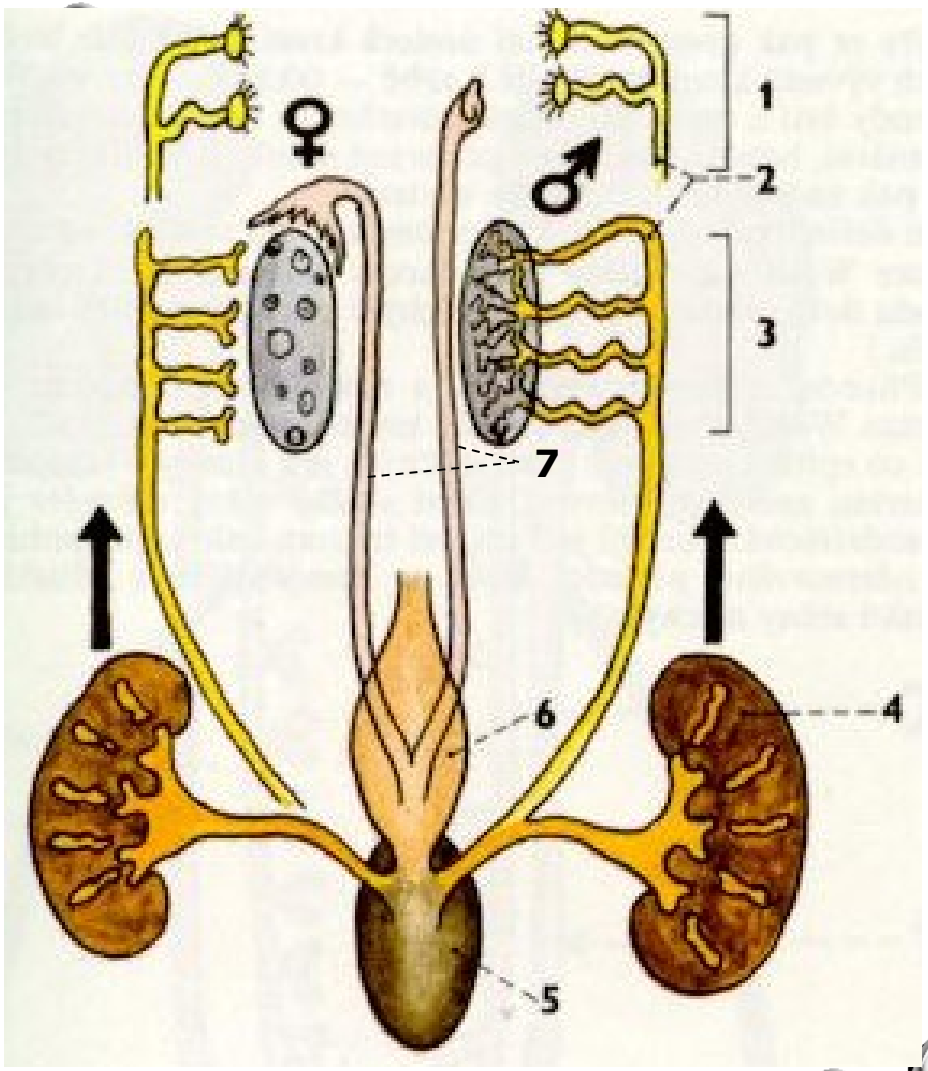
Urogenital system



1) DEGENERATING PRONEPHROS

2) WOLFF´S DUCT (MESONEPHRIC)

3) DEGENERATING MESONEPHROS

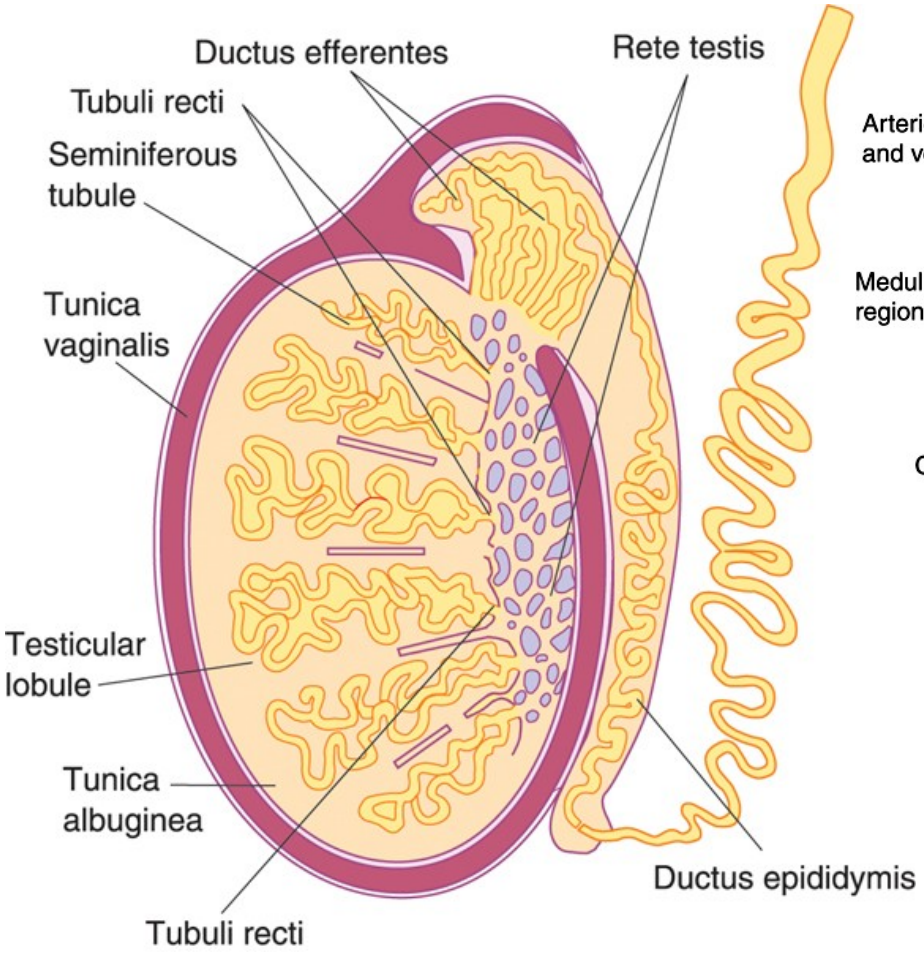
4) METANEPHROS

5) UROGENITAL SINUS

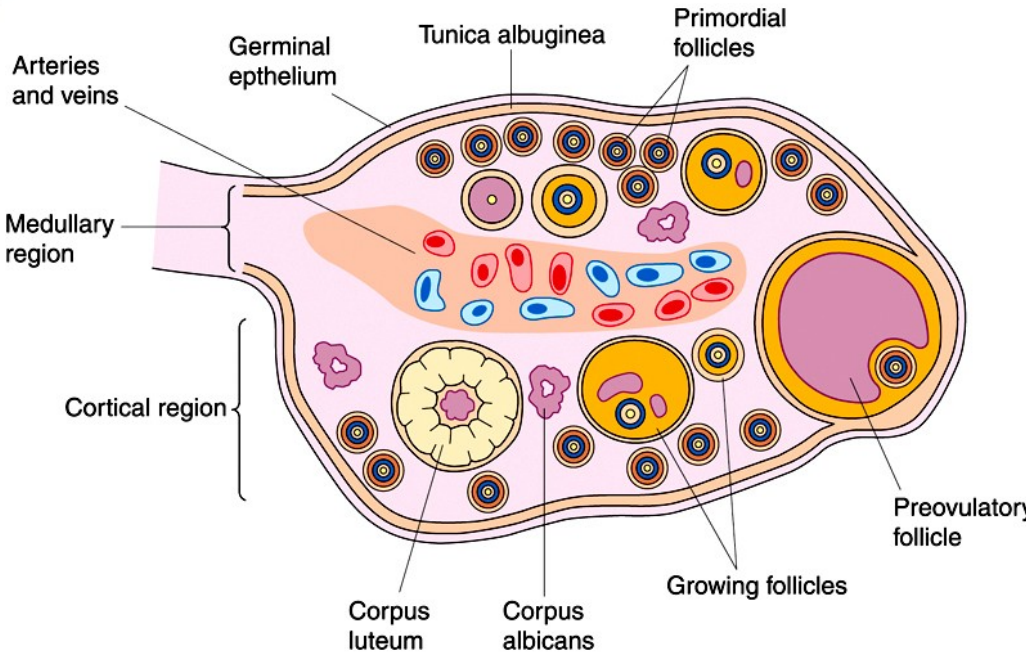
6) ANLAGE OF URINARY BLADDER

7) MÜLLER´S DUCT (PARAMESONEPHRIC)

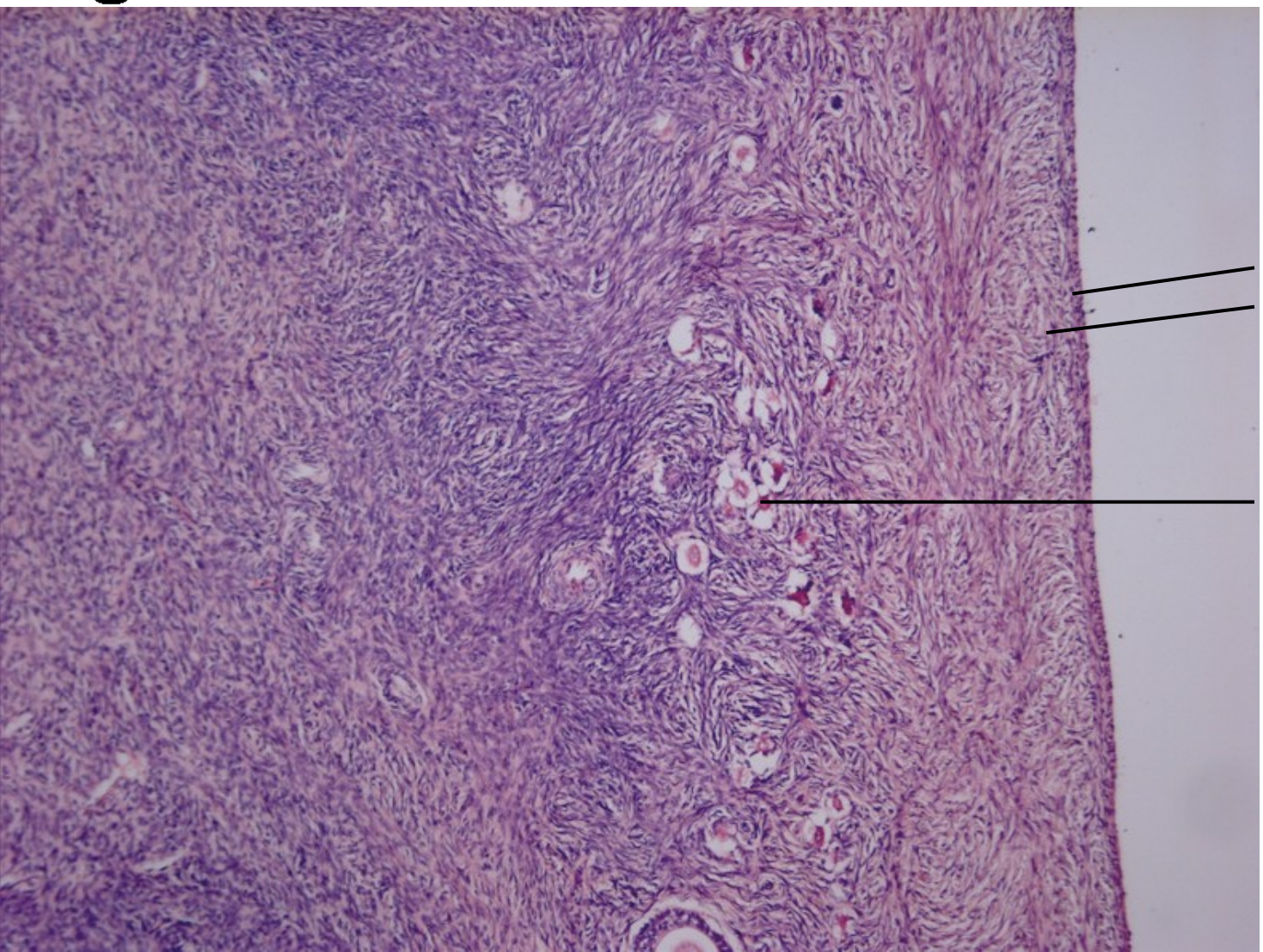
Testes



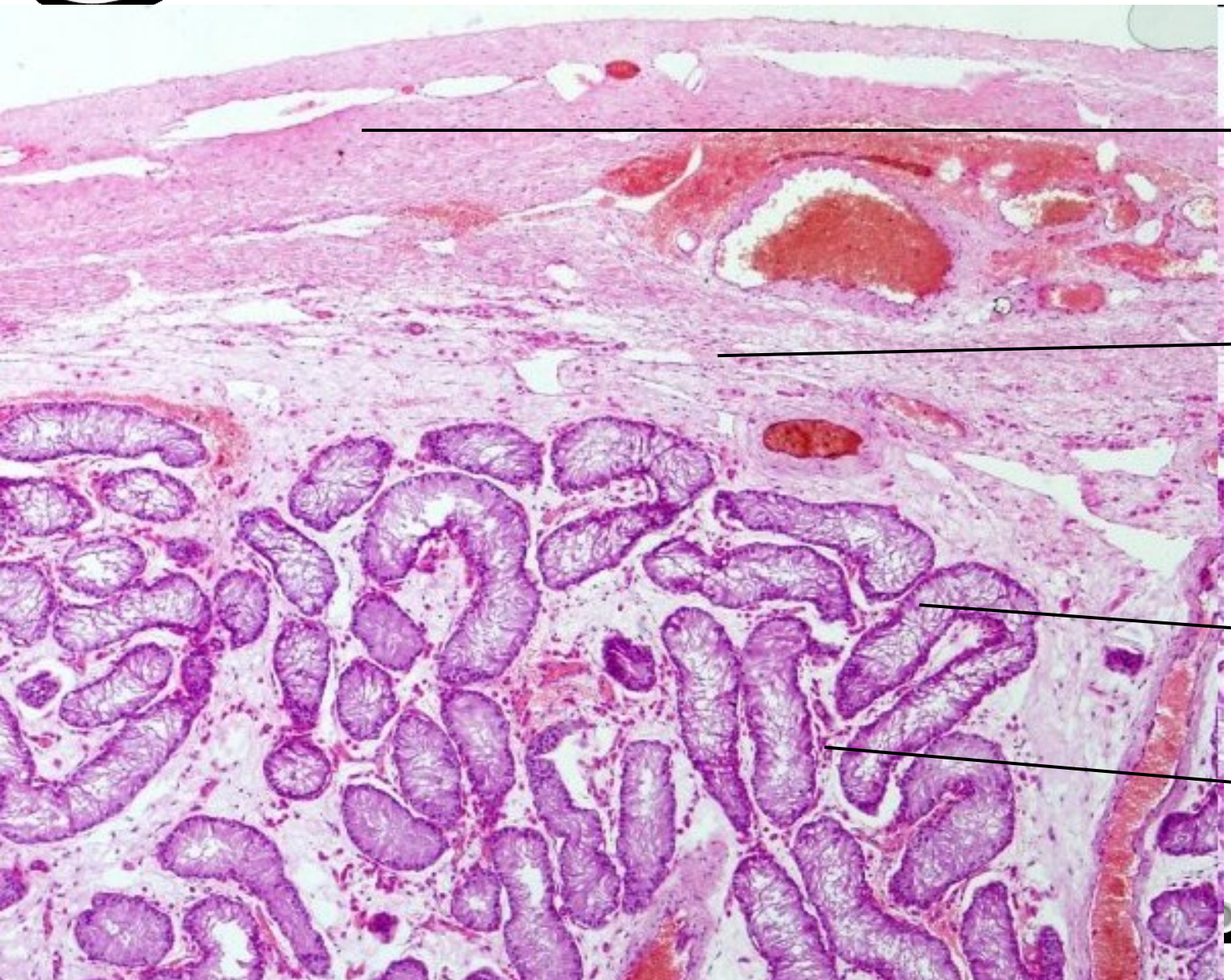
Ovary



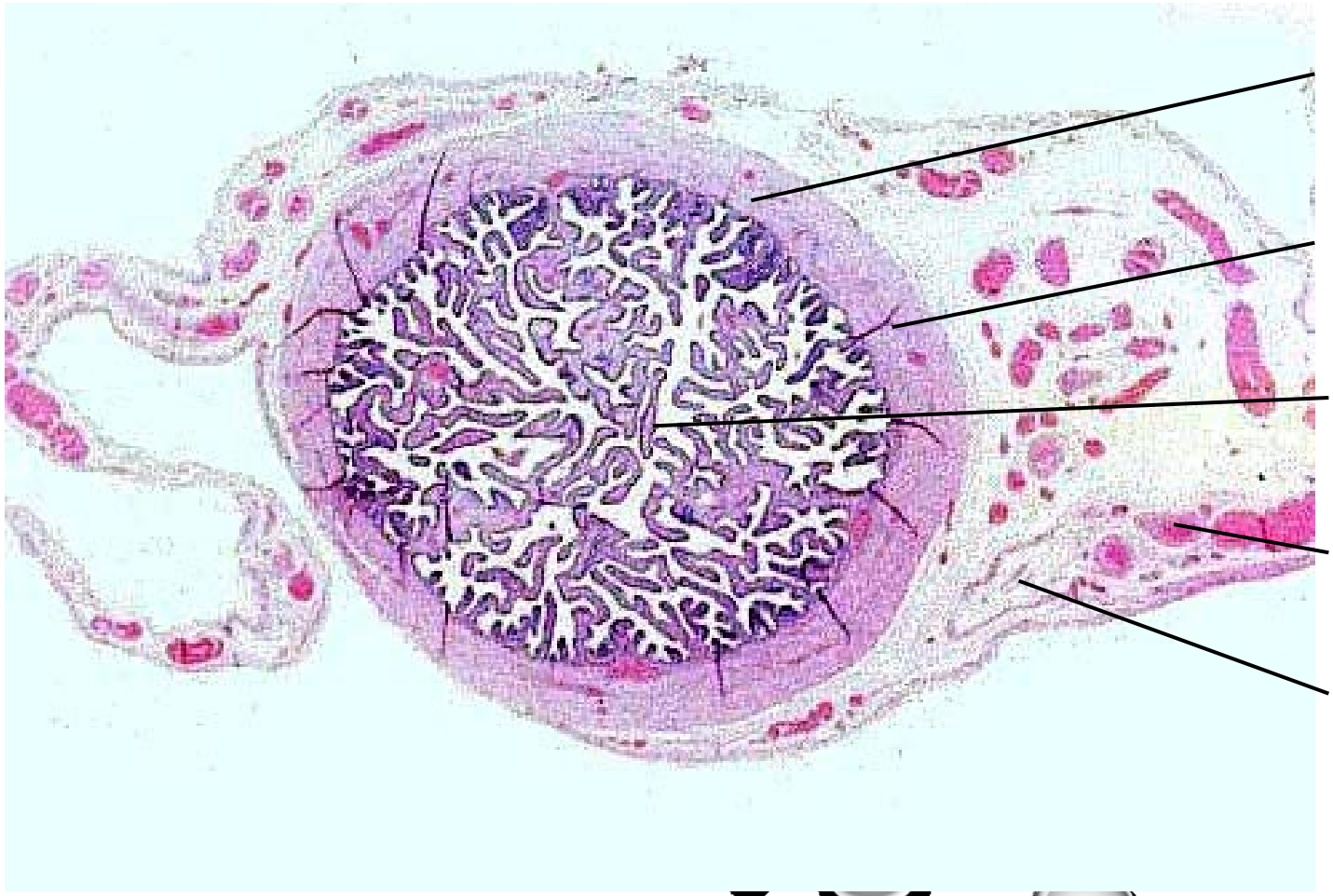
Cortex of ovary



Testes


Tunica Vaginalis
Tunica Albuginea
Seminiferous tubuli (Sertoli´s cells)
Leydig´s cells
Magn. x10

TUBA UTERINA – AMPULLA (MIDDLE PART)

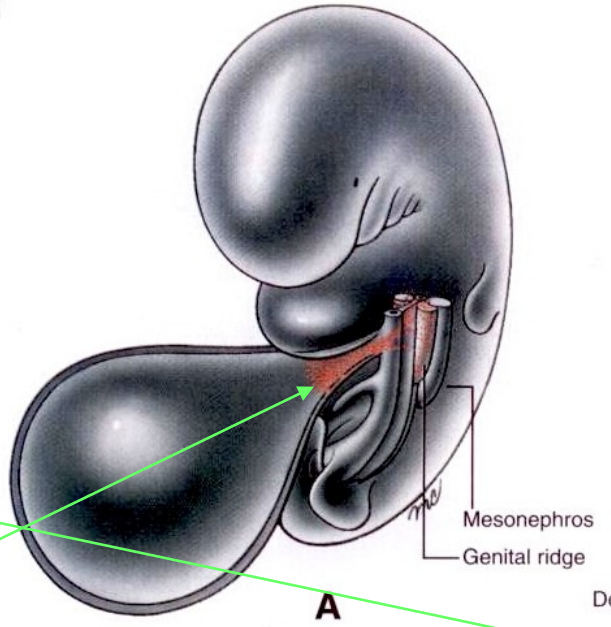


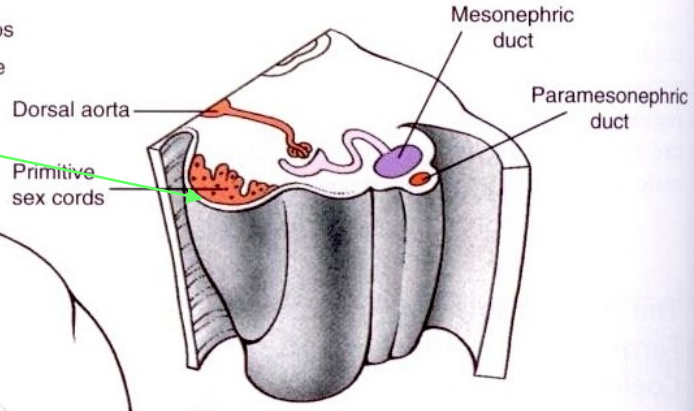
Magn. x4

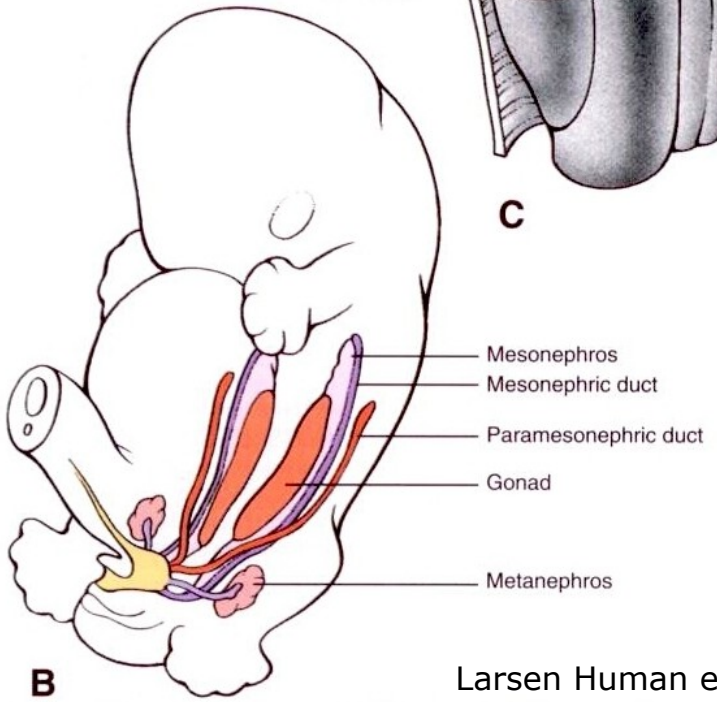
Indiferent gonad

Plica genitalis
- flat mezodermal coelomic epithelium
- proliferation
- migration of primordial germ cells
- multilayer epithelium
- growing in to mesoderm
- sex cords (toward mesonephros)

Beginning of 6th week iud
- Müller´s duct (paramesonephric)
- invagination of coelomic epithelium
- runs in paralel with Wollf duct (mesonephric)

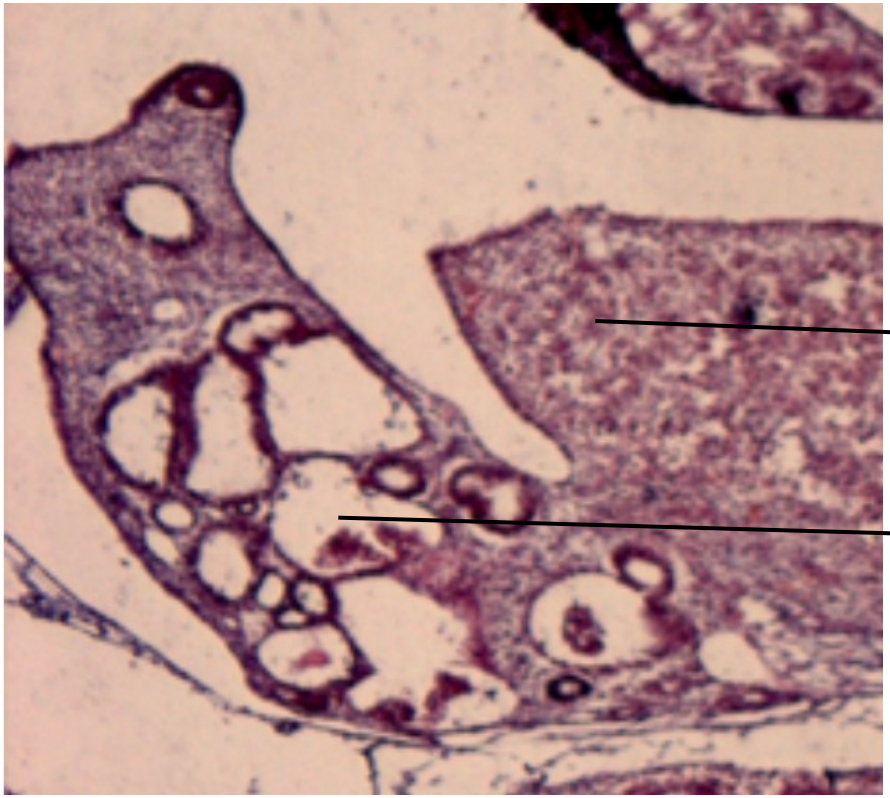






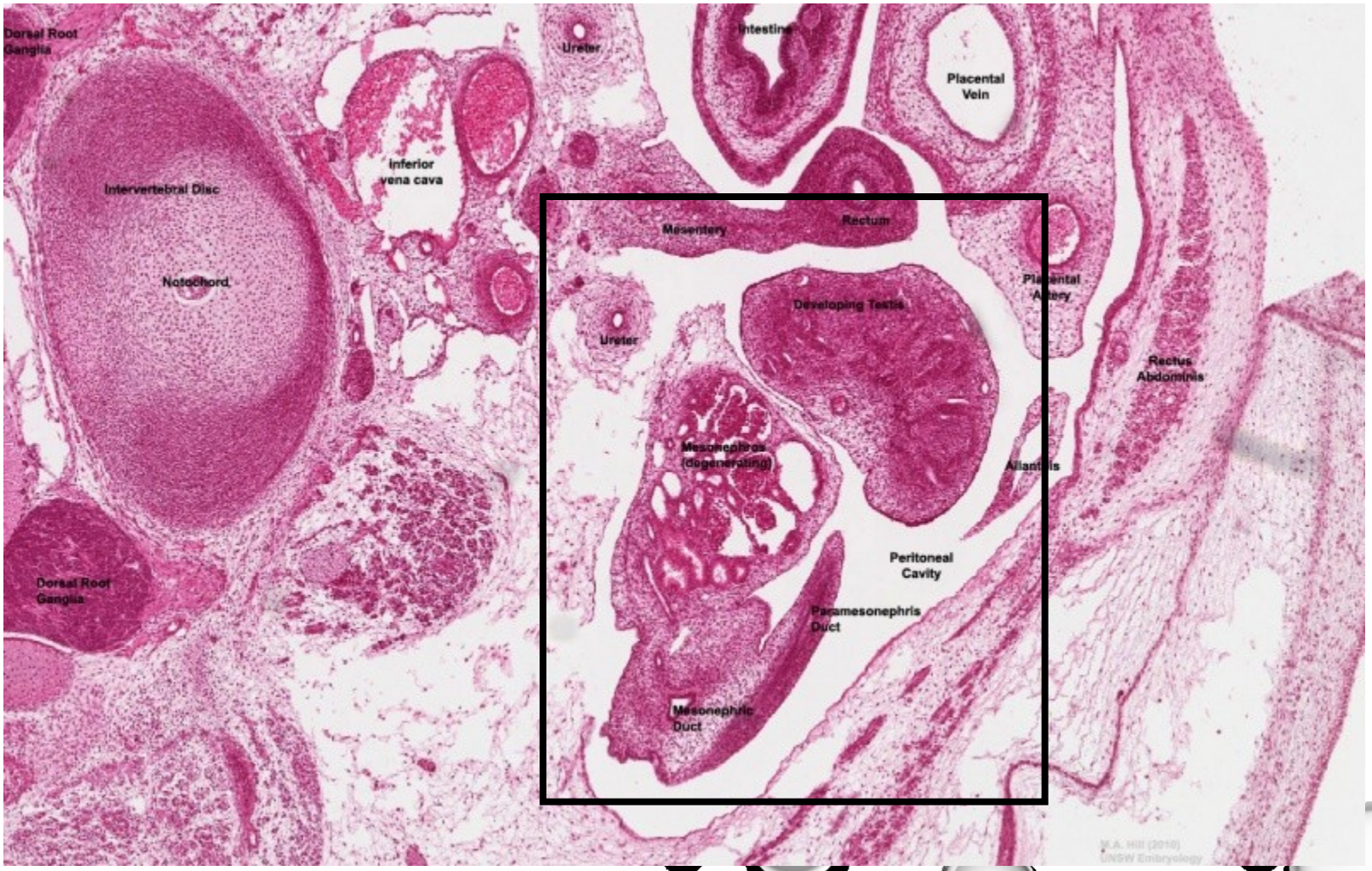
Larsen Human embryology 2001

Mesonephros E1208T 7th week iud



Magn. x10

Embryonal abdominal cavity – 8th iuv



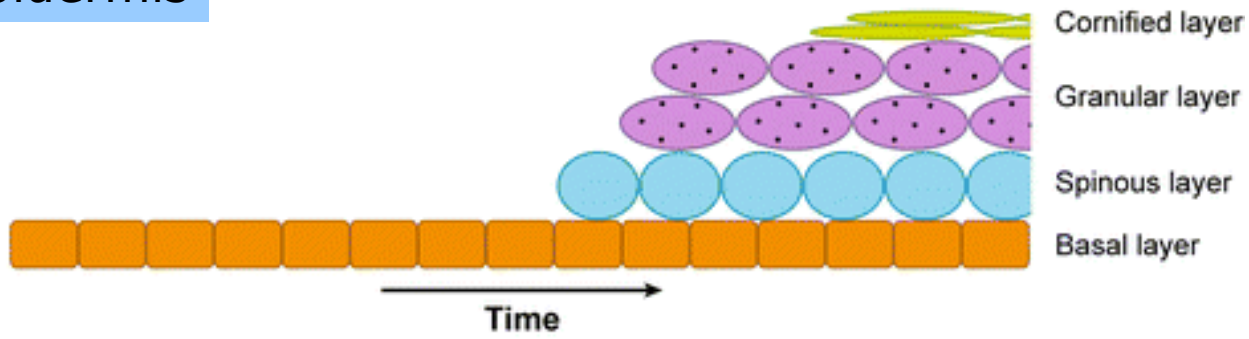
Magn. x4

Ectodermal origin

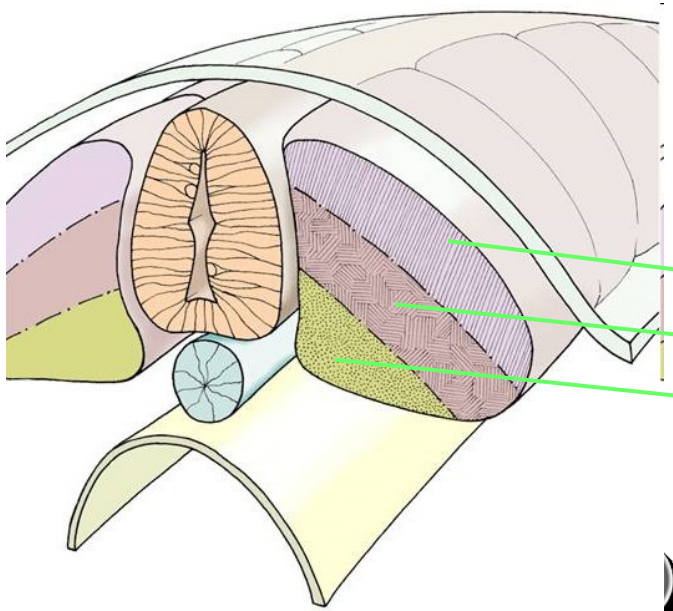
\+ Mezodermal origin

KŮŽE

Epidermis

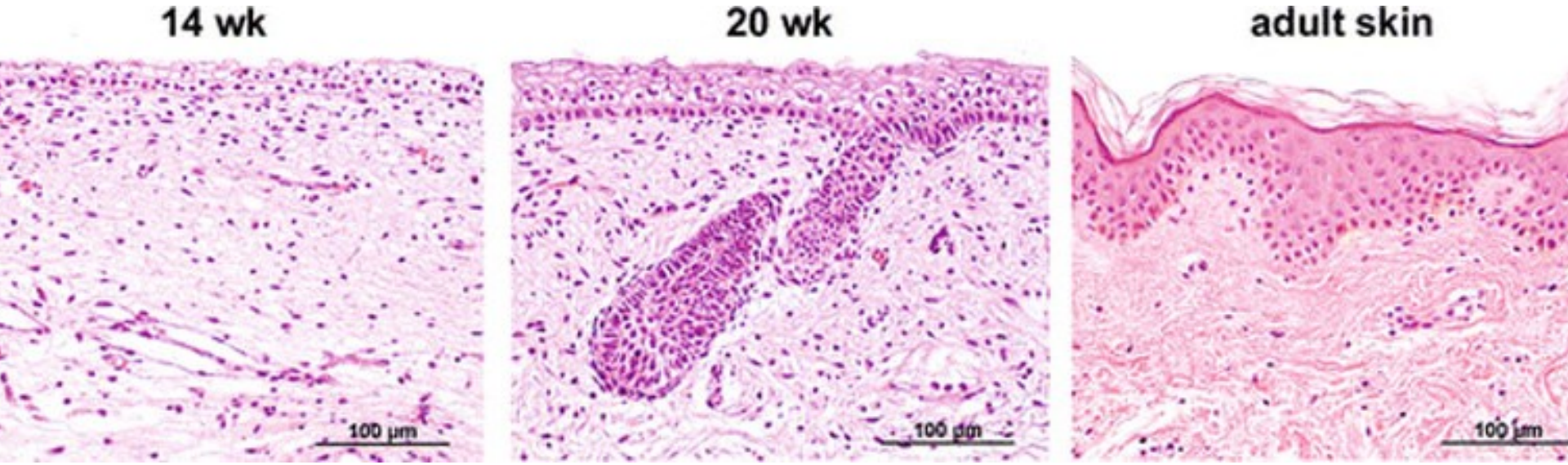


Dermis

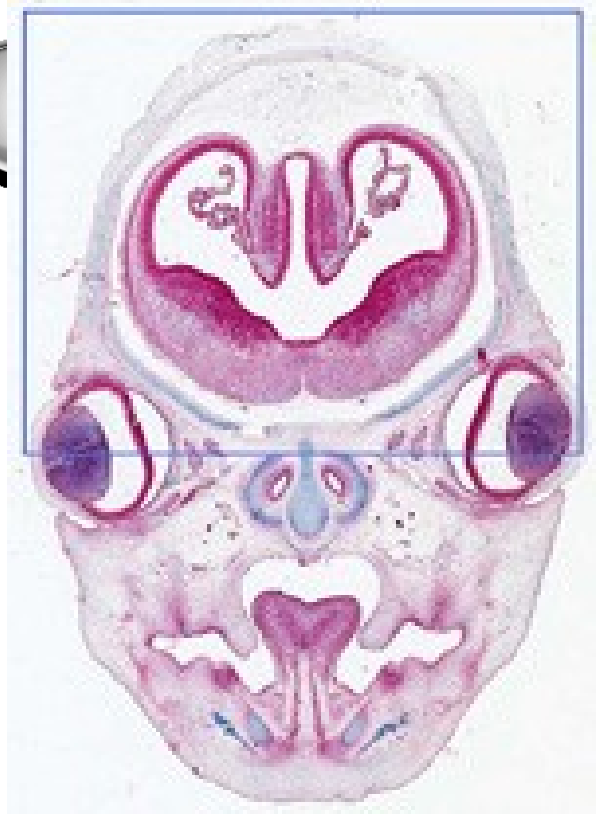


Dermatome
Myotome
Sklerotome

SKIN DEVELOPMENT



http://php.med.unsw.edu.au/embryology/images/8/85/Fetal_integumentary_histology_01.jpg



CNS AND SENSES

Ektodermální původ

1. GASTRULATION

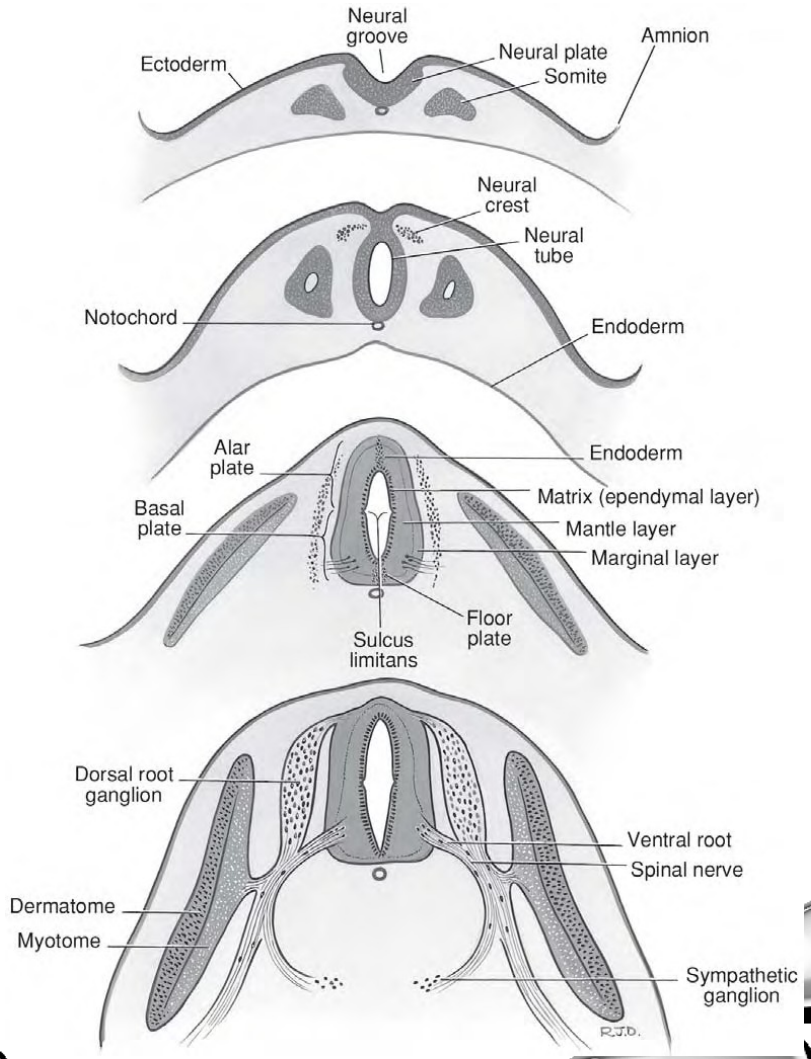
2. NOTOCHORD
3. NEURULATION

Neural induction → neural plate

Folding of neural plate

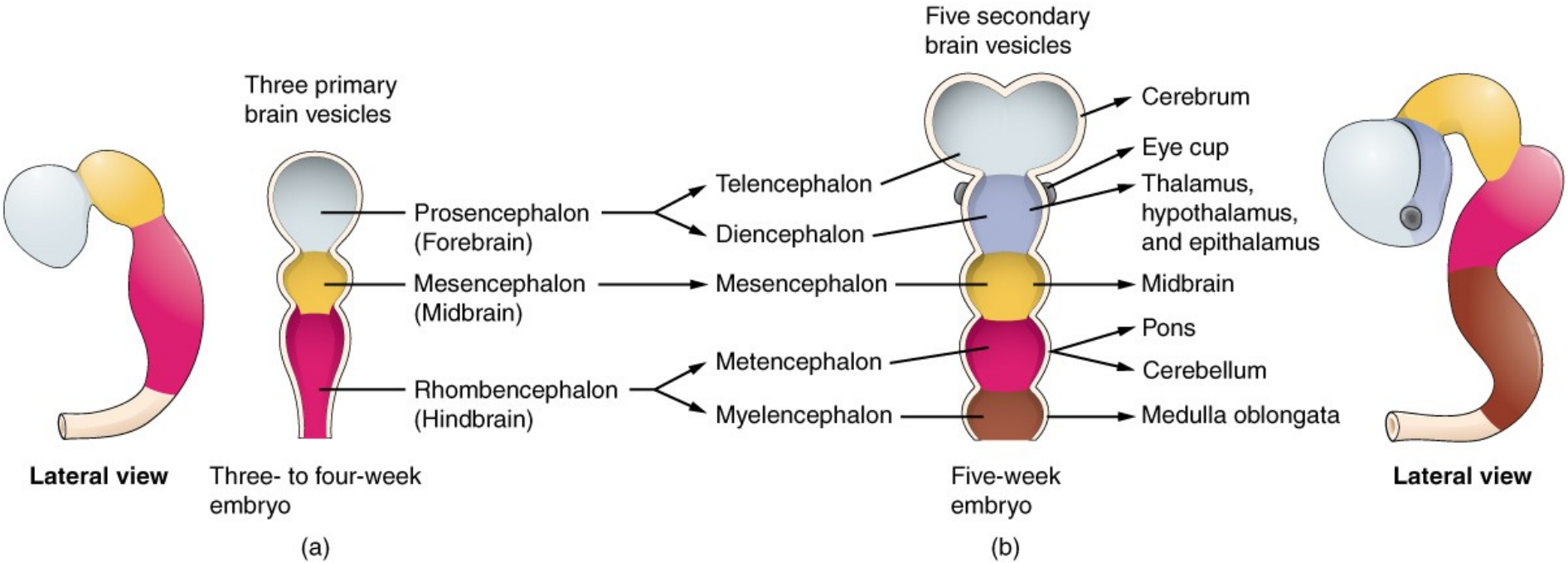
Neural groove and folds

Closure of neural tube



The human nervous system 2005

PRIMAL A SECONDARY VESSICLES



HTTPS://OPEN.OREGONSTATE.EDUCATION/AANDP/CHAPTER/14-1-EMBRYONIC-DEVELOPMENT

Hlodavci – tvorba neurální trubice kolem 9. dne (polovina těhotenství)
H.S.S – tvorba neurální trubice 3-4. týden (desetina těhotenství)

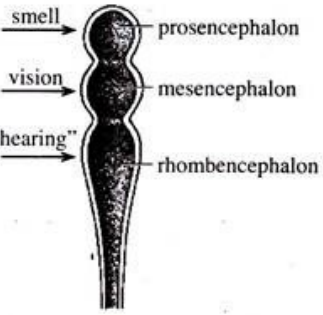
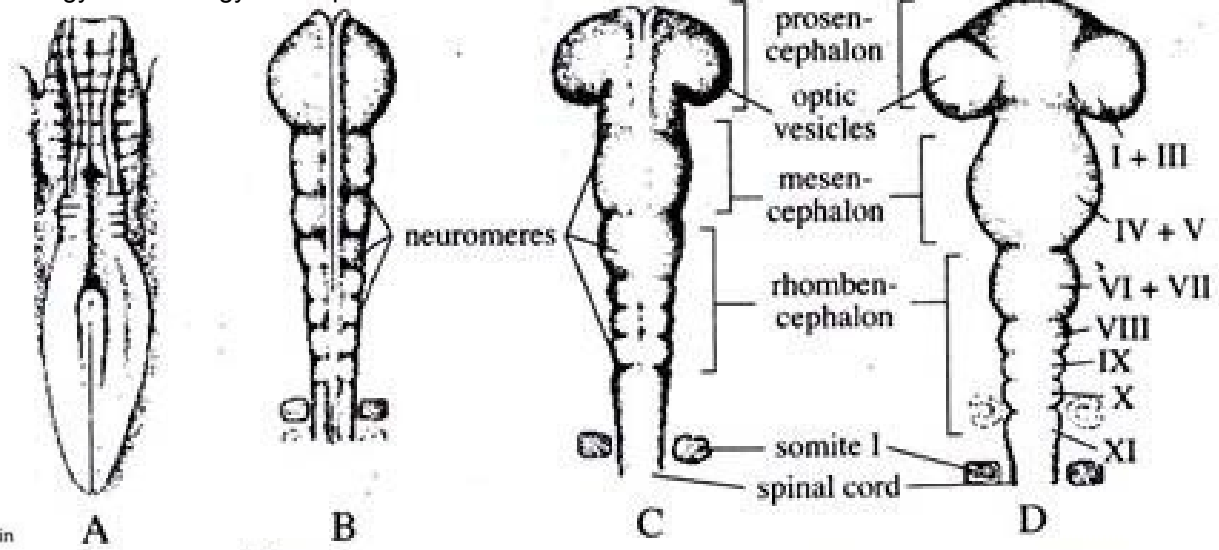


Diagram of the three-part division of the brain in relation to smell, vision and hearing.



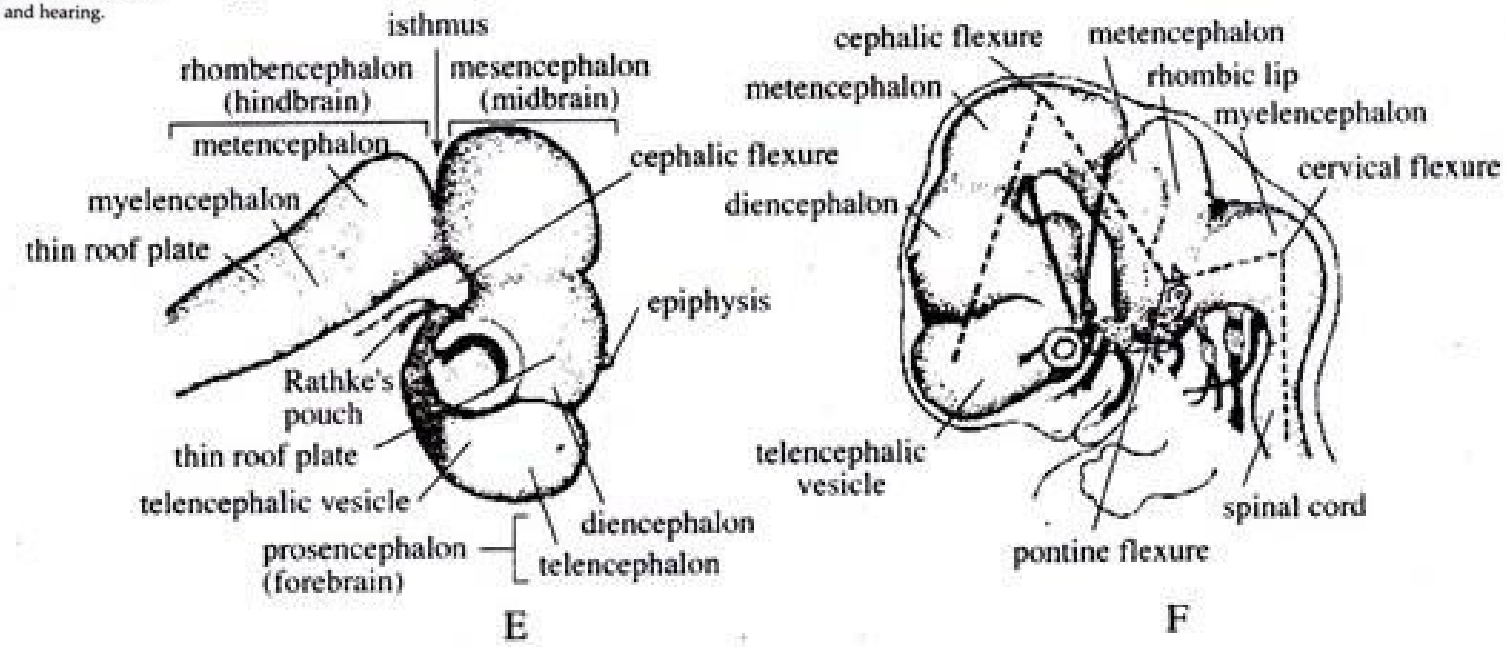
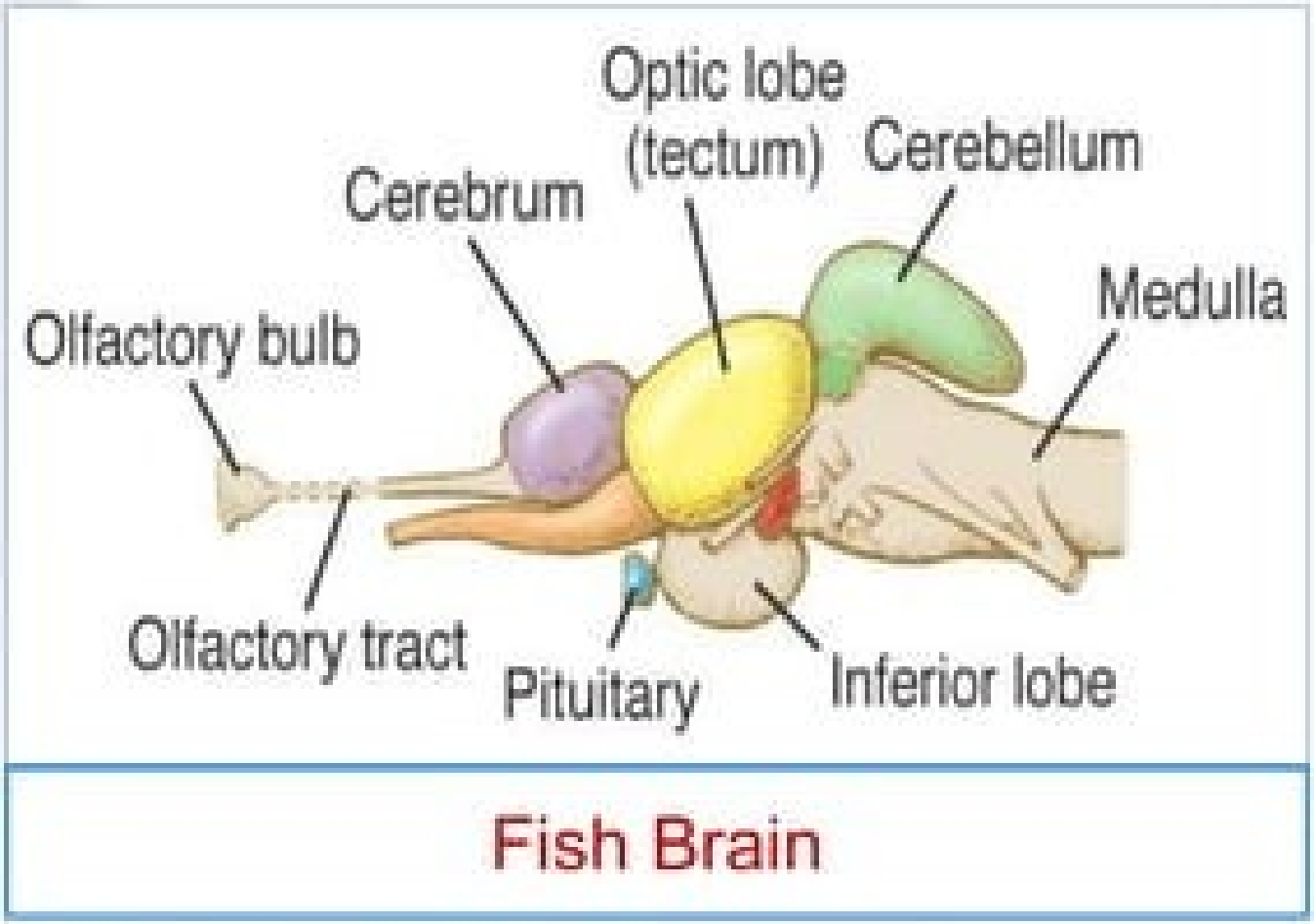


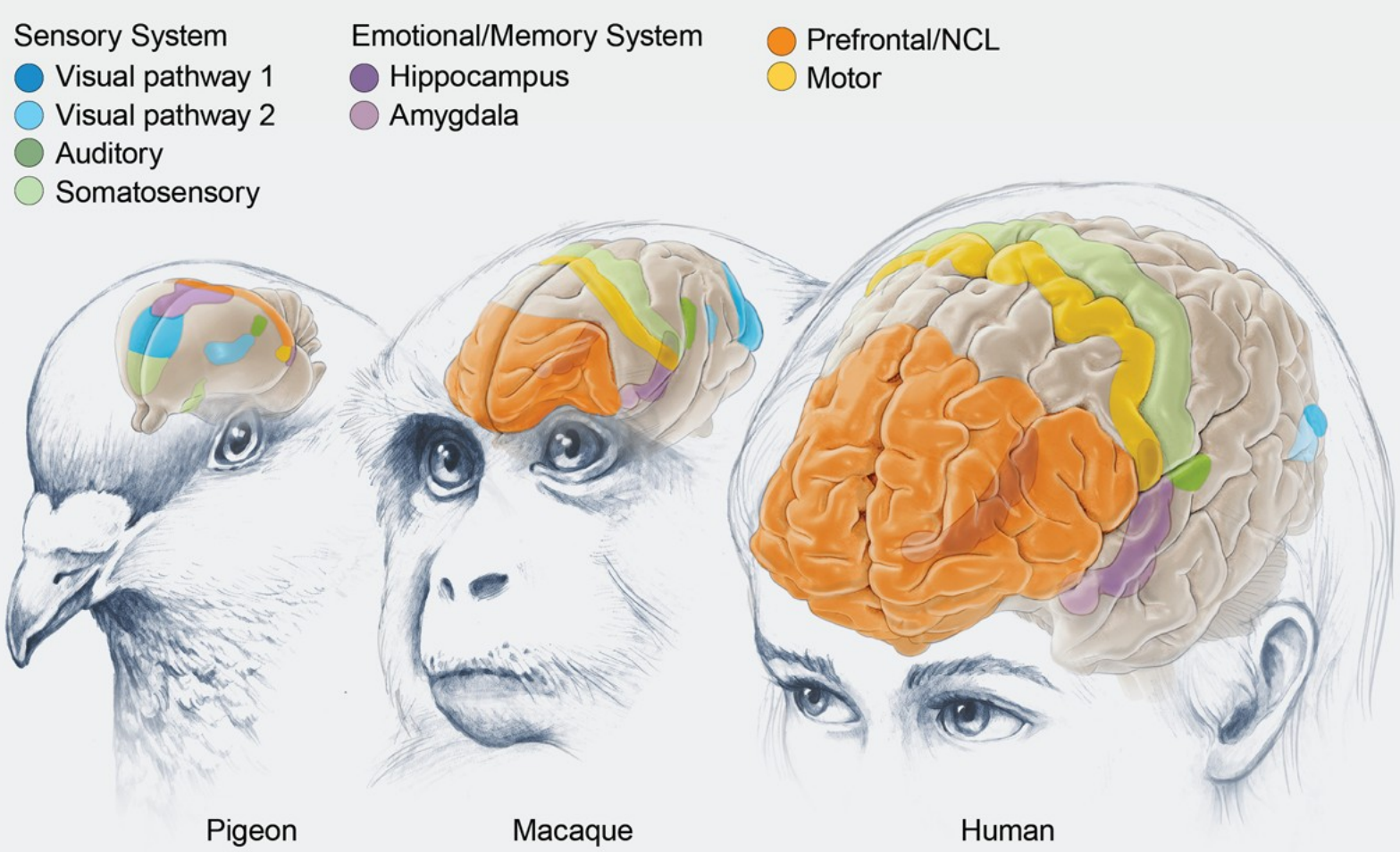
Fig. 5.71 : Early development of the brain in chick showing the tendency to form neural segments or neuromeres. (A) Dorsal view of developing brain of chick embryo with 4 pairs of somites. (B) Dorsal view of primitive brain or encephalon of chick embyo with 7 pairs of somites. (C) Dorsal view of developing brain of chick embryo with 14 pairs of somites. (E) Lateral view of brain of chick embryo about 75 to 80 hours of incubation. (F) Lateral view showing the flexures.


Optic lobe
(tectum)
Cerebellum
Cerebrum
Medulla
Olfactory bulb
Olfactory tract
Pituitary
Inferior lobe

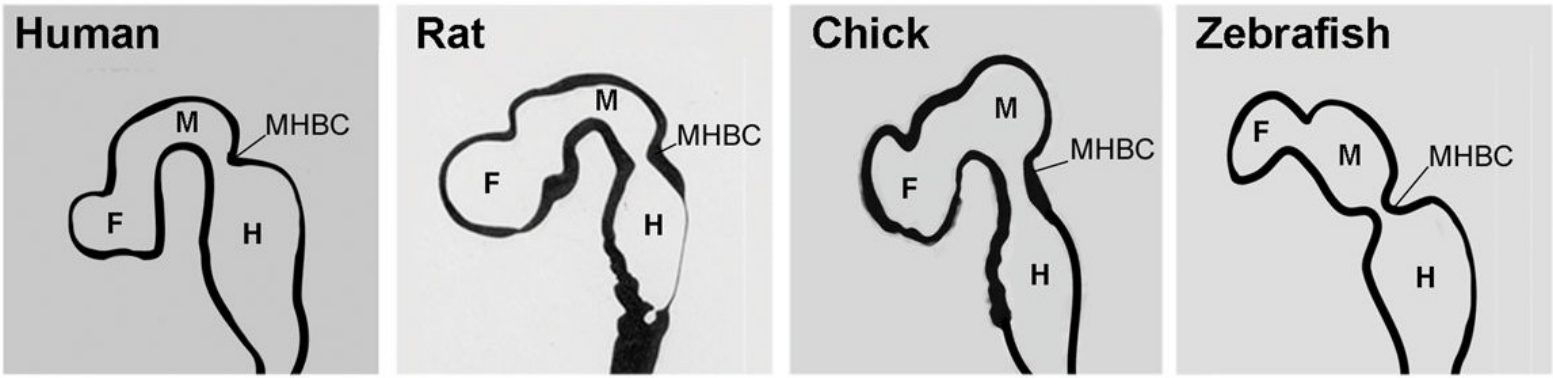
Fish Brain

SIMILAR FUNCTIONS, DIFFERENT PLACEMENTS

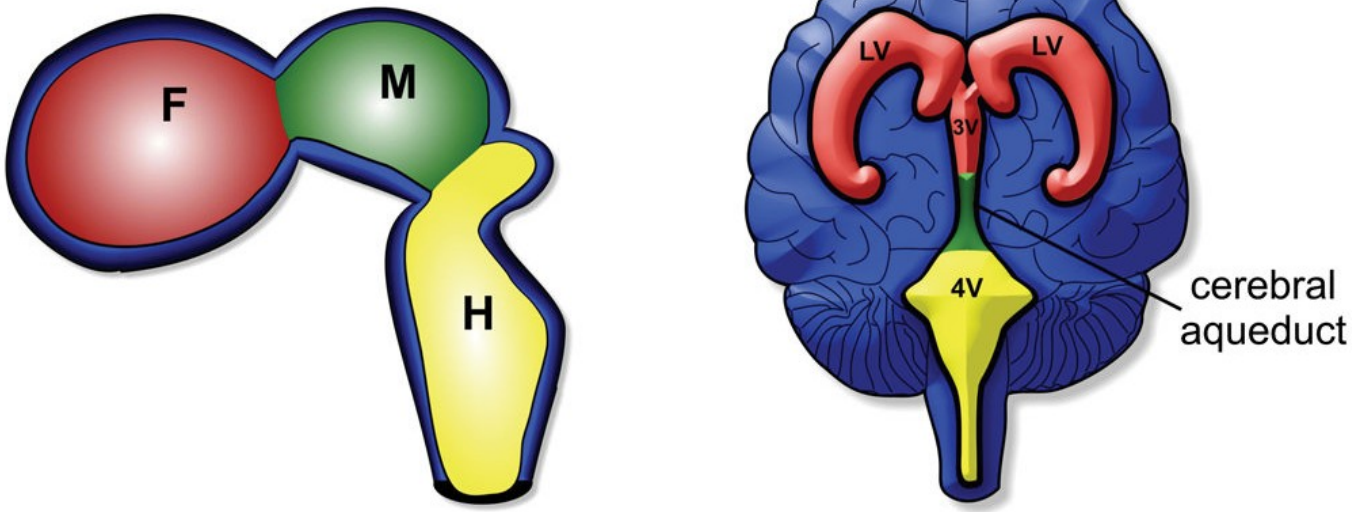
Birds' brains are equipped with sensory and cognitive processing centers roughly equivalent to those in primates. But their placement can differ. The nidopallium caudolaterale (NCL) at the back of the brain, for instance, serves as an integrating hub for all of the animals' sensory, limbic and motor systems—similar to the prefrontal cortex in primates.



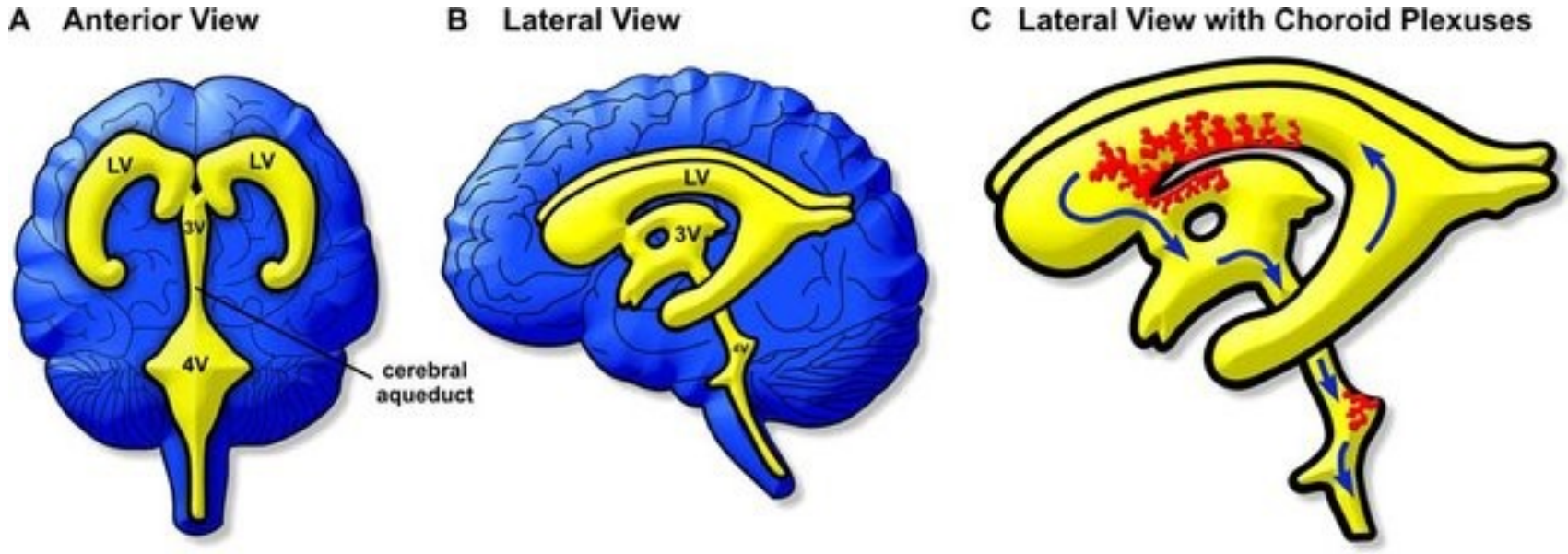
B Conservation of Embryonic Brain Ventricle Structure



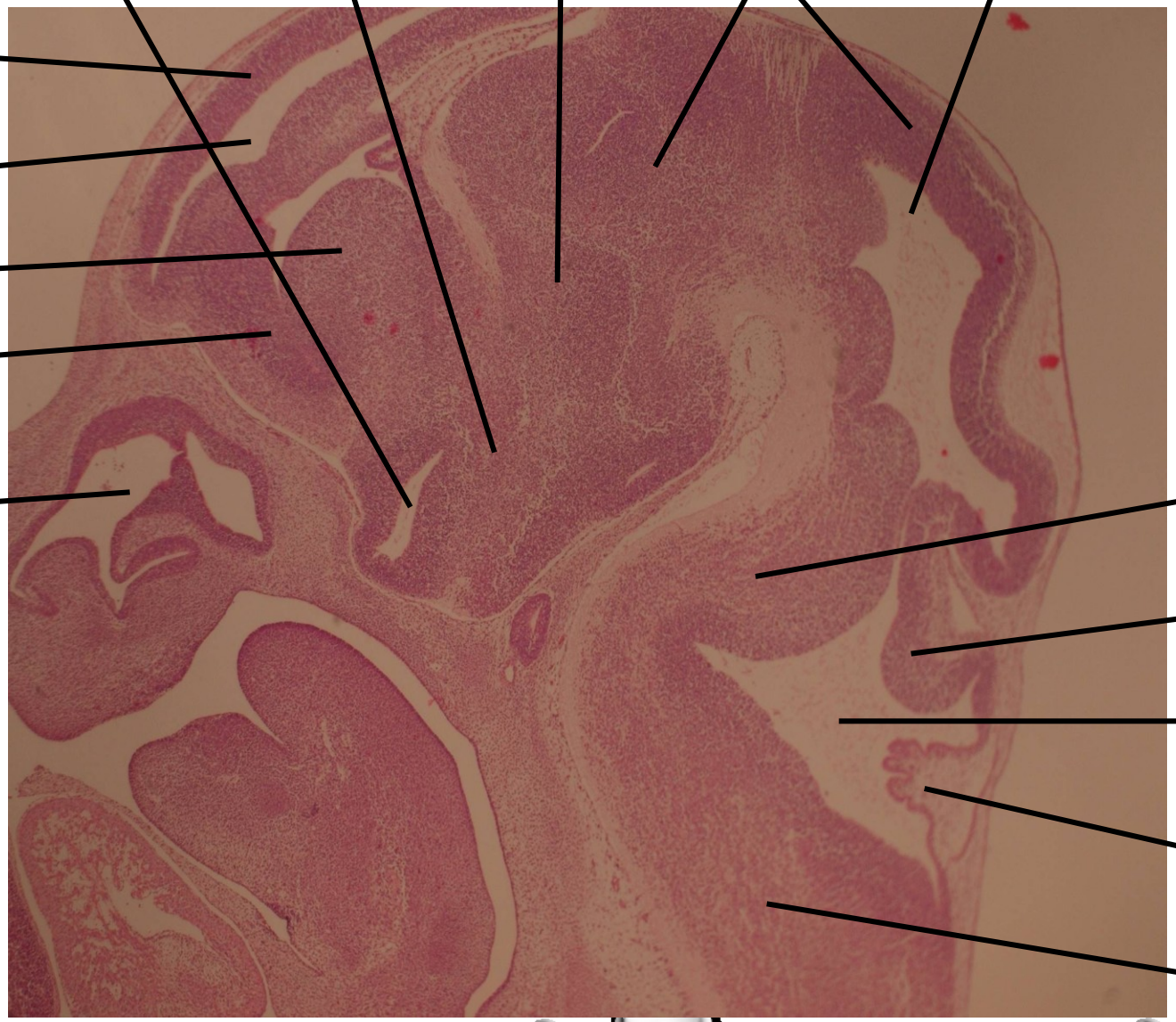
C Early Embryonic Brain Ventricles vs Adult Brain Ventricles



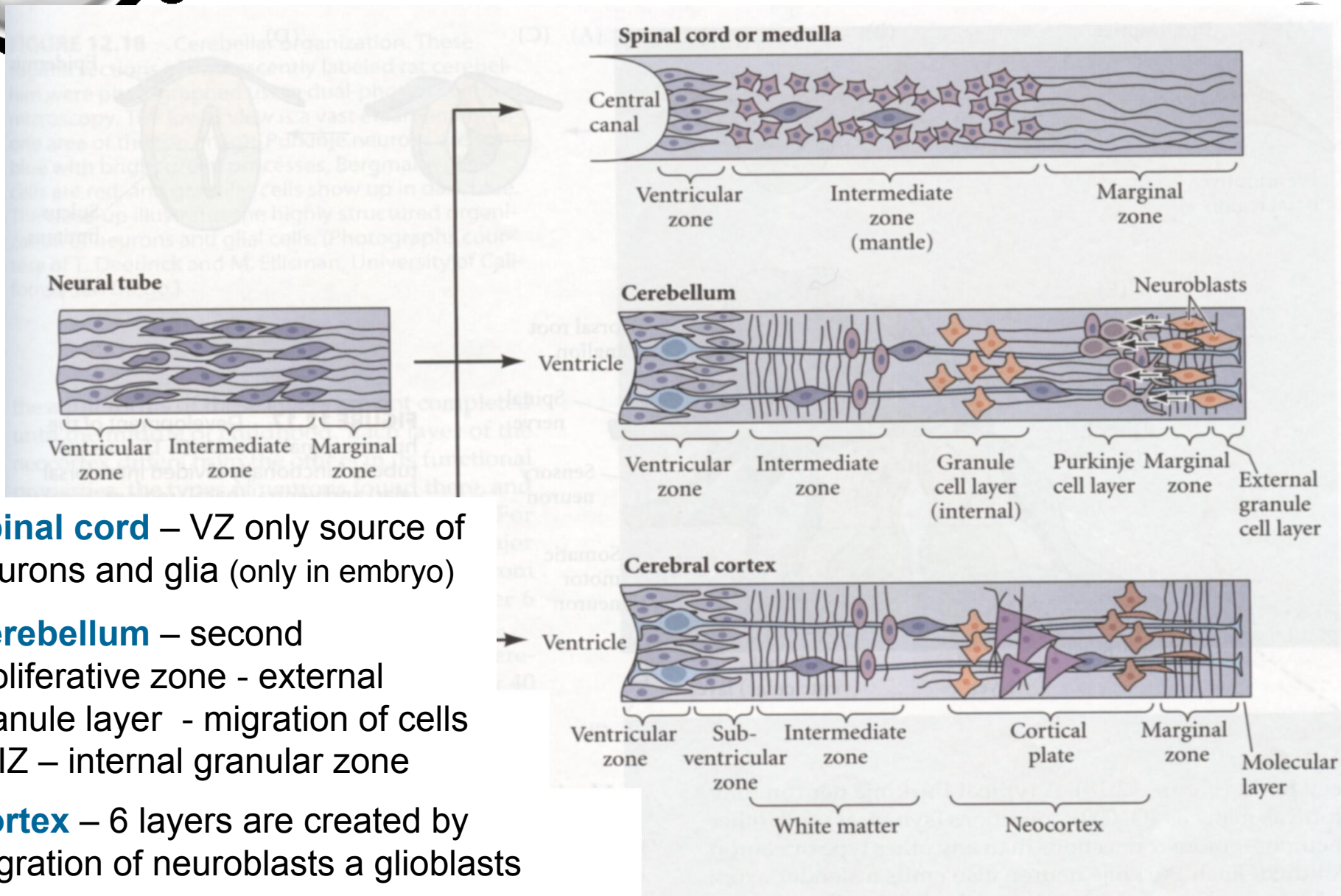
https://onlinelibrary.wiley.com/doi/epdf/10.1002/bies.200800207?saml_referrer


A Anterior View
B Lateral View
C Lateral View with Choroid Plexuses
LV
LV
3V
4V
cerebral
aqueduct
LV
3V

mouse
E12


mouse
E12
Hypothalamus
Thalamus
Midbrain
Aquaduct of sylvii
Rathke pouch
Cerebral
cortex
Lateral
Ventricle
Septum
Olfactory
bulb
Nasal cavity
Pons
Cerebellum
Fourth
Ventricle
Choroid plex
Myelenceph.

Diferenciace stěny neurální trubice



Spinal cord – VZ only source of neurons and glia (only in embryo)

Cerebellum – second proliferative zone - external granule layer - migration of cells to IZ – internal granular zone

Cortex – 6 layers are created by migration of neuroblasts a glioblasts

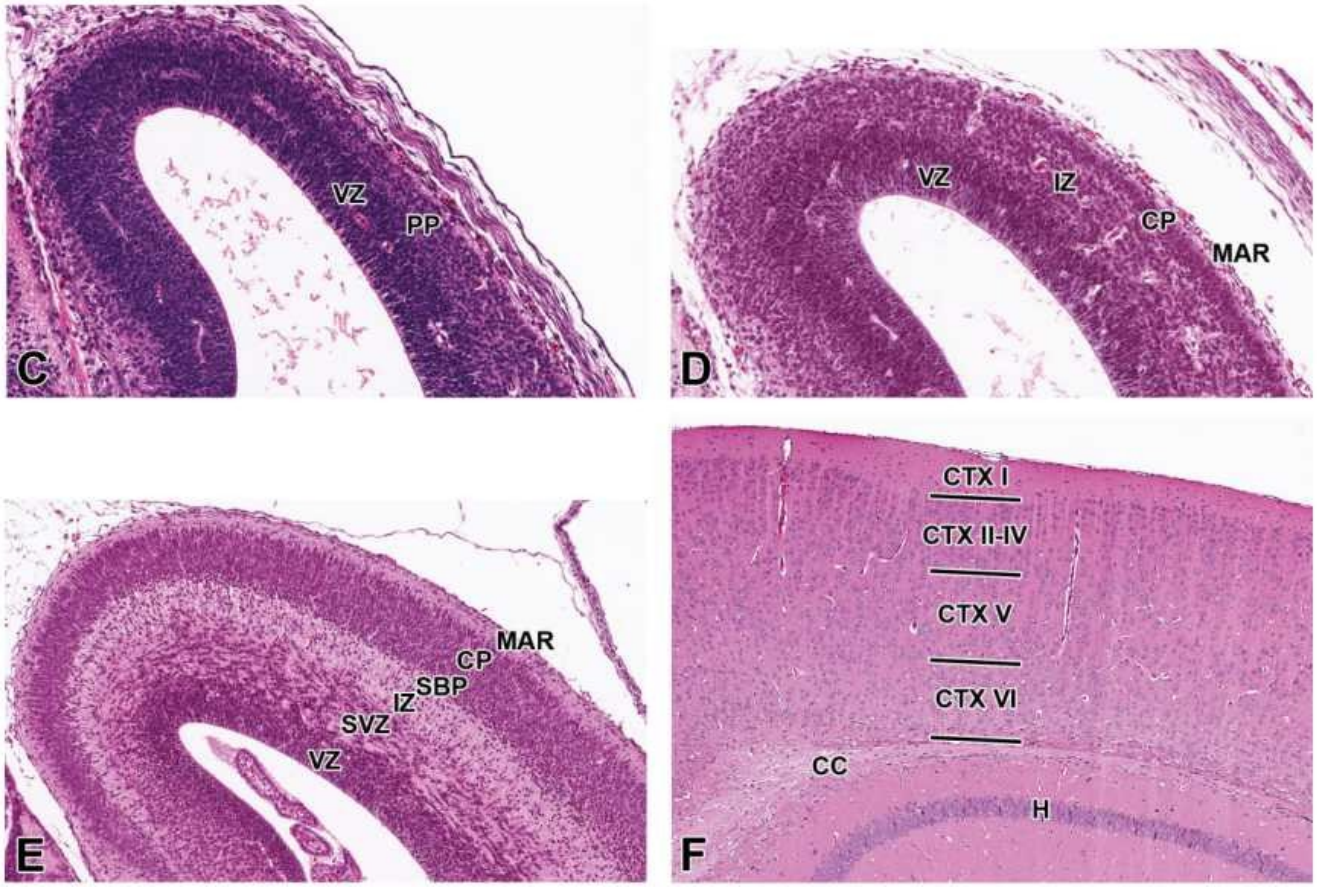
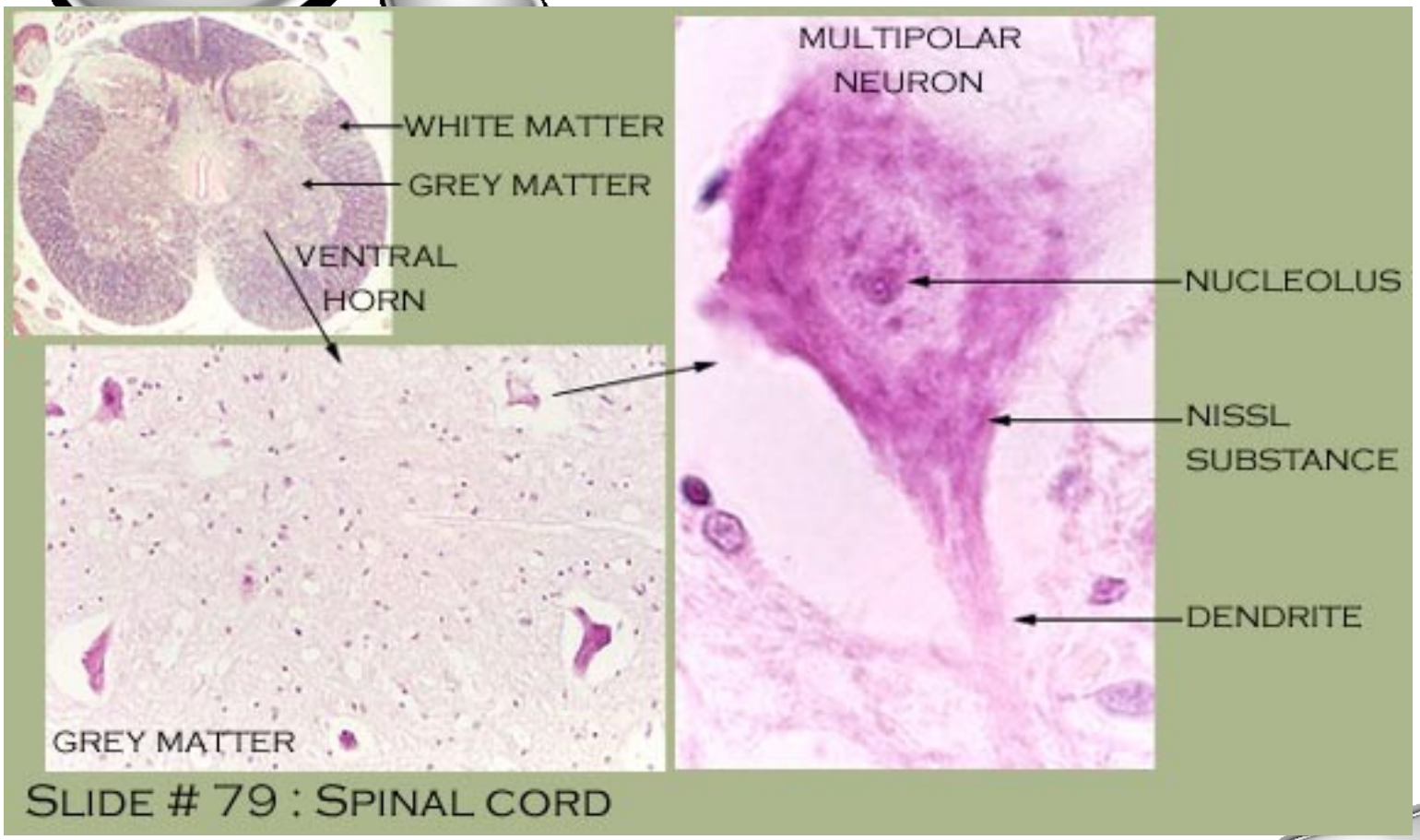


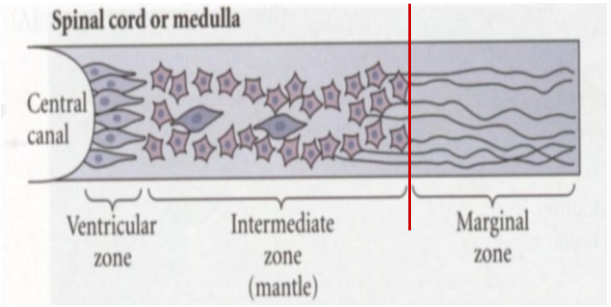
Figure 7. Representative images of the cerebral cortex during brain development. Hematoxylin and eosin–stained sections of the prosencephalic (A) and telencephalic (B, C, D, E, and F) walls. (A) E9.5, sagittal section. (B) E11.5, transverse section. (C) E13.5, coronal section. (D) E15.5, coronal section. (E) E17.5, coronal section. (F) P21, coronal section. CC = corpus callosum; CP = cortical plate; CTX I-VI = cortical layer I-VI; EP = ependymal layer; H = hippocampus; IZ = intermediate zone; MAR = marginal layer; PP = cortical preplate; SBP = cortical subplate; SZ = subventricular zone; VZ = ventricular zone.

Spinal cord



Dorsal horns – senzoric neurons
Ventral horns – large motoric multipolar neurons
Nissl substance – granuli of neurons – rough ER (protein synthesis)
Bodian – silverized axons of neurons

Ventral horn of spinal c.



Grey spinal matter

White spinal matter

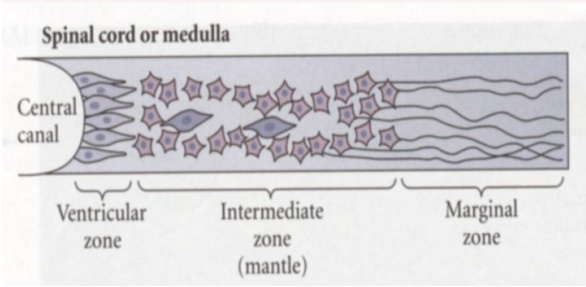
Glial cells

Interneuron

Motoneuron

Magn. x 40

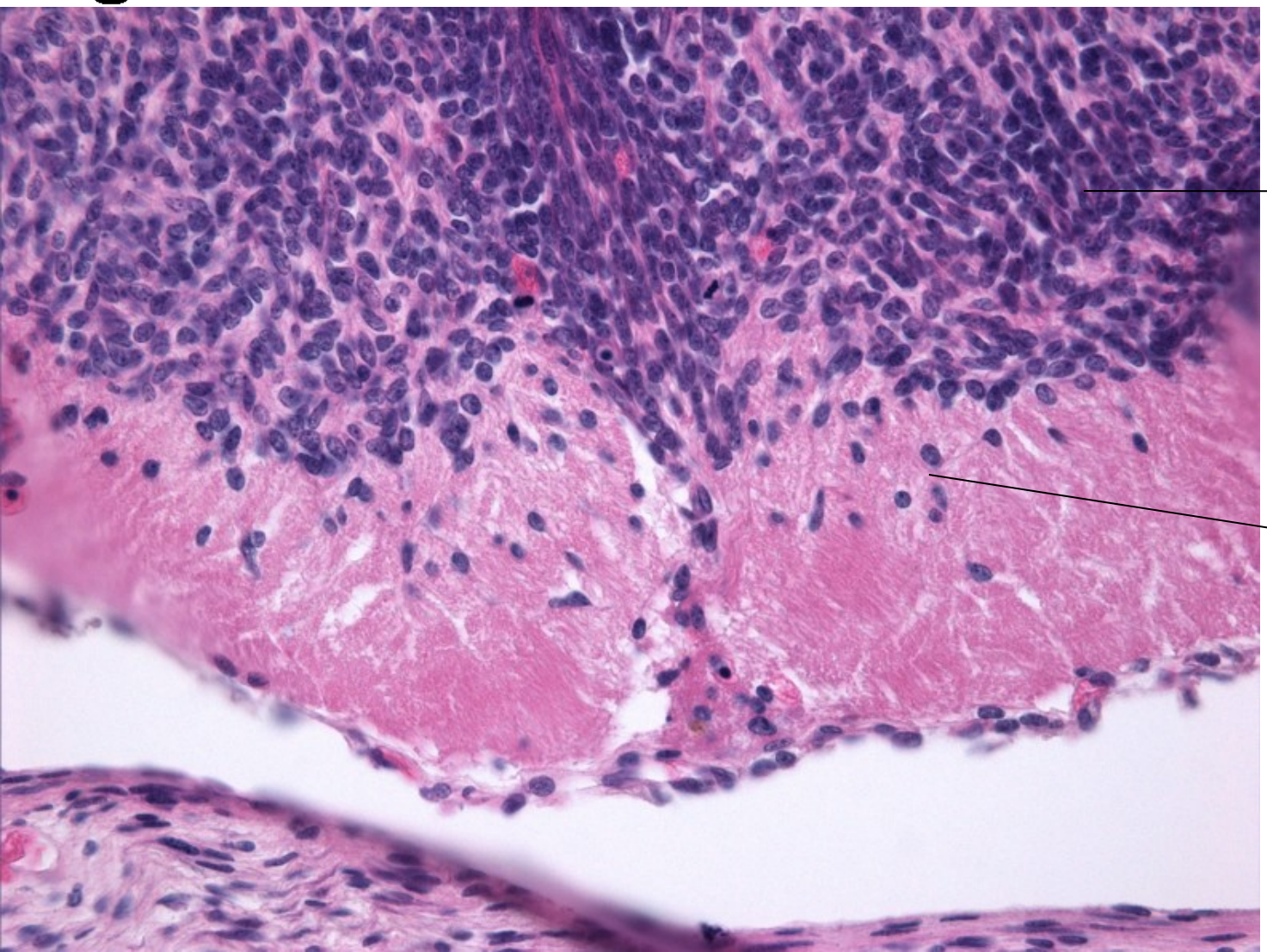
Embryonal spinal cord 8th week iud



White mat. (marginal)
Ventral horns grey matt.
Germinal layer
Dorsal horns
Commisure

Vertebral cartilage
Magn. x 5

Spinal cord HSS 8 week IUD

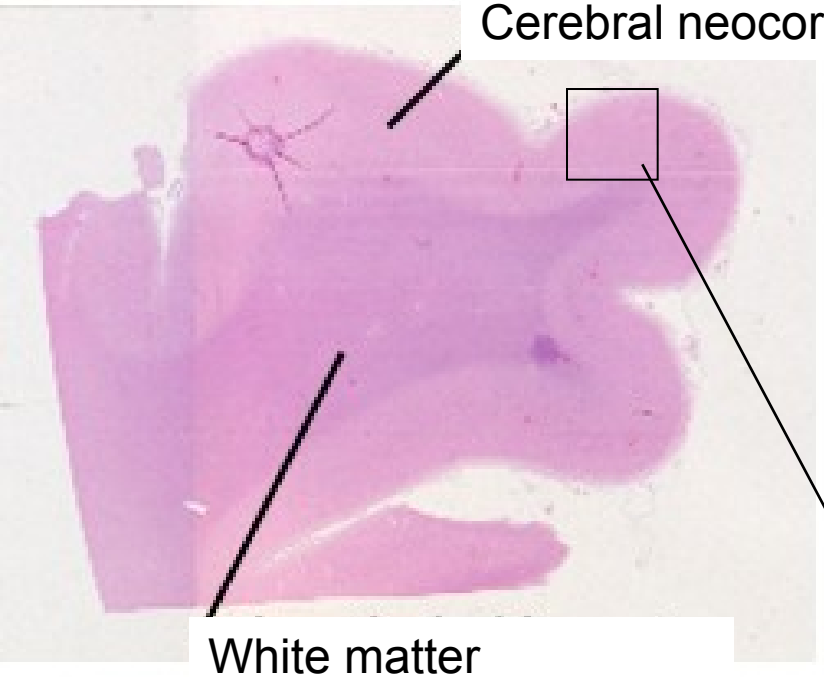


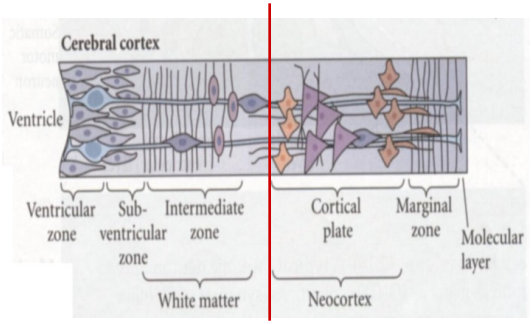
Neuron bodies

Axon of senso-
ric neurons
and motoneur.

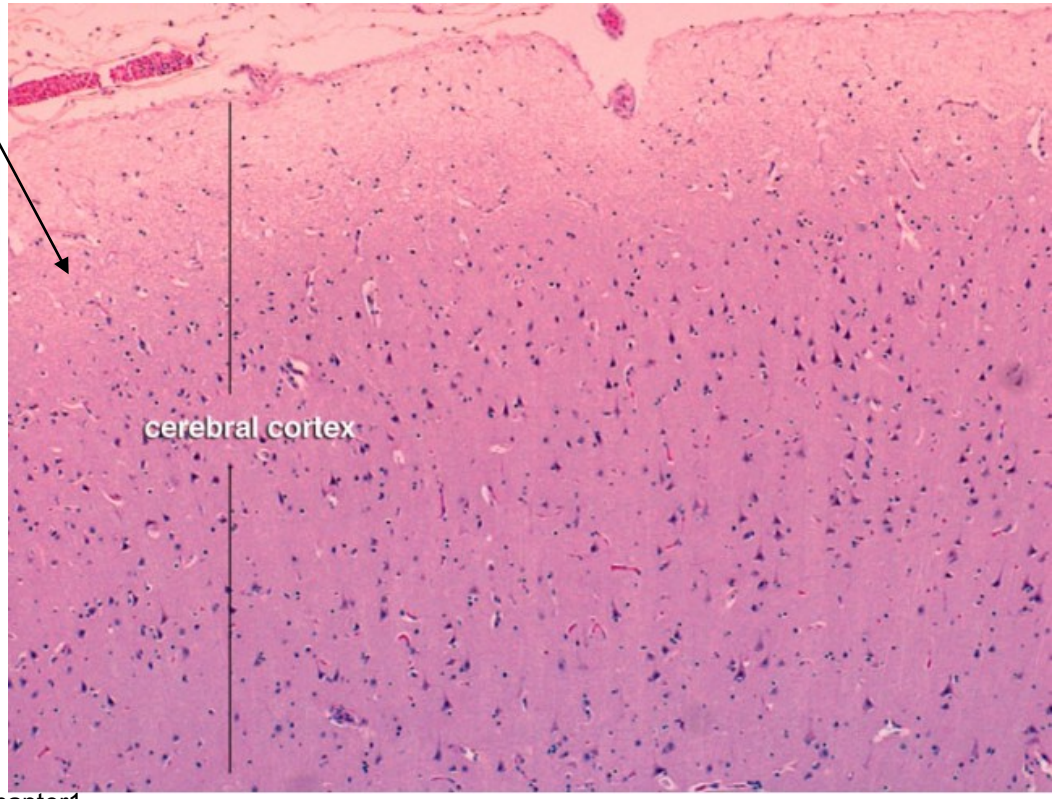
Magn. x40

TELENCEPHALON





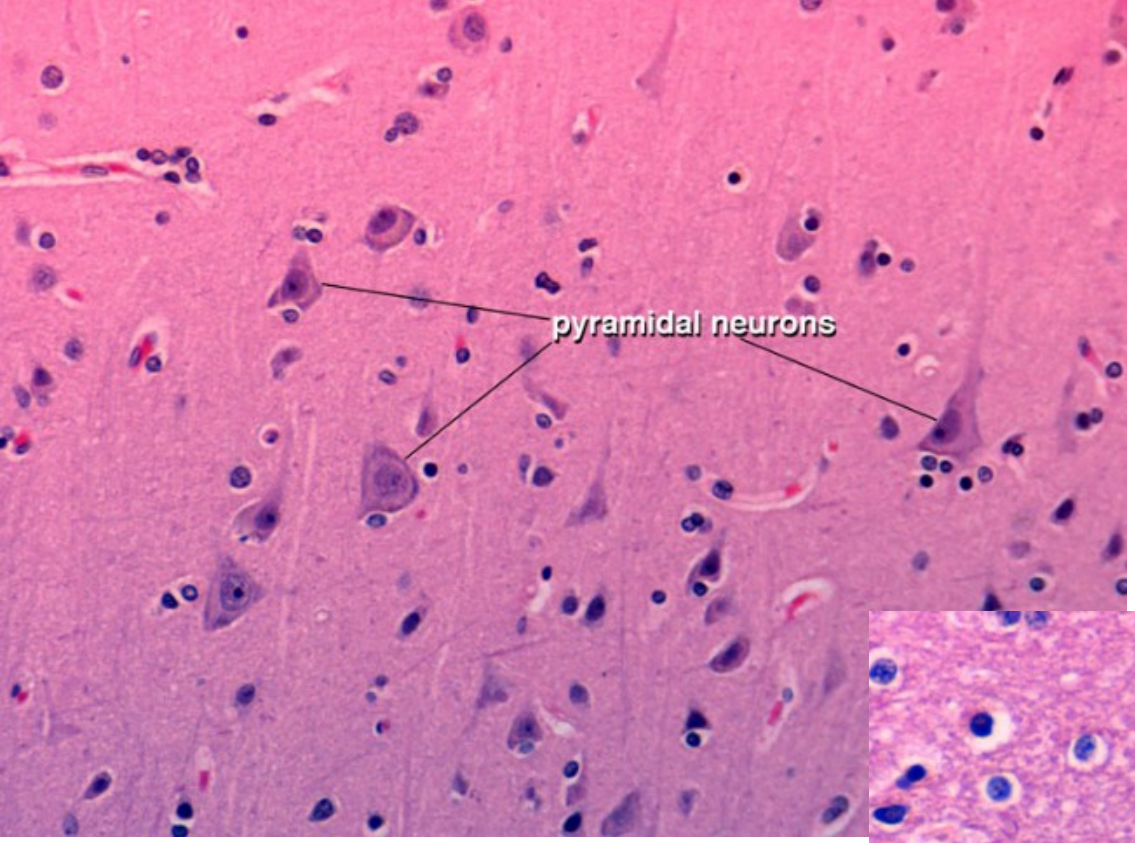
6 layers of cortex



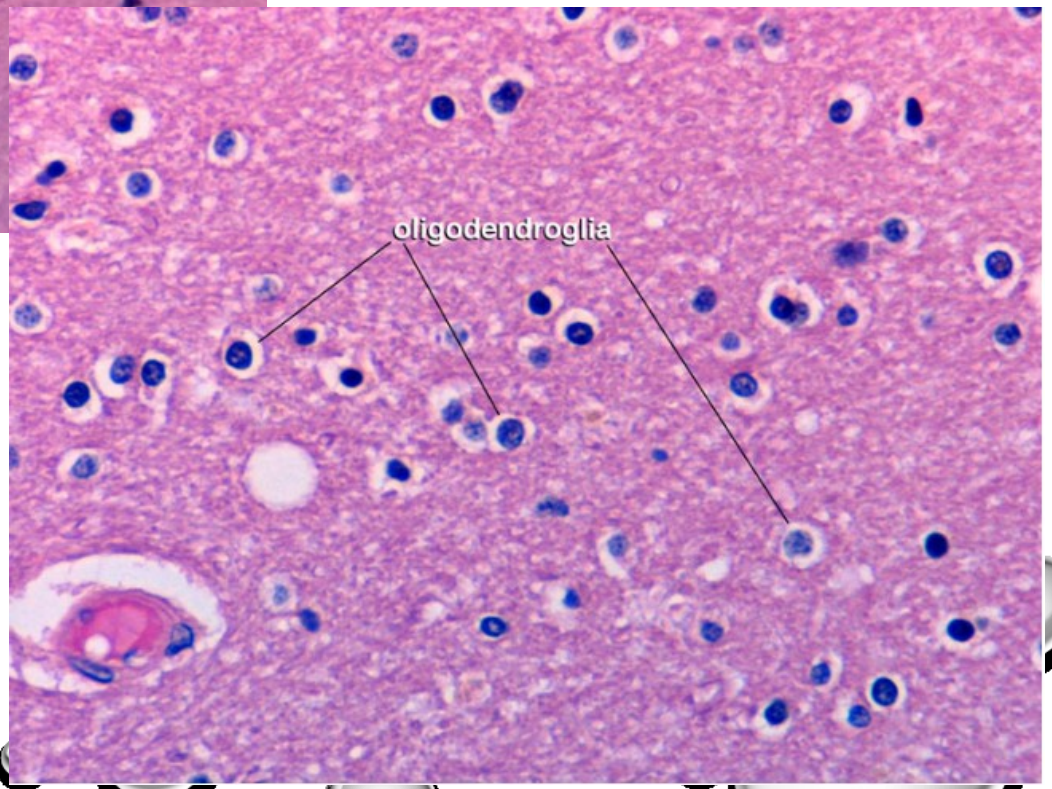
Molecular (plexiform) layer.
External granular layer.
External pyramidal layer.
Internal granular layer.
Internal pyramidal layer.
Multiform (fusiform) layer.

http://www.stonybrookmedicalcenter.org/pathology/neuropathology/chapter1

Telencephalon



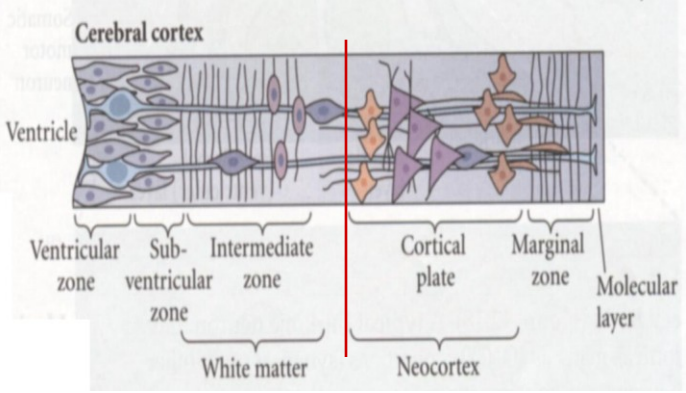
Grey matter (cortex)
- Layers III to V have the most pyramidal neurons

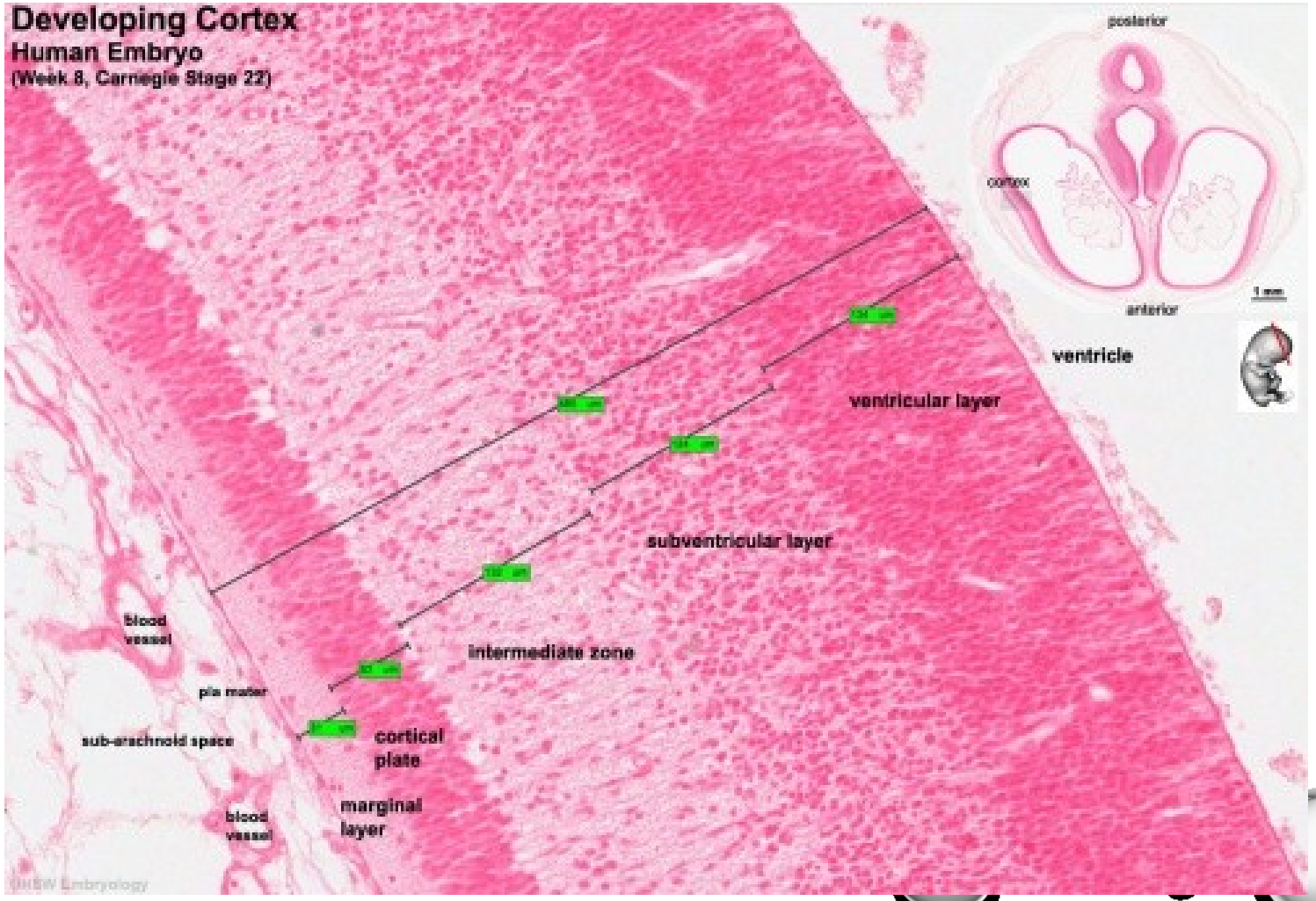


White matter
- oligodendroglia
- axons

http://www.stonybrookmedicalcenter.org/pathology/neuropathology/chapter1

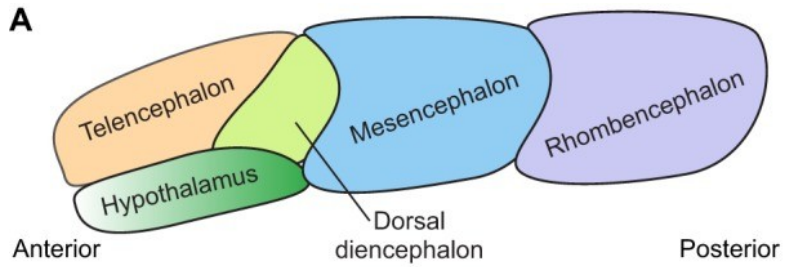
H.S.S 8TH WEEK I.U.D.



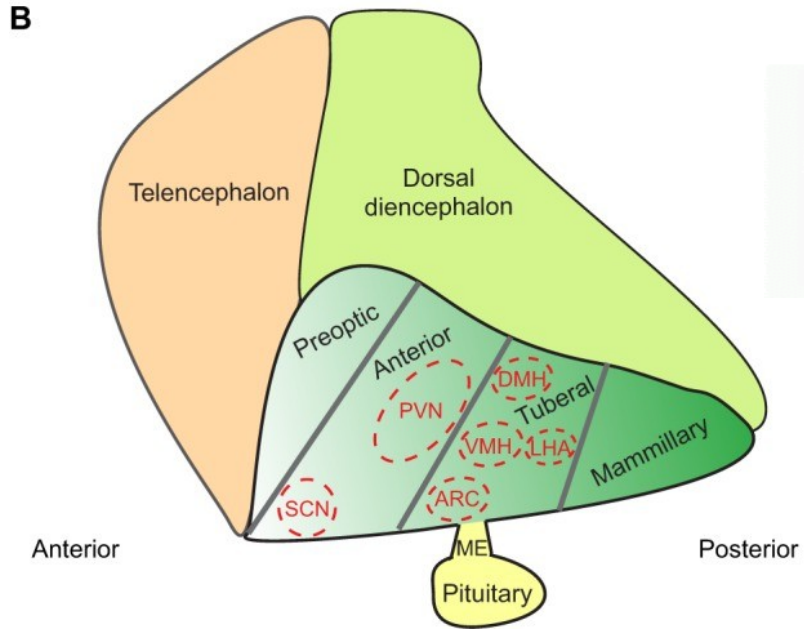


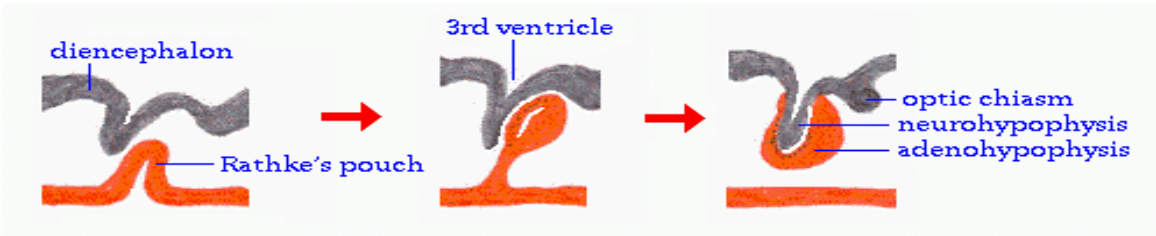
HYPOTHALAMUS + PITUITARY GLAND

1. Ventral part of intermedial zone of diencephalon
2. Alar and bazal part of telencephalon

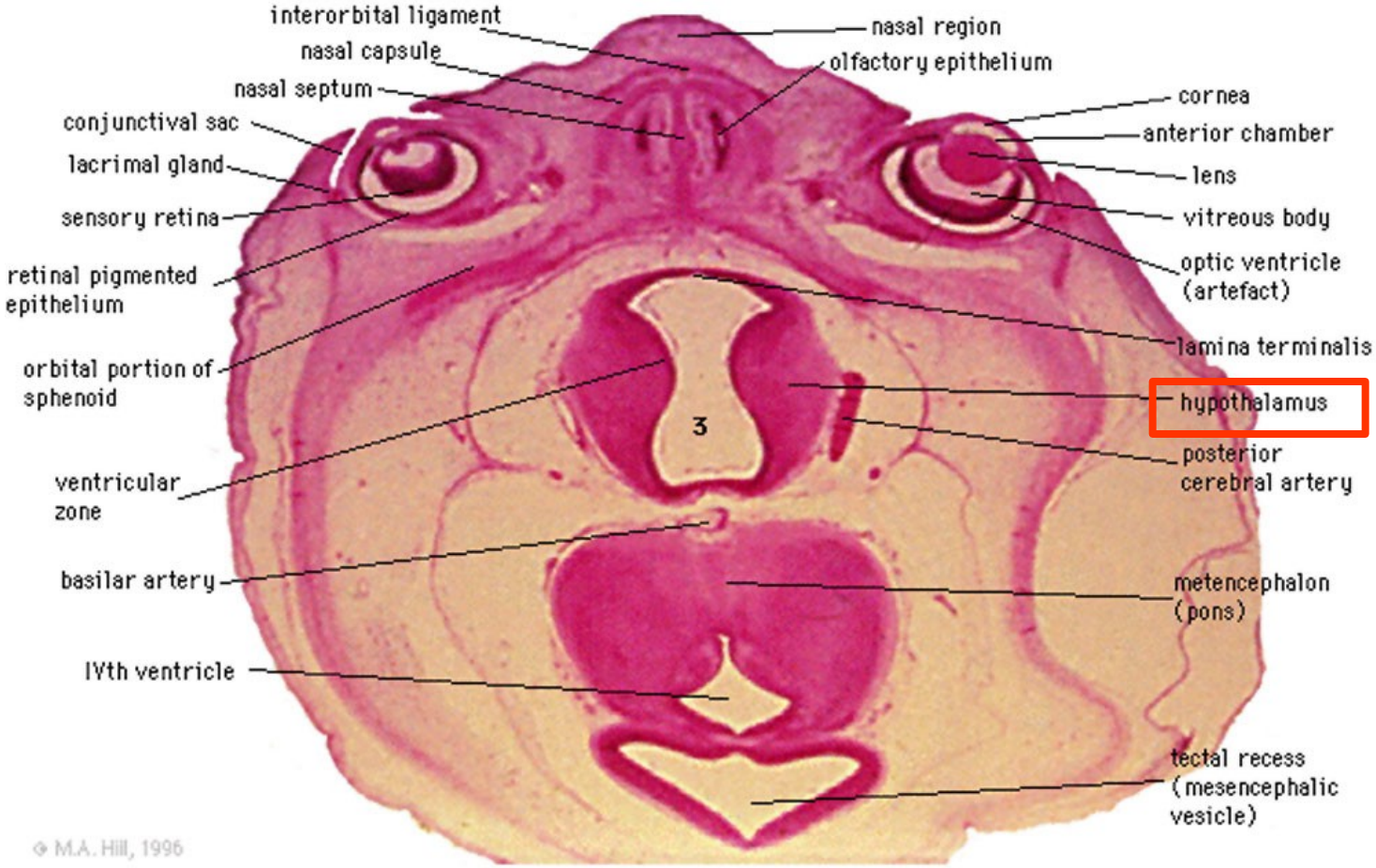


Ventral part of diencephalon +
Rathke pouch from primitivne mouth





H.S.S 8TH WEEK OF I.U.D

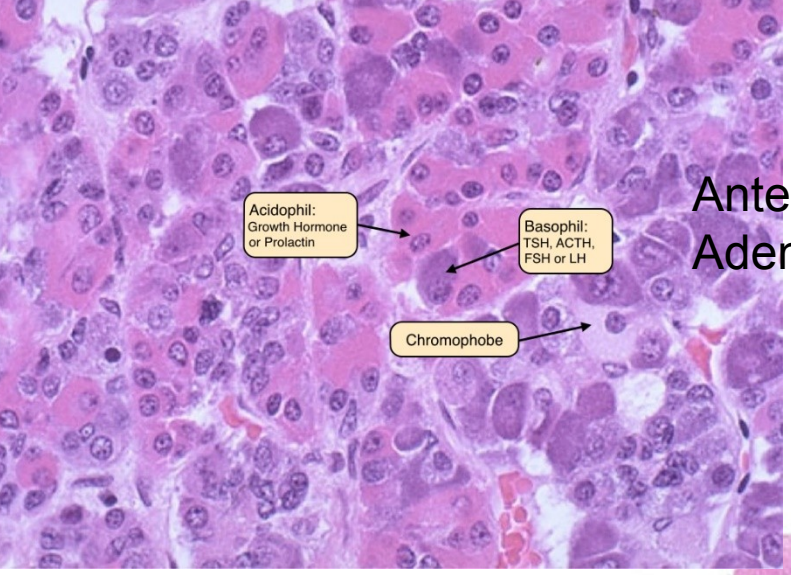


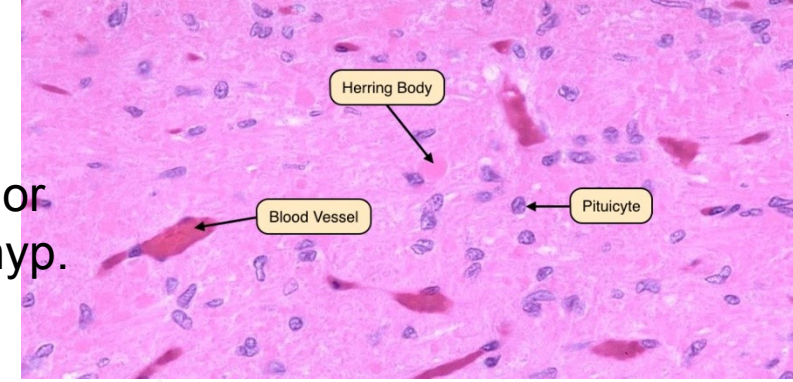
https://embryology.med.unsw.edu.au/embryology/index.php/Endocrine_-_Hypothalamus_Development#/media/File:Stage_22_image_055.jpg

Pituitary gl.

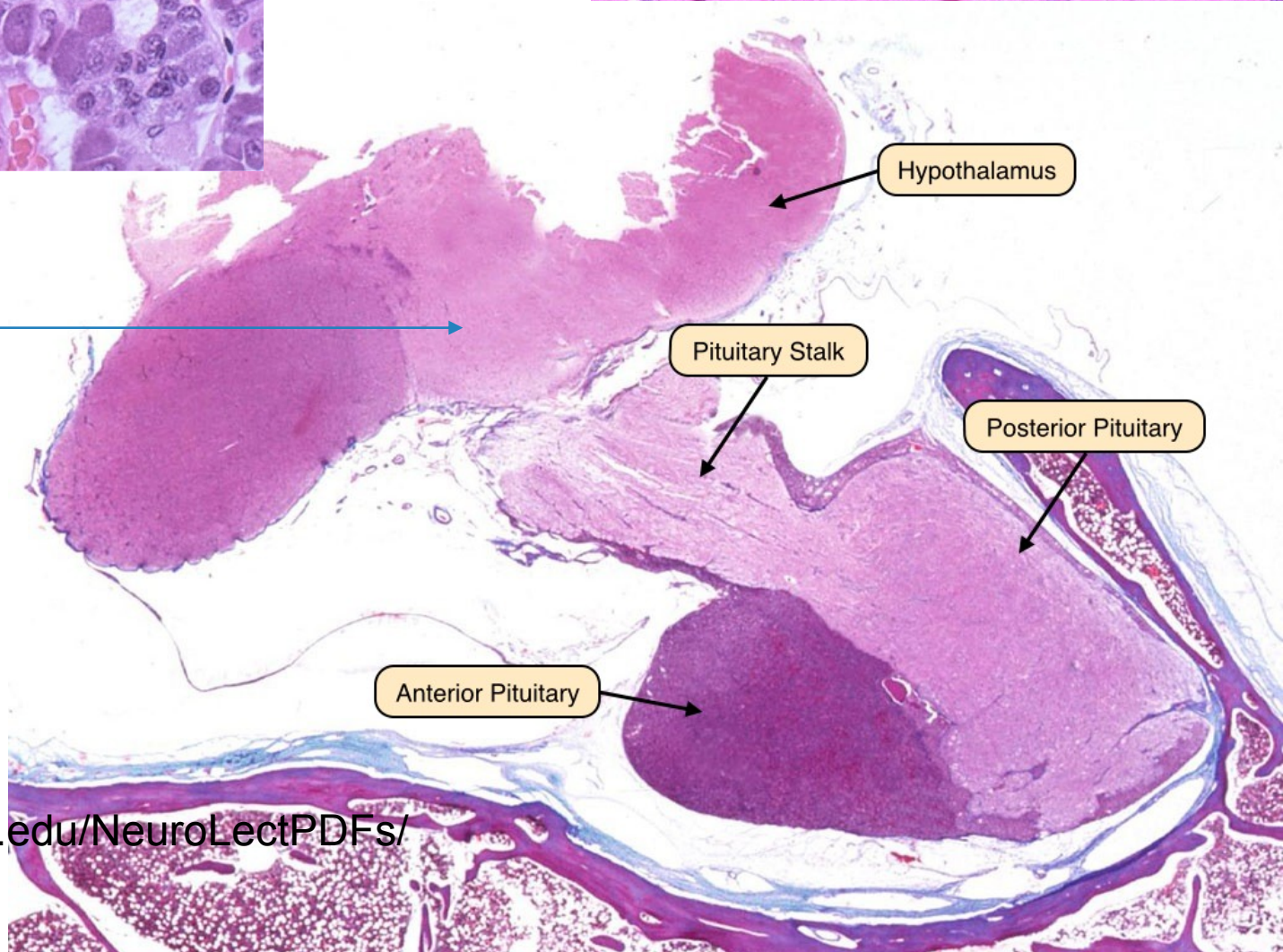
Anterior Adenohyp.

Posterior Neurohyp.





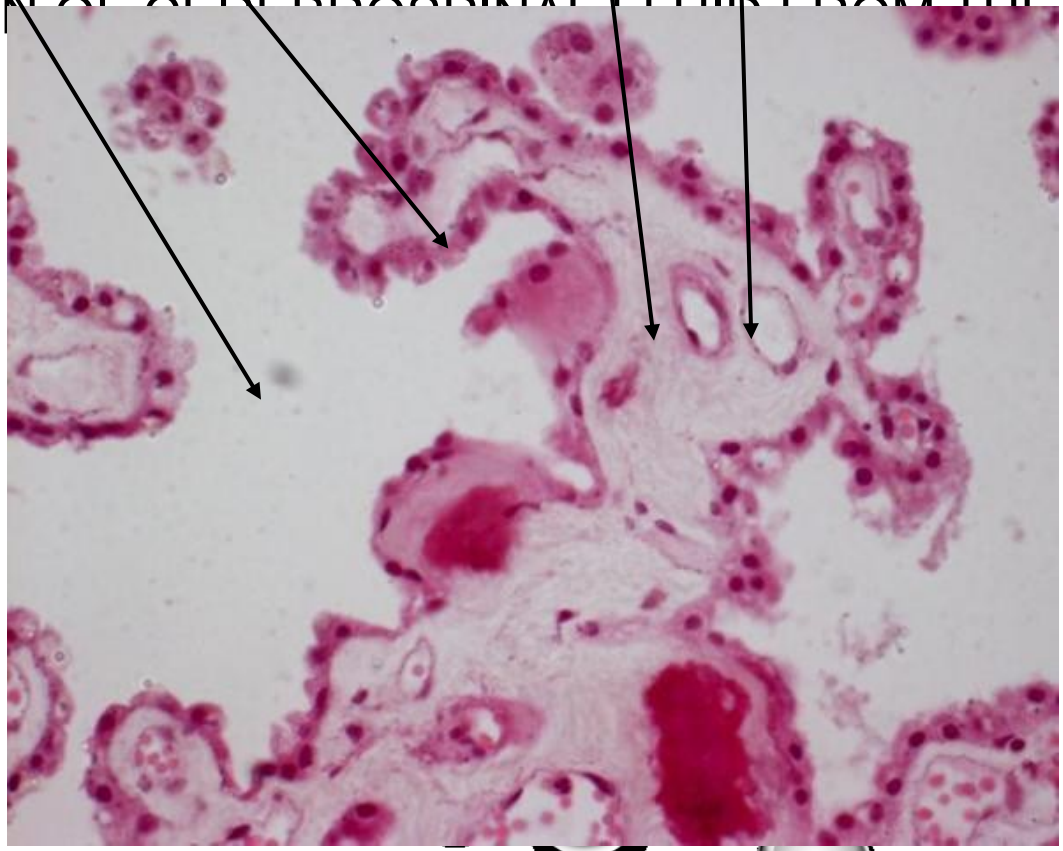
hypothalamus



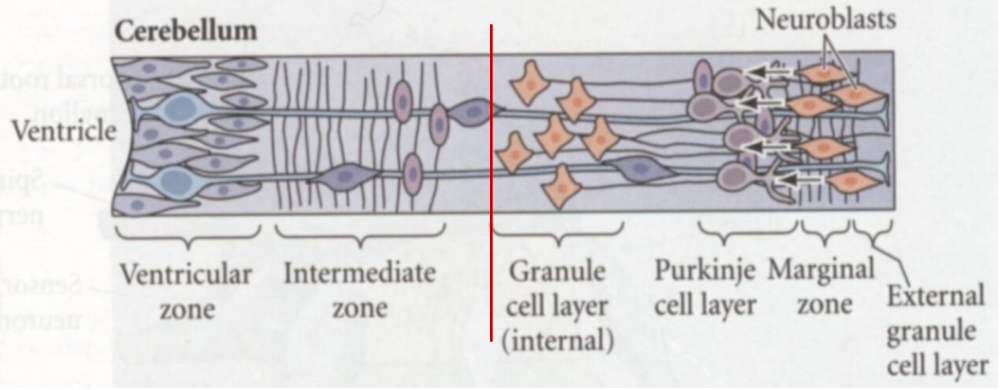
http://vanat.cvm.umn.edu/NeuroLectPDFs/LectDienceph.pdf

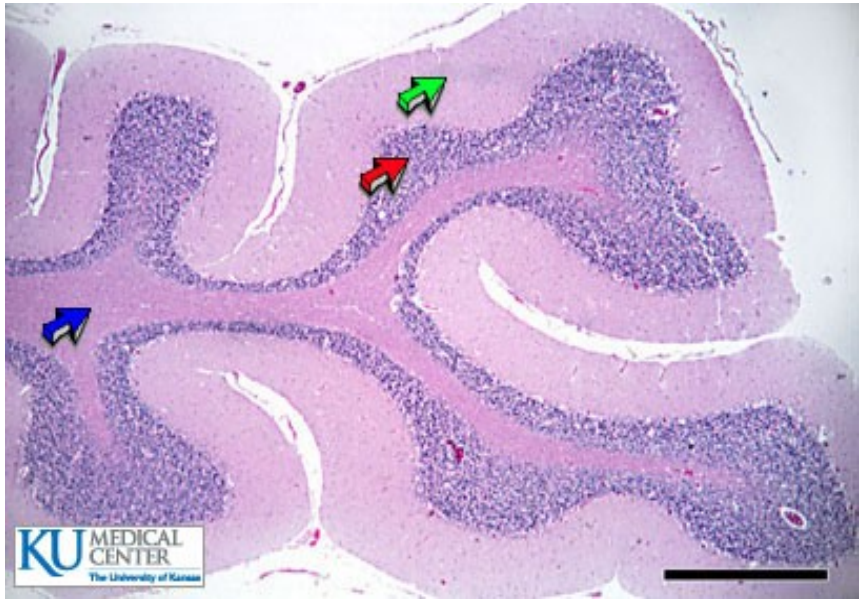
PLEXUS CHOROIDEUS

INTO THE VENTRICLES PROTRUDES THE PLEXUS CHOROIDEUS. IT IS COVERED BY EPENDYM AND IT CONTAINS BLOOD VESSELS LACKING THE HEMATOENCEPHALIC BARRIER IN CONNECTIVE TISSUE. ITS FUNCTION IS FILTRATION OF CEREBROSPINAL FLUID FROM THE PLASMA.



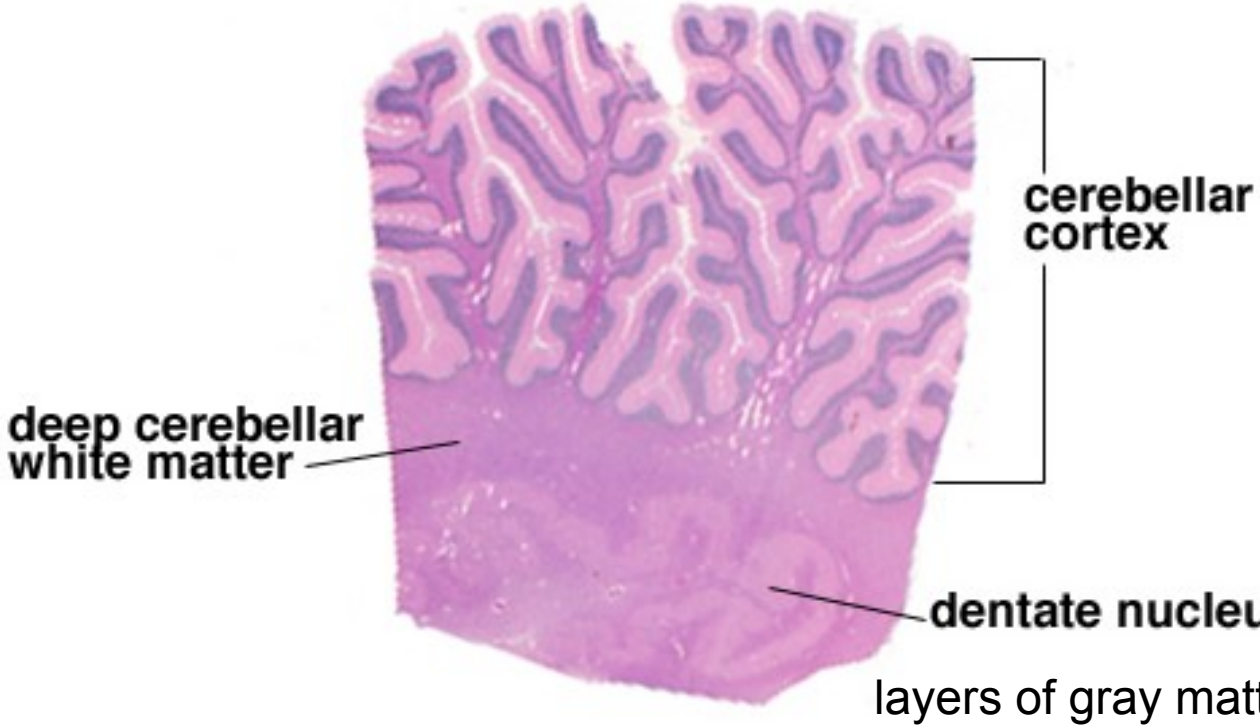
Záhyby pia mater
III. a IV. komora





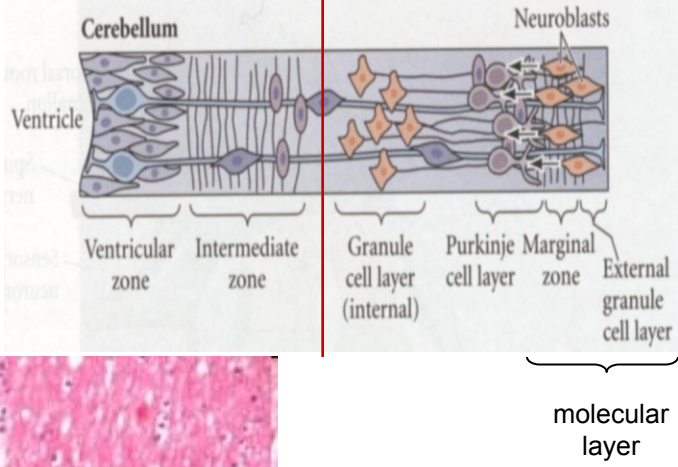
CEREBELLUM
(part of metencephalon)

White matter
Granular layer
Molecular layer



layers of gray matter in the white matter mass

Cerebellum



Stratum moleculare

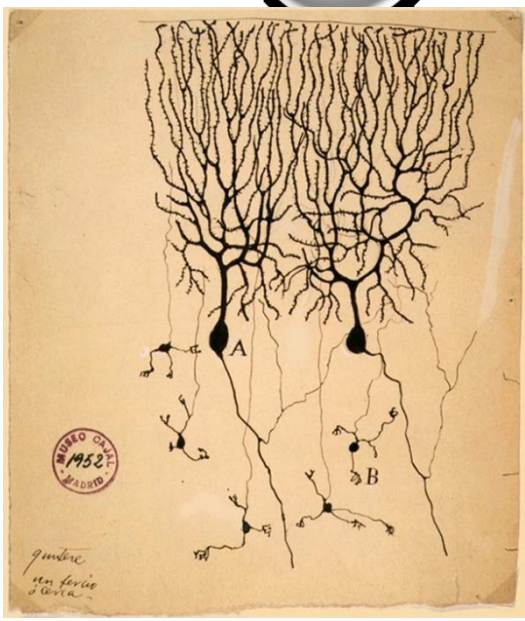
Purkynje Cells

Stratum granulosum

White matter

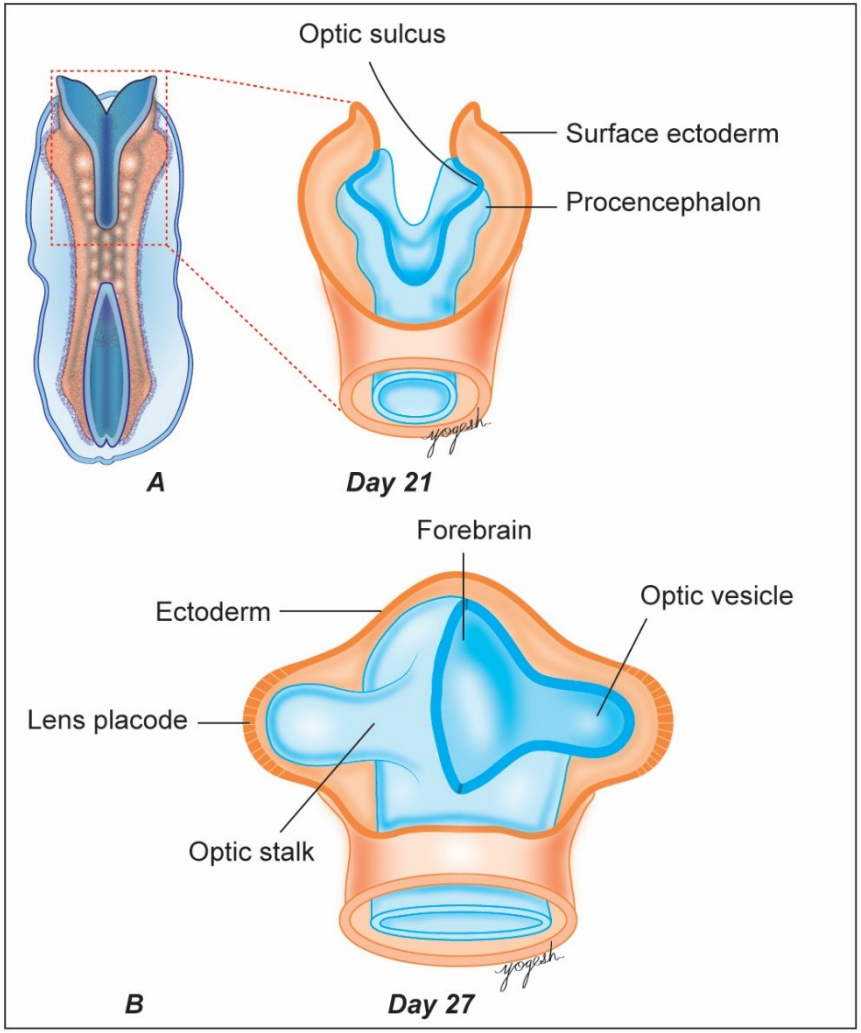
Magn. x 5

Mozeček – šedá hmota

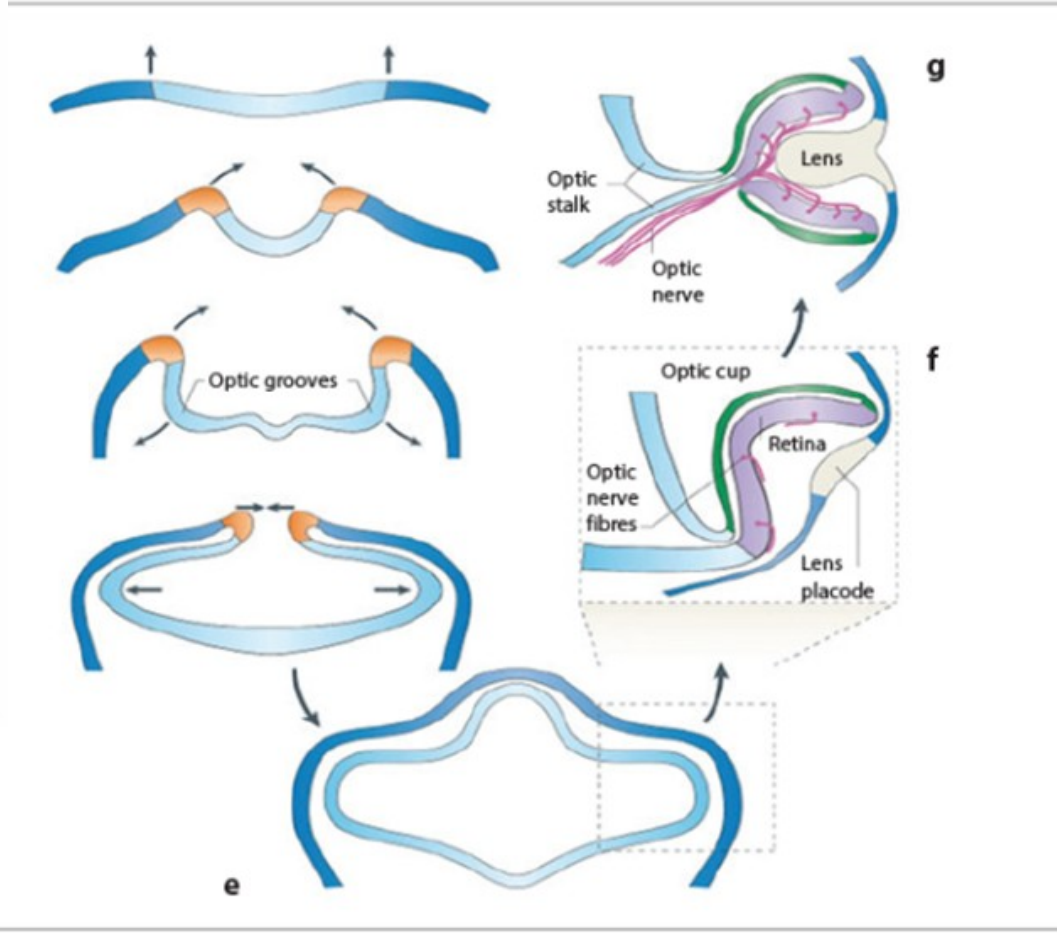


Mol: Molecular layer
Gr: Granular layer
Pkj: Purkinje cells
D: Dendrites

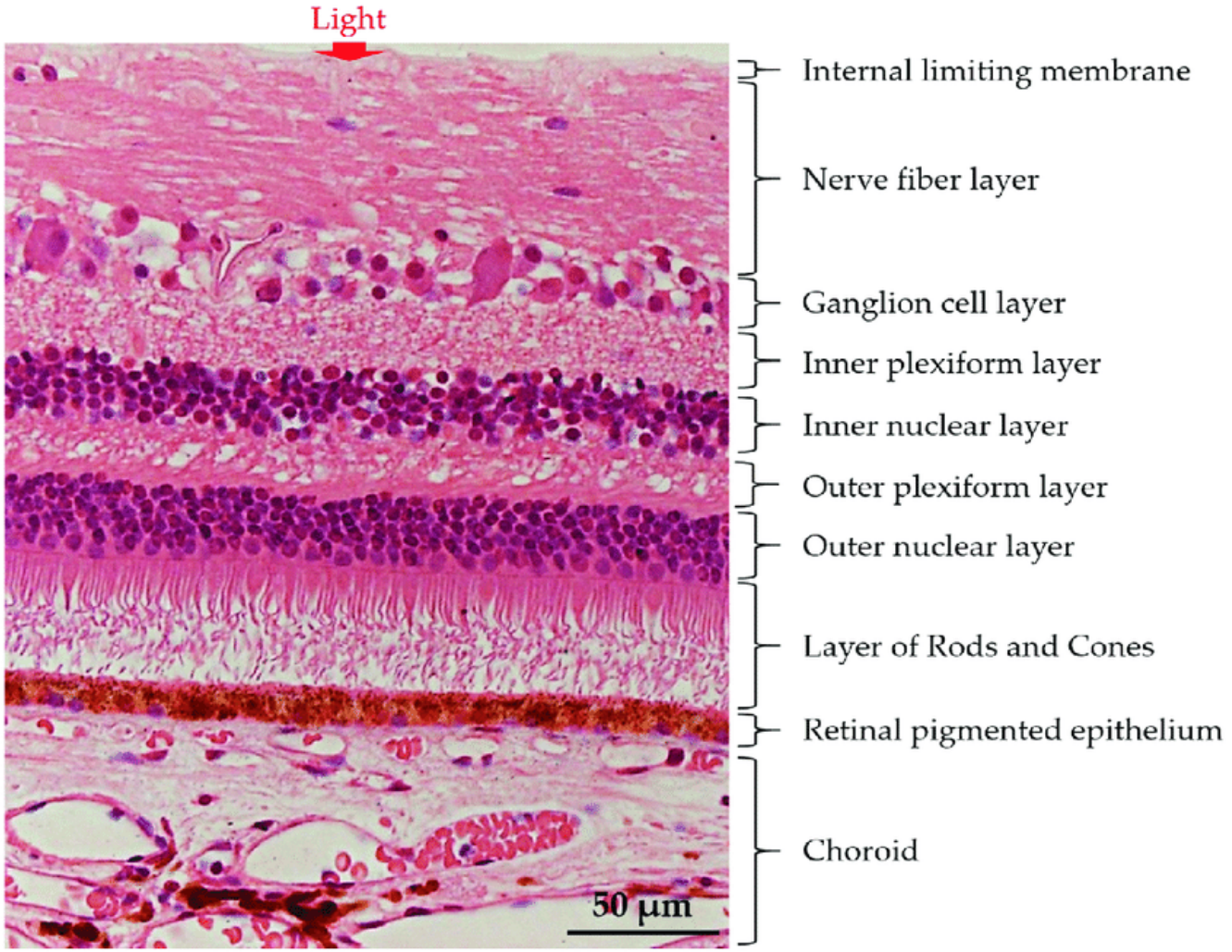
EYE

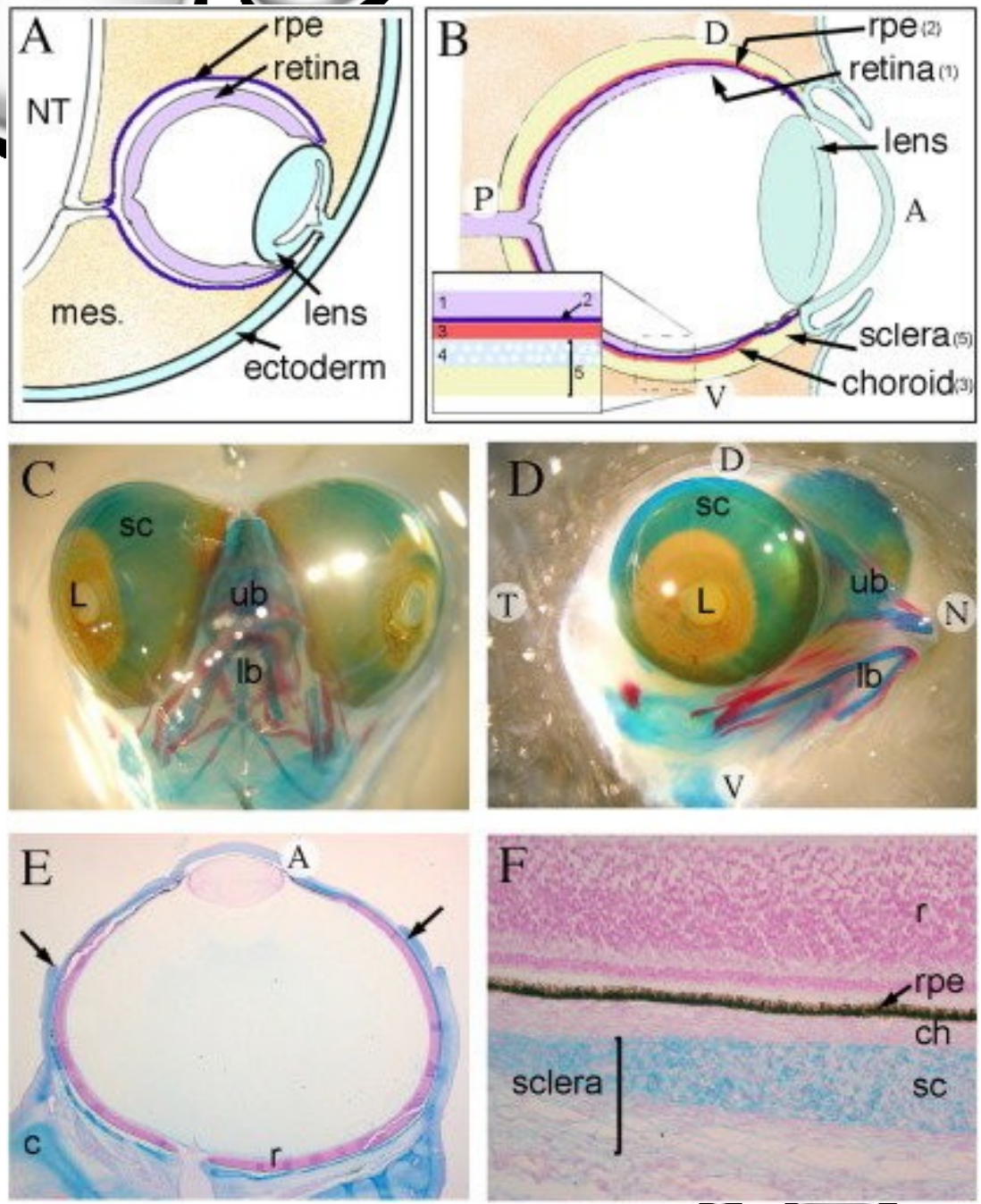


Diverticle of diencephalon



RETINA LAYERS

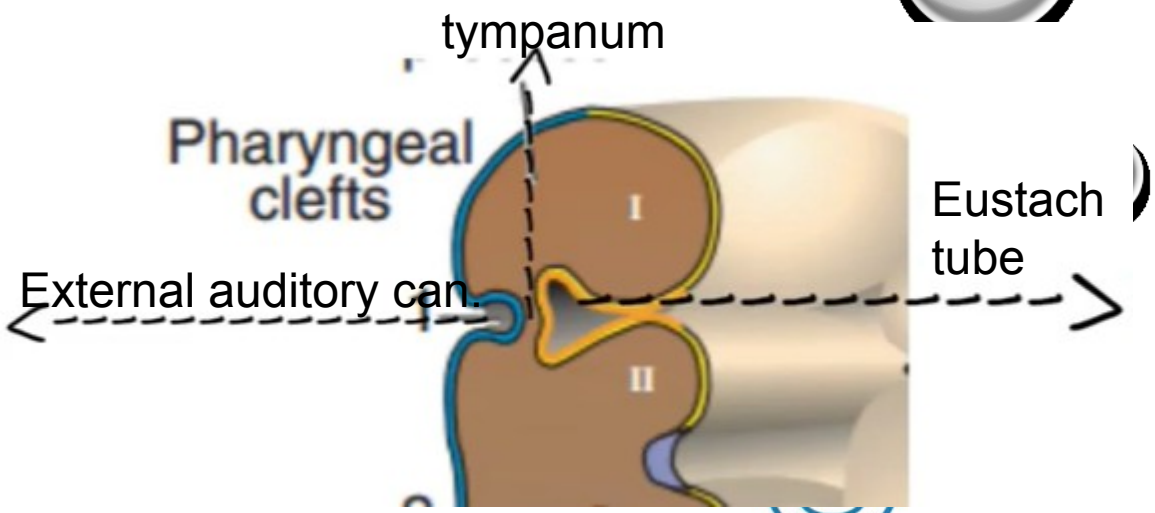




Chicken
Since HH34 7
We can observe sclera
Cartilage stained by
Alcian blue

https://www.researchgate.net/figure/Cartilage-is-found-within-the-scleral-layer-of-the-eye-A-Schematic-showing-the_fig1_45648772

EAR



EMBRYOLOGY

EXTERNAL EAR

PINNA : 6 HILLOCK OF HIS

EXTERNAL AUDITORY CANAL : 1ST CLEFT

MIDDLE EAR

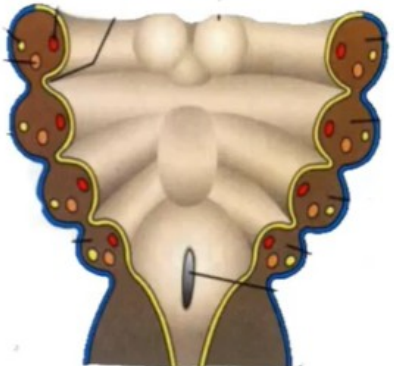
TYMPANIC MEMBRANE : 3 GERM LAYE

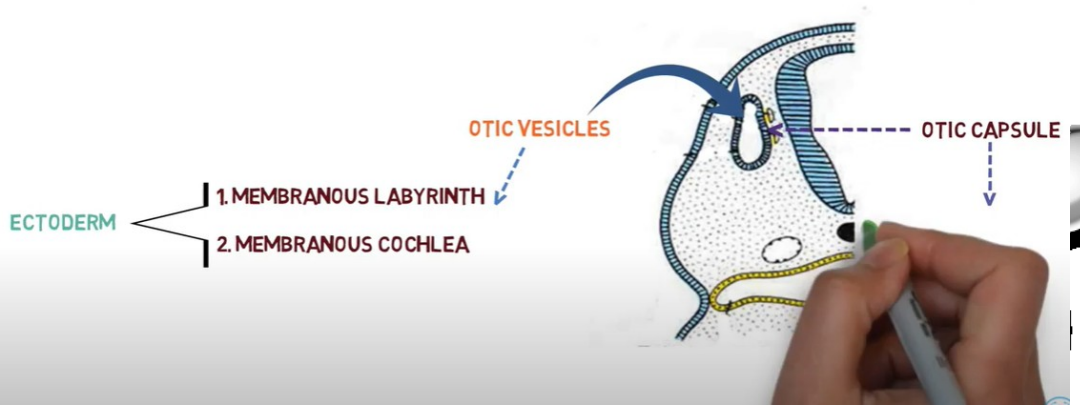
EUSTACHIAN TUBE : 1ST POUCH

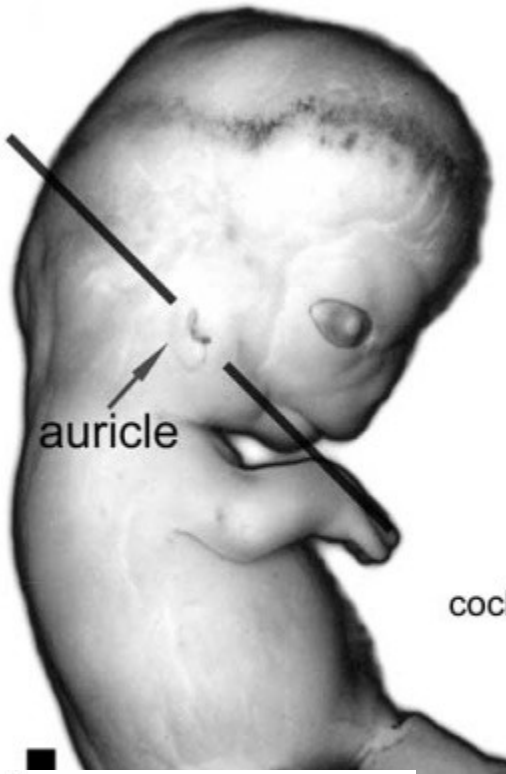
INNER EAR

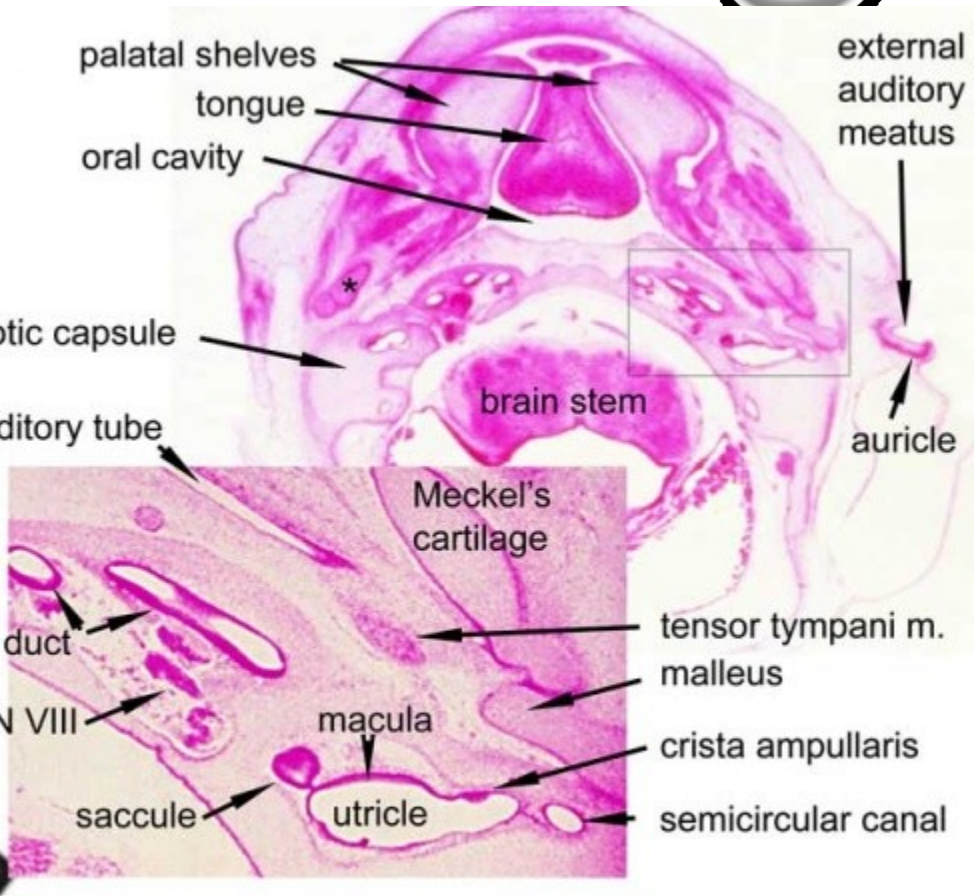
BONY : OTIC CAPSULE

MEMBRANOUS : OTIC VESICLE



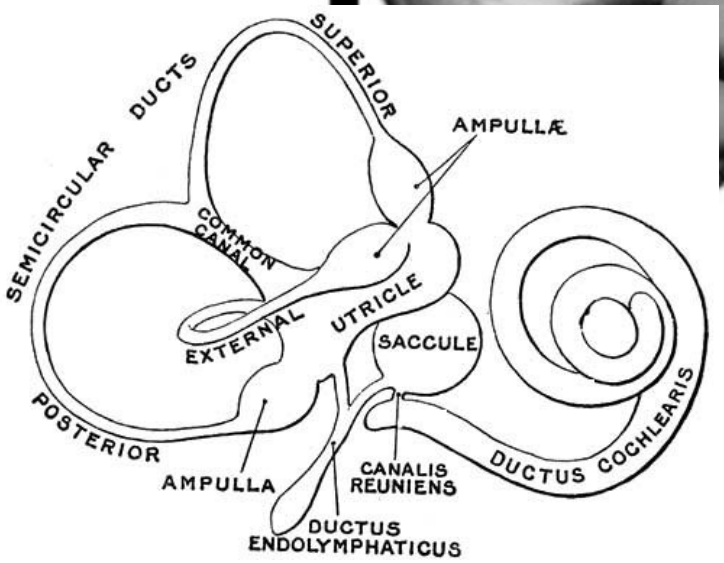






Stage 22 Embryo

(week 8, 54-56 days, 23-28 mm)



https://embryology.med.unsw.edu.au/embryology/index.php?title=Hearing_-_Inner_Ear_Development

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.

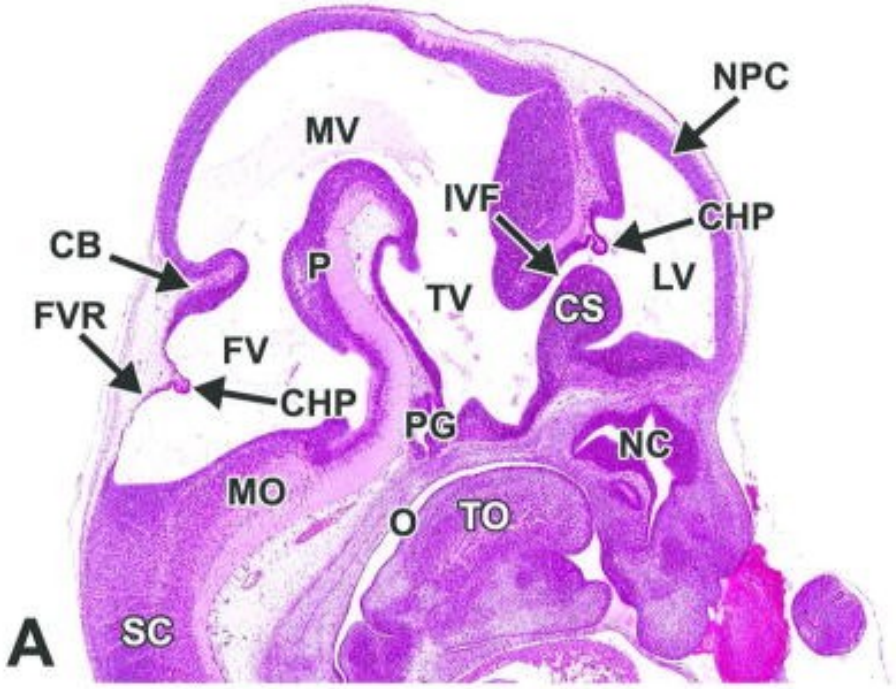
- G.G. HH10 (1,5 D) = 3. TÝDEN IUV H.S.S. (21 D)
- G.G. HH20 (3,5 D) = 5. TÝDEN IUV H.S.S.
- G.G. HH24 (4,5 D) = 6. TÝDEN IUV H.S.S.
- G.G. HH26 (5D) = 6,5. TÝDEN IUV H.S.S.
- G.G. HH28 (5,5-6D) = 7. TÝDEN IUV H.S.S.

- T.E. 16D = BEGINNING OF ORGANOGENESIS (29 D)
- T.E. 27D = JUST BEFORE THE BIRTH

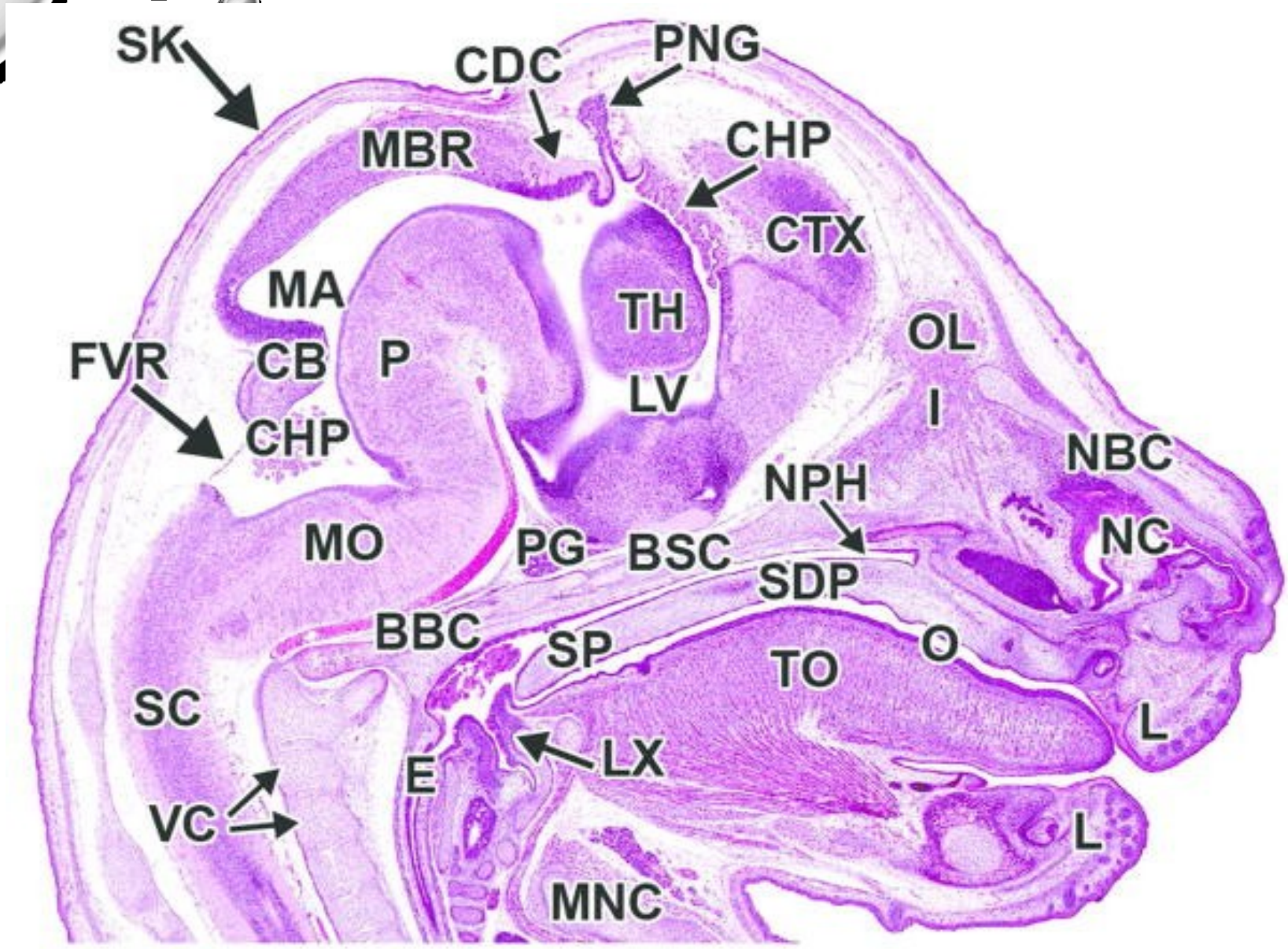
- M.A. 13,5D= 6. TÝDEN IUV H.S.S. (17D)
- M.A. 15D= JUST BEFORE THE BIRTH

- ZEBRAFISH 5D – LARVAL STAGE (EMBRYO HATCHING AT 3D)

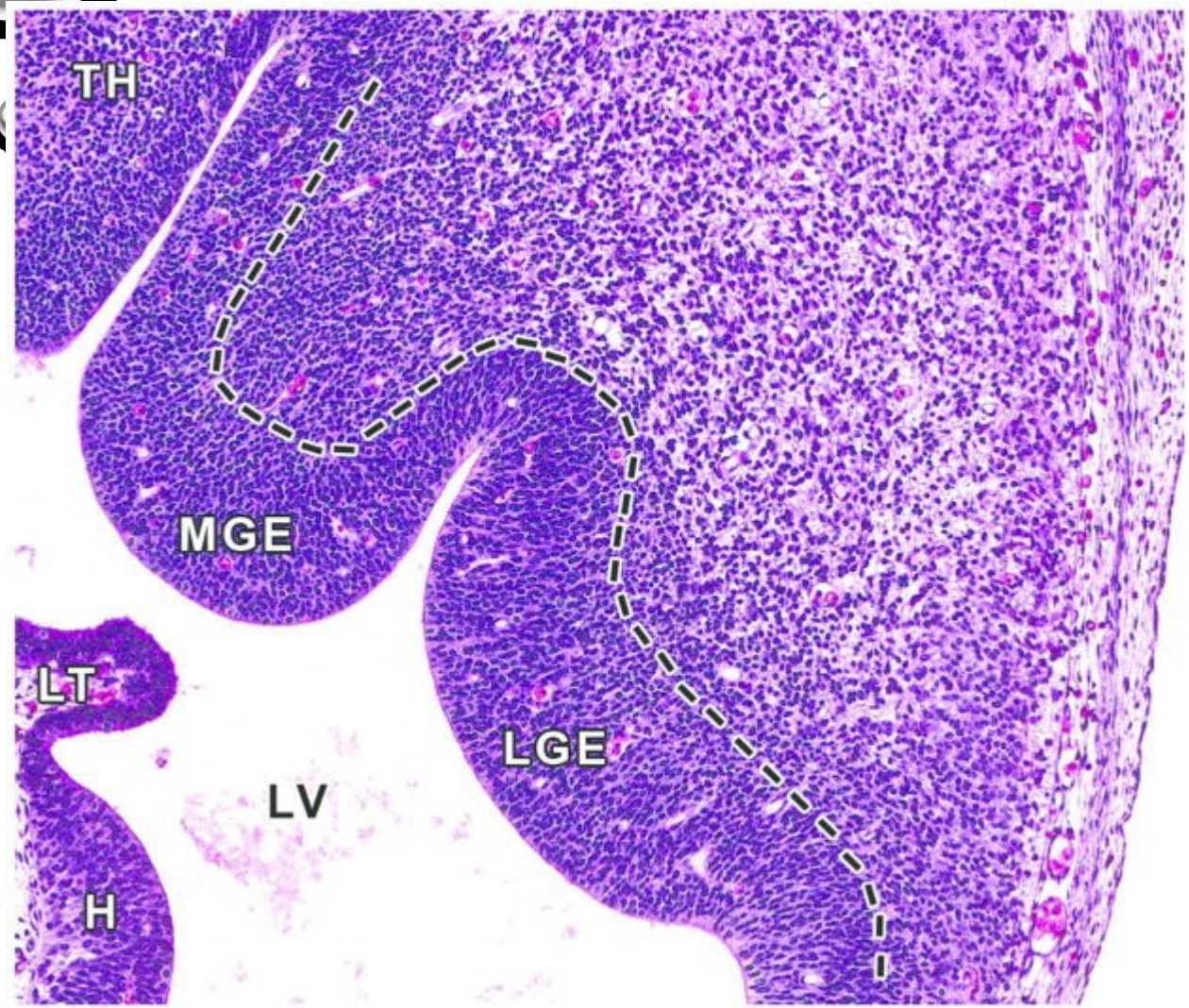
Representative images of an E12.5 embryonic mouse brainH&E-stained sagittal (**A**) and transverse (**B**) sections. AP= alar plate; CB= cerebellum; CF= choroidal fissure; CHP= choroid plexus; CS= corpus striatum; EM= ectomeninx; FC= falx cerebri; FV= fourth ventricle; FVR= fourth ventricle roof; HT= hypothalamus; IVF= interventricular foramen; LGE= lateral ganglionic eminence; LV= lateral ventricle; M= mesenchyme; MDS= median sulcus; MGE= medial ganglionic eminence; MO= medulla oblongata; MV= mesencephalic vesicle; NC= nasal cavity; NPC= neopallial cortex; O= oropharynx; P= pons; PG= pituitary gland; SC= spinal cord; TC= tentorium cerebelli; TH= thalamus; TO= tongue; TV= third ventricl



MM E18,5



https://europepmc.org/article/PMC/5754028


TH
MGE
LT
LGE
LV
H

CHICKEN

- BY E11.5, THE RAPID EXPANSION OF THE BRAIN RESULTS IN THE FORMATION OF LARGER AND MORE DEFINED SUBDIVISIONS (THEILER, 1989). THE NEUROECTODERM CONTINUES ITS DIFFERENTIATION BY SEGREGATION INTO MORPHOLOGICALLY DISTINCT EPENDYMAL, MANTLE, AND MARGINAL LAYERS. AS PREVIOUSLY MENTIONED, THE MANTLE AND MARGINAL LAYERS ARE DEMONSTRATED BEST IN THE SPINAL CORD AND BRAINSTEM, WHICH FUNCTIONS AS A ROSTRAL EXTENSION OF THE SPINAL CORD, WHILE THE CEREBRAL NEOCORTEX DISPLAYS THE LEAST DIFFERENTIATION INTO LAYERS AT THIS STAGE (**FIG. 7B**). IN **FIGURE 8A AND 8B**, THE NEURAL TUBE IS CHARACTERIZED BY A BROAD INNER EPENDYMAL LAYER AND AN INTERMEDIATE MANTLE LAYER (I.E., FUTURE VENTRAL HORN GRAY MATTER) LOCATED ADJACENT TO THE FLOOR PLATE. THE EPENDYMAL LAYER STILL CONSTITUTES THE MAJORITY OF THE NEURAL TUBE THICKNESS BUT BECOMES LESS PRONOUNCED BY E12.5–13. THE OUTER MARGINAL LAYER (FUTURE WHITE MATTER TRACTS) IN THE SPINAL CORD CAN BE SEEN CLEARLY IN THE VENTRAL AND LATERAL REGIONS (**FIG. 8A, B**). IN THE BRAIN, THESE TISSUE LAYERS ORIGINATE SIMILARLY, BUT THE DEFINITIVE LAYOUT OF THE CEREBRUM (ROSTRAL BRAIN), MESENCEPHALON (MIDBRAIN), AND THE MORE CAUDALLY LOCATED HINDBRAIN DIFFERS. BEGINNING AROUND E14.0, THE MANTLE LAYER NEUROBLASTS IN THE BRAIN MIGRATE TOWARD THE PERIPHERY OF THE ORGAN SO THAT IN MATURITY THE GRAY MATTER IS SUPERFICIAL TO THE WHITE MATTER.
- AT E12.0, THE TELENCEPHALIC VESICLES HAVE CONTINUED THEIR RAPID EXPANSION DORSOLATERALLY AND NEARLY COVER THE DIENCEPHALON BY THIS STAGE (**FIG. 6A**). IN THE DIENCEPHALON, THE THALAMUS, HYPOTHALAMUS, AND EPITHALAMUS CONTINUE TO ENLARGE AND BEGIN TO EXHIBIT REGIONAL DIFFERENTIATION INTO DISTINCT NUCLEI (**FIG. 6B**). THE TWO HALVES OF THE THALAMUS NEARLY COME TO MEET AT THE MIDLINE, WITH A CONCOMITANT DECREASE IN THIRD VENTRICLE VOLUME.