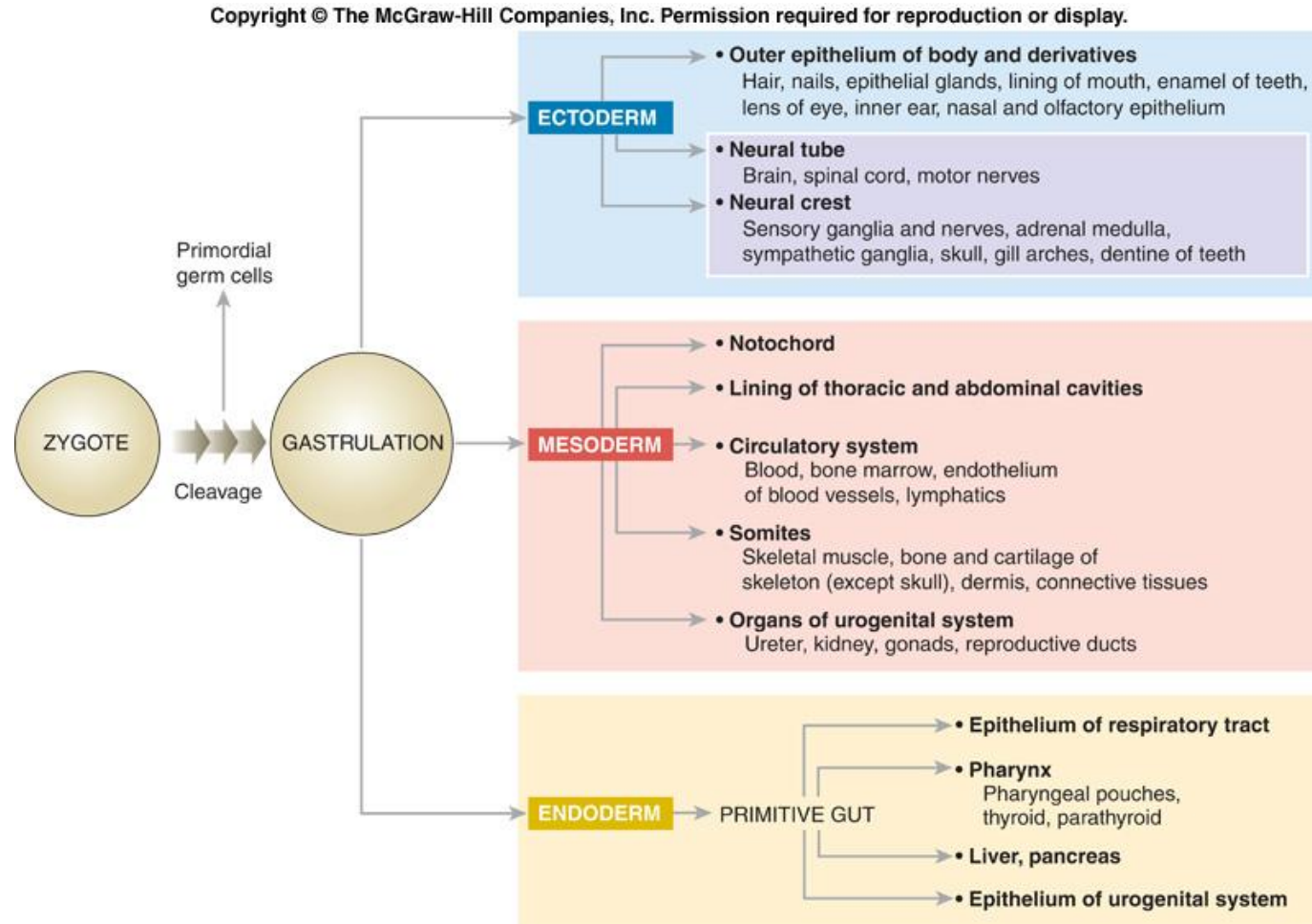


ORGANOGENESIS

Various regions of the three embryonic germ layers develop into the rudiments of organs during the process of organogenesis.

ORGANOGENESIS

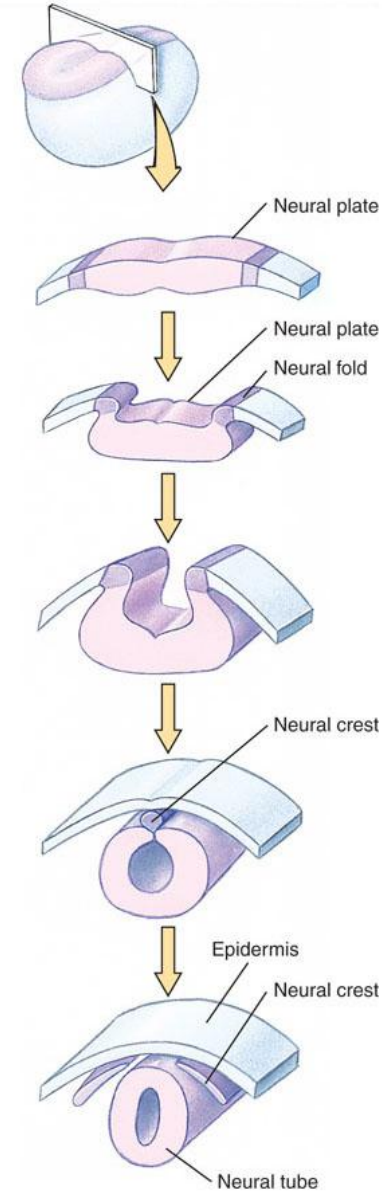
Many different structures are derived from the three embryonic germ layers during organogenesis.



DERIVATIVES OF ECTODERM: NERVOUS SYSTEM AND NERVE GROWTH

Just above the notochord (mesoderm), the ectoderm thickens to form a neural plate.

- Edges of the neural plate fold up to create an elongated, hollow neural tube.
 - Anterior end of neural tube enlarges to form the brain and cranial nerves.
 - Posterior end forms the spinal cord and spinal motor nerves.



DERIVATIVES OF ECTODERM: NERVOUS SYSTEM AND NERVE GROWTH

Neural crest cells pinch off from the neural tube.

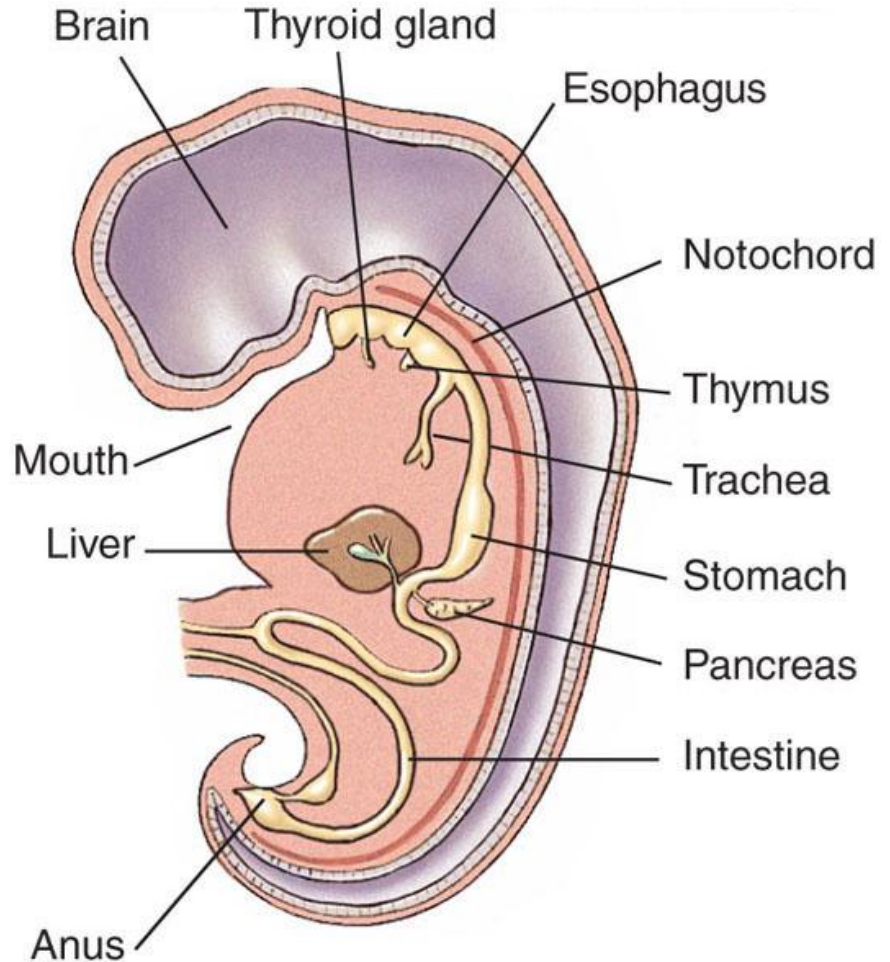
- Give rise to
 - Portions of cranial nerves
 - Pigment cells
 - Cartilage
 - Bone
 - Ganglia of the autonomic system
 - Medulla of the adrenal gland
 - Parts of other endocrine glands
- Neural crest cells are unique to vertebrates.
 - Important in evolution of the vertebrate head and jaws.

DERIVATIVES OF ENDODERM: DIGESTIVE TUBE AND SURVIVAL OF GILL ARCHES

During gastrulation, the archenteron forms as the primitive gut.

This endodermal cavity eventually produces:

- Digestive tract
- Lining of pharynx and lungs
- Most of the liver and pancreas
- Thyroid, parathyroid glands and thymus



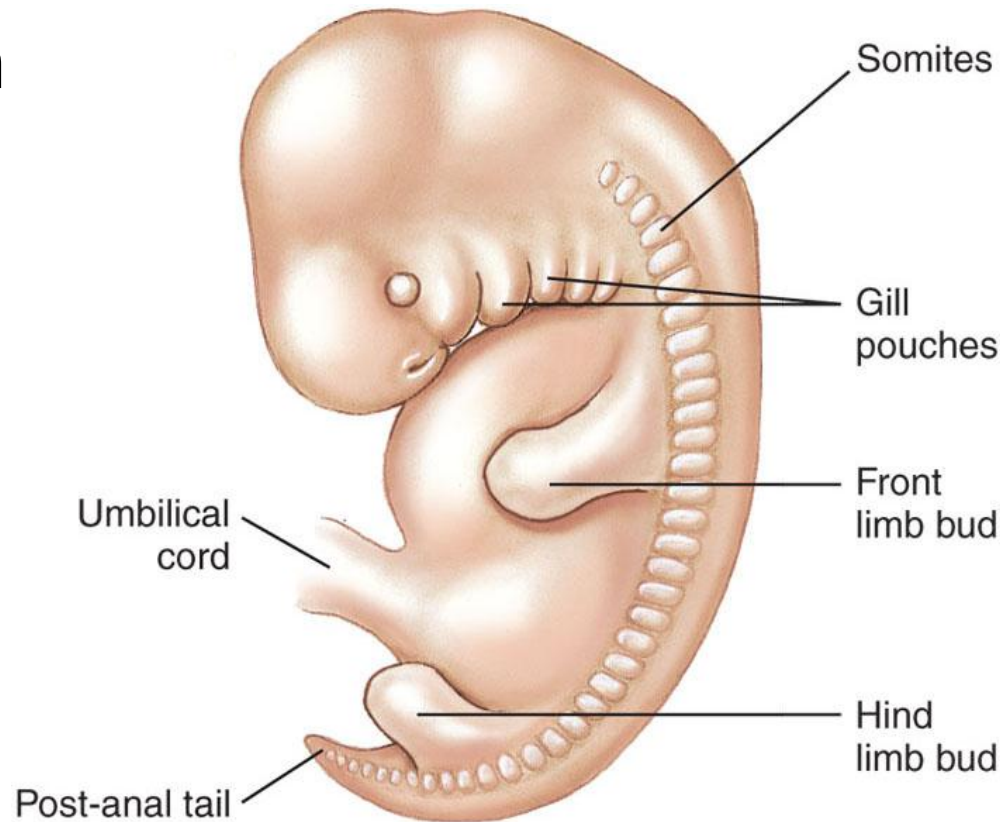
DERIVATIVES OF ENDODERM: DIGESTIVE TUBE AND SURVIVAL OF GILL ARCHES

Pharyngeal pouches are derivatives of the digestive tract.

- Arise in early embryonic development of all vertebrates.
- During development, **endodermally-lined** pharyngeal pouches interact with overlying **ectoderm** to form gill arches.
- In fish, gill arches develop into gills.
- In terrestrial vertebrates:
 - No respiratory function
 - 1st arch and endoderm-lined pouch form upper and lower jaws, and inner ear.
 - 2nd, 3rd, and 4th gill pouches form tonsils, parathyroid gland and thymus.

DERIVATIVES OF MESODERM: SUPPORT, MOVEMENT AND THE BEATING HEART

Most muscles arise from **mesoderm** along each side of the neural tube. The **mesoderm** divides into a linear series of somites (38 in humans).



DERIVATIVES OF MESODERM: SUPPORT, MOVEMENT AND THE BEATING HEART

The splitting, fusion and migration of somites produce the:

- Axial skeleton
- Dermis of dorsal skin
- Muscles of the back, body wall, and limbs
- Heart

Lateral to the somites the **mesoderm** splits to form the coelom.

