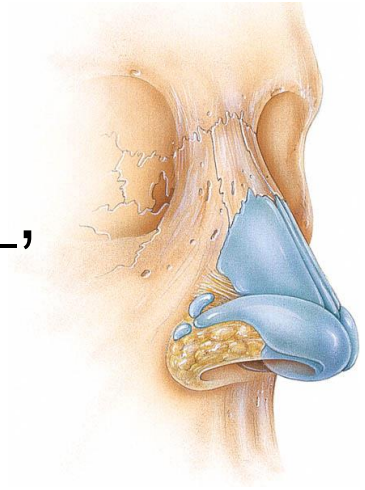
- Lungs are one of the \_\_\_\_\_  
to develop
  - Surfactant levels are not large until late in pregnancy
  - \_\_\_\_\_ = fatty molecule that lowers the surface tension of water in the lining of alveoli
- Fetus – lungs filled with \_\_\_\_\_
  - All respiratory gas exchange made by \_\_\_\_\_
- At birth – passageways are drained and alveoli \_\_\_\_\_  
\_\_\_\_\_ for the first time
- Lungs are not fully inflated until \_\_\_\_\_

# ***Anatomy of the Respiratory System***

- Consists of the nose, pharynx (throat), larynx (voice box), trachea (windpipe), bronchi, and lungs with alveoli.

# Nose

**Function** = warming, \_\_\_\_\_,  
and moistening inhaled air; detecting  
smells; and modifying the sounds  
of speech



## Externally:

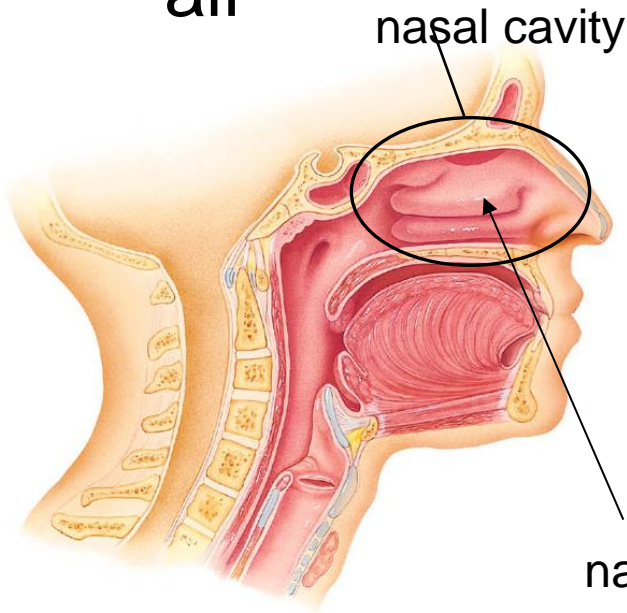
- Air enters external nares (\_\_\_\_\_)

## Internally:

- Divided into right and left sides by the ***nasal septum***
- Space within = \_\_\_\_\_

# Nose

- ***Nasal Conchae*** = three shelves within the nasal cavity lined with mucosa
  - \_\_\_\_\_ through the cavity and traps particles, as well as warm the air



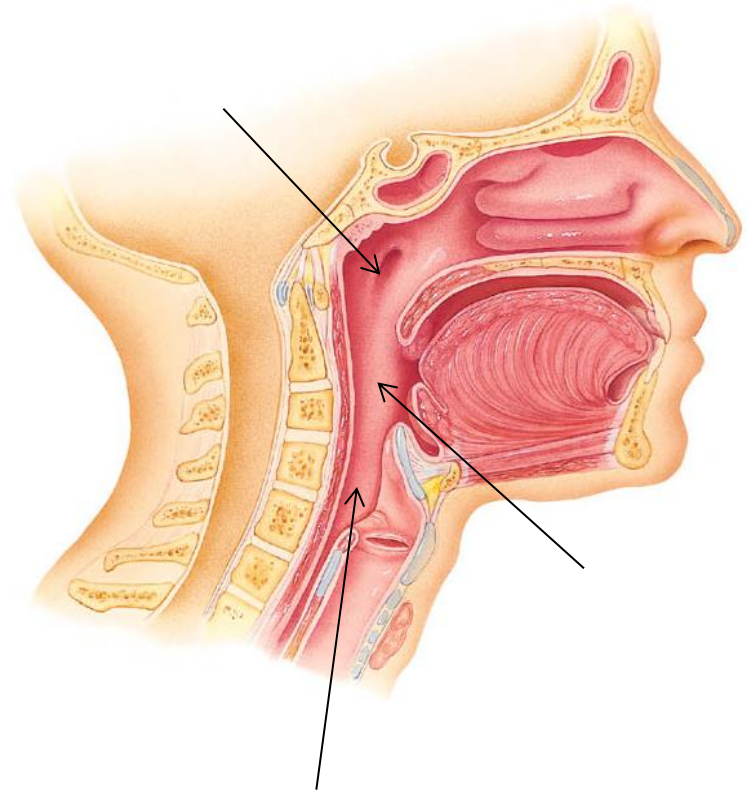
- \_\_\_\_\_ within the nasal cavity wave mucus to the throat, where it, along with trapped particles, is swallowed and/or spit out.

- The nasal cavity is separated from the oral cavity below by a partition called the palate
  - Hard palate – \_\_\_\_\_ part that is supported by bone
  - Soft palate – unsupported \_\_\_\_\_ part
- The nasal cavity is surrounded by a ring of paranasal \_\_\_\_\_
  - **Function:** lighten skull, add resonance chambers for speech, produce mucus which drains into the nasal cavity



# Pharynx

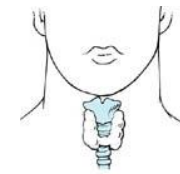
- Funnel-shaped tube from the end of the nasal cavity to the superior border of the larynx
- **Function** = passageway for \_\_\_\_\_, \_\_\_\_\_, provides a resonating chamber for voice, and houses the tonsils, which are lymphatic nodules



- \_\_\_\_\_ (uppermost portion) = Air travels from the nasal cavities into the nasopharynx
  - Also, the *auditory tubes* open into the nasopharynx, allowing pressure equalization in the middle ear
- \_\_\_\_\_ (middle portion) = Has openings into the mouth and nasopharynx; passage for air and food
- \_\_\_\_\_ (lowermost portion) = Connects with the esophagus, oropharynx, and the larynx

# Larynx

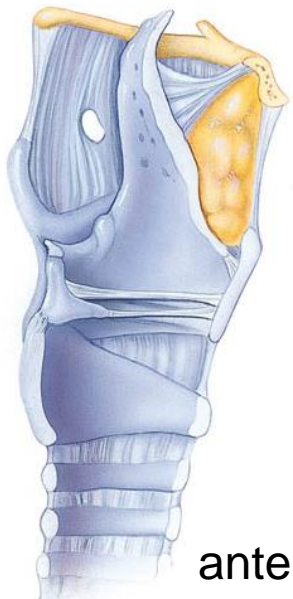
- **Larynx** (Adam's Apple = rigid cartilage structure (hyaline and elastic) that connects the pharynx with the trachea (windpipe))
- **Function** = \_\_\_\_\_



larynx

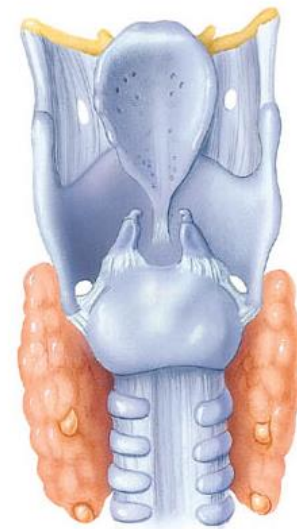


anterior



anterior

- Present in both genders, but is \_\_\_\_\_ and more pronounced in males.

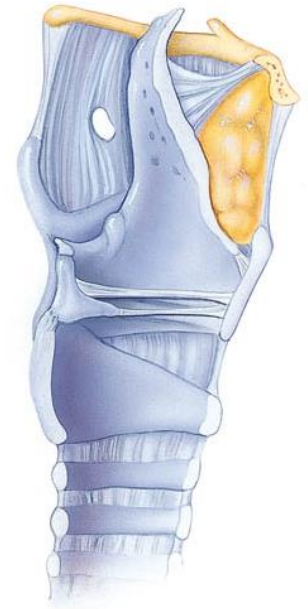


posterior

- ***Epiglottis*** = large flap of \_\_\_\_\_ cartilage which attaches to the anterior rim of the thyroid cartilage and the hyoid bone
  - As you swallow, the larynx and pharynx \_\_\_\_\_ and the pharynx widens as it rises to accommodate the swallowed food
  - As the larynx rises, the epiglottis moves down and \_\_\_\_\_ over the opening to the trachea, preventing food and/or drink from getting into the airways

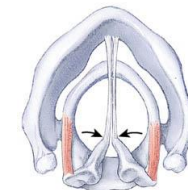
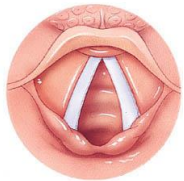
# Voice Production

- The structures that allow for vocalization are folds in the larynx
- **False vocal cords** = allow you to “hold your breath against \_\_\_\_\_”, as when you pick up something heavy
- **True vocal cords** = vibrate to give your voice \_\_\_\_\_ and \_\_\_\_\_. The space between the folds is called the \_\_\_\_\_



superior view:  
muscles and  
cartilage

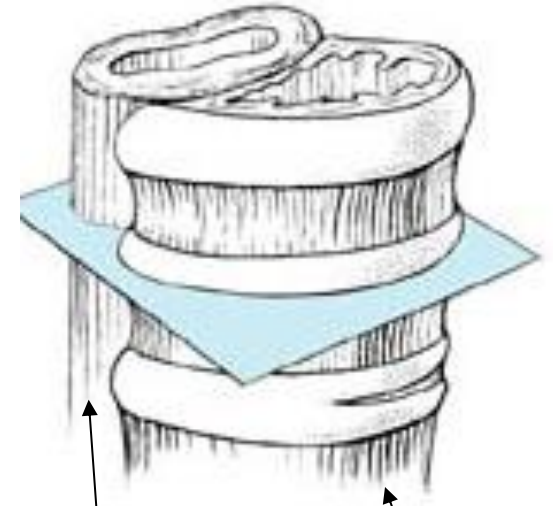
superior view:  
as if through a  
laryngoscope



- Tiny \_\_\_\_\_ within the larynx move the folds closer together, farther apart.
- Males tend to have deeper voices because their vocal cords are usually \_\_\_\_\_ and \_\_\_\_\_ than those of females. Thus, they naturally vibrate more slowly

# Trachea

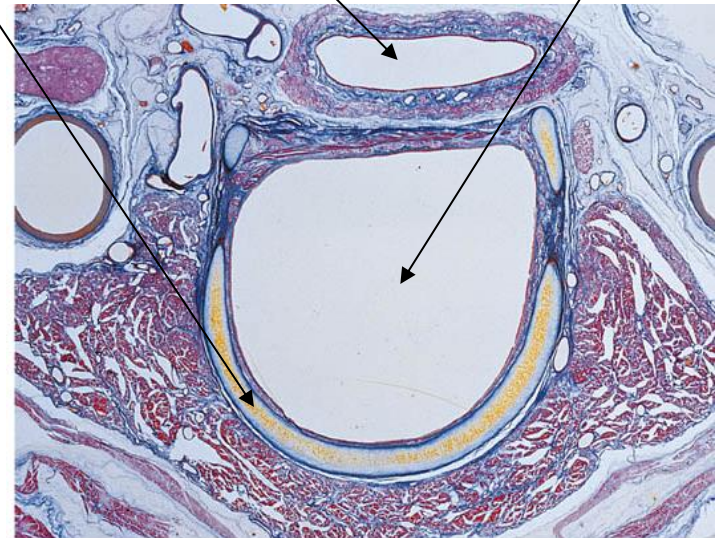
- Also known as the \_\_\_\_\_
- Tubular air passage that splits in to ***right and left bronchi***.
  - Wall is lined with mucosa (pseudostratified ciliated columnar epithelium)
  - Cilia in the trachea move mucus \_\_\_\_\_ it to the throat to remove the trapped particles from the respiratory tract



cartilage "C"

esophagus

trachea



- Supported by C-shaped rings of cartilage to keep trachea from \_\_\_\_\_
- The gap in the C faces the esophagus, which is posterior to the trachea.
  - This accommodates the \_\_\_\_\_ as food is swallowed and sent down to the stomach

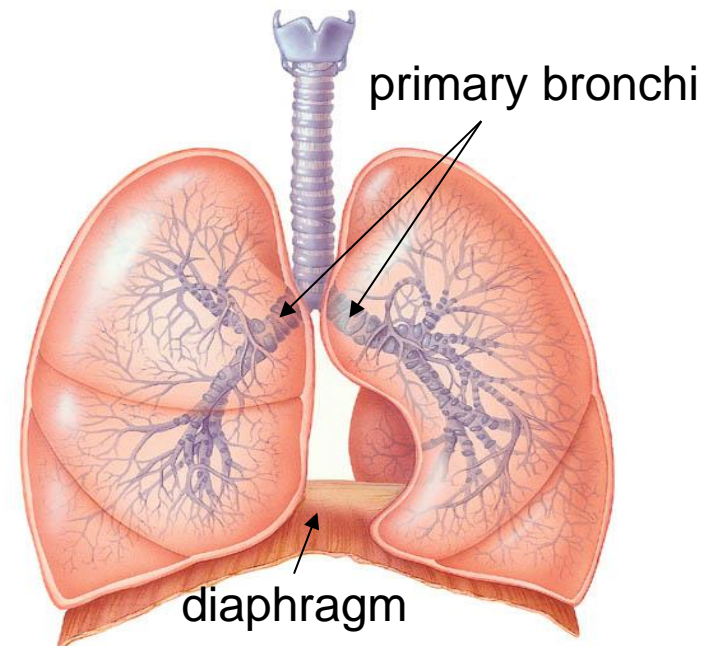


# Bronchi and Bronchioles

- Trachea divides at its bottom into the right and left ***primary bronchus*** = entryways into each lung
  - Right primary bronchus is wider, \_\_\_\_\_, and straighter than the left
    - more common site for an inhaled object to become \_\_\_\_\_
  - By the time air gets to bronchi, it is warmed, cleansed, and well humidified

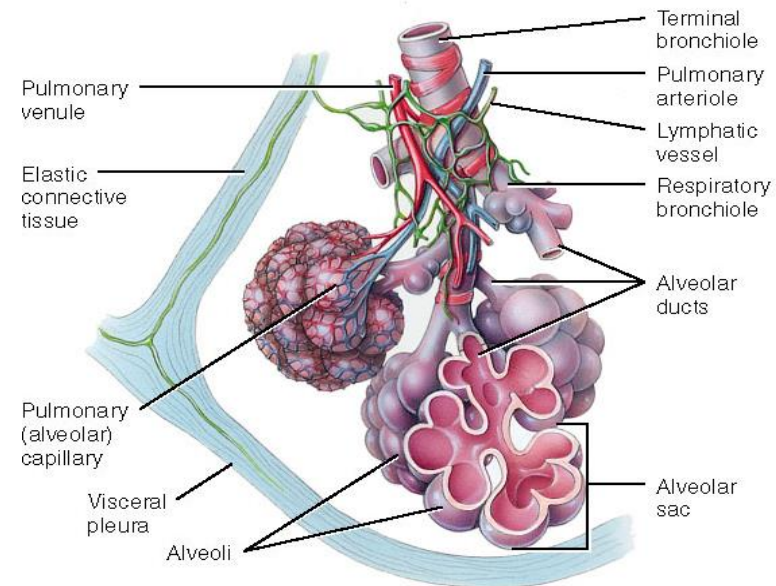
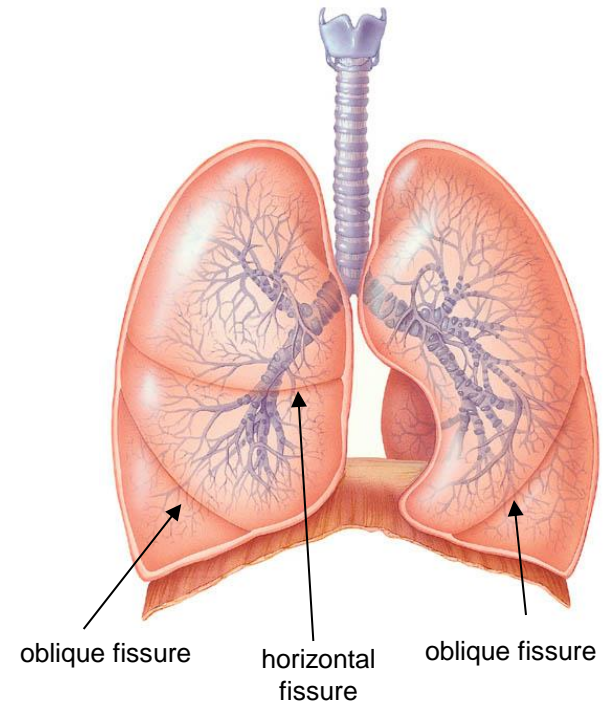
- Once in the lung, the primary bronchi split into ***secondary bronchi*** – one for each lobe of the lung
  - Secondary bronchi divide into *tertiary bronchi*, which continue to “divide” into smaller and smaller tubes known as
-

- As branching increases:
  - Cartilage rings \_\_\_\_\_, then ultimately vanish
  - Smooth muscle \_\_\_\_\_ – this can dilate or constrict airways due to demand
    - \_\_\_\_\_ **attacks** involve spasms of this smooth muscle, constricting the airways.



# Lungs

- Spongy, \_\_\_\_\_ shaped organ in the thoracic cavity that is separated by the heart and other structures in the mediastinum
- Surrounded by the ***pleural membrane*** which has a visceral side and a parietal side. In between the layers is filled with fluid to ease \_\_\_\_\_.



(a) Diagram of a portion of a lobule of the lung

- The smallest organizational unit of the lung is a \_\_\_\_\_.
- Terminal bronchioles subdivide into ***respiratory bronchioles***, which are capable of gas exchange.
- These further subdivide into ***alveolar ducts*** and eventually into \_\_\_\_\_.

# Alveoli

- Cup-shaped section of an alveolar sac which is the \_\_\_\_\_ by \_\_\_\_\_ between the lungs and the bloodstream
  - Walls are extremely thin simple squamous tissue
- **The Respiratory Membrane:** combination of \_\_\_\_\_ and \_\_\_\_\_ that separate gas in the lungs from the bloodstream.

- Within the alveoli are cells called ***surfactant secreting cells***, which keep the inner surface of the alveoli moist by secreting a fluid known as ***alveolar fluid***.
- Contained within alveolar fluid is **surfactant** – a lipid/protein substance that helps prevent alveoli from \_\_\_\_\_.
- Also have ***alveolar macrophages*** that are present to help remove particulates and other debris in the alveolar spaces.

# Close view of an Alveolus:

