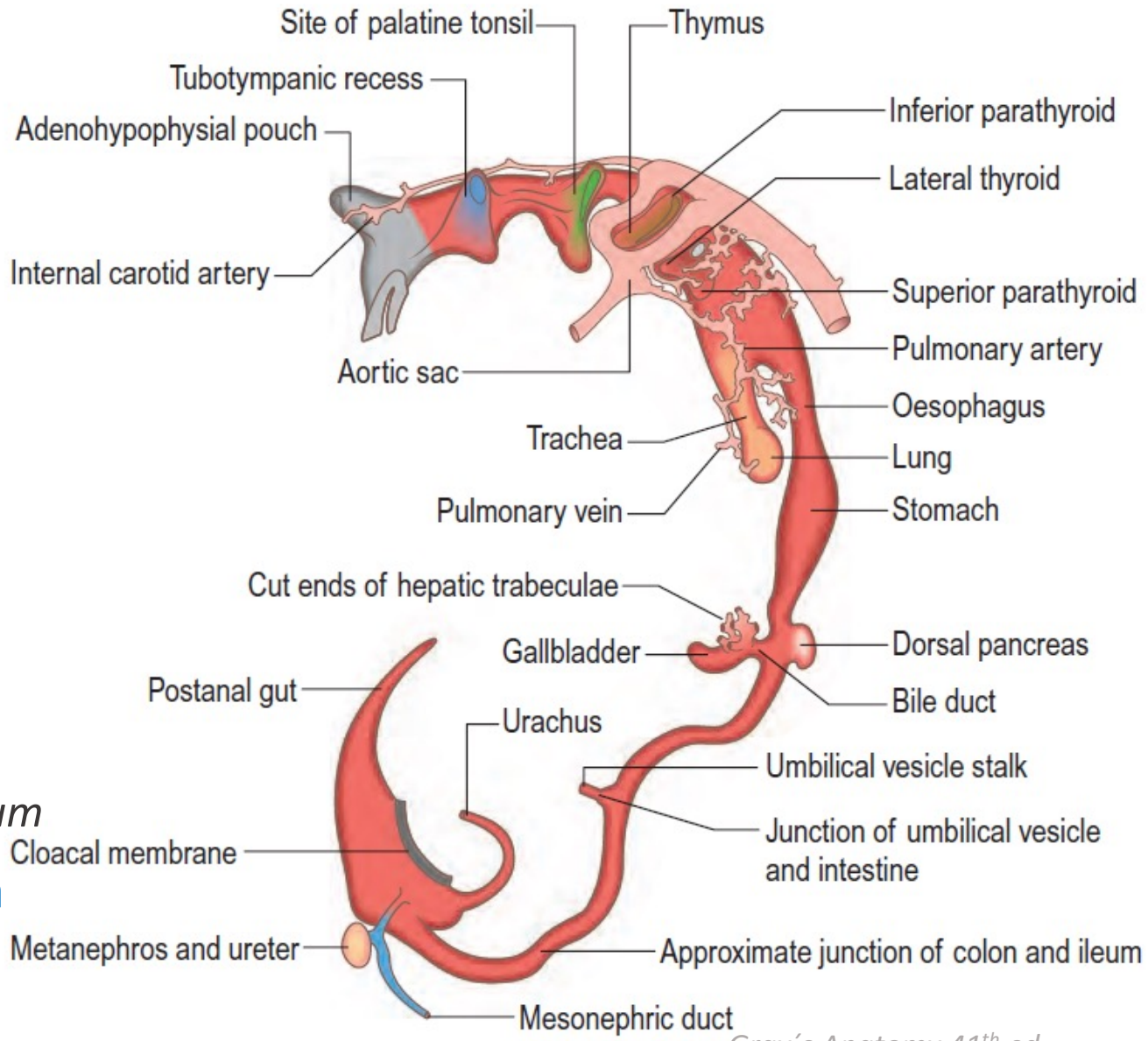
General anatomy – metabolic systems

Prof. MUDr. Jiří Ferda, Ph.D.

Gastropulmonal system

- **Ectodermal division - stomodeum**
  - **Cavitas oris**
  - **Cavitas nasi**
  - **Nasopharynx rostrální část**
- **Endodermal divisionarchenteron**
  - **foregut**
  - *Pharynx, oesophagus, ventriculus, pulmones*
  - **midgut**
  - *Intestinum tenue, intestinum crassum*
    - *To lienal flextion*
  - **hindgut**
  - *Colon descendens, sigmoideum a horní rektum*
- **Ectodermal distal division - proctodeum**
  - **Canalis analis**

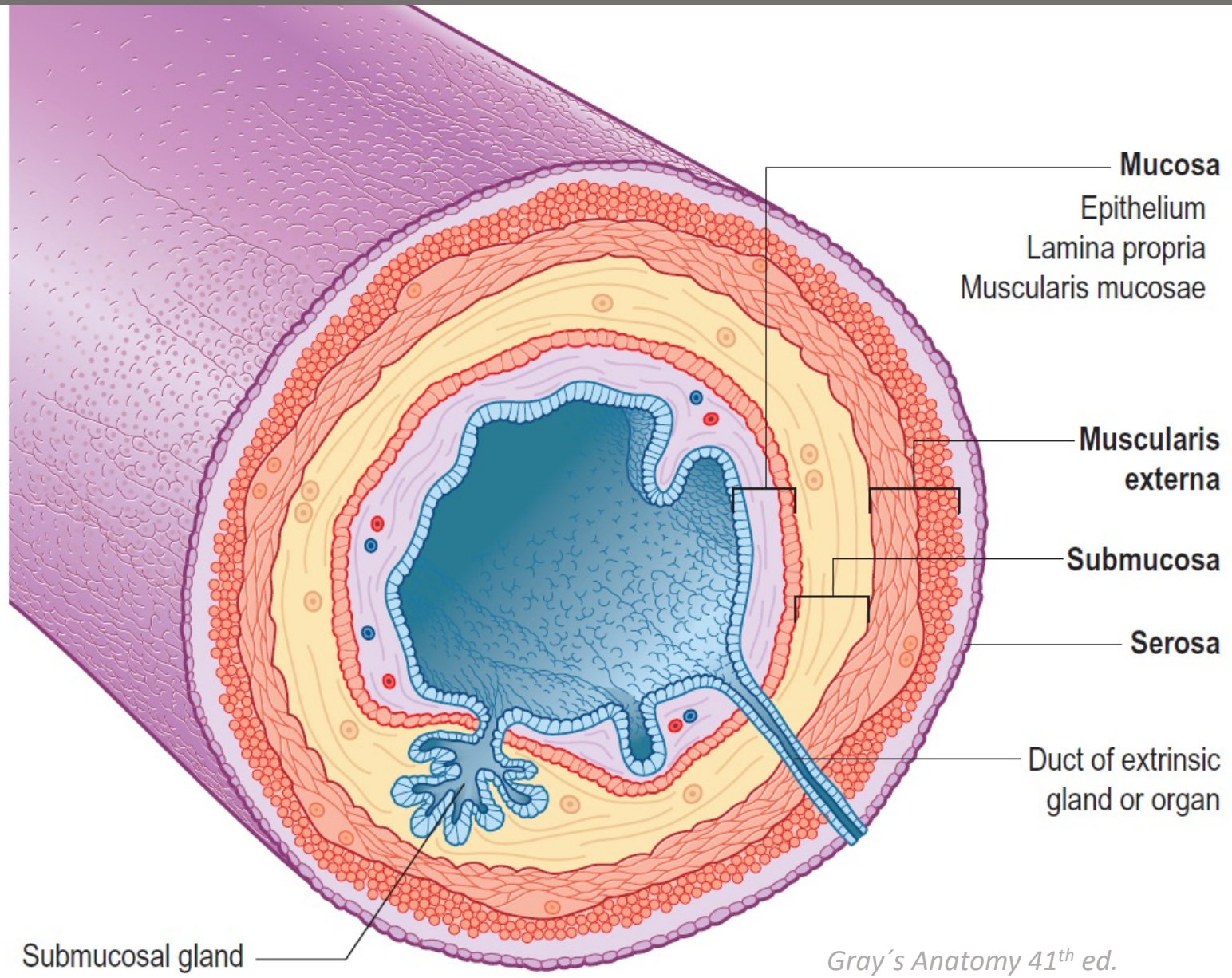


Gray´s Anatomy 41th ed.

Digestive system

- mucosa, muscularis mucosae
- submucosa
- muscularis
- serosa (adventitia)

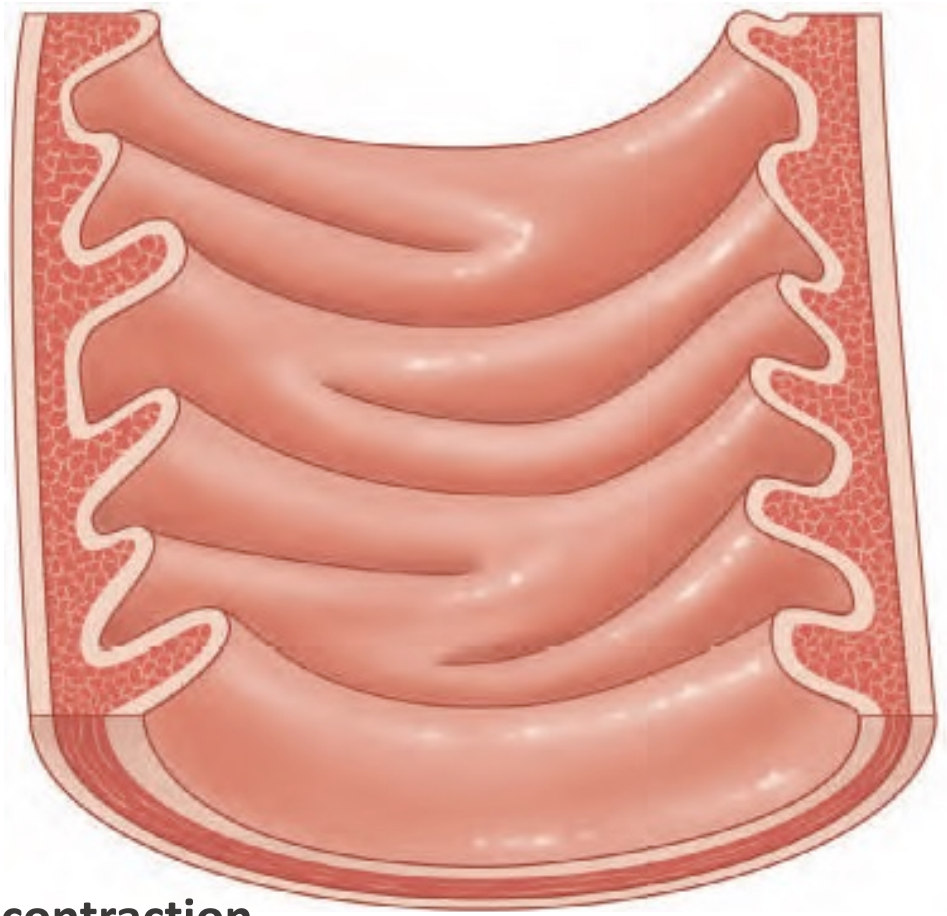
- Submucous glands
- Extramural glands



Gray´s Anatomy 41th ed.

Tunica mucosa

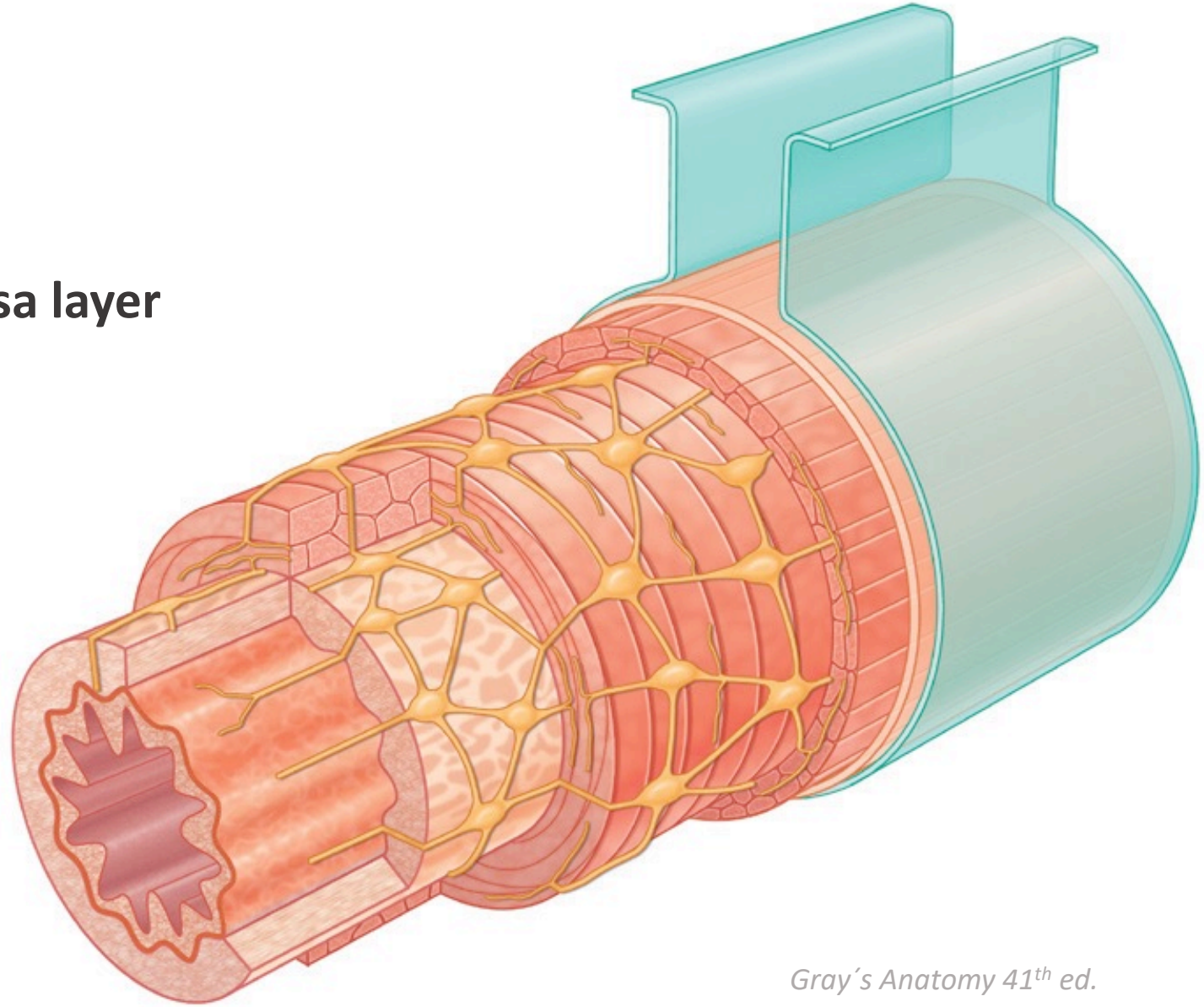
- **mucosa**
  - glossy
  - Plicae – folds
  - Papillae
  - Vili
- **Mucus**
- **Lamina epithelialis**
- **Lamina propria mucosae**
  - Connective tissue enters folds
- **Lamina muscularis mucosae**
  - Smooth muscle
  - Protecting the motion of mucosa during outer muscle contraction
- **Folliculi lymphatici solitarii, aggregati**



Gray´s Anatomy 41th ed.

Tunica submucosa

- Joining mucosa and muscular layer
- **Plexus submucosus**
- Autonomous plexus
- Neural branches entering the mucosa layer

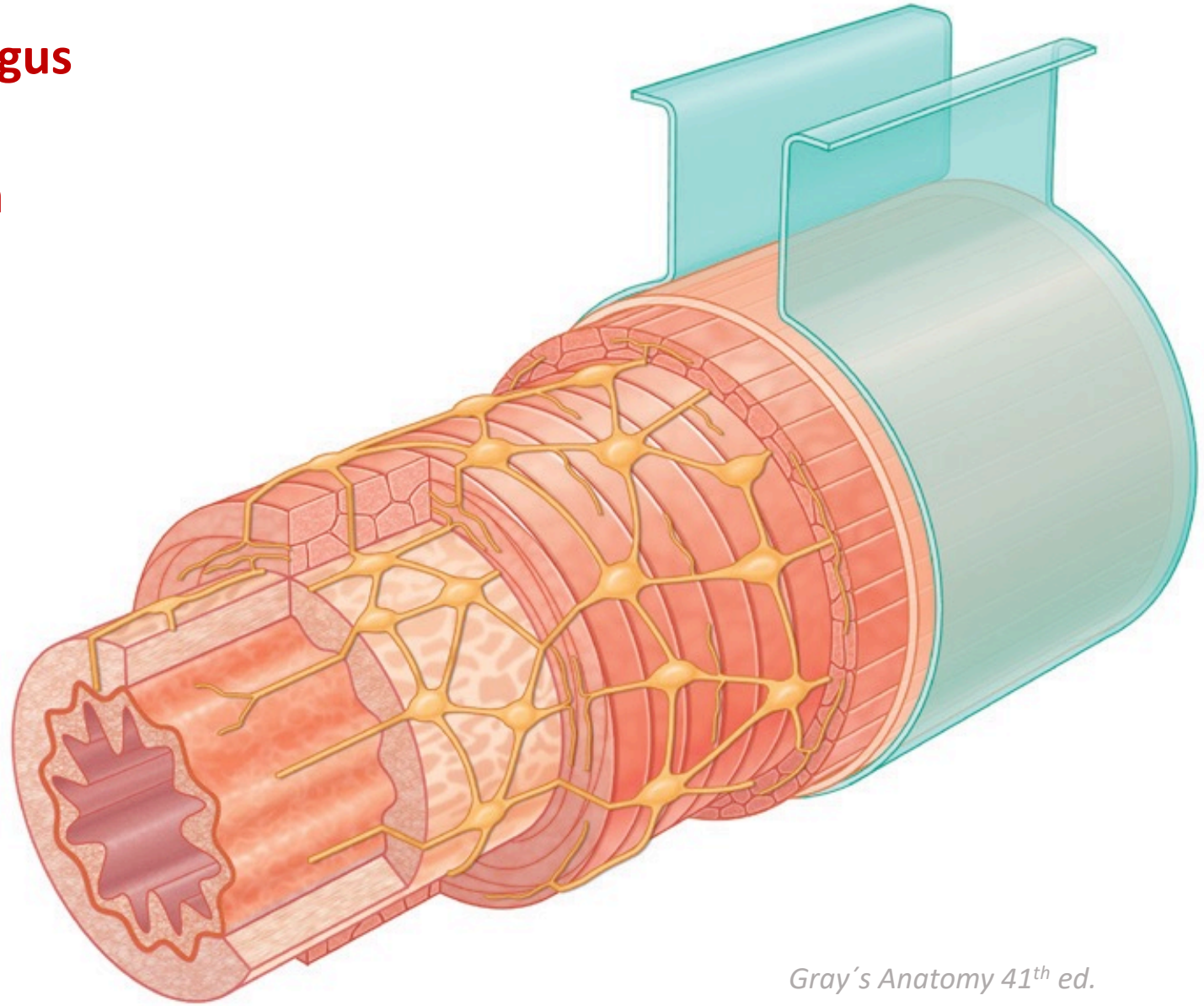


Gray´s Anatomy 41th ed.

Tunica muscularis

- **Oral cavity to upper 2/3 of oesophagus**
  - stripped
- **Dostal 1/3 of oesophagus to rectum**
  - smooth
- **Anal channel**
  - stripped

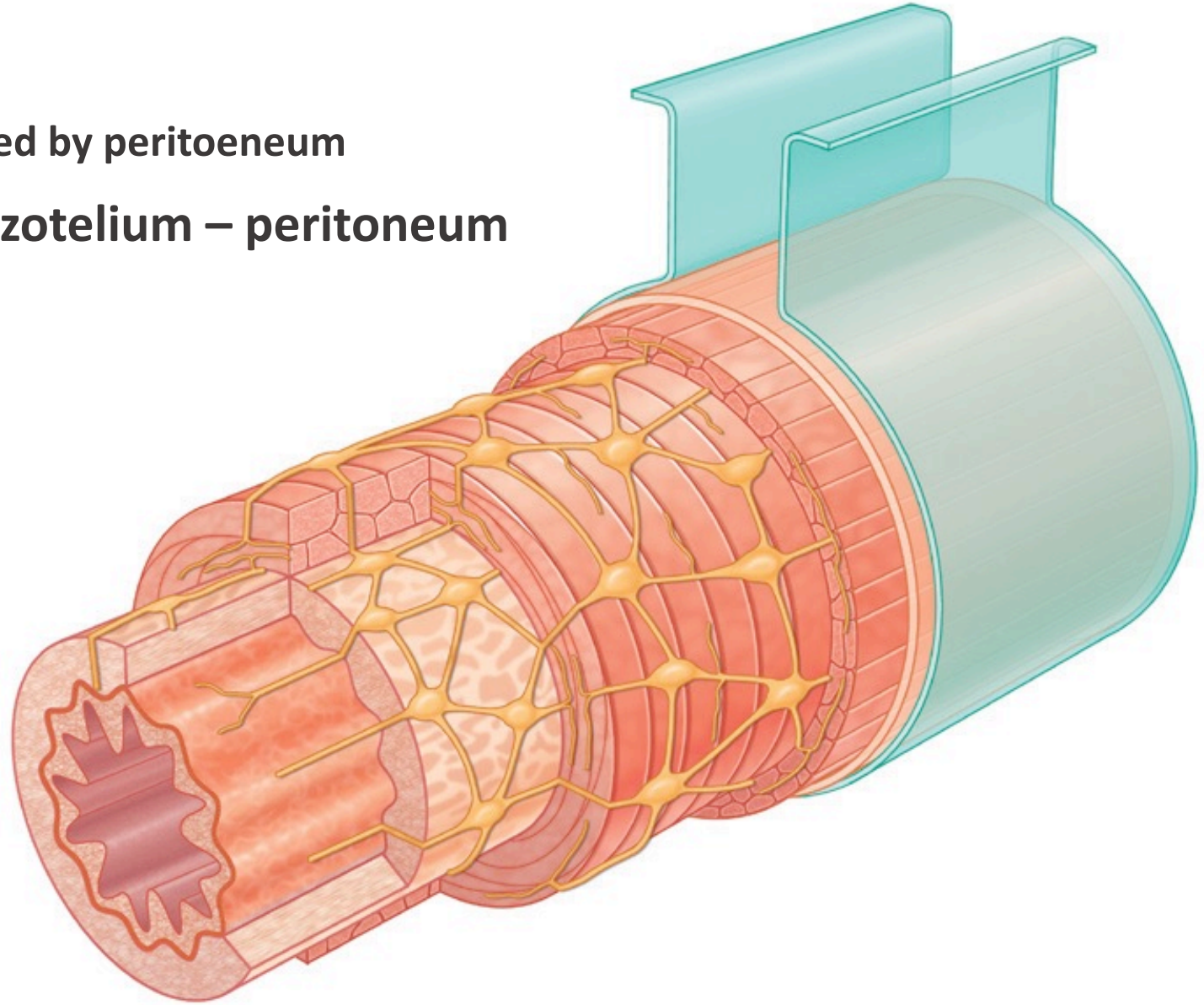
- **Stratum circulare**
- Thin layer of connective tissue
- plexus myentericus
- **Stratum longitudinale**
- Local contrqction, peristaltis



Gray´s Anatomy 41th ed.

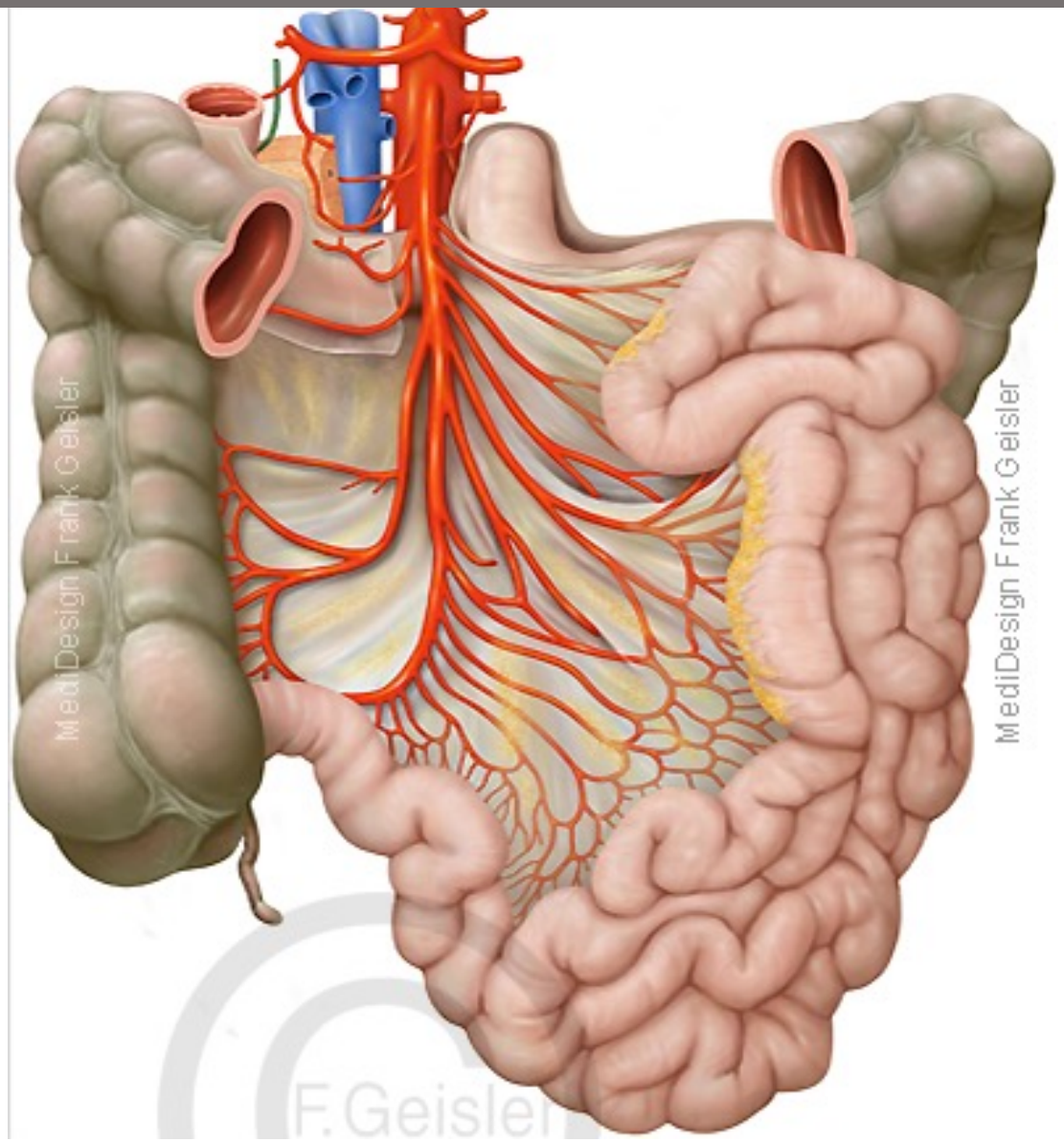
Tunica externa

- **Tunica adventitia**
  - Ont hte surface of the orgns not covered by peritoeneum
- **Tunica serosa** – mesothelium, mezotelium – peritoneum
  - Lamina visceralis peritonei
  - Lamina parietalis peritonei
  - Mezotheklium
    - Epithelium of mesodermal origin
    - Flat cells with lobulated margins
  - resorption
  - Peritoneal cavity
  - Infection and tumorous spread



Mesenterium

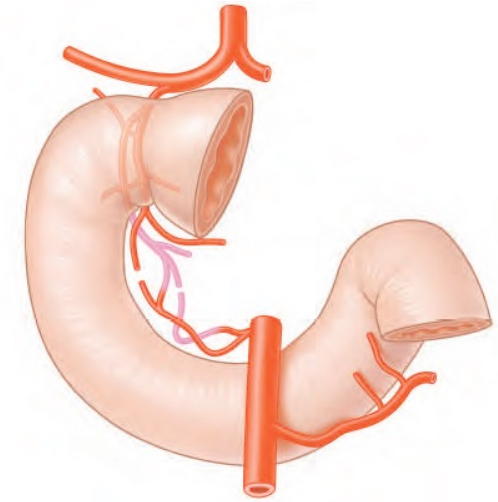
- Bowel hanging
- Mesenterium ventrale
- Mesenterium dorsale

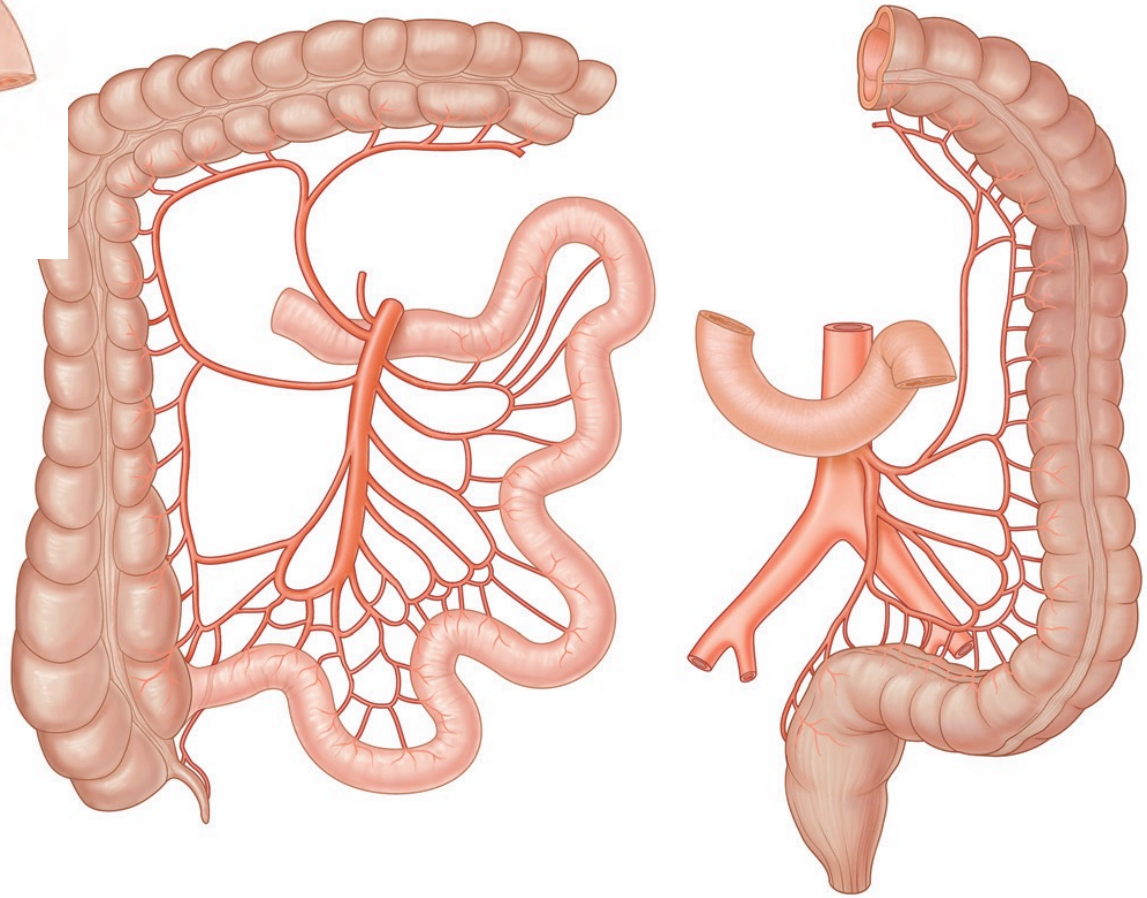


https://anatomie-online.com/bauchfell-seine-beziehungen-zu-den-inneren-organen/

Mezenterial vessels

- **foregut**
  - Tr. coeliacus
  - Stomach, duodenum
- **midgut**
  - A. mesenterica superior
  - Jejunum
  - Ileum
  - Colon up to fl. lienalis
- **hindgut**
  - A. mesenterica inferior
  - Colon descendens, sigmoideum, rectum

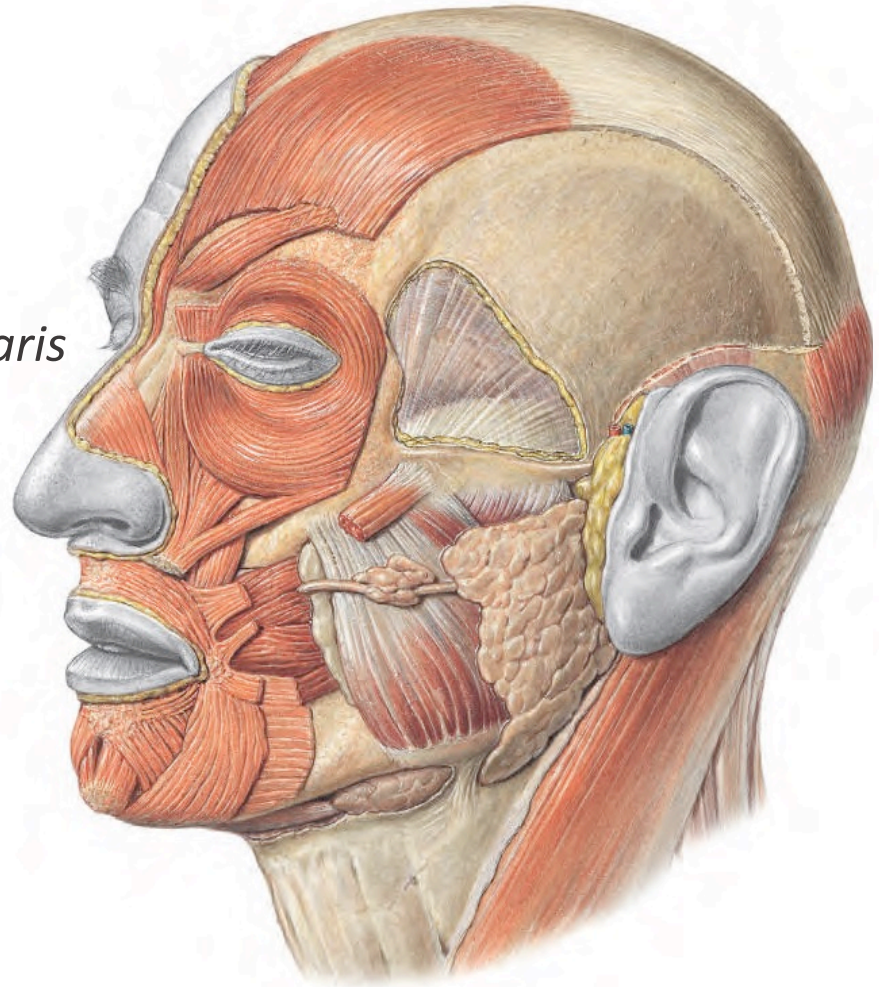


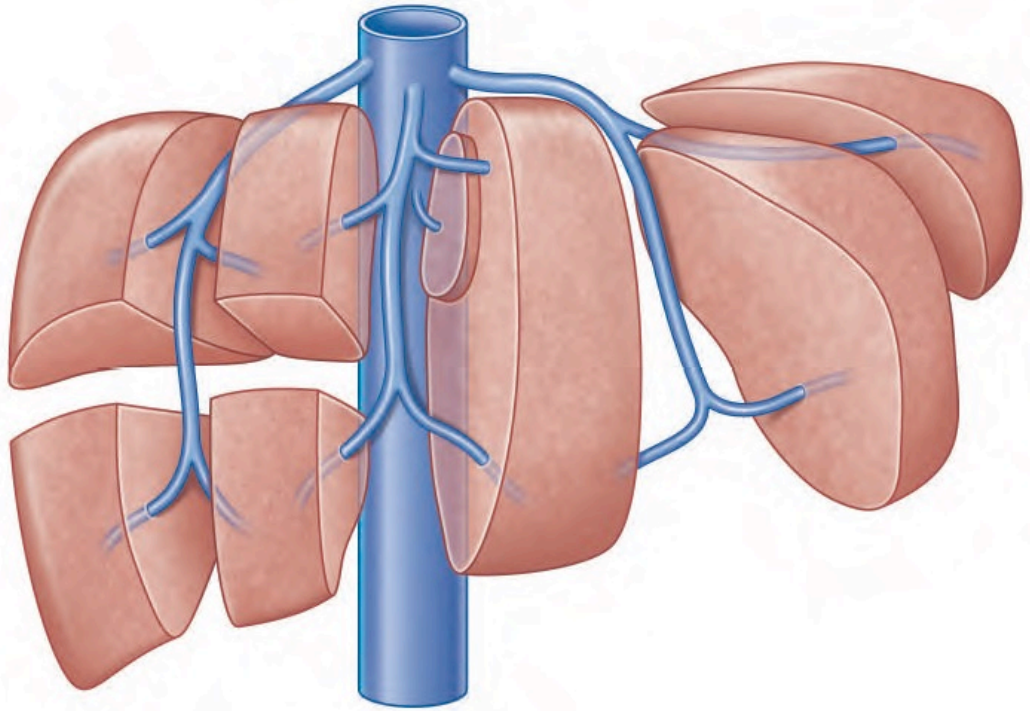


Gray´s Anatomy 41th ed.

Glands participating to digestion

- **Gll. salivariae**
  - *saliva*
  - *Gl. parotis*
  - *Gl. sublingualis*
  - *Gl. Submandibularis*
  - *Gll. parvae*
- **Hepar**
  - *Bilum - bile*
  - *Bile ducts*
- **Pancreas**
  - *Pancreatic jouice*
  - *Exocrine*
  - *Endocrine*

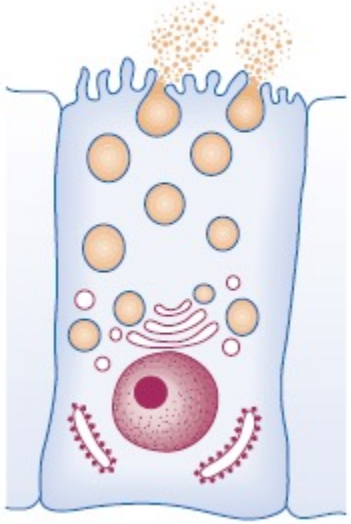


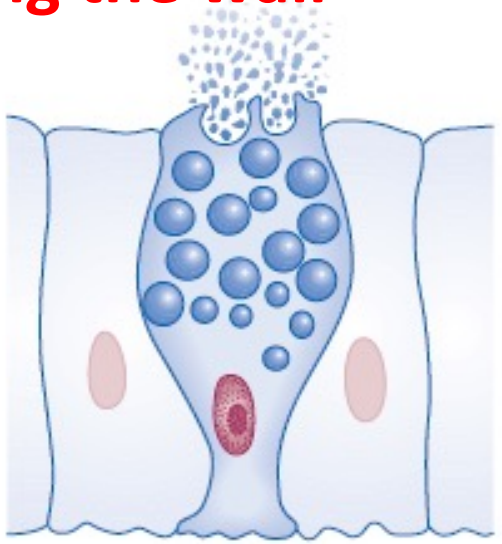


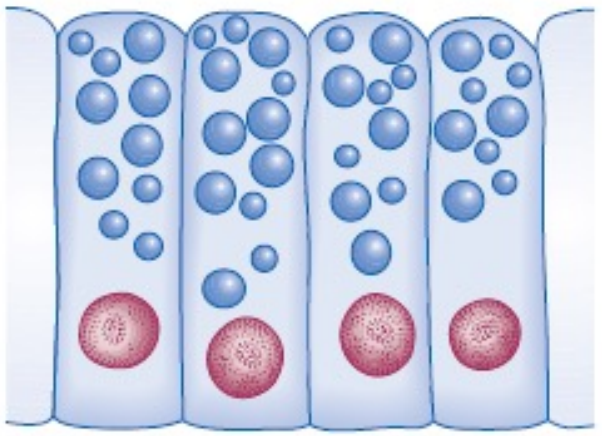
Gray´s Anatomy 41th ed.

Glandulae

- **Secretoric – merocrine– salivary glands and pancreas**
  - ***Merocrine - exocytose***
  - *Apocrine – aromatic glands and mamma*
  - *Holocrine – whole cell is a part of secrete – sebaceous glands*
- **Glandulae intramurales – in the wall**
- **Glandulae externae – duct is passing the wall**
  - **Glandulae salivariae**
    - *Sublingualis – mucinous*
    - *Parotis – serous*
    - *Submandibulární - mixed*
  - **Pancreas**
  - **Hepar**



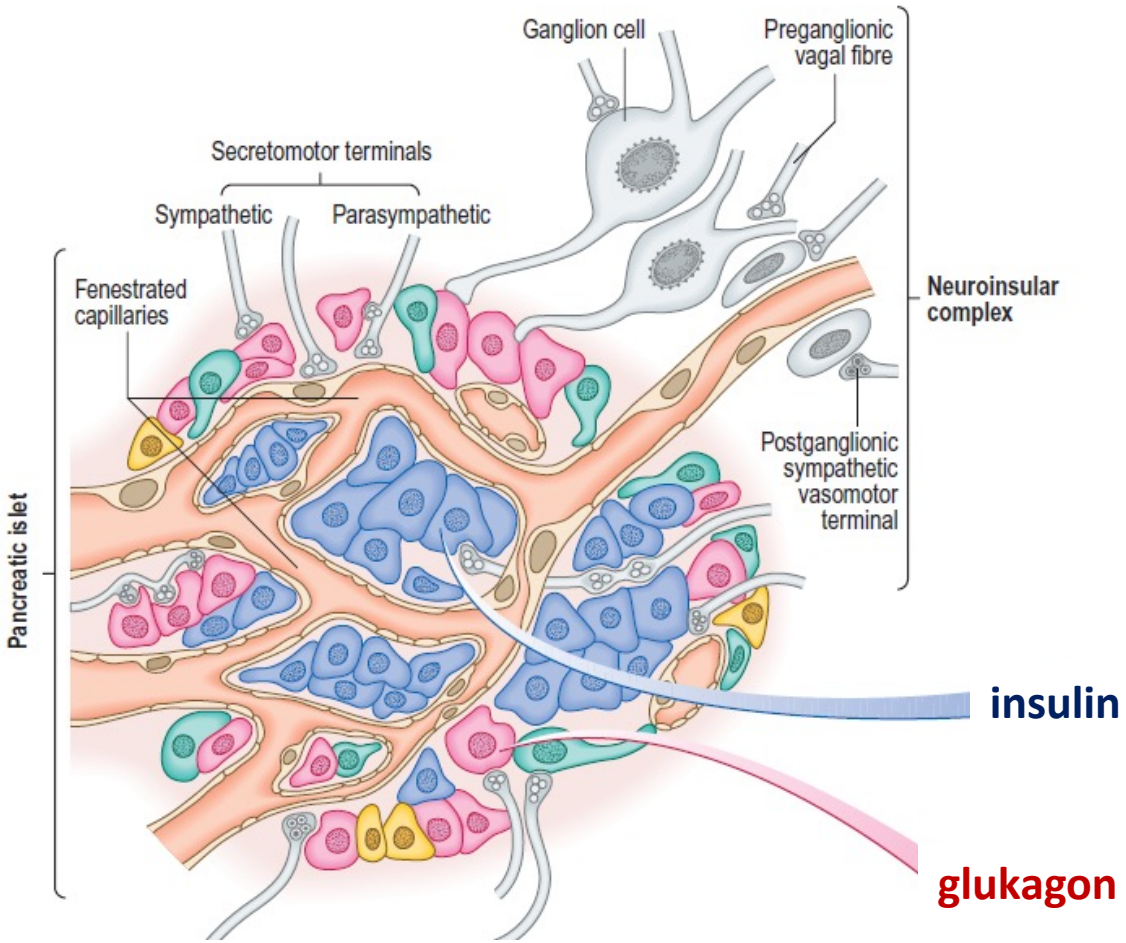




Gray´s Anatomy 41th ed.

Exocrine and exocrine glands

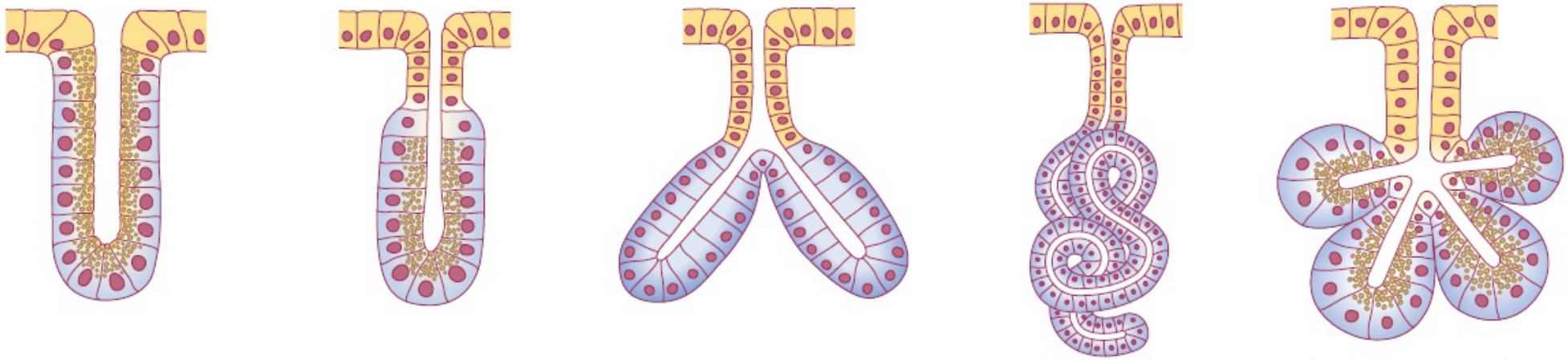
- **Exocrine gl.– ductus**
  - Production of secrete (excrete)
  - In GIT serous and mucinous
- **Endocrine – no duct**
  - **Secret is producted to the interstitial fluid**
  - **Taken by the circulation**
  - **Cells assembled**
    - **Around capillaries**
    - **Around sinusoids with fenestrated endothelium**
  - **Macromolecules enter circulation**
  - **Assembled into follicles**
    - **Follicles contain secret**



Gray´s Anatomy 41th ed.

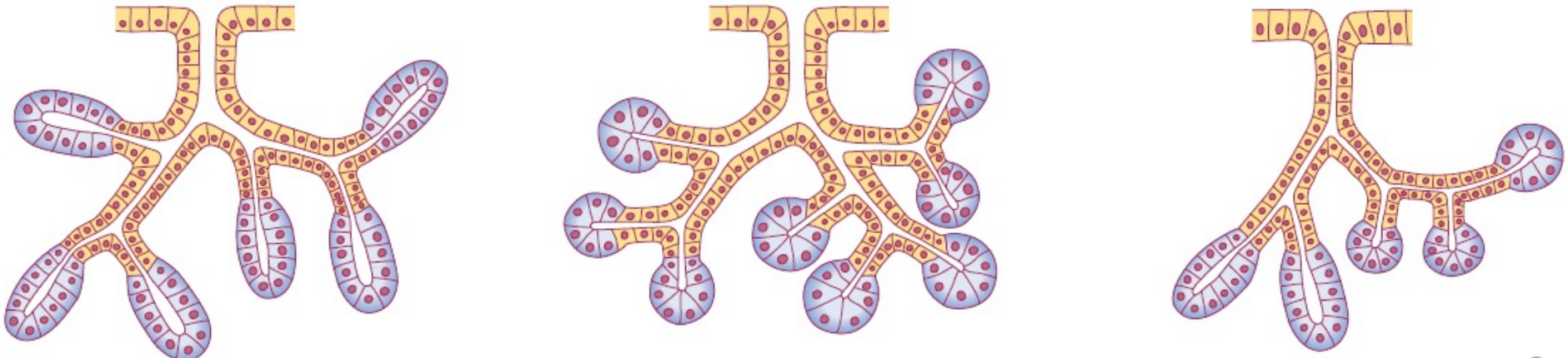
General structure of glands

Structural classification of glands – Simple glands with unbranched ducts



A. Simple tubular without duct | B. Simple tubular with duct | C. Simple branched tubular | D. Simple coiled tubular | E. Simple acinar or alveolar

Structural classification of glands – Ductal branching pattern of complex glands

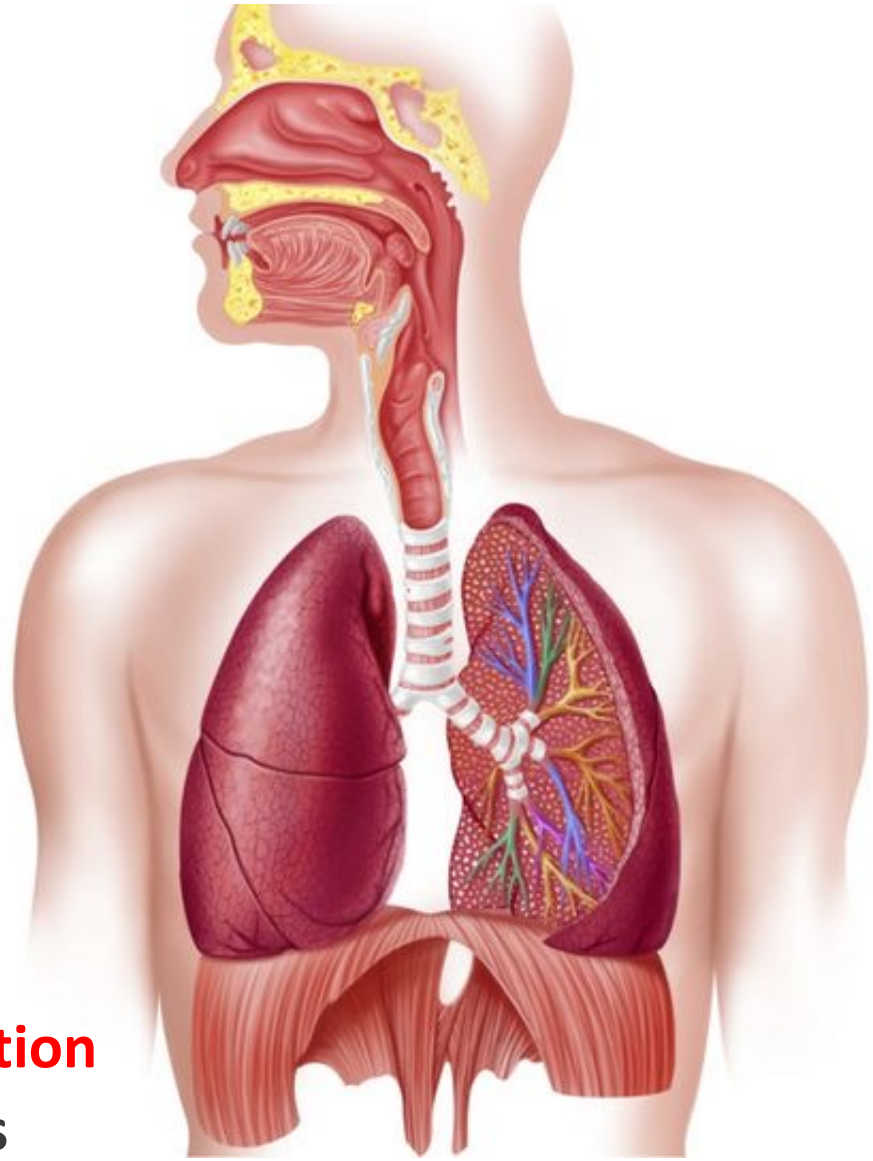


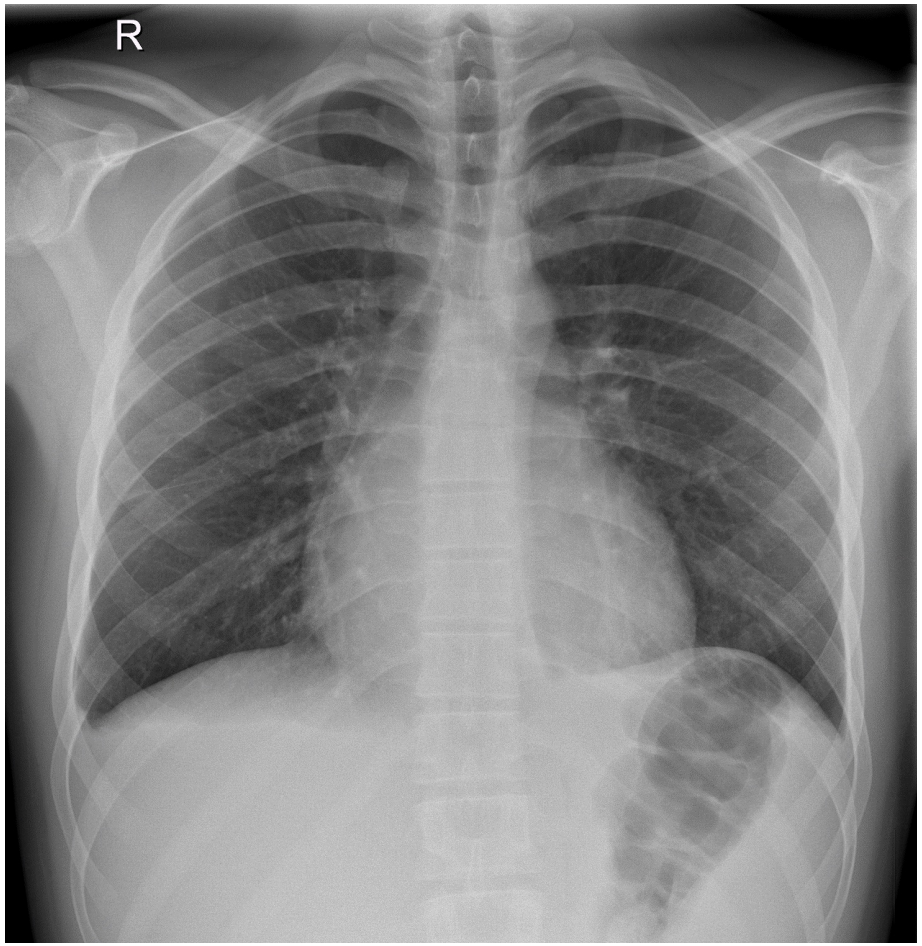
A. Branched tubular | B. Branched acinar/alveolar | C. Branched tubulo-acinar

Gray´s Anatomy 41th ed.

Respiratory system

- *smell*
- *fonation*
- *Gases exchange*
- **Upper ways**
  - Cavum nasi
  - Pharynx
- **lower**
  - Larynx
  - Trachea
  - Bronchi
- **Organ of the respiration**
  - Pulmones - lungs

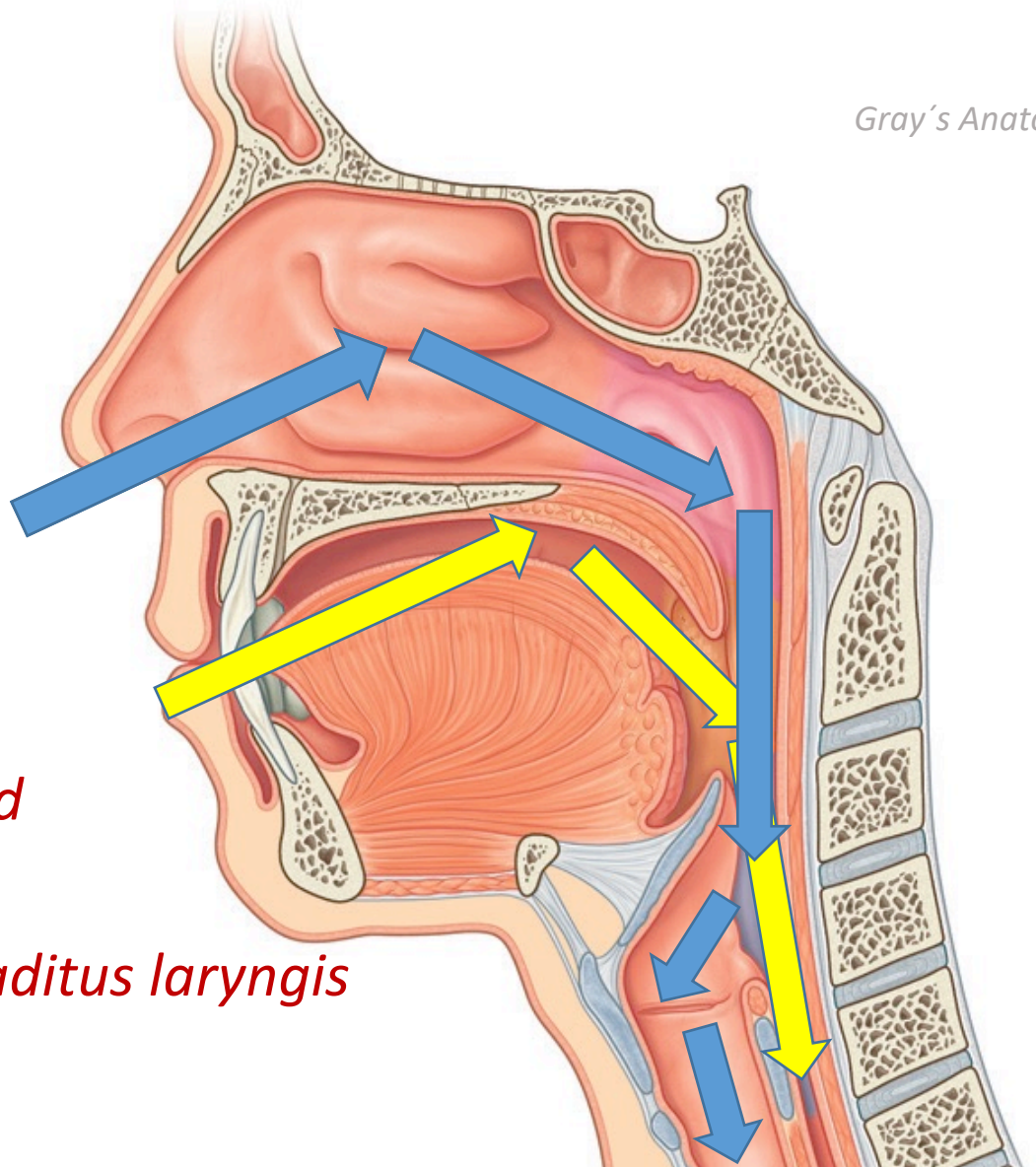




https://www.thoughtco.com/respiratory-system-4064891

The air course

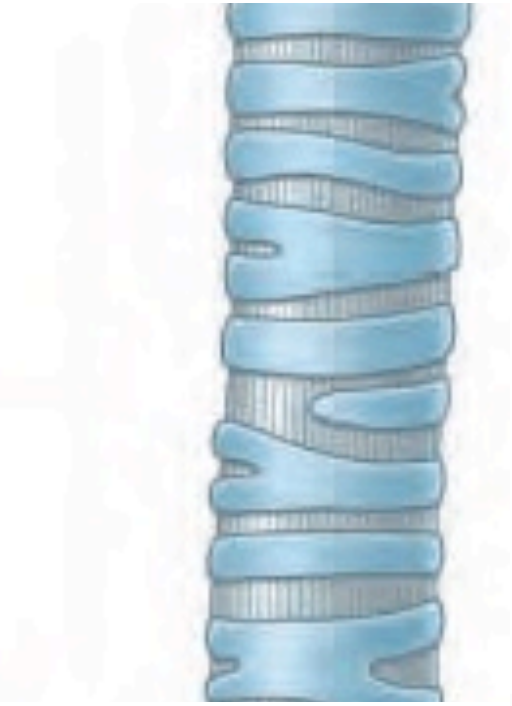
- Nares
- Cavitas nasi
- Choanae
- Pharynx
  - *Nasopharynx*
  - *Oropharynx – crossing the swallowing*
  - *Laryngopharynx*
- Aditus laryngis
- **breathing**
  - *Soft palate declinated, epiglottis opened*
- **swallowing**
  - *Soft palate elevated, epiglottis closing aditus laryngis*

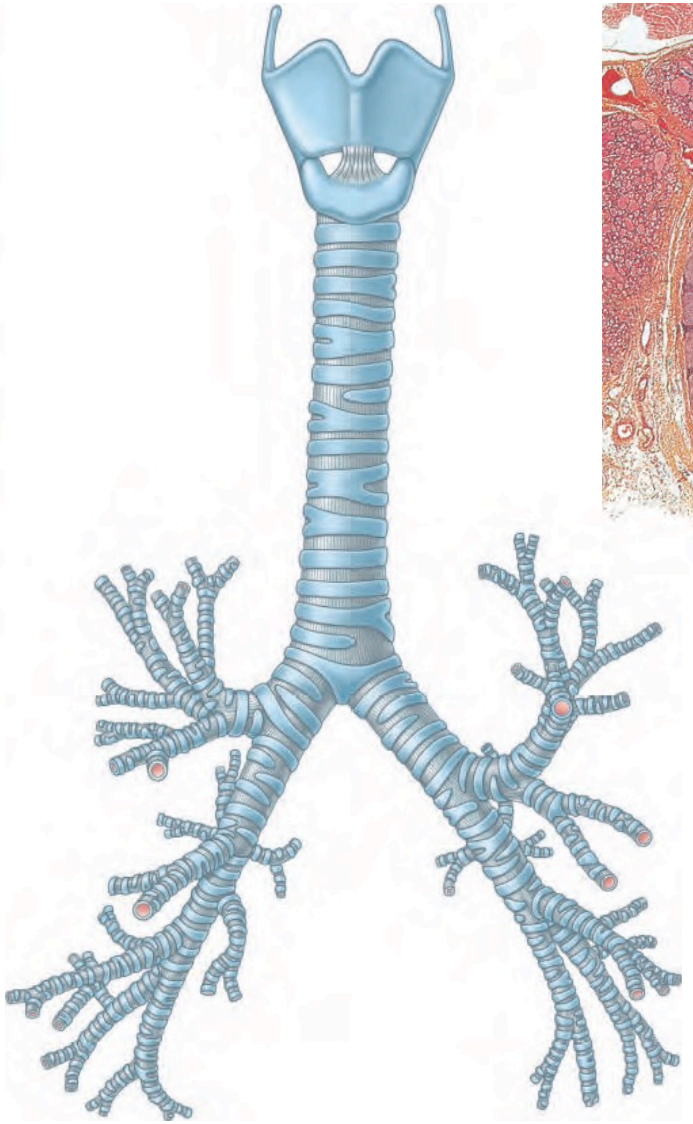


Gray´s Anatomy for Students

Trachea + bronchi

- **wall**
  - *Cartilagines*
  - *Ligamenta anularia*
  - *Pars membranacea*
- **Trachea - C6 - Th4**
- ***Bifurcatio tracheae***
- **Bronchus dexter**
  - **Stright and short**
  - **aspiration**
- **Bronchus sinister**
  - **Longer, s-shaped, bowed, lower angle**
  - **(bronchus principalis dexter et sinister)**





Gray´s Anatomy 41th ed.

Lungs - pulmones

- **Pulmo dexter**
  - *Trilobatus*
  - Lobus superior
  - Lobus medius
  - Lobus inferior
- **Pulmo sinister**
  - *bilobatus*
  - Lobus superior
    - Lingula
  - Lobus inferior

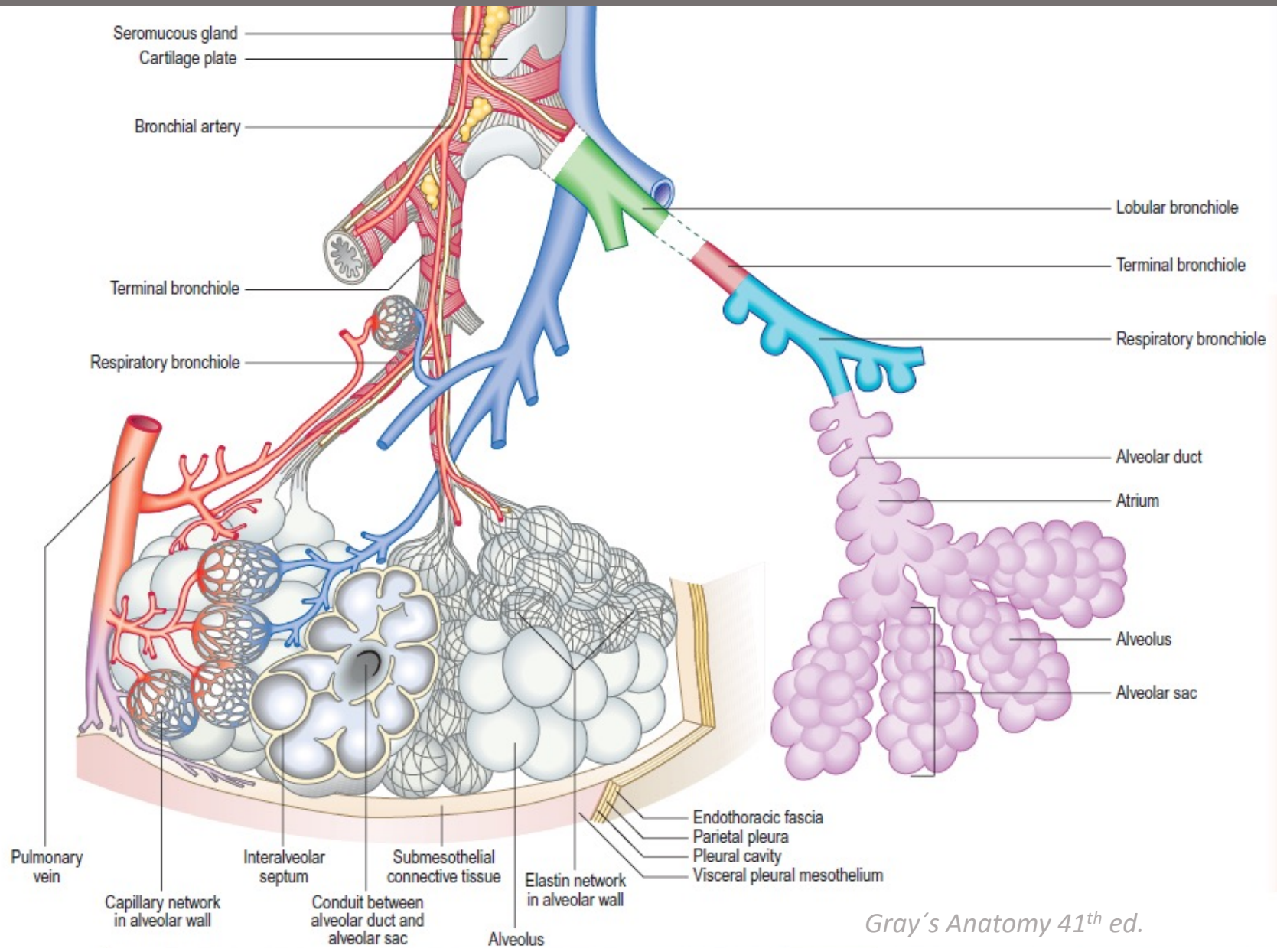
Gray´s Anatomy 41th ed.

Respiration organ

- Bronchus terminalis
- Bronchiolus respiratorius
- Ductus alveolaris
- Atrium sacculi alveolares
- Alveoli pulmonis

- A. pulmonalis
- Rete capillare
- V. pulmonalis

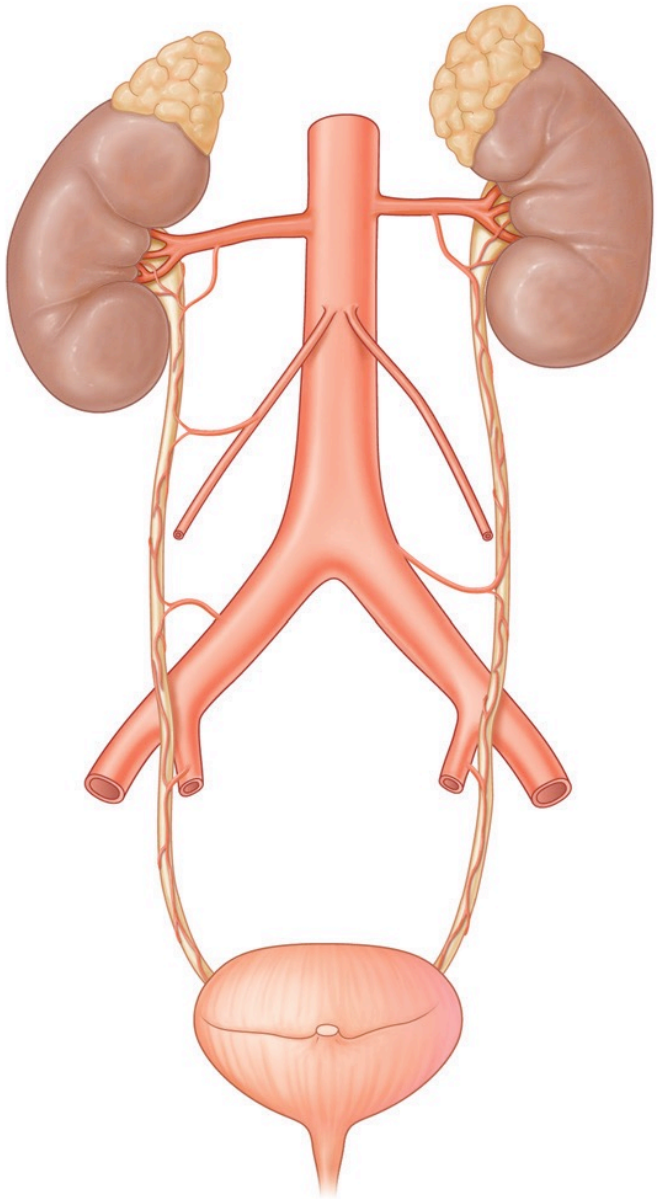
- A. bronchialis

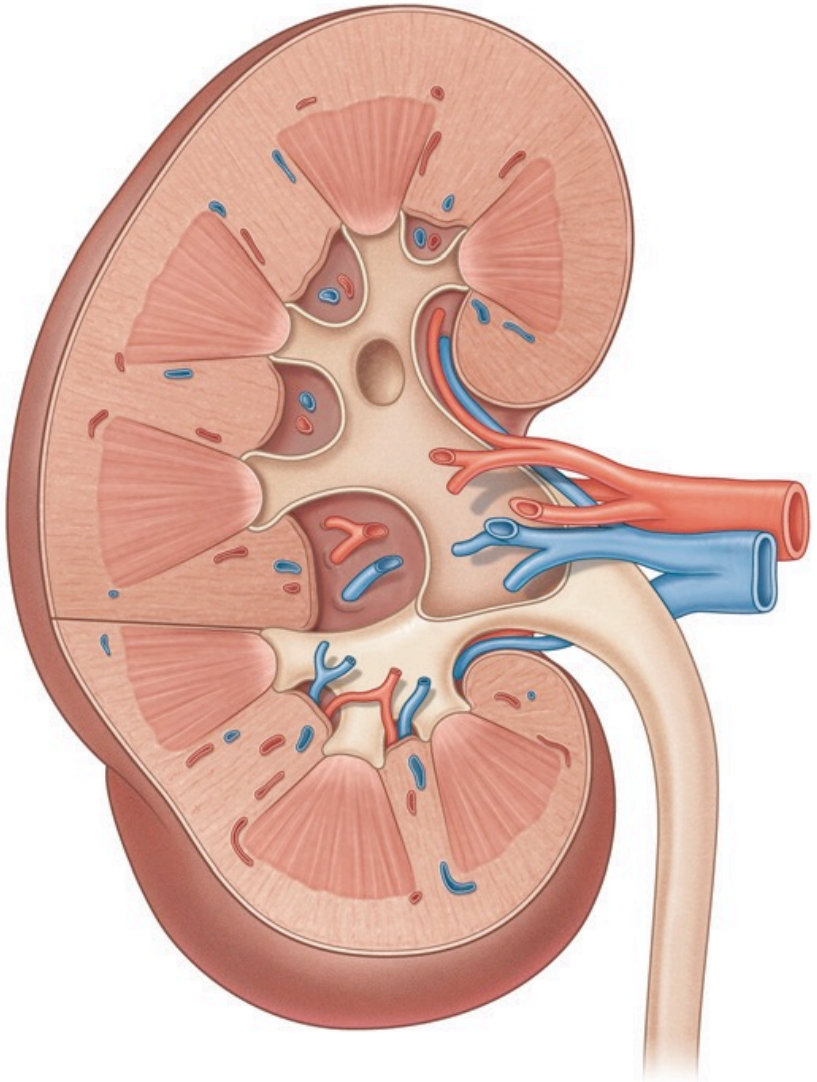


Gray´s Anatomy 41th ed.

Excretory system

- *Urine creation*
- *Urine outflow*
- *reproduction*
- **Ren**
  - **Cortex renis**
  - **Medulla renis**
- **Calices**
- **Pelvis**
- **Ureter**
- **Vesica urinaria**
- **Urethra**
- **Organa genitalia**

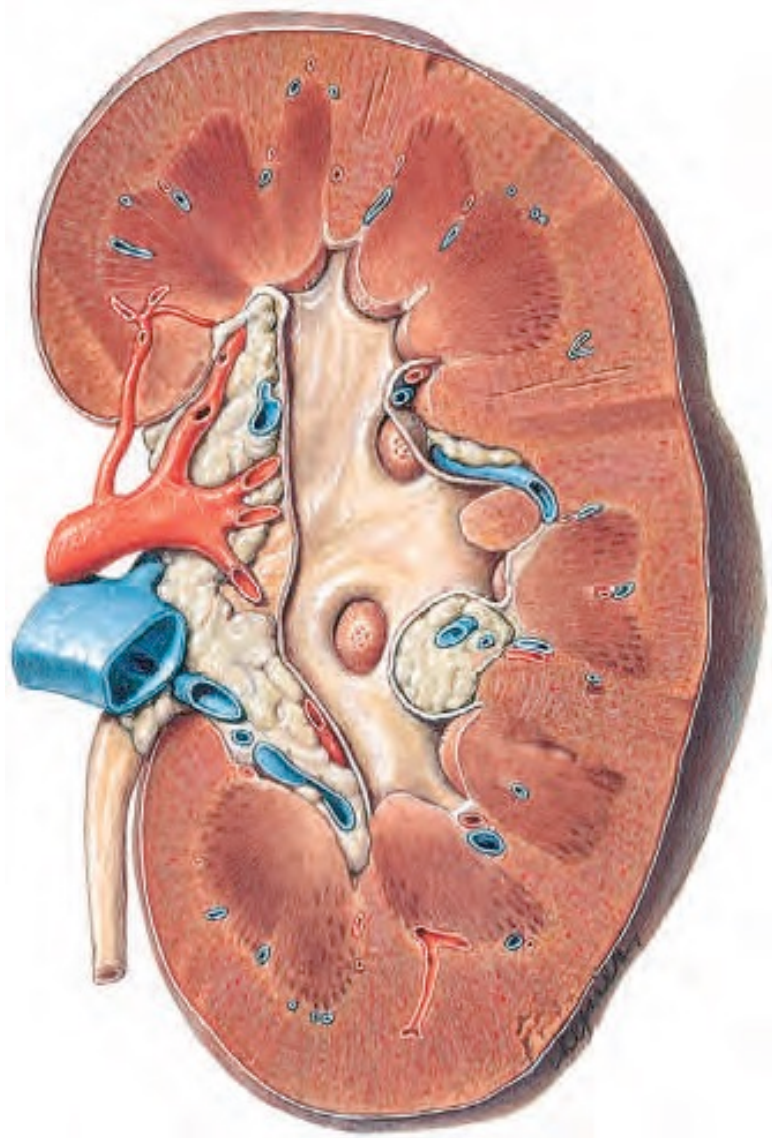


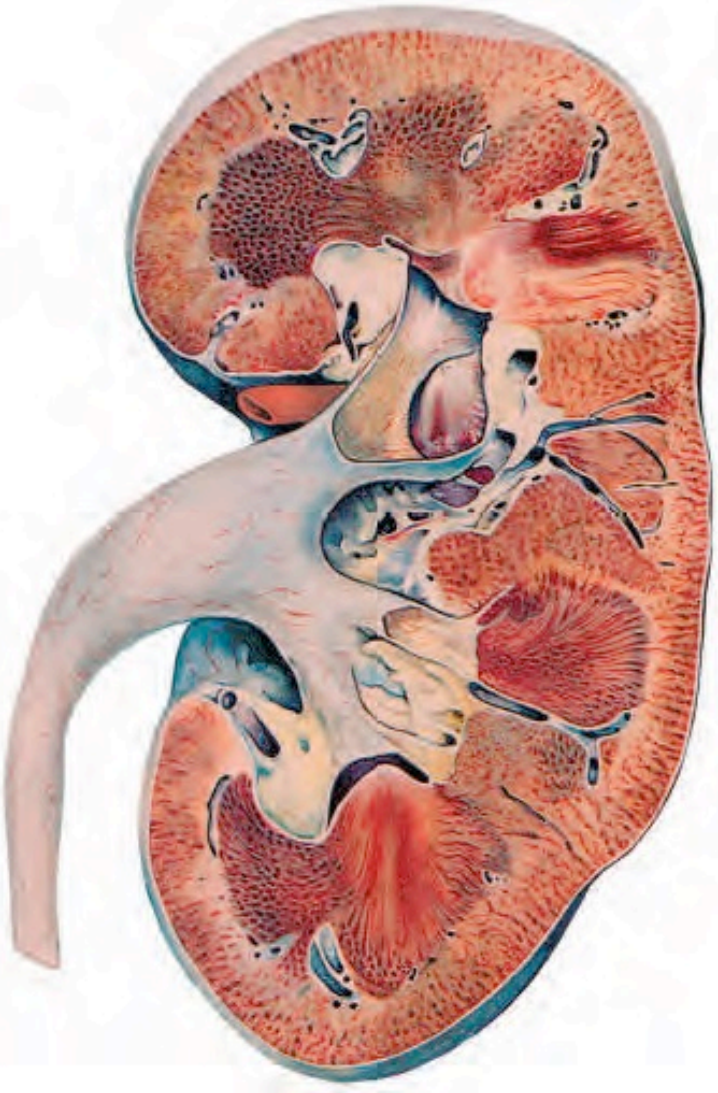


Gray´s Anatomy 41th ed.

Ren, kidney

- **Complex tubullar gland**
- Product - urine
- Blood - filtration
- Exkret
- **Elementar unit - nephron**
  - Corpusculum renis Malpighi
  - proximal tubulus
  - Henle loop
  - Distal tubulus
- **Collector tubules**
  - Tubulus colligens
  - Ductus papillaris

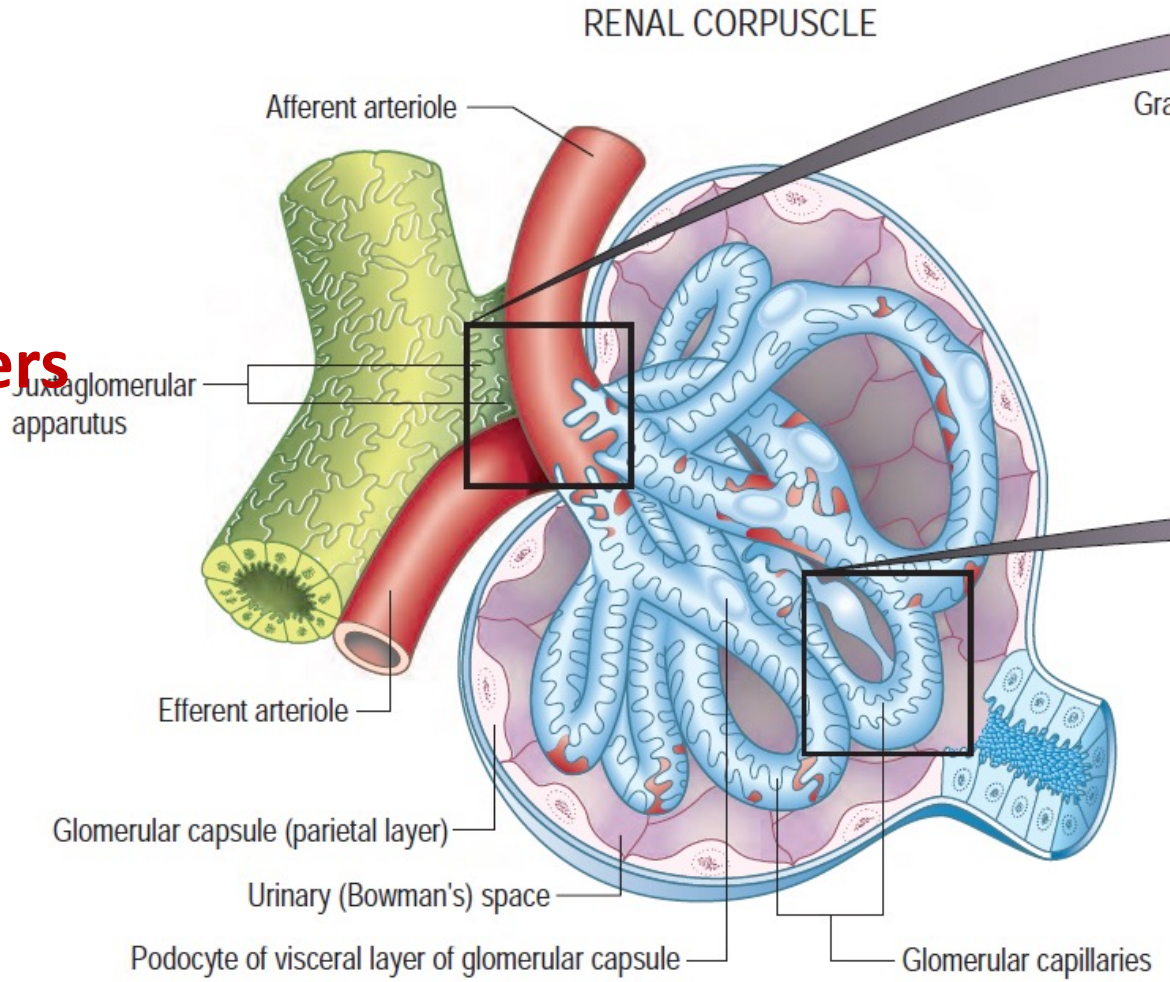




Gray´s Anatomy 41th ed.

Corpusculum renis Malpighi

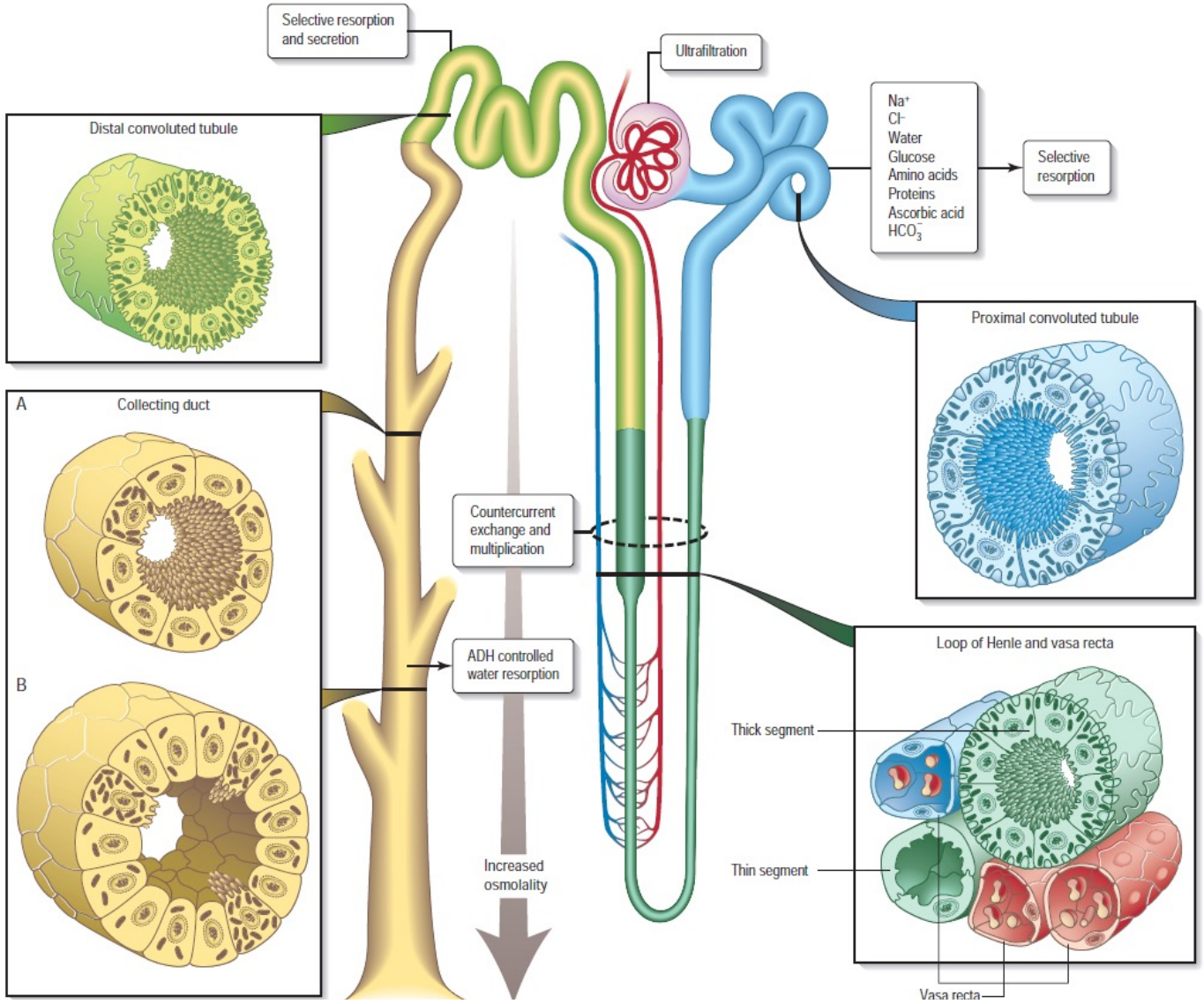
- Glomerulus + capsula glomeruli
- Glomerulus - rete mirabile arteriosum
  - Vas afferens
    - Pores in the endothelium
  - Vas efferens
- Capsula glomeruli - inner and outer layers
  - Bowmann sac
  - Inner - podocytes – flat cells



Gray´s Anatomy 41th ed.

Kidney function like a gland

- exocrine
- Corpusculum renis
  - Primary urine
  - 170 -200 ml/day (1 gr.)
- Following divisions
  - Back resorption
  - 99,5%
  - Aldosteron - Na
  - Antidiuretic hormon - water
- endocrine
- Juxtaglomerular apparatus
  - Renin (vasokonstriction)
  - Erythropoetin



General anatomy 3

Prof. MUDr. Jiří Ferda, Ph.D.