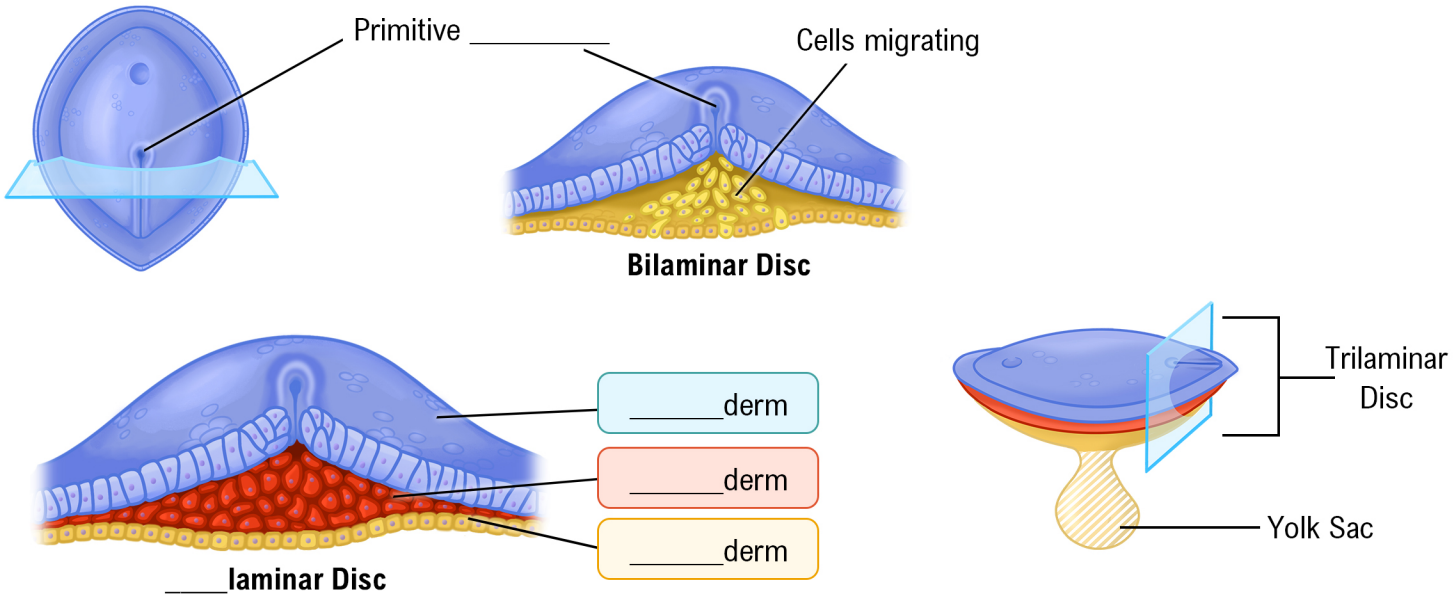
TOPIC: EMBRYONIC DEVELOPMENT (WEEKS 3-8)

Gastrulation: Germ Layer Formation (Days 12-16)

- **Germ Layer:** Primary layer of cells that gives rise to a specific group of tissues & _____.
- **Gastrulation:** Conversion of a bilaminar embryonic disc to trilaminar disc; forms the _____ primary germ layers.
  1. **Endoderm** (“inner skin”) 2. **Mesoderm** (“middle skin”) 3. **Ectoderm** (“outer skin”)
- **Primitive Streak:** Groove on caudal end of embryonic disc that facilitates _____.
  - Cells _____ toward primitive streak, forming the mesoderm.
- In week 4 the disc undergoes folding, which makes it cylindrical.



EXAMPLE

Which groove-like feature on the embryonic disc facilitates the process of gastrulation?

a) Primordial ridge.

b) Primitive streak.

c) The cephalic streak.

d) Ectoderm.

PRACTICE

Which of the following is the **middle** layer of the trilaminar disc?

a) Endoderm

b) Ectoderm.

c) Mesoderm.

d) Neuroderm.

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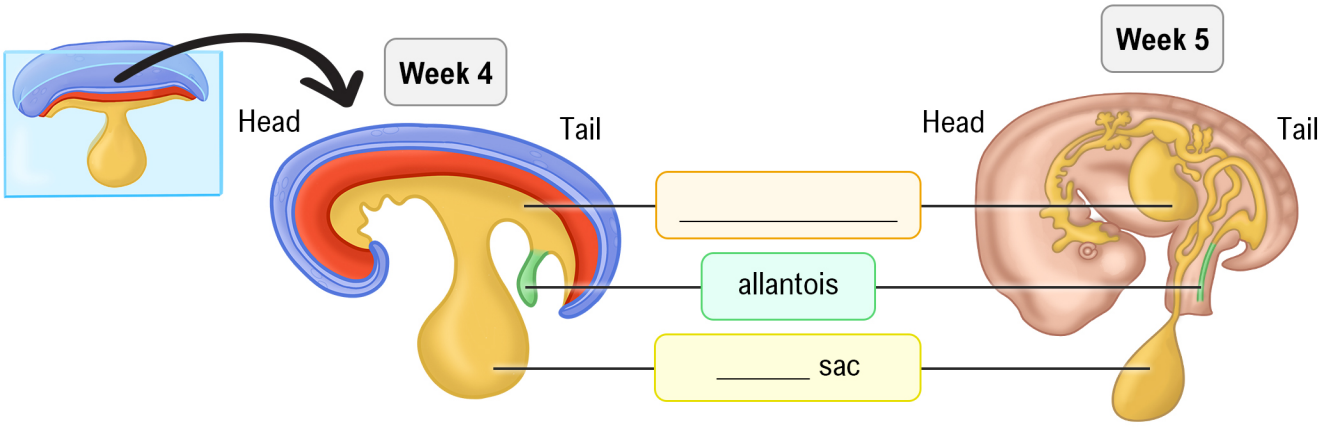
Organogenesis

- **Organogenesis:** Process of the 3 primary germ layers differentiating into _____ & organ systems.
- By the end of the embryonic period, all organ systems are recognizable & some are even functional.

Specialization of the Endoderm

- **Endoderm:** Inner primary germ layer, closest to the _____ sac.
  - Becomes the epithelial _____ of digestive, respiratory & urogenital systems.



EXAMPLE

If there was a malformation of the endoderm of the trilaminar disc, which of the following might you expect to see in the developing fetus?

a) Abnormalities in the spinal cord.

b) Atypical bone formation.

c) Abnormalities in the digestive tract.

d) Atypical skeletal muscle development.

PRACTICE

The embryonic period of a time of rapid organogenesis. By about what age are all organ systems recognizable?

a) Week 5.

b) Week 6.

c) Week 7.

d) Week 8.

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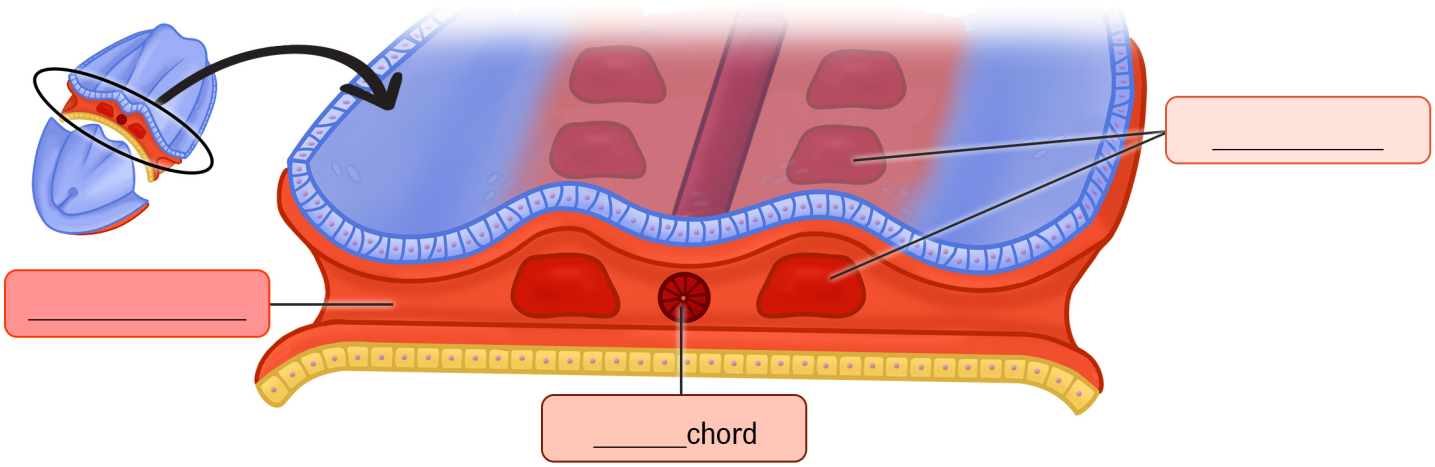
Specialization of the Mesoderm

- **Mesoderm:** _____ germ layer.
- Mesodermal cells at midline of embryo form the **notochord**; organizes embryo around central _____.
- Mesoderm on either side of notochord differentiates into **somites**, paired cube-like structures. Develop into:
  - _____
  - _____ of skin
  - Skeletal muscle
- Also forms cardiovascular system, kidneys, gonads, membrane of body cavities, and connective tissue of limbs.



EXAMPLE

During embryonic development, which of the following structures arises from the mesoderm?

a) The musculoskeletal system.

b) The central nervous system.

c) The epidermis.

d) The urogenital system.

PRACTICE

Which of the following structures helps to organize the embryo around a central axis?

a) Somites.

b) Neural plate.

c) Notochord.

d) Allantois.

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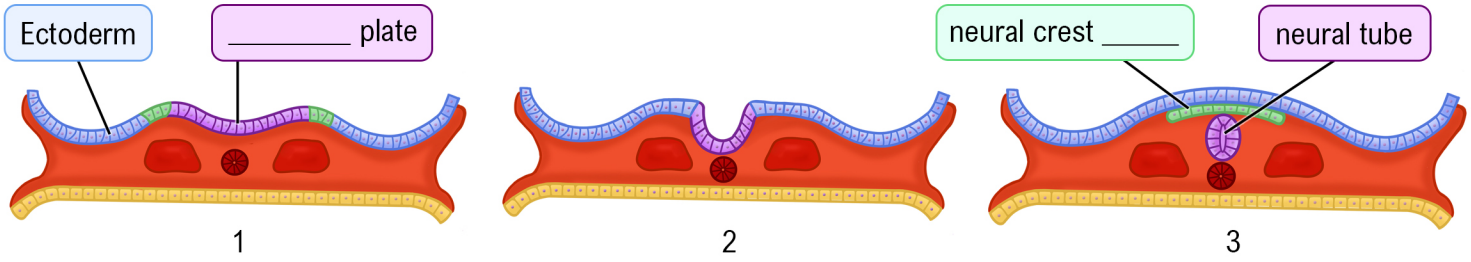
Specialization of the Ectoderm

- **Ectoderm**: _____ germ layer.
- Goes on to become majority of _____ system, sense organs, and epidermis of skin.
- _____ major event of organogenesis is **neurulation**; forms the nervous system.

1. Portion of ectoderm thickens and forms **neural** _____.
2. Neural plate folds inwards.
3. Edges fuse into **neural** _____ and **neural** _____ **cells** form between ectoderm and neural tube.
   - Neural tube creates _____ and spinal cord.
   - Neural crest cells create the remainder of nervous system structures.



EXAMPLE

The _____ becomes the _____, which develops into the brain and spinal cord.

a) Endoderm; neural plate.

b) Neural plate; neural crest cells.

c) Neural tube; neural plate.

d) Neural plate; neural tube.

PRACTICE

Which of the following structures is **NOT** formed by neural crest cells?

a) Cranial nerves.

b) Spinal cord.

c) Spinal nerves.

d) Sensory ganglia.

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Review of Embryonic Layer Specialization

- The following table highlights some of the major structures that each embryonic layer develops into:

Endoderm "Inner Skin"	Mesoderm "Middle Skin"	Ectoderm "Outer Skin"
Epithelial lining of many structures in: • Digestive tract • Respiratory tract • Urogenital system	Skeleton Dermis of skin Skeletal muscle Cardiovascular system Kidneys Gonads Connective tissue of limbs Membranes of body cavities	The majority of nervous system Sense organs Epidermis of skin
Tip: Think of the endoderm as forming the innermost lining of your body.	*Tip: Many mesodermic structures are literally in the 'middle' of endodermic and ectodermic structures – between the epithelial lining of your organs and your epidermis.*	*Tip: "Ectoderm" literally translates to "outer skin" and that's what it forms – your epidermis!* *Your brain and sense organs help you interact with the 'outer' world.*

Recommended Study Strategy

Focus on studying the endoderm and ectoderm – these are much more specific. If you can remember these, you know that any other structures must come from the mesoderm.

Note: This table is NOT an exhaustive list. It focuses on the main structures students are typically responsible for knowing.