

Lecture 10 &11 Intra embryonic mesoderm- Assistant prof. Eman Ali Hashim

Objective: Divisions of mesoderm

Somites, age estimation& somite differentiation.

Results of lateral & cephalocaudal folding of embryo

Mesoderm development:

1. Thin sheet of mesodermal cells on each side of ----- .
2. Cells close to the midline proliferate and form thick plate (paraxial mesoderm), the more laterally mesoderm is known as lateral plate. Intermediate mesoderm is located between them. Lateral mesoderm is divided into parietal & visceral (----- & ----- .)

By the beginning of 3rd week, paraxial mesoderm become organized into segments (somites).1st pair of somites arise in oocipital region of an embryo at approximately day 20 . Then added in craniocaudal sequence at a rate of 3 pairs/day until end of 5th week 42-44 pairs are present.

Somite differentiation

By the beginning of 4th week, compact arrangement of cells in somite will change. Cells in the ventral & medial walls of the somite lose their epithelial characteristics, become mesenchymal & shift their position to surround the neural tube and notochord. These cells form sclerotome.

Dorsal wall of the somite will differentiate to form , dermomyotome , then myotome & dermatome are formed.

-Dermatome --- Skin components & s/c tissues.

-Myotome ---- Muscles.

-Sclerotome ----- Cartilage & bones.

Differentiation of intermediate mesoderm

Cervical & upper thoracic region forms segmentally arranged cell clusters, nephrotome .

Caudal region forms nephrogenic cord which is unsegmented mass of tissue.

Excretory units of urinary system are developed from both segmented & unsegmented parts of intermediate mesoderm.

Clinical correlates

Teratogenesis associated with gastrulation :

Holoprosencephaly: As a result of high dose of alcohol at the beginning of 3rd week kill cells in the anterior midline of germ disc, producing a deficiency of craniofacial structures(eyes, brain)

Caudal dysgenesis: insufficient mesoderm is formed in the caudal most region of the embryo. abnormalities in lower limbs, urogenital system& lumbosacral vertebrae.

Further development of trophoblast

Primary , secondary & tertiary villi (definitive placental villi). cells are entirely surround the trophoblast & be in direct contact with endometrium. (Cytotrophoblastic shell)

*Radial appearance of tertiary & secondary villi at the end of 3rd week.

*Intervillous spaces are lined by syncytium

*Stem anchoring villi.

* Terminal villi .

Lateral folding of embryo

With the development of somites, lateral folding results in a large portion of endoderm to be incorporated into the body of embryo.

GIT is the main organ system derived from endoderm.

Two branches of lateral plate line the intra embryonic cavity & surround the organs.

Parietal ----- of ----- plate mesoderm, together with ectoderm will form lateral & ventral body wall.

The visceral layer of lateral plate mesoderm, together with endoderm will form the wall of gut.

Cephalo caudal folding

With the development & growth of brain vesicles, the embryonic disc begins to bulge into the amniotic cavity.

*Head & tail folds.

*Large portion of endoderm is incorporated into the body of embryo. Tube like structure, primitive gut.(foregut, midgut & hindgut) connected to ---- by -----
-----.

*Rupture of oropharyngeal membrane in the 4th week of development, whereas cloacal mem. Breaks down in the 7th week to create anal opening.

* partial incorporation of allantois.

Blood cells and blood vessels

Blood vessels form in 2 ways:

Vasculogenesis : vessels arise from blood islands.

Angiogenesis: New vessels sprout from existing ones.

The first blood islands appear in the wall of yolk sac at week 3 of development.

What are blood islands?

Mesodermal cells differentiate and form hemangioblast (angioblast) . These cells aggregate forming angiogenic cell clusters.

Centrally located cells will form blood cells .

Peripherally located cells will form flattened endothelial cells.

Both cells form blood islands.

Cardiogenic area developed in the visceral branch of lateral mesoderm shared with intra embryonic coelom.

Derivatives of mesoderm

Tissue & organs of mesodermal origin are:

- * C.T, cartilage & bones.
- * Muscles.
- * Blood & lymph cells.
- * Blood , lymph vessels& wall of the heart.
- * Kidneys & gonads.
- *Cortical part of adrenal gland.
- * Spleen.

Embryonic period (3rd to 8th week)

1st & 2nd month

External appearance of embryo during the 1st month, is characterized by the presence of somites & pharyngeal arches (swelling on the external surface of pharynx). At the end of 4th week, 28 somites are present.

Age estimation during the 2nd month by CRL.

CRL is crown- rump length , measurement length of embryo from the vertex of skull to the midpoint between apices of buttocks.

External features of an embryo during 2nd month

- * External appearance is changed greatly , presence of face with ears , nose & eyes.
- * Formation of limb buds paddle shaped at the beginning of 5th week. Terminal portion of buds flattens & be separated from the proximal. 4 grooves or rays separate 5 slightly thicker areas. These development appear in the hand first & then in the foot.

Derivatives of endoderm

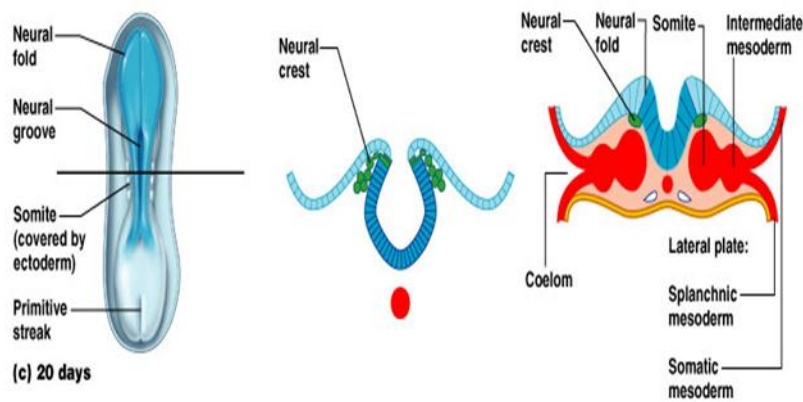
Epithelial lining of GIT.

Epithelial lining of respiratory tract.

Parenchyma of thyroid, parathyroid, liver & pancreas.

Epithelial lining of urinary bladder & urethra.

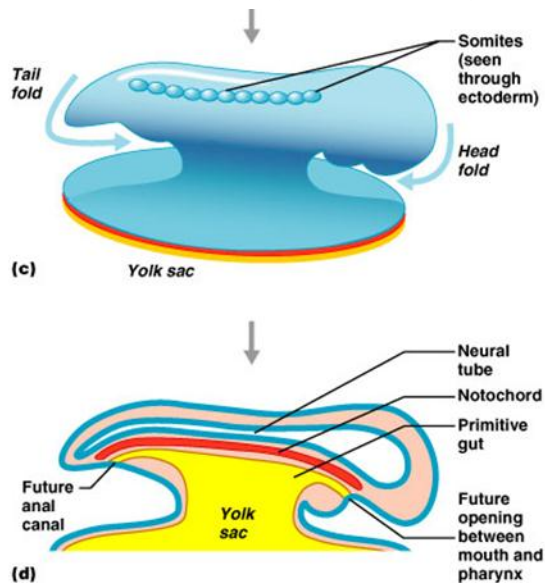
Epithelial lining of tympanic membrane.



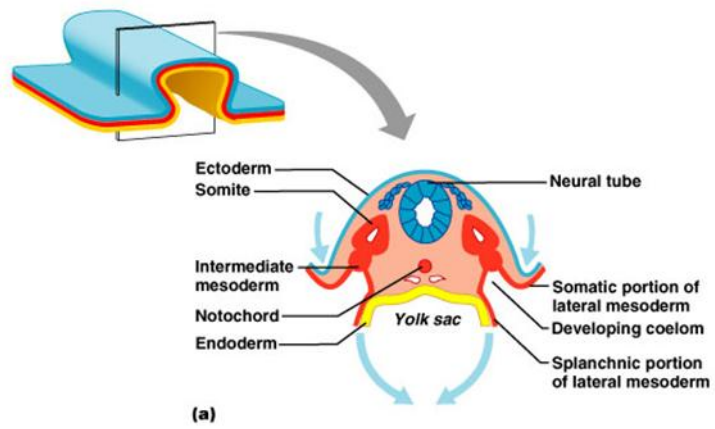
Clinical correlates

Most major organs & organ system are formed during ----- . This period is critical for normal development . (organogenesis)

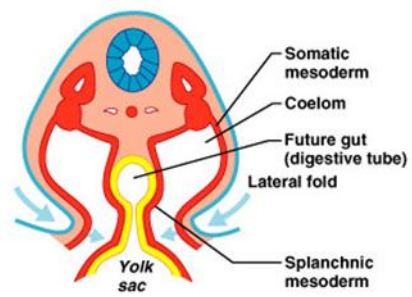
Stem cell populations are establishing each of the organ primordia, and these interactions are sensitive to any harmful factors. During embryonic period , most



birth defects are induced.



(a)



(b)