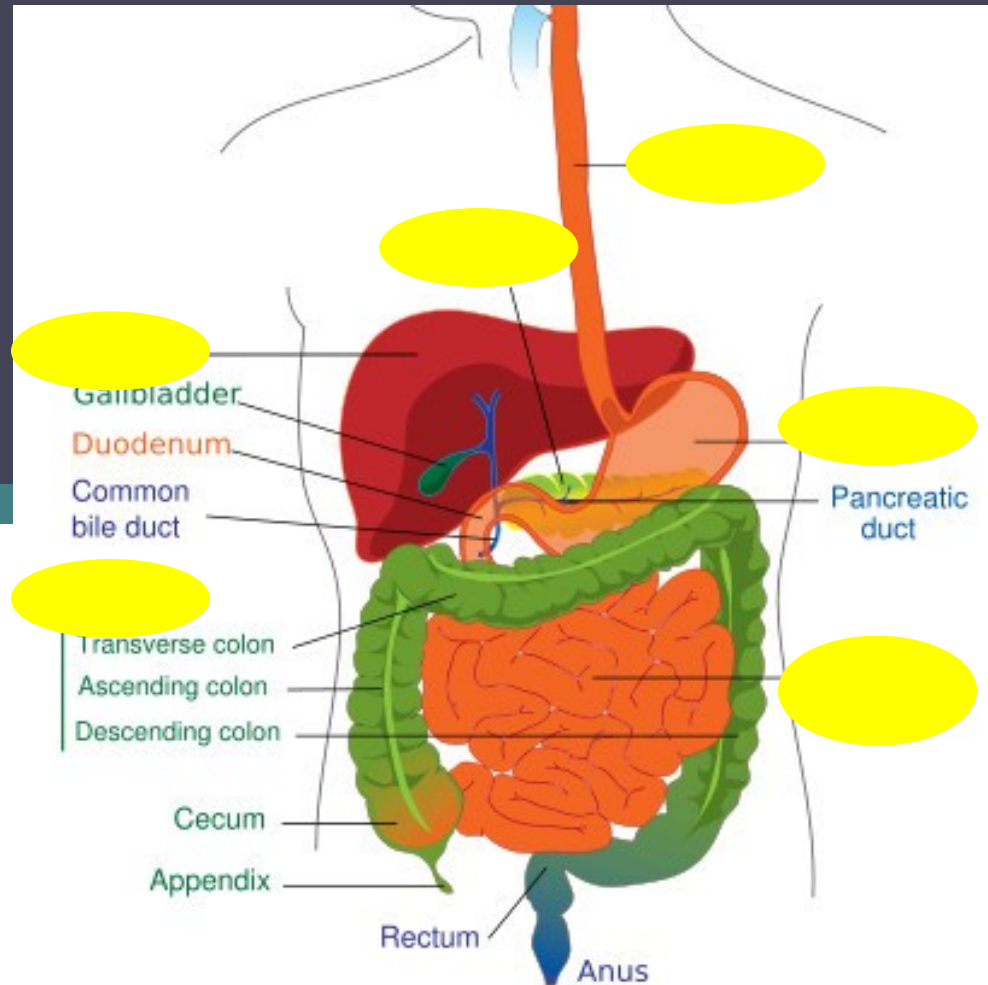


Gastrointestinal system

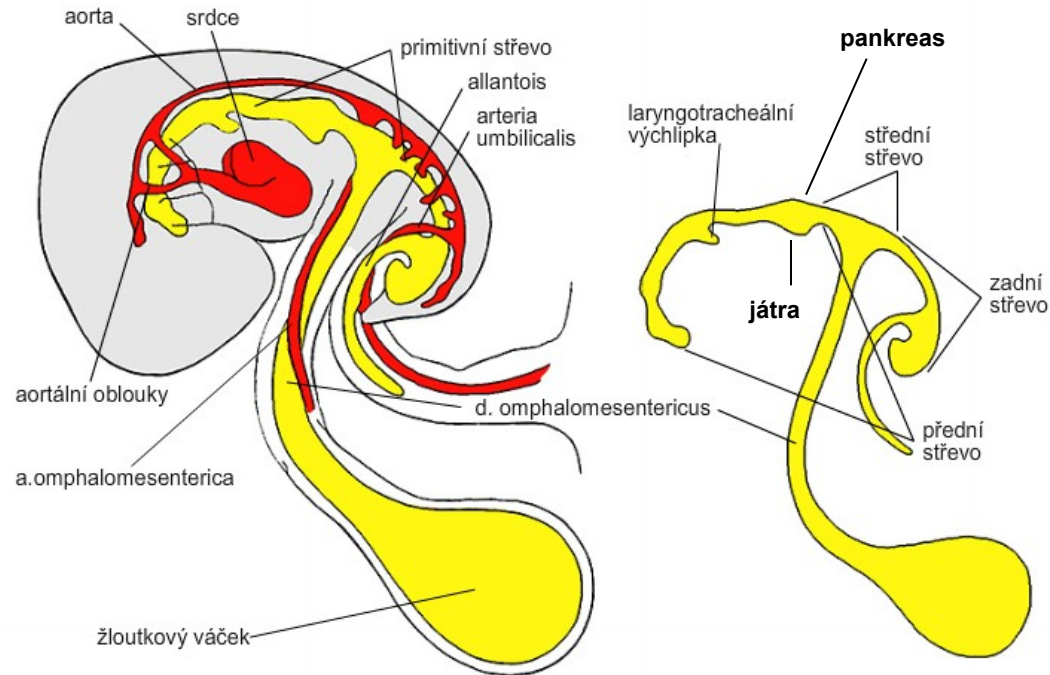


Endodermal origin – epithelium - mucose

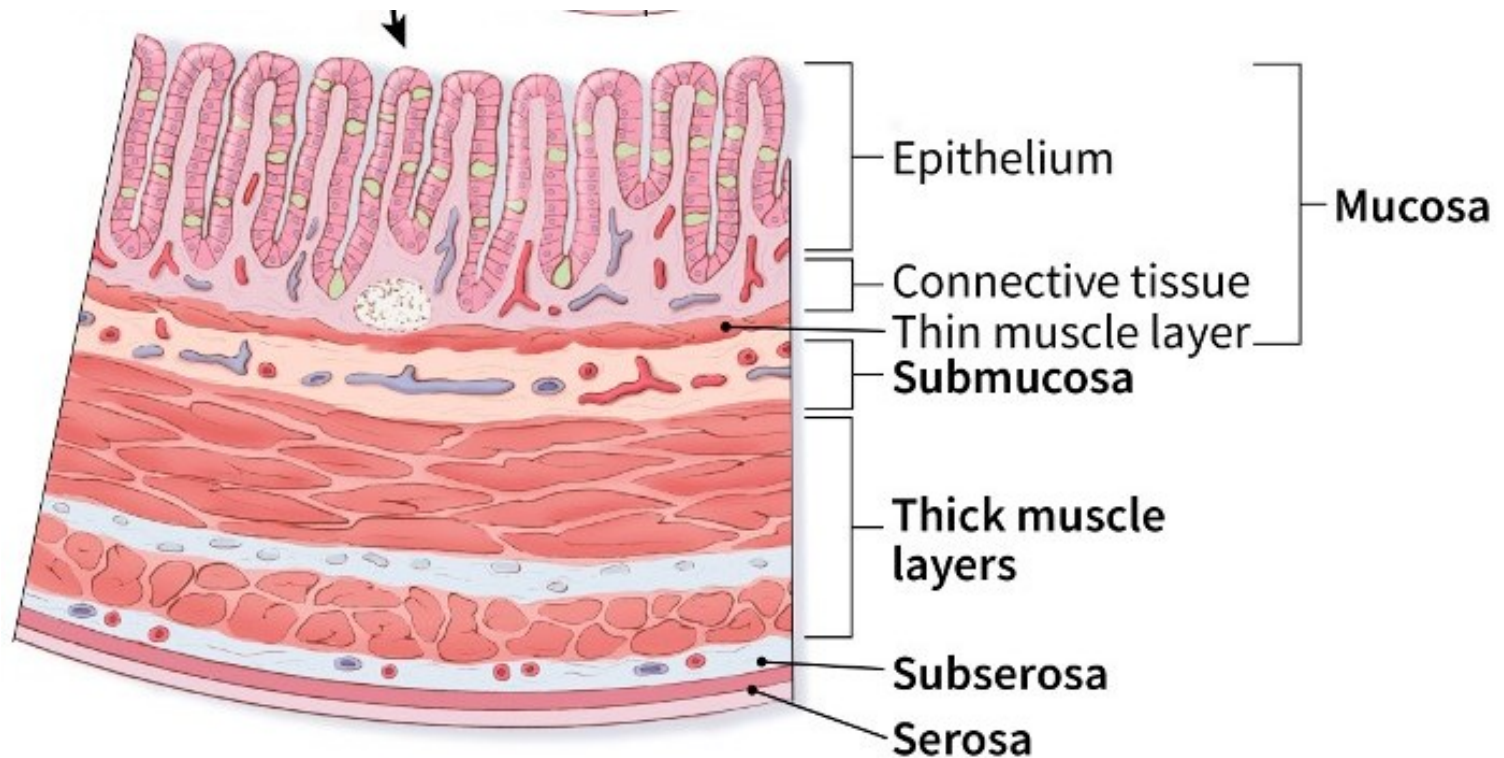
Mezoderm of splanchnopleura – other layers

Origin of primitive intestine

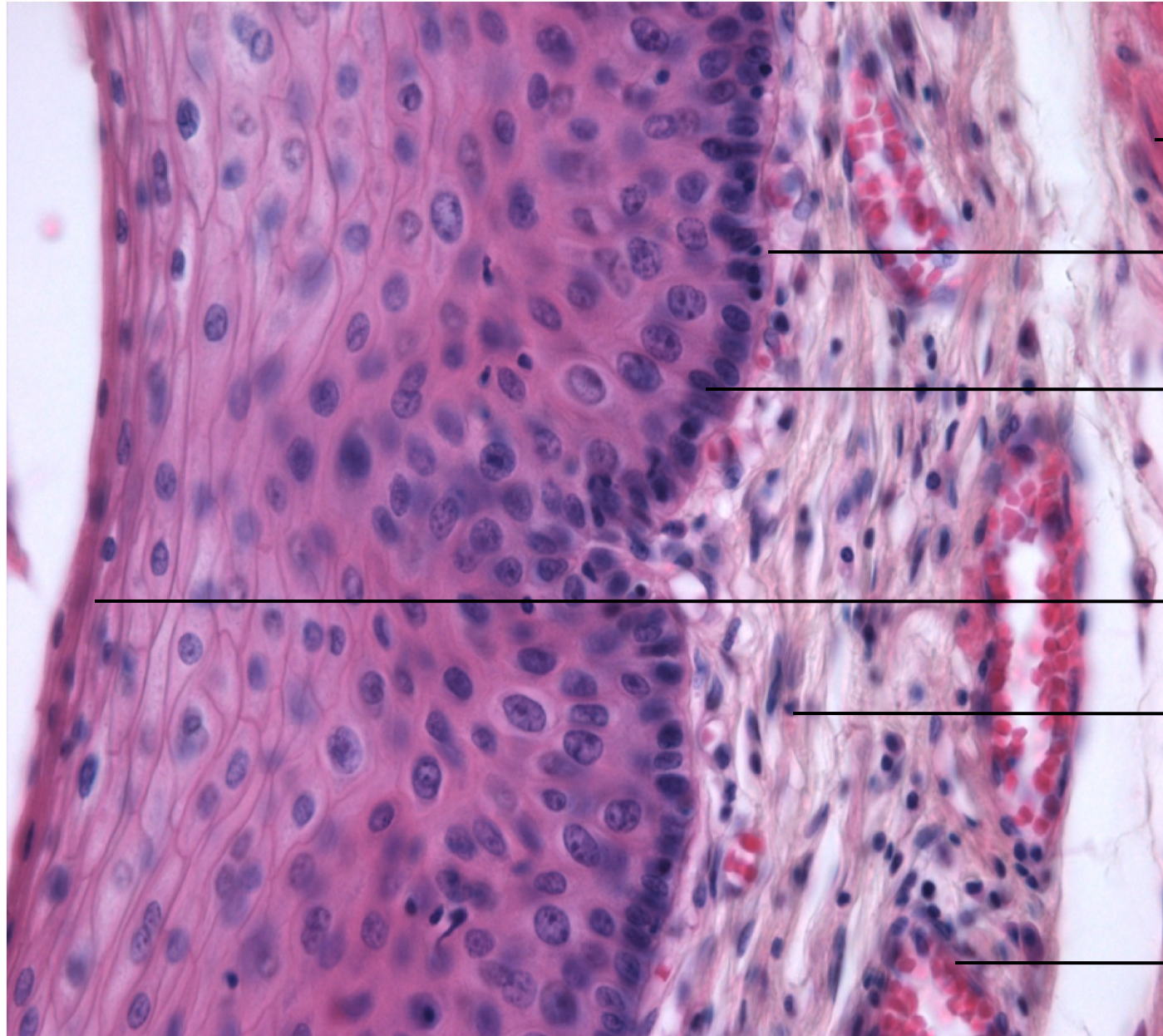
<http://www.youtube.com/watch?v=qMnpxP6EeIY&feature=related>



Intestinal layers



Oesophagus, adult



Muscle

Basal lamina

Cubic epithel.

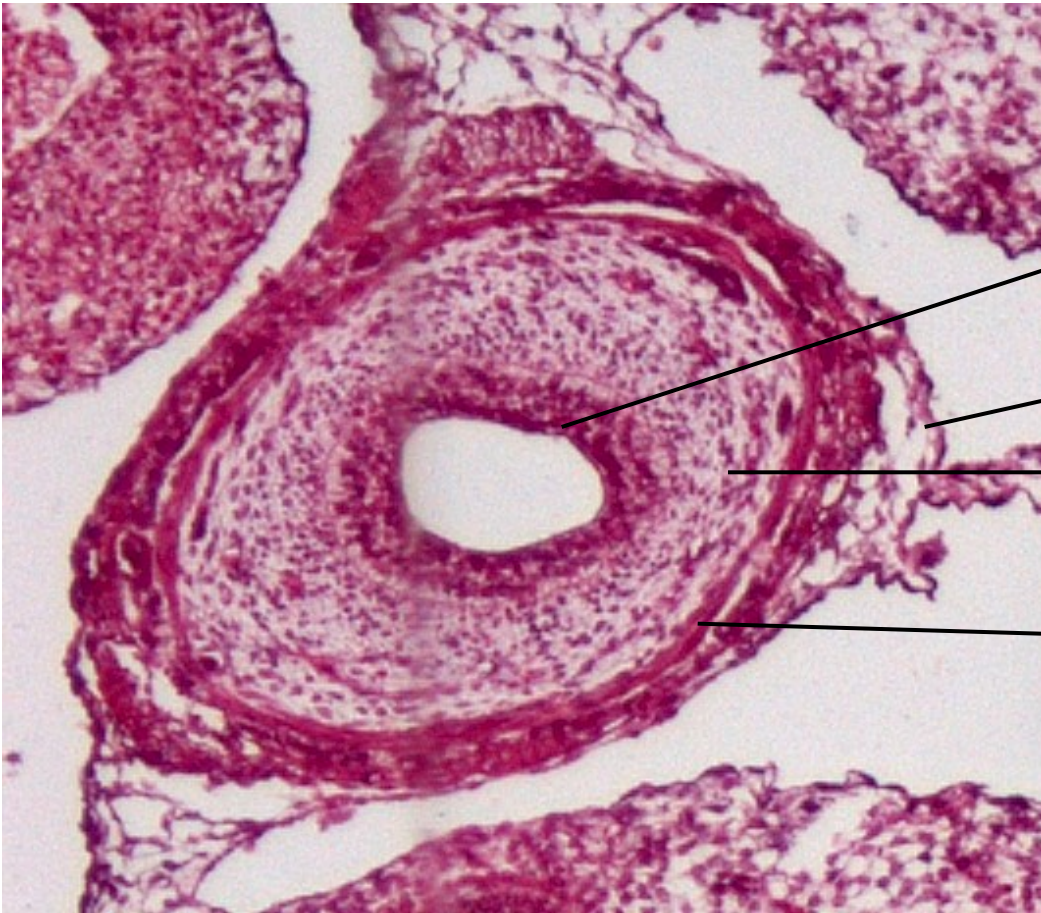
Squamous
Epithel.

Lamina propria
(Submukosis)

Vessel

Magn. x40

Embryonal oesophagus E2111/5 8th week iud



Mucosa

Serosa

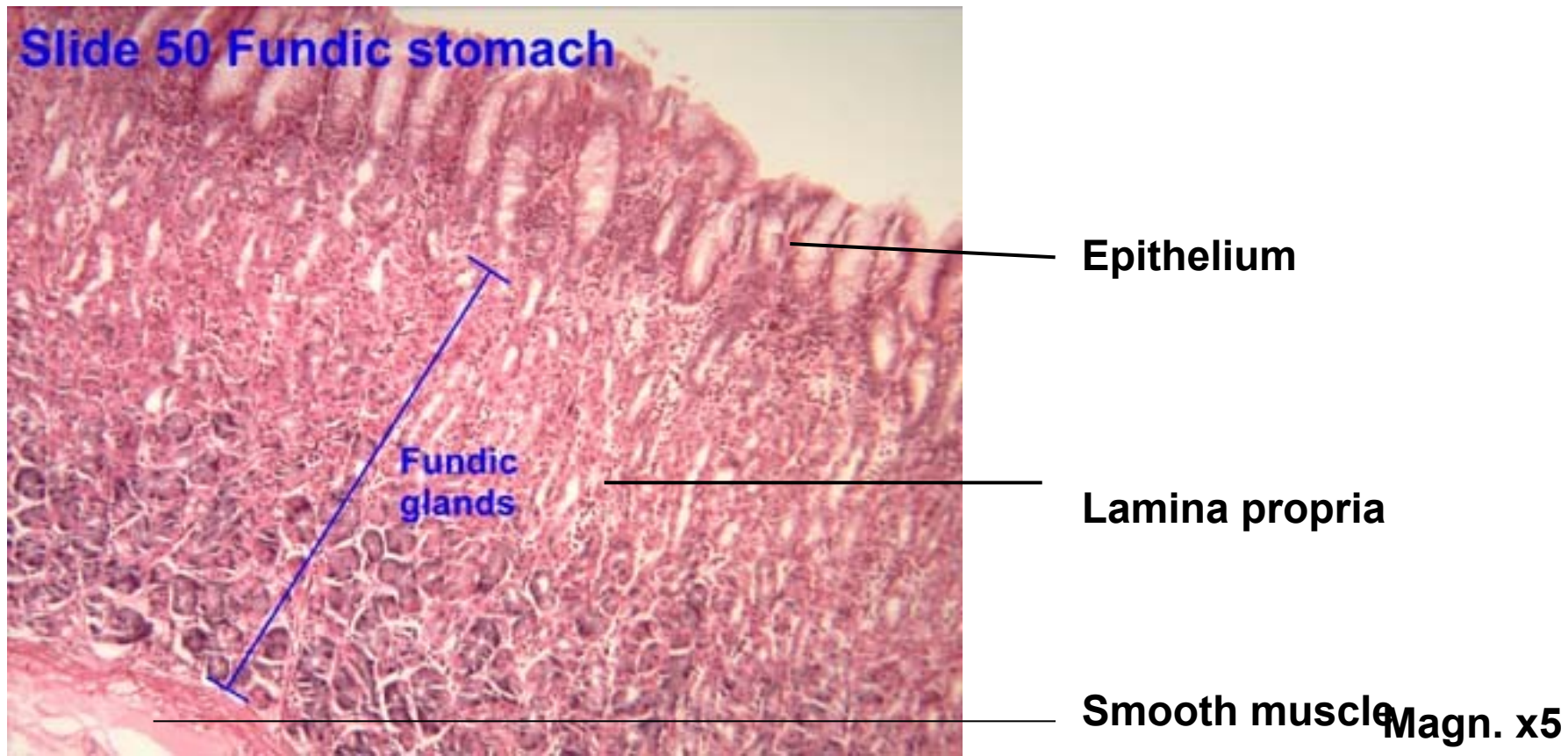
Submucosa

Smooth muscle

Magn. x5

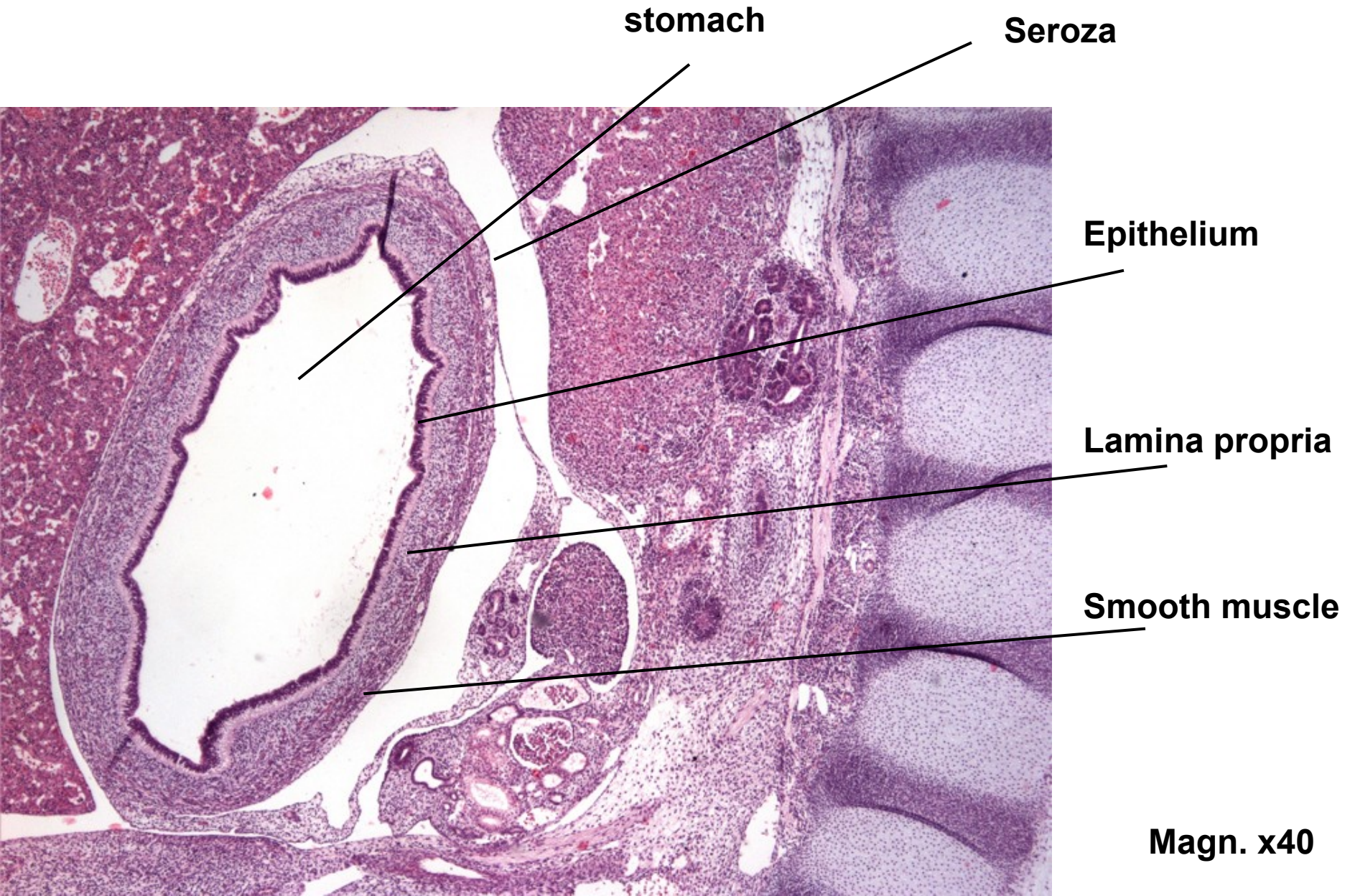
Stomach

- One layer columnar epithelium
- Many mucus and serose glands



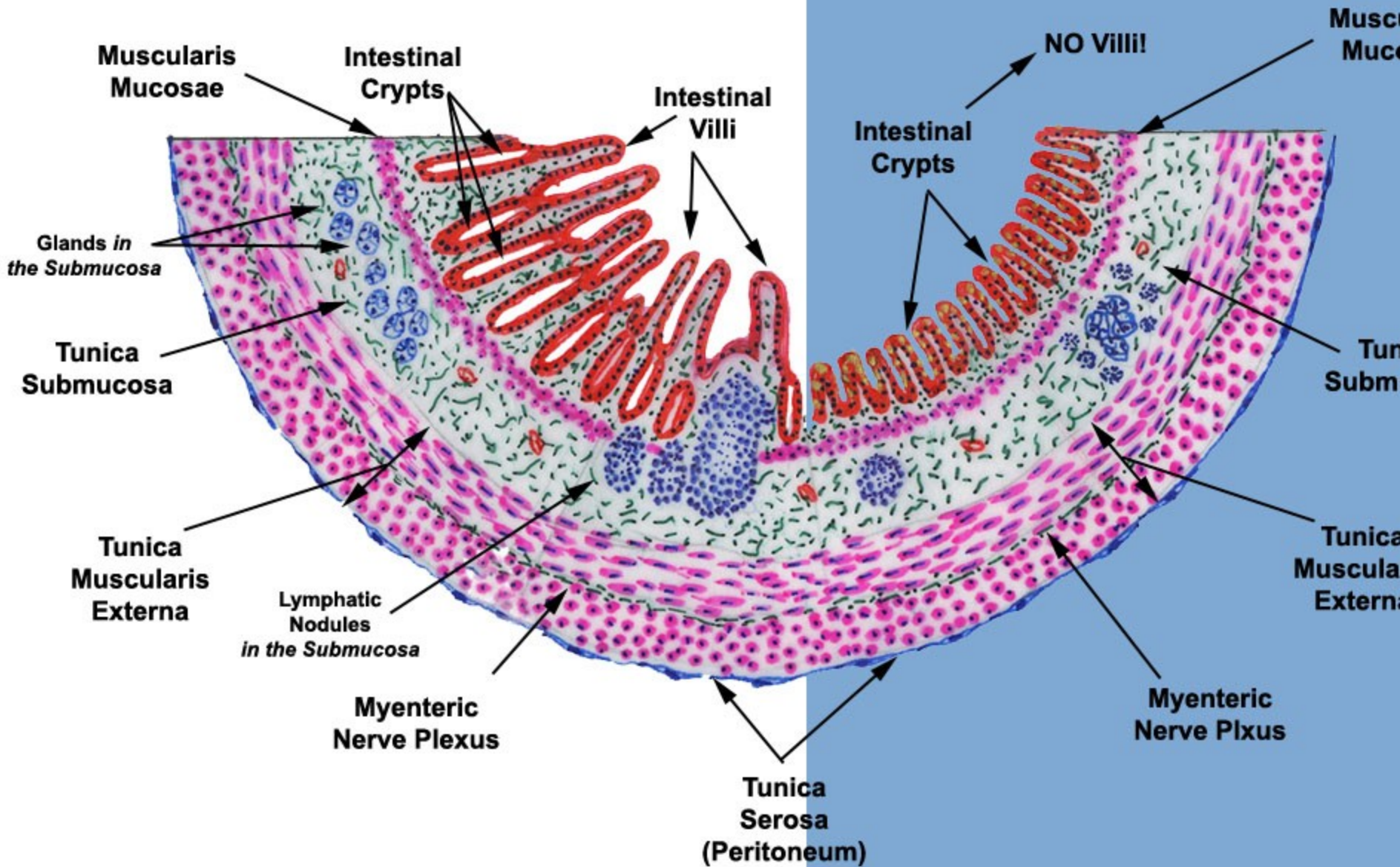
Embryo

6th week iud



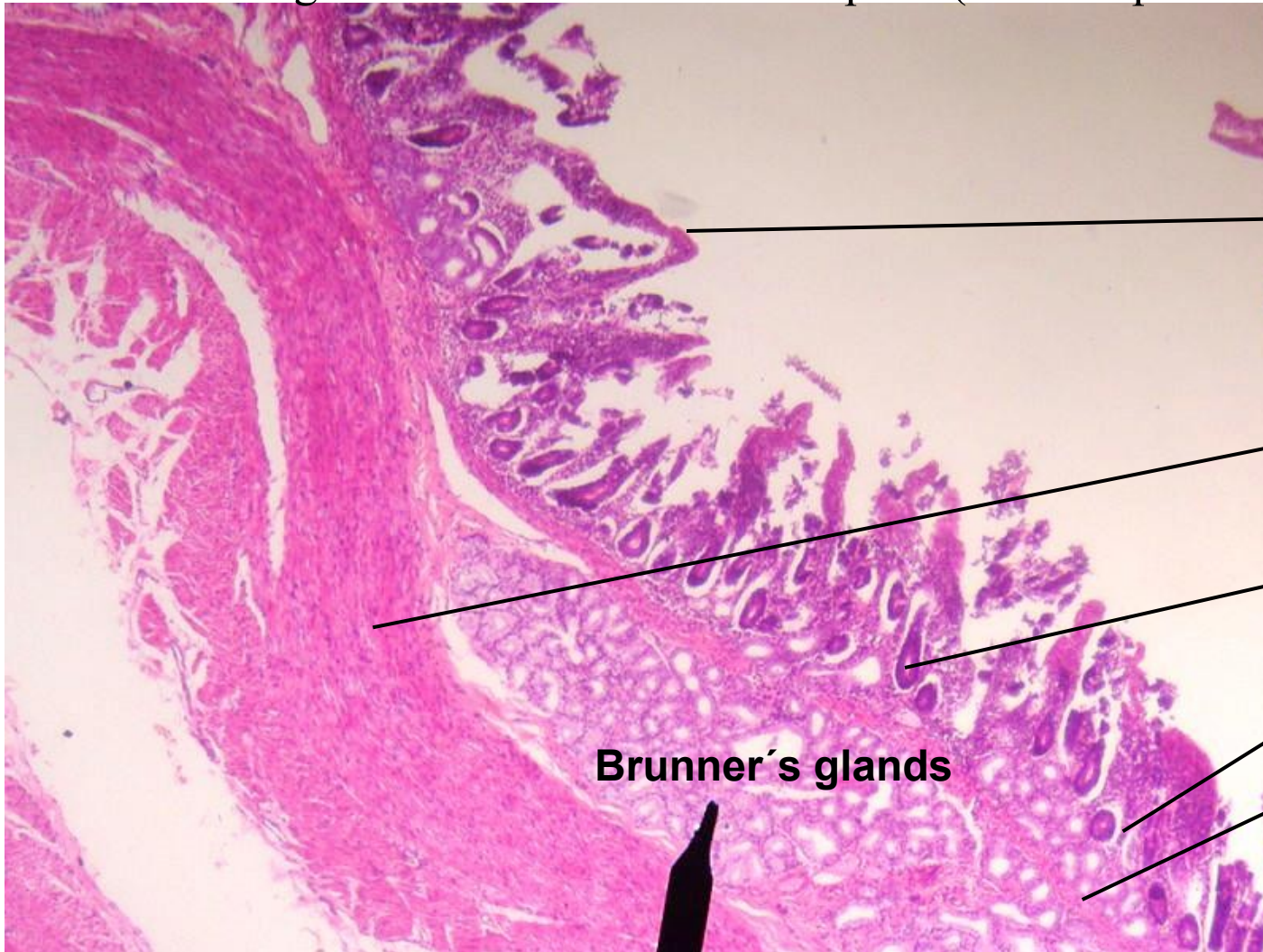
SMALL INTESTINE

LARGE INTESTINE



Small intestine

- One layer, columnar epithelium
- Enterocytes, undifferentiated cells, goblet cells, paneth cells., endocrine cells,
- Brunner's glands – mucous and serous parts (increases pH of the food)



Mucosa of villi

Muscularis
externa

Mucosa crypt

Lamina propria

Muscularis
Mucosae

Brunner's glands

Magn. x5

11 week iud

Proliferation of mucose of primitive gut is followed by recanalization



Serosa

Smooth muscle

Submucose

Crypt

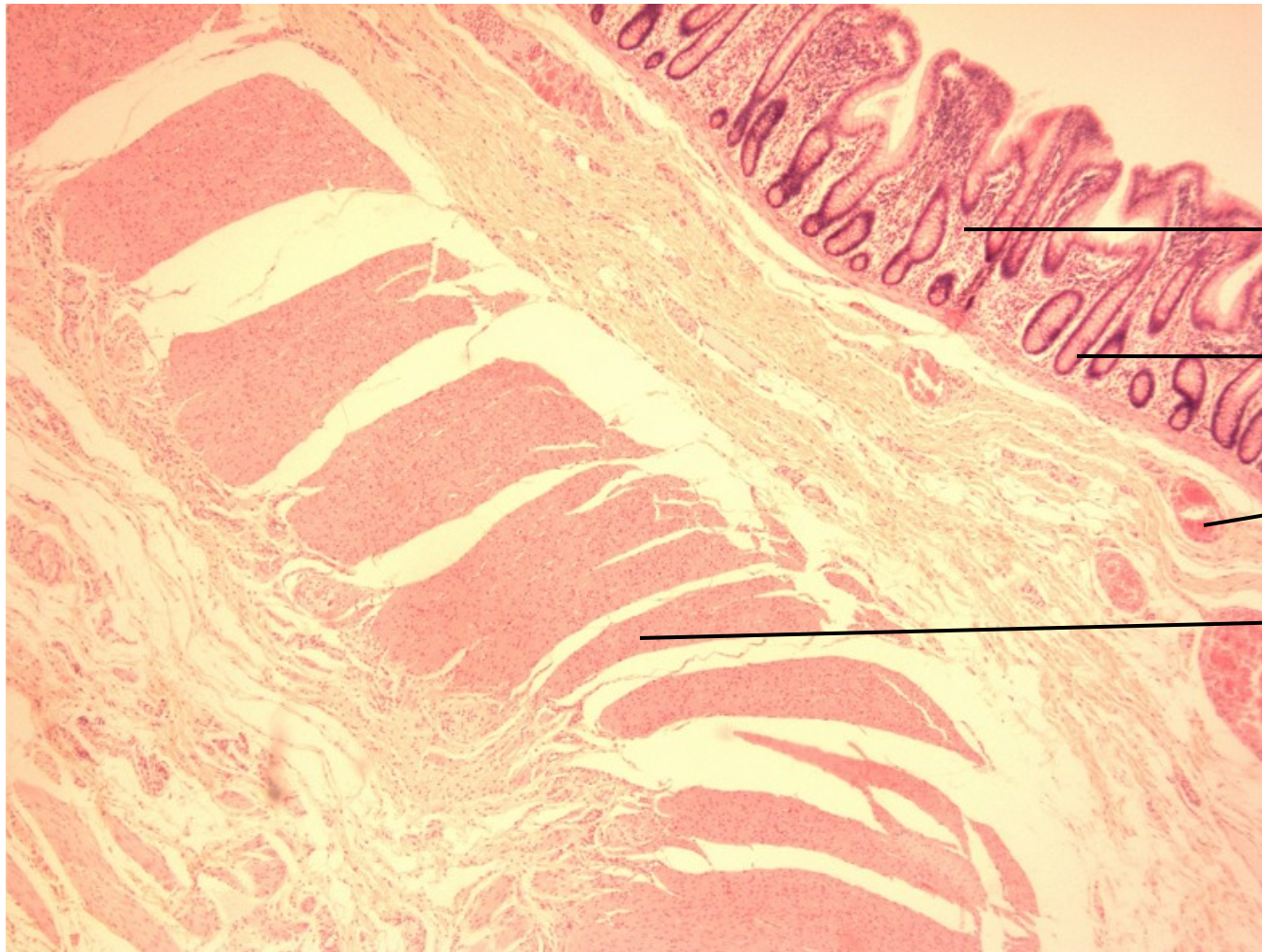
Villus

Endothelium

Magn. x5

Large intestine

- One layer columnar epithelium – absence of villi
- goblet cells are more numerous than in small intestine



Lamina propria

Luberkuhn's
crypt

Artery in
submucosa

Muscularis externa

Magn. x5

10th week iud



Mucosa

**Lamina
Propria**

**Smooth
muscle**

Serosa

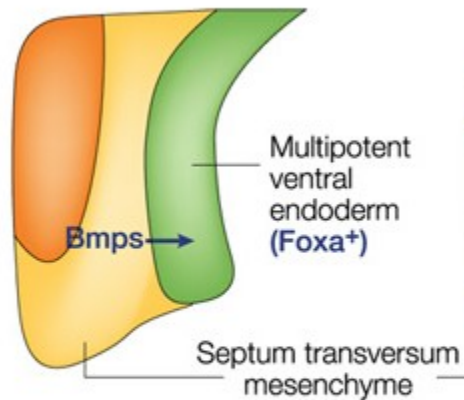
Magn. x5

Liver

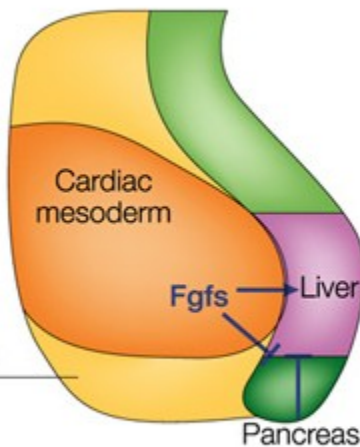
Endodermal origin

Mezodermal origin

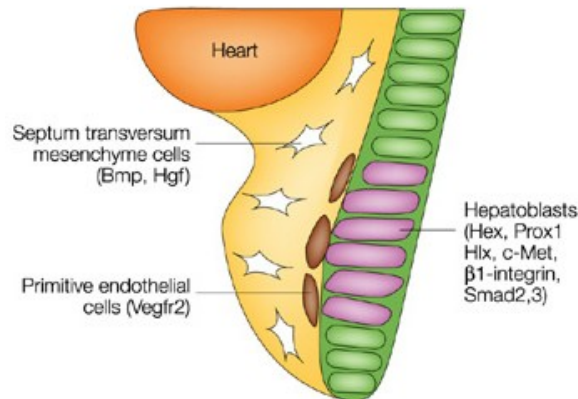
a Competence
2–6-somite stage



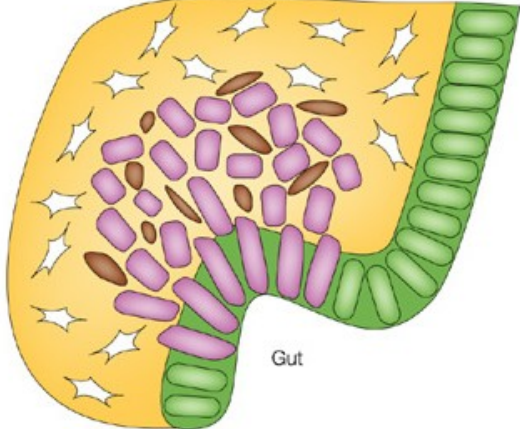
b Specification
7–8-somite stage



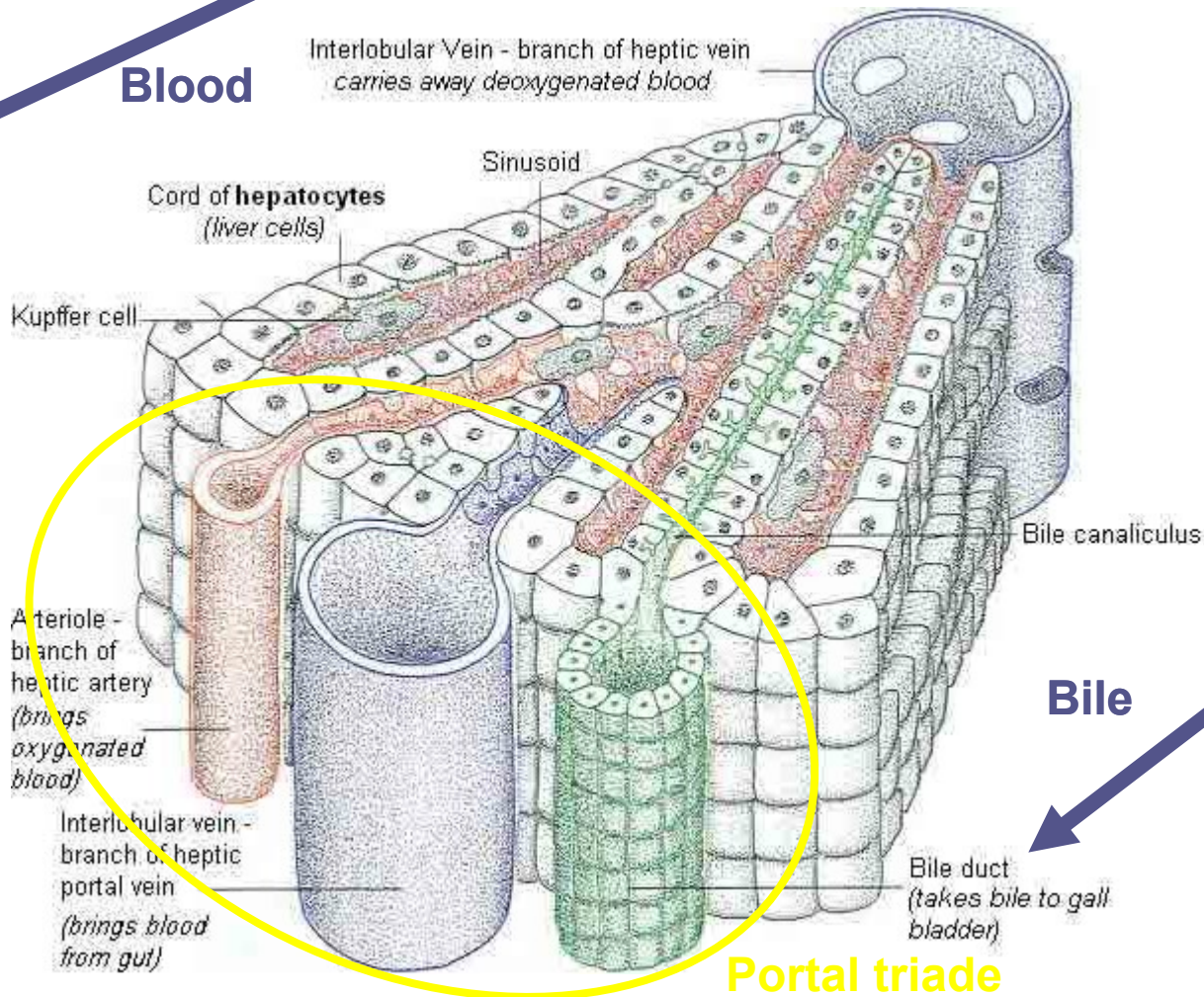
a Post-specification
11–13-somite stage

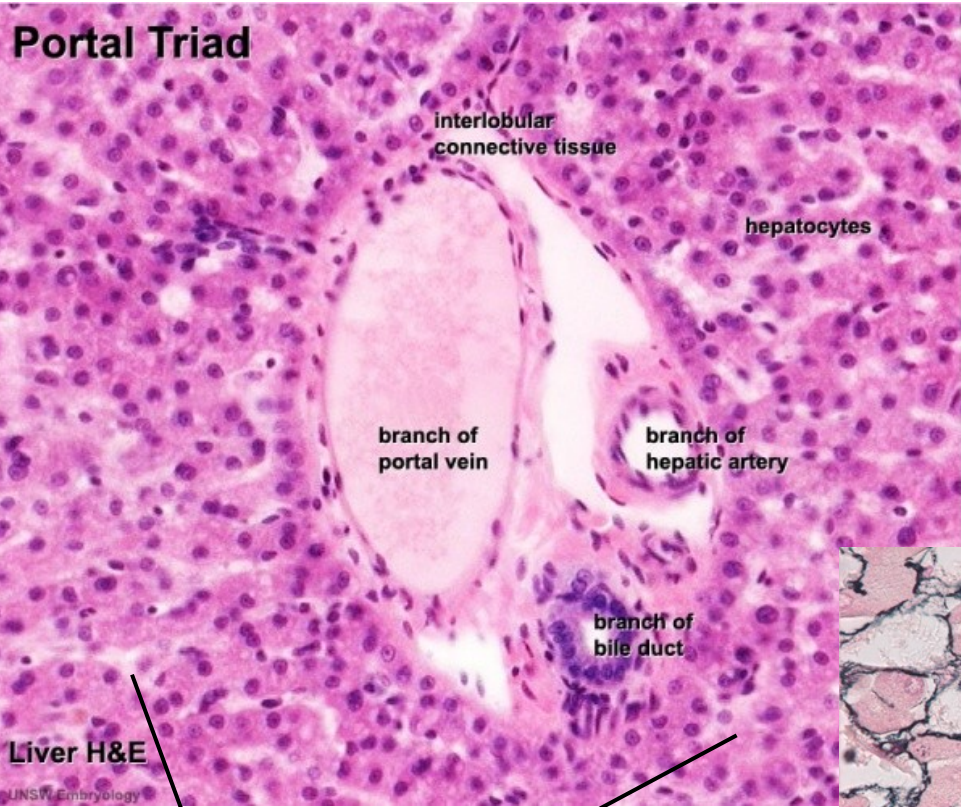


b Liver-bud stage
18–25-somite stage



Játra - struktúra

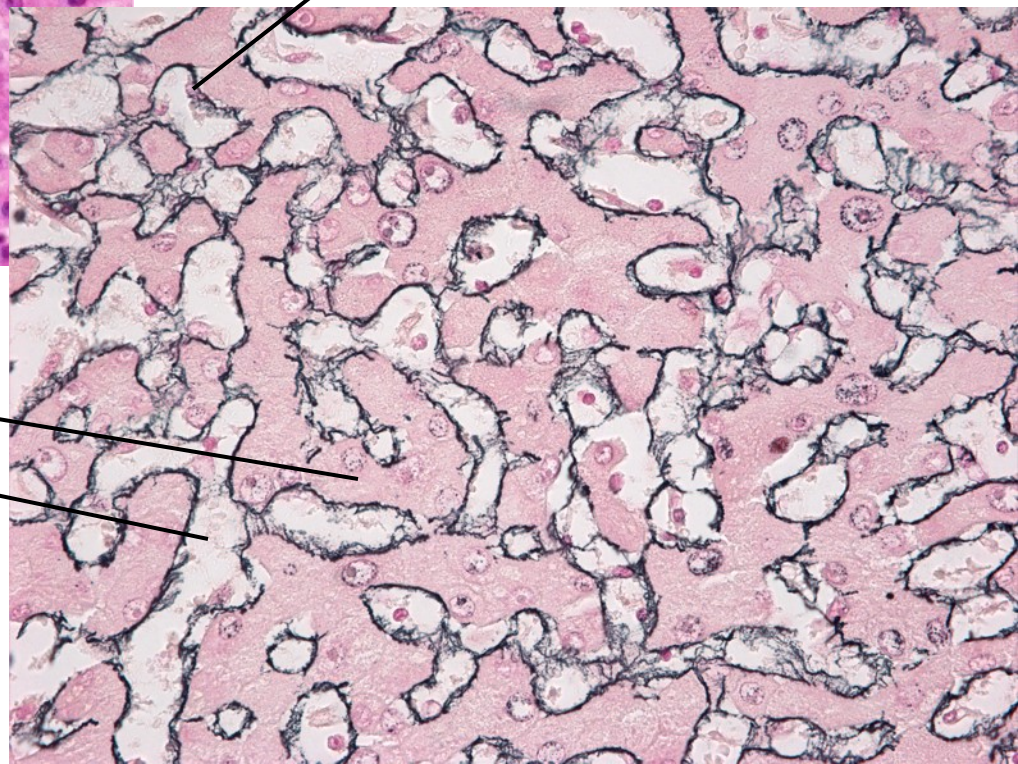




Liver - adult

Magn. x40

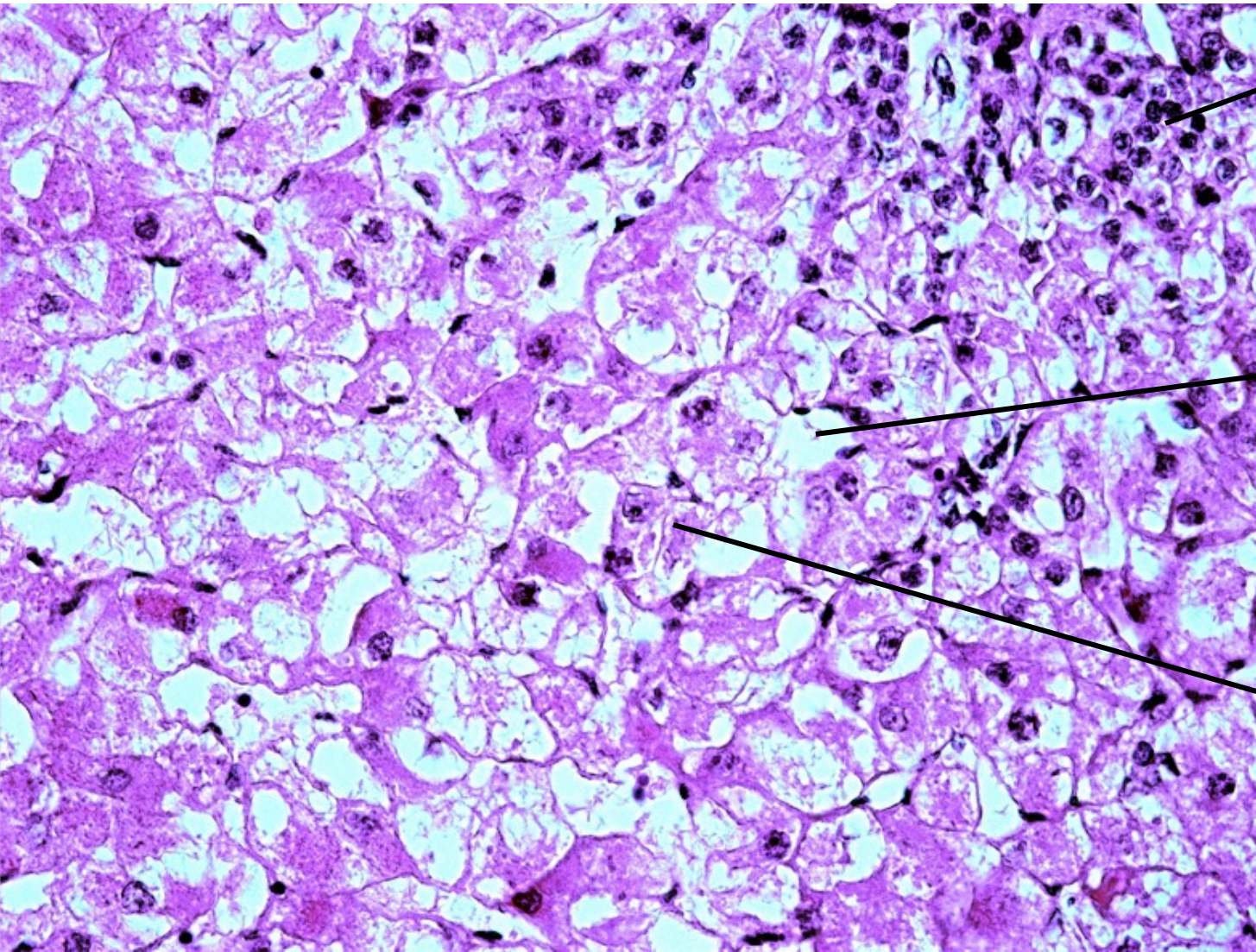
**Gomori stain -
Reticular fibres
(collagen type III, mesh which is
the „backbone“ of soft tissues)**



Sinusoid

Hepatocytes

Embryonal liver 14th week iud



Hematopoesa

Sinusoid

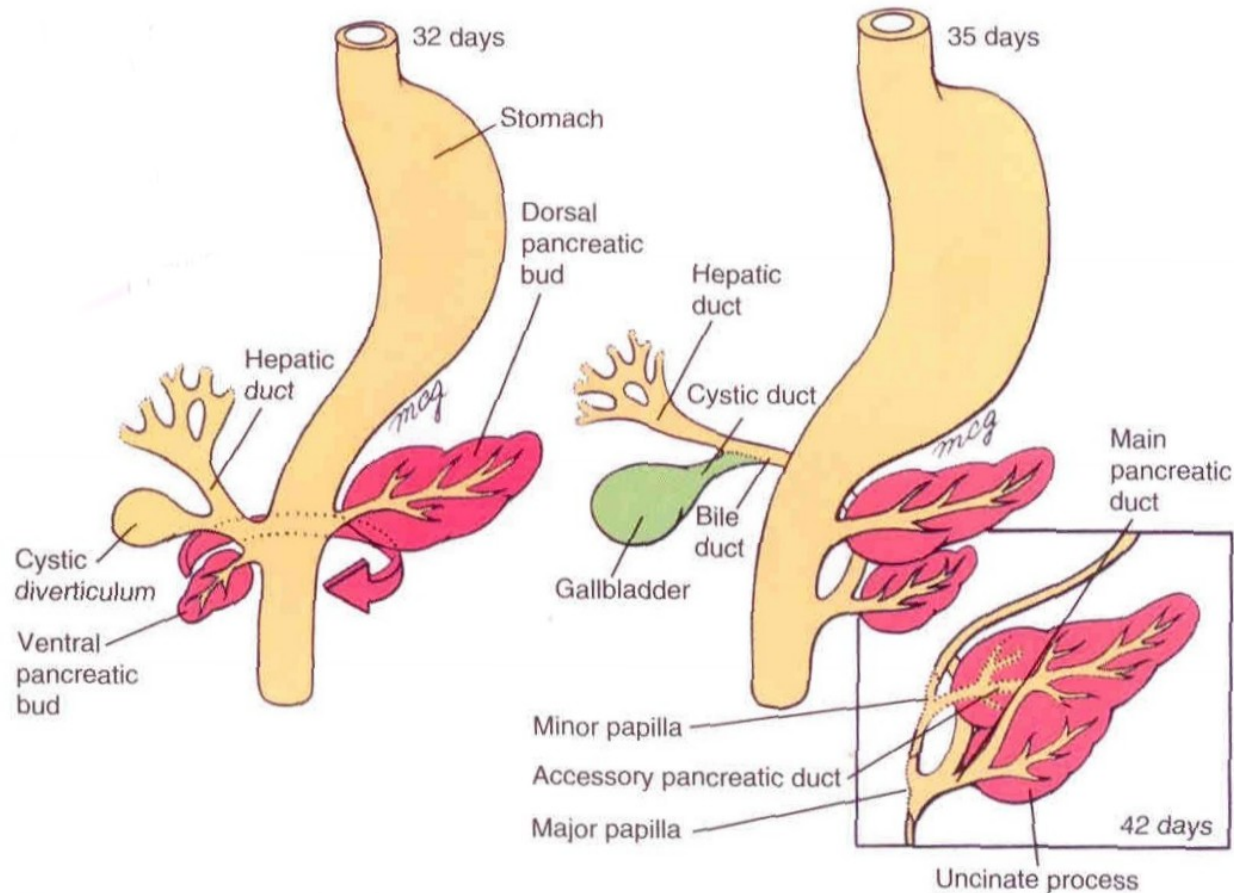
Hepatocytes

Magn. x40

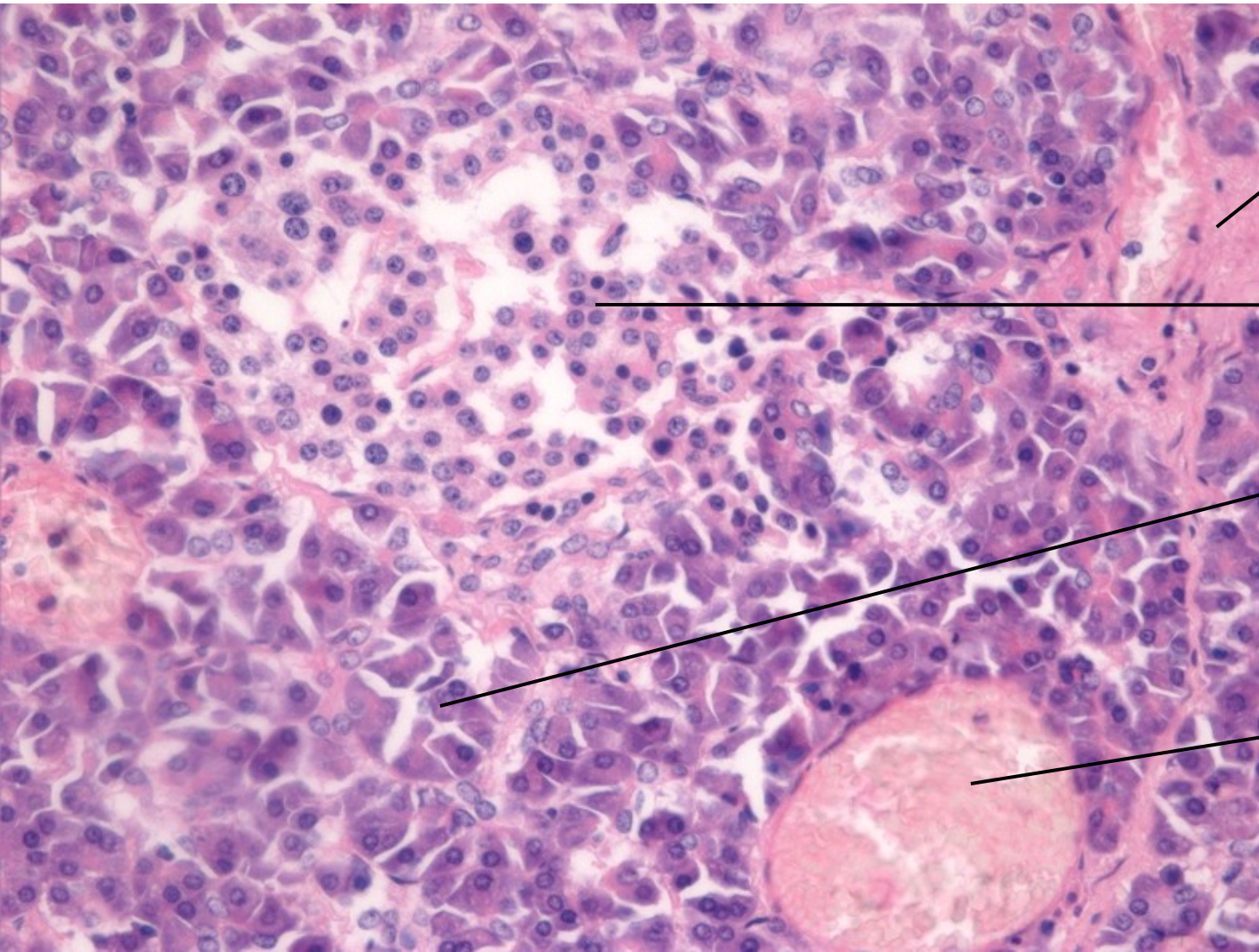
Pancreas

Endodermal origin

1. Turn of ventral anglage – the head of pancreas
2. Ventral a. encloses the dorsal anlage – the tail of pankreas
3. Ducts fusing



Pancreas



Connective tissue

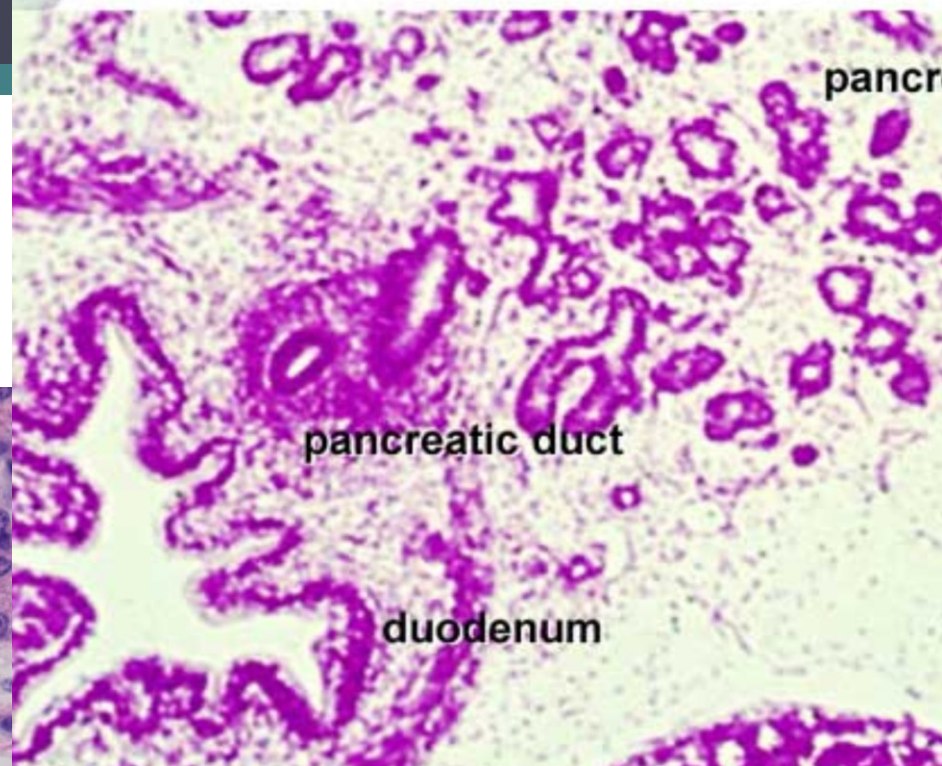
Langerhans.
islets

Exocrine glands

Artery

Magn. x40

Embryonal pancreas 8th week iud

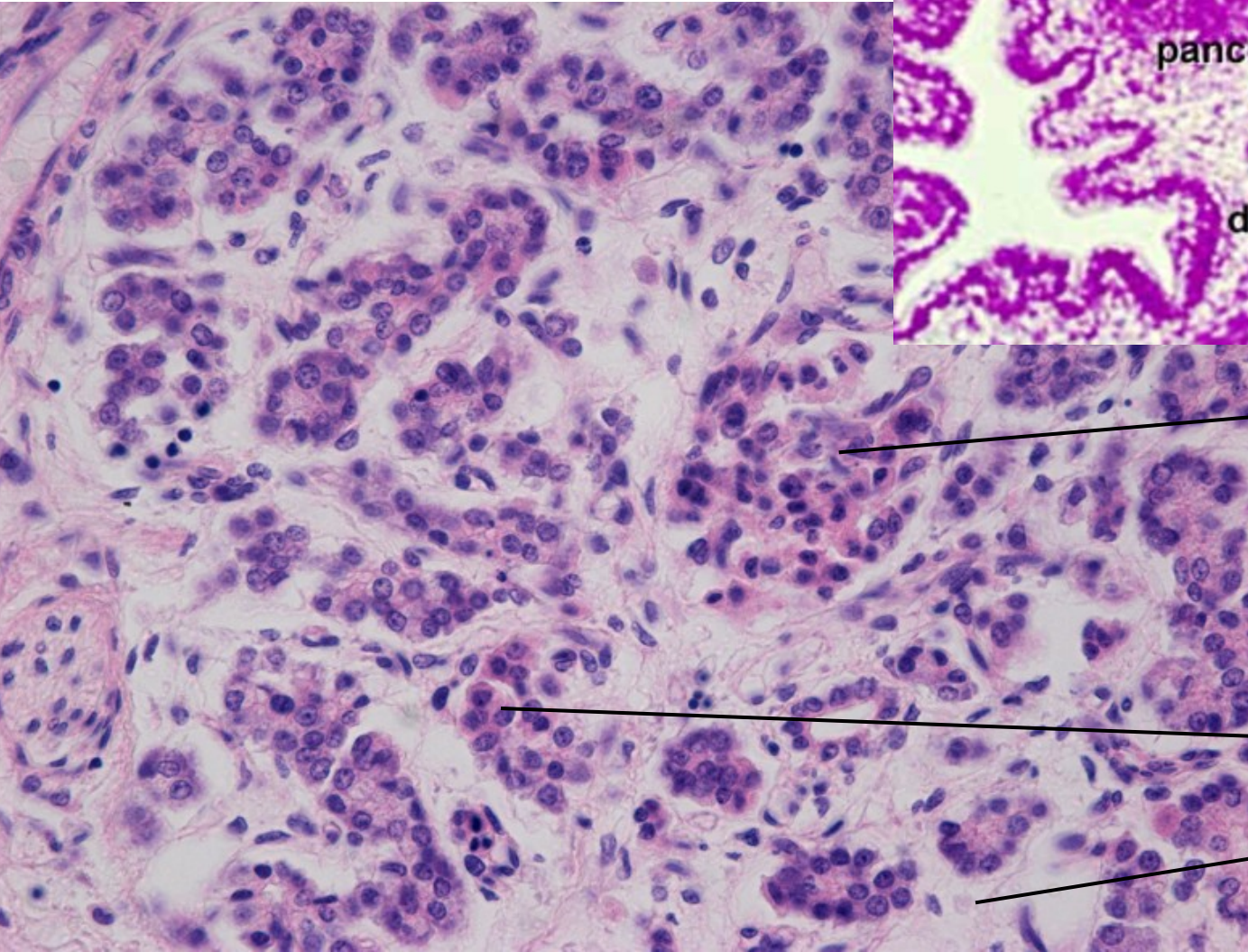


pancreatic duct

duodenum

pancr

Embryonal pancreas 22th week iud

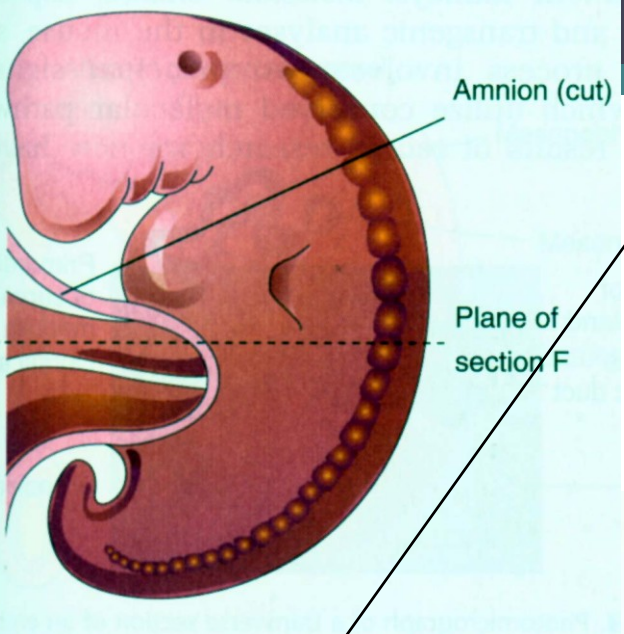


Langer. isle

Tubulus/acinus

Mezenchyme

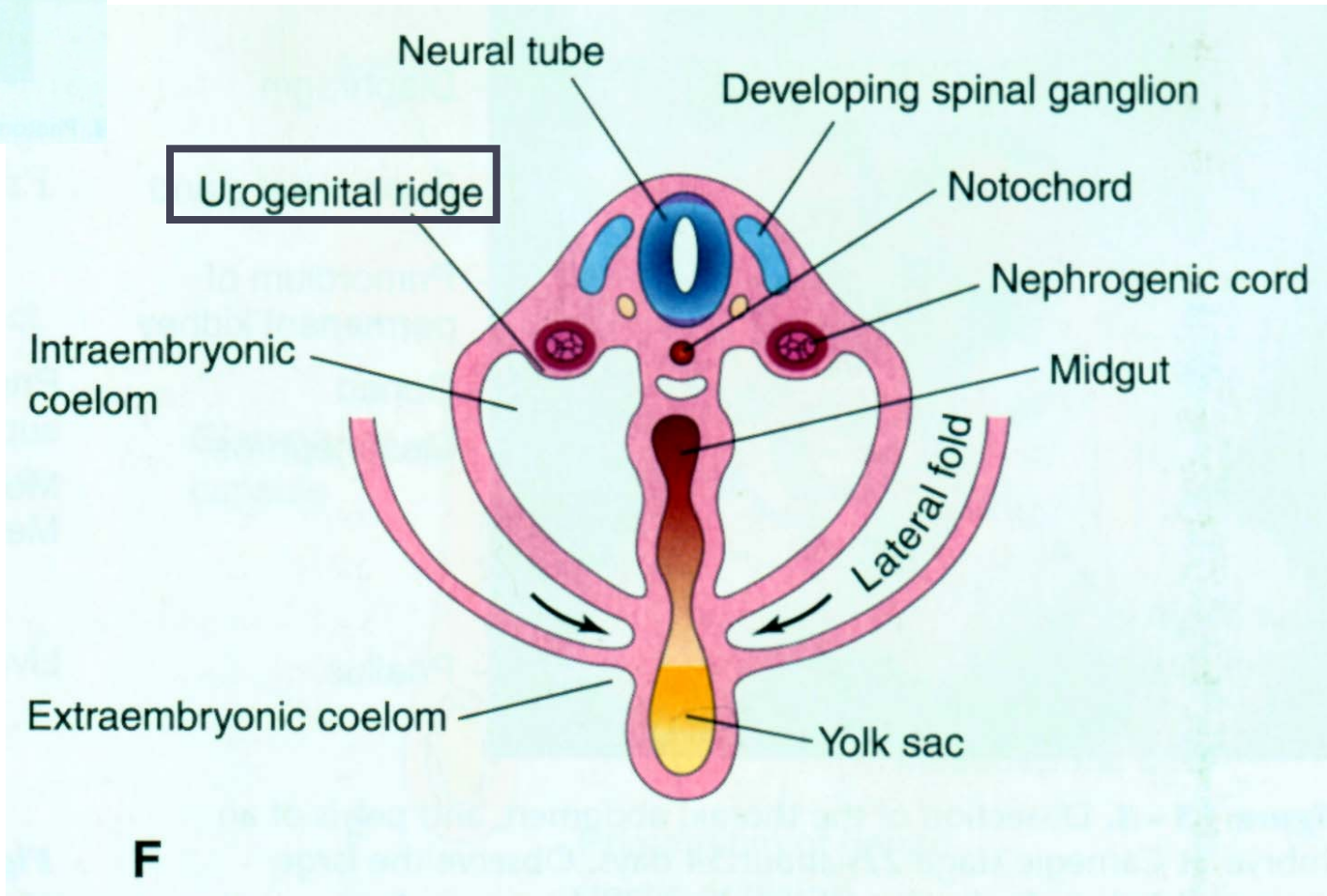
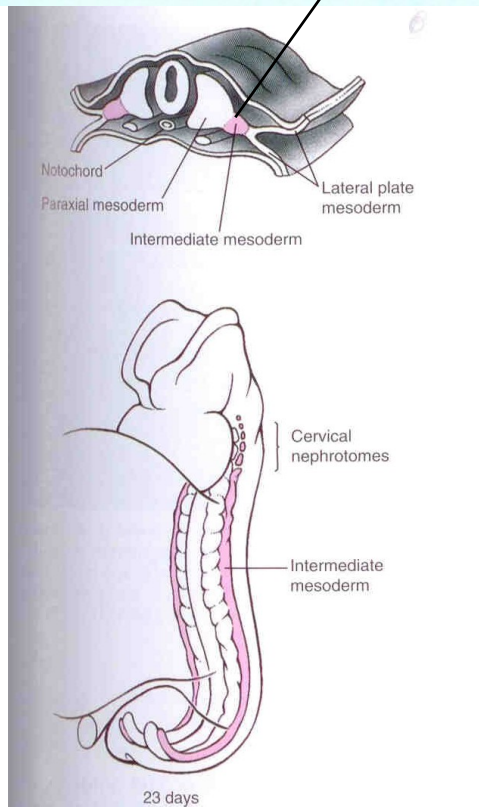
Magn. x40



Kidney

Intermediate mesoderm

Urogenital ridge – anlage of kidney and gonads (6th week iud)

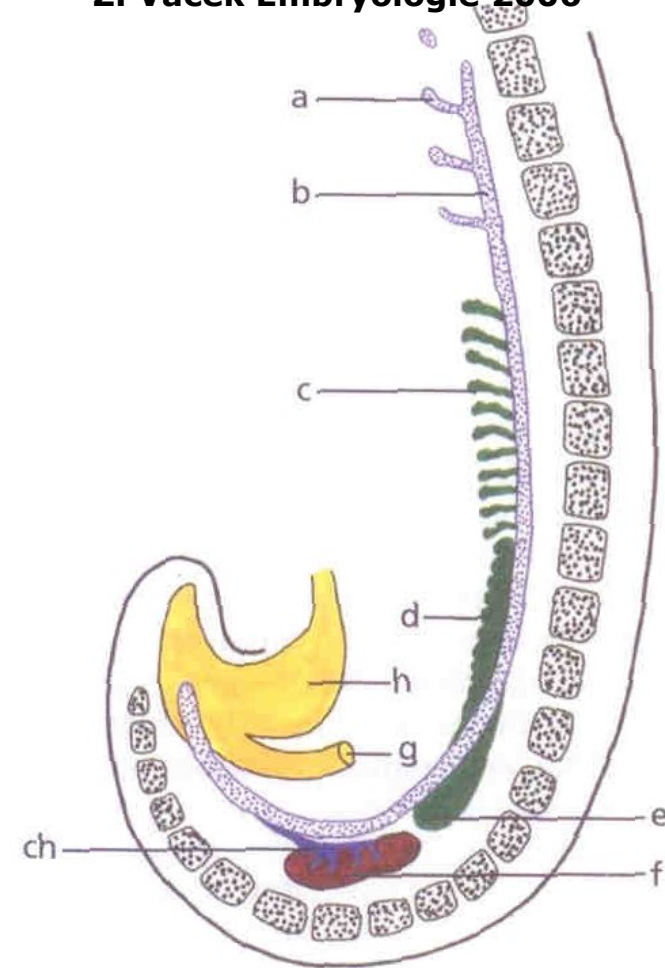


3 stages of development

Beginning of 4th week iud
Pronefros – pronefric duct
(base of Wolffii duct)

End of 4th week iud
Mezonefros – mesonefric duct (Wolffi)
- ureter bud

Beginning of 5th week iud
Metanefros – definitive kidney



Obr. 8.98 Schéma vývoje pronefros, mezonefros a metanefros u embrya 5 mm dlouhého, asi 4 týdny starého.

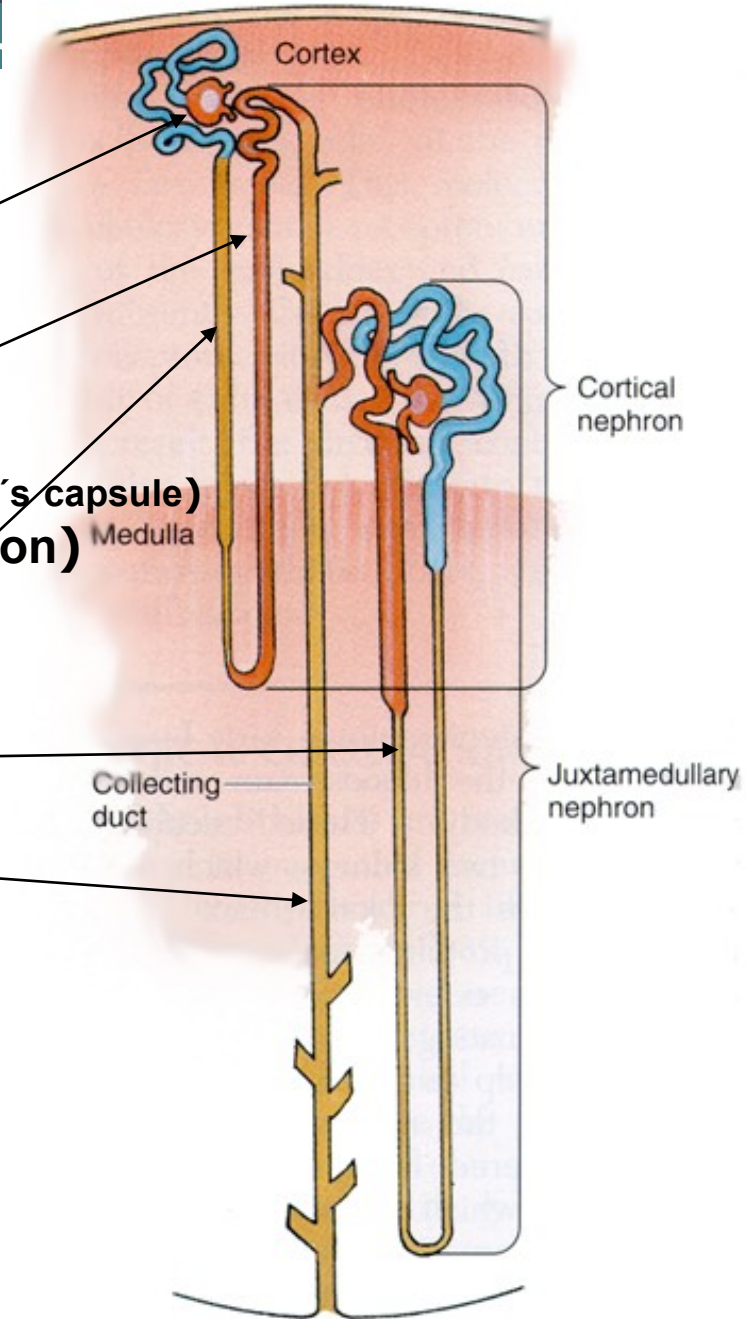
a – kanálek pronefros, b – ductus mesonephricus (Wolffi), c – kanálek mezonefros, d – mezonefrogenní blastém, e – dolní hranice mezonefrogenního blastému, f – metanefros, g – zadní střevo, h – močový měchýř, ch – základy sběracích kanálků.

NEPHROS

NEPHRON – functional unit

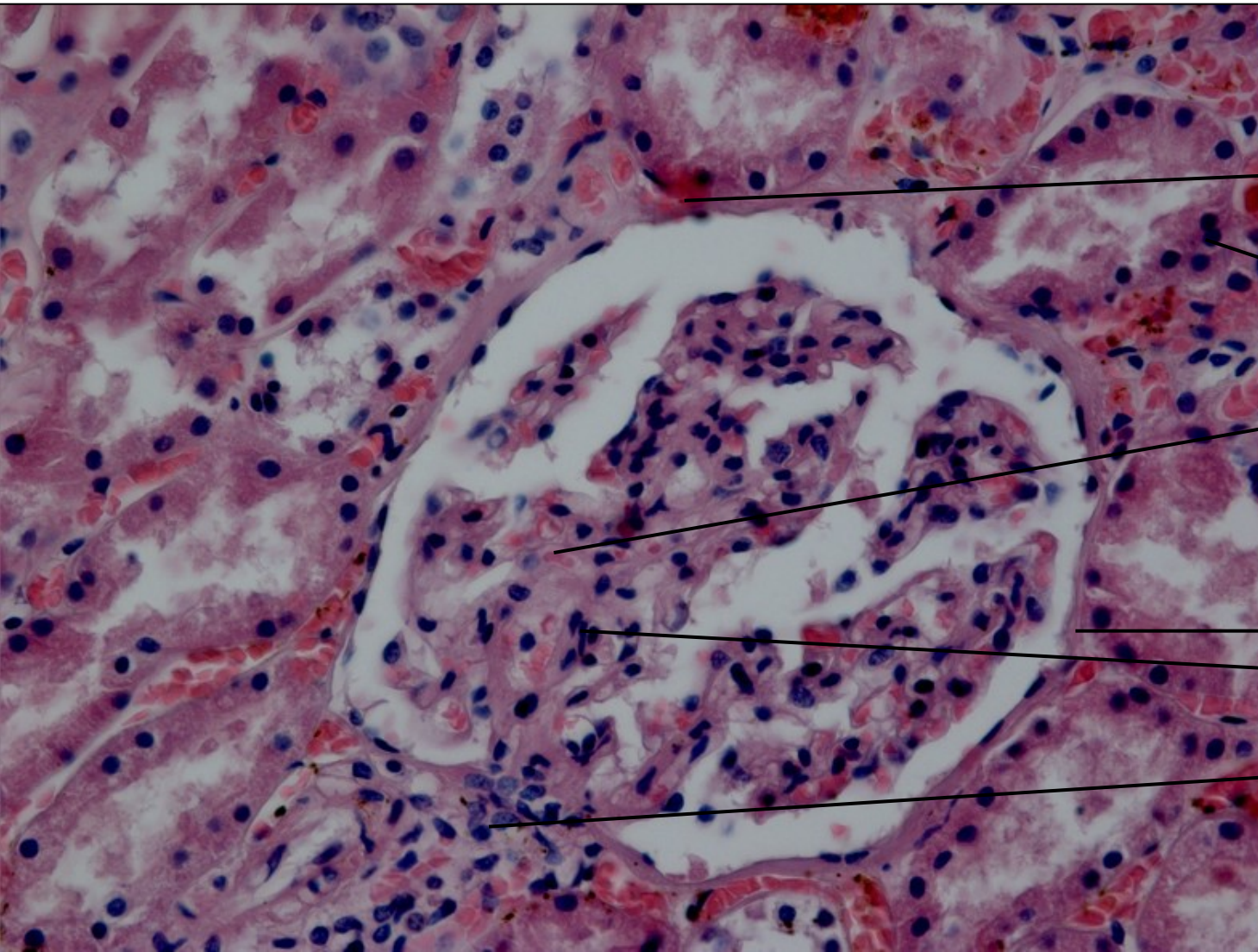
Cortex – renal corpuscle (glomerulus + Bowman's capsule)
- proximal tubulus (backward absorption)
- distal tubulus

Medulla – Henle's loop
- collecting duct



Metanephros - cortex

Nephron



Erythrocytes

Tubulus

Glomerular
capillary

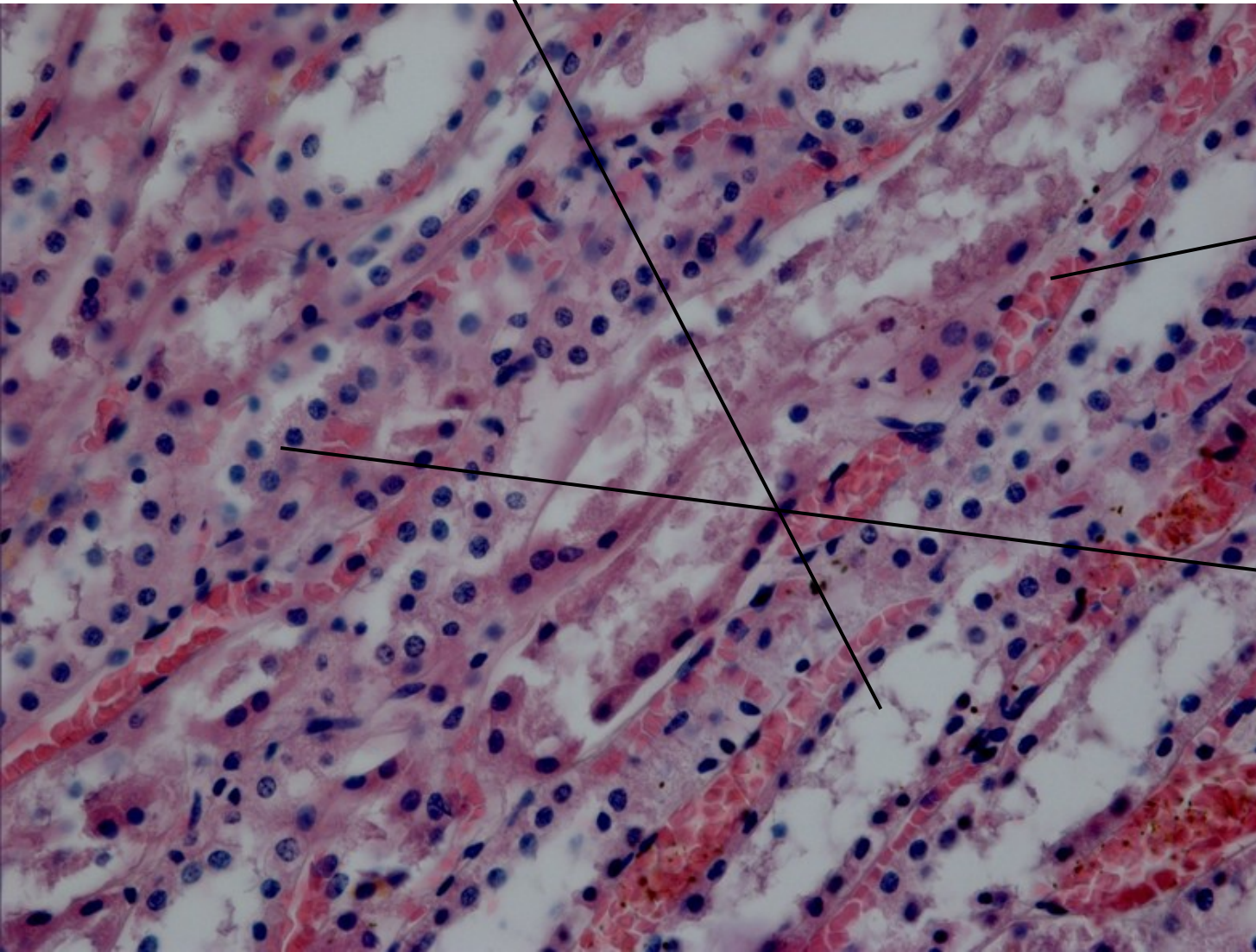
Bowman's caps.
Podocytes

Juxtaglomerular
cells

Magn. x40

Metanephros - medulla

Henle's loop (lower cells)

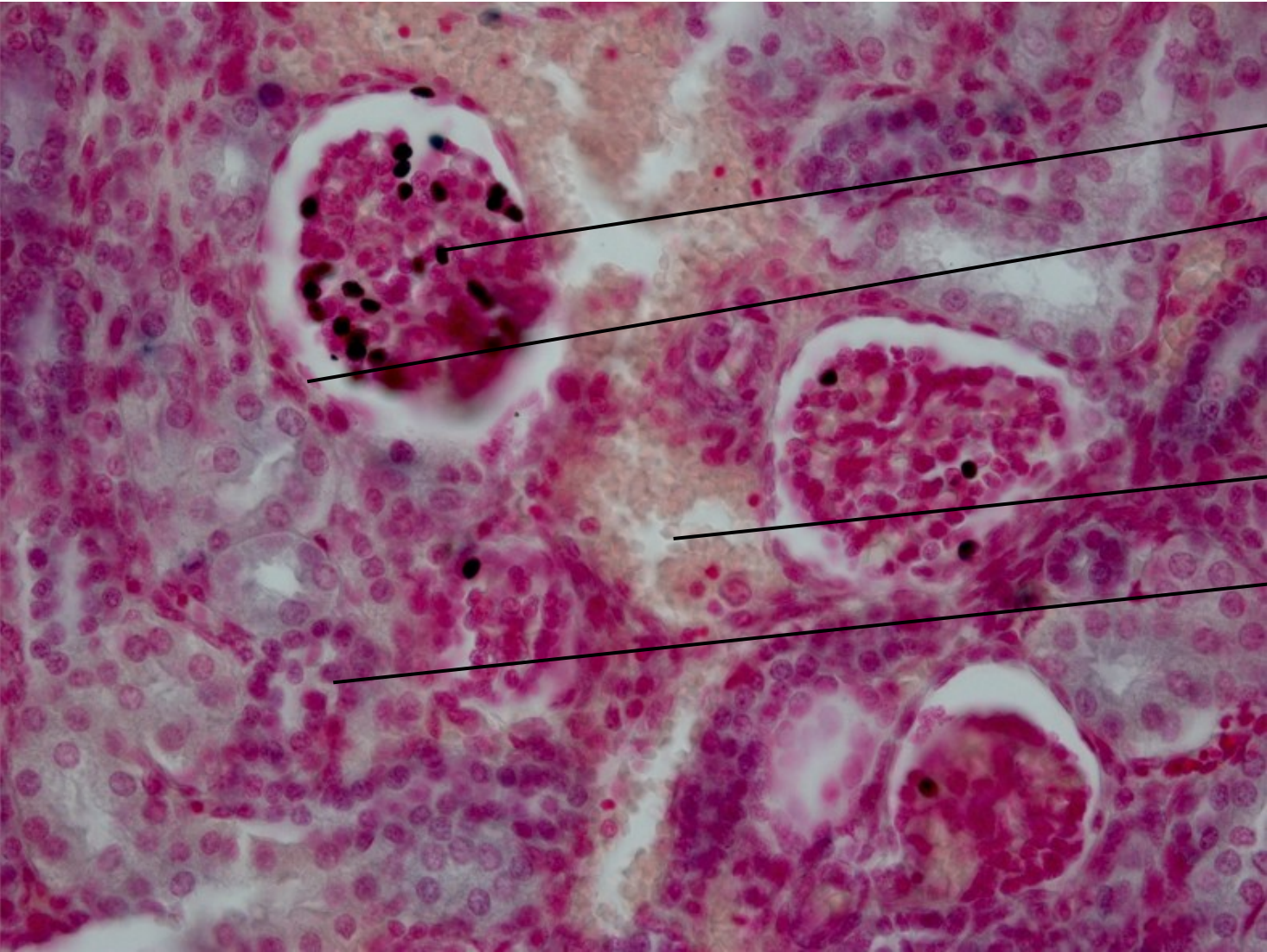


Capillaries

Collecting duct
(taller cells)

Magn. x40

Embryo metanephros cortex 21st week of iud



Glomerulus

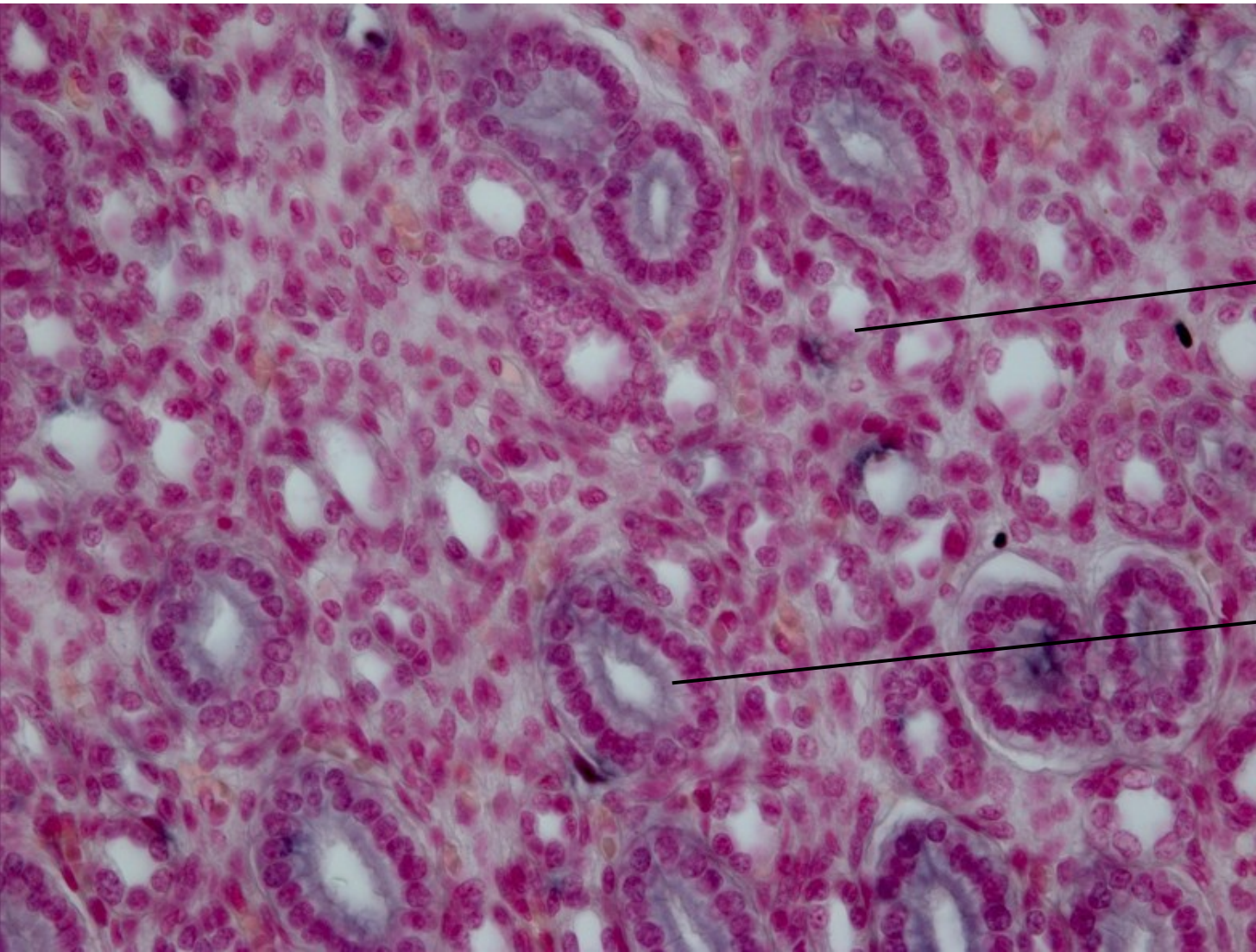
Bowman's capsule

Capillary

Proximal and distal tubules

Magn. x40

Embryo metanephros medulla 21st week of iud

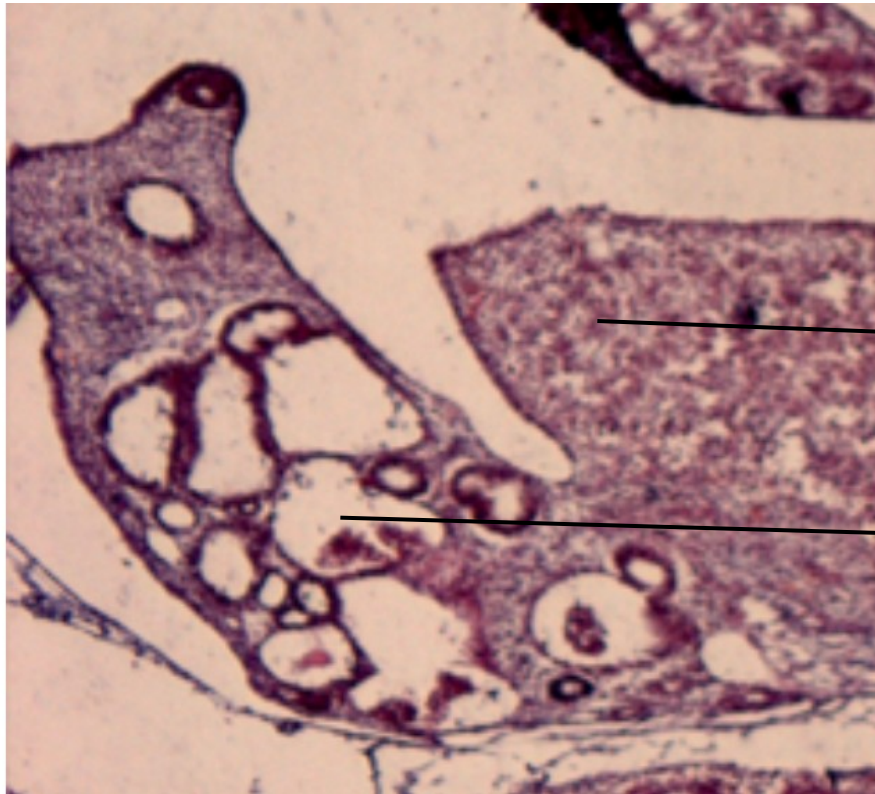


Henle's loop
(lower cells)

Collecting duct
(taller cells)

Magn. x40

Mesonephros E1208T 7th week iud

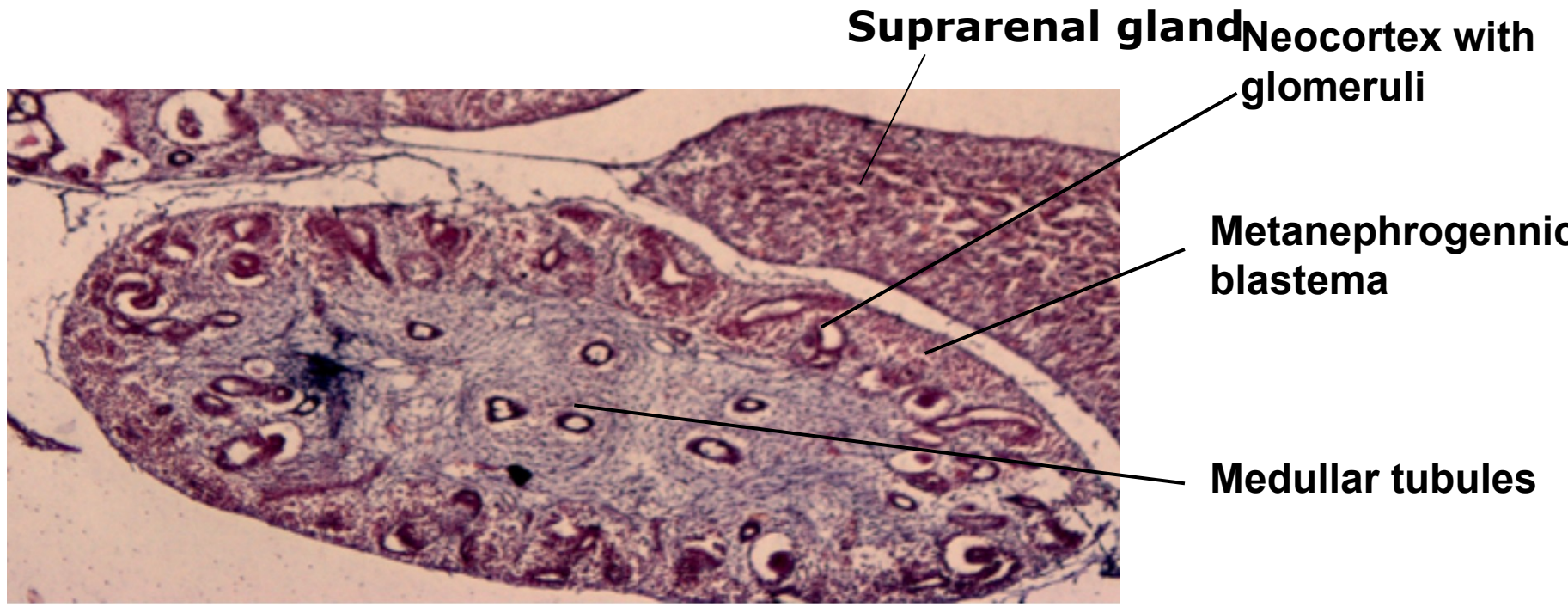


Gonads

**Degenerating
glomeruli**

Magn. x10

Metanephros E 1208T 7th week iud



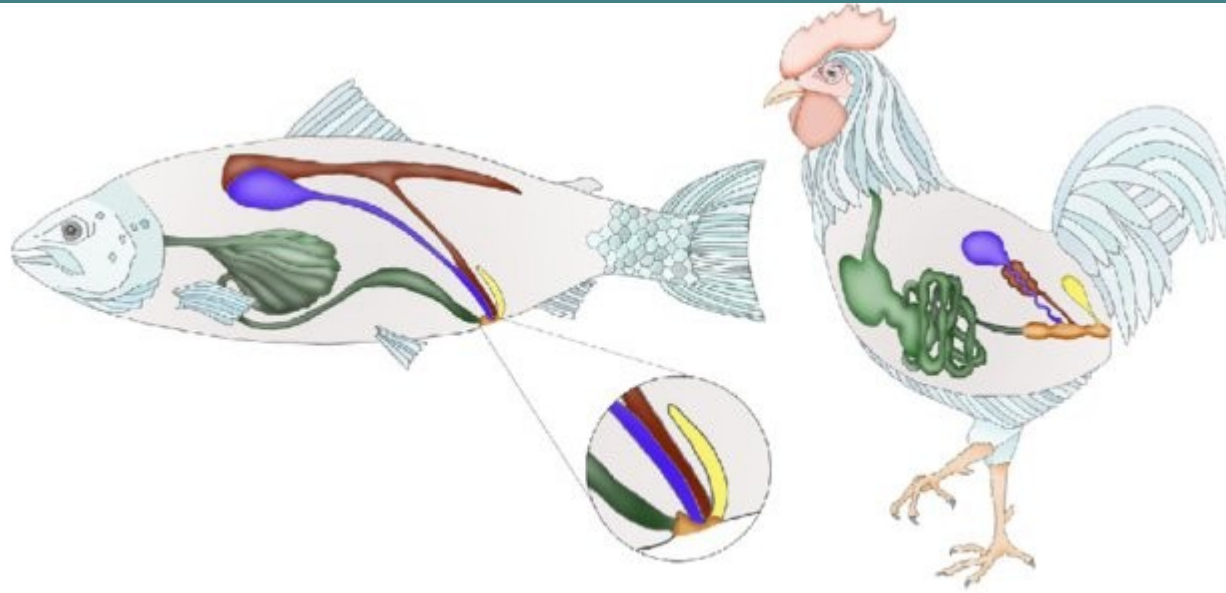
Suprarenal gland
Neocortex with glomeruli

Metanephrogenic blastema

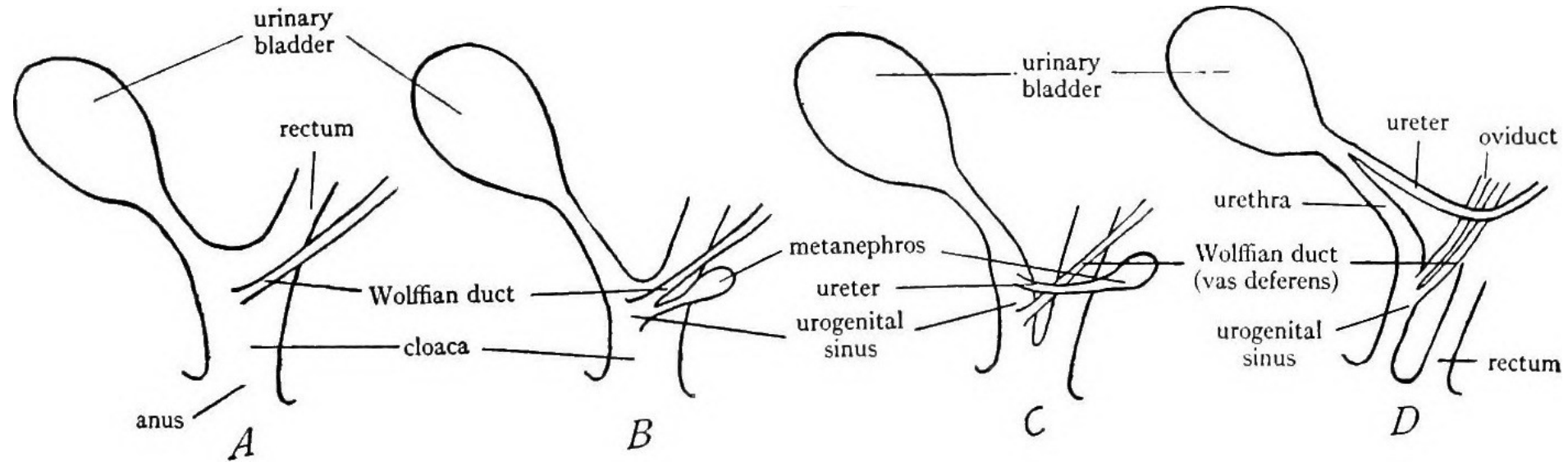
Medullar tubules

Magn. x10

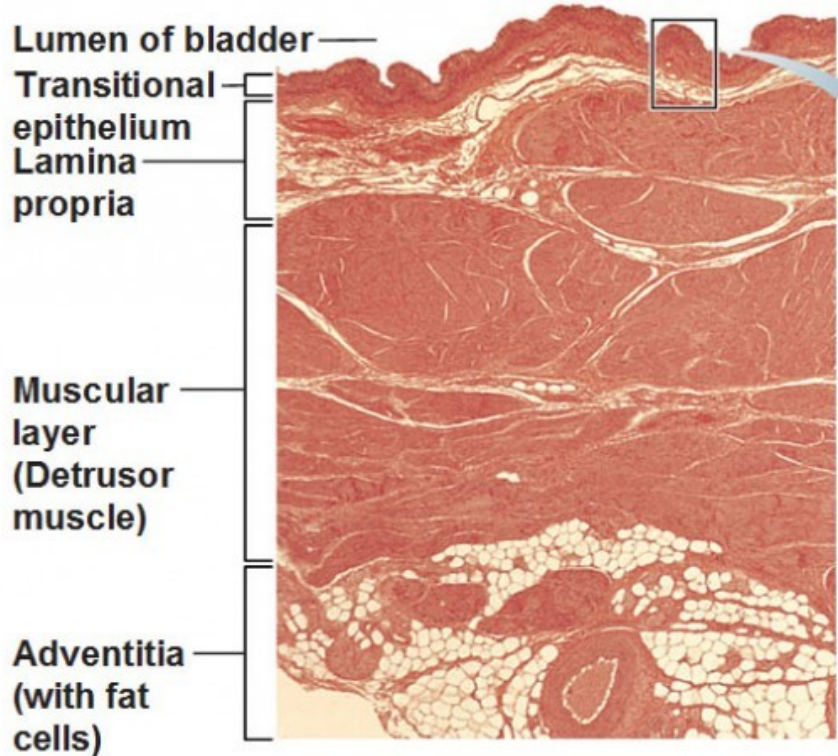
Cloaca



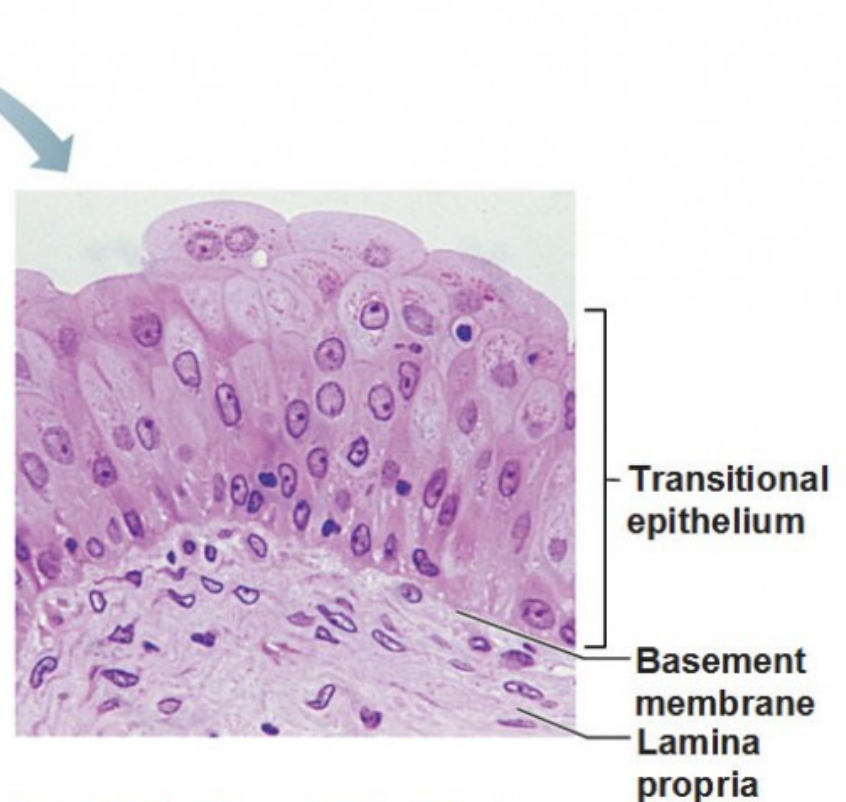
● Gastrointestinal tract
 ● Reproductive system
 ● Urinary system
 ● Bursa
 ● Cloaca



Histology of the Urinary Bladder

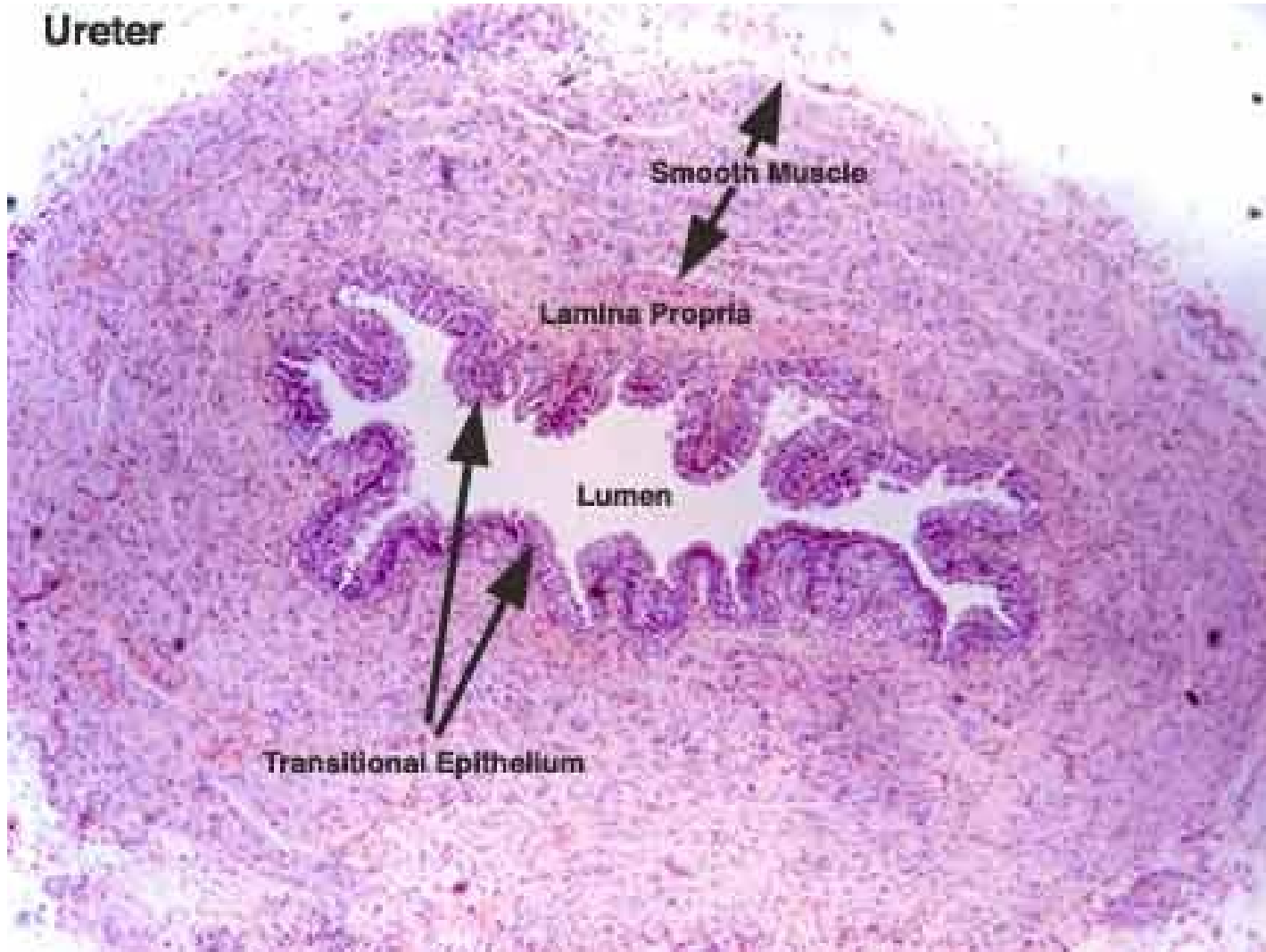


(a) Micrograph of the bladder wall (17X)



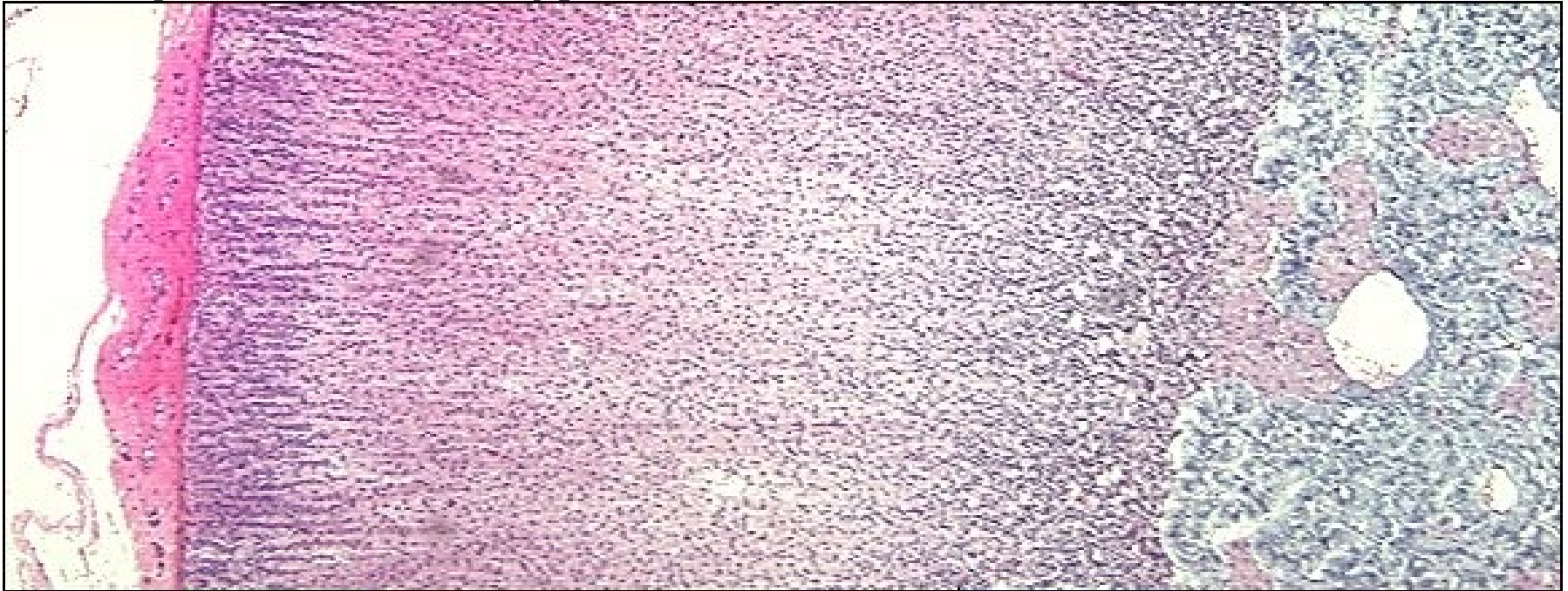
(b) Epithelium lining the lumen of the bladder (360X)

Ureter = močovod



Magn. x4

Suprarenal gland

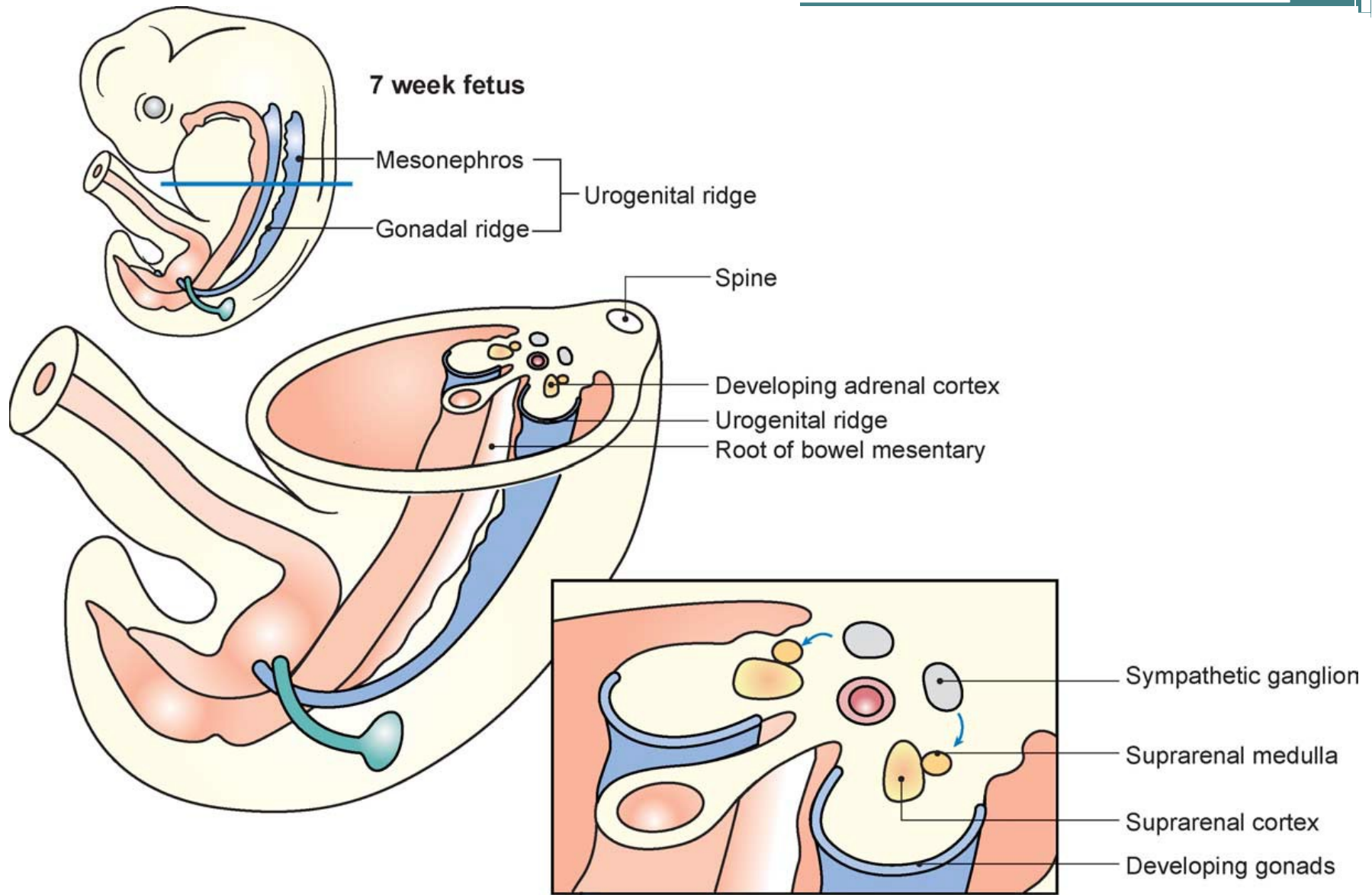


capsule	glomerulosa	fasiculata	reticularis	Medulla
	Cortex			

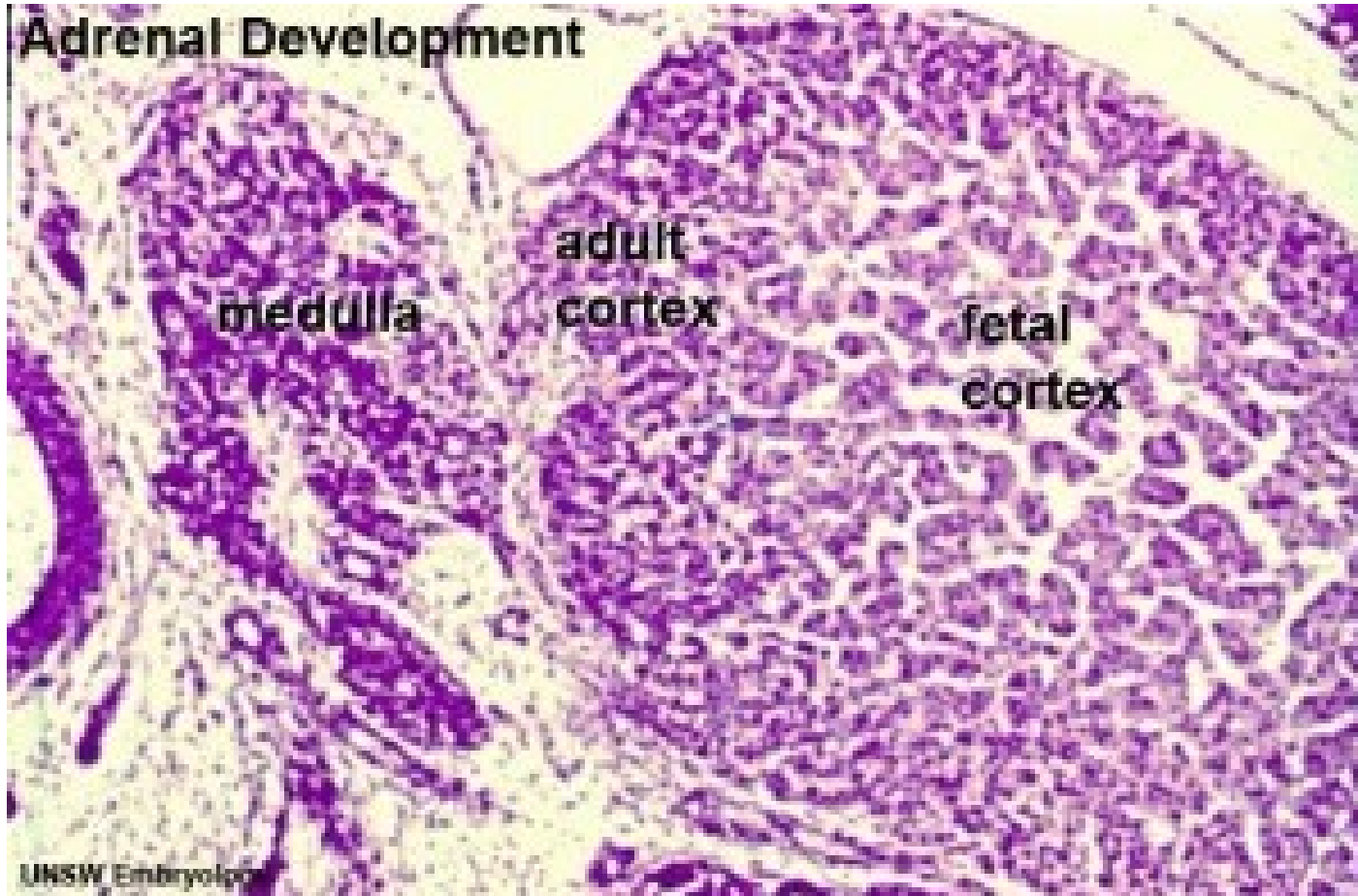
Cortex	zona Glomerulosa	Mineralocorticoids (aldosteron)
	zona Fasiculata	Glucocorticoidy (cortisol)
	zona Reticularis	Sex hormones - androgens
Medulla	Catecholamins - (nor)adrenalin	

Double origin of Adrenals

- **Medulla – neuroectoderm**
 - Neural crest cells form sympathetic ganglion in solar plexus = chromaffin cells + primitive sympathetic cells (noduli)
 - Travel to cortex (7th week iud) and along main vein get to its center
- **Cortex - intermediate mesoderm**
 - Cluster of cells in urogenital ridge (5th week iud) – primitive cortex
 - Second wave of differentiation of mesotel cells (6th w iud) – definitive cortex
 - 8th w iud – separation from other organs by connective tissue
 - Zona reticulata appears after 3rd year of life
 - Proliferation and apoptosis reshape primitive cortex in definitive c.



Adrenals - fetus



8th week iud - medulla is not surrounded by cortex

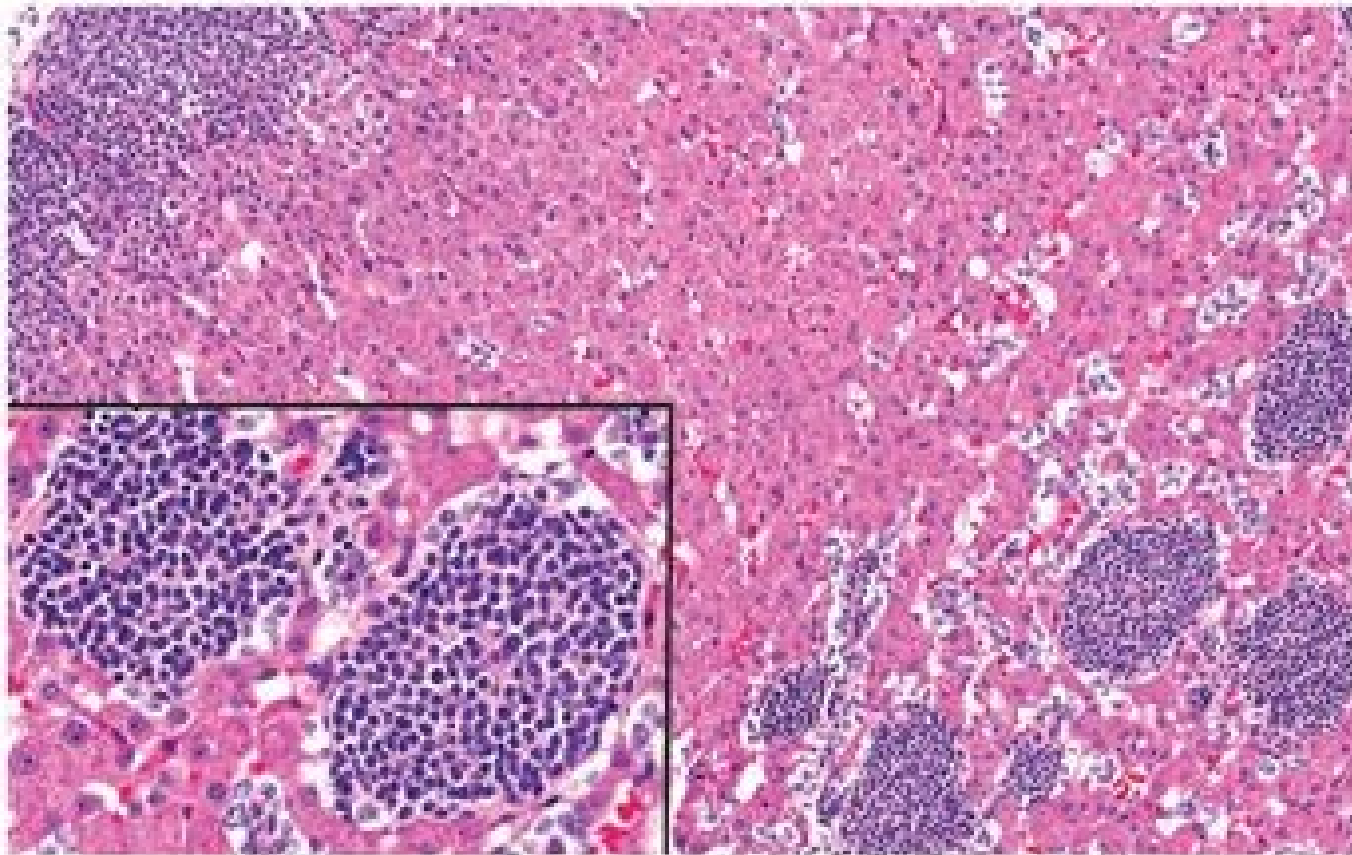


FIGURE 14.3 Nests of primitive sympathetic cells are present within the fetal cortex and at higher magnification (*inset*) in a 14-week fetus. The definitive cortex is seen in the *upper left*.

Samples

- H.S.S. embryos 6th – 22nd week iud (46 weeks)
- M.M. E12 = 5-6th week iud H.S.S. (21 days)
- M.M. E14,5 = 7.-8. Ttýden iuv H.S.S.

- G.G. HH10 (1,5 d) = 3. týden iuv H.S.S. (21 d)
- G.G. HH20 (3,5 d) = 5. týden iuv H.S.S.
- G.G. HH24 (4,5 d) = 6. týden iuv H.S.S.
- G.G. HH26 (5D) = 6,5. týden IUV H.S.S.
- G.G. Hh28 (5,5-6D) = 7. týden iuv H.S.S.

- T.E. 16D = beginning of organogenesis (29 d)
- T.E. 27d = just before the birth

- M.A. 13,5D= 6. týden iuv H.S.S. (17d)
- M.A. 15D= just before the birth

- Zebrafish 5D – larval stage (embryo hatching at 3D)

Carnegie Stage	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Human Days	1	2-3	4-5	5-6	7-12	13-15	15-17	17-19	20	22	24	28	30	33	36	40	42	44	48	52	54	55	58
Mouse Days	1	2	3	E4.5	E5.0	E6.0	E7.0	E8.0	E9.0	E9.5	E10	E10.5	E11	E11.5	E12	E12.5	E13	E13.5	E14	E14.5	E15	E15.5	E16
Rat Days	1	3.5	4-5	5	6	7.5	8.5	9	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5	17	17.5

Note these Carnegie stages are only approximate day timings for average of embryos. Links: Carnegie Stage Comparison

Srovnání vývoje lidského a myšního embrya Vývoj trvá 21 dní

https://embryology.med.unsw.edu.au/embryology/index.php/Category:Mouse_E12

Atlas myšního embrya

http://www.emouseatlas.org/eAtlasViewer_ema/application/ema/kaufman/plate_25a.php

Stádia vývoje kuřecího embrya

https://embryology.med.unsw.edu.au/embryology/index.php/Hamburger_Hamilton_Stages

Vývoj trvá 21 dní

Stádia vývoje krtka evropského (talpa europea)

https://www.researchgate.net/publication/250068036_Developmental_Stages_and_Growth_Rate_of_the_Mole_Talpa_occidentals_Insectivora_Mammalia

Vývoj trvá 28 dní