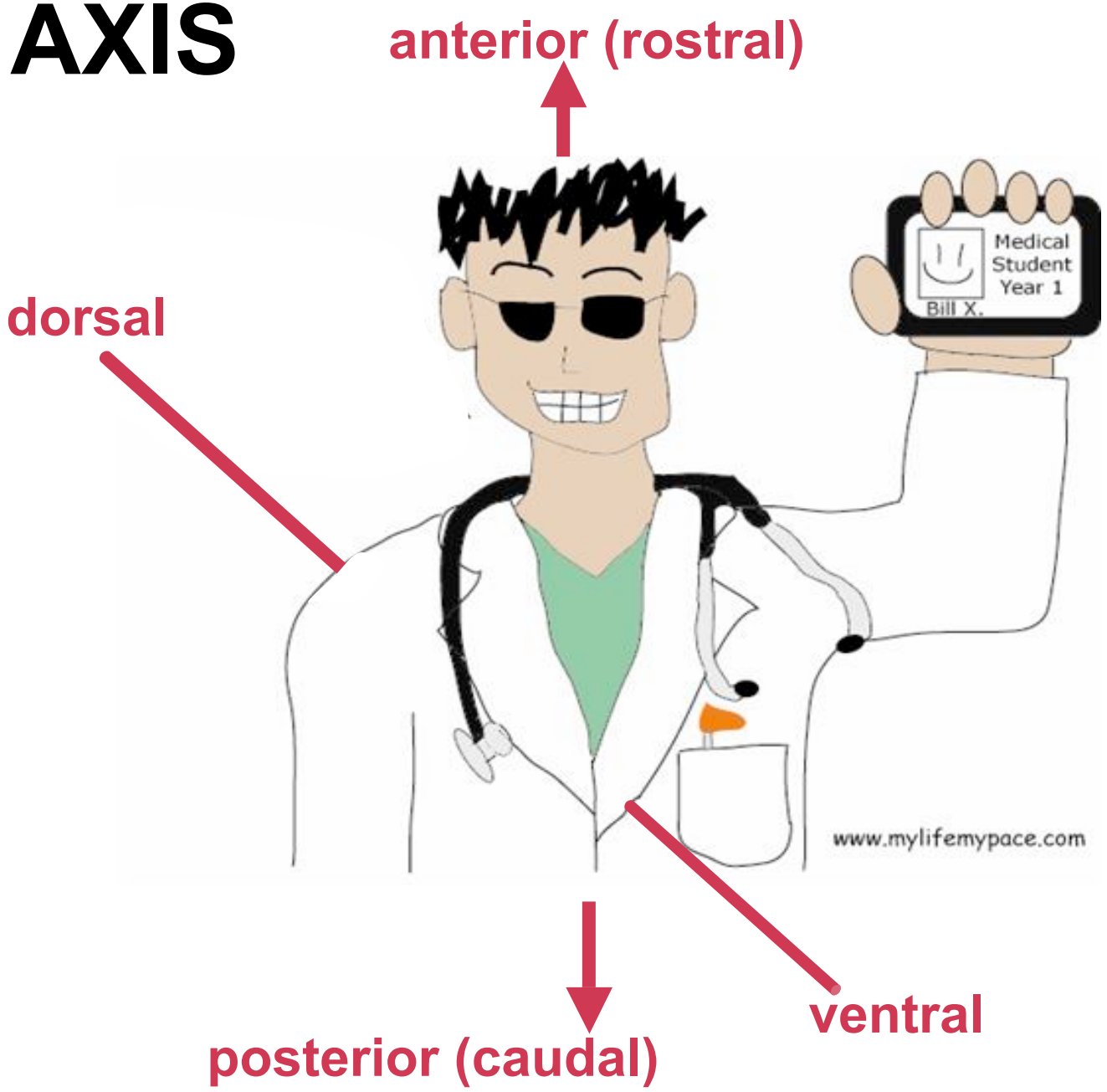
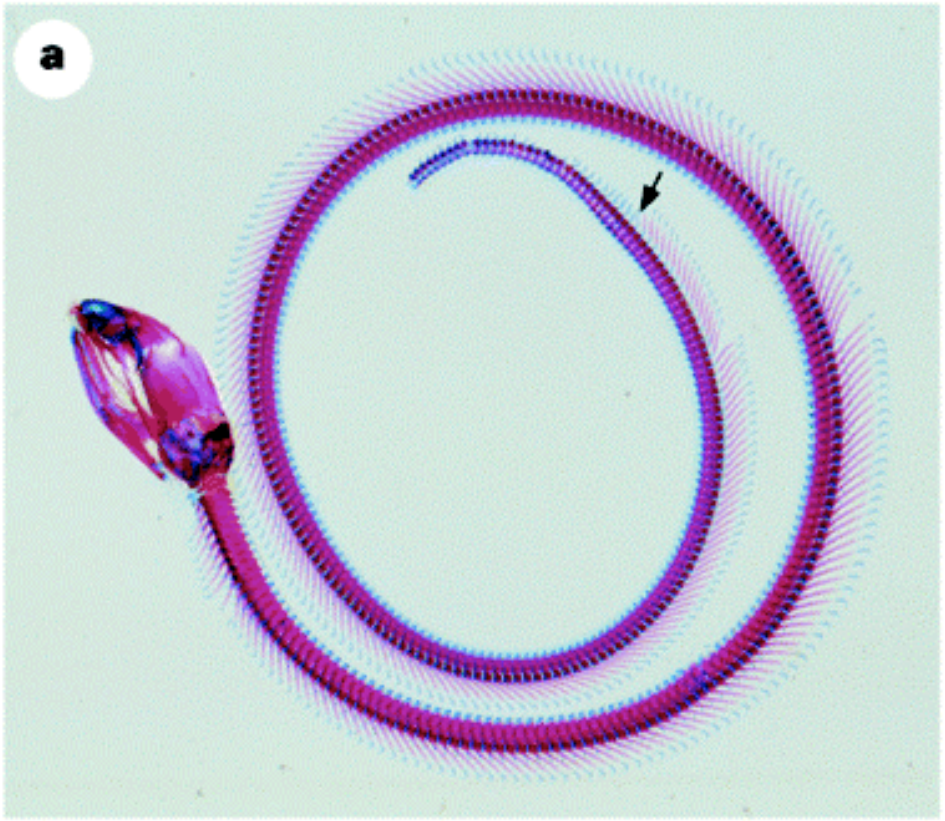
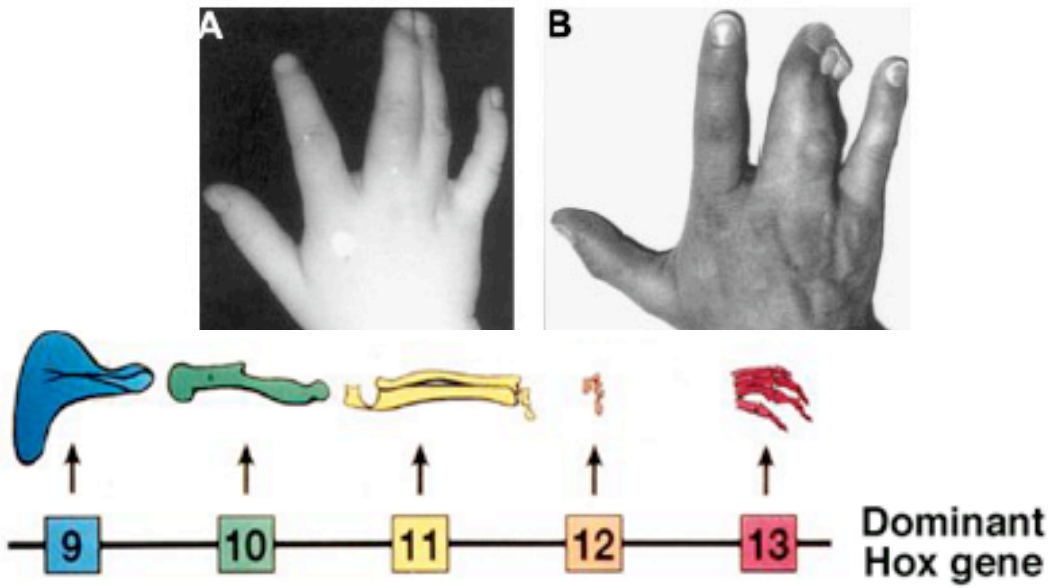
OUR AXIS

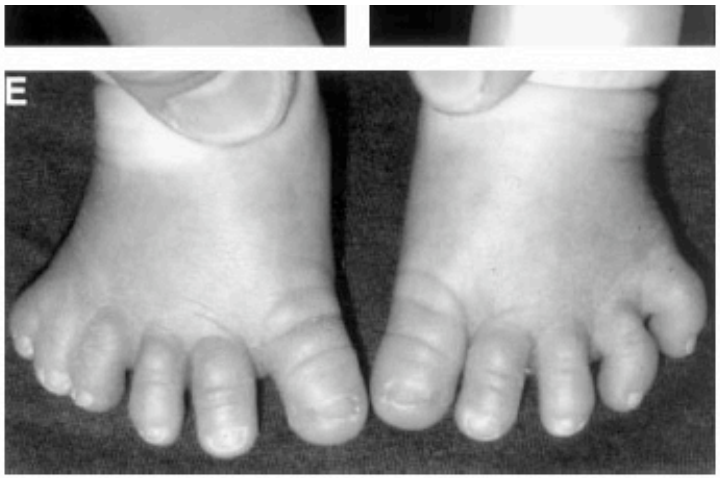

anterior (rostral)
dorsal
Medical
Student
Year 1
Bill X.
www.mylifemypace.com
ventral
posterior (caudal)



segmentation and patterning

Synpolydactyly can be caused by alanine repeat expansions in Hox D13





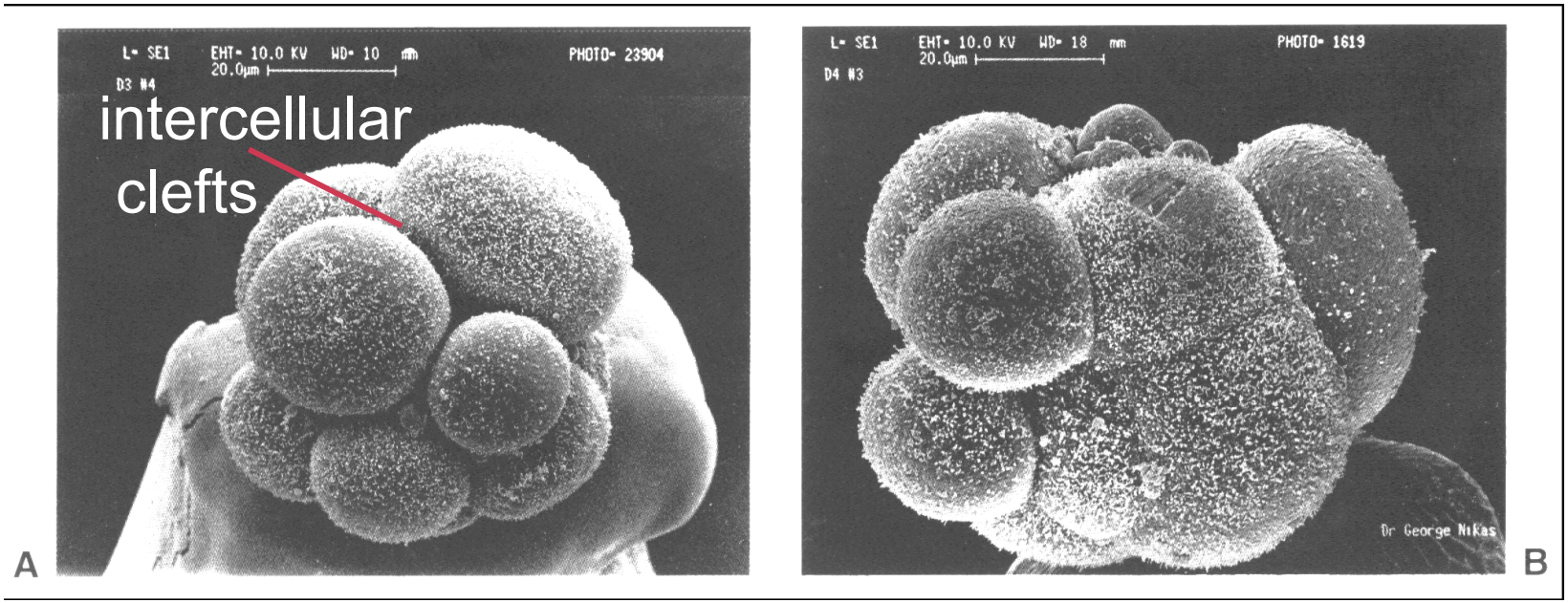
the spermatozoon cell membrane has fused with the oocyte membrane

chromatin is enclosed within male and female pronuclei, membranes disappear, chromosomes replicate prior to cleavage.

fertilization-4cells

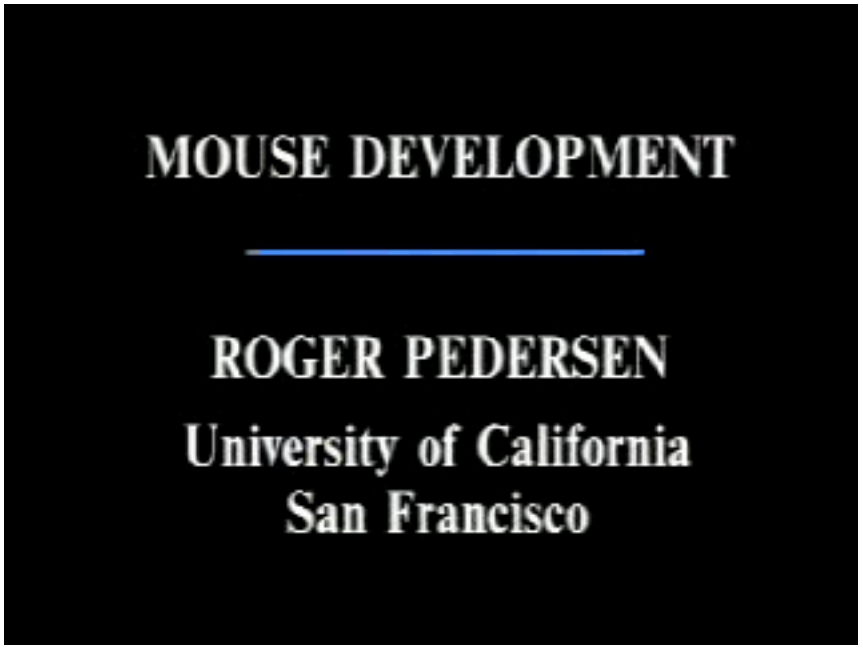
after fertilization, cleavage occurs as the zygote travels down the oviduct

1. mitotic divisions w/o increase in size
2. zygote subdivides into blastomeres (daughter cells)
3. asynchonous divisions
4. after about 4 days (32 cells) = Morula



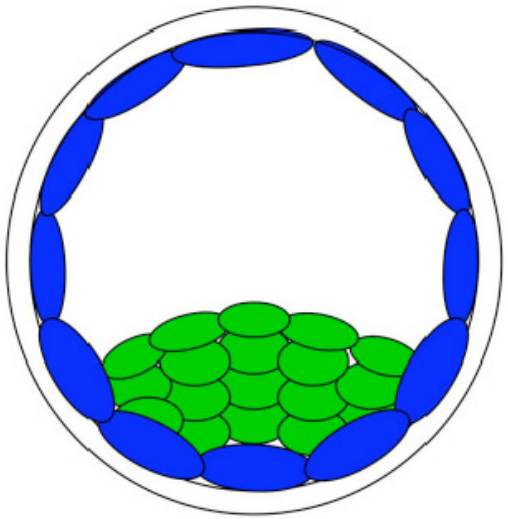
Compaction: The embryo is transformed from a loosely organized ball of cells into a compact closely adherent cluster-they lose their intercellular clefts

compaction



formation of the blastocyst

blastocyst = inner cell mass + trophectoderm



Trophectoderm

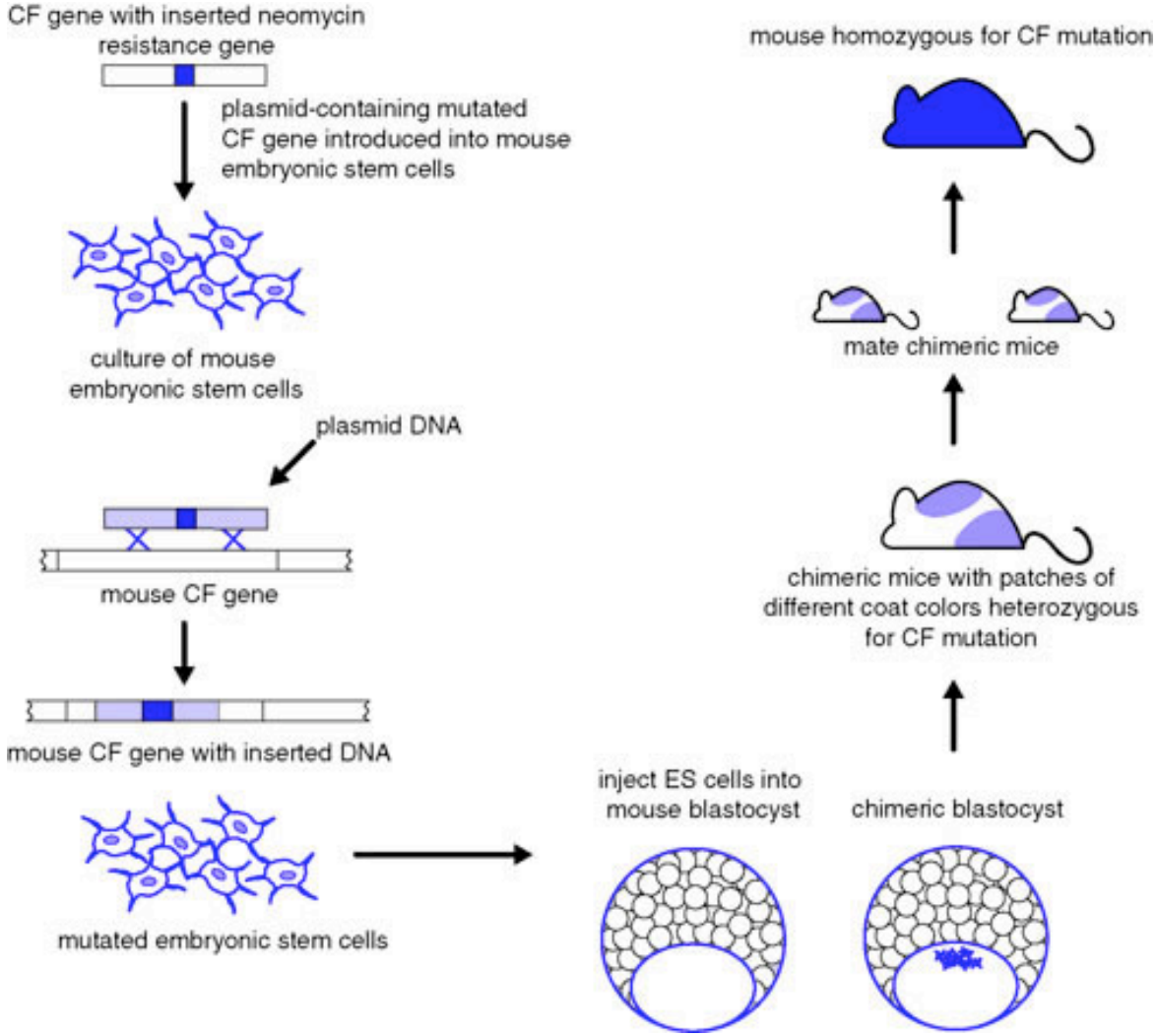
extra-embryonic
tissue

ICM

embryo
yolk sac
amnion
part of placenta

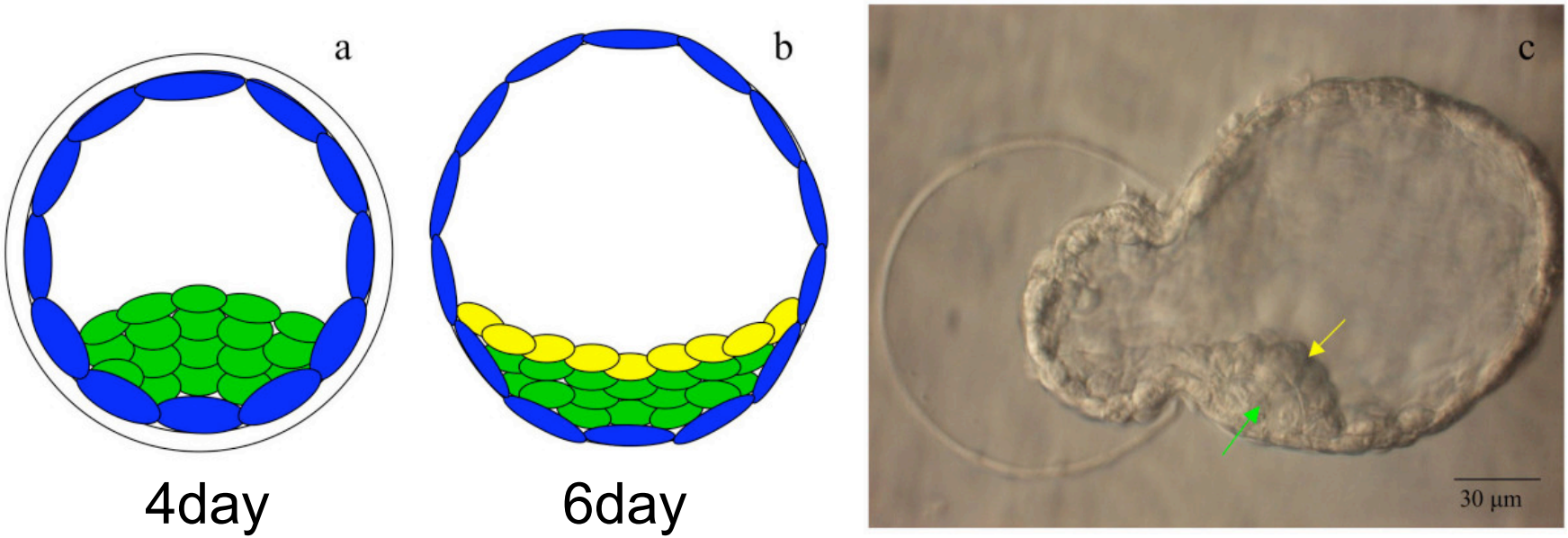
The ICM is a source of totipotent embryonic stem (ES) cells

Gene targeting



ES cells can be used for gene targeting & gene therapy

24h before implantation:



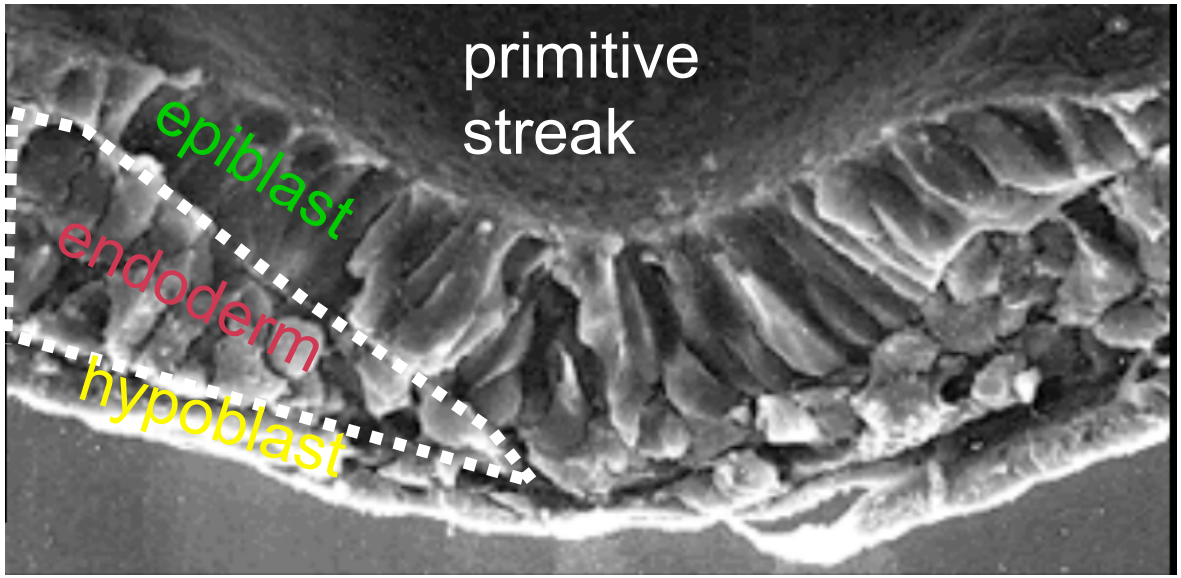
epiblast (embryo) hypoblast (primitive endoderm)

Formation of a 2-layered embryo within the inner cell mass. Organization of primitive endoderm. Schematic of expanded blastocyst with absence (a) and presence (b) of primitive endoderm (hypoblast) in a day 4 expanded blastocyst and day 6 hatched blastocyst, respectively. In b, ICM remnant is defined as the epiblast (green) and the hypoblast (yellow). Hatching blastocyst (c) with epiblast (green arrow) and hypoblast (yellow arrow). Scale = 30 µm.
Tanaka et al. Journal of Translational Medicine 2006 4:20 doi:10.1186/1479-5876-4-20

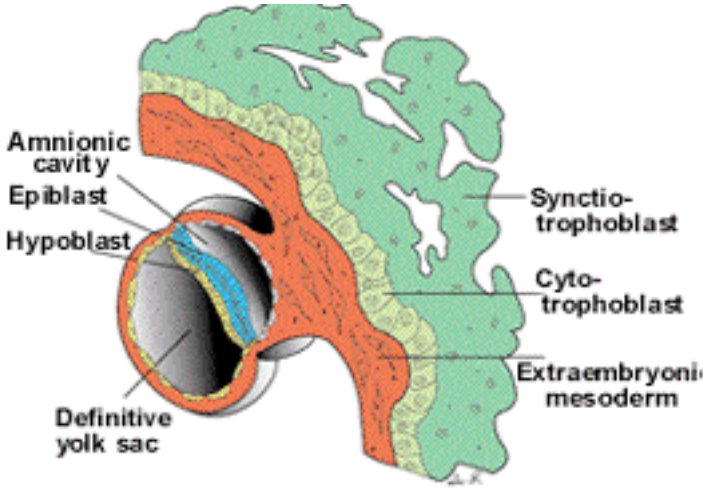
Gastrulation-why is it so important?

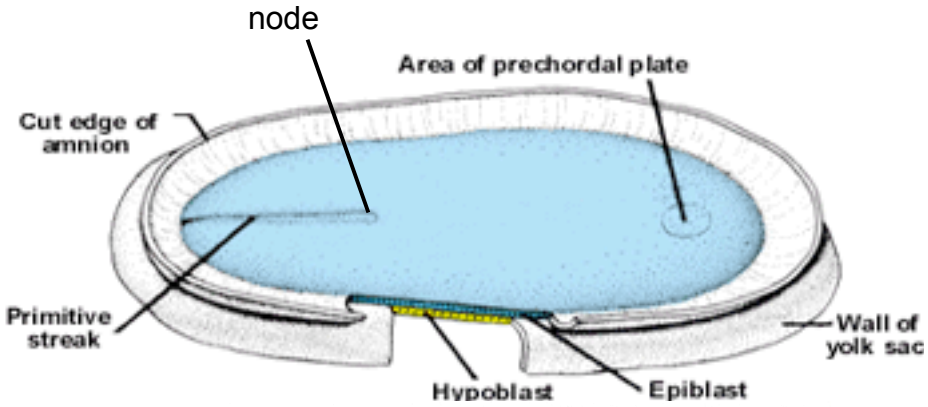
2-layered germ-disc is converted to a 3-layered germ disc

cells in different layers interact to initiate embryonic development



Gastrulation starts with formation of the primitive streak:





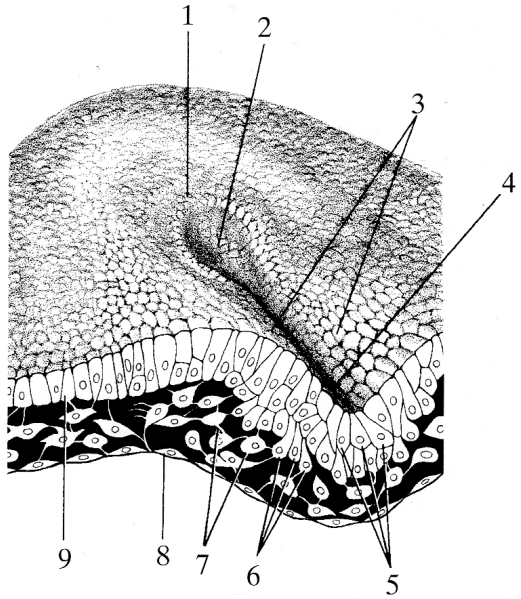


Fig. 3.8. Drawing of the cranial half of a blastoderm at the definitive primitive streak stage. The blastoderm has been cut transversely.

1. Primitive knot
2. Primitive pit
3. Primitive ridges
4. Primitive groove
5. Ingressing prospective mesodermal cells
6. Bottle cells
7. Filopodia
8. Endodermal cell
9. Epiblast cell

•The primitive streak is a thickened region at the midline formed by cells of the epiblast

•It begins to form at the posterior pole of the embryo

•The node forms at the cranial end of the embryo

•Primitive streak cells move over the primitive pit, over the primitive ridges and into the groove forming endoderm and mesoderm.

•The remaining cells form ectoderm

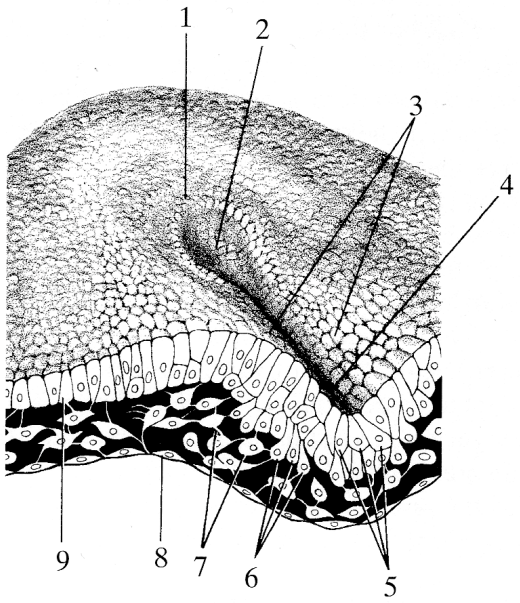
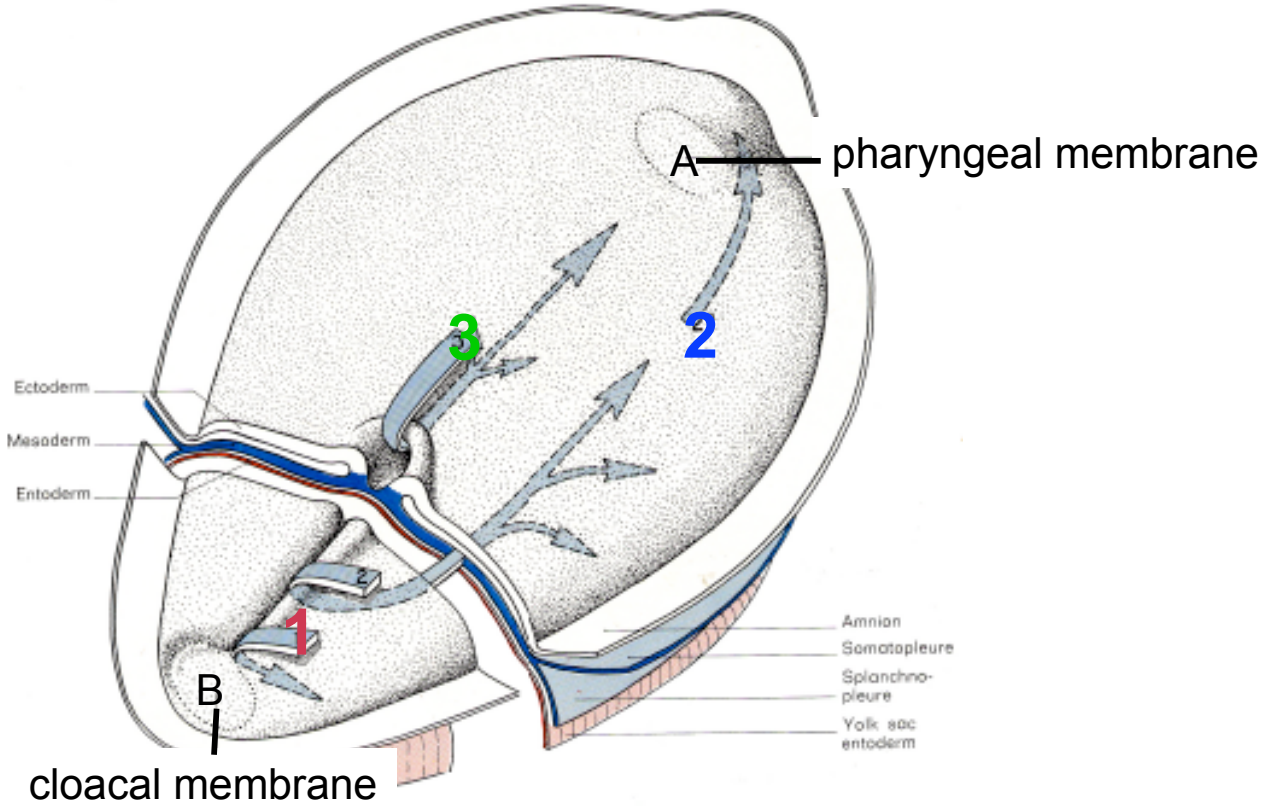


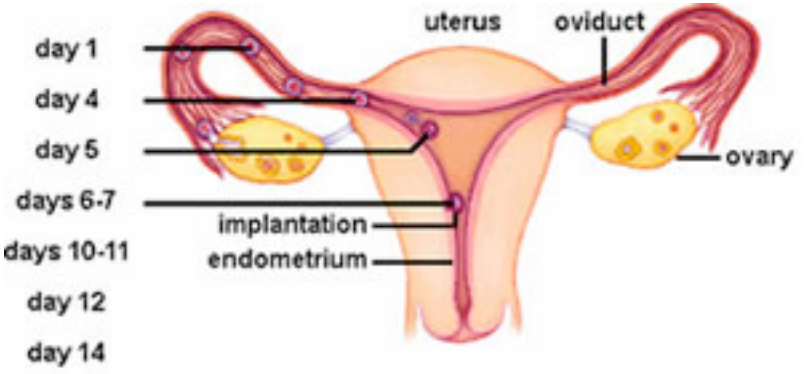
Fig. 3.8. Drawing of the cranial half of a blastoderm at the definitive primitive streak stage. The blastoderm has been cut transversely.

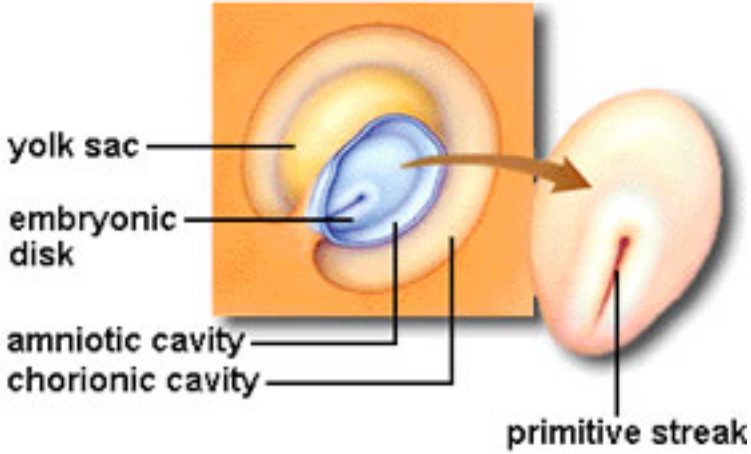
1. Primitive knot
2. Primitive pit
3. Primitive ridges
4. Primitive groove
5. Ingressing prospective mesodermal cells
6. Bottle cells
7. Filopodia
8. Endodermal cell
9. Epiblast cell

ECTODERMAL MOVEMENTS DURING GASTRULATION:

1: origin of caudal mesoderm
2: origin of lateral mesoderm
3: origin of notochord
A and B: mesoderm is not interposed between ectoderm and endoderm: these are the future pharyngeal (A) and cloacal (B) membranes.

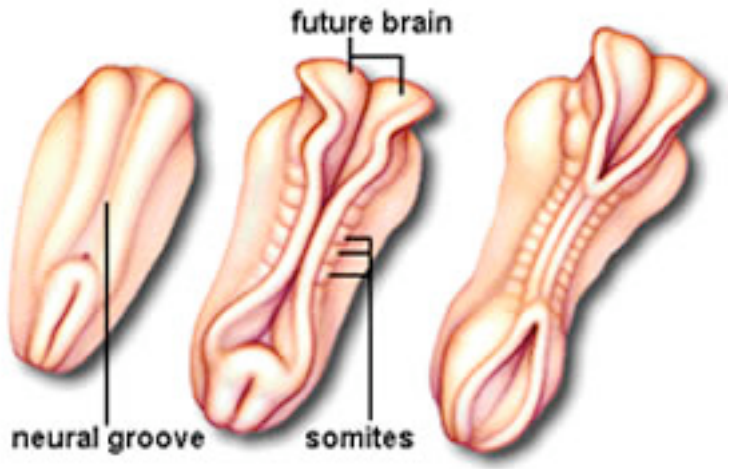




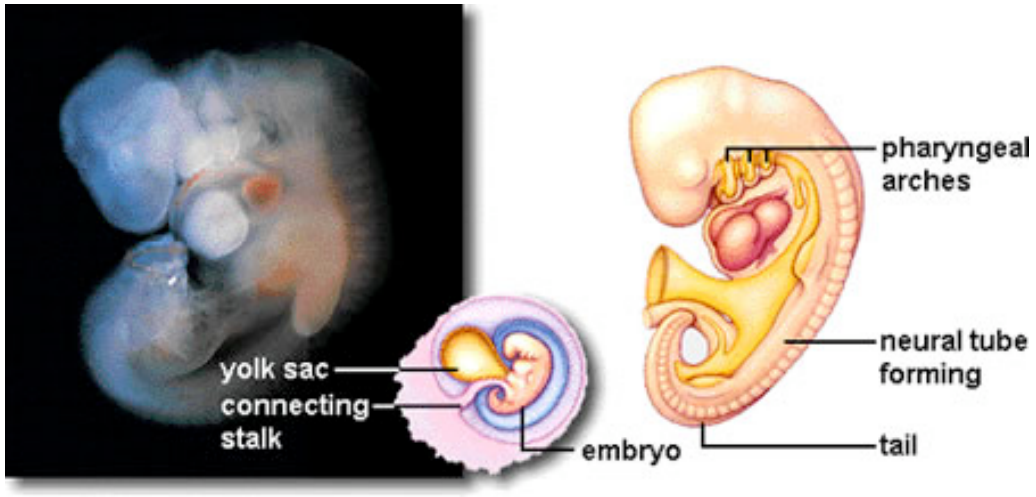


Day 6 -7: Blastocyst attaches to the endometrium and burrows in: implantation.

gastrulation:
formation of 3 germ layers

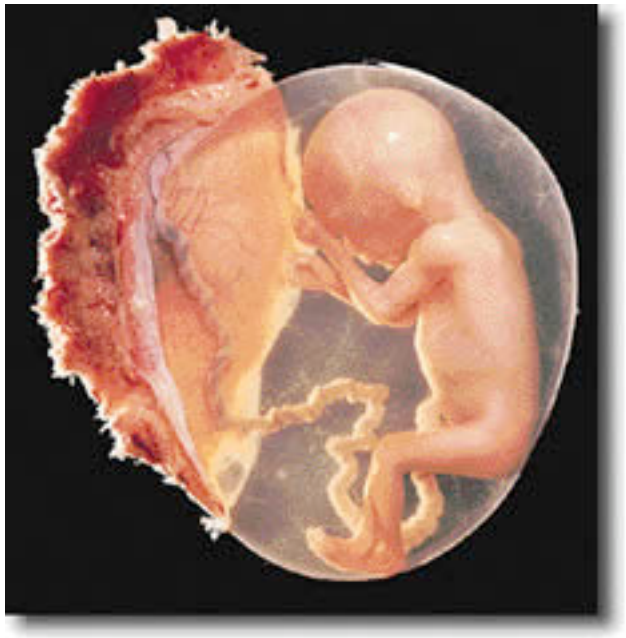


day 15-21

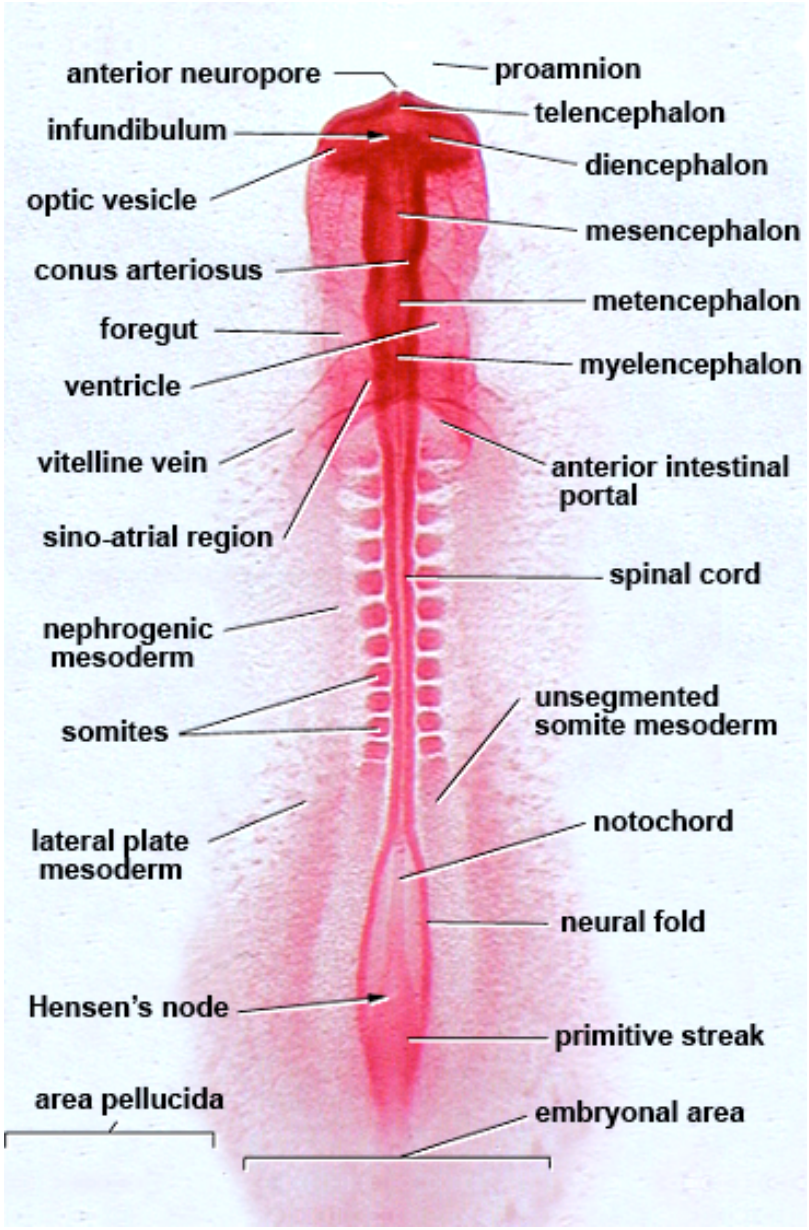


week 4

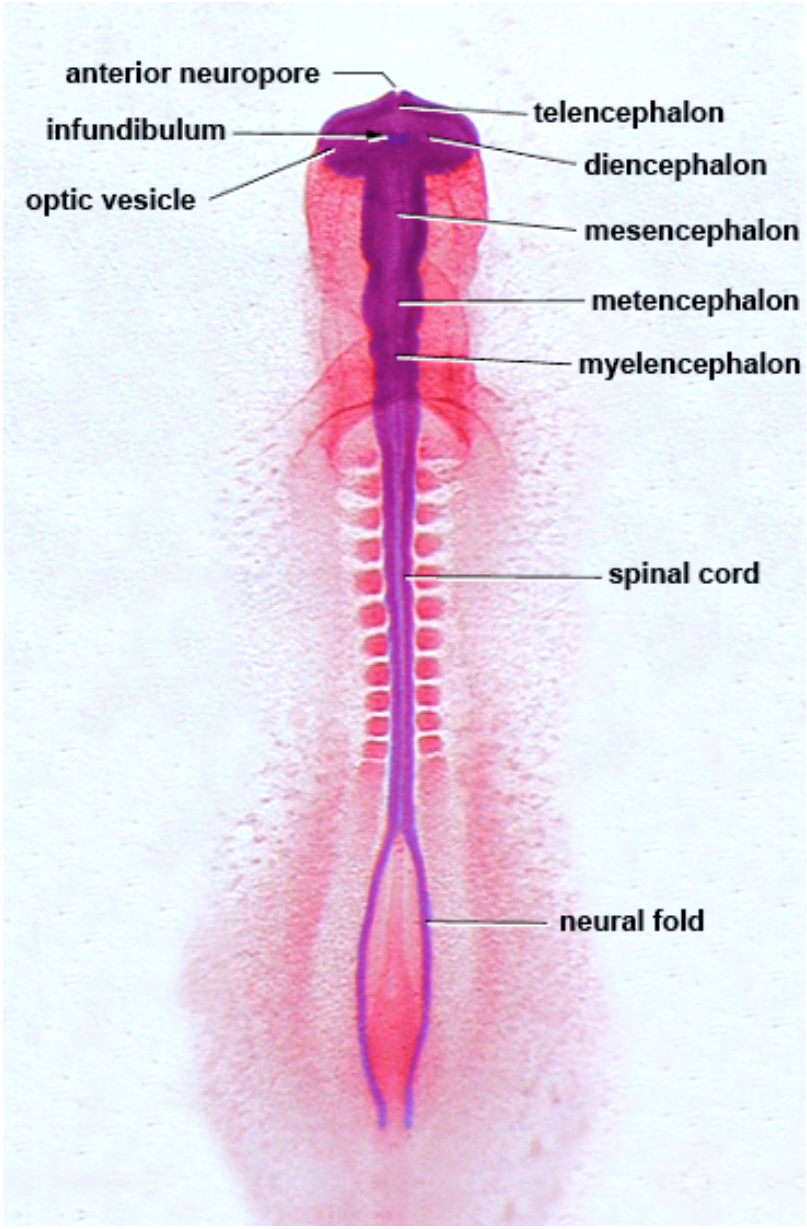
week 7-organs formed
(except brain and lung



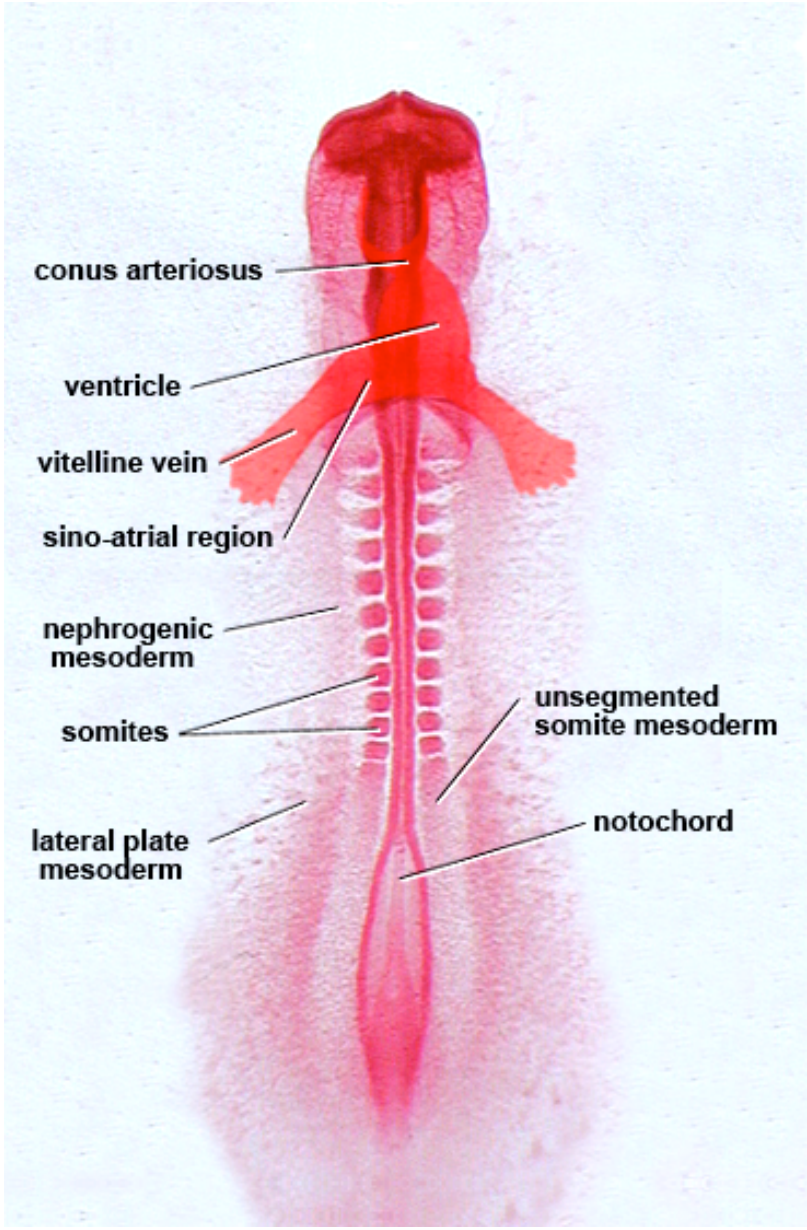
week 9-40
brain and lung continue to develop


anterior neuropore
proamnion
telencephalon
infundibulum
diencephalon
optic vesicle
mesencephalon
conus arteriosus
metencephalon
foregut
myelencephalon
ventricle
vitelline vein
anterior intestinal portal
sino-atrial region
spinal cord
nephrogenic mesoderm
unsegmented somite mesoderm
somites
notochord
lateral plate mesoderm
neural fold
Hensen's node
primitive streak
area pellucida
embryonal area

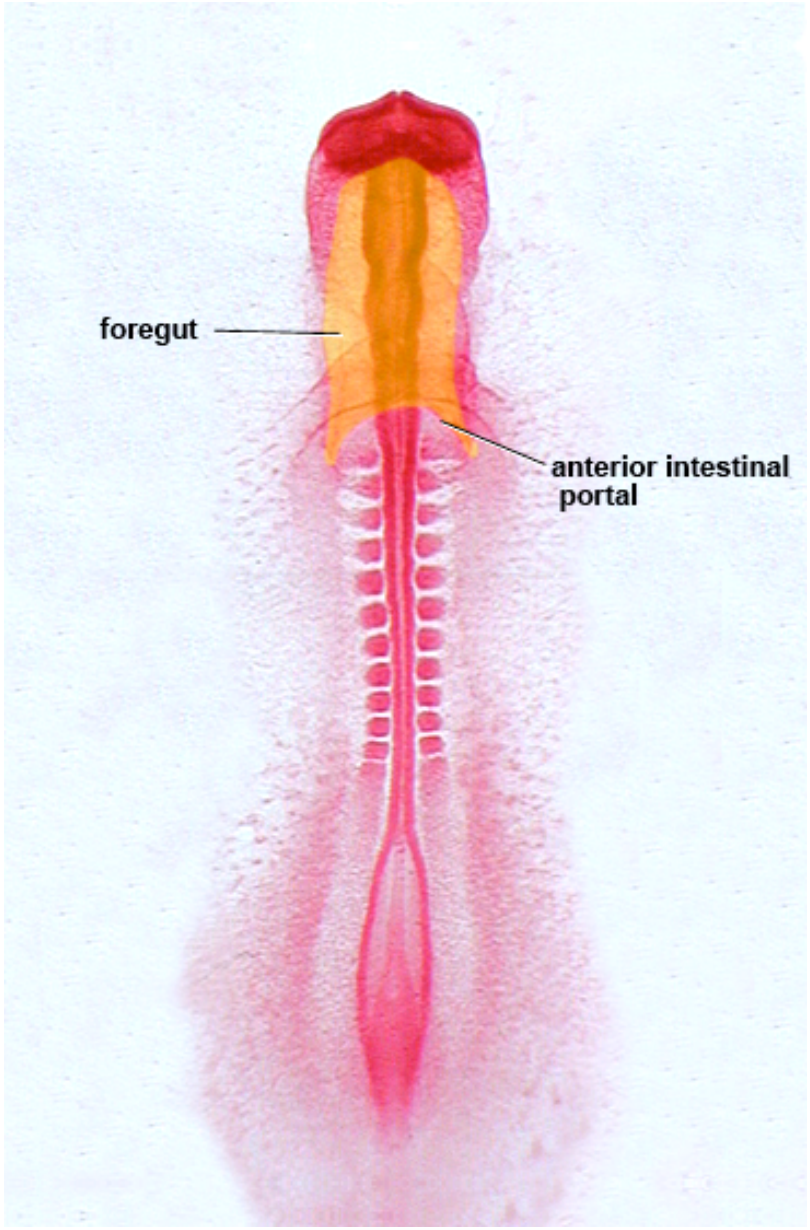
Ectodermal derivatives

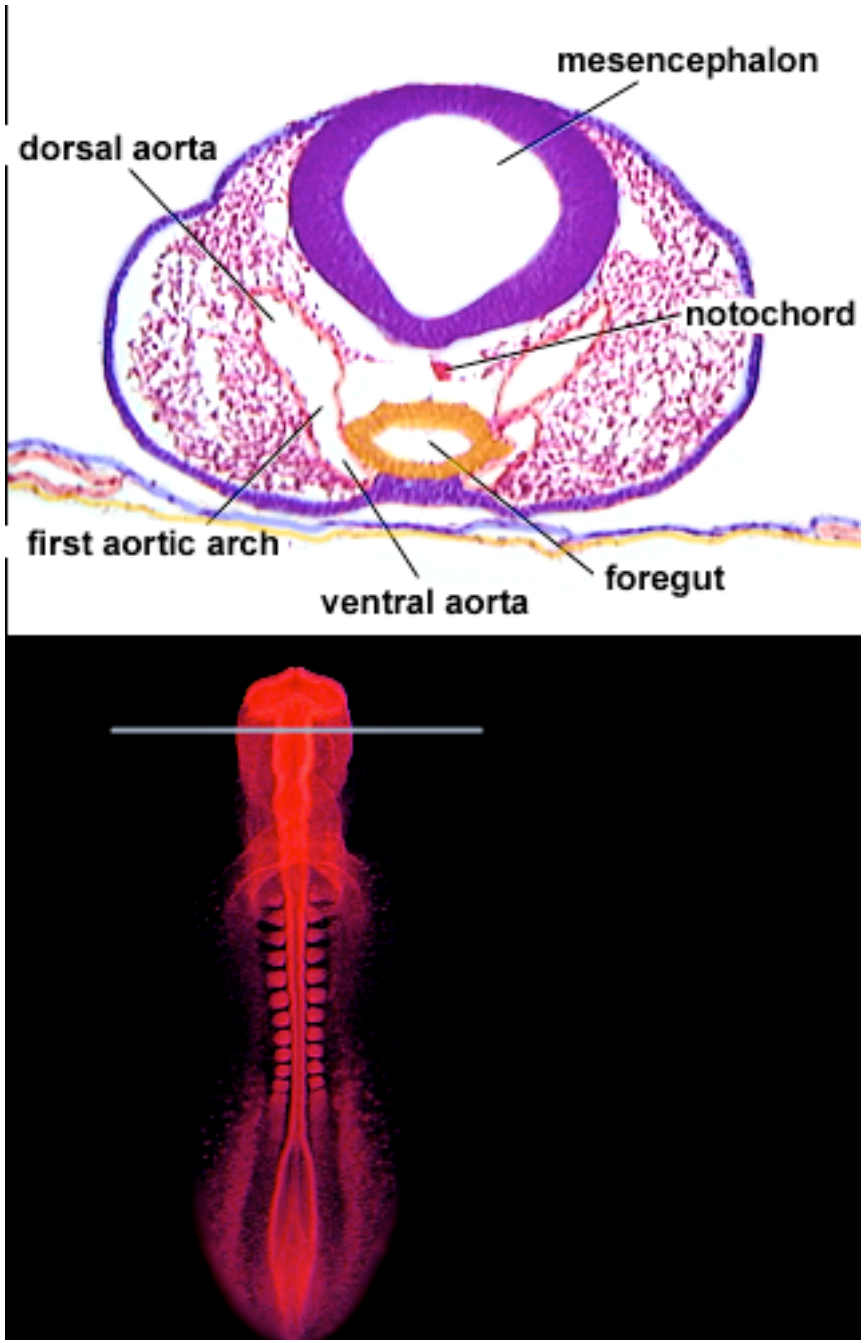


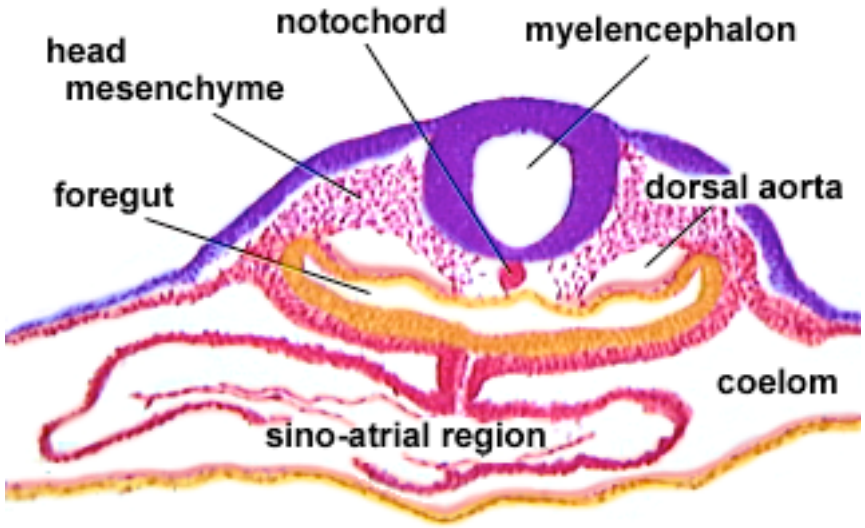
Mesodermal derivatives

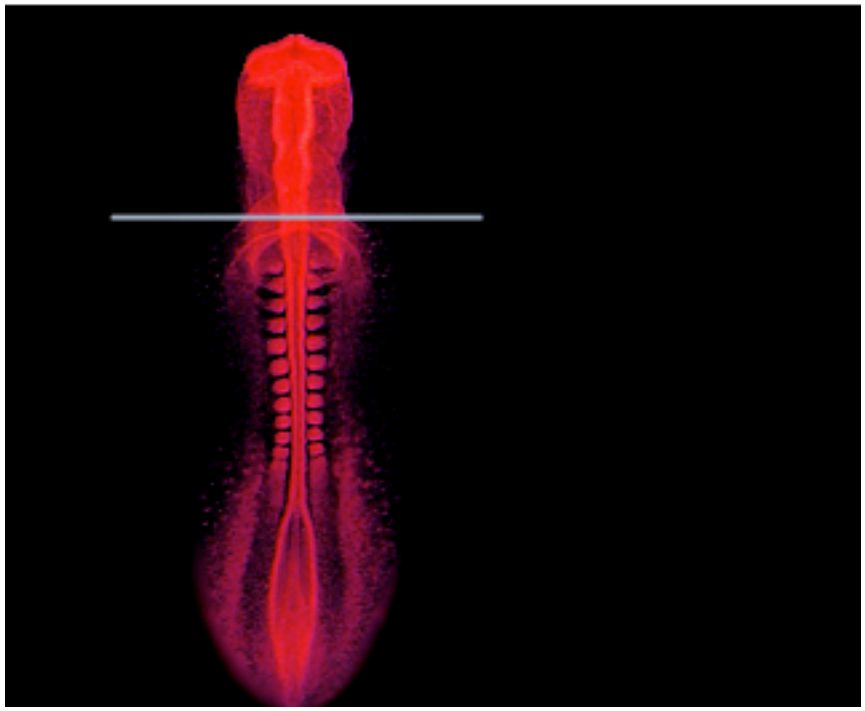


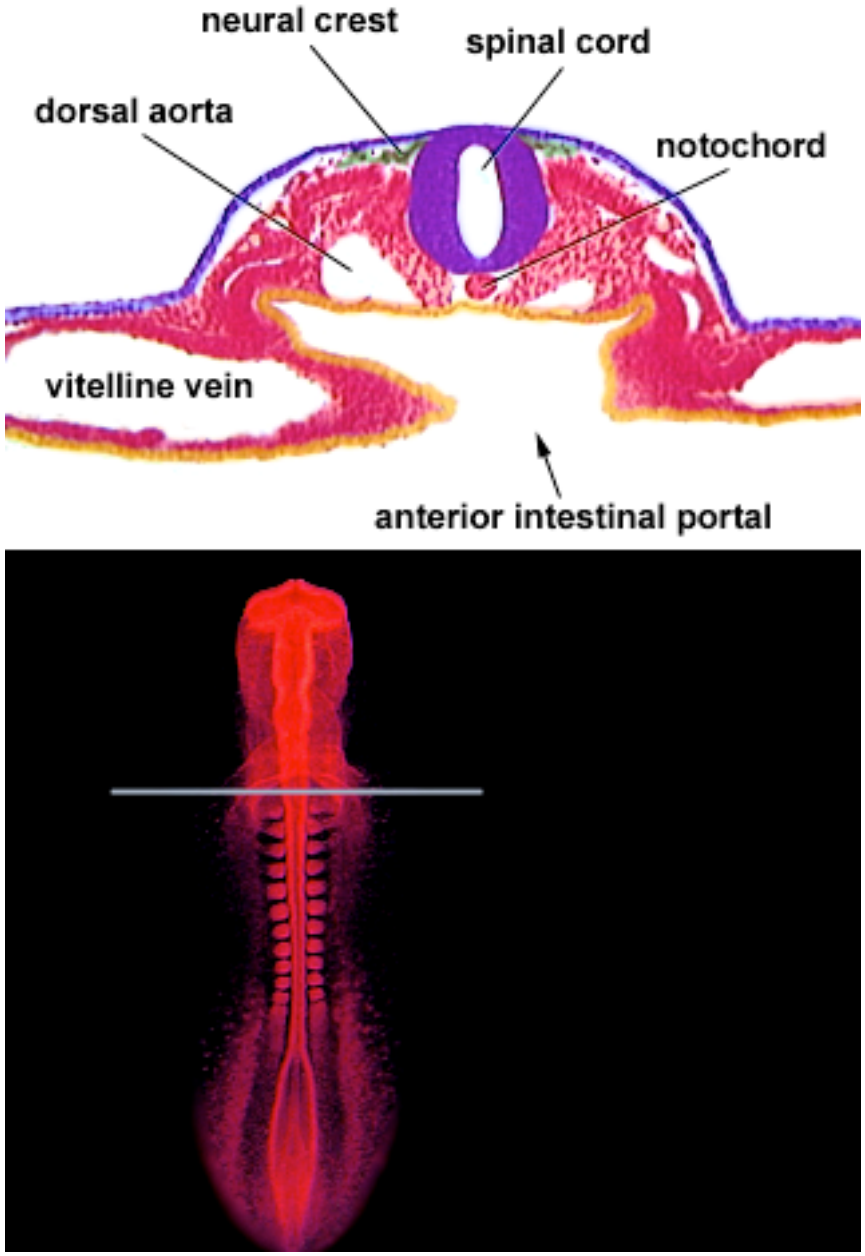
Endodermal derivatives

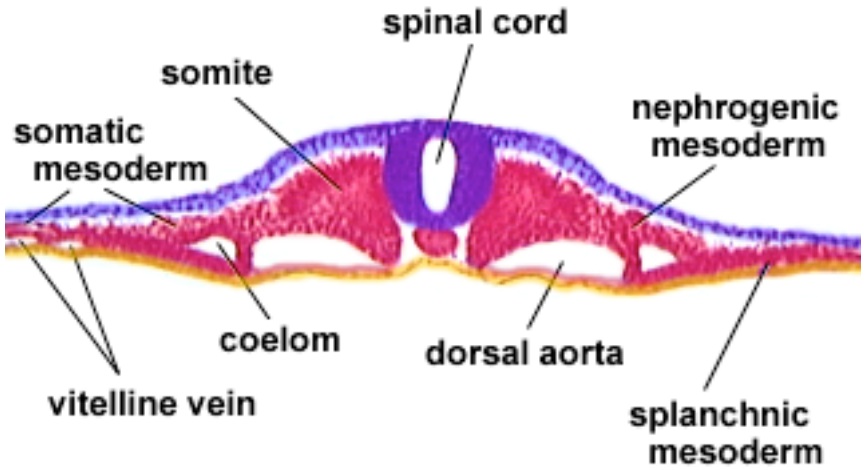


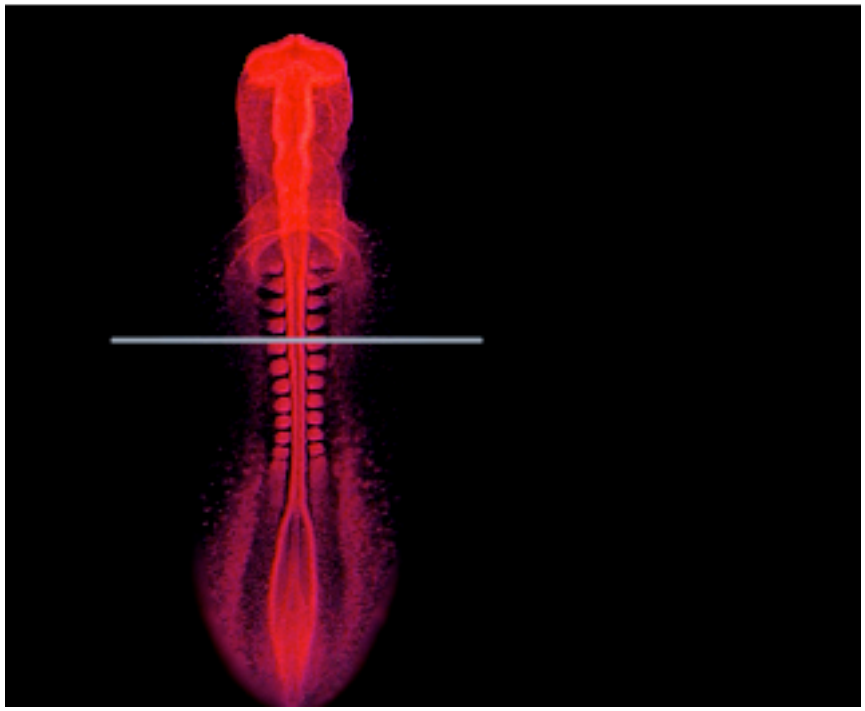

mesencephalon
dorsal aorta
notochord
first aortic arch
ventral aorta
foregut

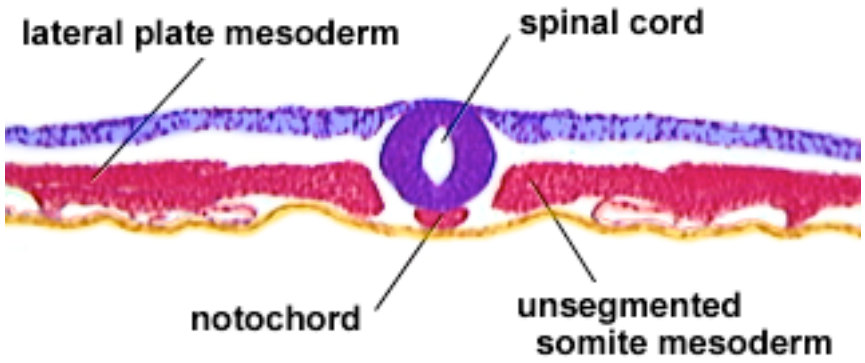

notochord
myelencephalon
head
mesenchyme
foregut
dorsal aorta
coelom
sino-atrial region

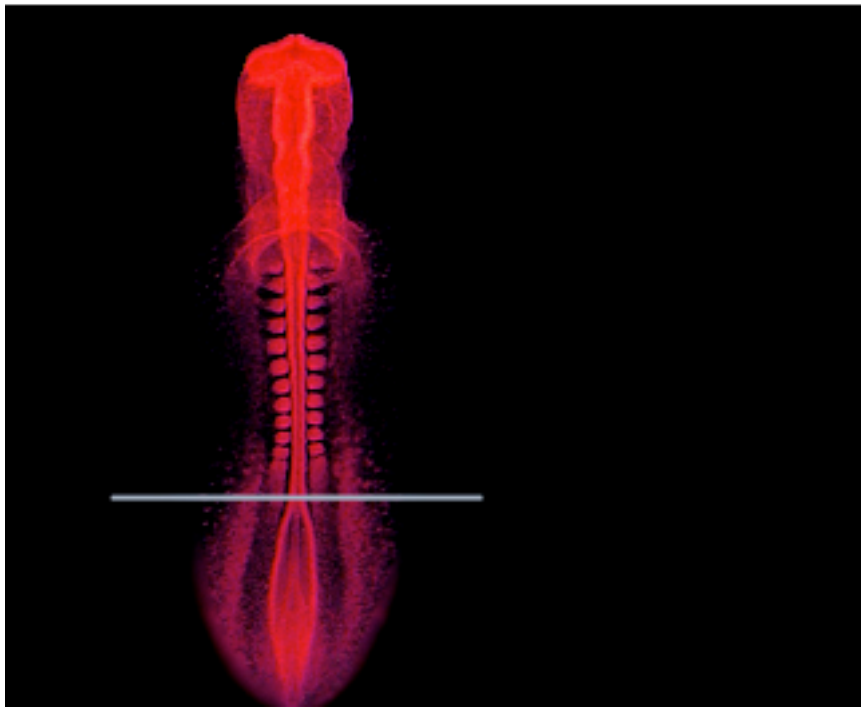


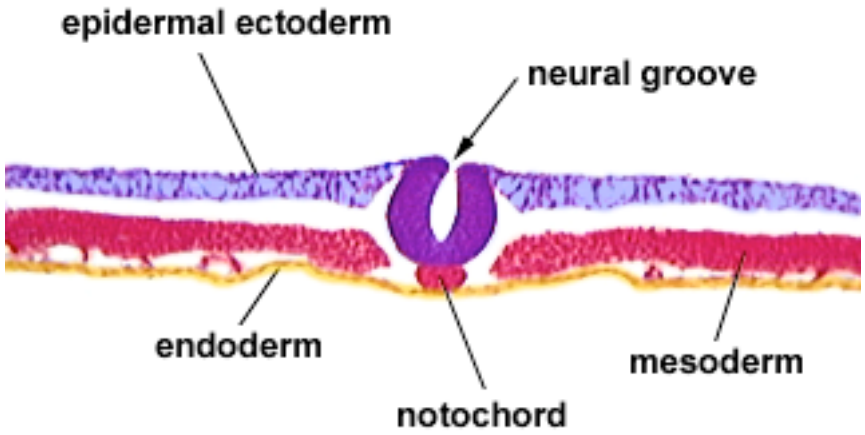

neural crest
spinal cord
dorsal aorta
notochord
vitelline vein
anterior intestinal portal


spinal cord
somite
somatic mesoderm
nephrogenic mesoderm
coelom
dorsal aorta
vitelline vein
splanchnic mesoderm




lateral plate mesoderm
spinal cord
notochord
unsegmented
somite mesoderm




epidermal ectoderm
neural groove
endoderm
notochord
mesoderm