1. **Appearance of Primitive Streak**
   1. Establishes: MIDLINE
   2. *First morphological sign of GASTRULATION*
      1. Appears caudally; on dorsal aspect of embryonic disk
      2. Elongates by addition of cells to caudal end
         1. while cranial end proliferates to form
            1. primitive node

primitive pit = small depression in node

* + - 1. develops primitive groove
         1. deep cells (*mesenchyme*) eventually form supporting tissues of embryo
  1. Embryo now called a *GASTRULA*

1. **Development of Notochord**
   1. Notochord process elongates by invagination of cells from the primitive pit
      1. Primitive pit extends under embryonic endoderm to form the NOTOCHORDAL CANAL
         1. Grows: Cranially
            1. Oropharyngeal Membrane

future: Oral cavity

* + - 1. Grows: Caudally
         1. Cloacal Membrane

future: Anal cavity

* + - 1. Notochord induces embryonic endoderm on top of NOTOCHORDAL CANAL to form NEURAL PLATE
         1. future: CNS
         2. at DAY 18, NEURAL PLATE invaginates to form NEURAL GROOVE

with two NEURAL FOLDS

first sign of brain development

Fuse to form: NEURAL TUBE with a NEURAL CANAL

Rostral End

closes ~ 25 days

failure: Ancephaly

Caudal End

closes ~ 27days

failure: Spina Bifida

leftover: NEURAL CRESTS

form: PNS, ANS

form: Melanocytes

NEURAL TUBE = Brain/Spinal cord

*Mesenchyme* around TUBE forms MENINGES

Pia, Arachnoid, Dura mater

Subarachnoid space: CSF (5th week)

on either side of TUBE, SOMITES develop

later develop into: Axial Skeleton & Muscles

**Brain**

NEURAL TUBE: Cranial 🡪 4th pair somites

* + - * + 3 PRIMARY VESSICLES

Prosencephalon (Forebrain)

Telecephalon

Cerebral Hemispheres

Diencephalon

Thalami, 3rd ventricle

Mesencephalon (Midbrain)

Midbrain

tectum = roof

Rhombencephalon (Hindbrain)

Metencephalon

Pons, cerebelum, 4th ventricle

Myelencephalon

Medulla

Caudal part (closed) looks like SC

Rostral part (open)

*Pontine flexure*: divides Metencephalon from Myelencephalon

*Cervical flexure*: rostral end

**Spinal Cord**

NEURAL TUBE: 4th pair somites 🡪 Caudal

Terminates: L2-3 (newborn), L1 (adult)

IMPORTANT CELLS that come from NEURAL TUBE

Neuroblasts

Neurons

Glioblasts ("glue")

Astrocytes - structure & support of brain

Oligodendrocytes - create myelin

Microglial cells

Immune system

NEURAL CANAL

Form: ventricles and central canal of spinal cord

SULCUS LIMITANS

Extends to midbrain/forebrain jxn

therefore: alar/basal plate differentiation is only noted in midbrain and hindbrain

Dorsal to: alar plate (afferent, sensory)

Ventral to: basal plate (efferent, motor)

1. **Gastrulation**
   1. Defined: Formation of 3 germ layers which are precursors to embryonic tissues
      1. bilaminar disc --> trilaminar disc
   2. Beginning of: *Morphogenesis* (development of body form)
      1. Process that gives: *Axial Orientation* (midline)
   3. Ecdoderm
      1. Fxn: Sensory
      2. Structures: Epidermis, CNS, PNS, eye, inner ear
   4. Mesoderm
      1. Fxn: Support
      2. Structures
         1. Connective Tissue
            1. Muscles, bones, ligaments, tendons, blood cells, etc.
         2. Reproductive & Excretory system organs/ducts
         3. Create *somites* craniocaudally (head down) 🡪 axial skeleton, associated muscles & adjacent dermis
            1. DNA determines & differentiates somites
         4. Lining of Body Cavities
            1. 2nd month (8 weeks): Intramembryonic coelem 🡪 3 body cavities

Pericartial (Heart)

Pleural (Lungs)

Peritoneal (Guts)

* + - 1. Cardiovascular System
         1. Phase out: yolk sac
         2. Phase in: creation of blood vessels that draw nutrients from uteroplacental circulation (maternal blood flow)
         3. \*\*FRAGILE system: if arteries/veins are impaired during 2-3 week mark, development is severely compromised.
  1. Endoderm
     1. Structure: Lining of respiratory and digestive systems