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Clinical anatomy of the abdomen

**PD Dr. med. Dr. med. habil.
M. Schmidt**

**German Red Cross Blood Donor Service
Baden-Wuerttemberg - Hessen and
Johann Wolfgang Goethe University Frankfurt / Main
Institute for Transfusion Medicine and Immunohematology**



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Overview

- 🔴 **Structure of the human body**
- 🔴 **Part A: Gastrointestinal tract**
- 🔴 **Break 10-15 min**
- 🔴 **Part B: Abdominal organs (liver, pancreas, kindeys)**

- 🔴 **Anatomy structures**
 - **Macroscopic structures**
 - **Microscopic structures**
- 🔴 **Modern therapeutic opportunities**

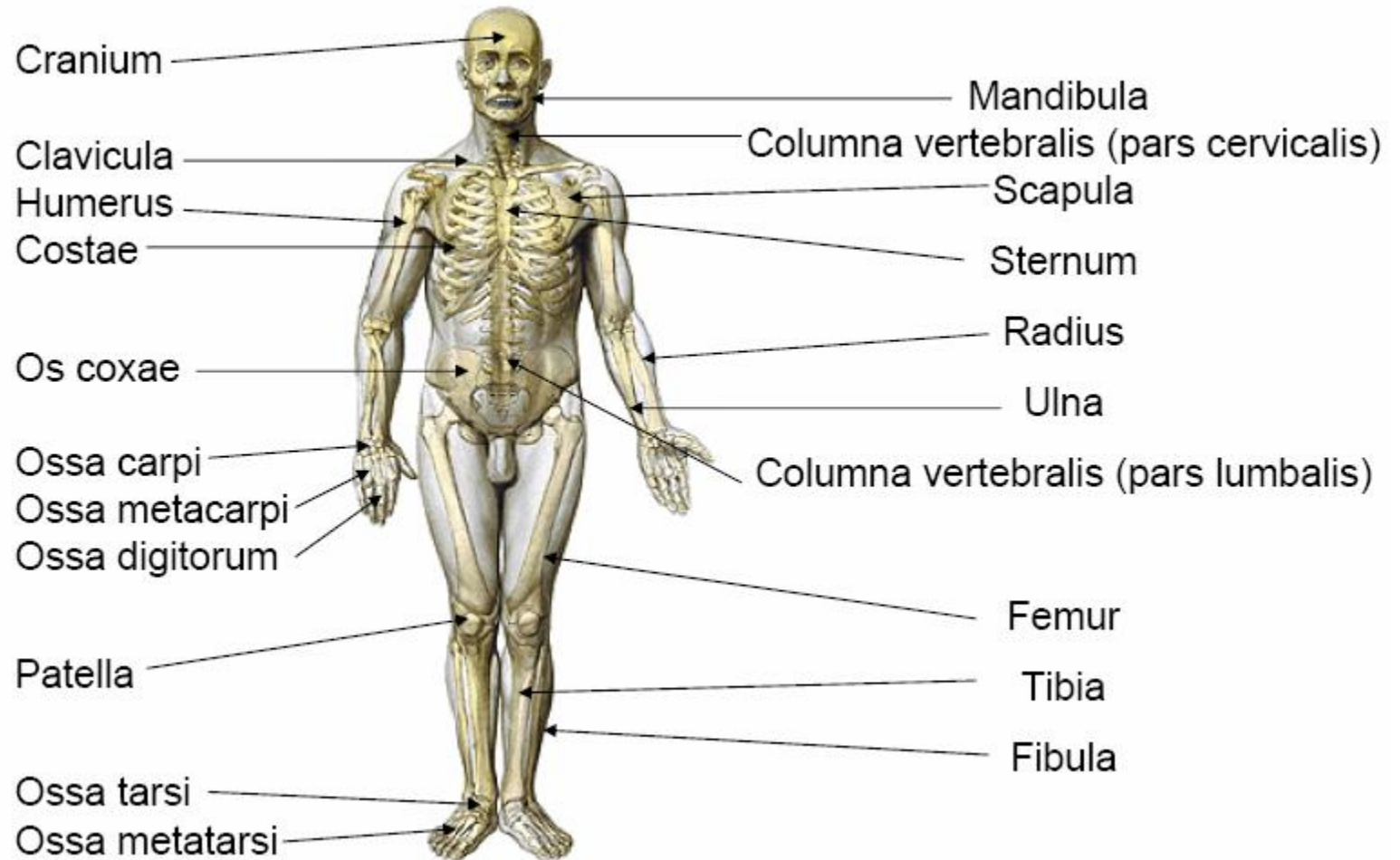


200 bones and 100 joints



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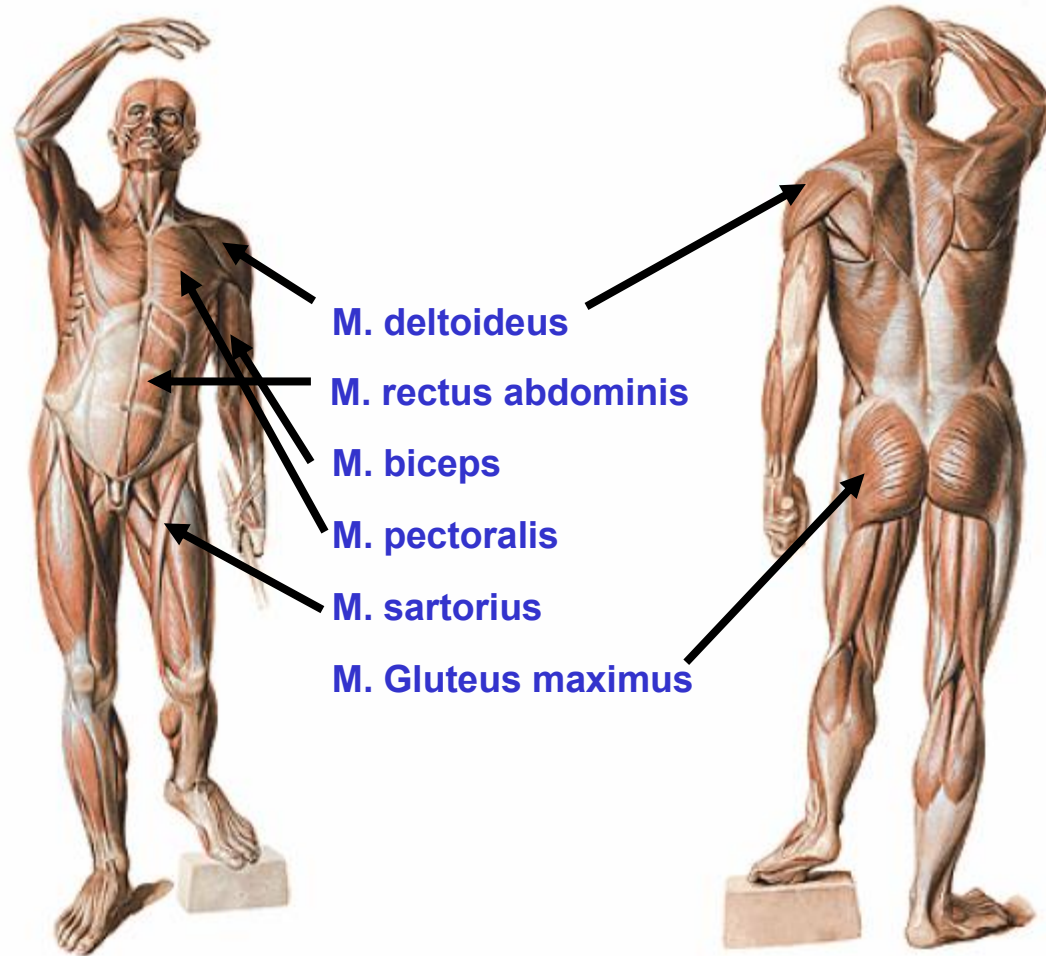


300 skeletal muscles



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300 arteries and 300 veins

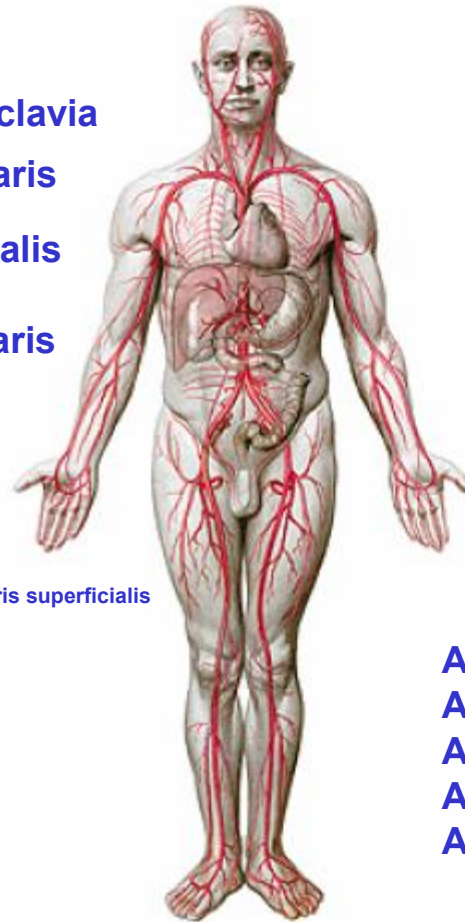
A. carotis communis dextra

A. subclavia

A. axilaris

A. radialis

A. ulnaris



Arcus palmaris superficialis

Aorta

A. iliaca

A. femoralis

A. tibialis anterior

A. tibialis posterior

A. fibularis

A. dorsalis pedis

A. arcuata



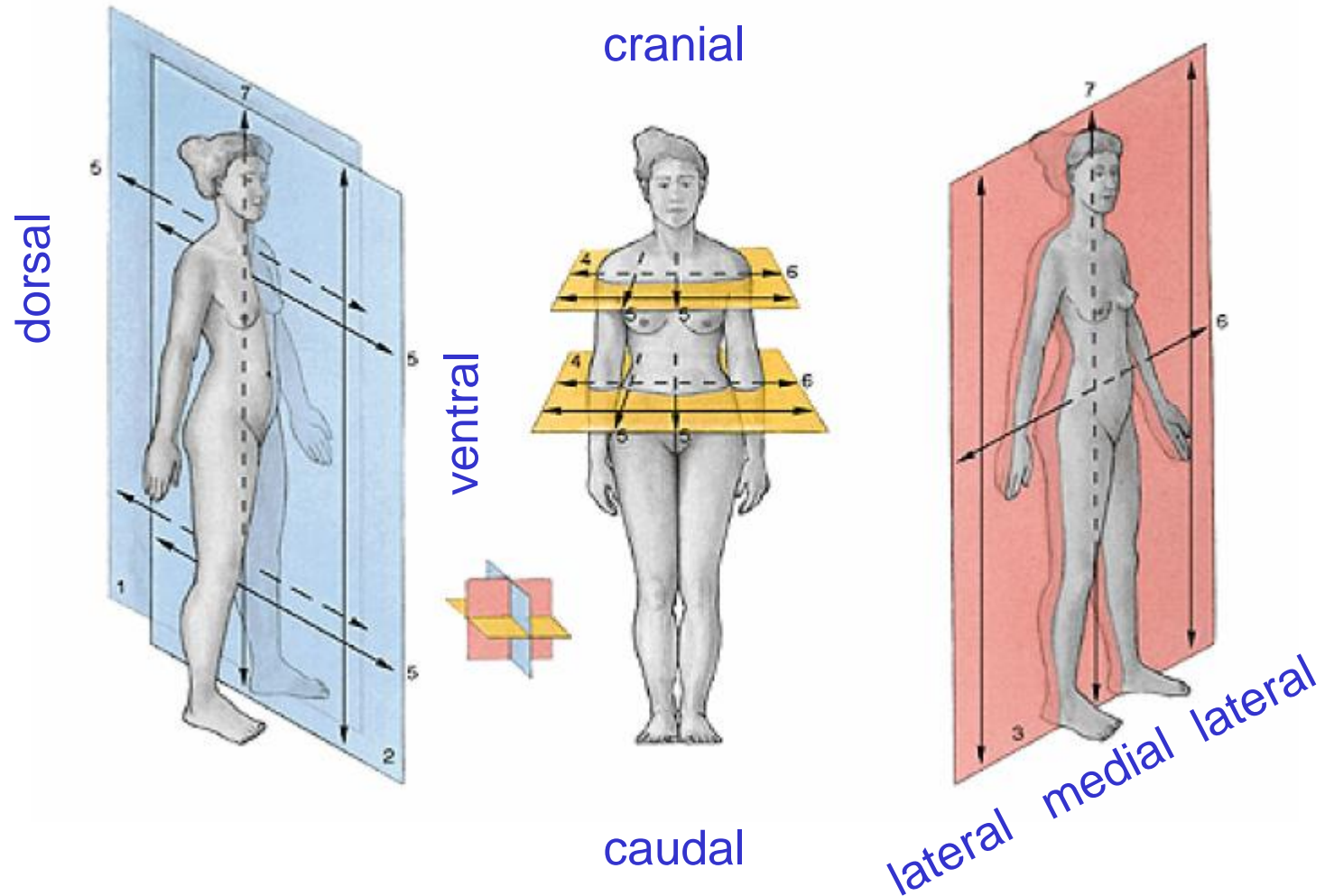


Directions in the body



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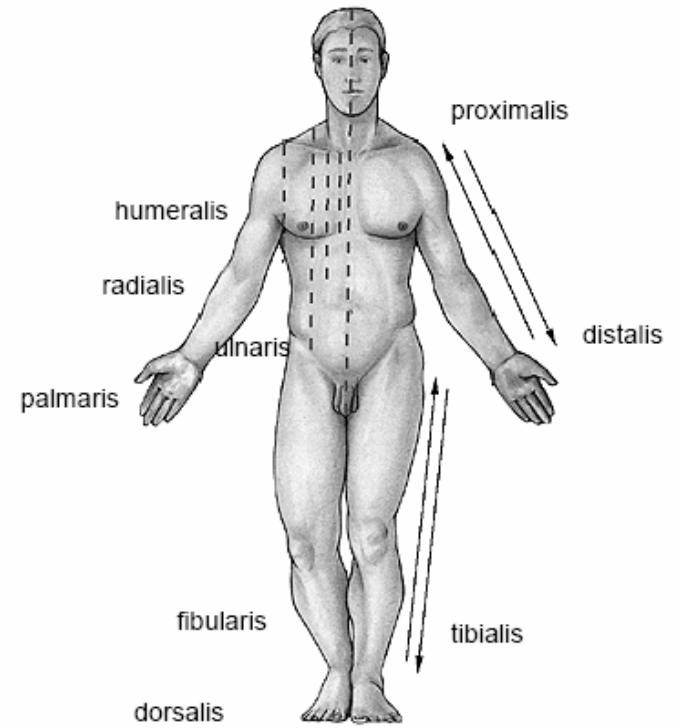
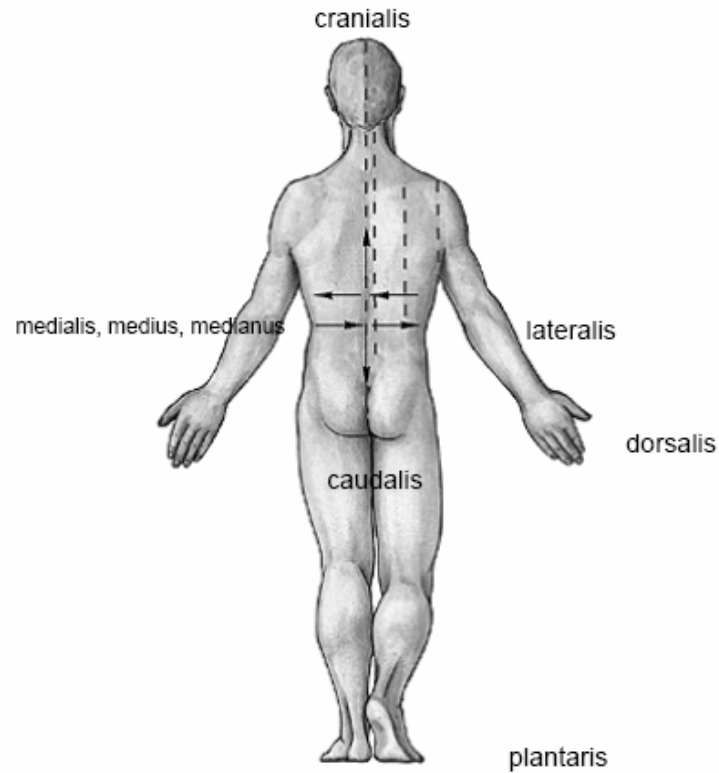


Directions in the body



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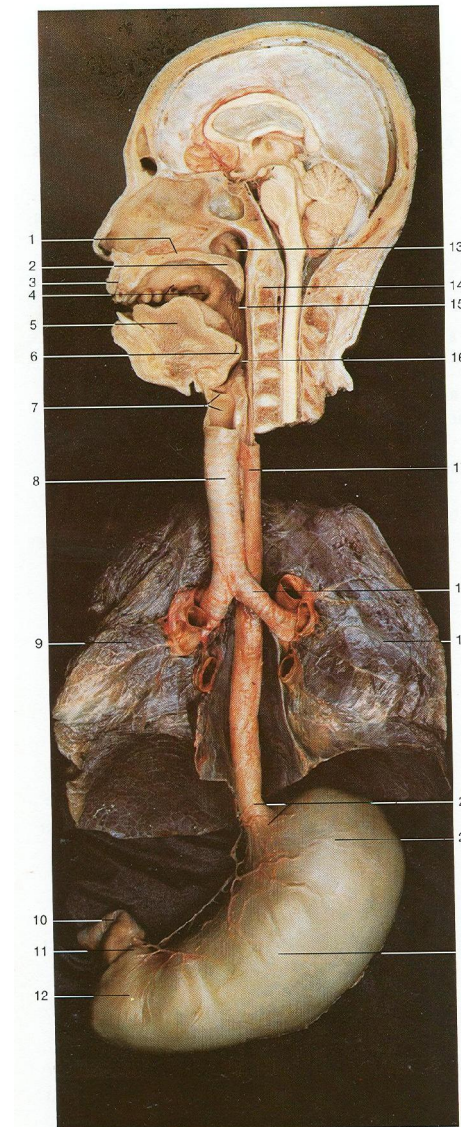
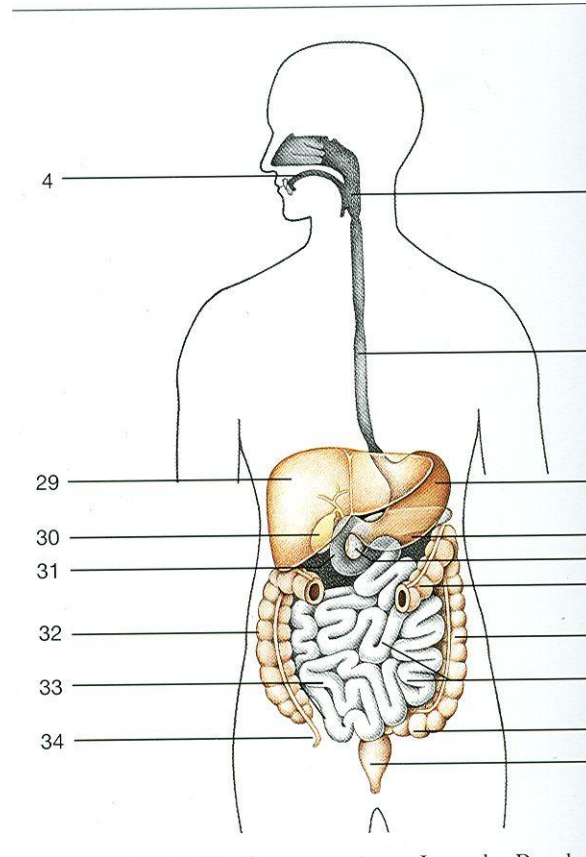


Gastrointestinal tract I



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Gastrointestinal tract



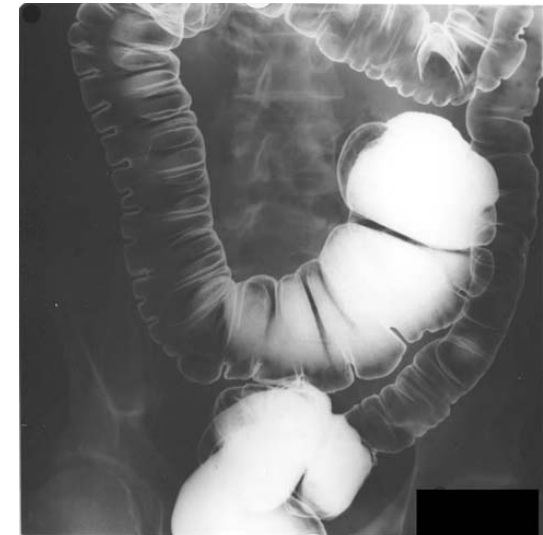
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- Oesophagus
- Stomach
- Small intestine
 - Duodenum
 - Jejunum
 - Ileum
- Large intestine
 - Appendix
 - Colon ascendens
 - Colon transversum
 - Colon descendens
 - Signum
 - Rectum
 - Anus

4-5 m

1.5 m



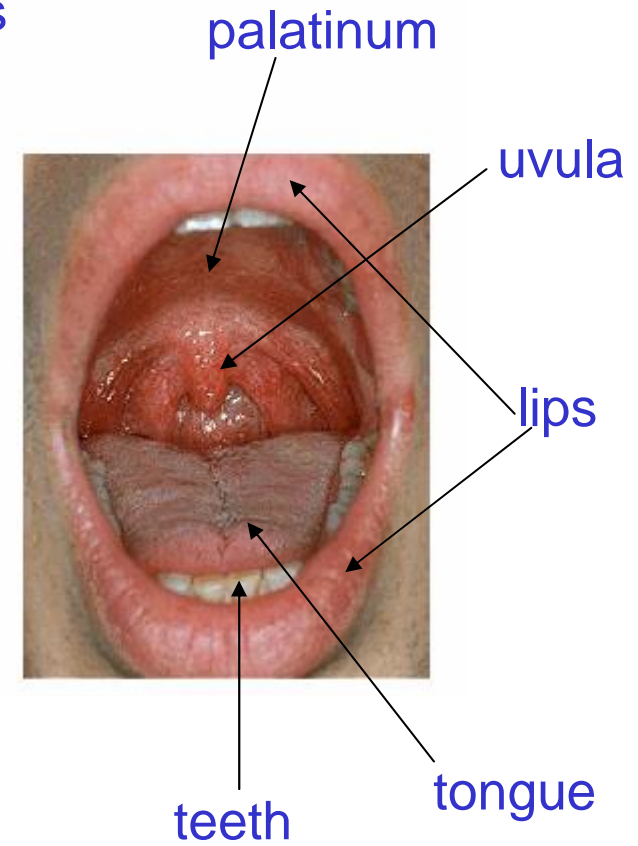
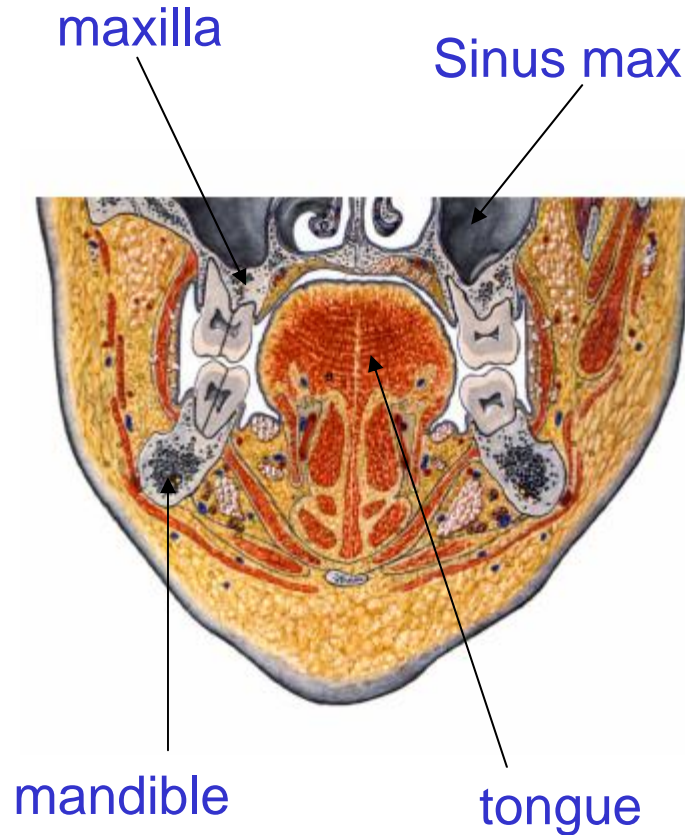


Anatomy of the mouth



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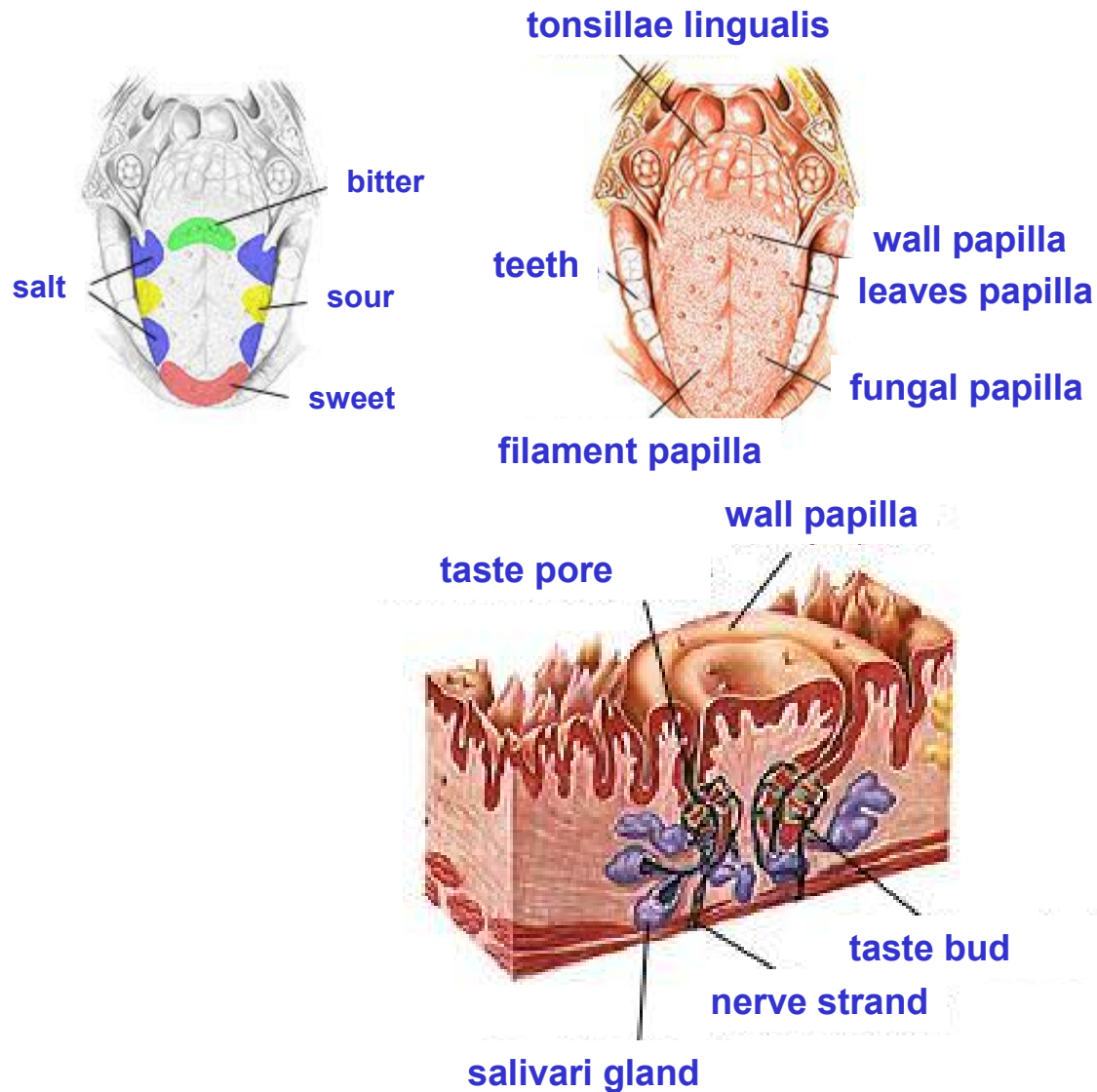


Function of the tongue



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Function of the mouth

- 🔴 Chewing of food
- 🔴 Tasting of food
- 🔴 Digestion of carbohydrates



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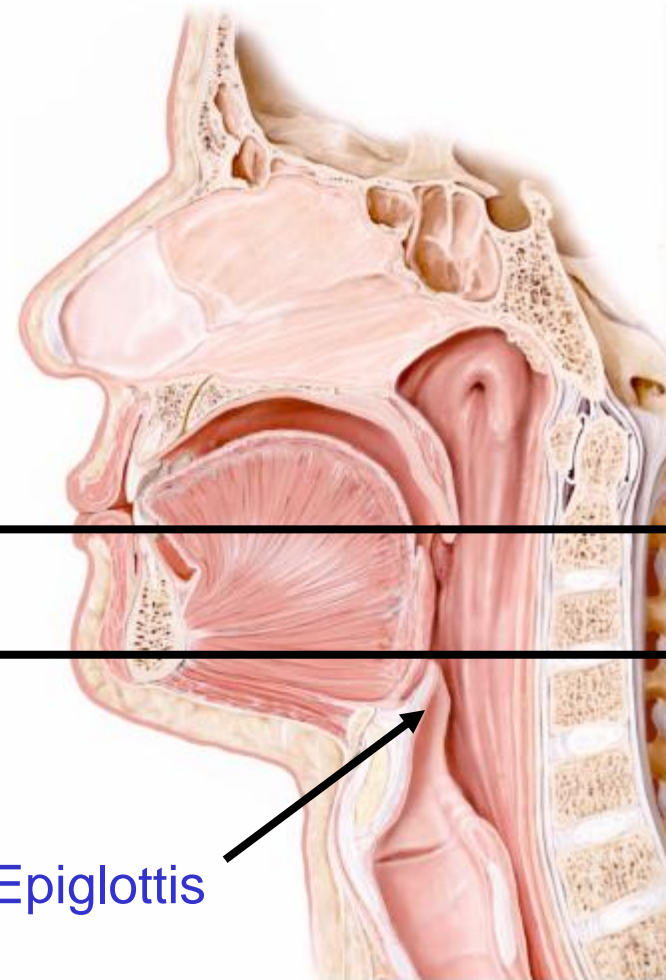
Anatomy of the pharynx

Pars nasalis pharyngis

Pars oralis pharyngis

Pars laryngea pharyngis

Epiglottis





Endoscopic view

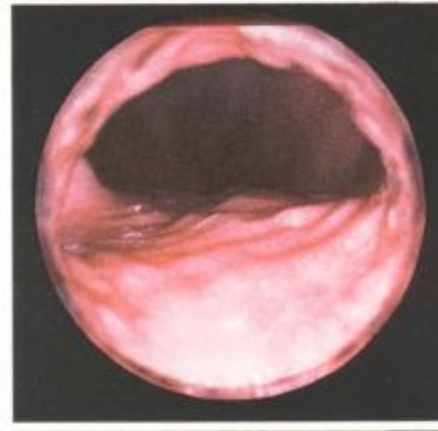


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Ostium oesophagi



Pars thoracica oesophagi

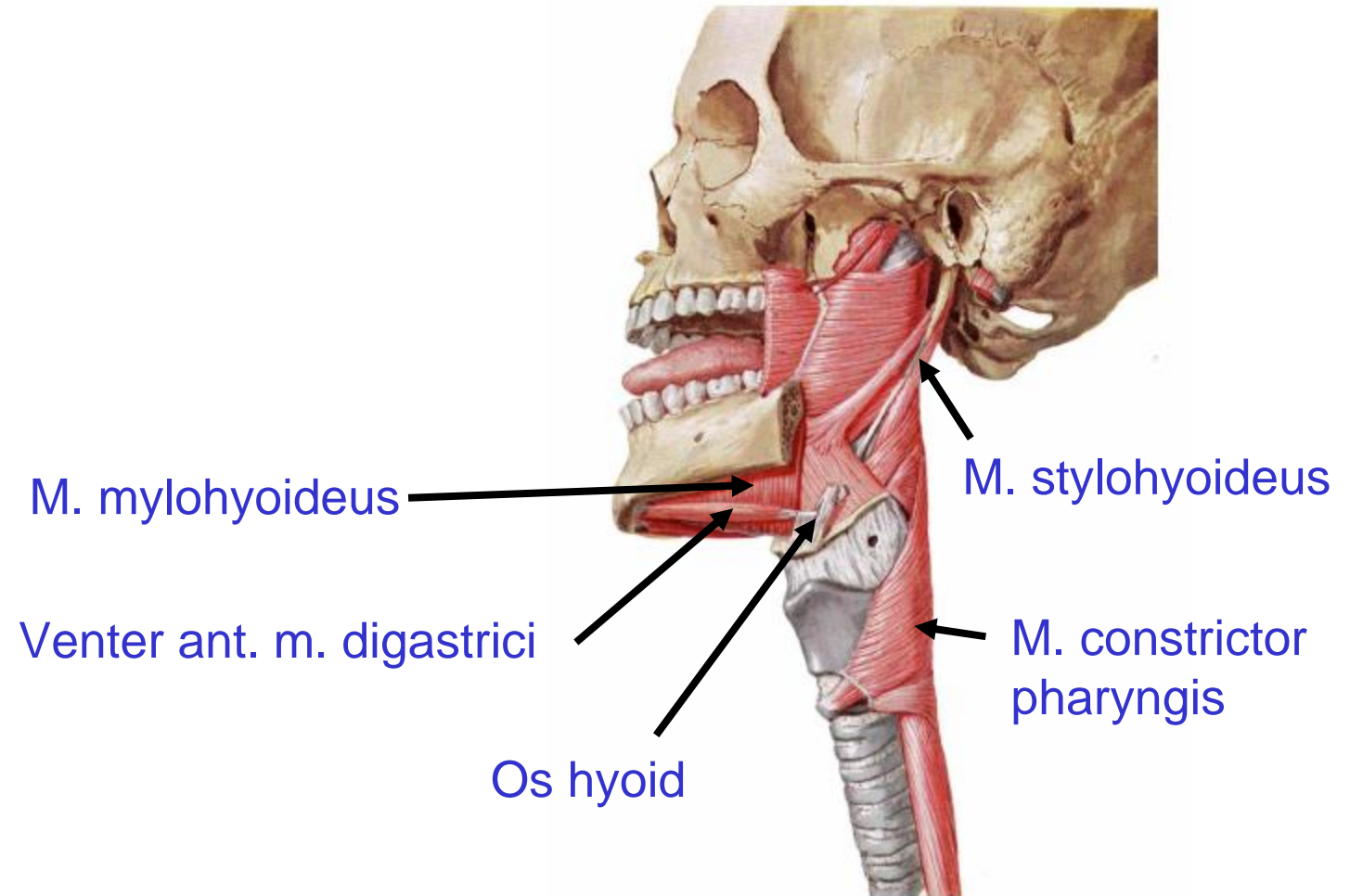


Lateral pharynx muscles



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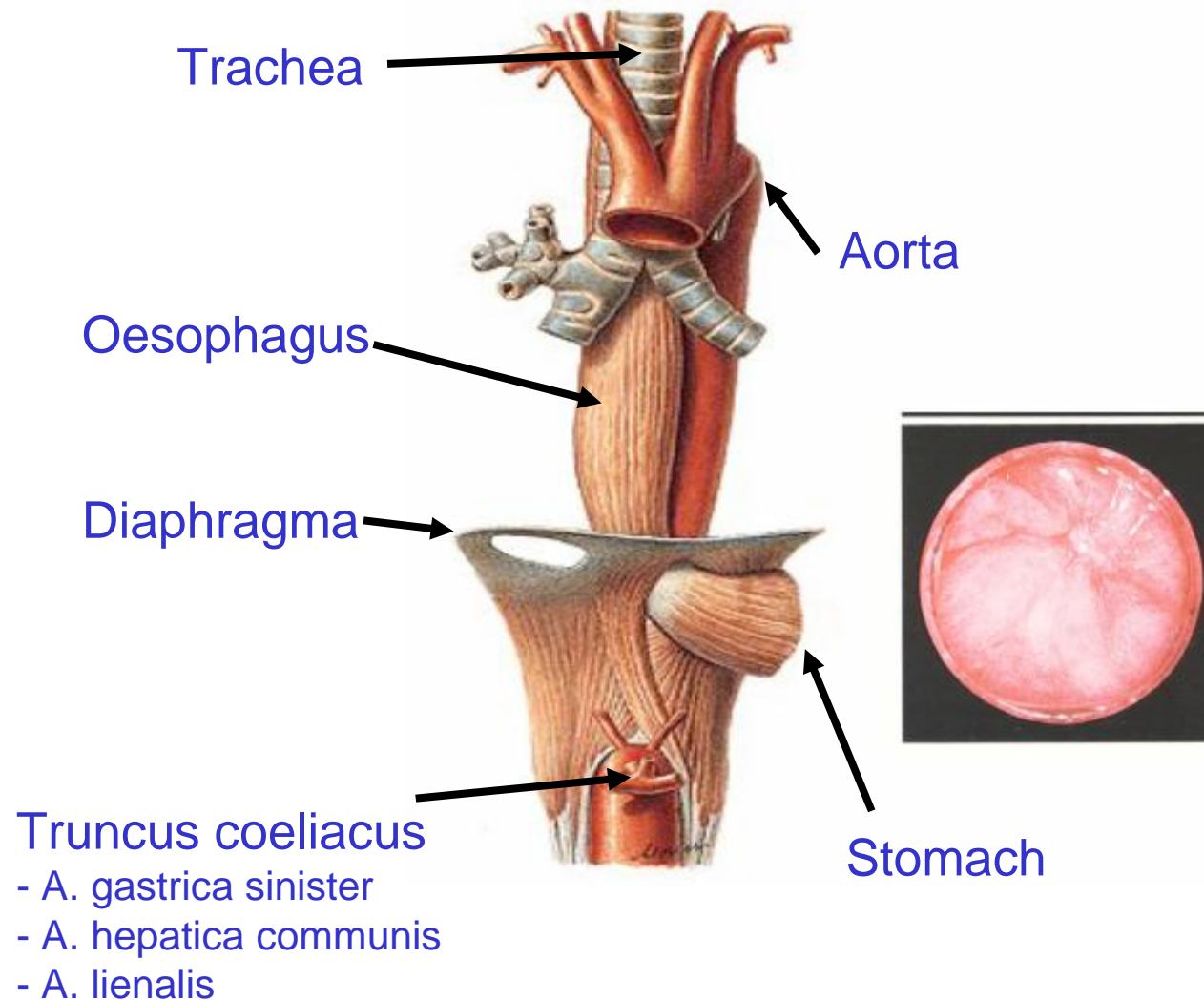


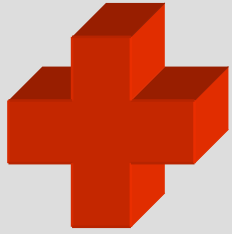
Anatomy of the oesophagus



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Muscularis of the Gastrointestinal tract

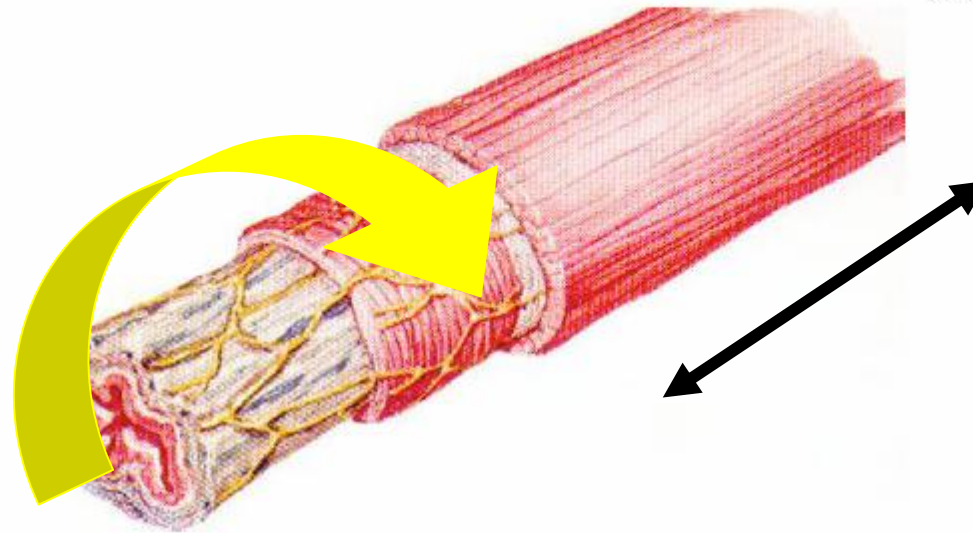
Tunica mucosa

Tela submucosa

Tunica muscularis

Tunica adventitia

Tunica serosa

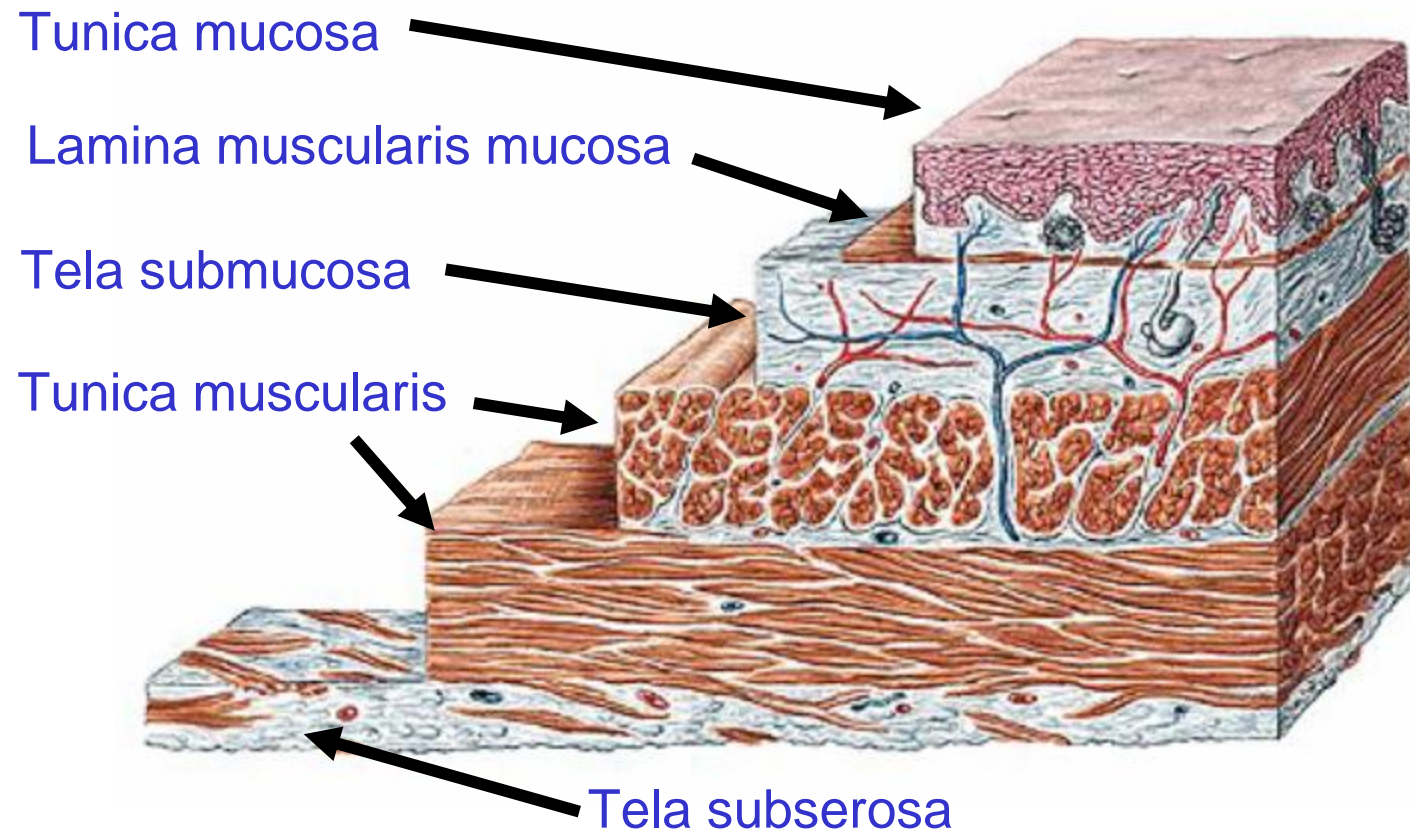




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Details of the oesophagus





From oesophagus to stomach



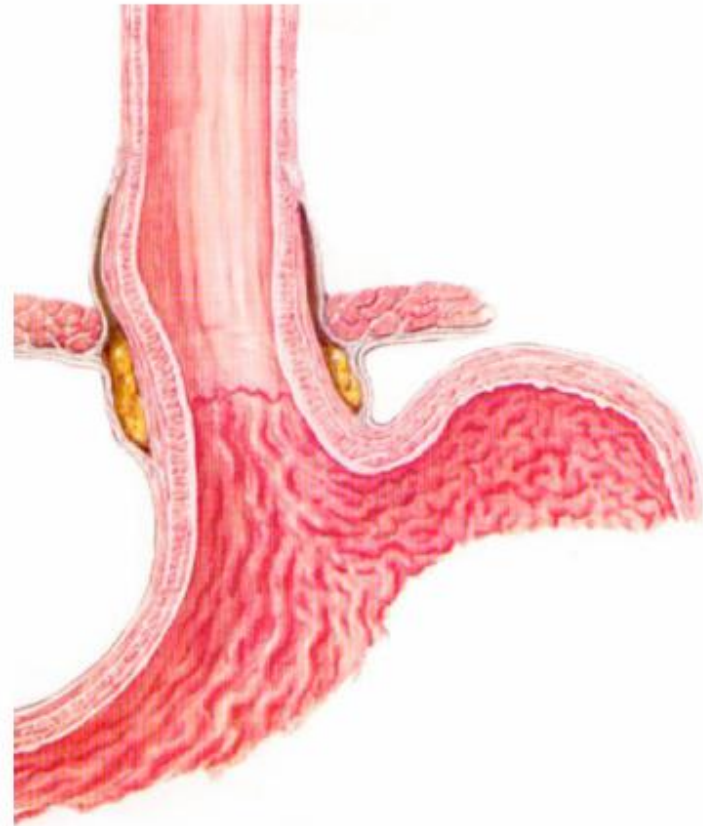
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plicae oesophageales

ora serrata (Z-line)

ostium cardiacum

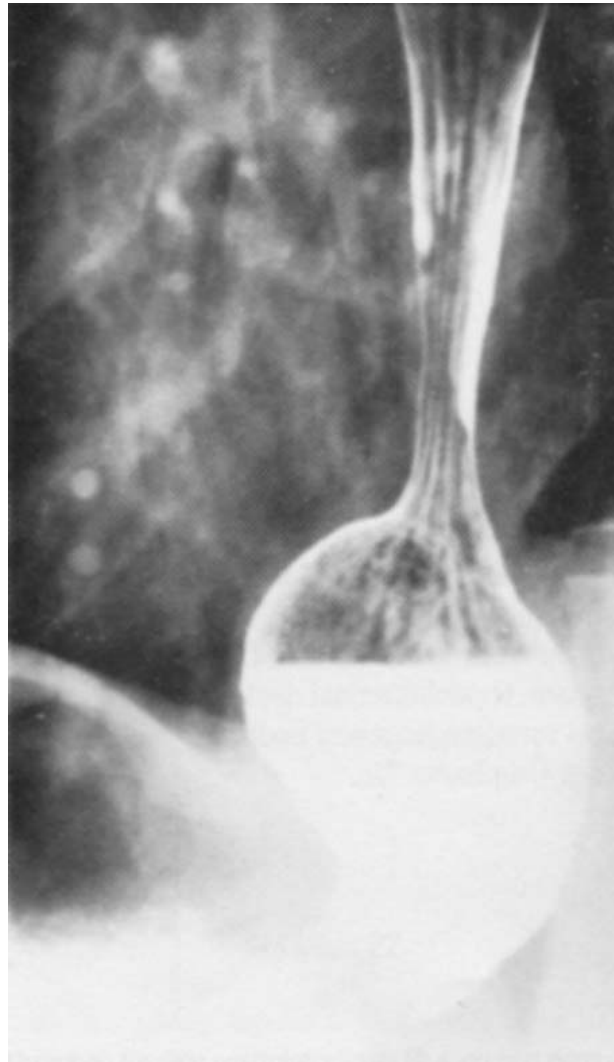




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X-Ray



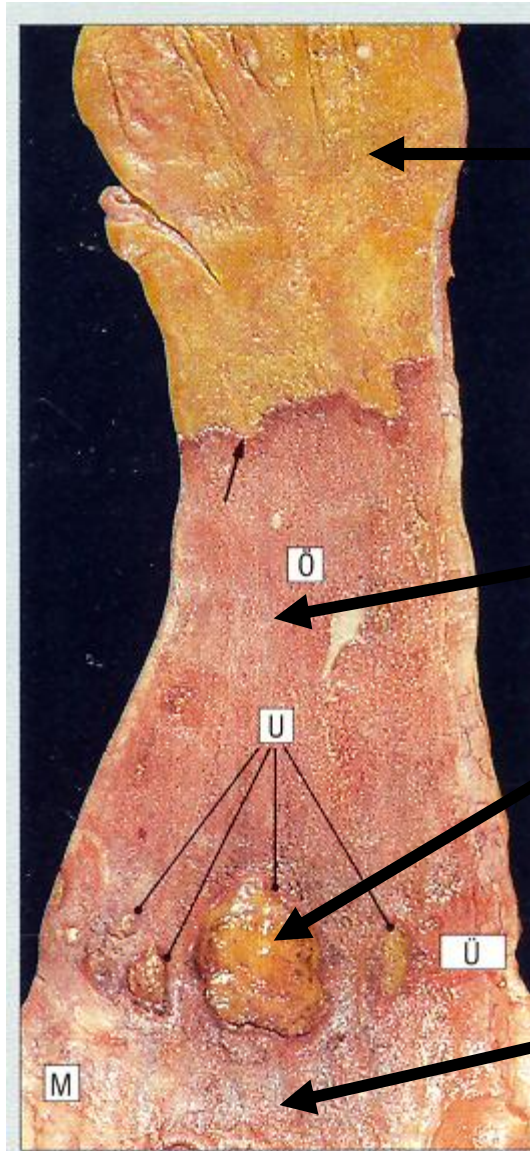


Barrett oesophagus/ Ulcus



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Oesophagus normal cells

Oesophagus abnormal cells

Ulcus

Stomach normal cells



Function of the oesophagus



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- **Transport of food into the stomach**
- **Reflux prevention**

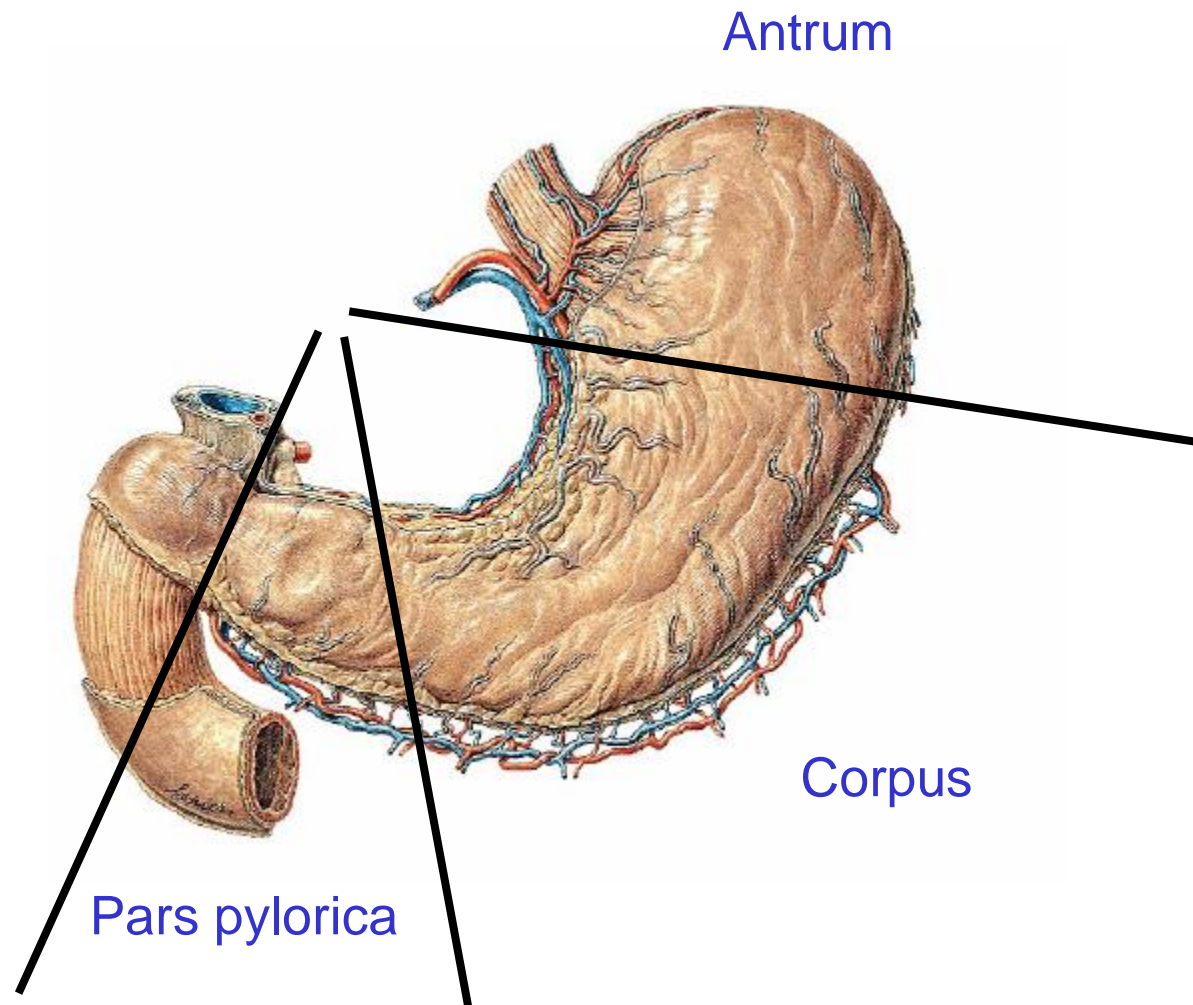


Anatomy of the stomach



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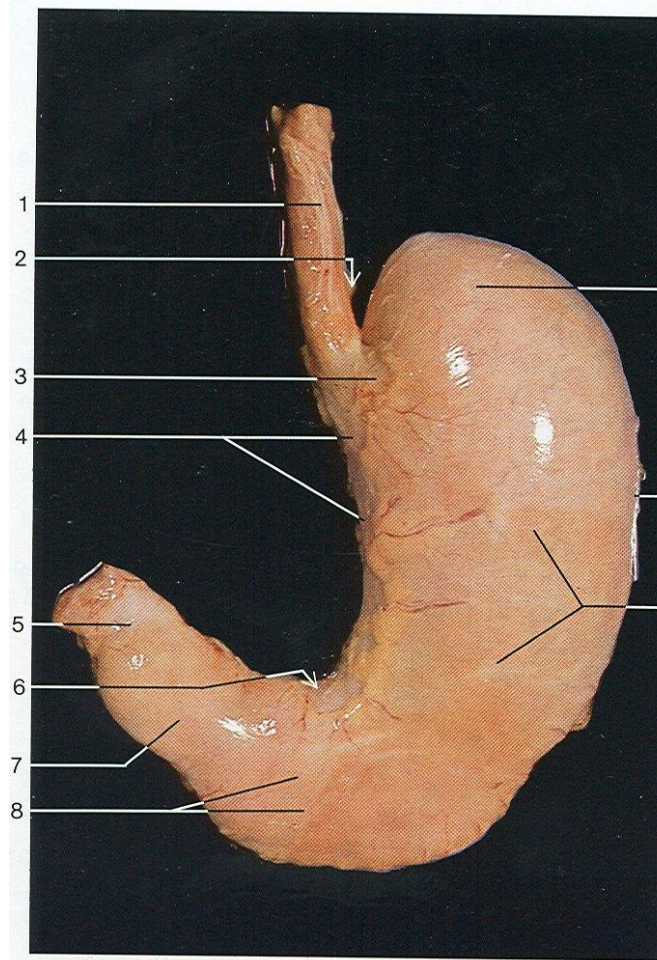


Stomach



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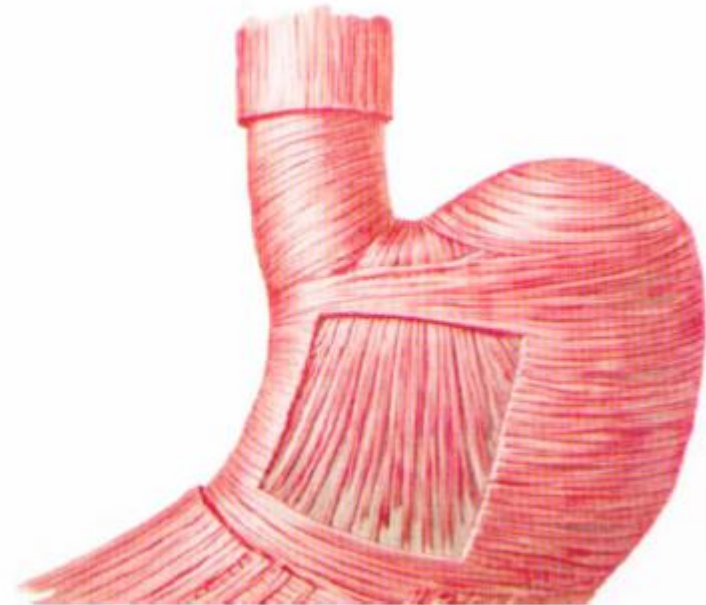


Muscles of the stomach



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Structure of the stomach



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Surface cells: protection mucus

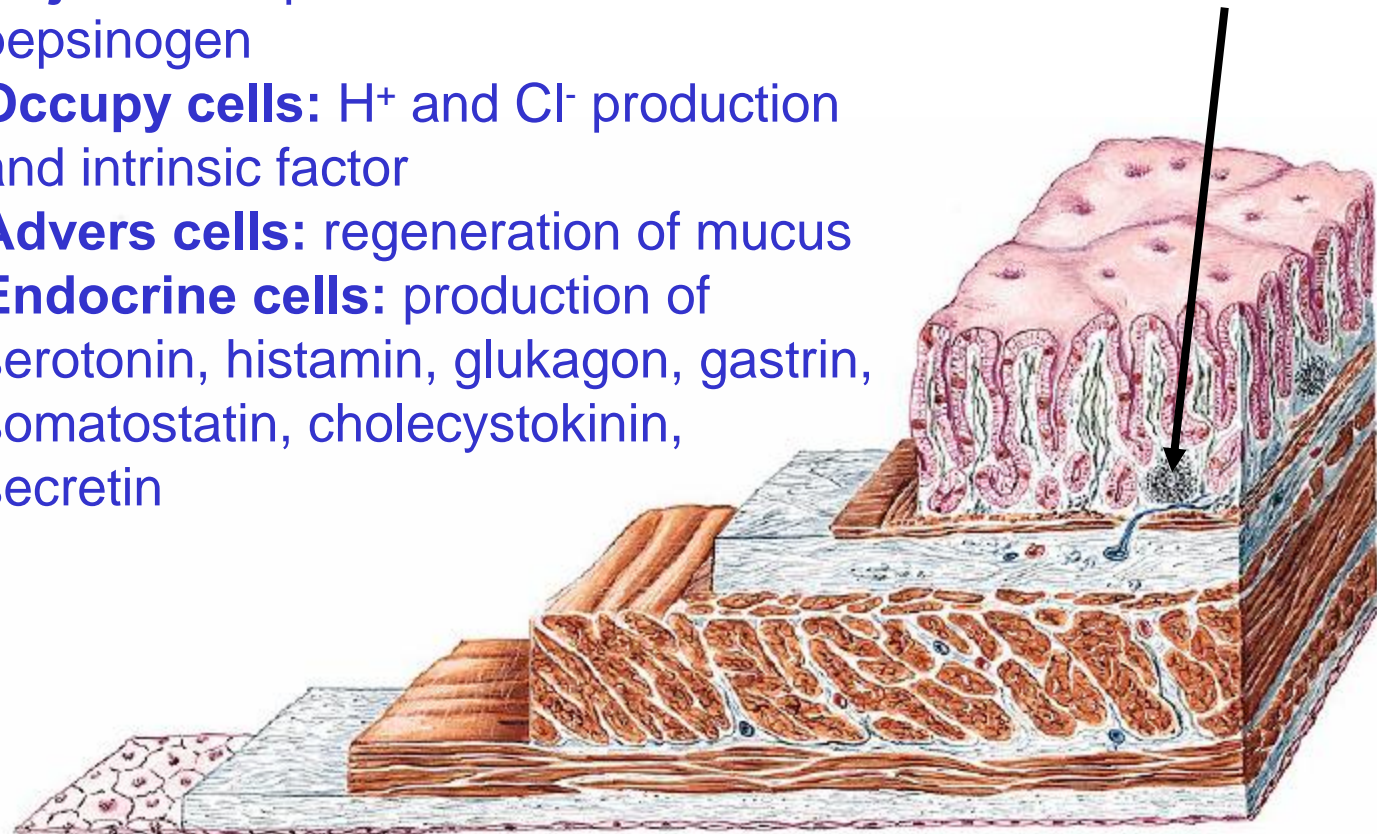
Major cells: production of
pepsinogen

Occupy cells: H^+ and Cl^- production
and intrinsic factor

Advers cells: regeneration of mucus

Endocrine cells: production of
serotonin, histamin, glukagon, gastrin,
somatostatin, cholecystinin,
secretin

Lymph nodes

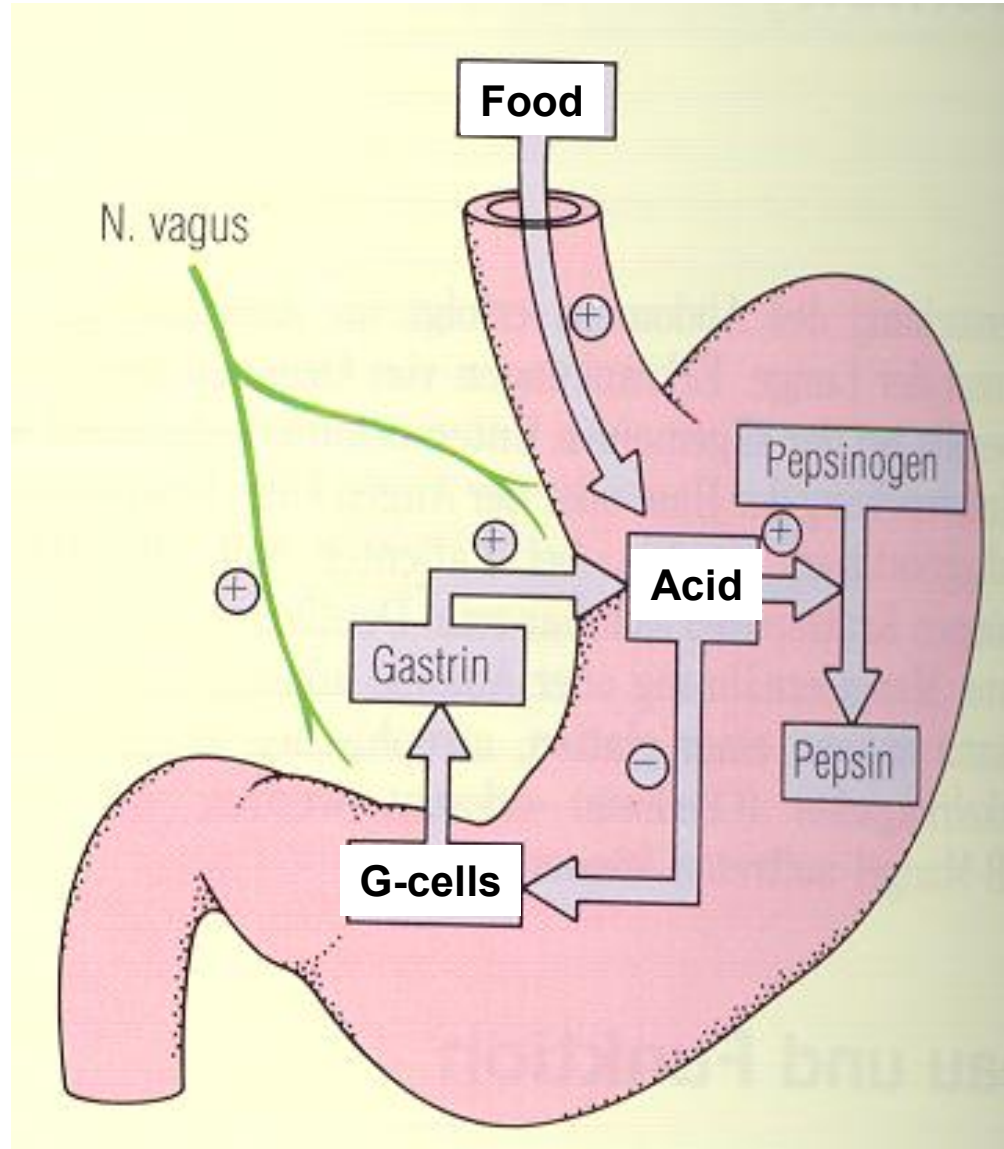




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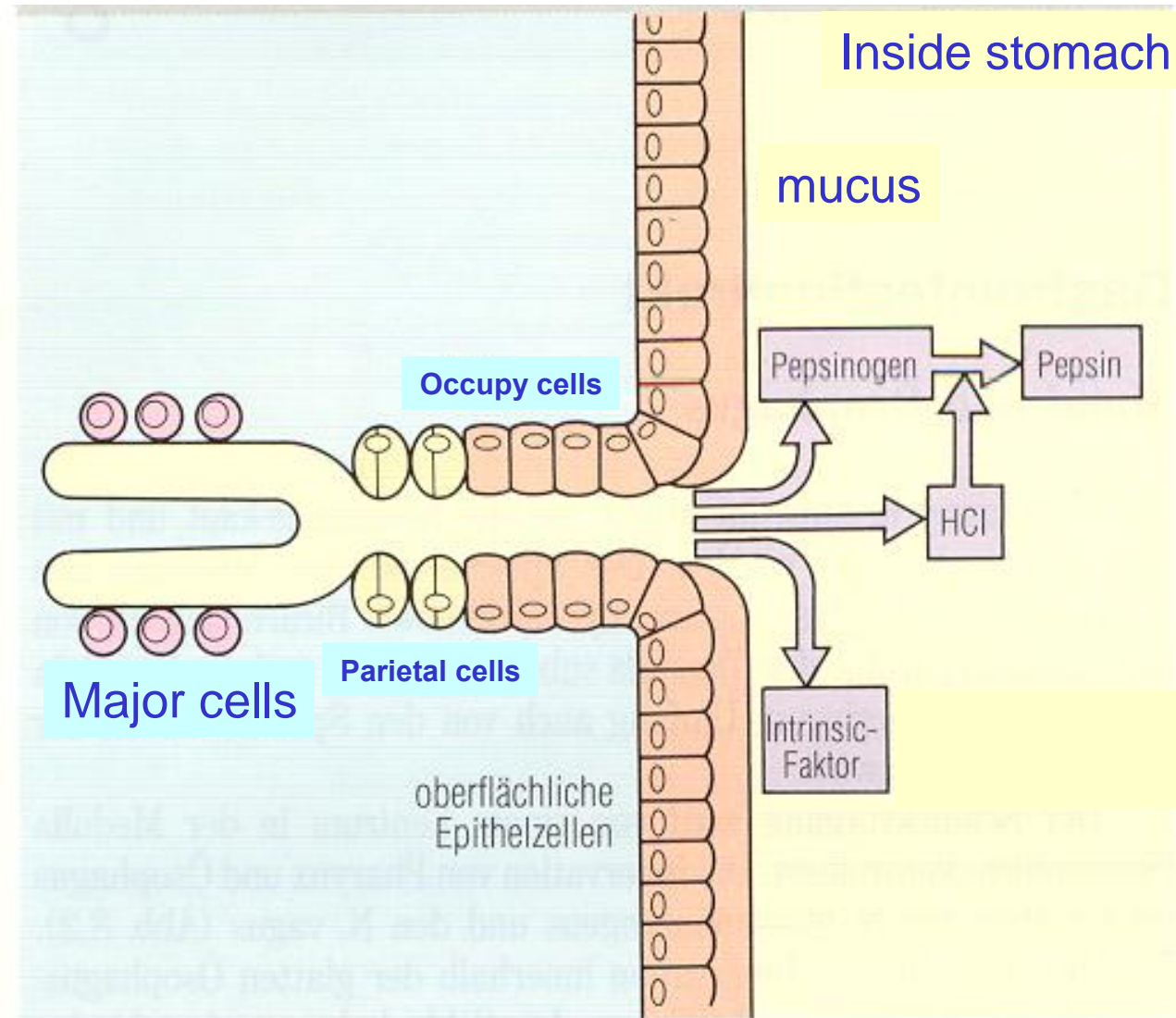




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Stomach





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Function of the stomach

- 🔴 **Digestion of food**
- 🔴 **Digestion of carbohydrates**
- 🔴 **Start digestion of proteins**
- 🔴 **Emulsion of fett acids**
- 🔴 **Secretion of H⁺**
- 🔴 **Secretion of intrinsic factor**



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Case report

- **Symptom: awful pain, immediately after eating**
- **Diagnosis:**
 - **Anamnesis**
 - **Clinical examination**
 - **Special examination**



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Anamnesis

🔴 Questions?

- How long occurred the symptoms?
- At which time and in which context?
- About the environment, background, job, life-events etc.
- About the family, are there other members with the same symptoms?



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Special examinations

- 🔴 **Gastroscopy**
- 🔴 **X-Ray**
- 🔴 **Computertomography (CT)**
- 🔴 **Magnet-Resonance-Tomography (MRT)**
- 🔴 **Sonography (Ultra-scan)**



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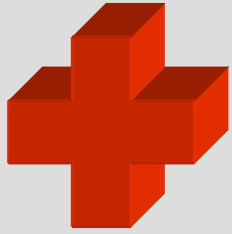
Ulcer / Gastritis

● Ulcer/ Gastritis

- Type A (autoimmune gastritis)
- Type B (H. pylori)
- Type C (chemical toxic)

● Therapy

- Reduce the acid
- Stabilisation of the mucus
- Eradication of H. pylori

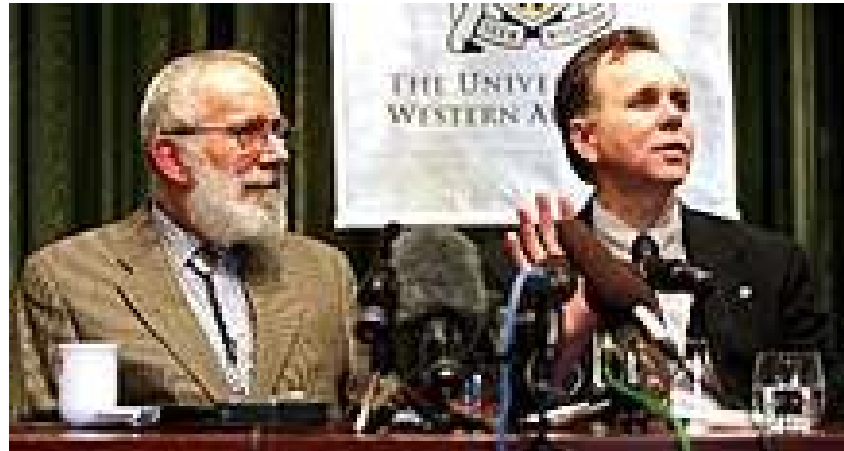


Helicobacter pylori



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Robin Warren and Berry Marshall

- 🔴 1978 provement of H. pylori in the stomach
- 🔴 Responsible for 80% of all ulcus diseases
- 🔴 Therapy with H₂-inhibitors and antibiotics

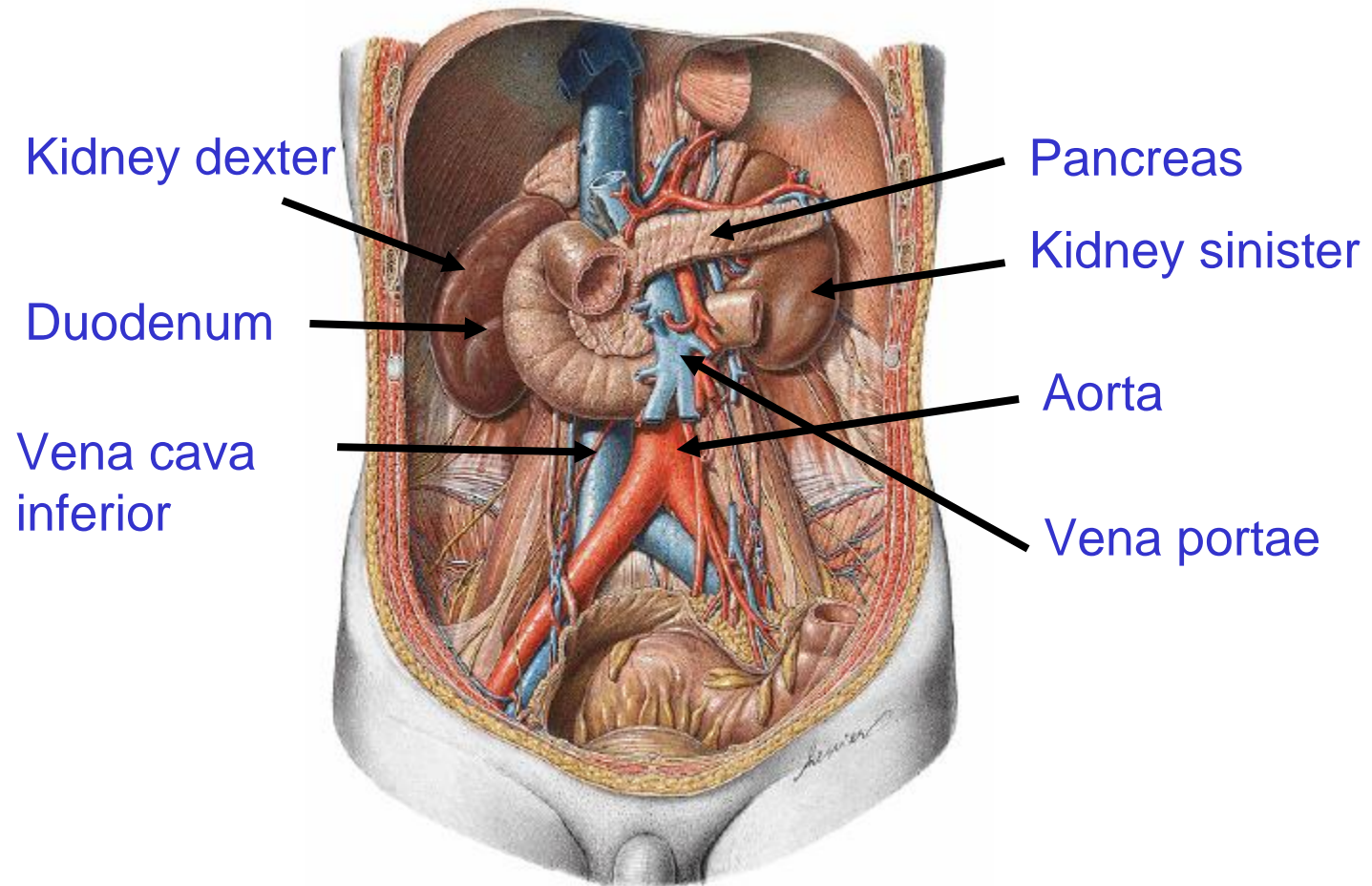


Anatomy of the duodenum



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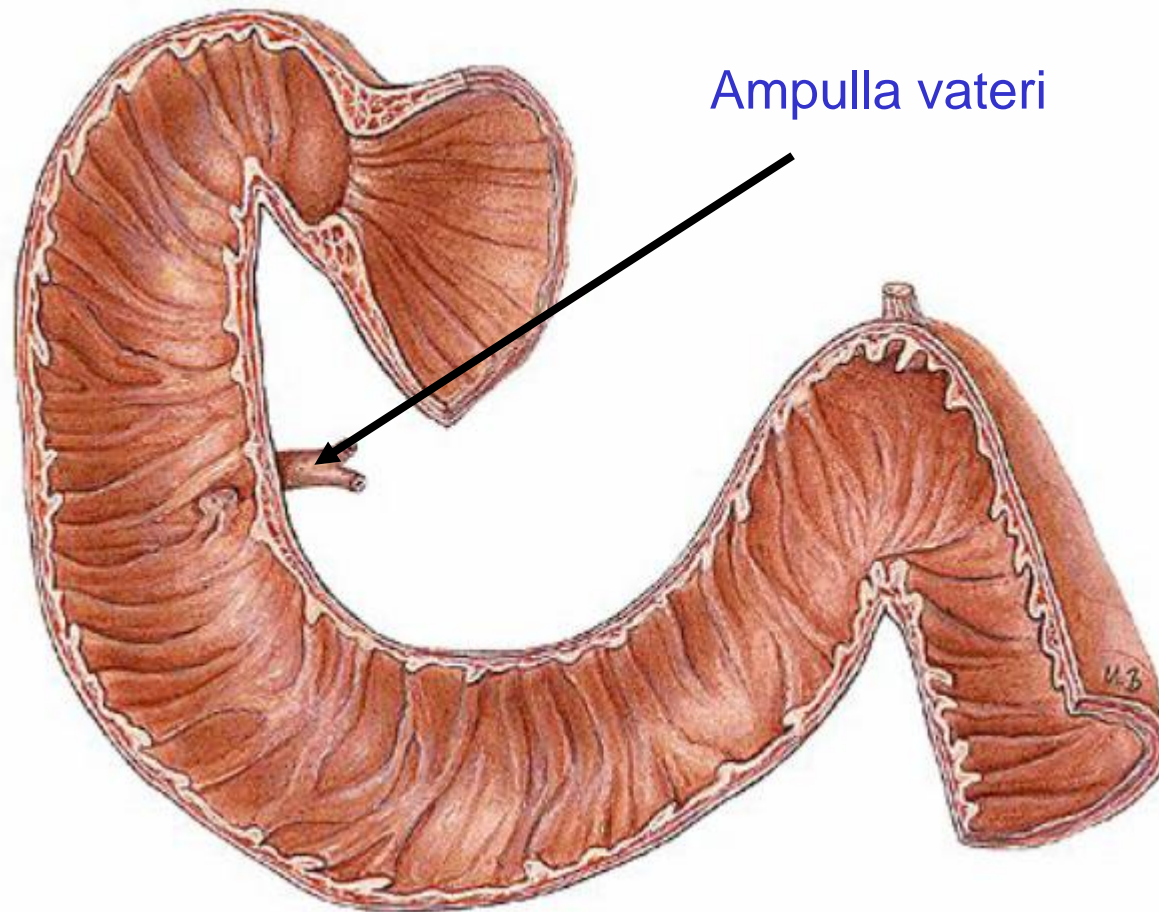


Structure of the duodenum



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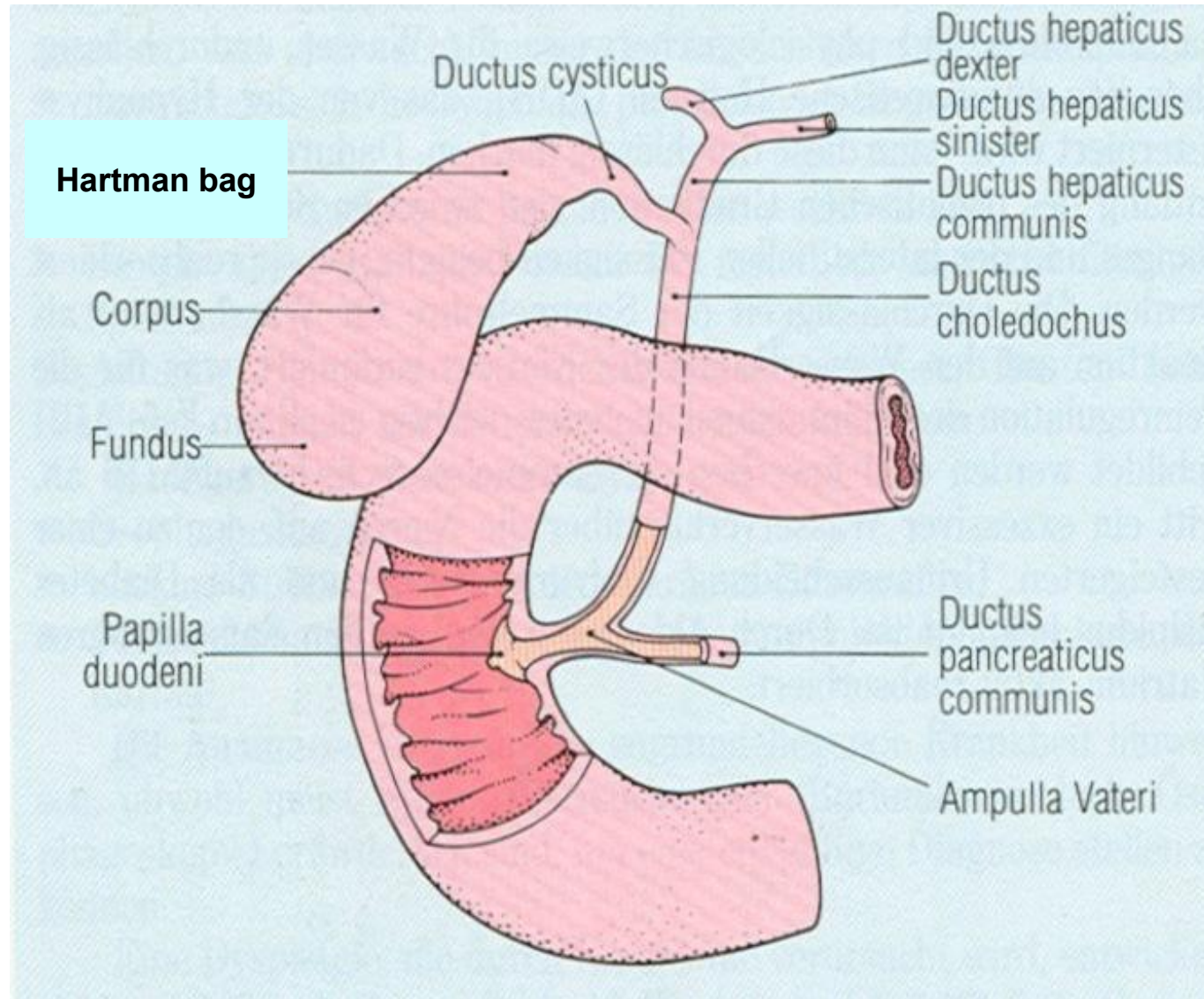


Anatomy of gallbladder



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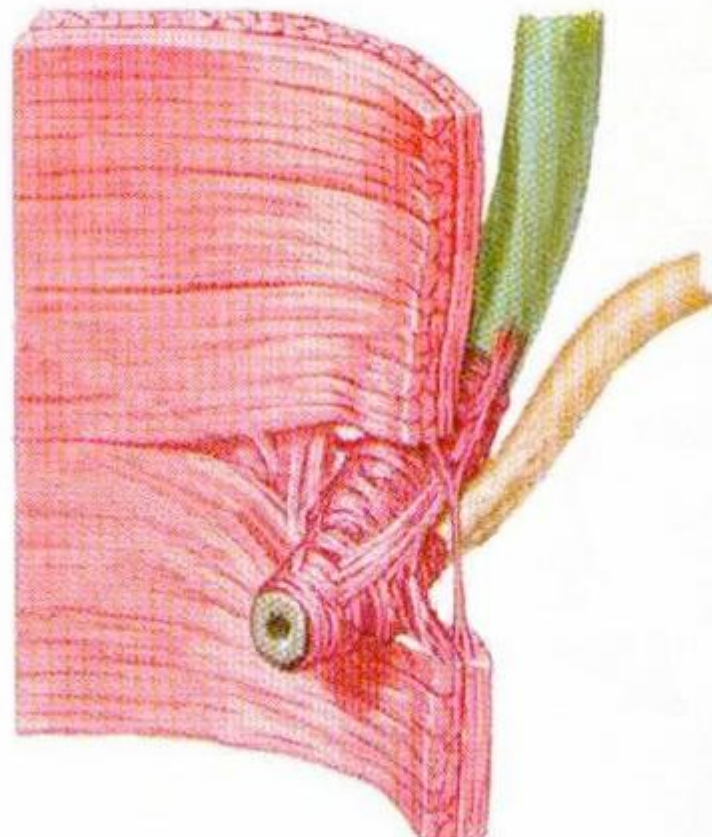
Structure of the duodenum

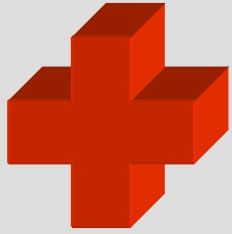


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m. sphincter Oddi





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Function of the duodenum

- Secretion of gall
- Secretion of pancreas enzymes
 - Exocrine function



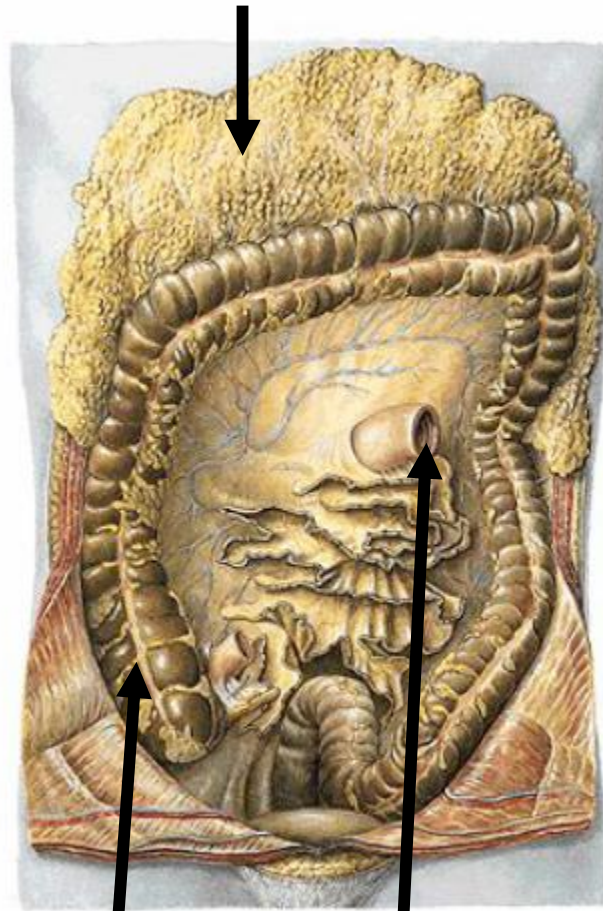
Anatomy of the small bowel



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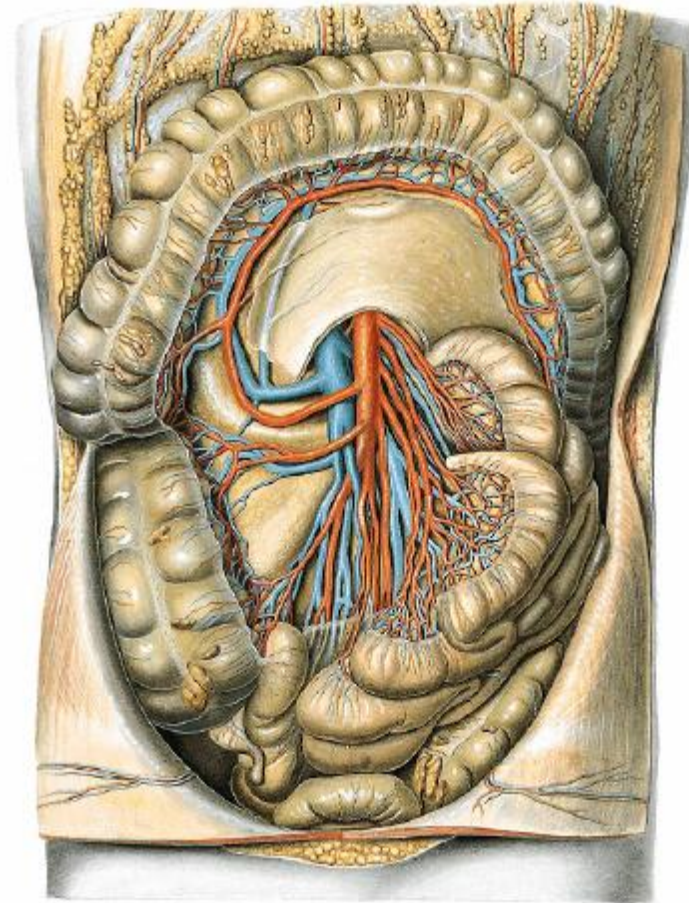
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Peritoneum



Colon

Doudenum





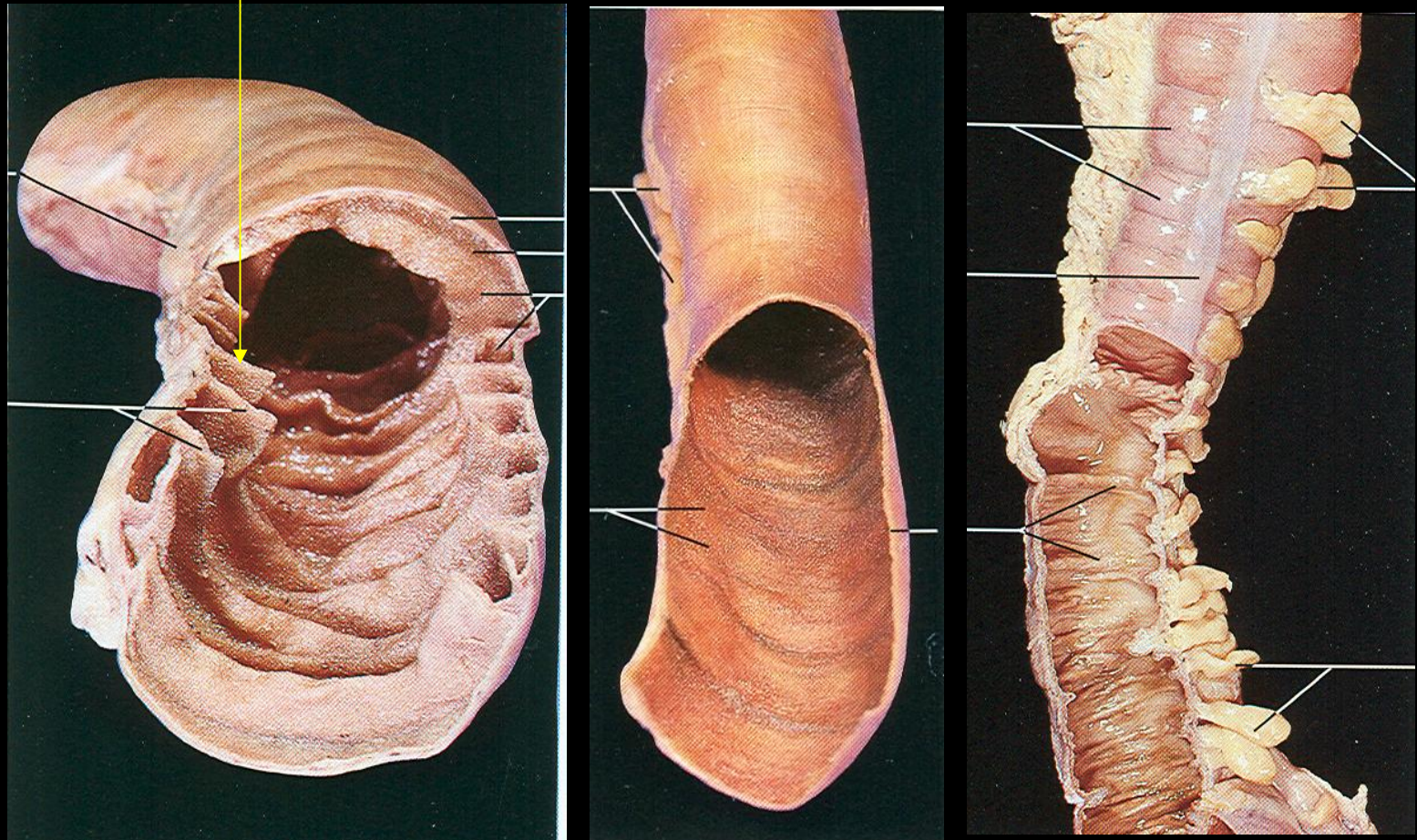
Detail structure of the intestine



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Plicae circulares 3x surface enlargement





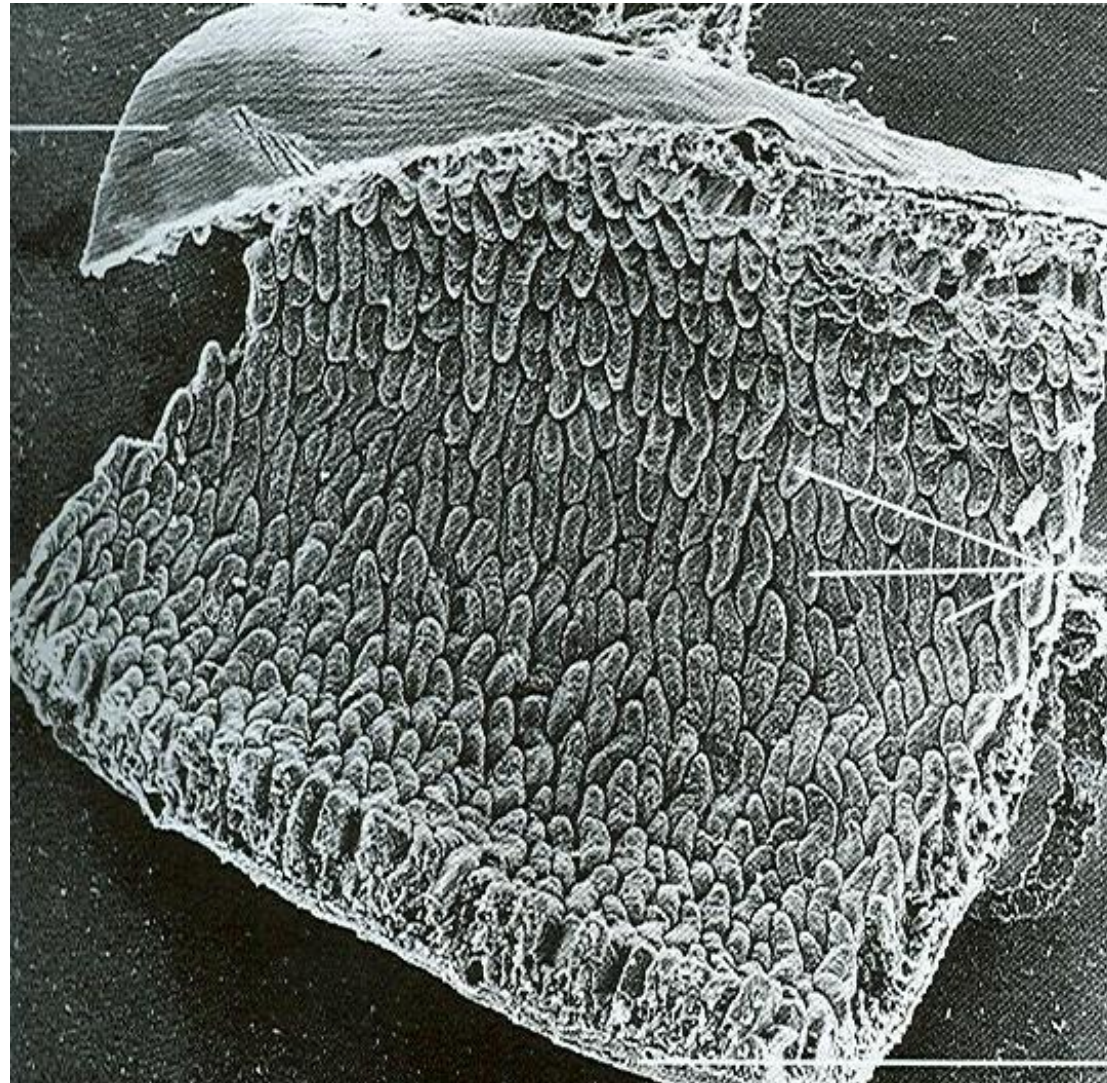
Surface enlargement



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Villi intestinales 10x surface enlargement



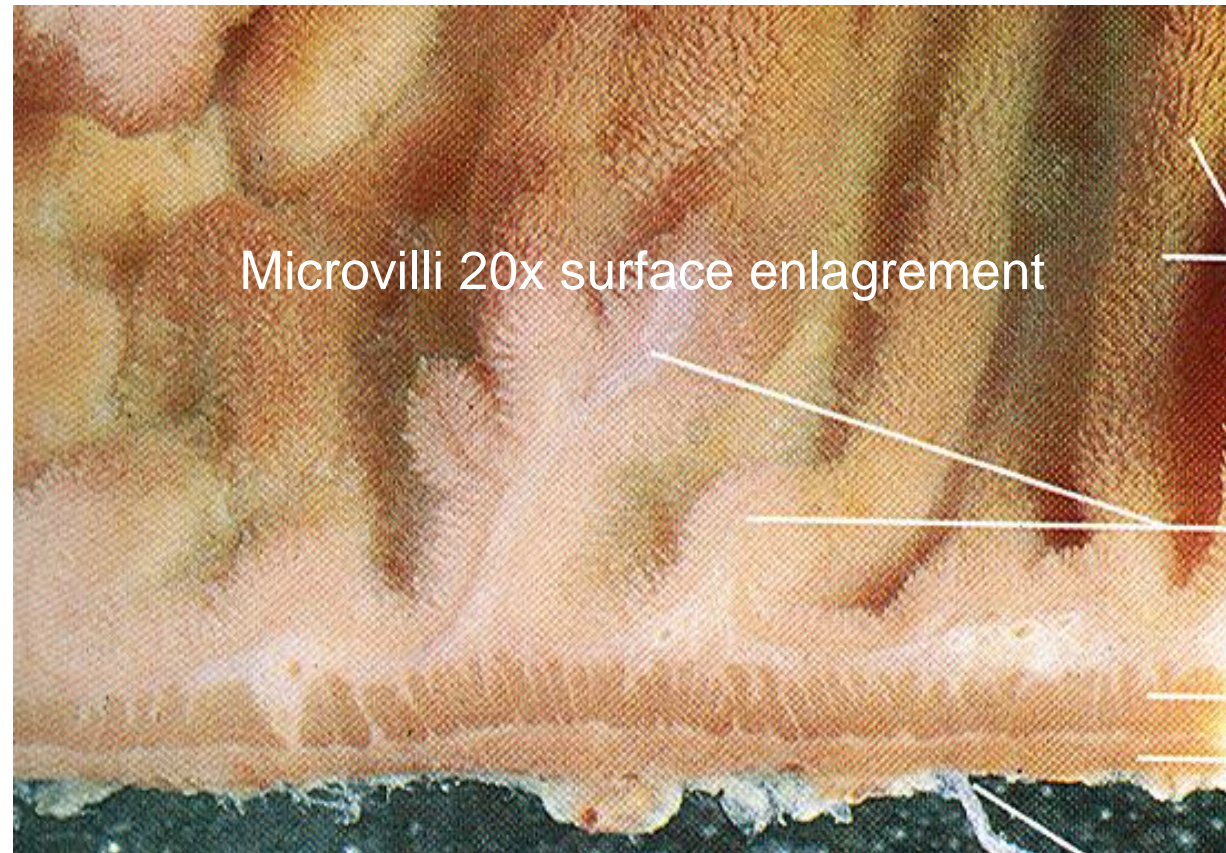


Principle of surface enlargement



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Principle of surface enlargement



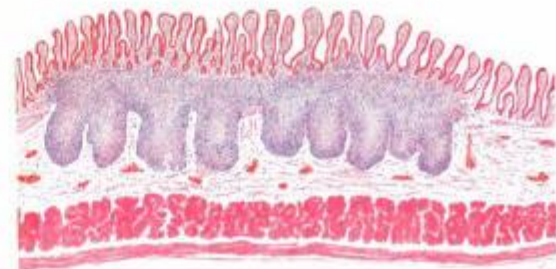
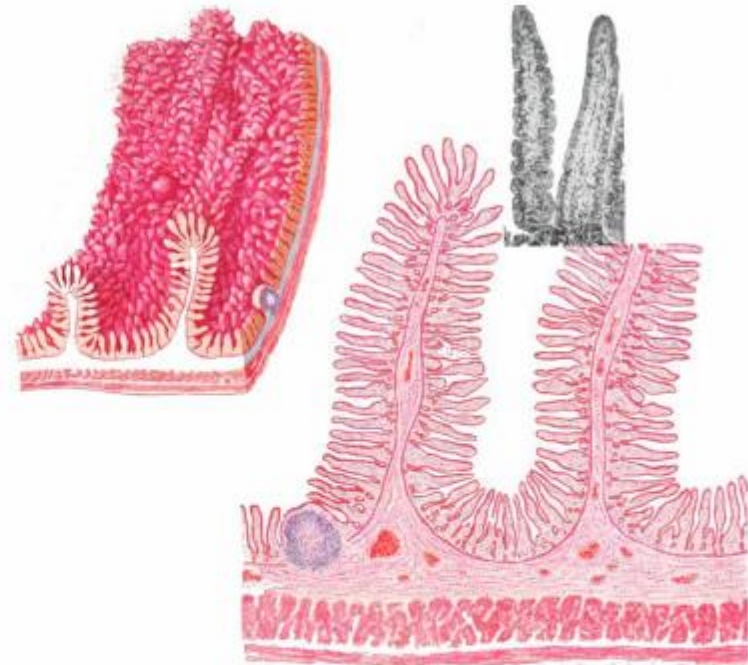
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1. Plicae circulares: x 3
2. Villi intestinales + Krypten: x 10
3. Mikrovilli: x 20

Total surface for resorption

> 200 m²





Cells of the small intestine



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- Enterocytes
- Goblet cells
- Paneth cells
- Entero-endocrine cells
- Enterochromaffine cells (EC-cells)
- APUD cells (Amine Precursor Uptake and Decarboxylation cells)
- Gastrin cells
- Entero-glukagon cells
- Sekretin cells
- Cholezystokinin producing cells
- K-cells (Gastro inhibitin peptid)

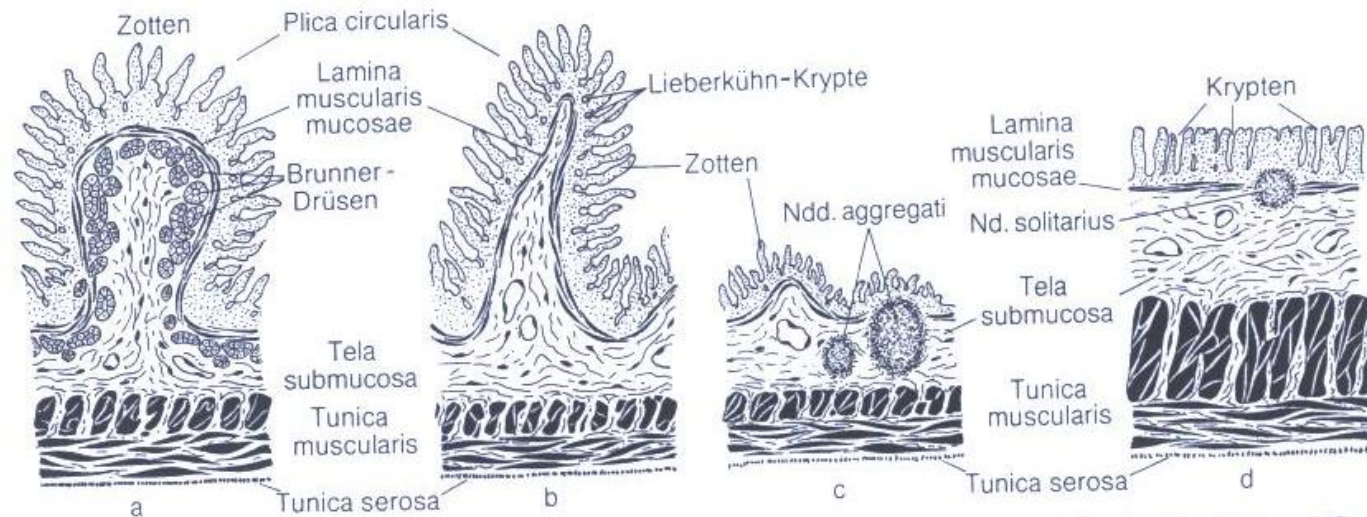


Structur of the gastrointestinal tract



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Duodenum

Jejunum

Ileum

Colon

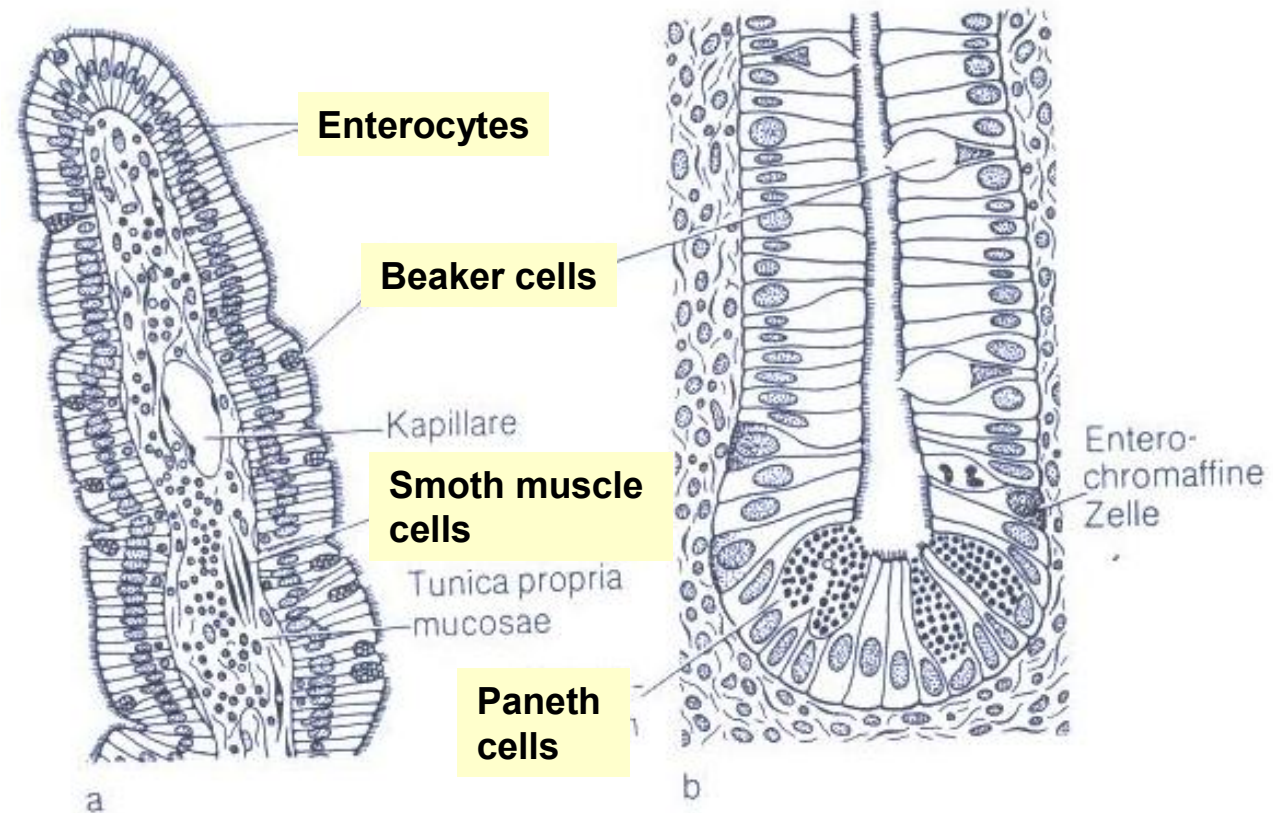


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Function of the small intestine



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- 🔴 Resorption of carbohydrates
- 🔴 Resorption of fatty acids
- 🔴 Resorption of proteins
- 🔴 Resorption of iron

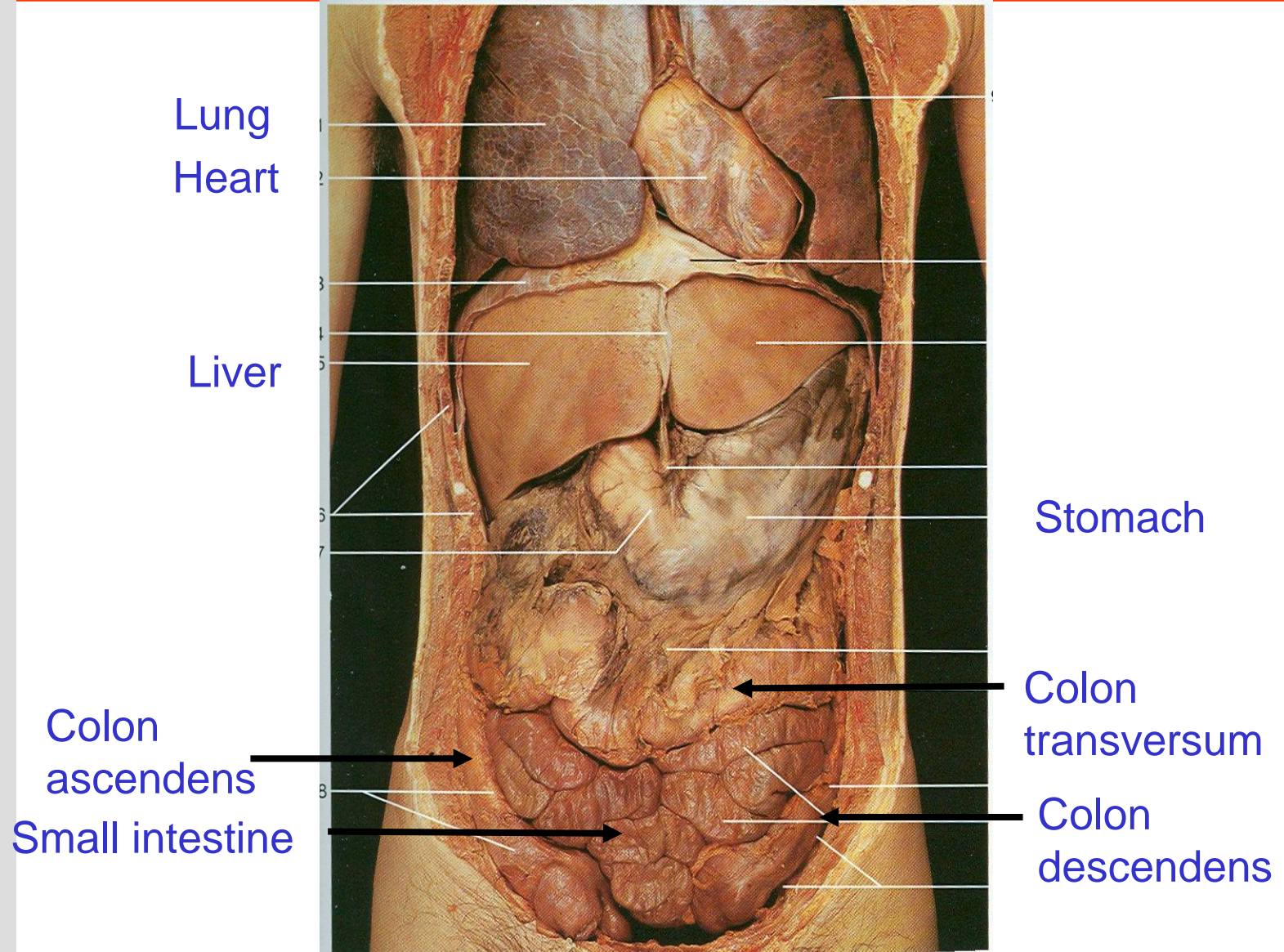


Small and large intestine



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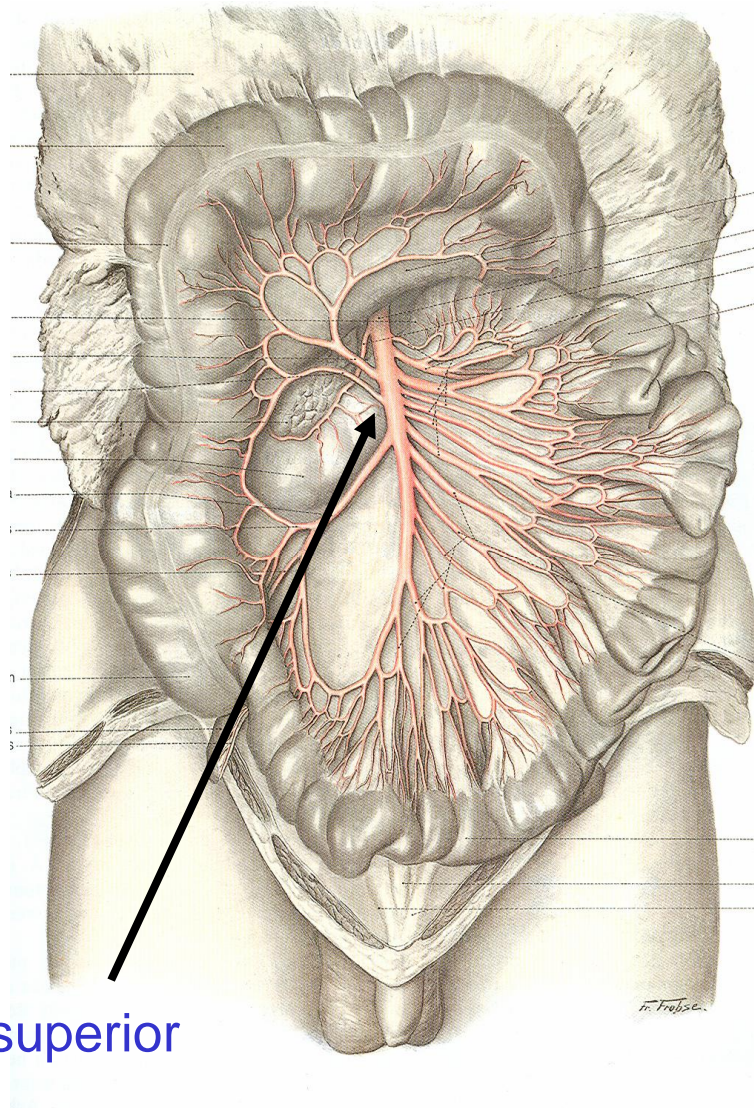


Blood supply of the intestinum



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Arteria mesenterica superior

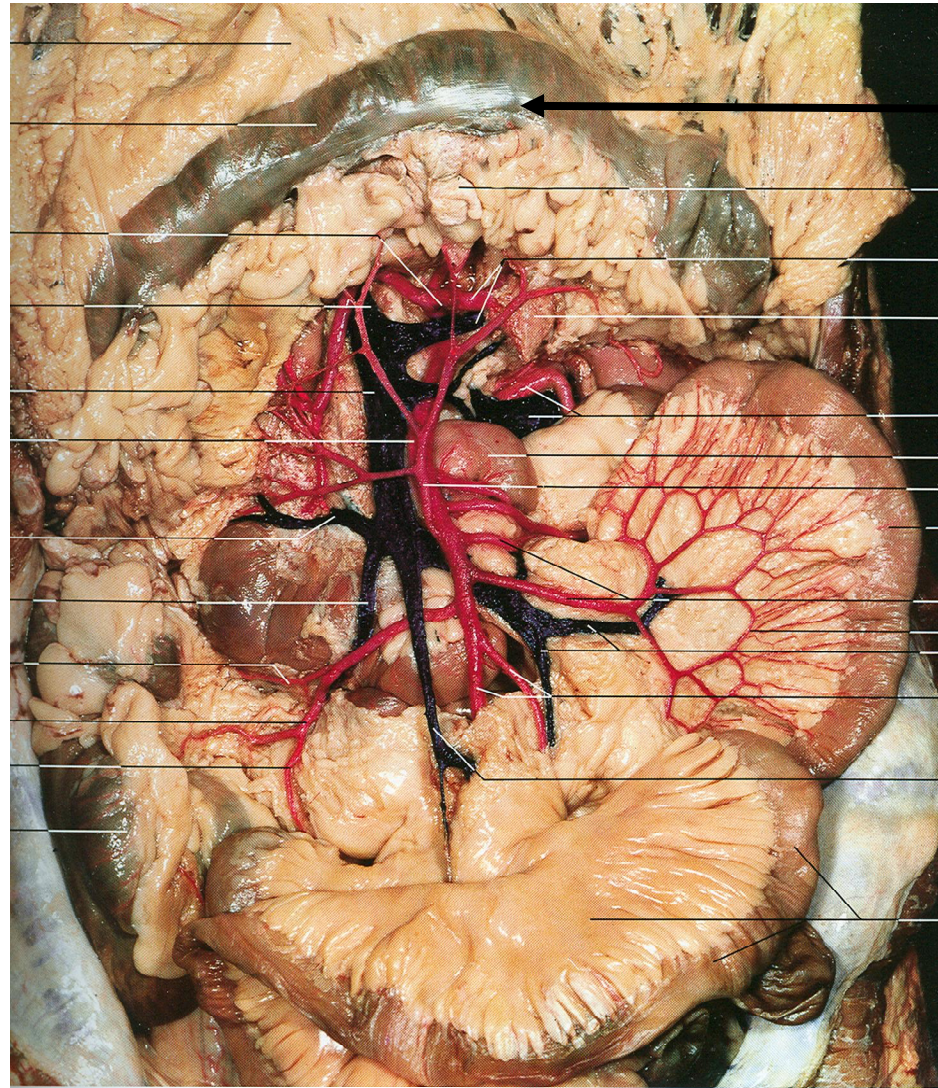


Be careful for the blood vessels



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Colon
transversum



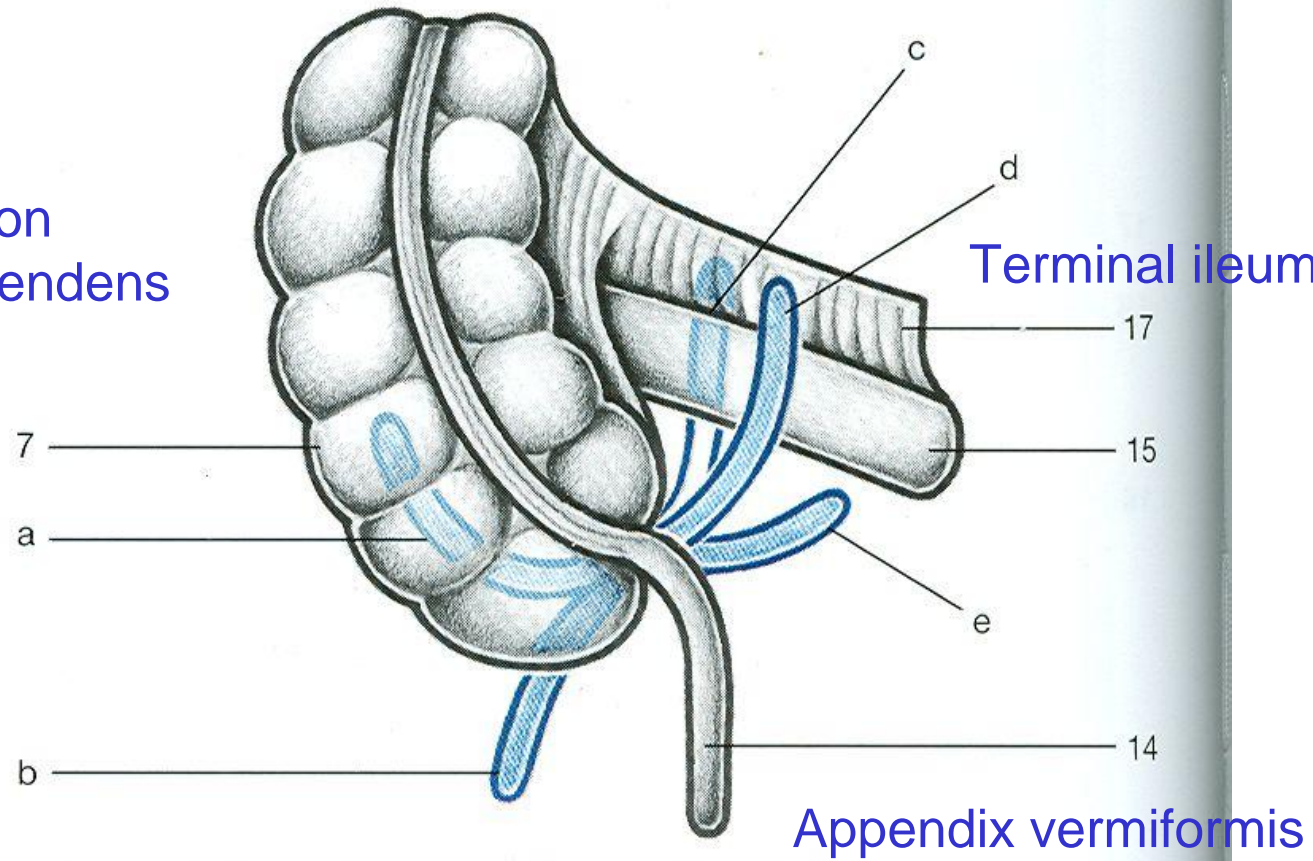
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Appendicitis

Colon
ascendens

Terminal ileum



Appendix vermiformis



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Appendicitis

Colon
ascendens

Appendix
vermiformis





Passage from small to large intestine



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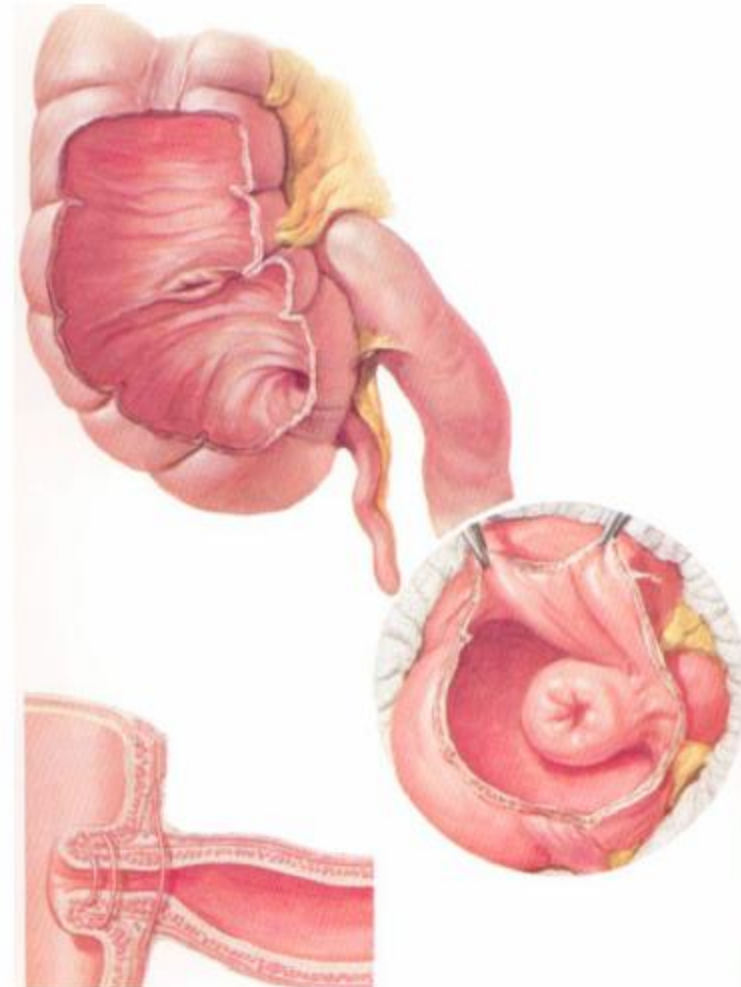
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valva ileocaecalis = Bauhin-Klappe

Labrum superius
ostium ileale
Labrum inferius

ostium appendicis vermiformis

papilla ilealis





Anatomy of the large intestine



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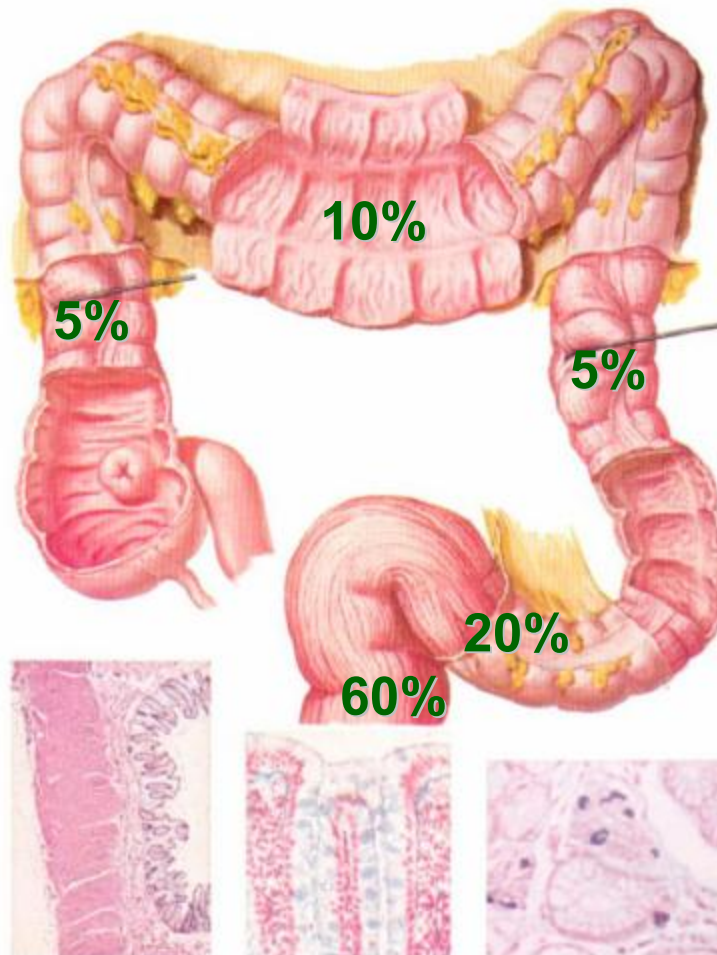
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Colon transversum

Colon
ascendens

Colon
descendens

Appendix





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X-ray of the large intestine





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Diseases of the Gastrointestinaltract

- 🔴 **Gastritis**
- 🔴 **Appendicitis**
- 🔴 **Crohns disease**
- 🔴 **Colitis ulcerosa**
- 🔴 **Cancer**



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Colon Cancer

- 🔴 60% Rectum
- 🔴 20% Sigma
- 🔴 5% Colon descendens
- 🔴 10% Colon transversum
- 🔴 5% Colon ascendens

Colon cancer is curable, if the cancer did not spread and make metastasis



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Anatomy of the rectum

3 plicae transversales recti

Ampulla recti

Linea anorectalis

Canalis analis:

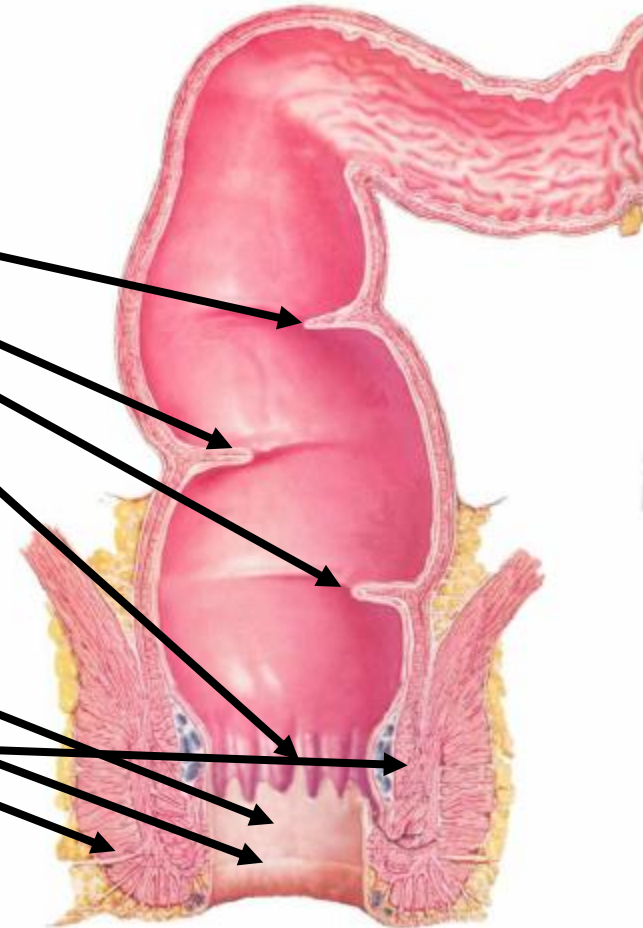
Columnae anales mit Corpus cavernosum

Linea pectinata

Linea anocutanea

m. sphincter ani externus

m. sphincter ani internus





Function of the large intestine



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Resorption of water



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Break for 15 minutes



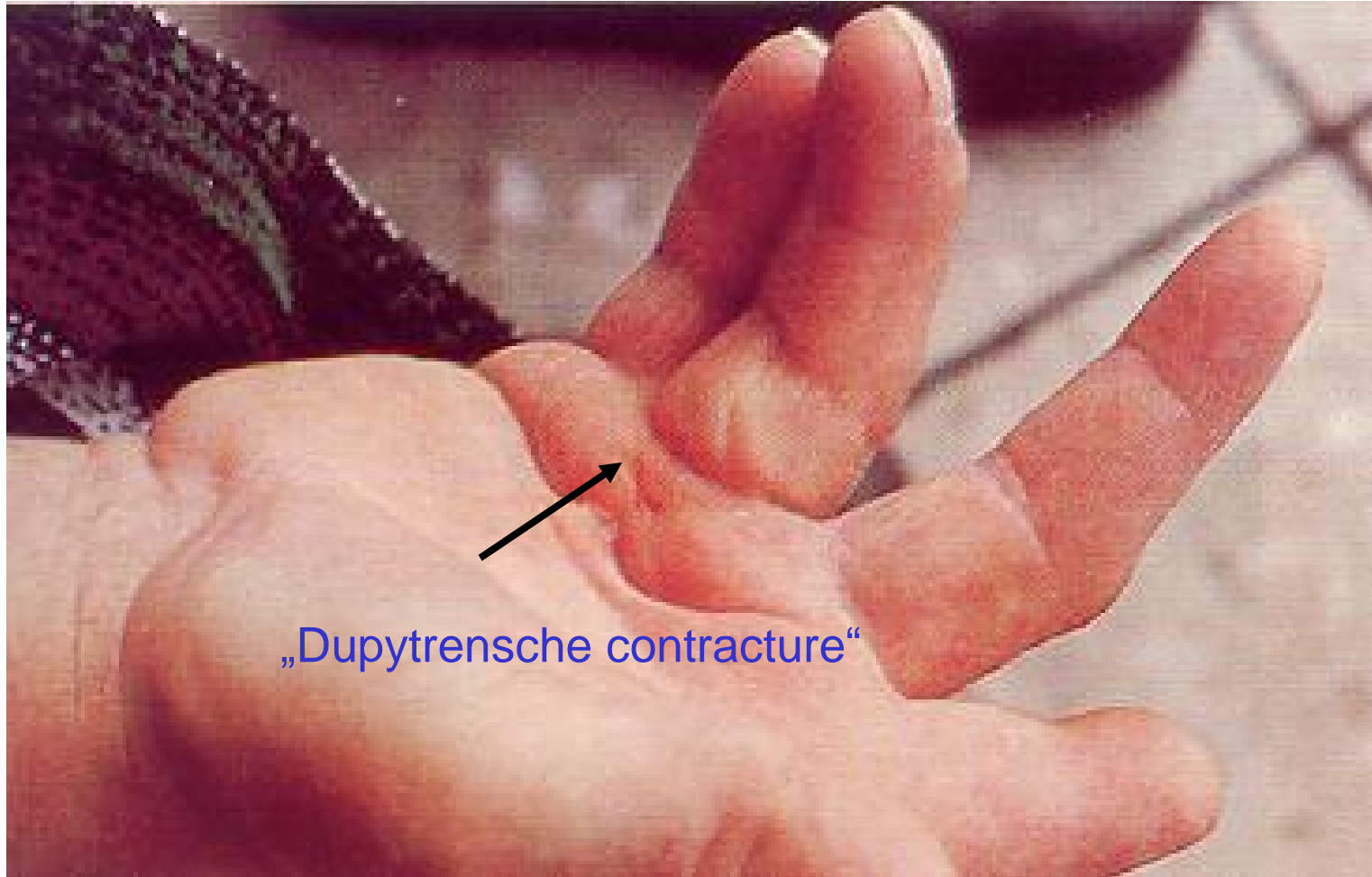


New disease?



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New disease?



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Spider naevi

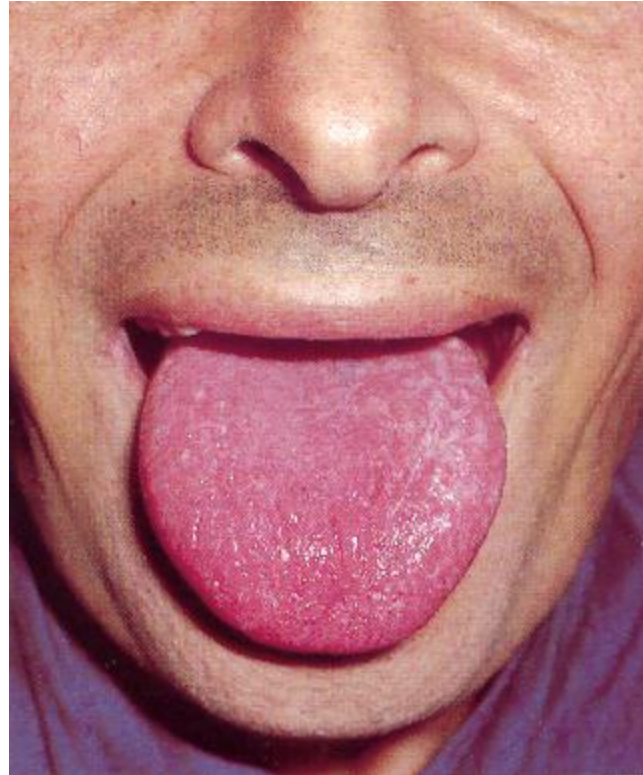


New disease?



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Ascites



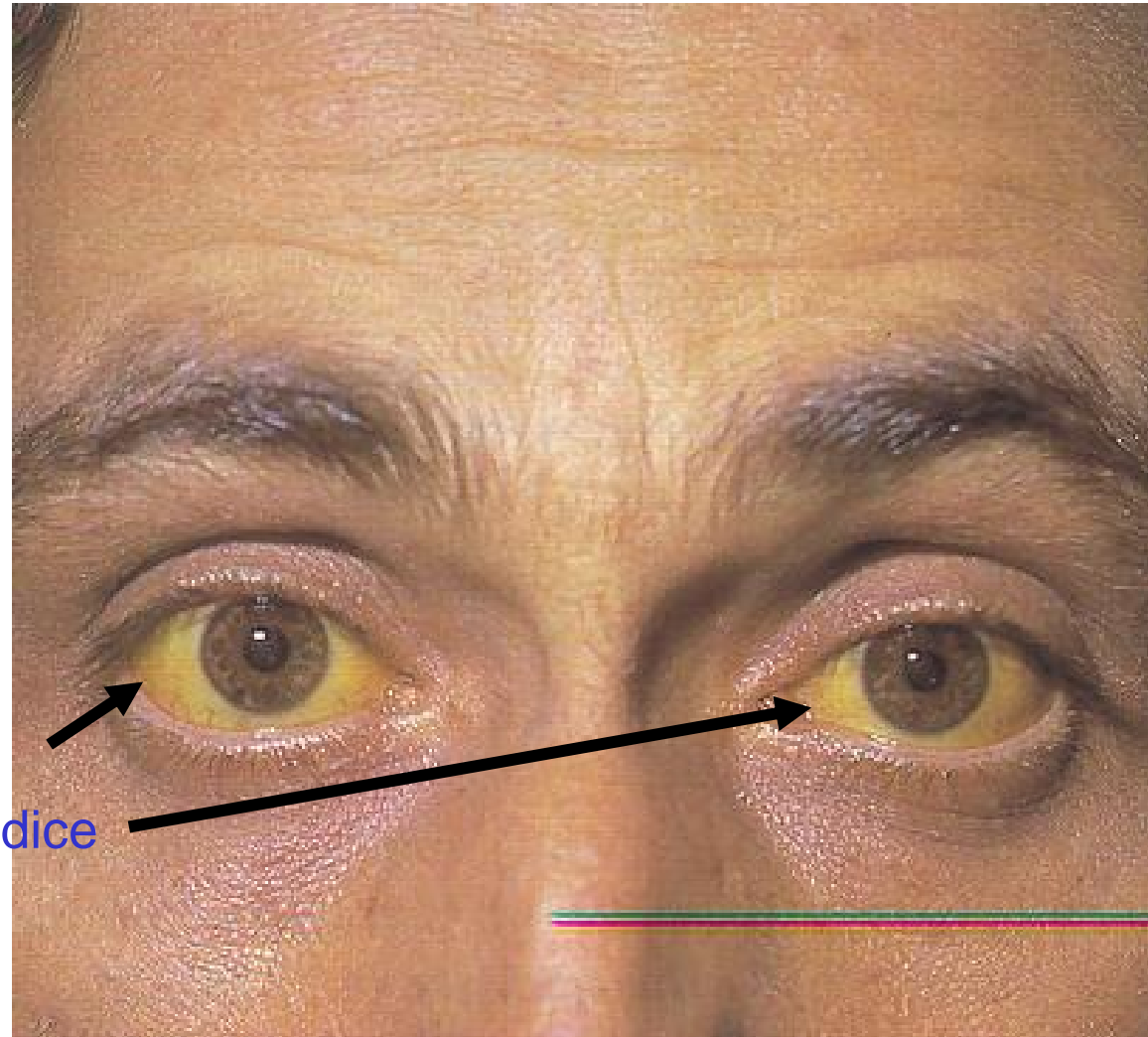


New disease?



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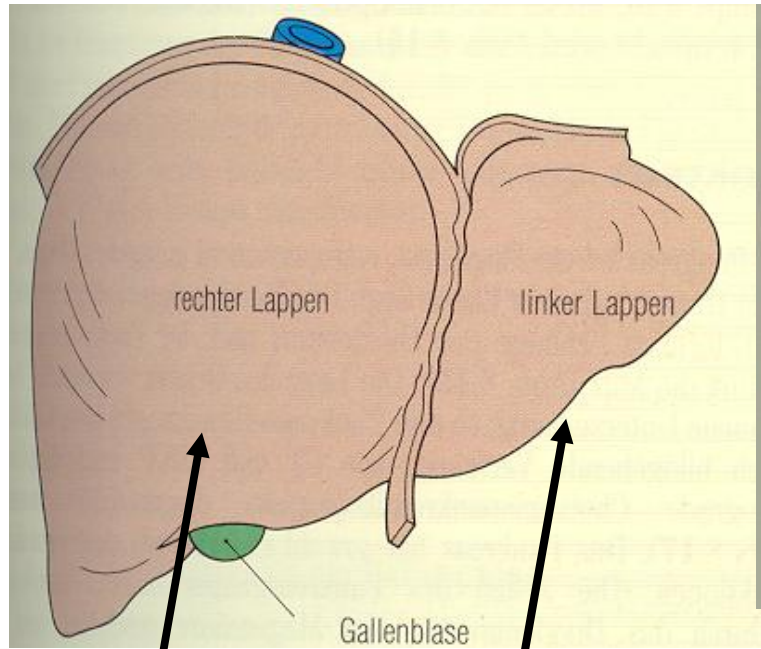
Jaundice



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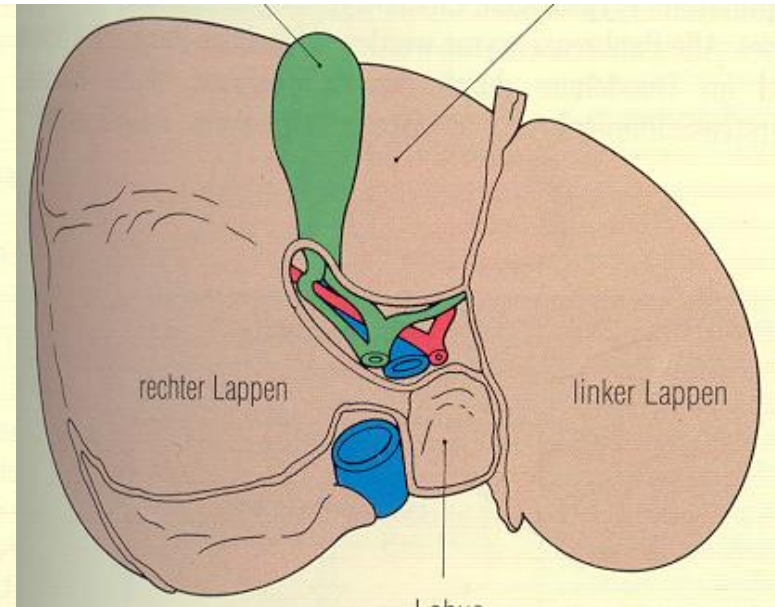
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Liver



Righth lobe

left lobe



caudate lobe

quadrate lobe

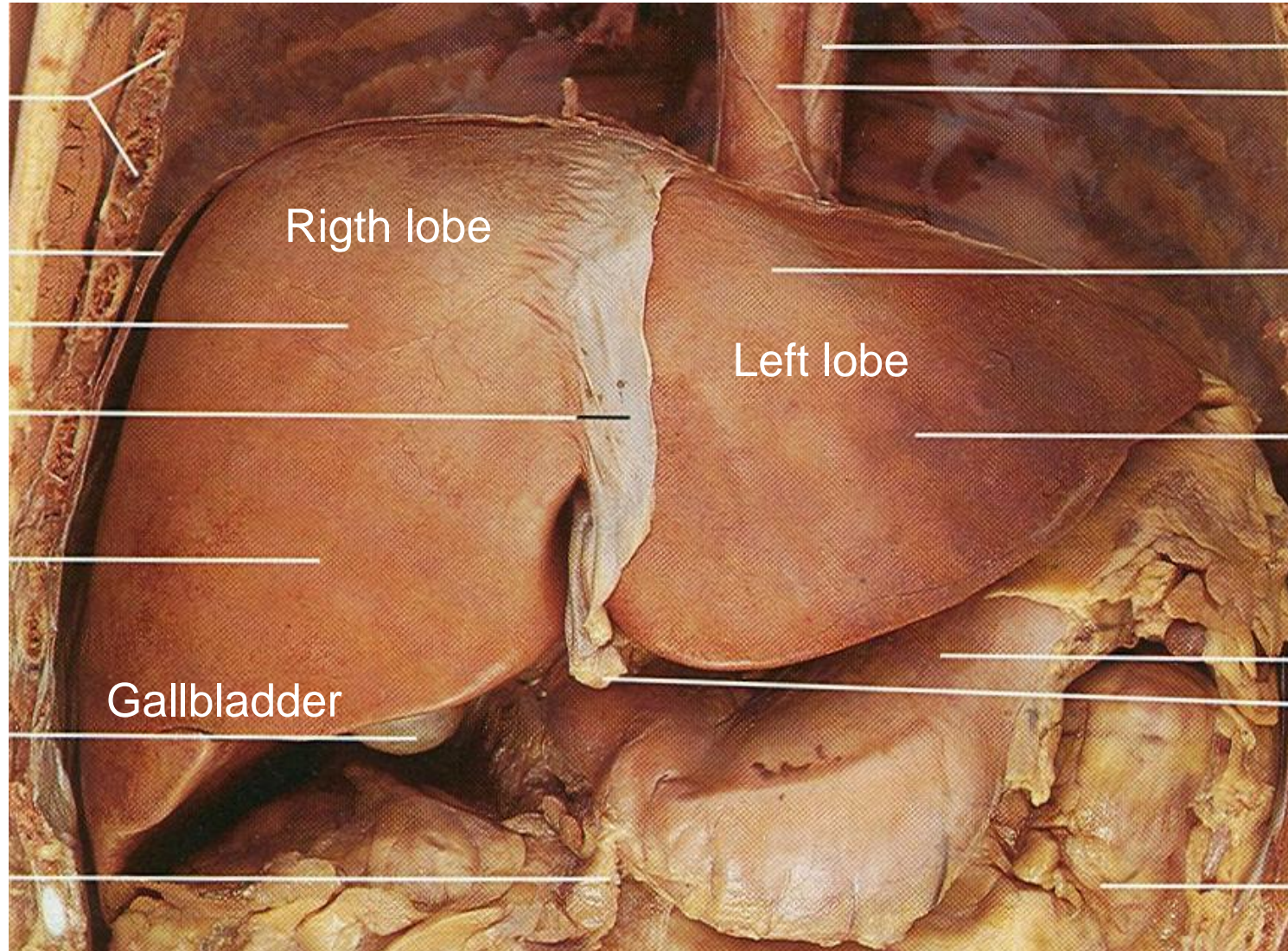


Anatomy of the Liver



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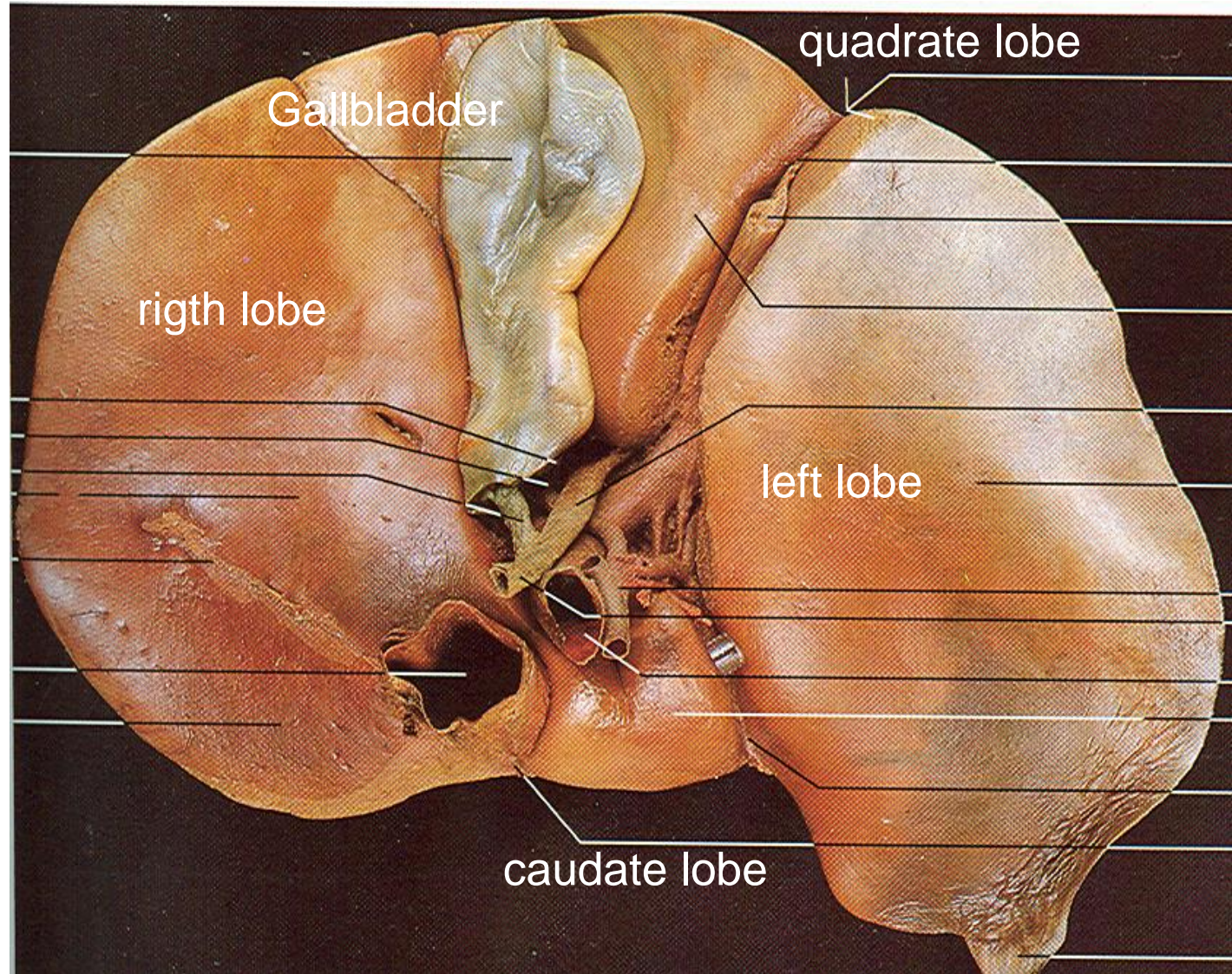


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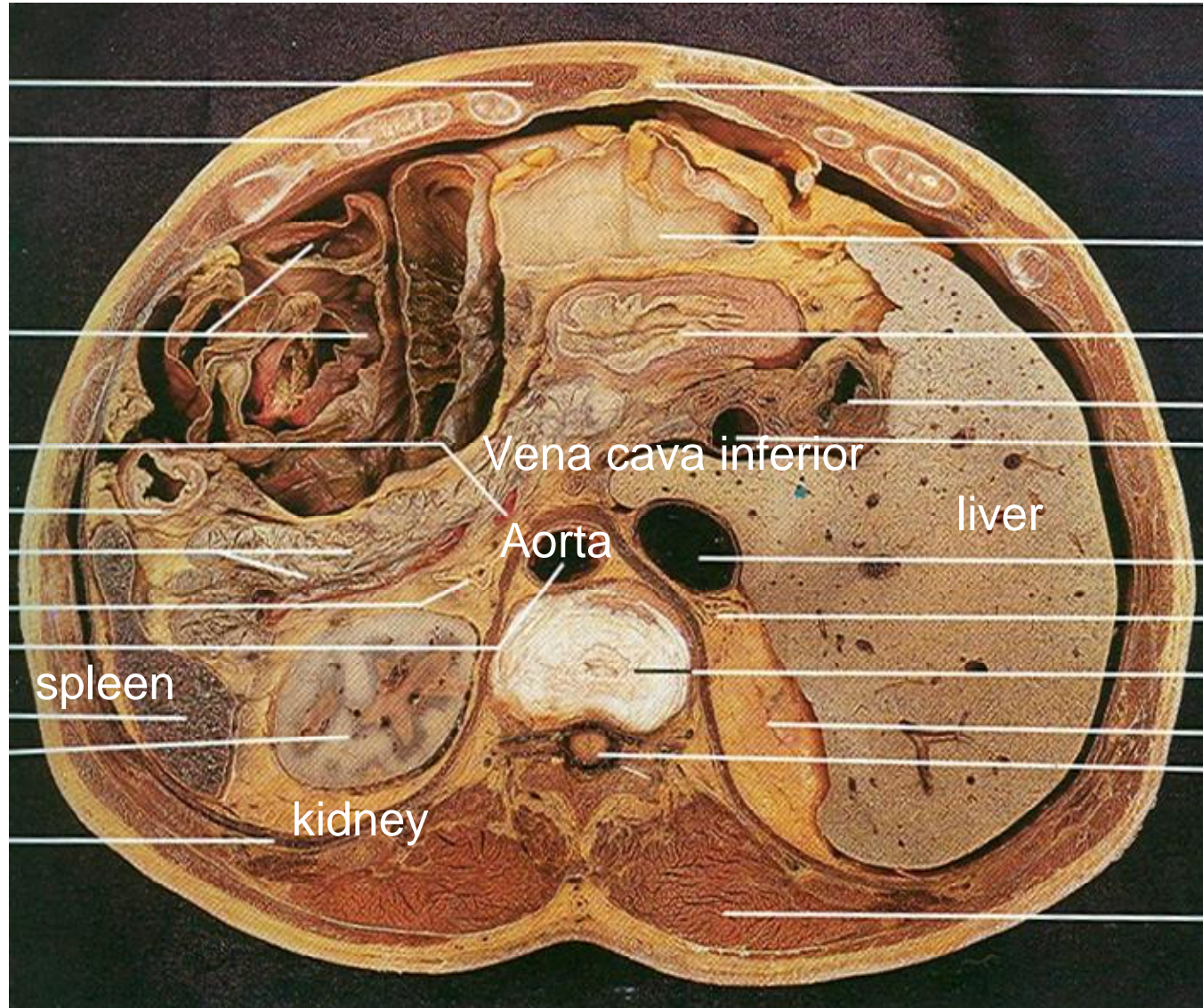


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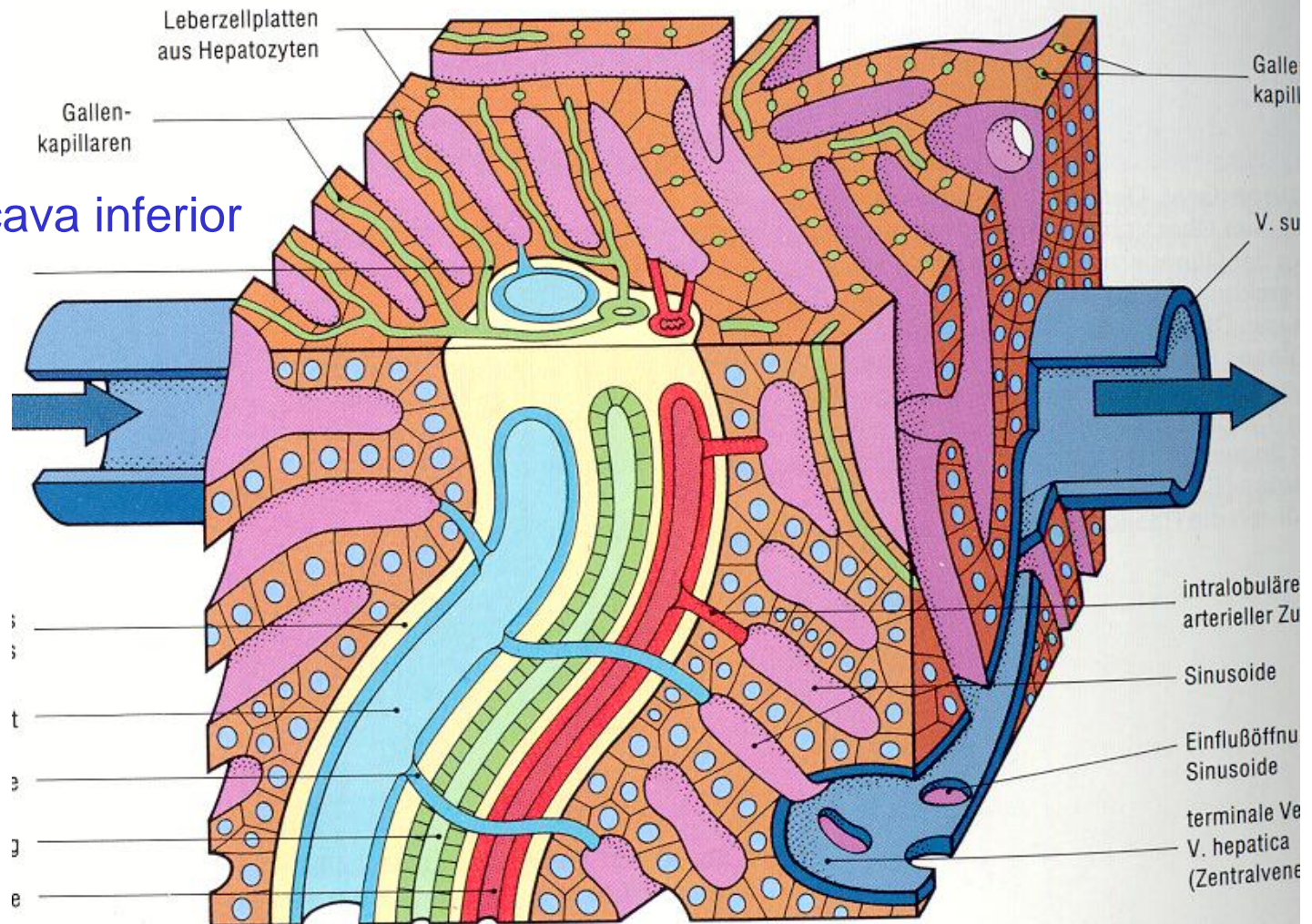
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V. cava inferior



V. portae

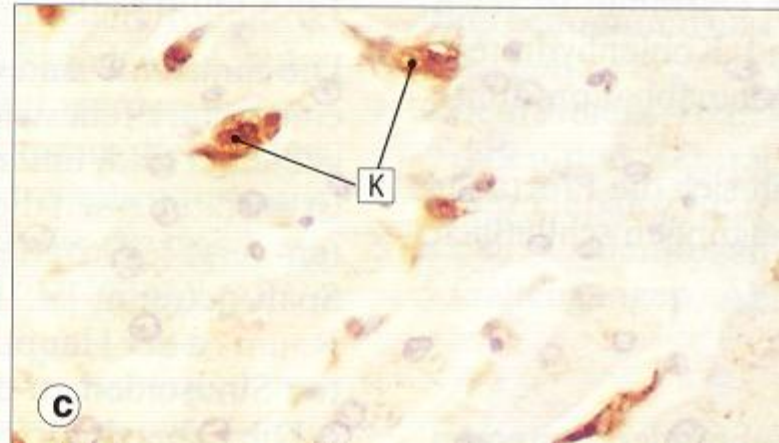
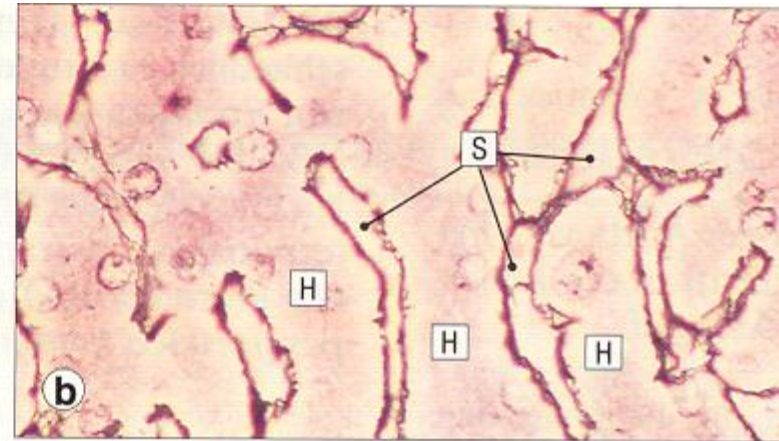
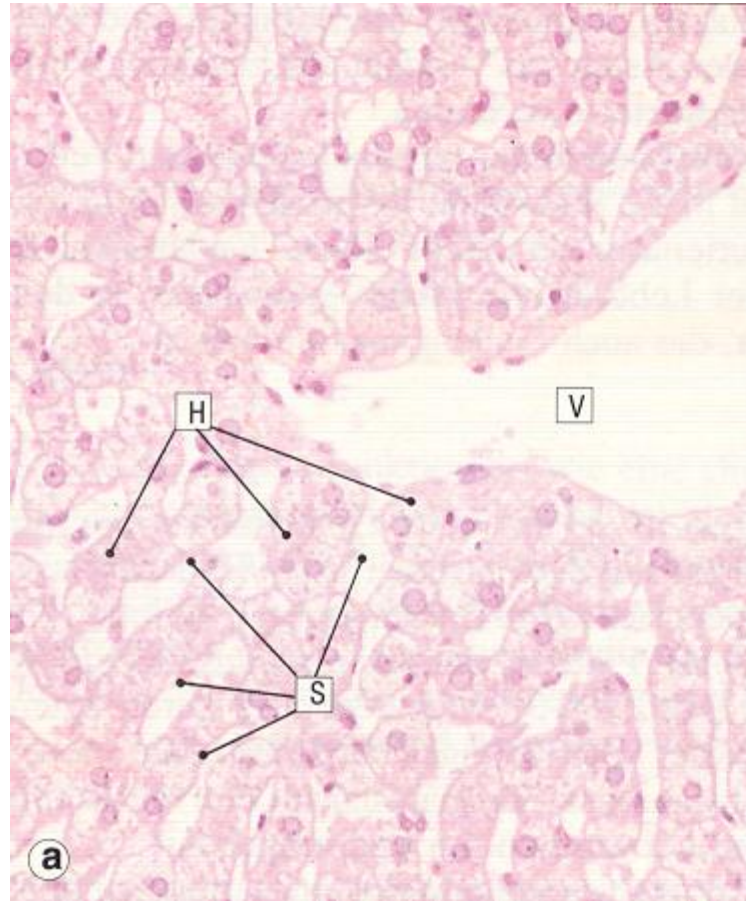


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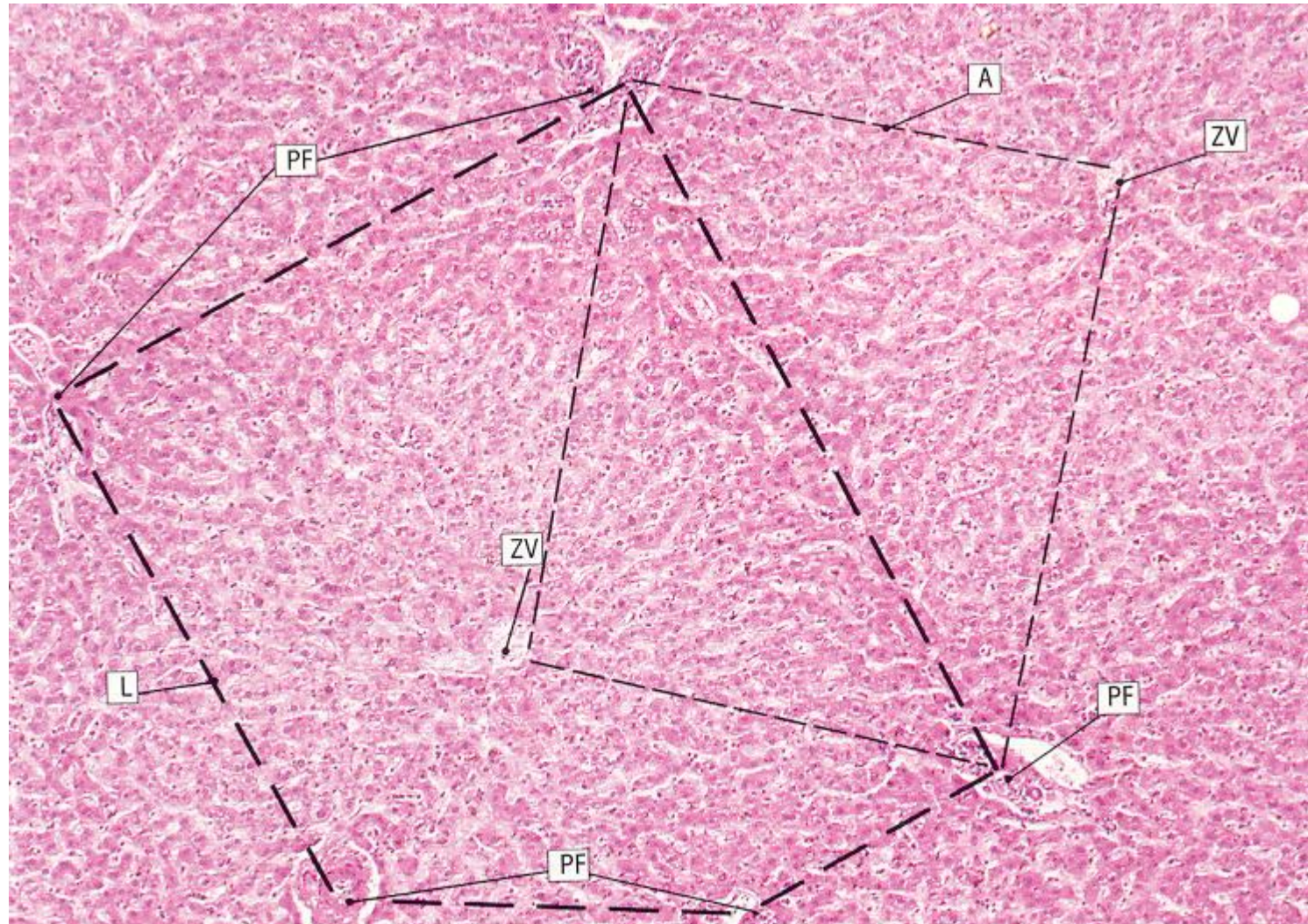


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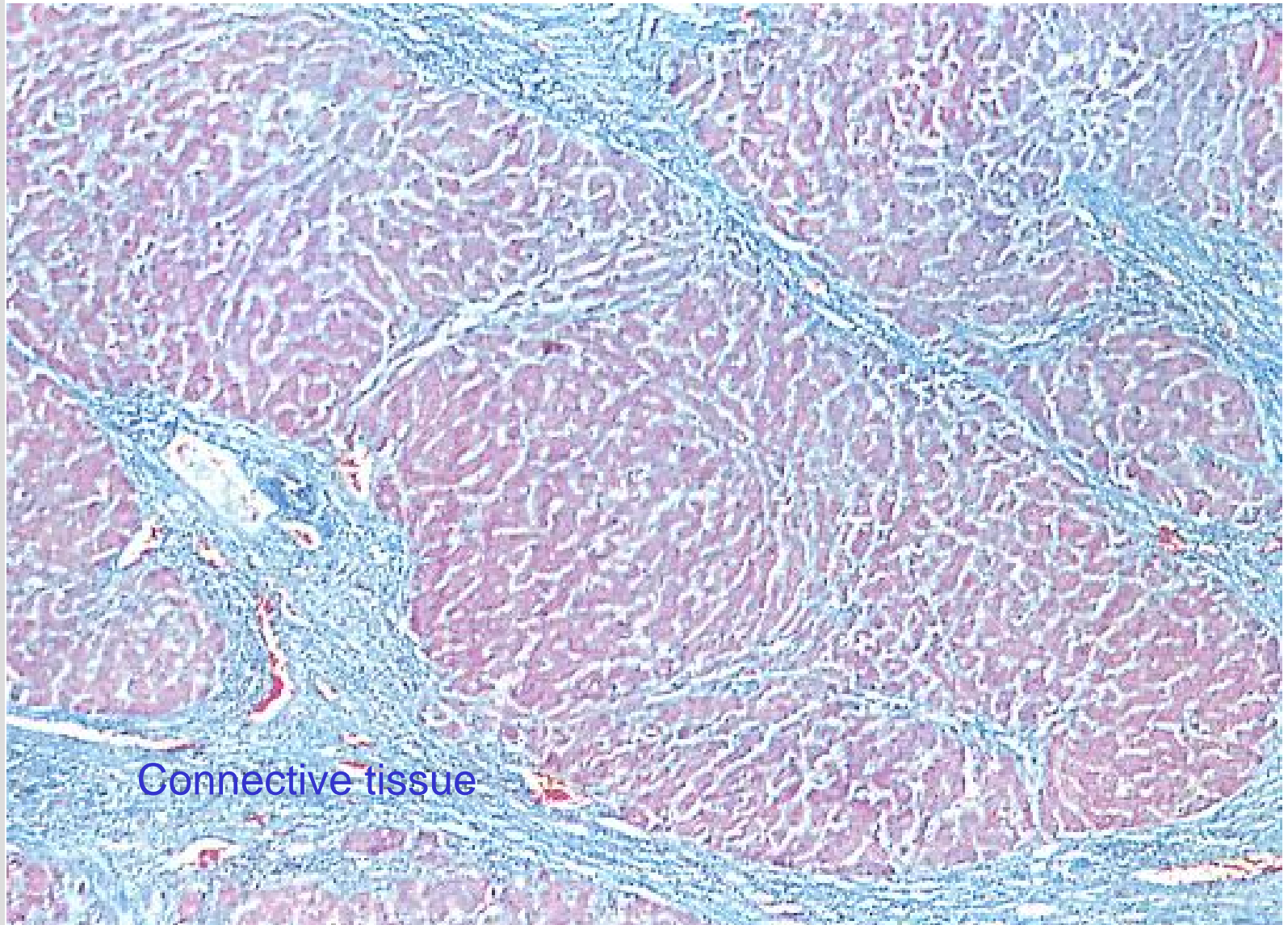




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Liver cirrohsis

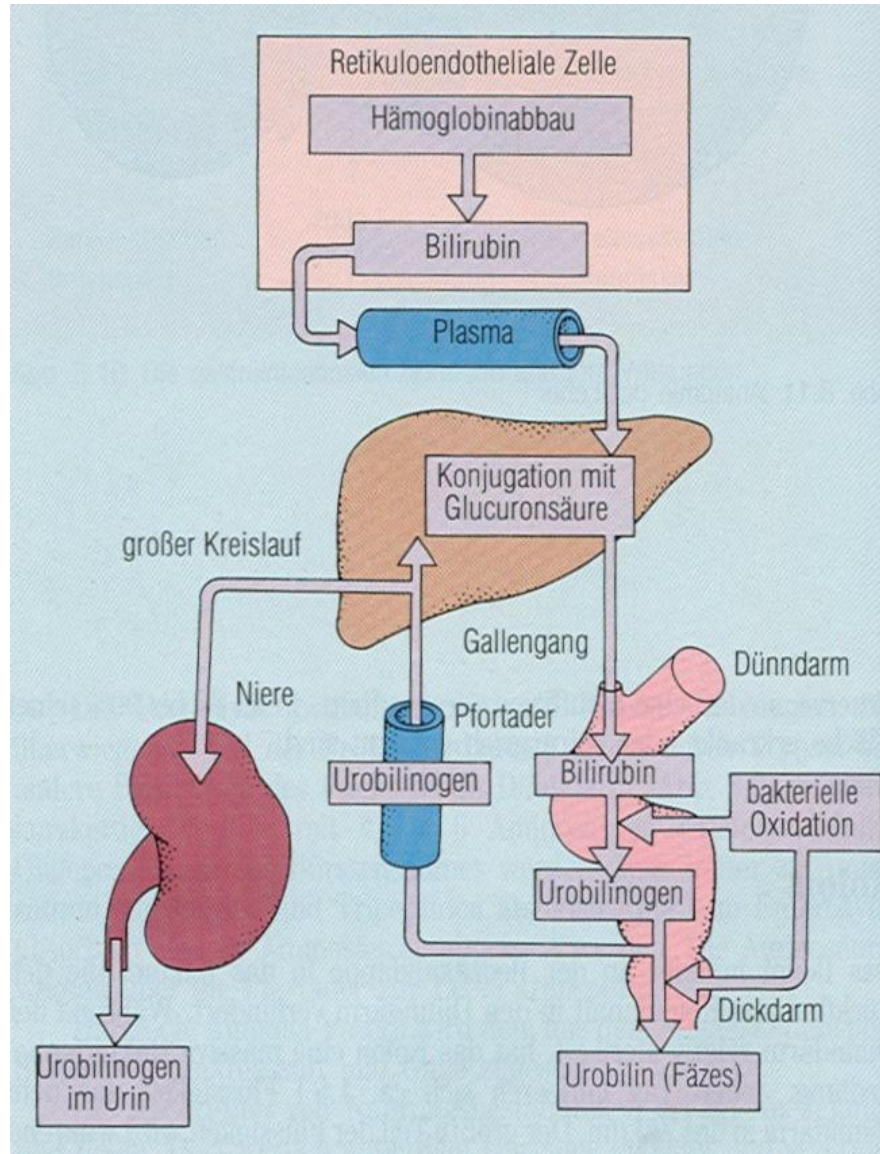




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Liver metabolism





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Liver metabolism

Fatty acid

Synthesis of
VLDL-
Lipoproteins

Resorption of
HDL- and LDL-
Lipoproteins

Amino acid

Production of
plasma proteins
(Albumine)

Proteins for
blood clotting
and fibrinolysis

carbohydrat metabolism

Glucose
Fructose → Glycogen
Galactose

Gluconeogenesis

Fatty acid → Glucose

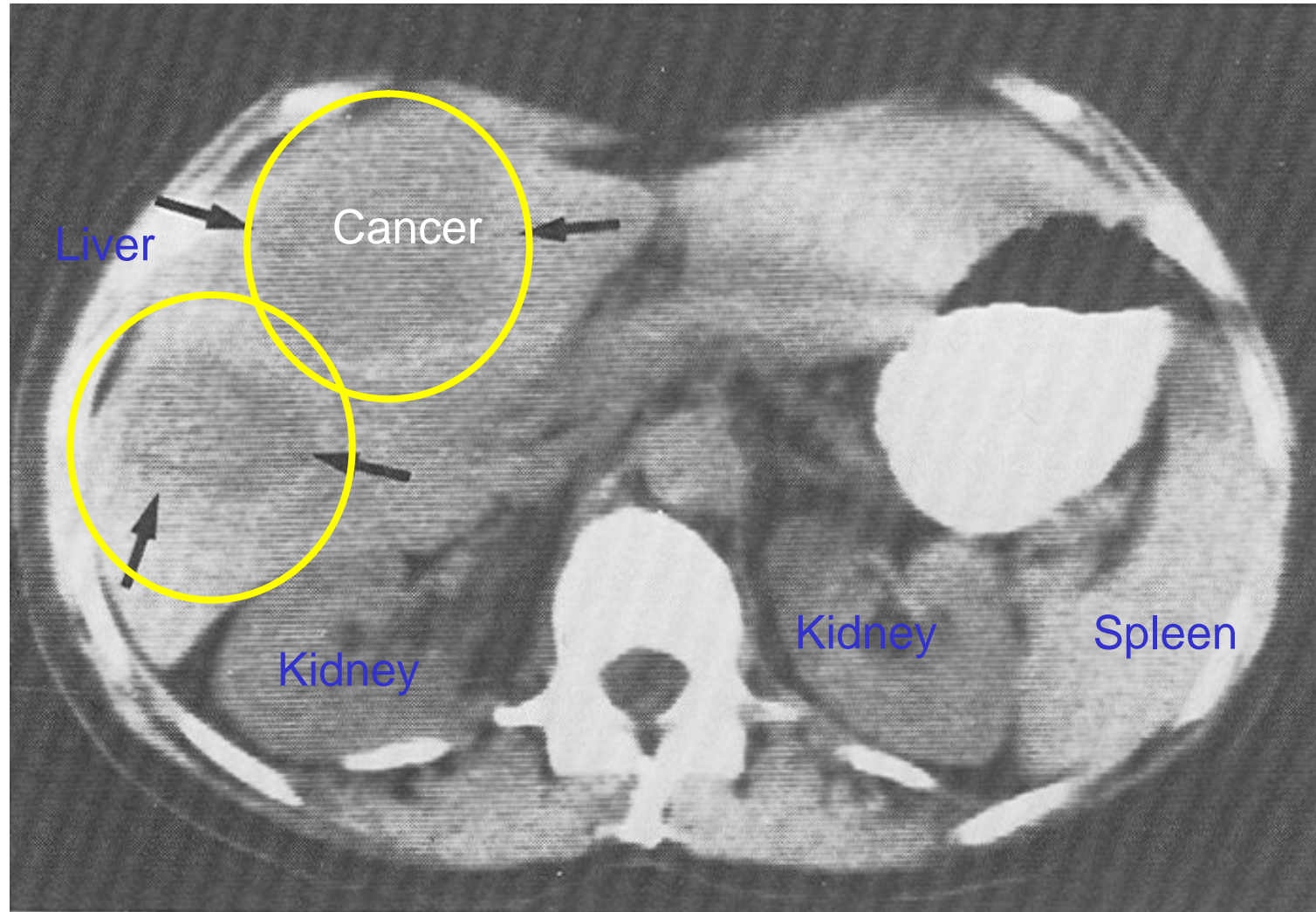


Liver CT-Scan



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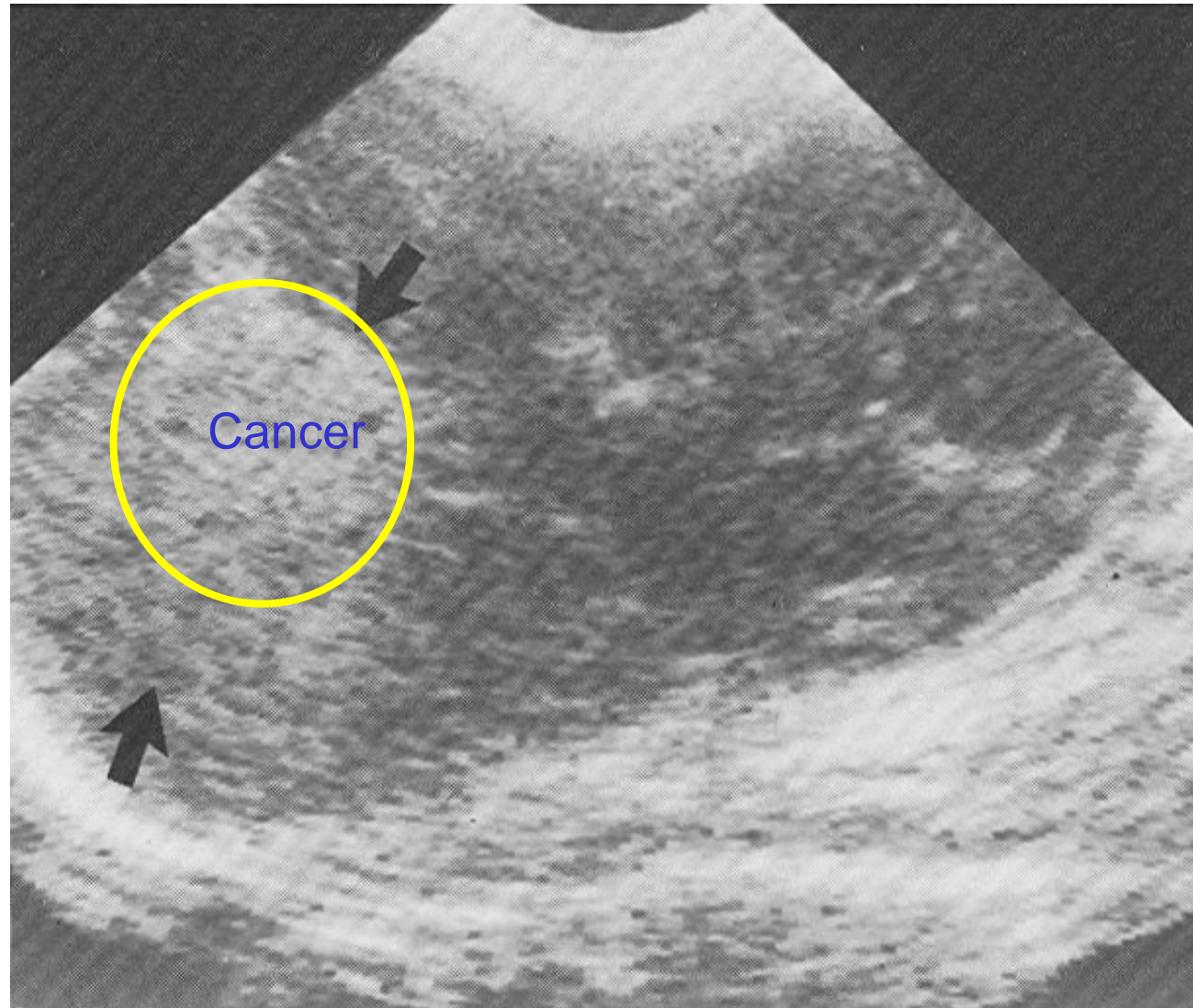




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Liver Ultra-Scan





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Livercirrhosis

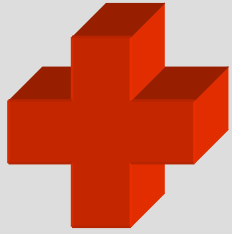
🔴 Toxicant cirrhosis

➤ Ethanol

🔴 Chronic virus infections

➤ HCV

➤ HBV

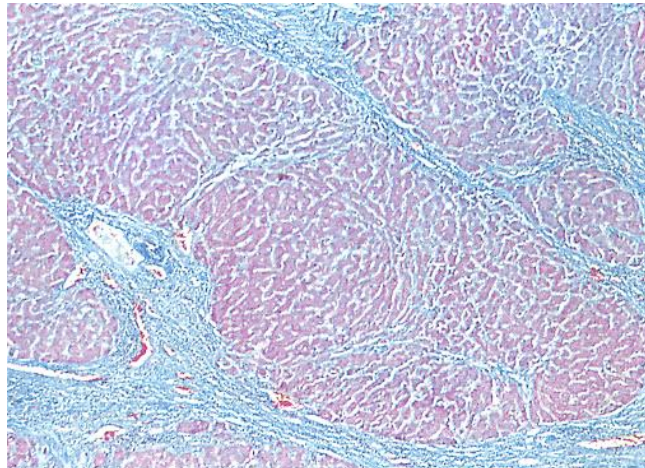
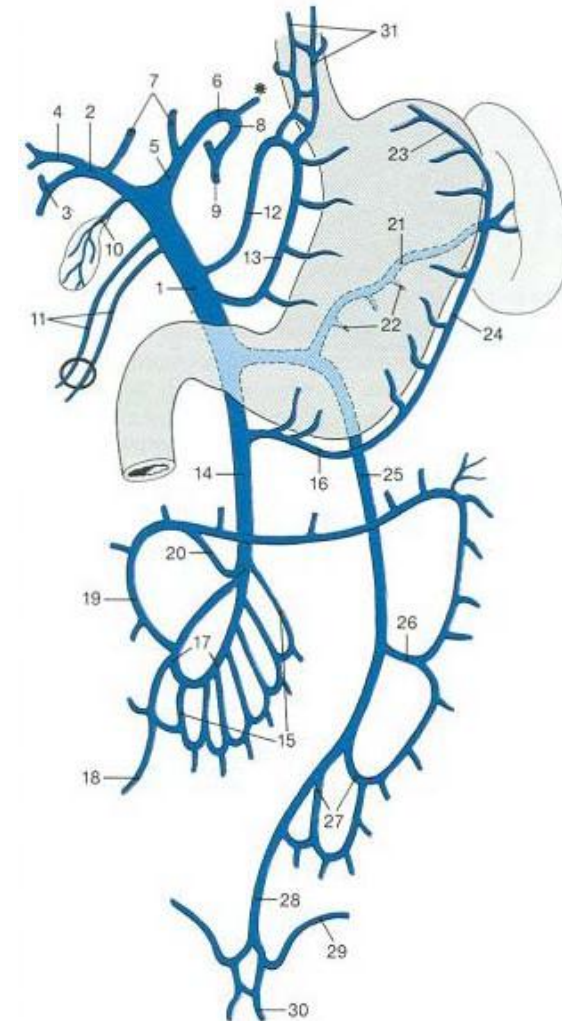
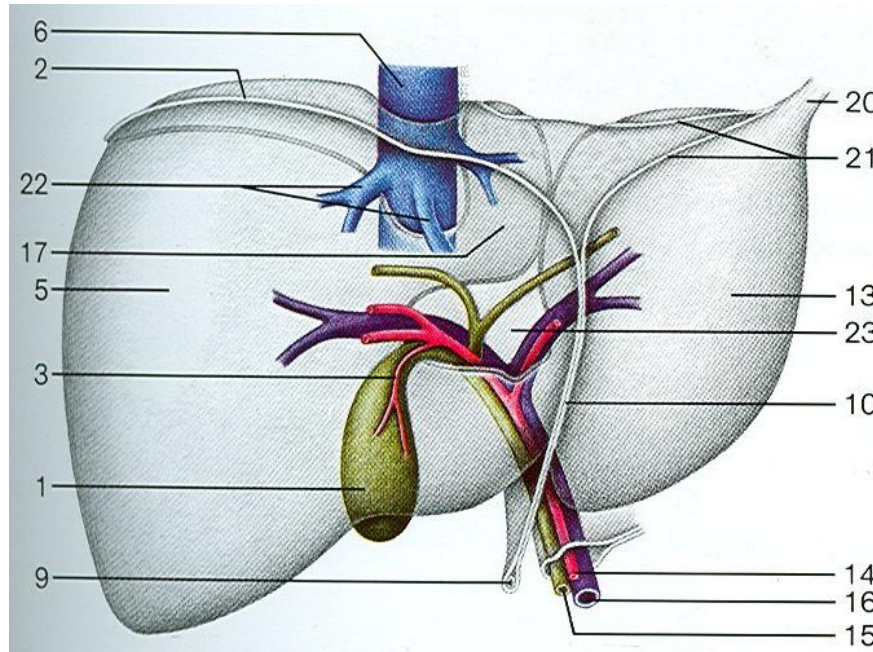


Problems with Liver cirrhosis



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TIPS-Therapy

Transjugular-Intrahepatic-Portal-Stent



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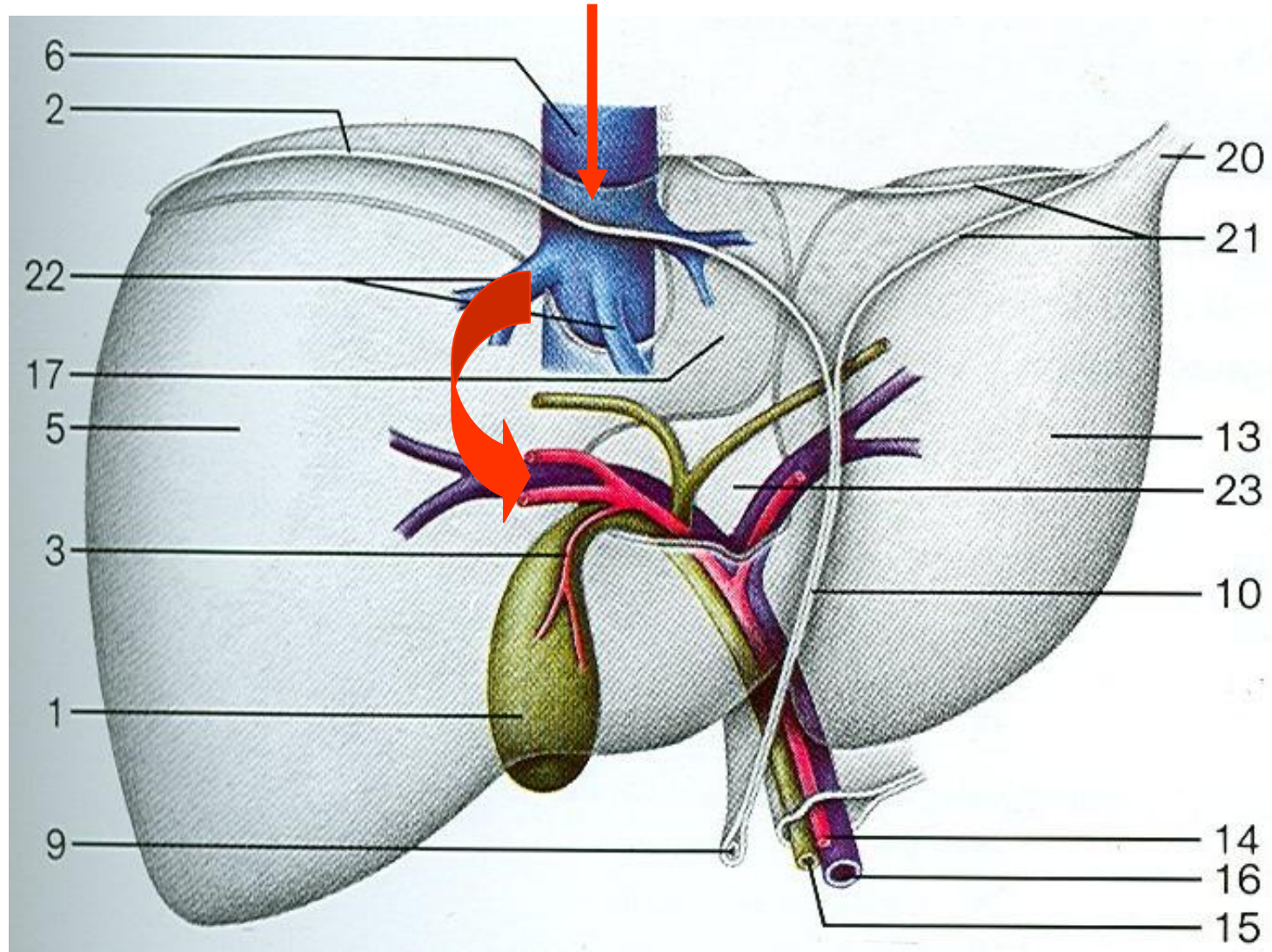


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Transjugular-Intrahepatic-Portal-Stent





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Function of the liver

- 🔴 **Metabolism of fett acids**
- 🔴 **Metabolism of carbohydrates**
- 🔴 **Metabolism of proteins**

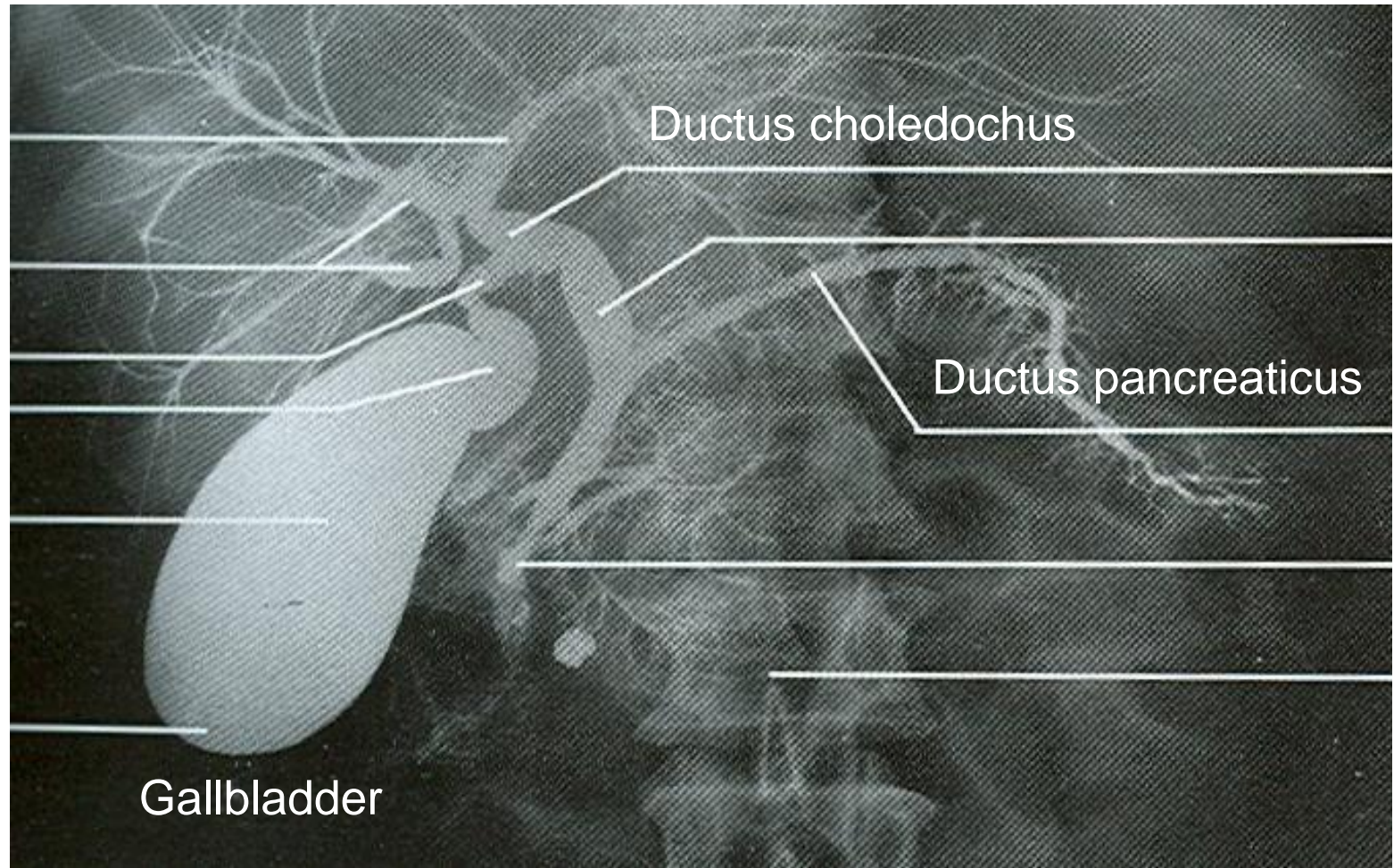


What can you see?



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Gallbladder



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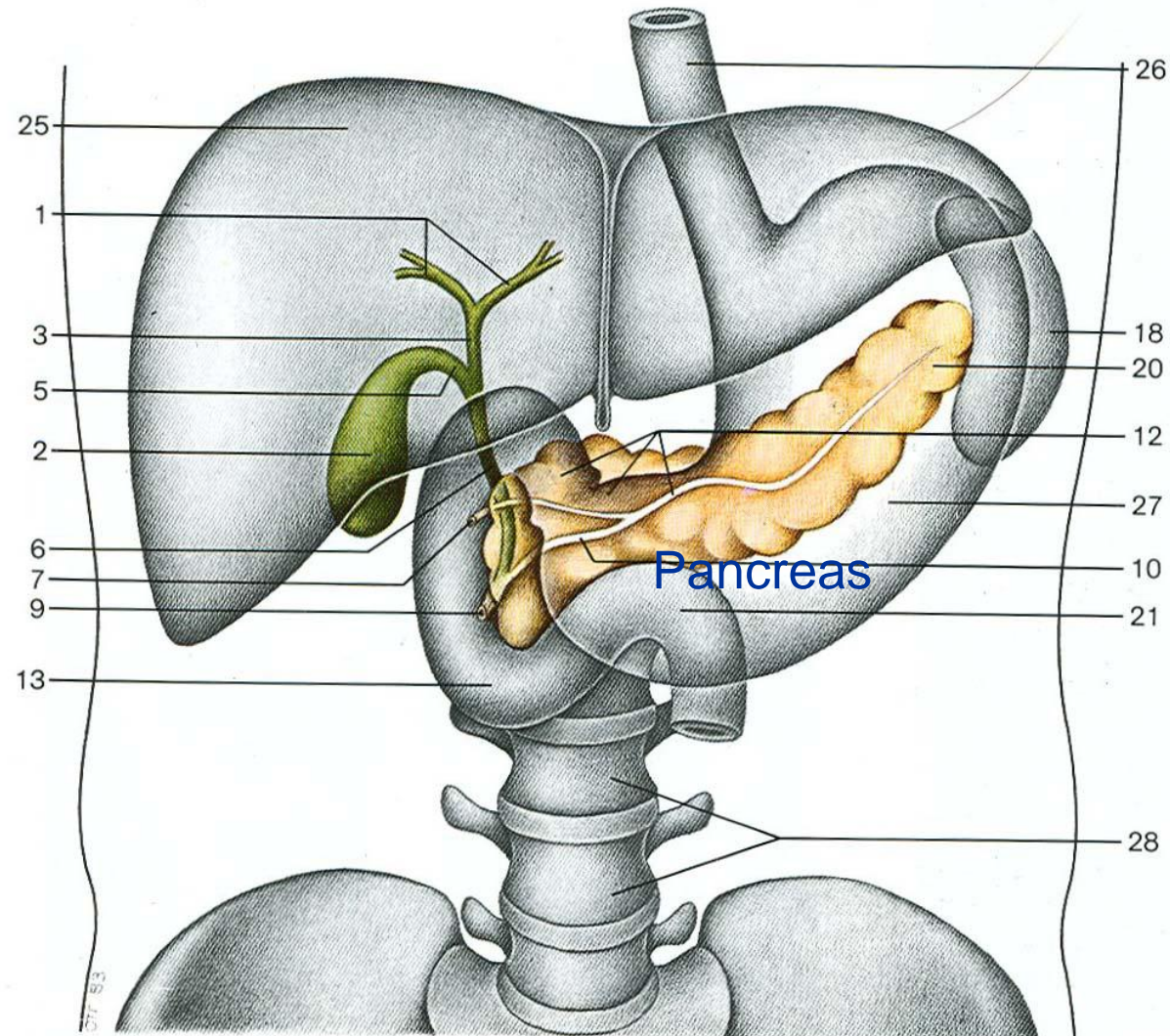


Anatomy of pancreas



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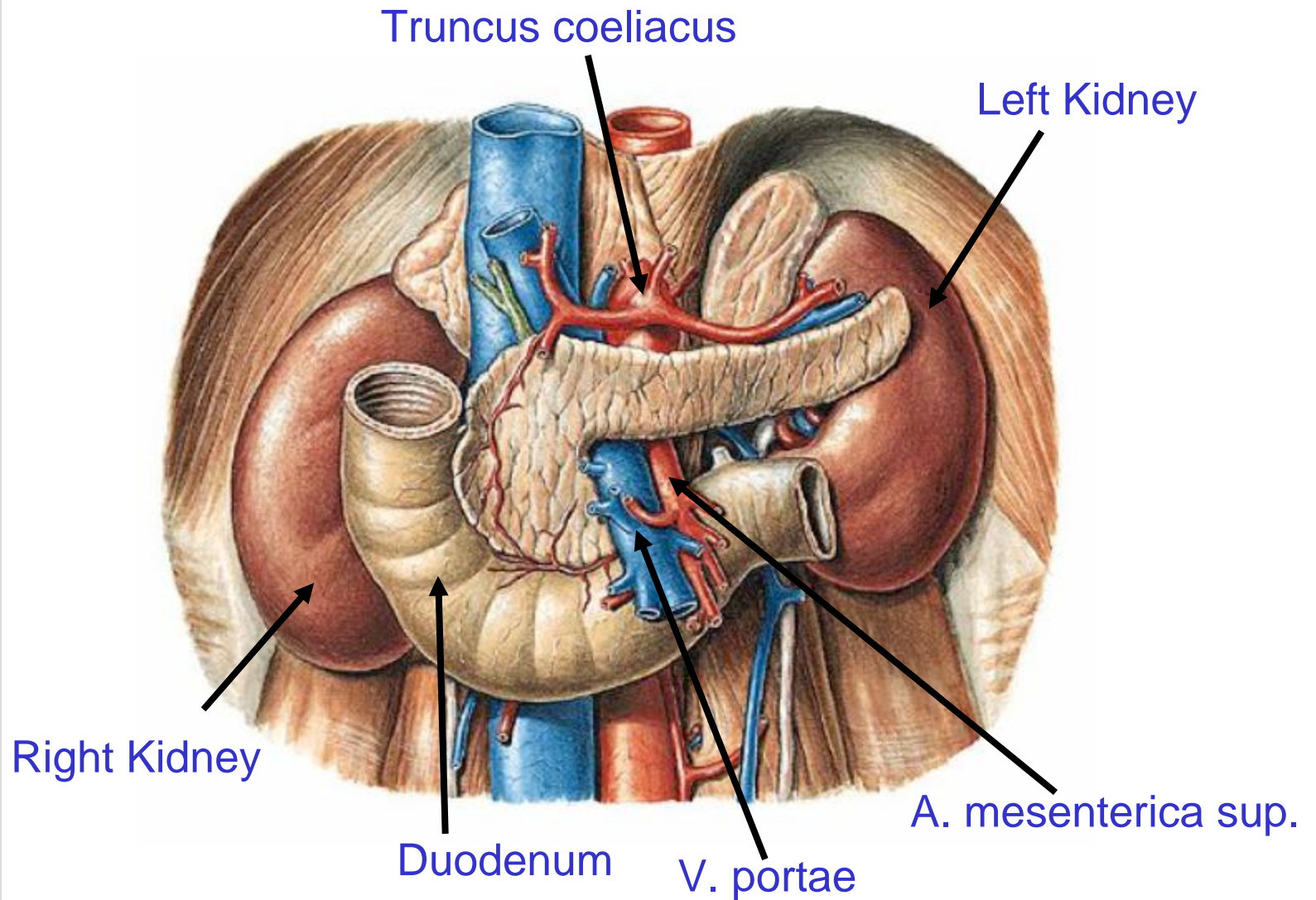


Anatomy of pancreas



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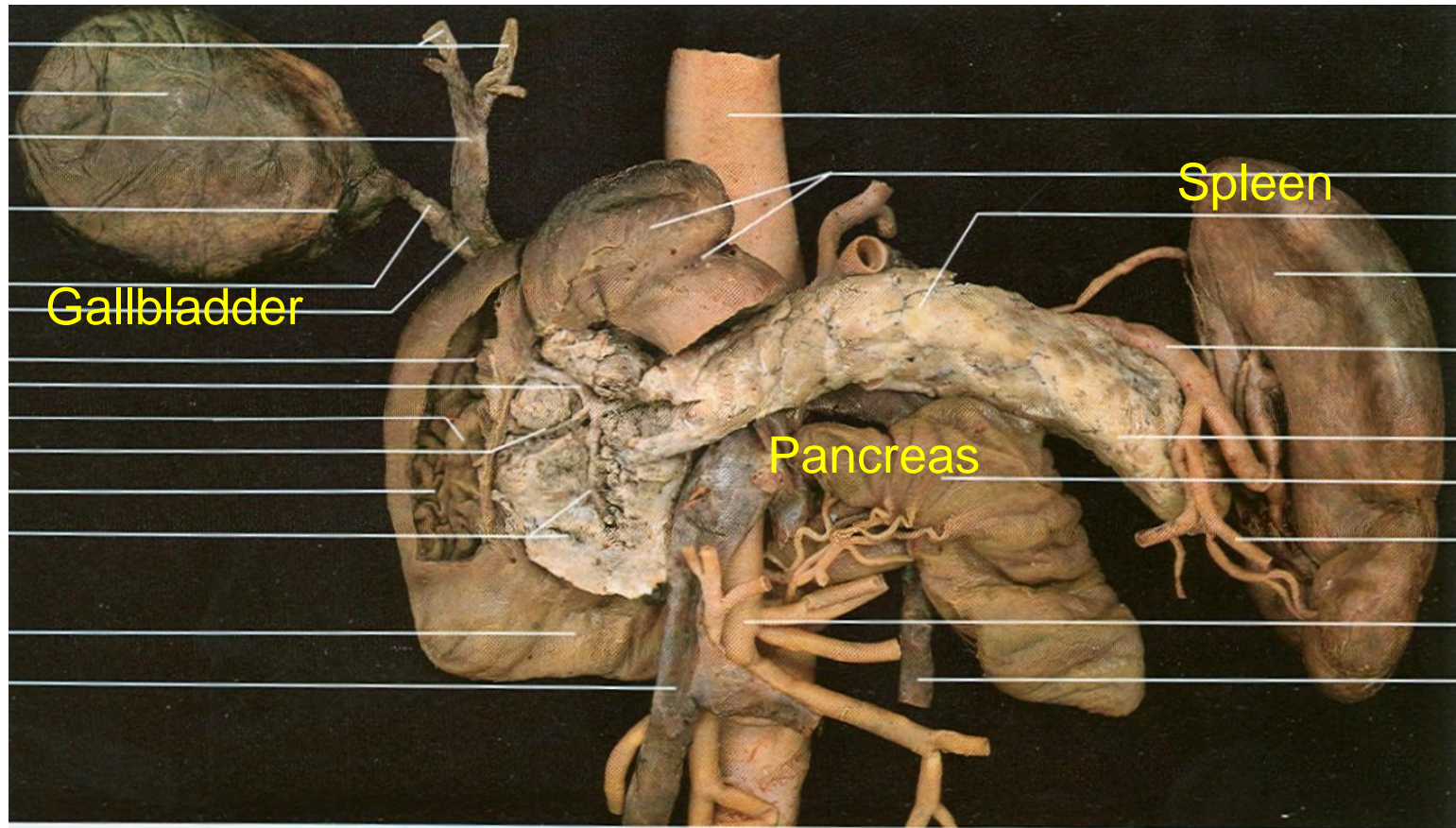


Pancreas



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Pancreas blood vessels



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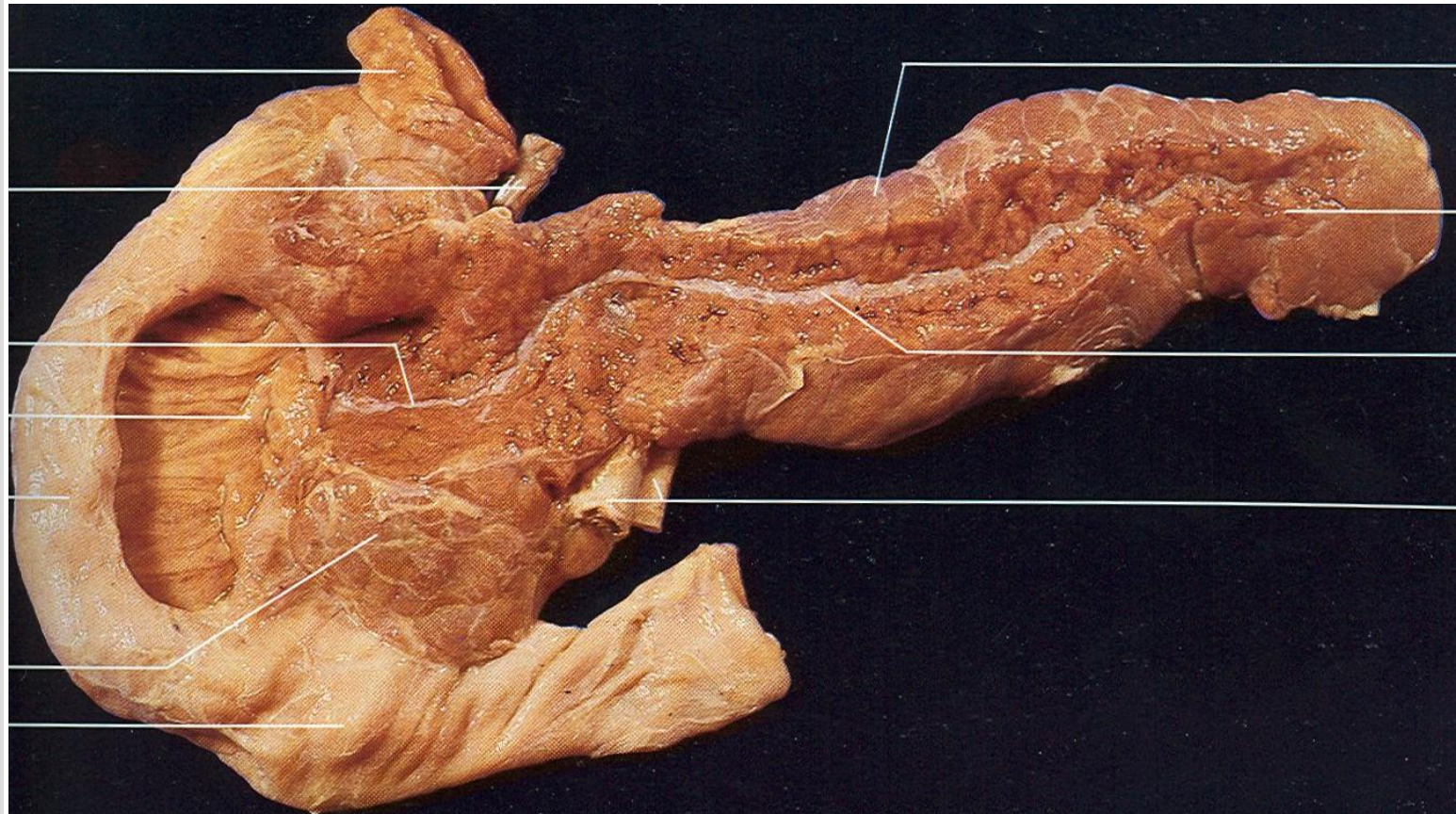


Pancreas ductus pancreaticus



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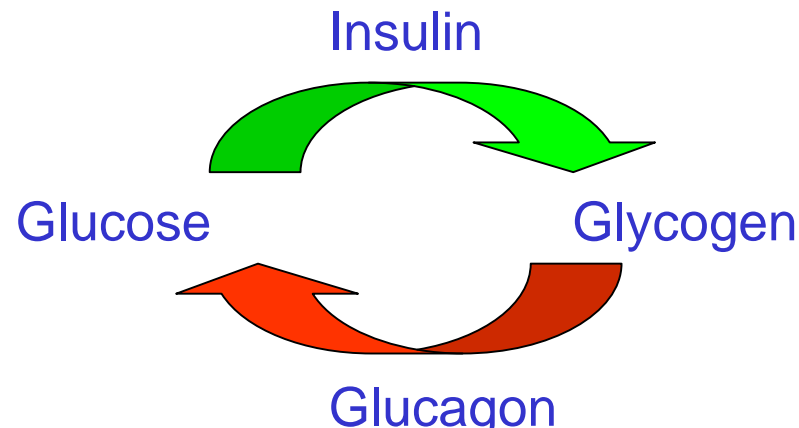
Function of pancreas

Exocrine function

- Production of enzymes for digestion of amino acids, fatty acids and carbohydrates

Endocrine function

- A-cells: production of glucagon
- B-cells: production of insulin
- D-cells: production of somatostatin



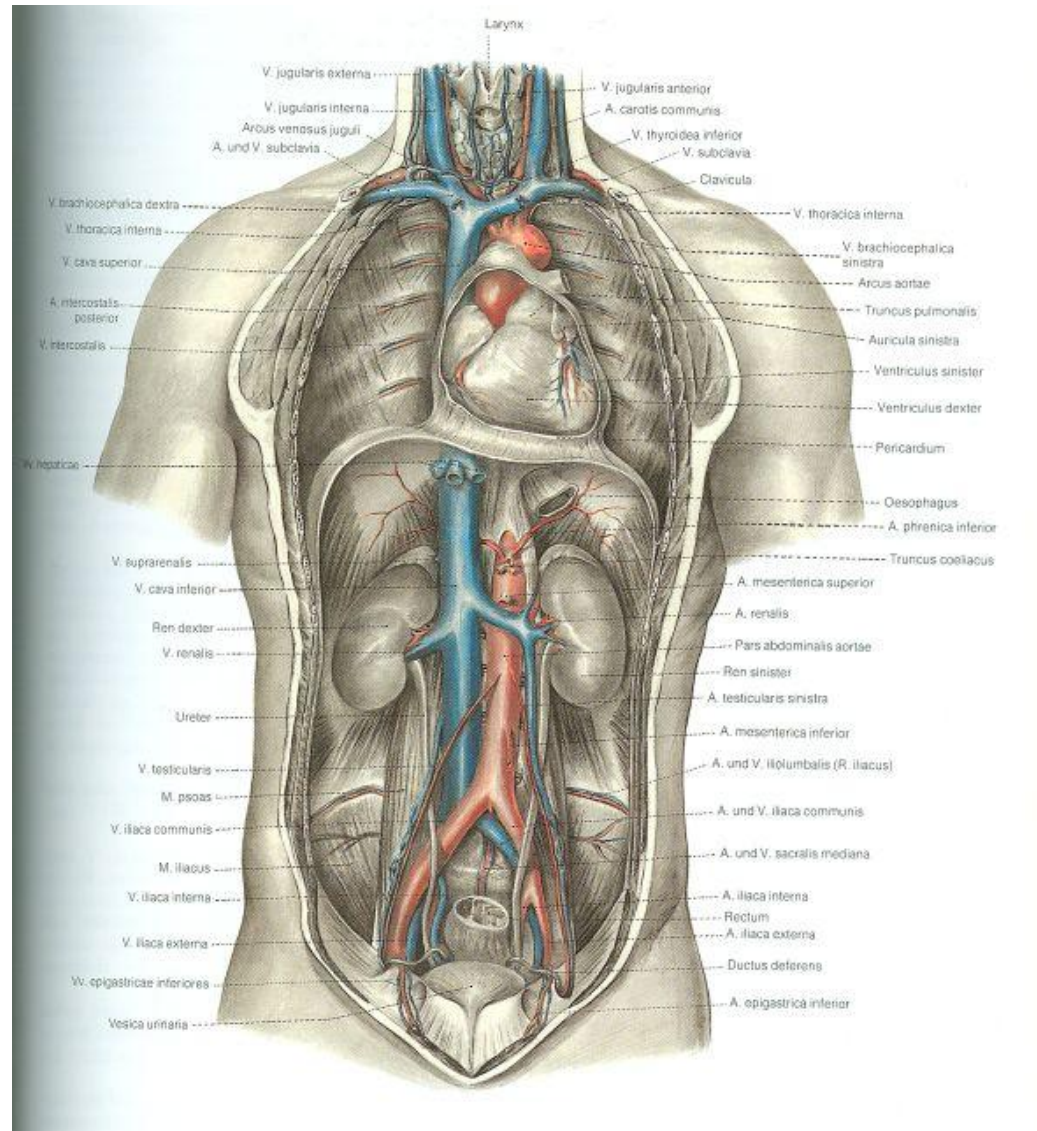


Anatomy of kidney



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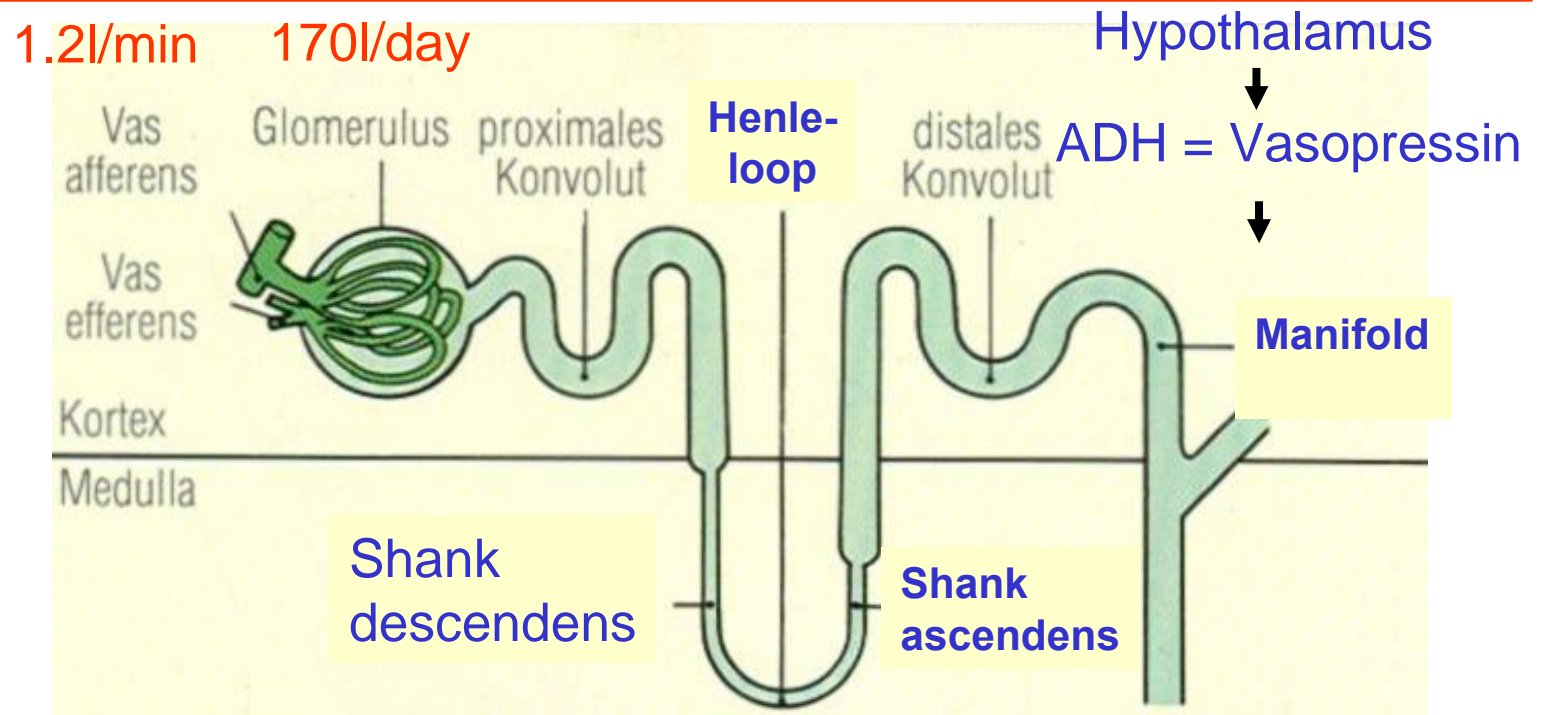




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Function of kidney



Daily production of urine: 1-2l



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Literature

- **Anatomy Schiebler – Schmidt**
- **DTV Atlas Anatomy**
- **Histology Stevens, Lowe**
- **Anatomy of humans Rauber/ Kopsch**
- **Anatomy of humans Rohen/ Yokochi**