

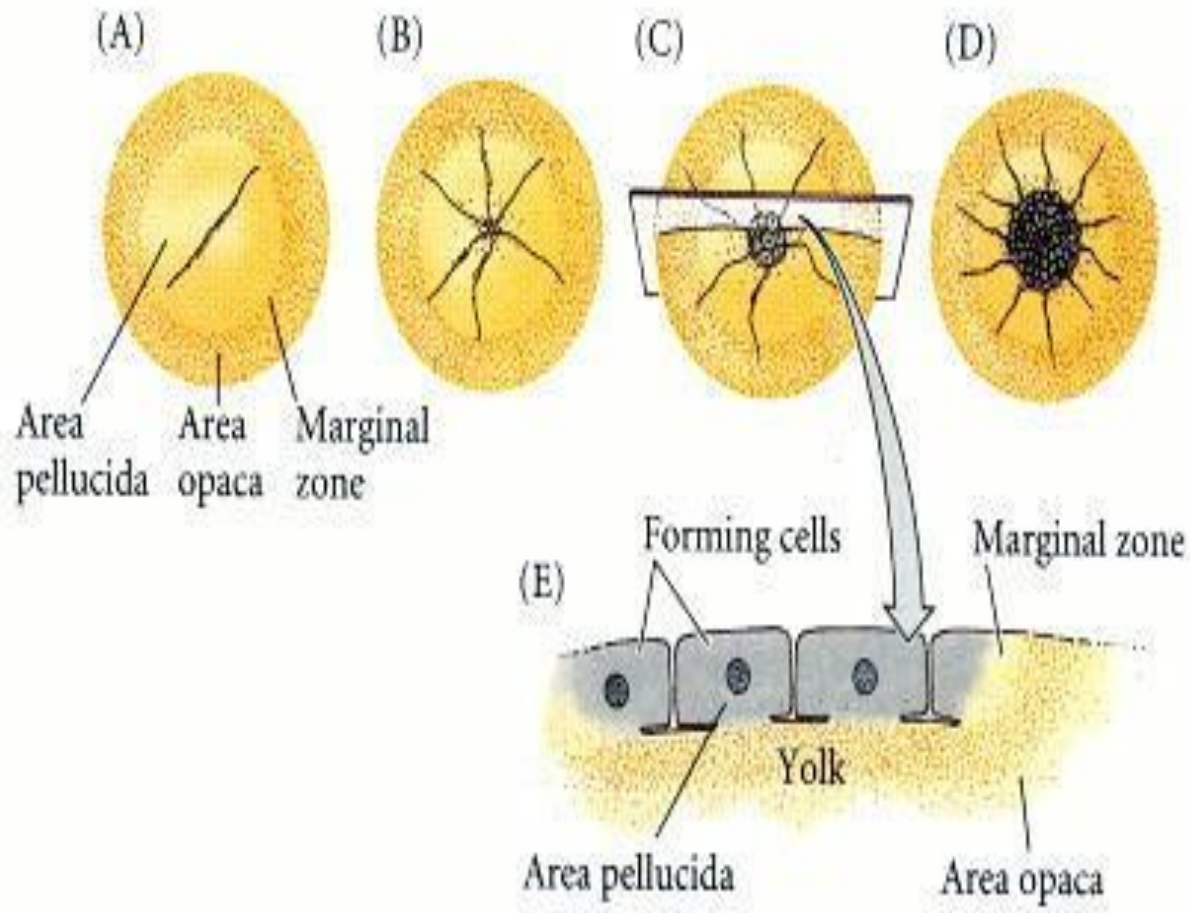
A. Upper view of the germinal vesicle

B. cross section before gastrulation

C. cross section during gastrulation

ap = area pellucida, ao = area opaca, ps = primitive streak, 1 = Epiblast (forms the ectoderm), 2 = Blastocoel, 3 = Hypoblast (forms the endoderm), 4 = Subgerminal cavity, 5 = Yolk

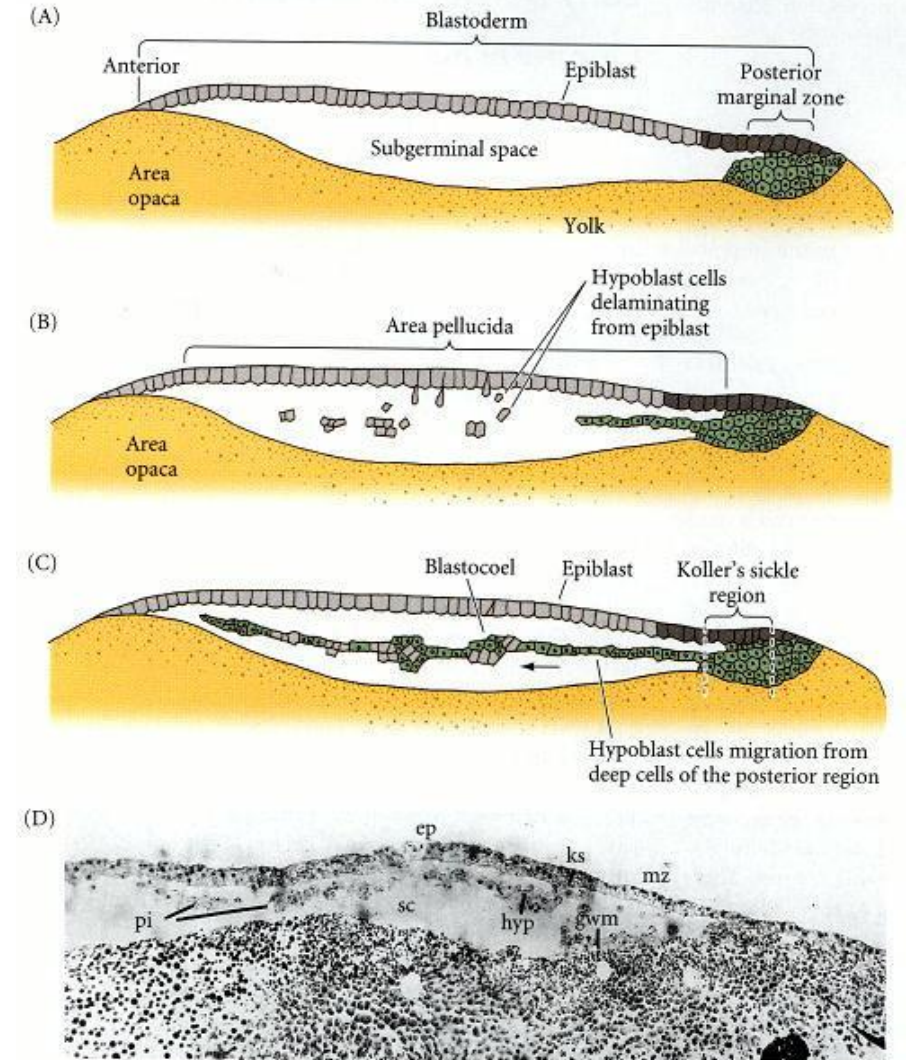
# 1. Cleavage in birds is discoidal meroblastic.



- cleavage occurs in blastodisc.
- equatorial and vertical cleavage divide the blastoderm into a tissue that is to 5-6 cell layers thick
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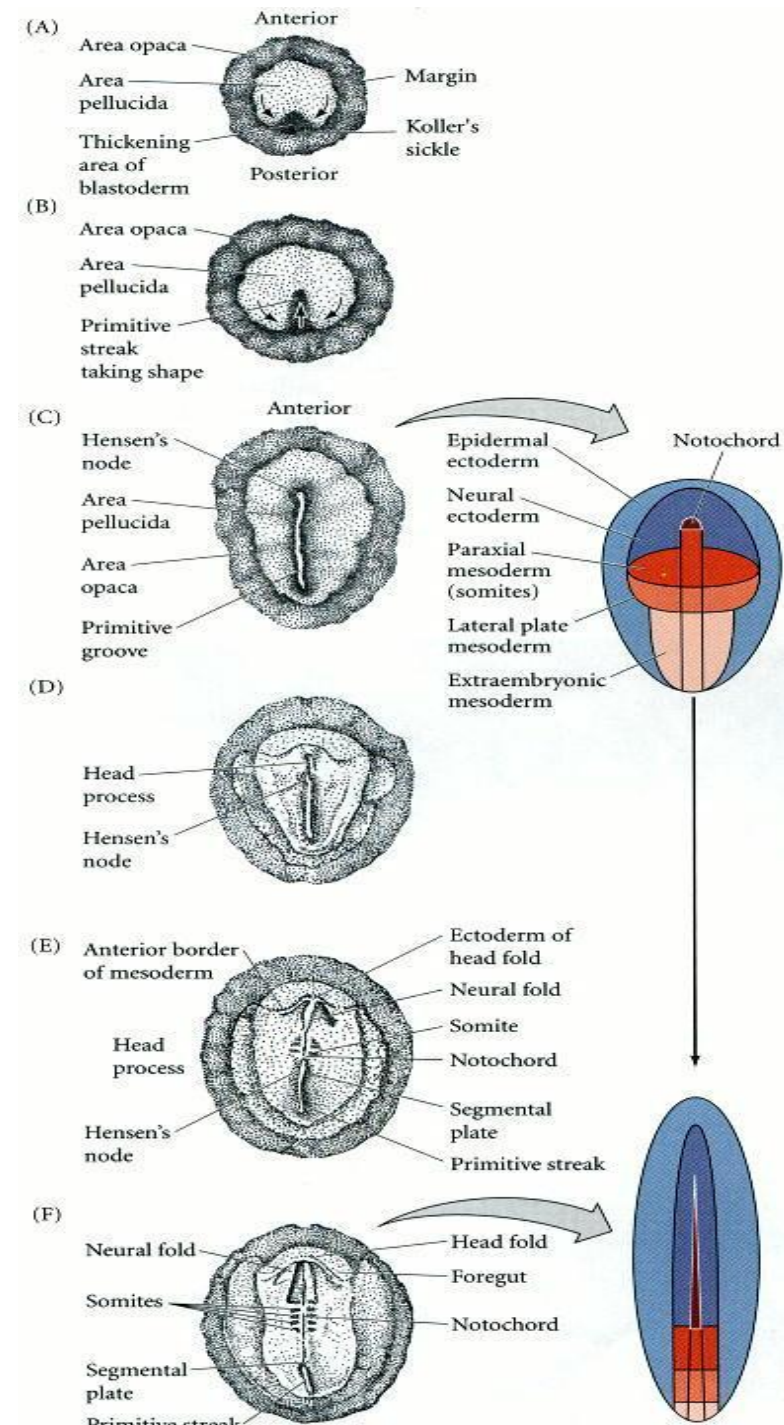
## 2. A two-layered blastoderm is formed via ingression and delamination

- Subgerminal cavity= space between the blastoderm and the yolk
- Area pellucida= the translucent central area of the blastoderm where embryo develops
- Area opaca= the peripheral opaque area that surrounds the area pellucida of a vertebrate embryo
  - responsible for the loss of the regulative ability of the primitive-streak-stage embryo

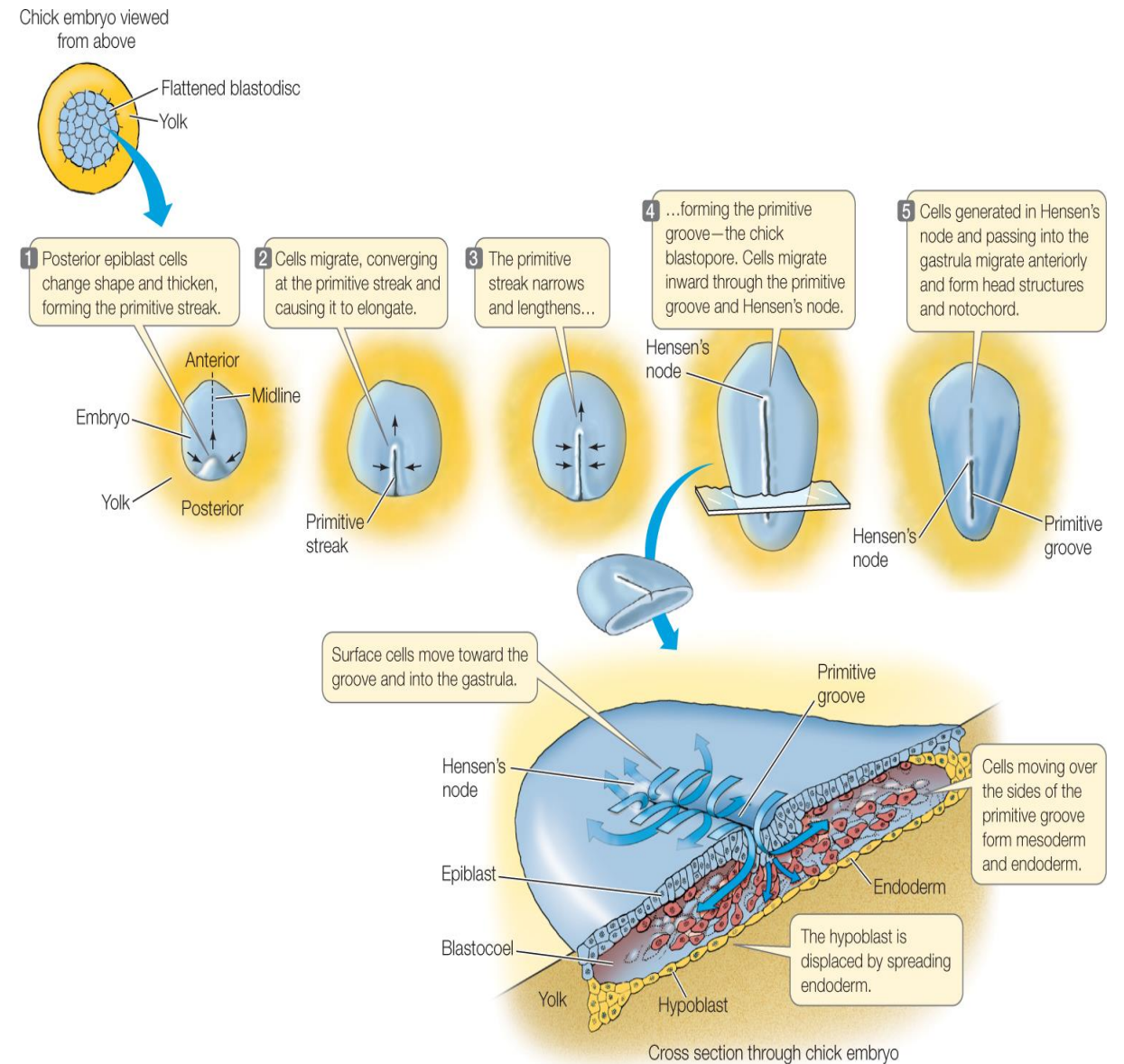


# 3. The primitive streak defines the axis of the embryo

- Primitive streak- thickening of the epiblast at the posterior region of the embryo
  - Formed by the ingression of endodermal precursors from the epiblast and migration of cells from the lateral region
  - it elongates towards the future head region
  - thickest at the anterior end, called the Hensen's node
  - Defines the axis of the embryo

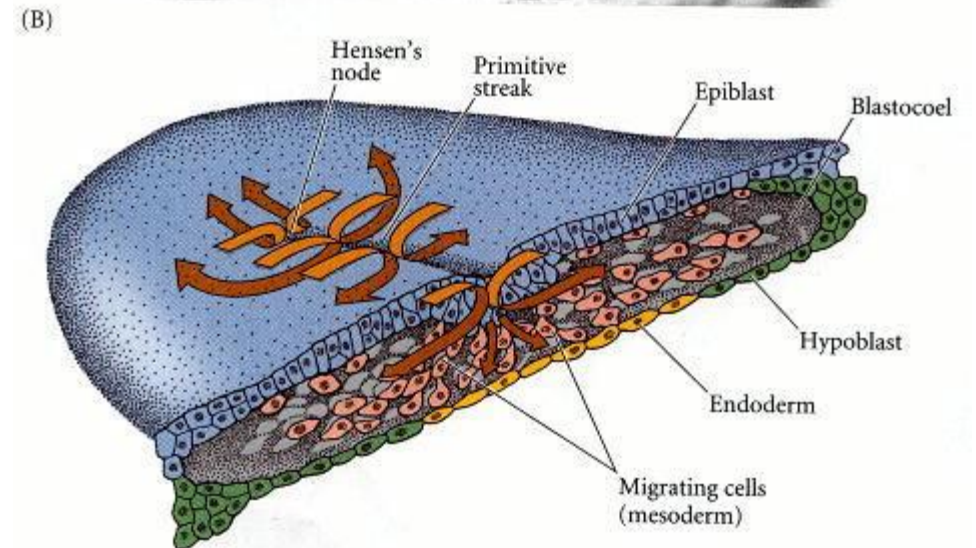
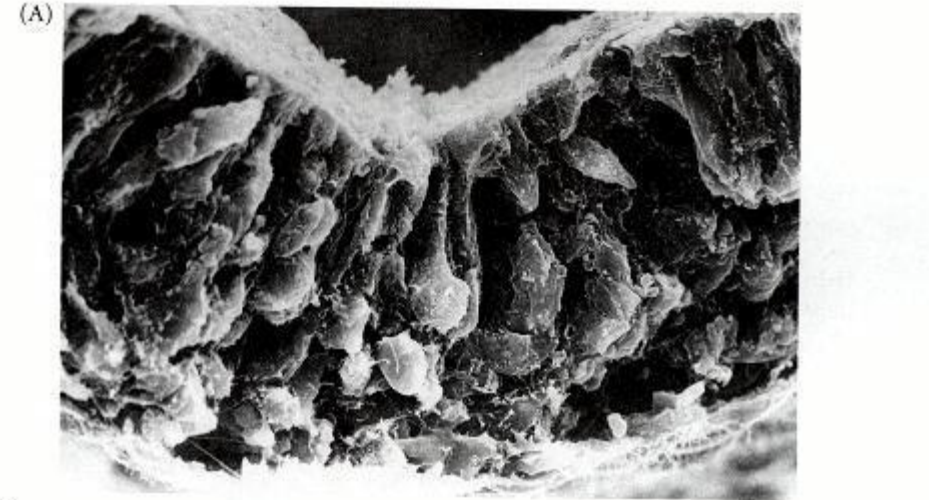


- Primitive groove- depression within the streak
  - opening through which migrating cells pass into the blastocoel
  - Analogous to amphibian blastophore
- Primitive knot-Hensen's node
  - Thickening at the anterior end
  - functional equivalent of the dorsal lip of the amphibian blastopore (i.e., the organizer)
- Primitive pit-funnel-shape depression at the center of the node
  - Where cells pass into the blastocoel



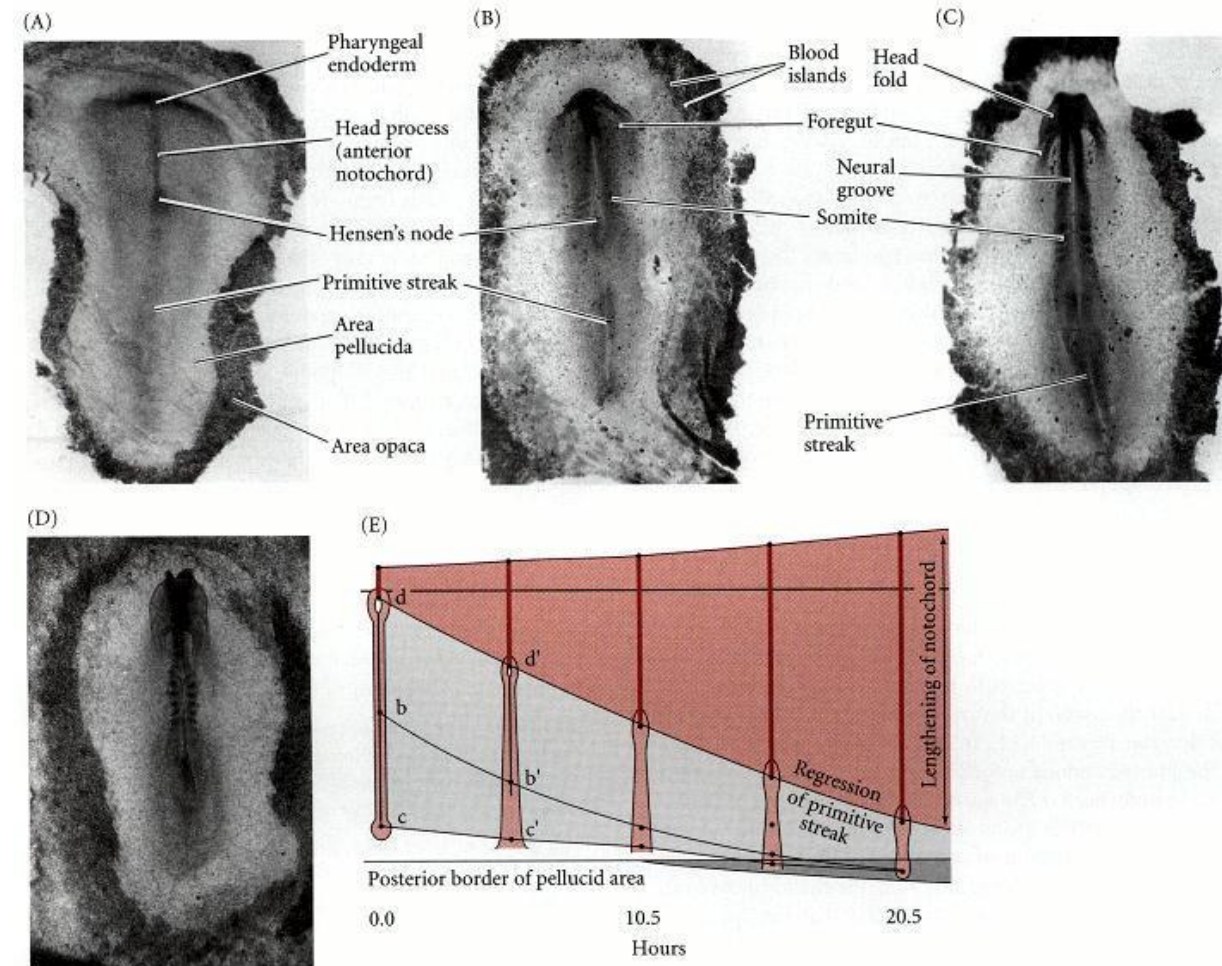
## 4. The primitive streak has a continually changing cell population.

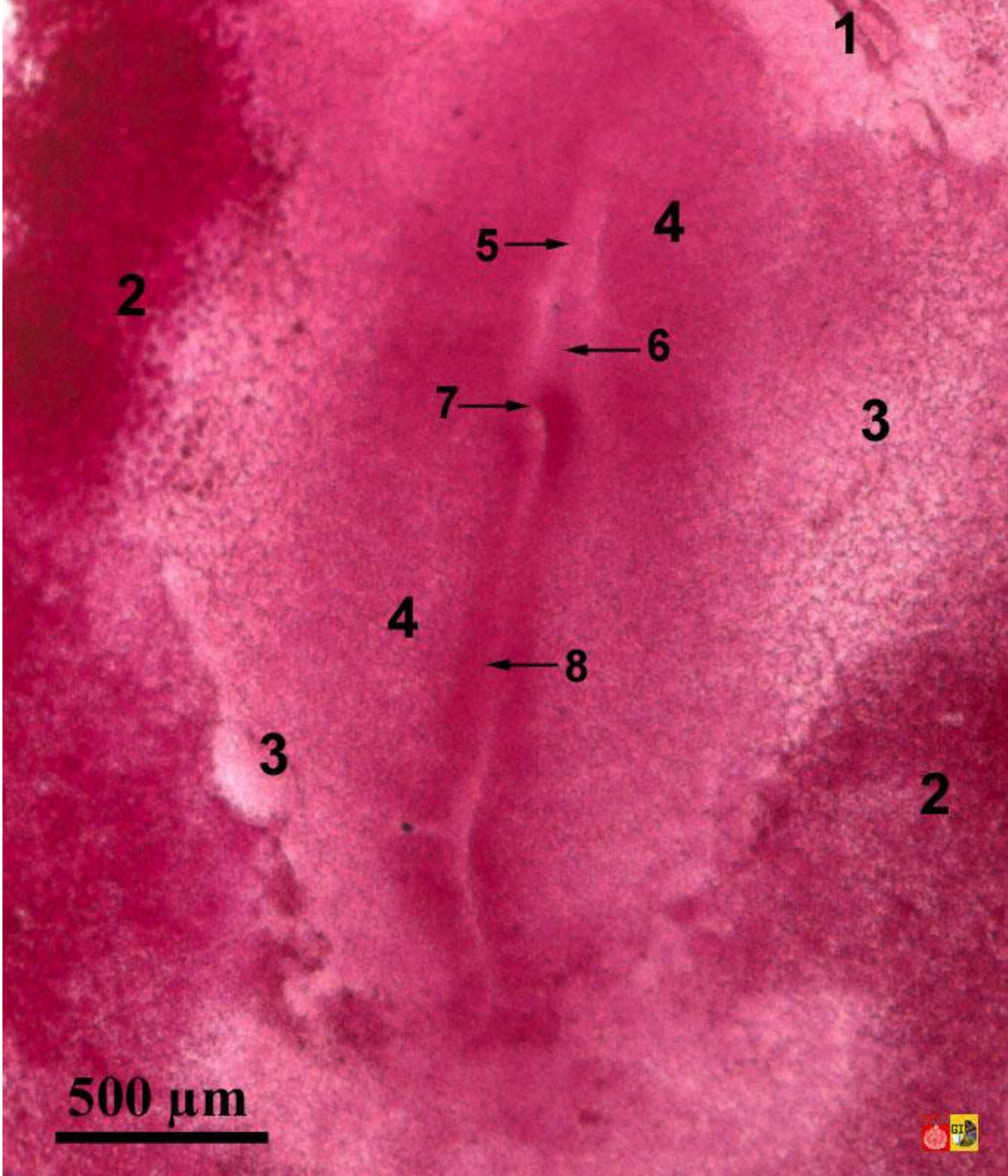
- Cell migrating thru the Hensen's node pass down to the blastocoel and migrate anteriorly= foregut, head mesoderm and notochord
- Cell passing thru the lateral portions of the primitive streak= endodermal and mesodermal tissues
- Scatter factor- 190kDa protein which enables EMT to happen



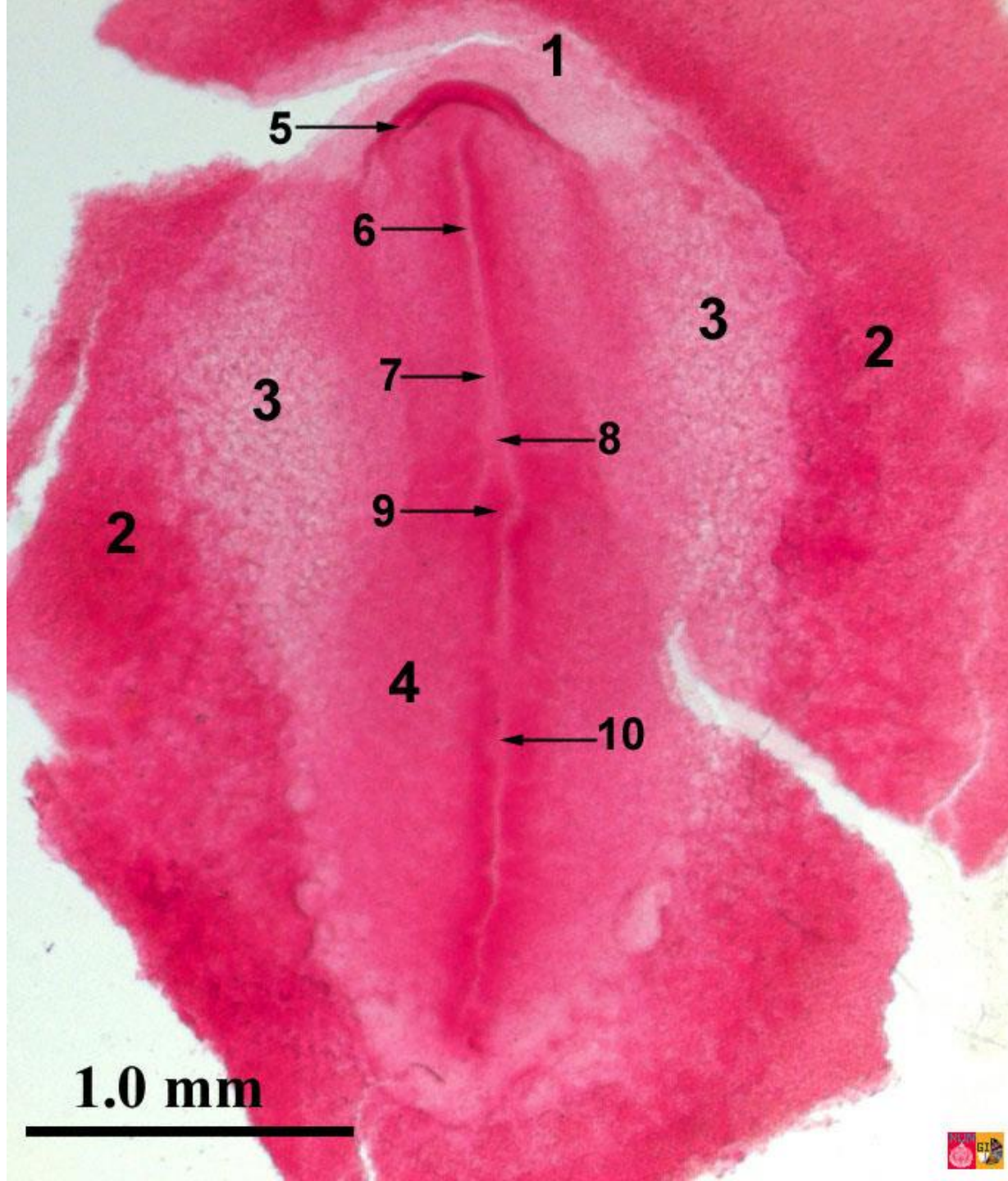
# 5. Migration through the primitive streak: formation of endoderm and mesoderm

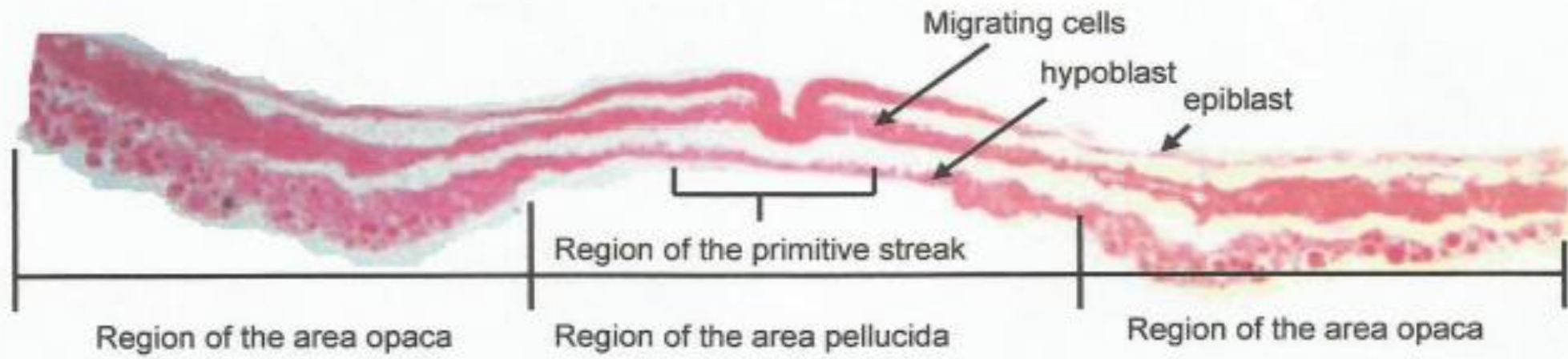
- First cells to migrate thru the hensen's node= pharyngeal endoderm of the foregut
- Germinal crescent-contains precursor of the germ cells
  - Cells that migrated anteriorly and eventually displaced the hypoblast cells to be confined in the anterior portion of the area pellucida
- Head mesenchyme and prechordal plate mesoderm- enters the blastocoel and do not move ventrally
  - Head process-anterior midline region of the epiblast
  - chordamesoderm-extends up to the presumptive midbrain; where hindbrain and trunk form
- Cell migrating inwardly thru the lateral portion of the primitive streak
  - Deep layer=endodermal organs + most extraembryonic membranes
  - spreads between endoderm and epiblast=- mesodermal portions+ extraembryonic membranes



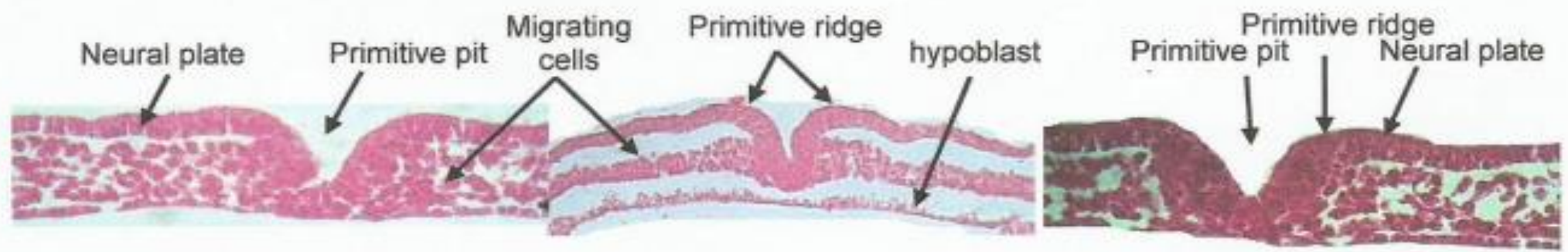
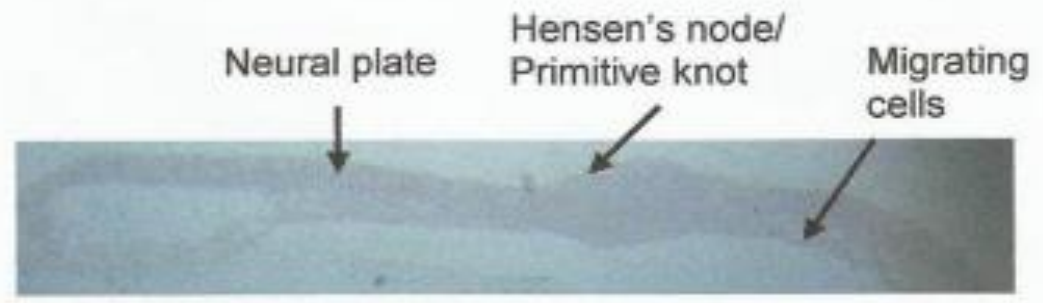


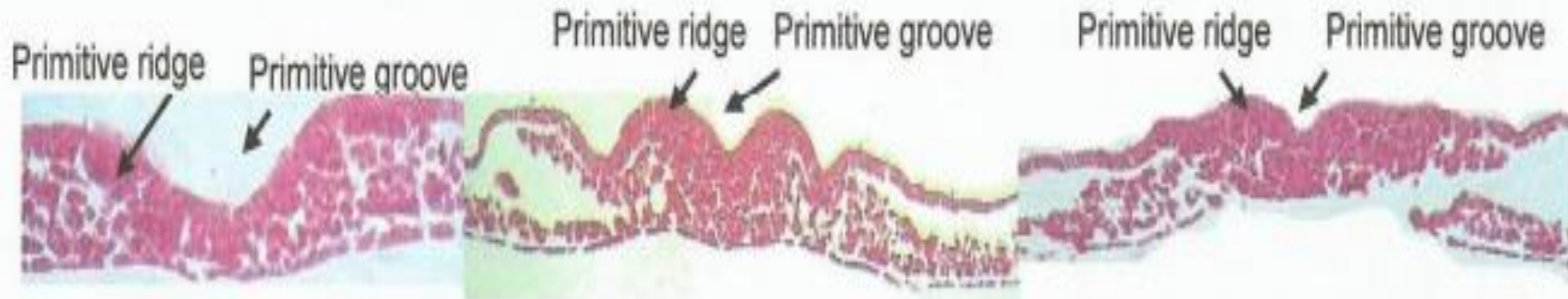
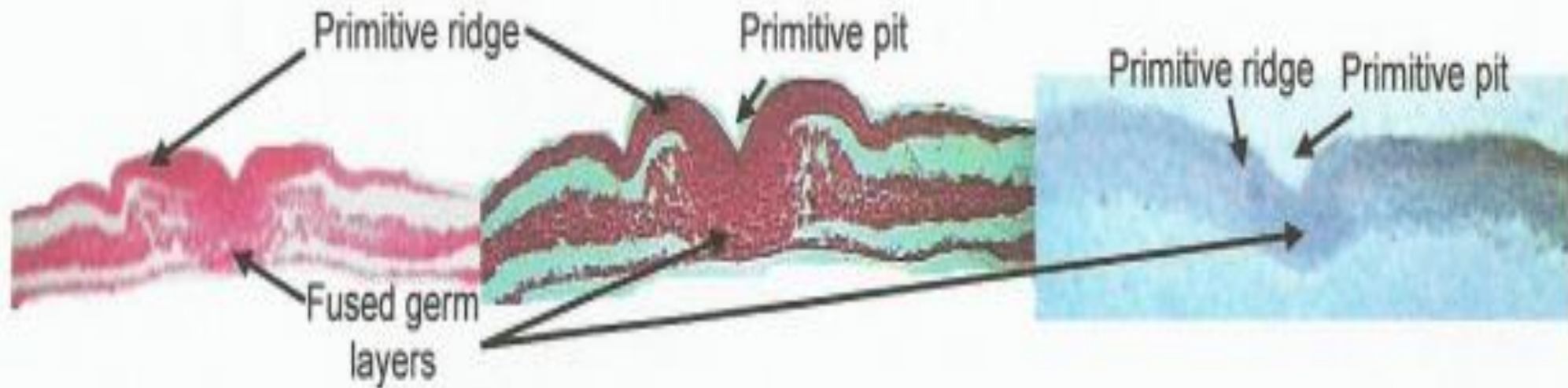






***Cross-section of a primitive streak at the primitive pit region during the 18<sup>th</sup> hour of embryonic stage.***

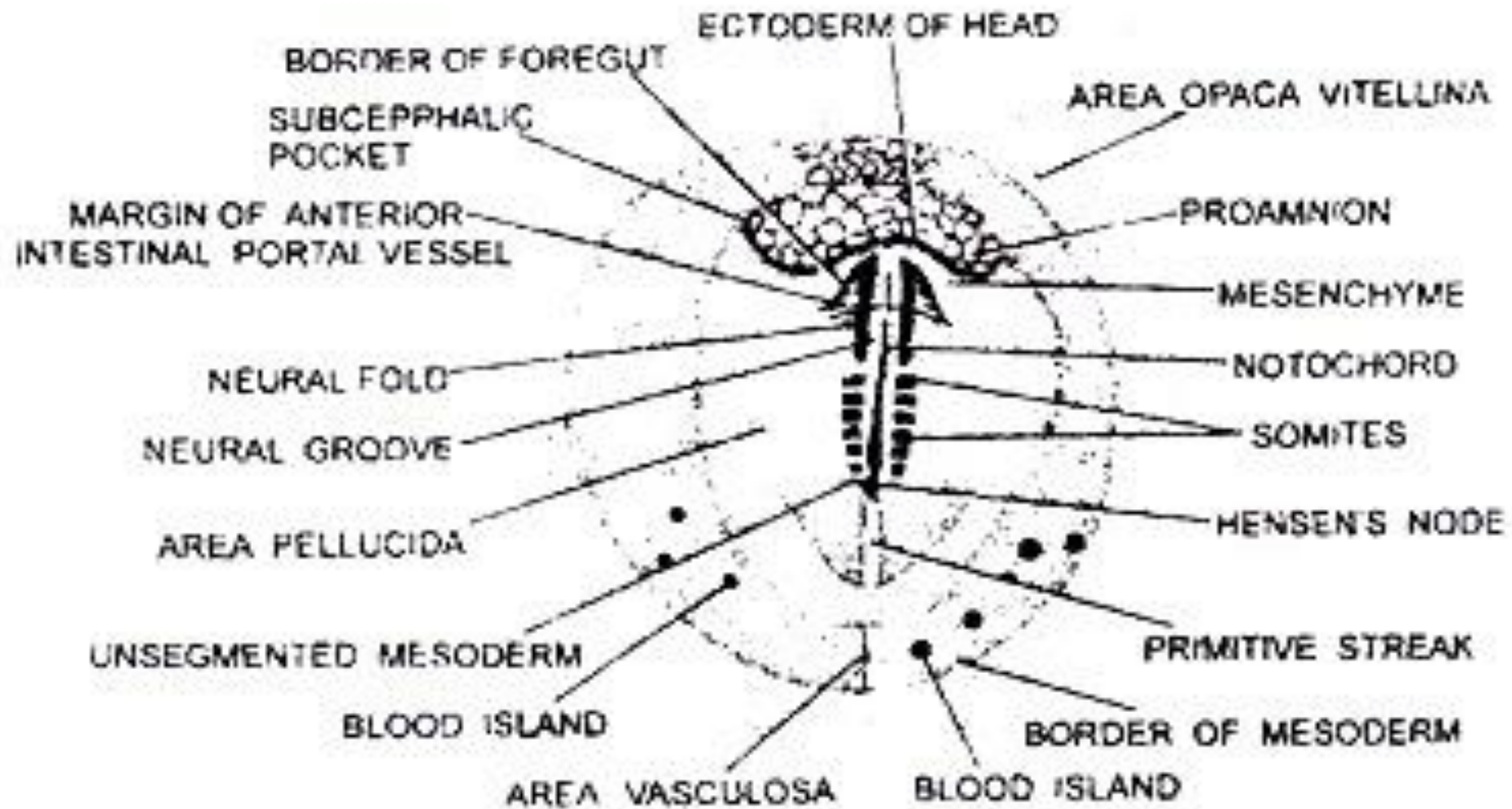




1. **Endoderm** - Endoderm gives rise to the epithelium of the alimentary tract, to structures derived from the pharyngeal pouches such as parathyroid glands, thymus gland, Eustachian tube and middle ear cavity (not the ossicles), and to structures that develop as an evagination of the gut, such as the thyroid gland, lungs or swim bladder, liver, gall bladder, pancreas, and urinary bladder.
2. **Mesoderm** - becomes organized into three regions: the epimere (dorsal mesoderm), mesomere (intermediate mesoderm), and hypomere (lateral mesoderm).
  1. Epimere: The somites constitute most of the dorsal mesoderm and have three regions:
    1. dermatome - forms the dermis of the mid-dorsal skin
    2. sclerotome gives rise to the vertebrae
    3. myotome forms skeletal muscles other than those of the gill arches - .
  2. Mesomere: gives rise to the kidney tubules, excretory organs, and reproductive ducts
  3. Hypomere: lateral-plate mesoderm is confined to the trunk and is divided into somatic mesoderm (parietal peritoneum) and splanchnic mesoderm (visceral peritoneum, mesenteries, heart and associated structures, lymphatic system, gonads and visceral muscles)

1. **Ectoderm** - gives rise to:
  1. Neural tube
  2. Epidermis and associated glands
  3. Neural crest and its derivatives: migrate through the embryo, giving rise to a diversity of structures
  4. Ectodermal placodes: localized thickenings that sink below the surface and give rise to sensory neurons and sensory structures: olfactory placodes, forming the olfactory sacs; lens placodes, for the lens of the eye; otic placodes, to become the membranous labyrinth; a group of placodes that contributes neurons to the sensory ganglia of cranial nerves V, VII, VIII, IX, and X; and last, placodes that form the neuromasts of the cephalic and lateral line canals

# 24 Hour



**Fig. 17.5. W.M. 24 hours chick embryo.**

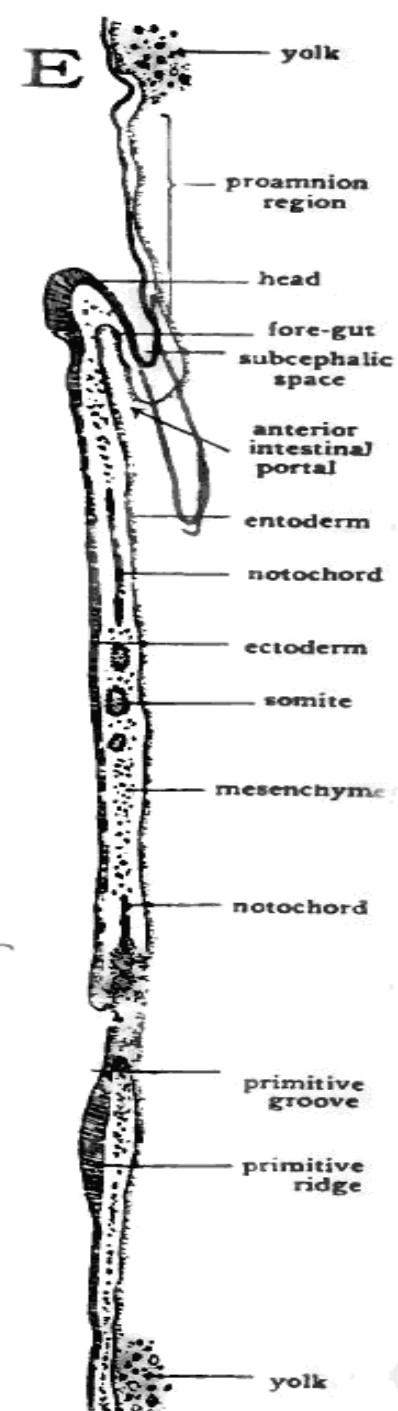
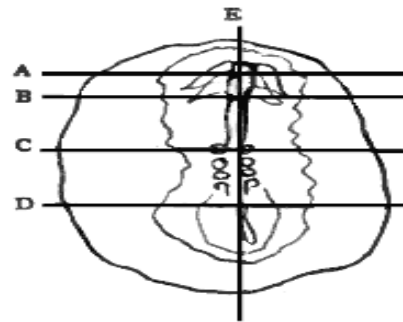
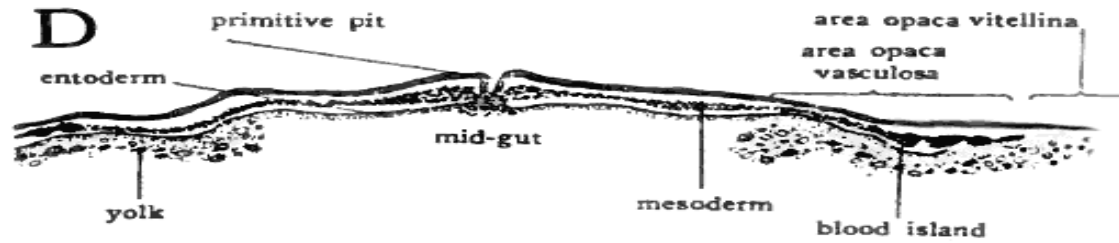
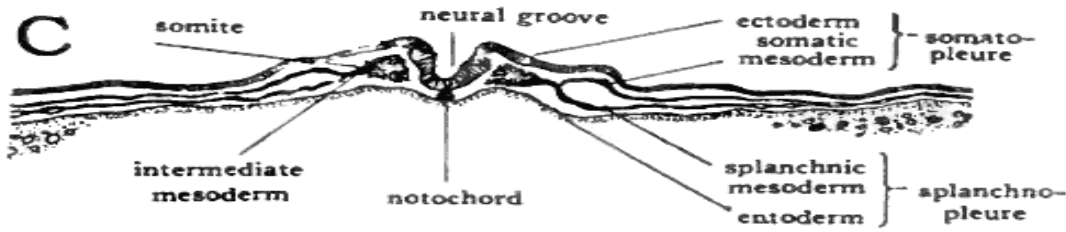
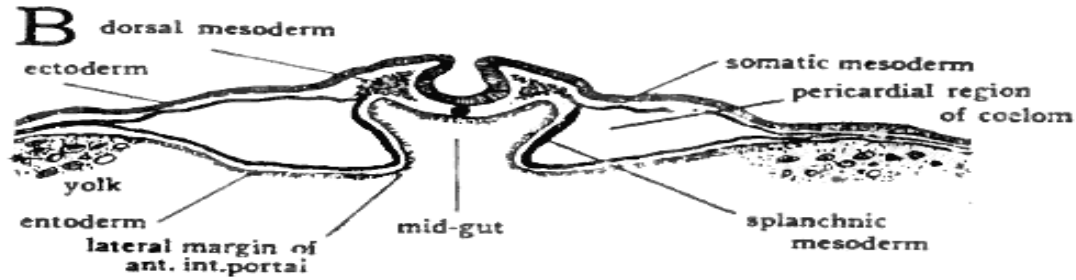
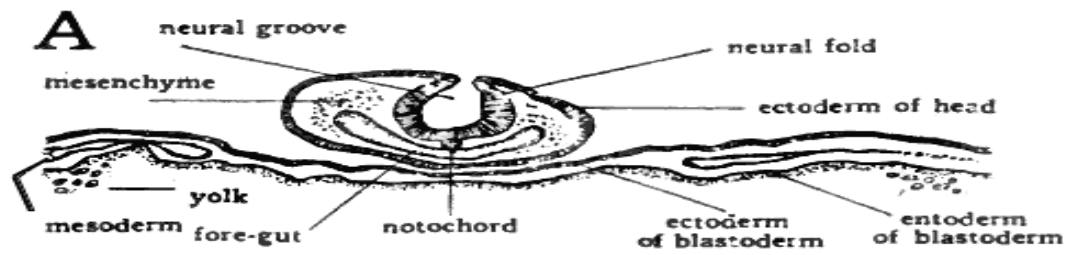
# 24 Hours

1. 4 pairs of somites
2. At this stage the dark peripheral area opaca and central translucent and colourless area pellucida are distinctly visible.
3. In the anterior part is present the proamnion, which is a small and comparatively more translucent region of area pellucida and is characterised by the absence of mesoderm.
4. In the middle of area pellucida, in its posterior half runs a primitive streak with a primitive groove in its centre. The primitive groove is bound by primitive folds.
5. In the anterior half of area pellucida, in the middle, runs the neural groove bound by neural folds.
6. The primitive streak and neural groove are separated by Hensen's node having a small depression in the centre-the Hensen's pit.

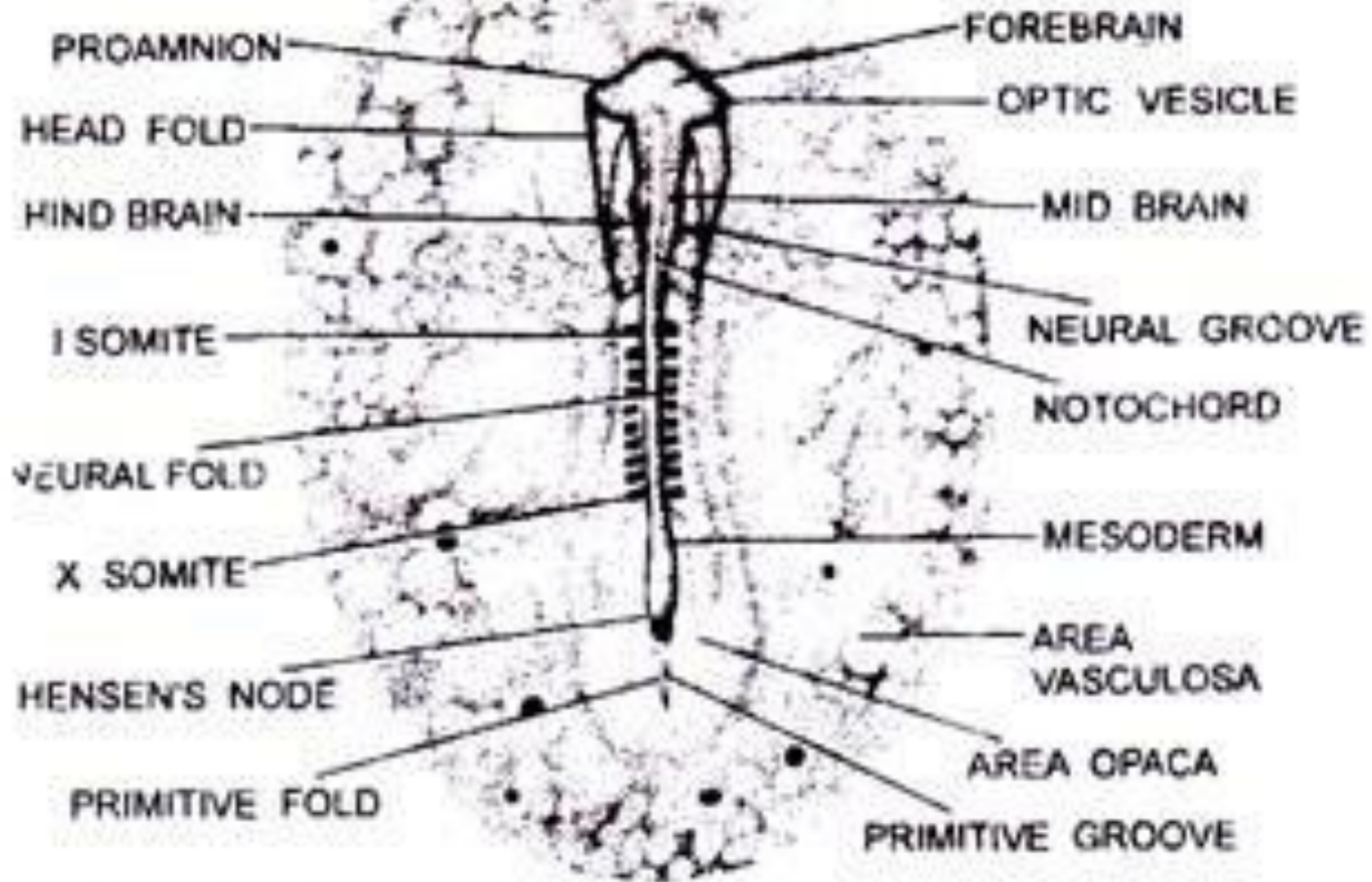
# 24-hours

7. Immediately below the primitive groove the primitive streak gives rise to a small out-growth, the notochord and on either side to mesoderm.
  8. In the area pellucida embryonic and extra embryonic regions also become distinguished.
  9. In the anterior-most part the ectoderm has given rise to head fold, which is a pocket-like extension of neural folds. The underlying endoderm is also transformed into a pocket-like foregut. The proamnion is greatly reduced.
  10. In front of Hensen's node the mesoderm of embryonic area differentiated into 3-4 pairs of mesodermal somites.
  11. The neural canal, in the region of head fold, gives rise to forebrain.
  12. The foregut extends on either side into an amino-cardiac vesicle.
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# 33 Hour



**Fig. 17.7. WM. of 33 hr (11-somies) chick embryo.**