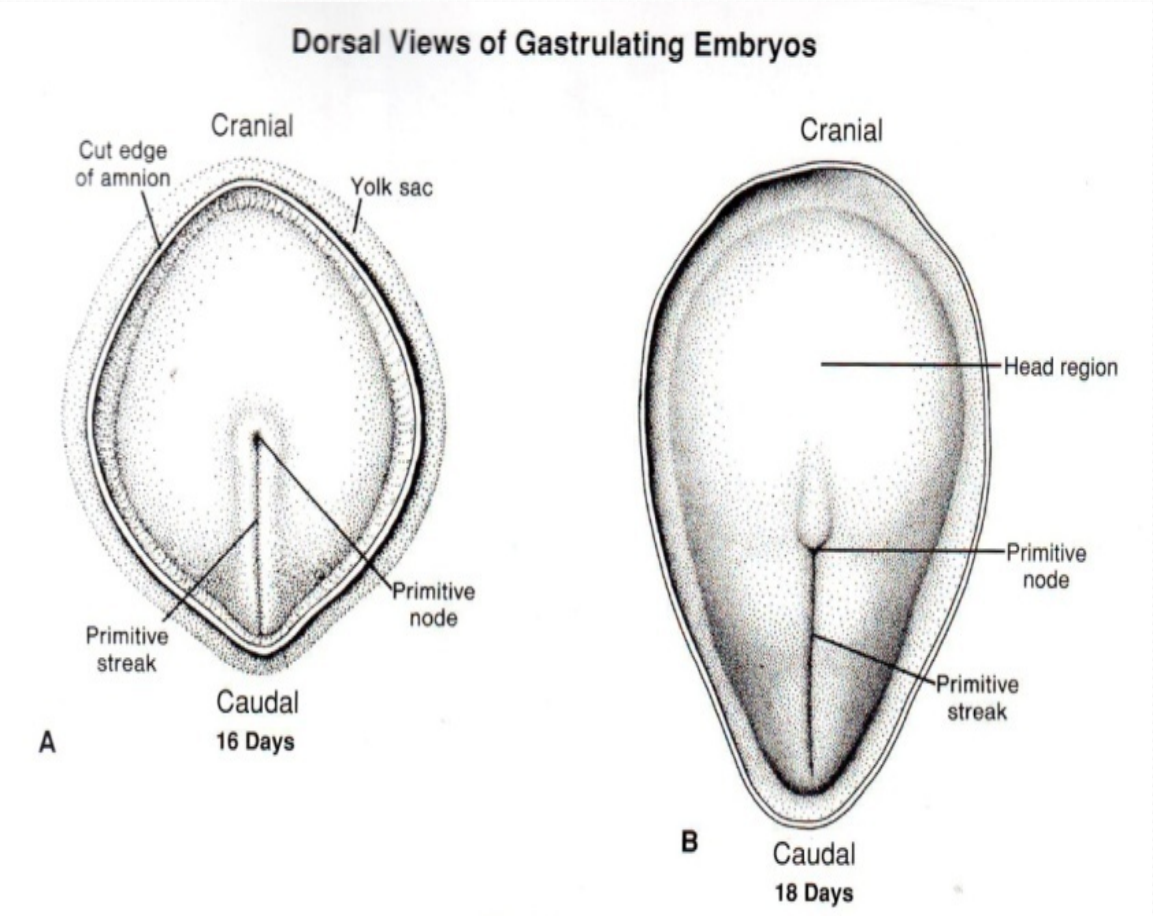
Third to Eighth Week: The Embryonic Period

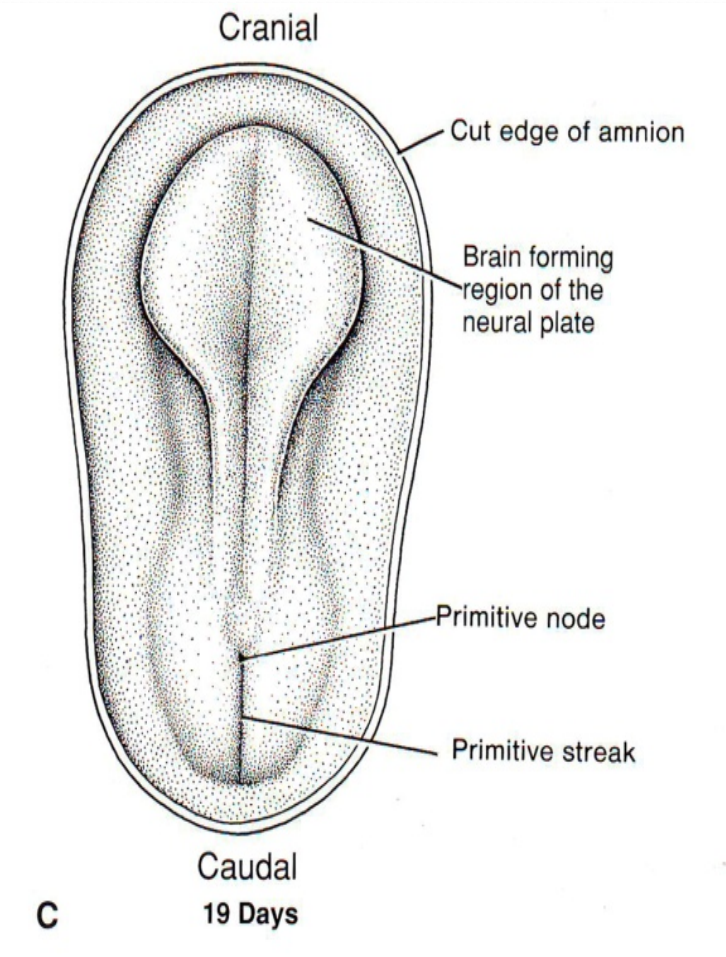
The **embryonic period** or period of **organogenesis**

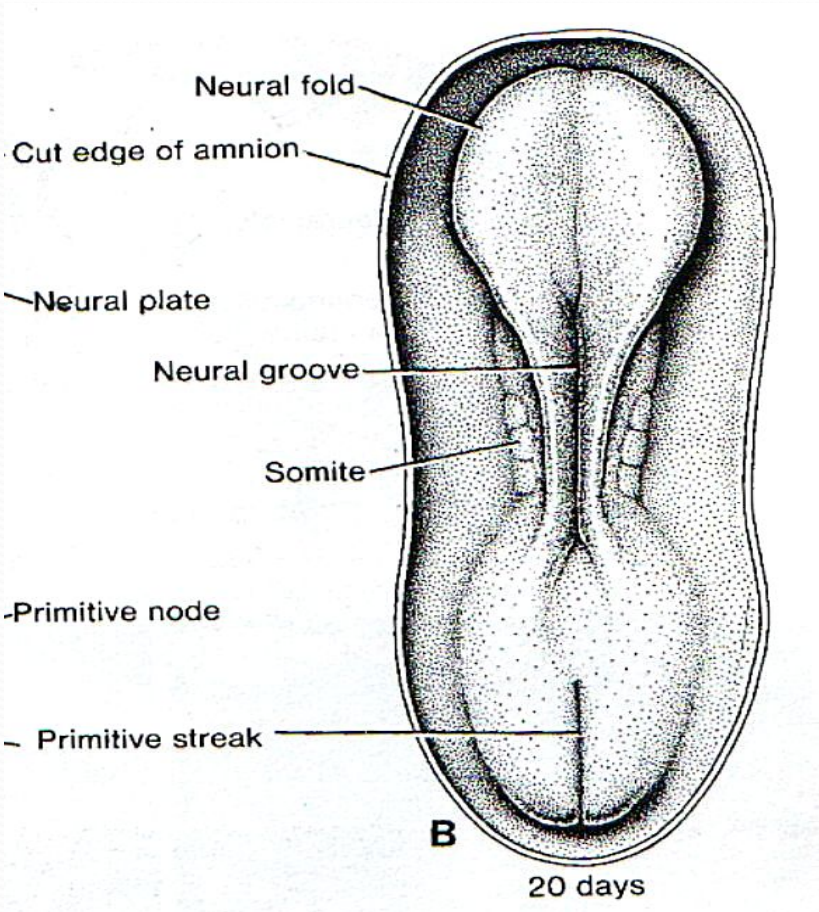
Derivatives of the Ectodermal Germ Layer

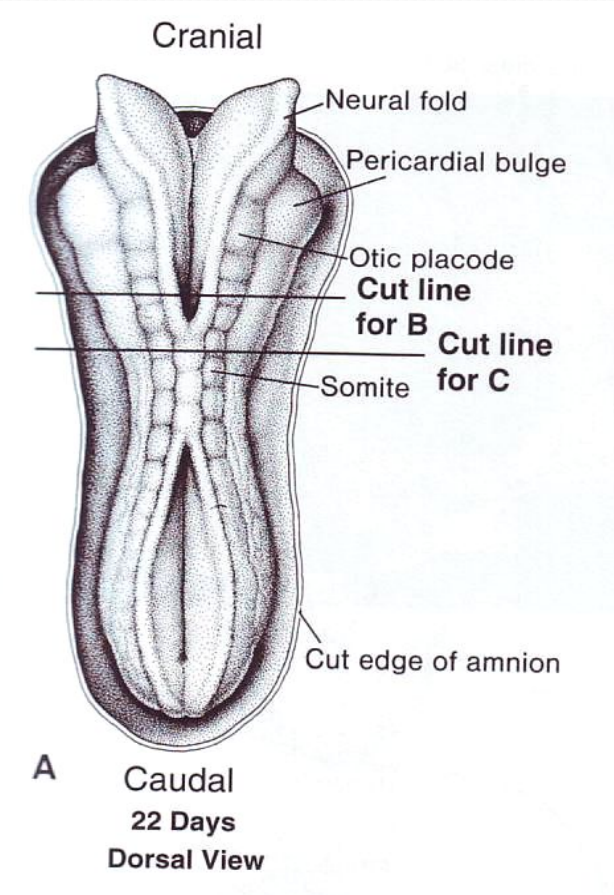
NEURULATION

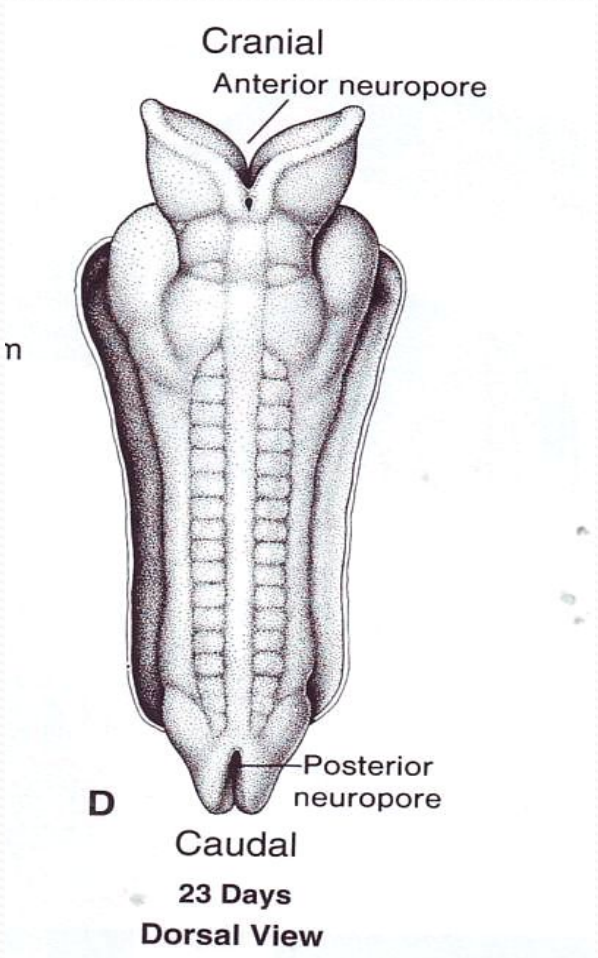


NEURULATION

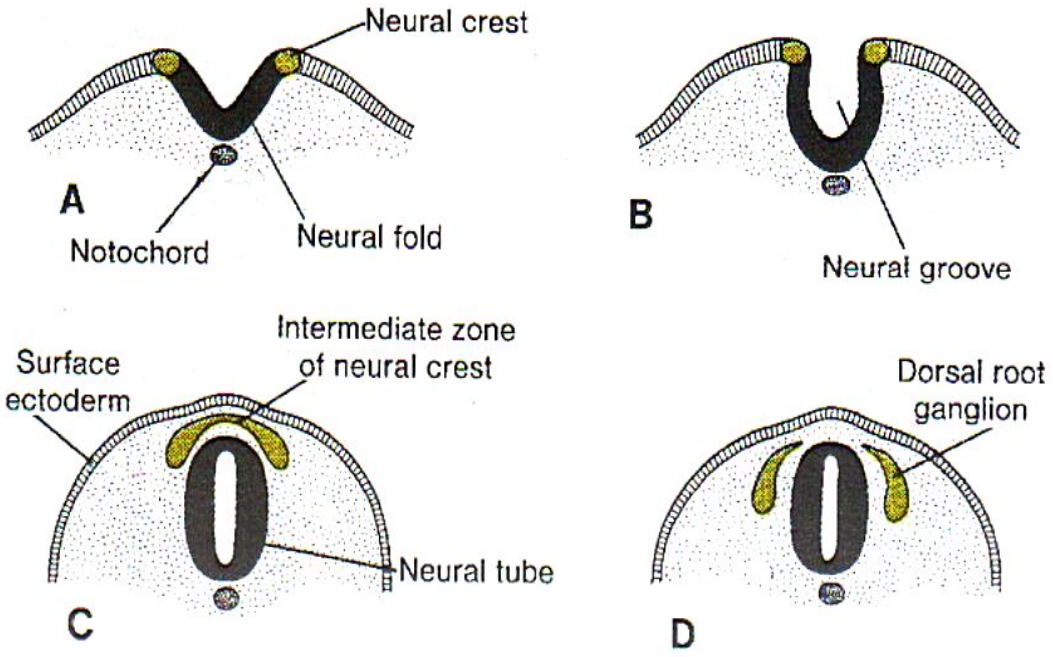





Cranial
Neural fold
Pericardial bulge
Otic placode
Cut line for B
Cut line for C
Somite
Cut edge of amnion
A
Caudal
22 Days
Dorsal View


Cranial
Anterior neuropore
Posterior neuropore
D
Caudal
23 Days
Dorsal View

Neurulation and neural crest

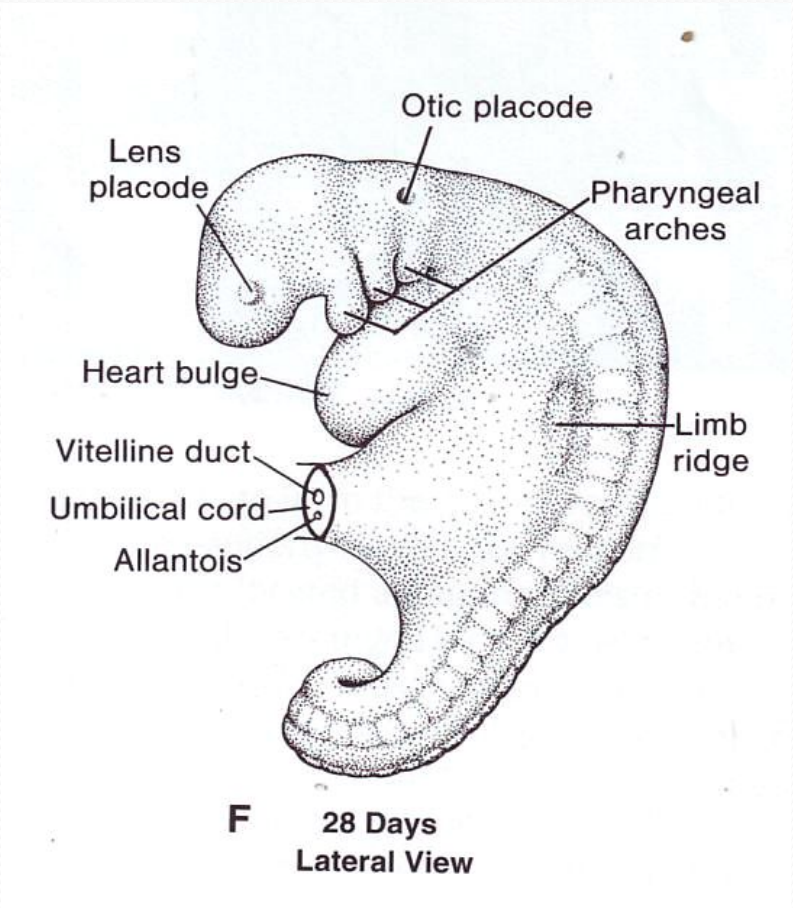


Crest cells from the **trunk region** leave the neural folds after closure of the neural tube and migrate along one of two pathways:

1. a dorsal pathway through the dermis, where they will enter the ectoderm through holes in the basal lamina to form **melanocytes** in the skin and hair follicles; and
2. a ventral pathway through the anterior half of each somite to become **sensory ganglia, sympathetic and enteric neurons, Schwann cells,** and **cells of the adrenal medulla**

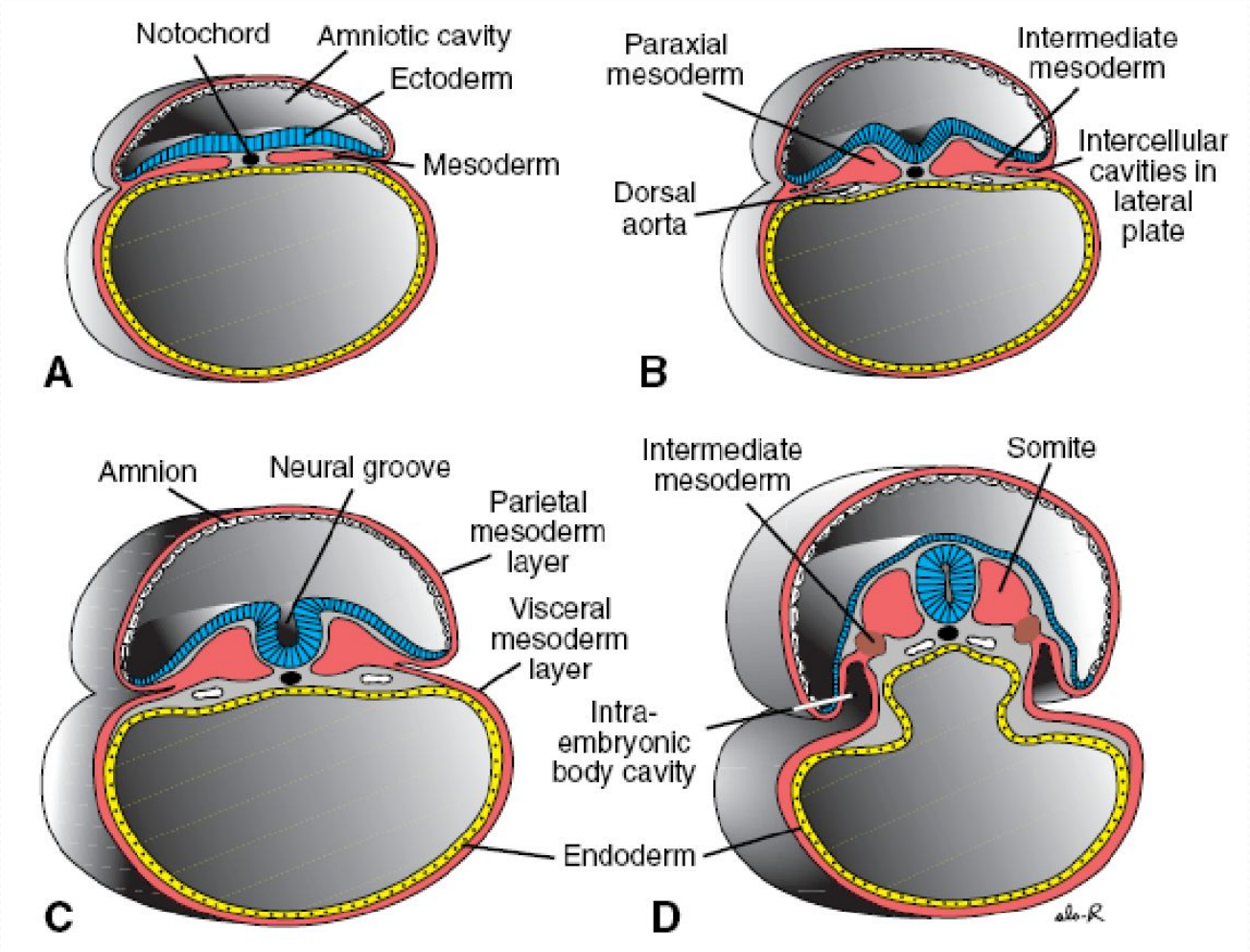
- Neural crest cells also form and migrate from cranial neural folds, leaving the neural tube before closure in this region. These cells contribute to the **craniofacial skeleton** as well as **neurons for cranial ganglia, glial cells, melanocytes,** and other cell types.

By the time the neural tube is closed, two bilateral **ectodermal thickenings,** the **otic placodes** and the **lens placodes**



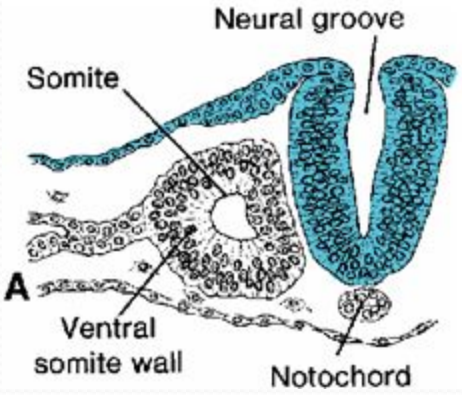
- In general terms, the ectodermal germ layer gives rise to organs and structures that maintain contact with the outside world:
- (*a*) the central nervous system;
- (*b*) the peripheral nervous system;
- (*c*) the sensory epithelium of the ear, nose, and eye; and
- (*d*) the epidermis, including the hair and nails. In addition, it gives rise to subcutaneous glands, the mammary glands, the pituitary gland, and enamel of the teeth.

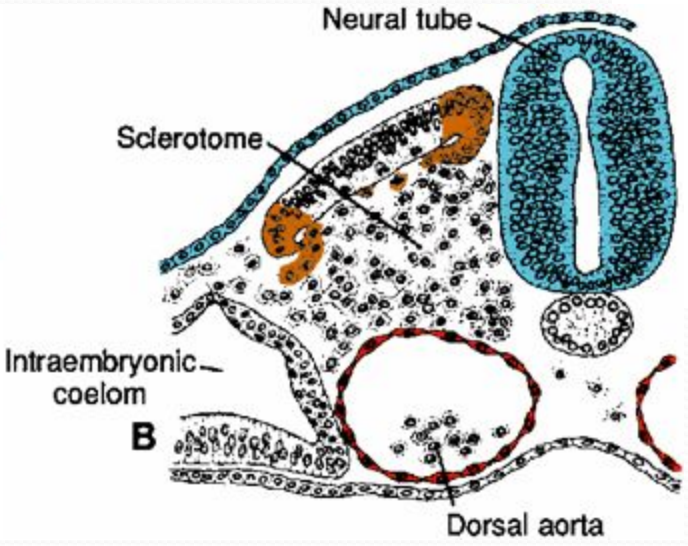
Derivatives of the Mesodermal Germ Layer

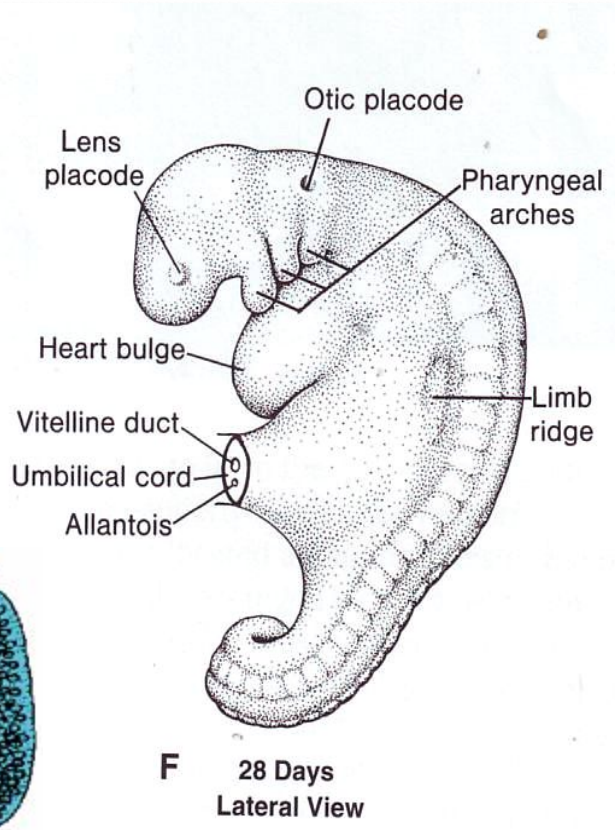


PARAXIAL MESODERM

- Organized into segments known as: Somitomeres
- In the Head region known as: Neuromeres
- In other places known as: Somites

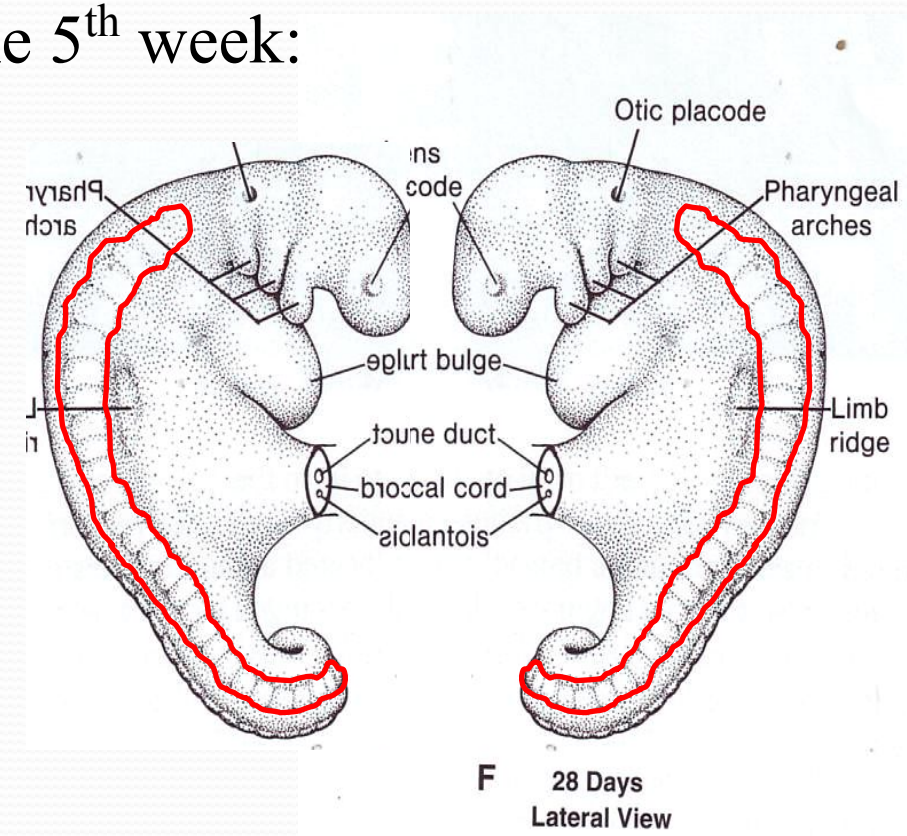




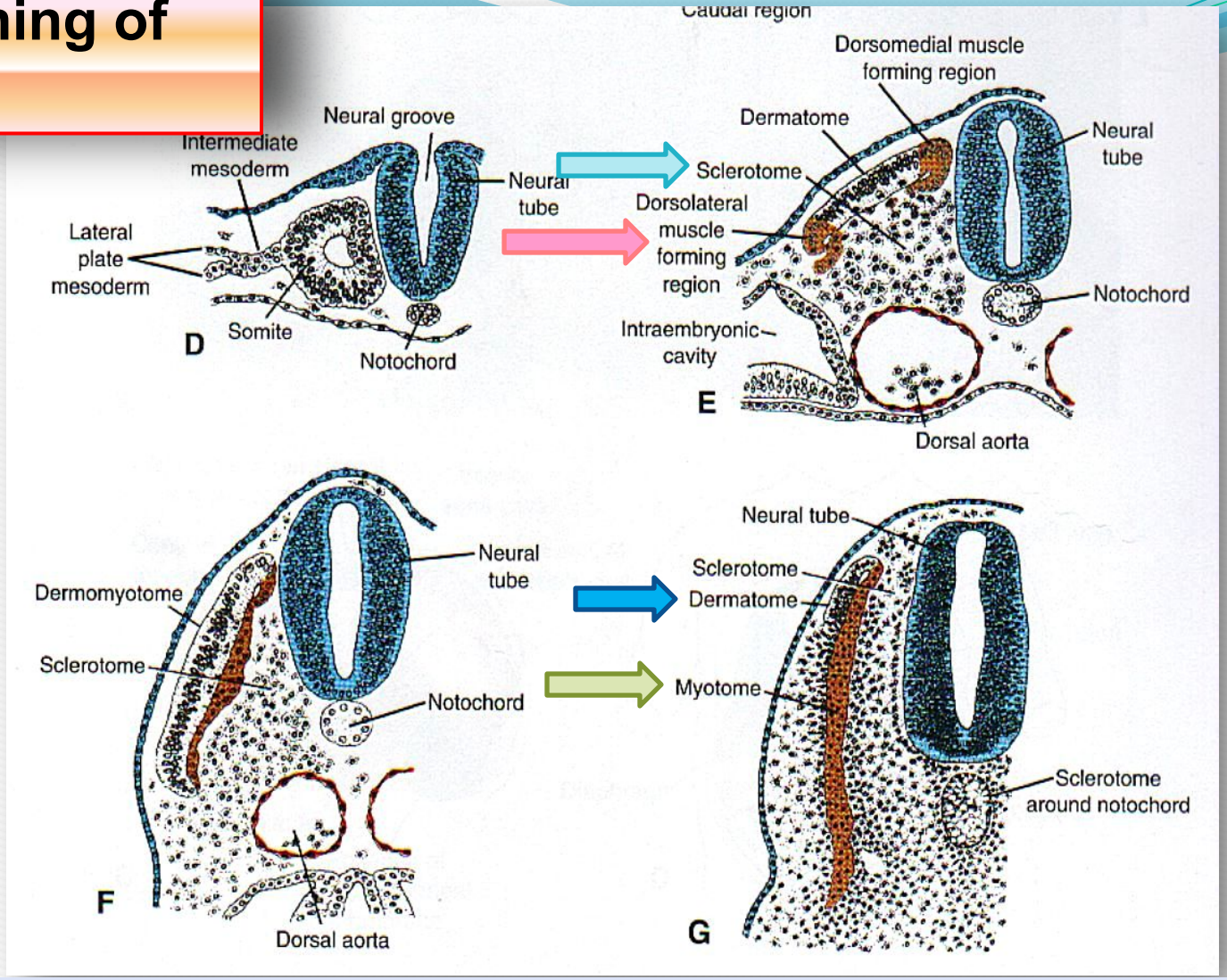


PARAXIAL MESODERM

- The somites developed as pairs
- The 1st pair appears at the 20th day of development
- Three pairs appear daily
- 42 to 44 pairs at the end of the 5th week:
  - 4 occipital
  - 8 cervical
  - 12 thoracic
  - 5 lumbar
  - 5 sacral
  - 8-10 coccygeal



By the beginning of the 4th week



The remaining dorsal epithelium forms the dermatome, and together these layers constitute the dermomyotome

layer, the myotome

They will surround the spinal cord and notochord to form the vertebral column.

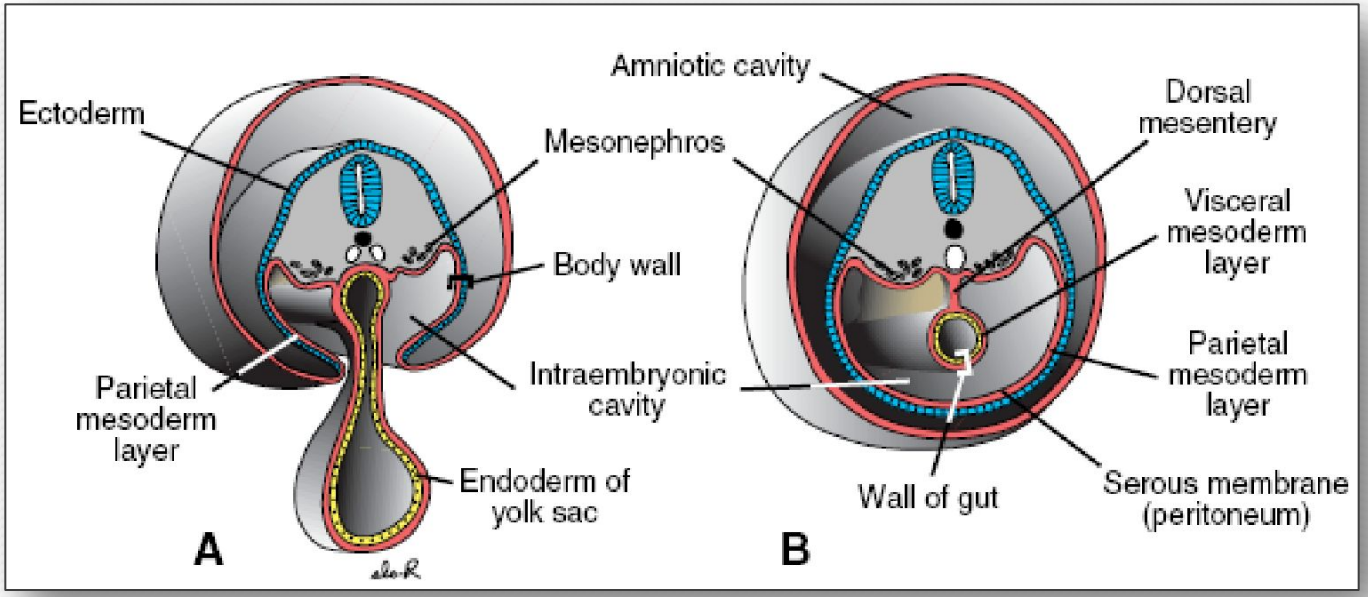
- Hence each somite forms its own **sclerotome** (the cartilage and bone component), its own **myotome** (providing the segmental muscle component), and its own **dermatome,** the segmental skin component.

- Each myotome and dermatome also has its own segmental nerve component.

INTERMEDIATE MESODERM

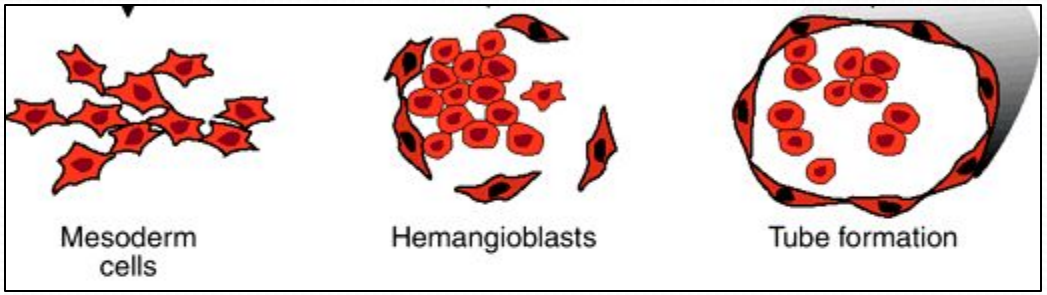
- Differentiates into urogenital structures.
- In cervical and upper thoracic regions, it forms segmental cell clusters (future **nephrotomes**), whereas more caudally, it forms an unsegmented mass of tissue, the **nephrogenic cord.** Excretory units of the urinary system and the gonads develop from this partly segmented, partly unsegmented intermediate mesoderm.

•LATERAL PLATE MESODERM



BLOOD AND BLOOD VESSELS

Blood vessels form in two ways: **vasculogenesis,** whereby vessels arise from blood islands, and **angiogenesis,** which entails sprouting from existing vessels.



blood islands arise from

mesoderm cells

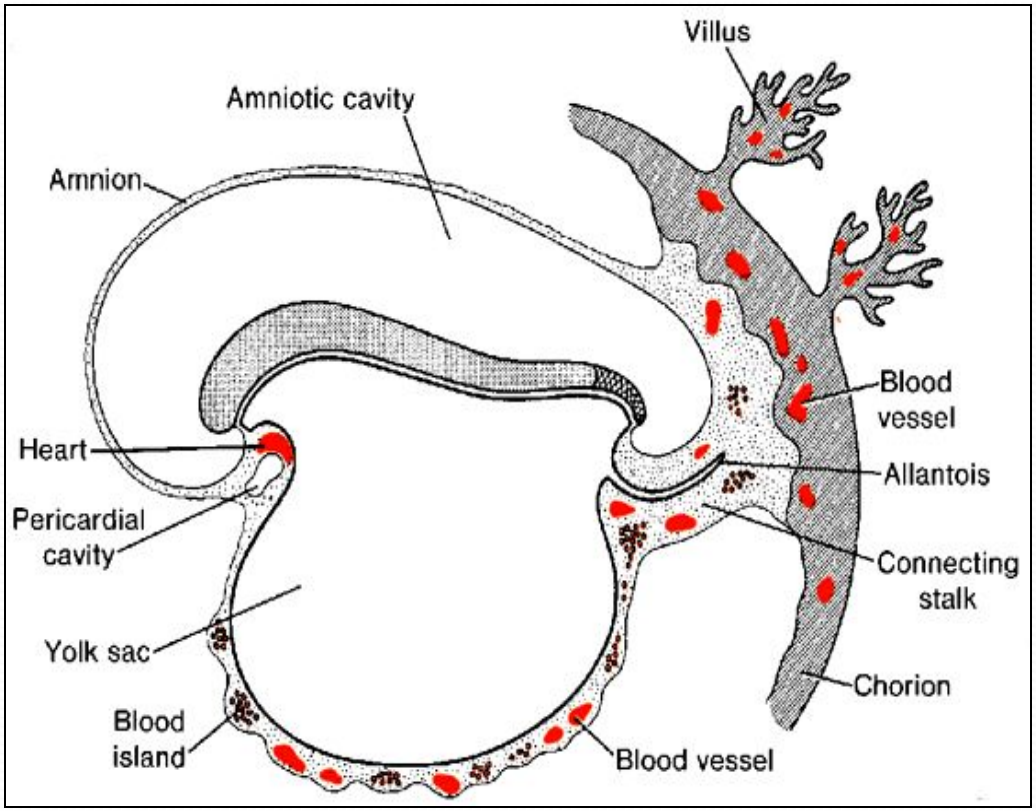
↓ FGF2

hemangioblasts

↙ ↓

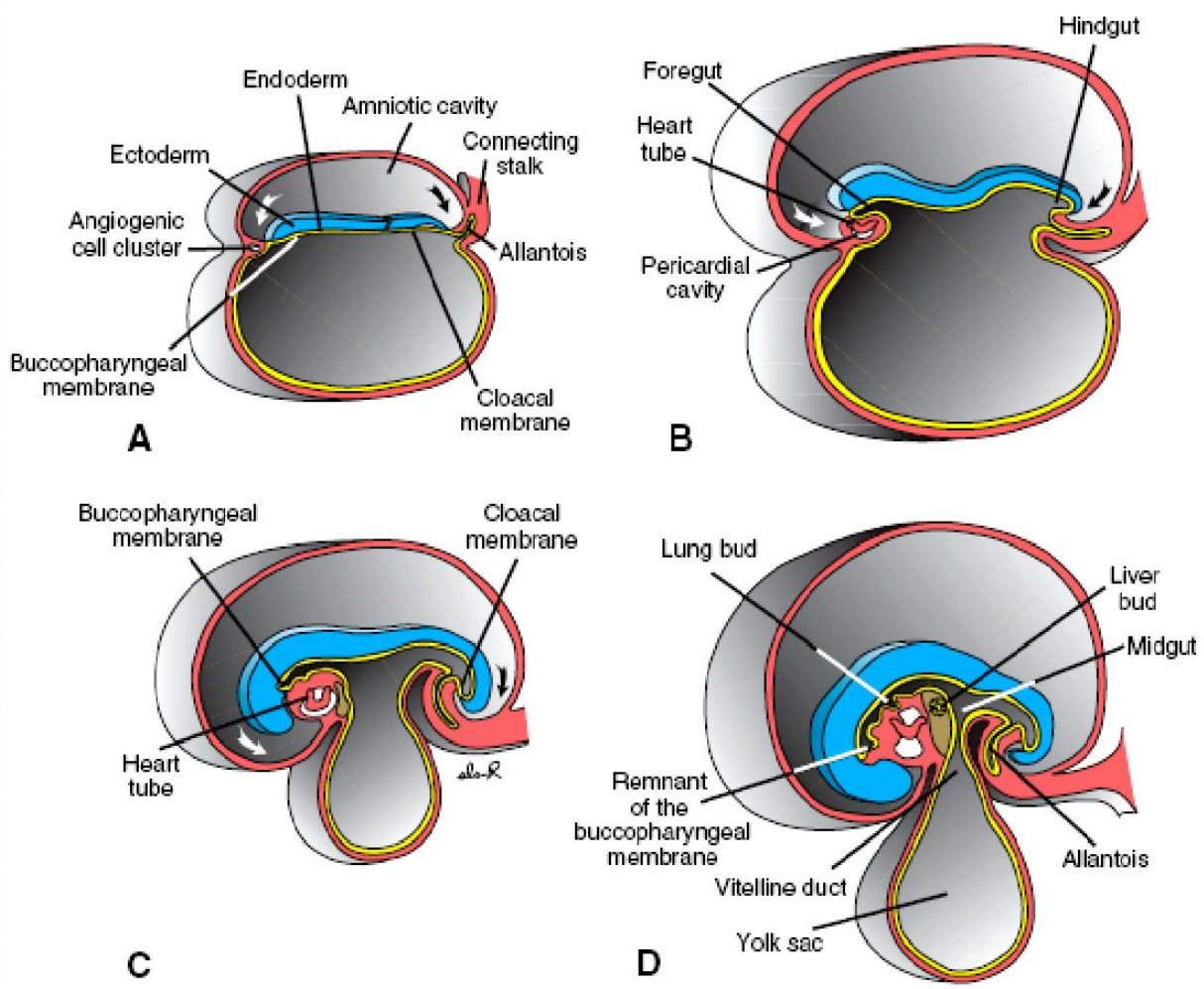
hematopoietic stem cells → blood cells

angioblasts ↓ VEGF → Endothelial cells of the primitive blood vessels

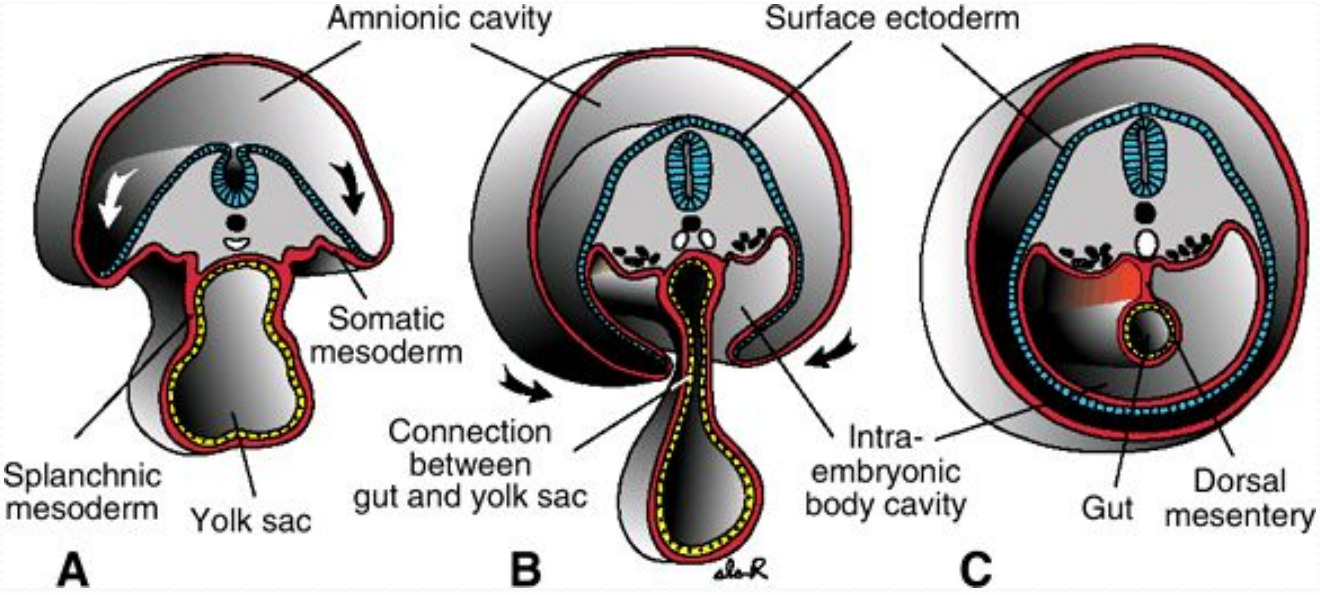


- **The first blood islands appear in mesoderm surrounding the yolk sac cavity (3rd week)**
- **Then, In the mesoderm of aorta-gonad-mesonephros region (AGM), these cells will colonized the liver of the fetus**
- **Later, stem cells from the liver will colonized the bone marrow**

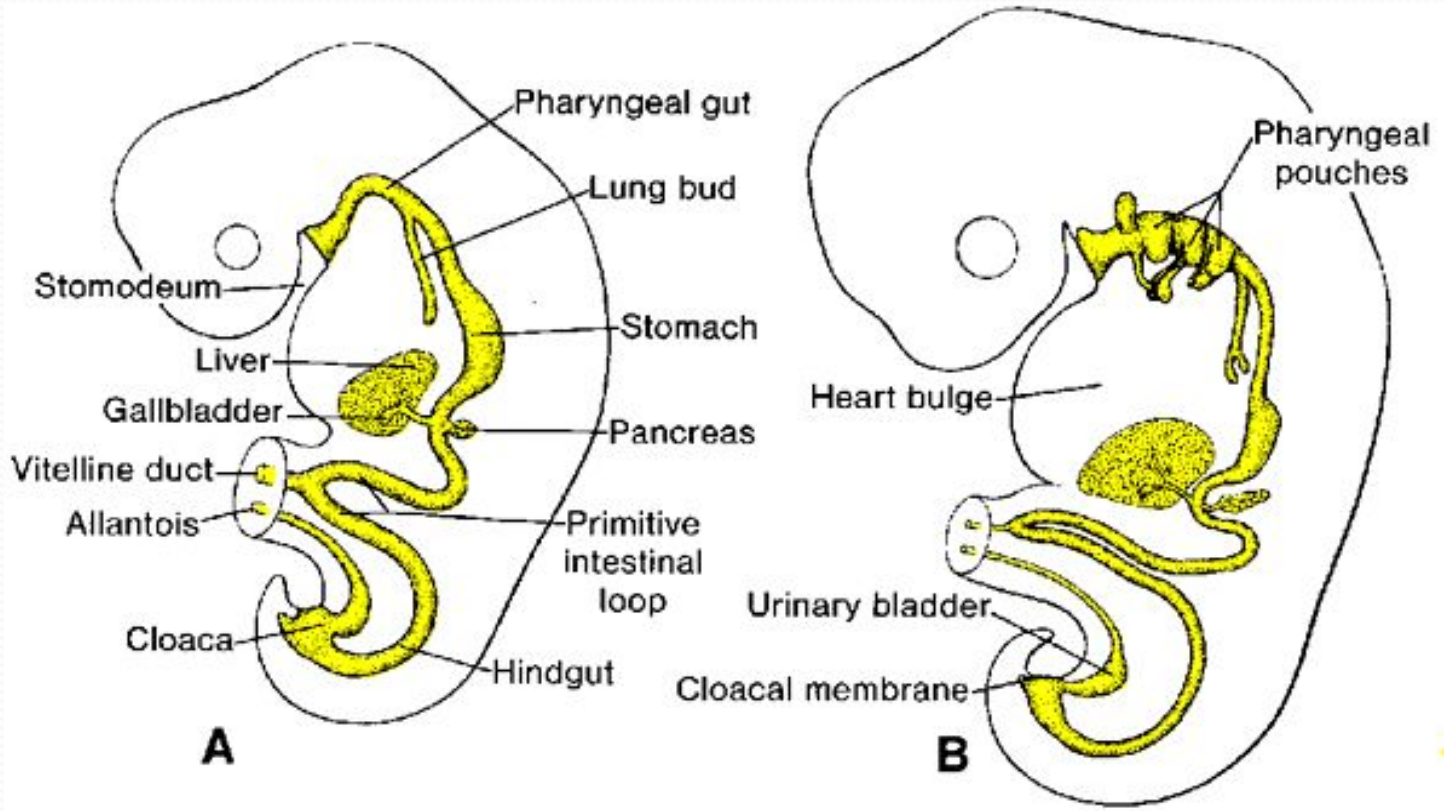
Derivatives of the Endodermal Germ Layer



Derivatives of the Endodermal Germ Layer



the endodermal germ layer initially forms the epithelial lining of the primitive gut and the intraembryonic portions of the allantois and vitelline duct. During further development, it gives rise to (*a*) the epithelial lining of the respiratory tract; (*b*) the **parenchyma** of the thyroid, parathyroids, liver, and pancreas (see Chapters 13 and 15); (*c*) the reticular stroma of the tonsils and thymus; (*d*) the epithelial lining of the urinary bladder and urethra; and (*e*) the epithelial lining of the tympanic cavity and auditory tube.


Pharyngeal gut
Lung bud
Stomodeum
Stomach
Liver
Gallbladder
Pancreas
Vitelline duct
Allantois
Primitive intestinal loop
Cloaca
Hindgut
A
Pharyngeal pouches
Heart bulge
Urinary bladder
Cloacal membrane
B

External Appearance during the Second Month

- the age of the embryo is then indicated as the **crown-rump length (CRL)** and expressed in millimeters. CRL is the measurement from the vertex of the skull to the midpoint between the apices of the buttocks.