veterinary EMBRYOLOGY

gastrulation

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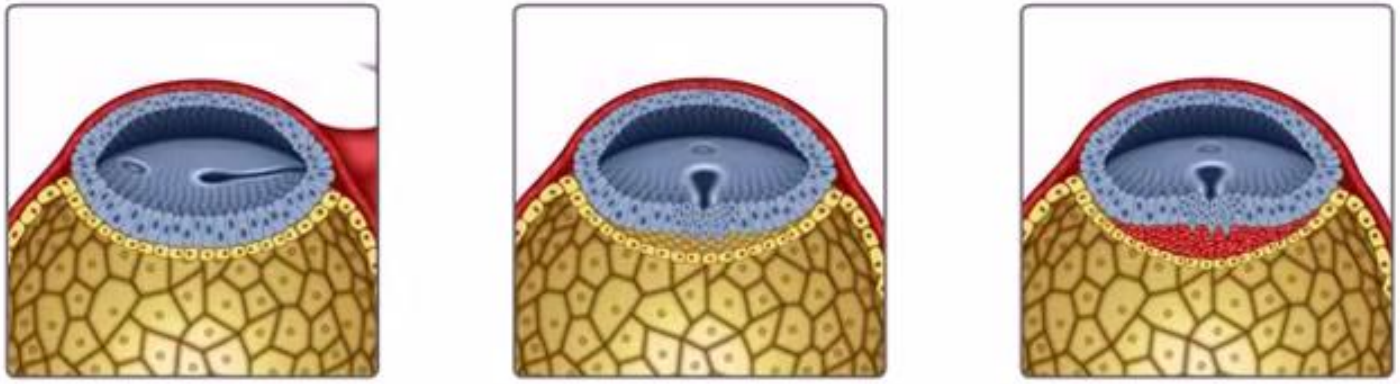
gastrulation

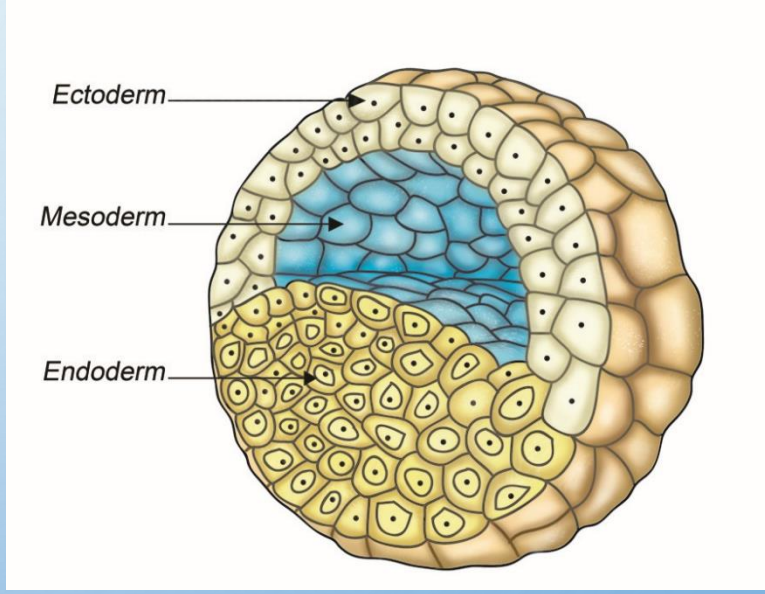
Gastrulation

Gastrulation is the process whereby the bilaminar embryonic disc undergoes reorganization to form a trilaminar disc.

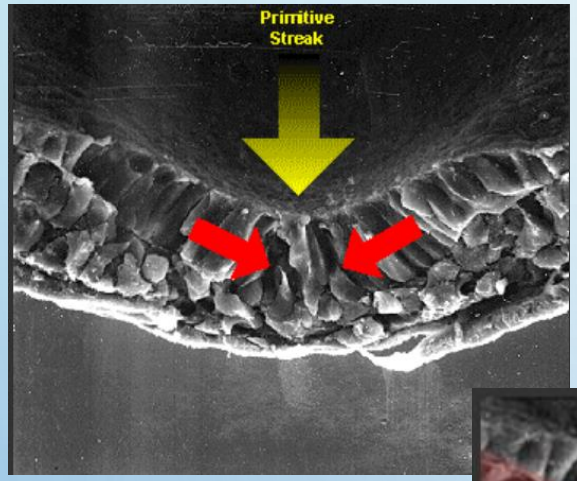


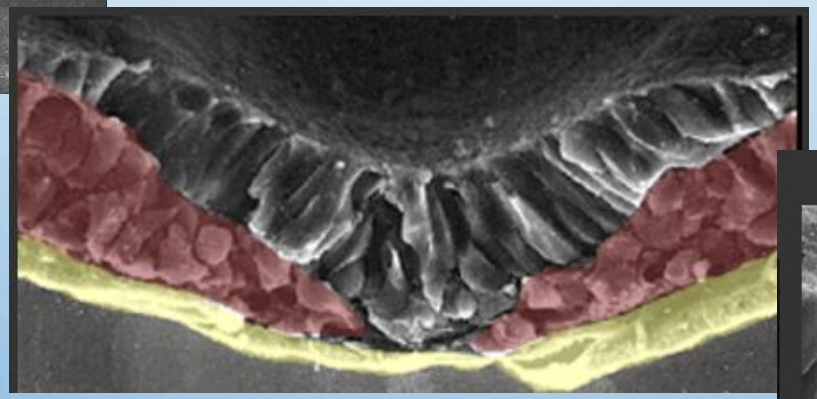
gastrulation

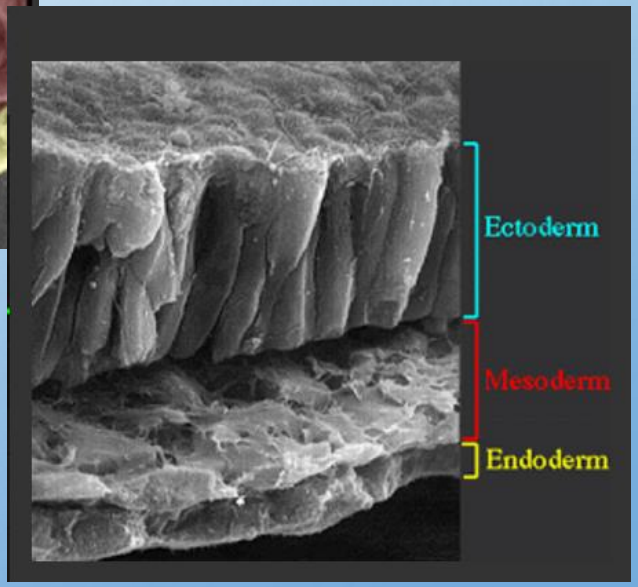
- A stage of embryological development during which the single-layered blastula is converted into a trilaminar structure consisting of an outer ectodermal, a middle mesodermal and an inner endodermal layer.



gastrulation







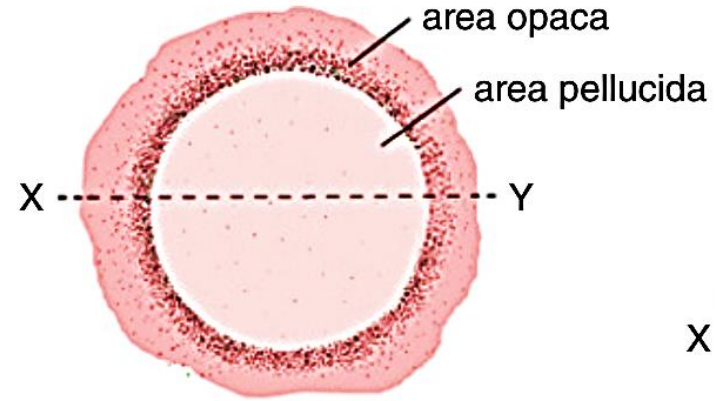
Germ layers

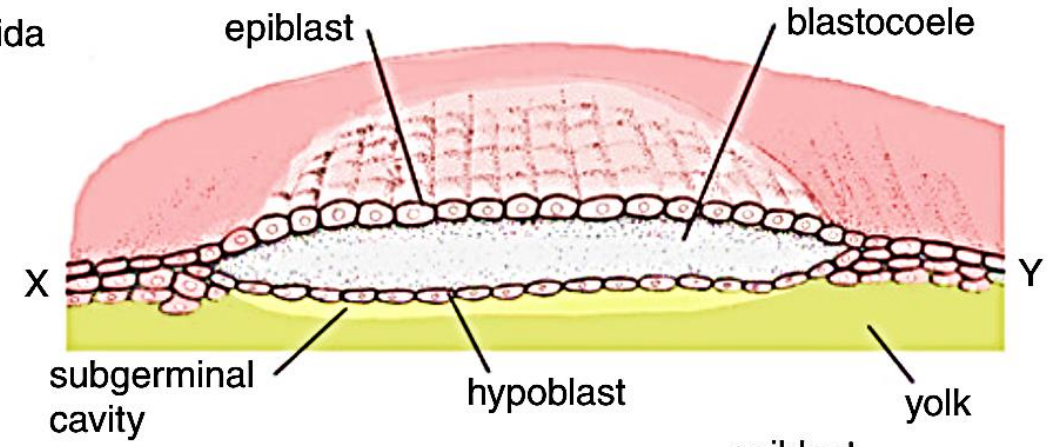
- **Outer ectoderm**
  - Gives rise to the epidermis and nervous system,and connective tissue of the head
- **Inner endoderm**
  - Give rise to the primitive gut or “archenteron”
- **Intermediate mesoderm**
  - Gives rise to the muscles and skeletal connective tissues ,urogenital system, heart and blood vessels

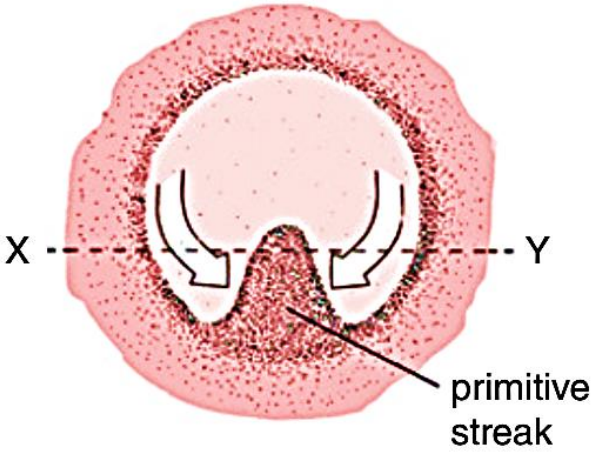
Germ layers

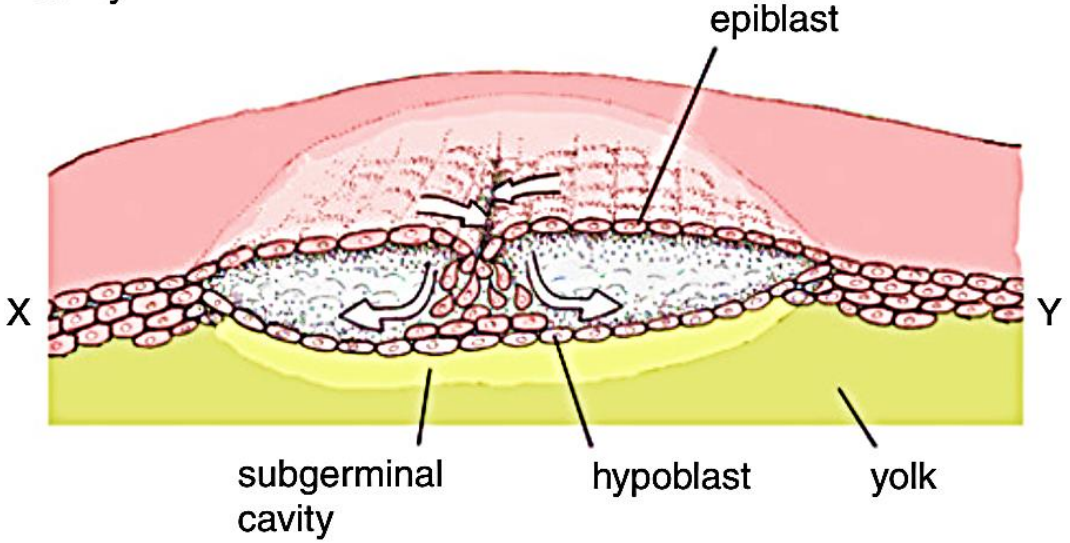
Ectoderm	*Mesoderm*	*Endoderm*
All nervous tissue	Skeletal, smooth, and cardiac muscle	Epithelium of digestive tract (except that of oral and anal cavities)
Epidermis of skin and epidermal derivatives (hairs, hair follicles, sebaceous and sweat glands, nails)	Cartilage, bone, and other connective tissues	Glandular derivatives of digestive tract (liver, pancreas)
Cornea and lens of eye	Blood, bone marrow, and lymphoid tissues	Epithelium of respiratory tract, auditory tube, and tonsils
Epithelium of oral and nasal cavities, of paranasal sinuses, and of anal canal	Endothelium of blood vessels and lymphatics	Thyroid, parathyroid, and thymus glands
Tooth enamel	Serosae of ventral body cavity	Epithelium of reproductive ducts and glands
Epithelium of pineal and pituitary glands and adrenal medulla	Fibrous and vascular tunics of eyes	Epithelium of urethra and bladder
Melanocytes	Synovial membranes of joint cavities	
Some cranial bones and branchial cartilages (derived from neural crest)	Organs of urogenital system (ureters, kidneys, gonads, and reproductive ducts)	

In avians


area opaca
area pellucida
X
Y


epiblast
blastocoele
X
Y
subgerminal cavity
hypoblast
yolk


X
Y
primitive streak


epiblast
X
Y
subgerminal cavity
hypoblast
yolk

gastrulation

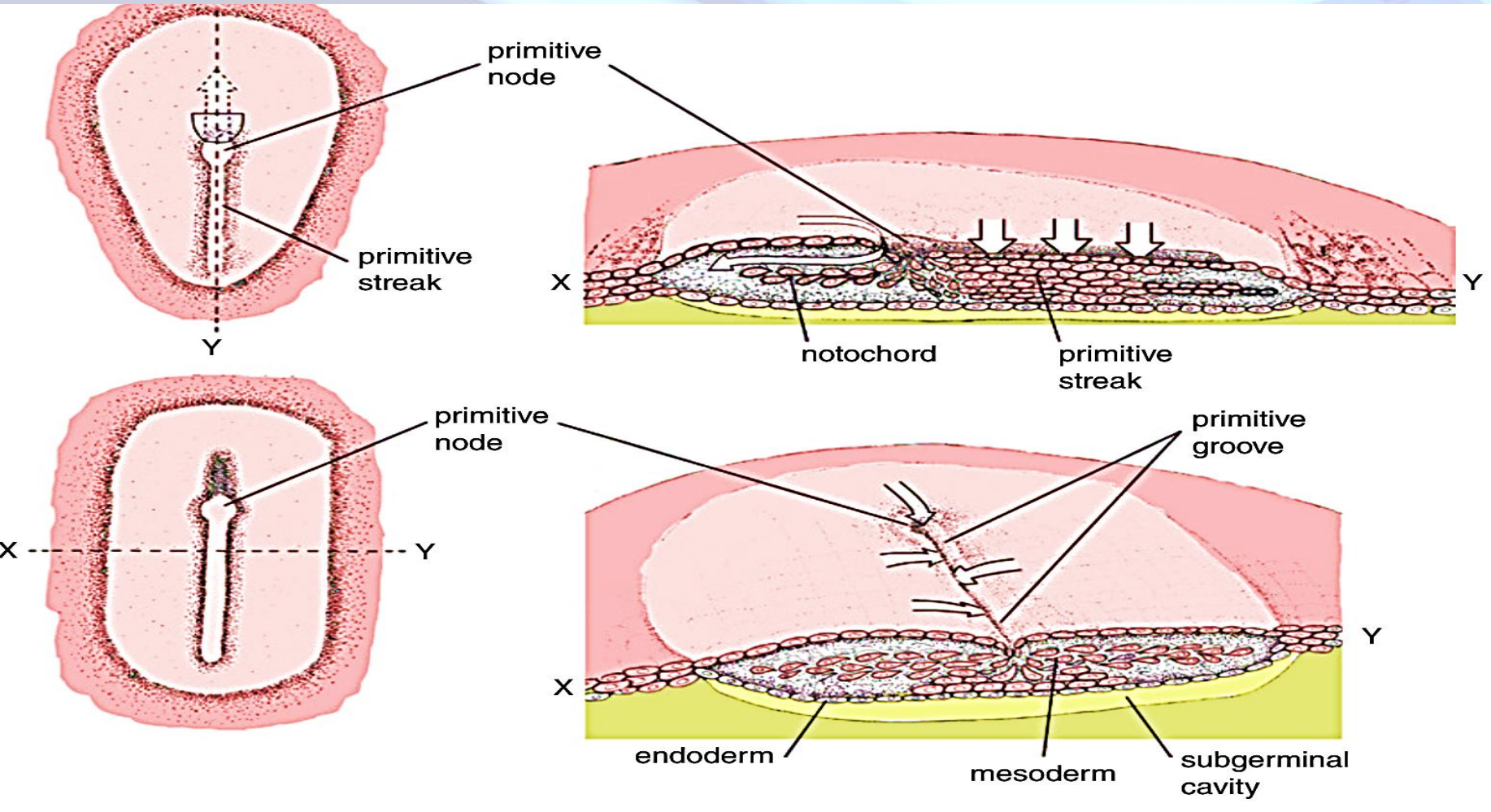
- **Blastoderm**
  - Consists of an upper layer, the **epiblast** and a lower layer, the **hypoblast** with a cavity in between, the **blastocoele**

  - **Epiblast**
    - Gives rise to the three germ layers
  - **Hypoblast**
    - Gives rise to primordial cells and to extraembryonic endoderm

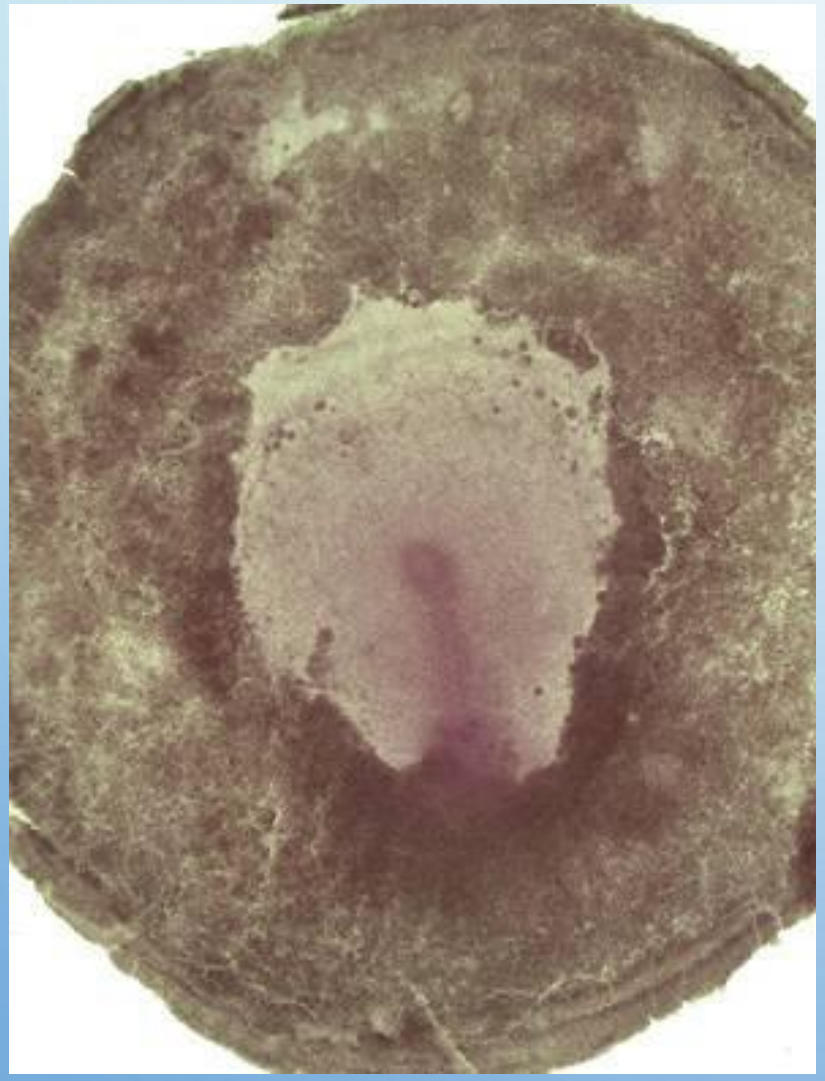
gastrulation

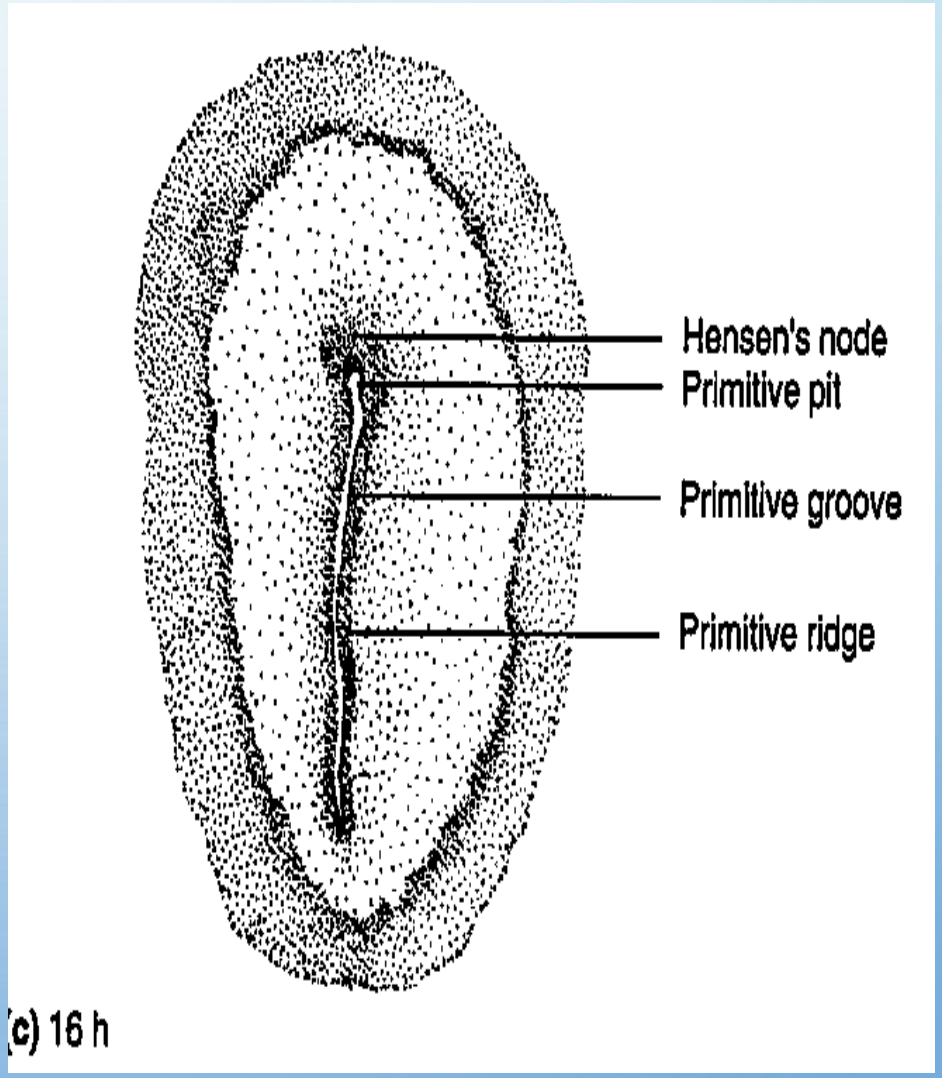
- **Area pellucida**
  - The central transparent portion separated from the yolk via the subgerminal cavity
- **Area opaca**
  - The peripheral opaque portion which is in direct contact with the underlying yolk

In avians

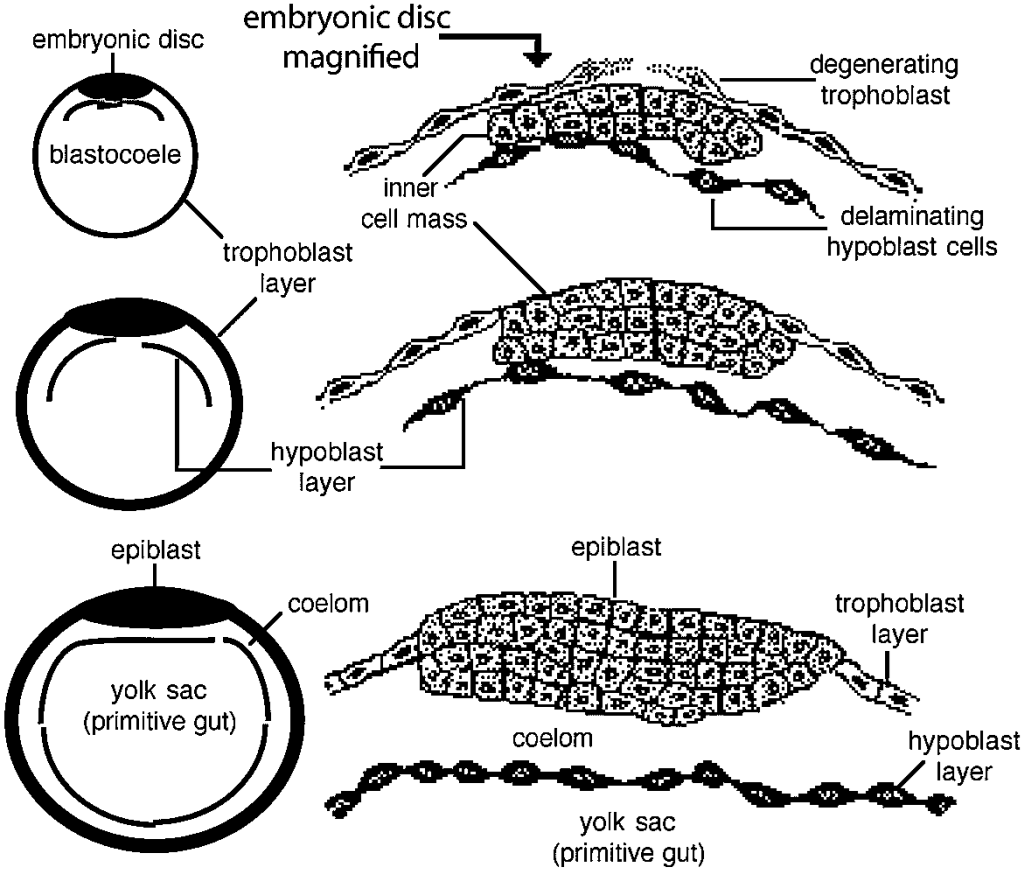

primitive node
primitive streak
Y
X
Y
notochord
primitive streak
primitive node
X
Y
primitive groove
X
Y
endoderm
mesoderm
subgerminal cavity

Primitive streak



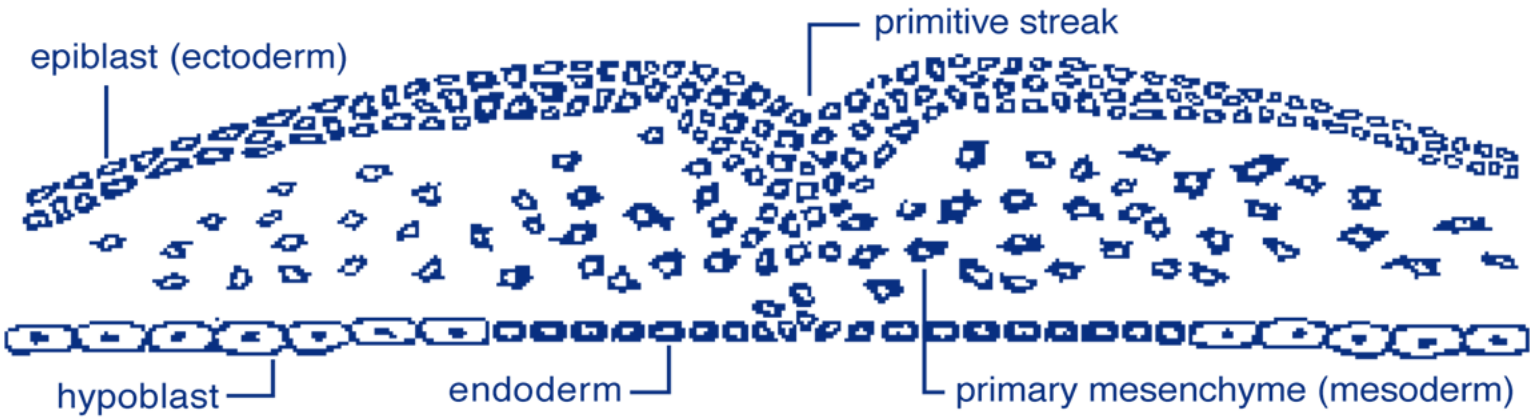


In mammals

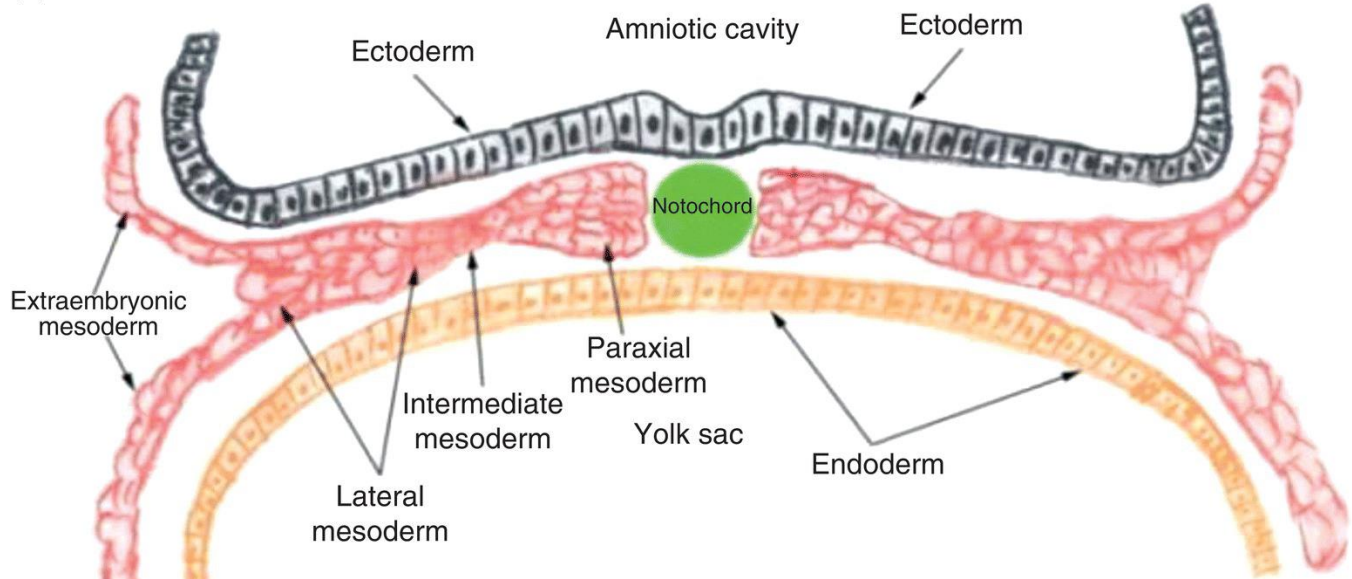

Hypoblast Formation (three stages)
embryonic disc
embryonic disc magnified
blastocoele
degenerating trophoblast
inner cell mass
delaminating hypoblast cells
trophoblast layer
hypoblast layer
epiblast
coelom
yolk sac (primitive gut)
epiblast
trophoblast layer
coelom
hypoblast layer
yolk sac (primitive gut)


1
2
3
4
5
B
25 µm

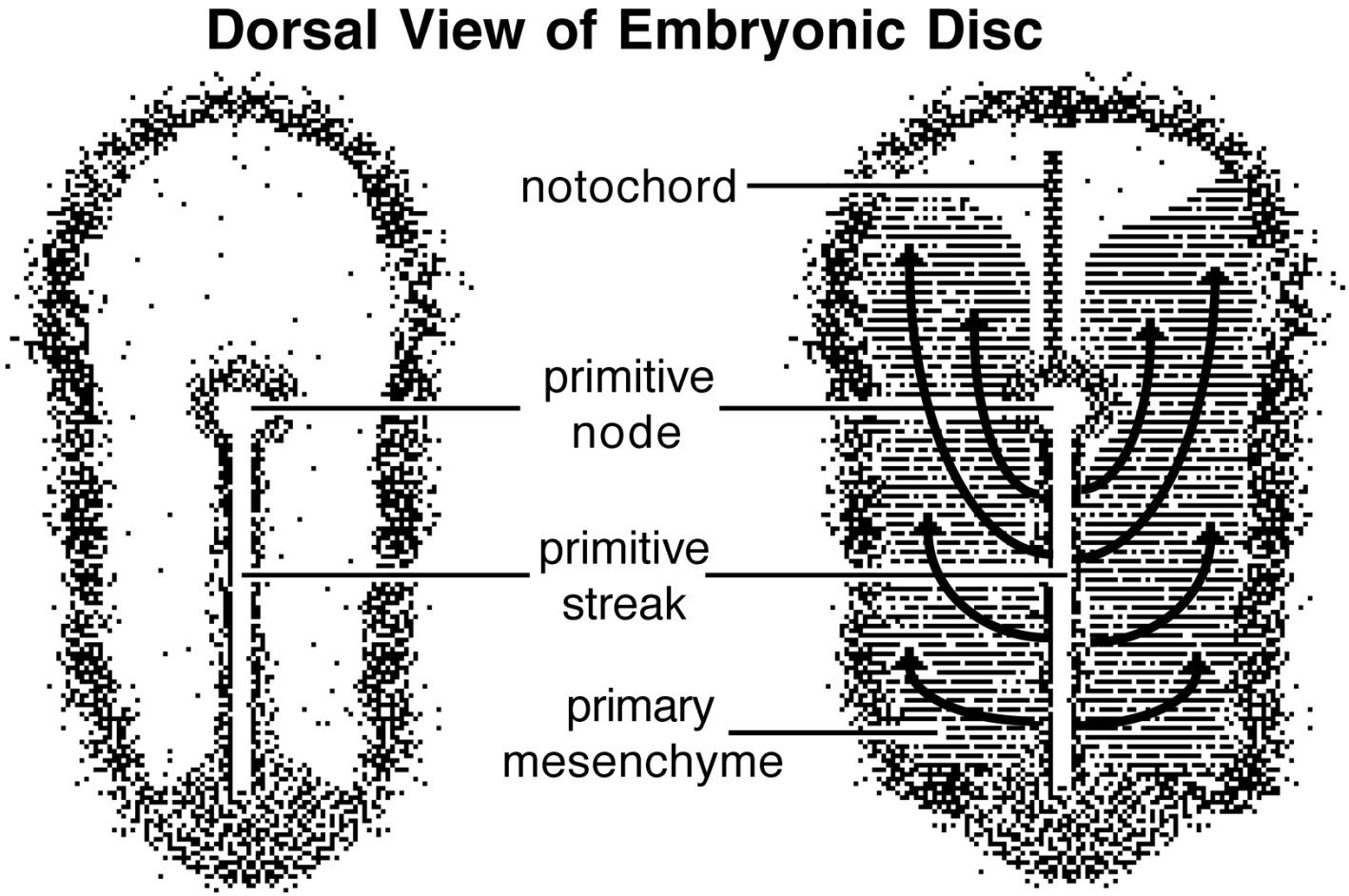
In mammals


primitive streak
epiblast (ectoderm)
hypoblast
endoderm
primary mesenchyme (mesoderm)

(a)


Ectoderm
Amniotic cavity
Ectoderm
Notochord
Extraembryonic mesoderm
Intermediate mesoderm
Paraxial mesoderm
Yolk sac
Endoderm
Lateral mesoderm

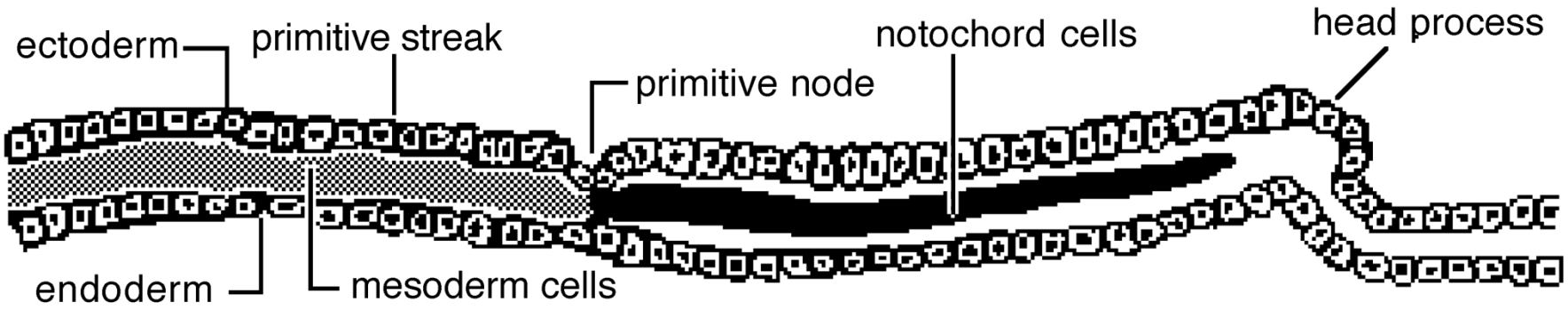
In mammals



NOTE: Arrows indicate the spread of primary mesenchyme through the primitive streak and between the epiblast and hypoblast

Notochord formation

Longitudinal Section Through Primitive Node and Notochord



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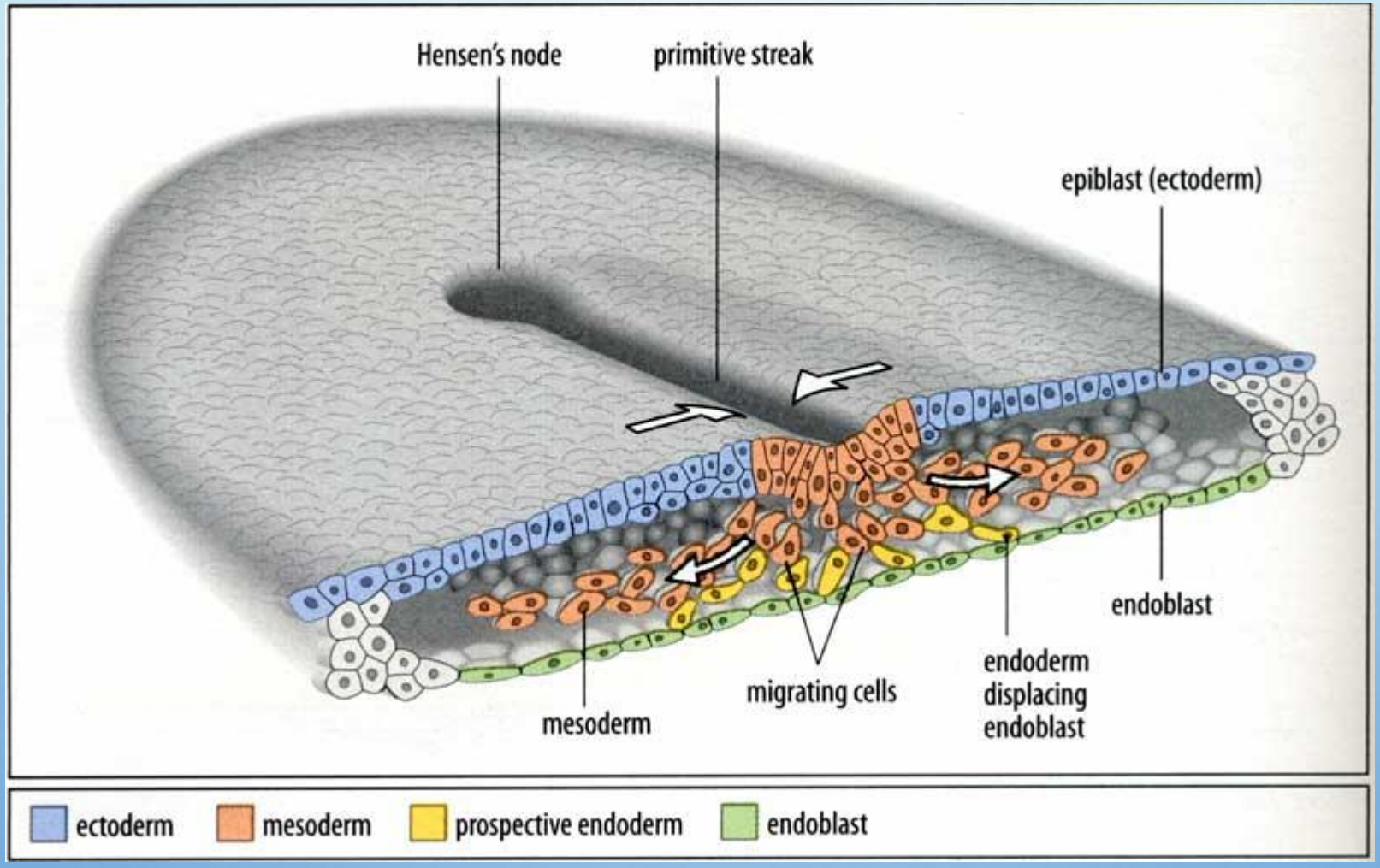

end... Thank you!