

Respiratory System (Ch. 23)
Human Anatomy lecture

I. Overview

A. Functions with cardiovascular system (= *cardiopulmonary* system)

- ① Deliver O₂
- ② Remove CO₂

Also

- Modifies air, delivers smells, produces sounds
- other physiological functions

B. Functionally 2 divisions

- 1. Conducting division:

- 2. Respiratory division:

C. Anatomically divided differently

- 1. Upper respiratory tract:

- 2. Lower respiratory tract:

II. Upper respiratory tract (KNOW Fig. 23.2)

A. Nose

Nasal cavity divided by nasal septum into Left & Right nasal fossae

External nose → formed by
L. & R. naris (pl. = nares)



L. & R. vestibule →



Internal nose

3 prs meatuses formed by 3 prs conchae (turbينات)



L & R posterior nasal apertures →
(choanae)



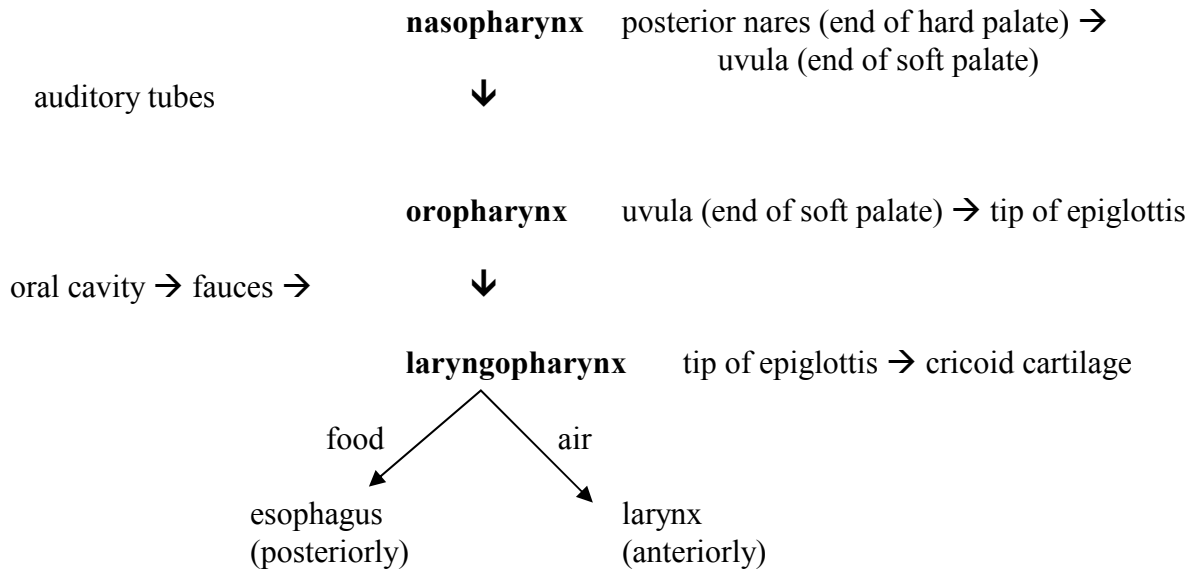
pharynx

- Why conchae? →
- L & R inferior concha has erectile tissue (**swell body**) →

B. Pharynx (= *throat*)

1. Funnel-shaped passage

2. 3 Divisions (Fig. 23.2c)



III. Lower respiratory tract

A. Larynx (voice box) → **KNOW Fig. 23.4** (partially)

1. Short passageway anterior to C₄-C₆

2. 9 cartilages, several ligaments and muscles

① epiglottis -

② thyroid (Adam's apple) -

③ cricoid -

+ 3 small pairs posteriorly and laterally

3. Mucosa forms 2 pairs of folds (Fig. 23.5)

- vestibular folds (false vocal cords) -
- vocal cords (vocal folds) -
- glottis -

4. Lined w/stratified squamous epi.
pseudostratified ciliated col. epi.
5. When you swallow:
 - larynx elevates,
 - epiglottis hinges “down,”
 - vestibular folds close glottis

B. Trachea (windpipe) → **KNOW Fig. 23.7a**

1. Anterior to esophagus,
2. Tubular passage
3. Lined w/pseudostratified ciliated col. epi.

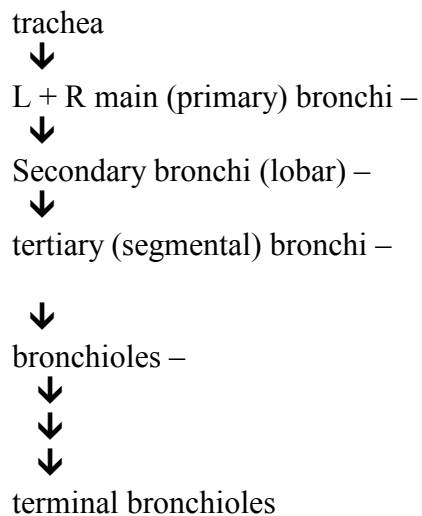
4. Trachealis muscle (smooth) and elastic c.t. hold ends of “C” together
- 5.

Why cartilage? Why C-shaped and not complete rings?

- maintains patency
- allows expansion
- allows adjustment of diameter

C. Bronchial tree (Fig. 23.7a)

1. System of branching tube/tubules (your text doesn't include trachea)



2. As move “down” tree:
 - diameter ↓
 - cartilage ↓
 - smooth muscle ↑
 - epithelium changes to non-ciliated simple cuboidal

3. Nicotine paralyzes cilia

D. Lungs

1. Surrounded by pleural membrane (Fig. 1-15)
 - insert sketch-

parietal pleura

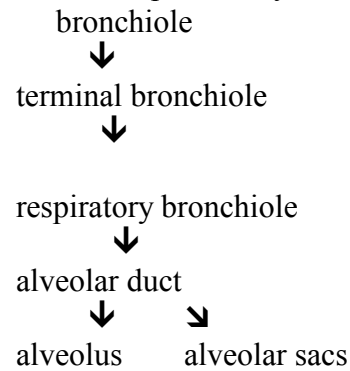
pleural cavity
serous fluid

visceral pleura

Functions? ①
 ②
 ③

2. Gross anatomy **KNOW Fig. 23.9**
 - apex & base
 - costal & mediastinal surfaces
 - hilum –indented region
 - root = bronchus & neurovascular bundle
 - lobes and fissures
 - cardiac impression
3. Each lobe divided by inward extensions of visceral pleura into bronchopulmonary segments (see chap. opening art, p. 632)
4. Each bronchopulmonary segment subdivided into

5. Within a pulmonary lobule: (**KNOW Fig. 23.11**)



6. Lots of elastic fibers in c.t. surrounding all these and in walls of tubes

7. Lung receives double blood supply

deoxygenated pulmonary A.	pulmonary V.
oxygenated bronchial AA.	azygos system

E. Alveolus

1. Designed to maximize O₂/CO₂ exchange:

2. Histology (Fig. 23.11)

①squamous (type I) alveolar cells

②great (type II) alveolar cells → outnumber type I

③Alveolar macrophages (dust cells) [WBC]

3. Alveolus jacketed by dense capillary network
 - gases must diffuse across respiratory membrane (Fig. 23.11c)
 - 6 layers (more than your text implies)
 - ① surfactant
 - ② squamous cell
 - ③ squamous cell basement membrane
 - ④ interstitial space
 - ⑤ capillary basement membrane
 - ⑥ capillary endothelial cell

4. Vital to prevent accumulation of fluid in lungs – How?

IV. Functional anatomy of breathing (Fig. 23.13)

A. Basic physics

↑ volume = ↓ pressure
 ↓ volume = ↑ pressure

How do you accomplish this change in thoracic volume?

B. Normal inspiration

1. Diaphragm – ~ 2/3

diaphragm relaxed
between breaths

diaphragm contracted
during inspiration

-- Increases vertical dimension of thorax 1 → 7 cm

2. Ribs - ~ 1/3

At rest, ribs angle ↘

Inspire: ribs angle →

“Bucket handle”

-- Increases anterior-posterior (AP) and transverse dimensions

C. Forced inspiration uses additional accessory muscles of inspiration.

D. Normal expiration is a passive process

1.

2.

E. Forceful expiration

-- internal intercostals contract:

-- abdominal muscles contract: