



Cleavage ,Implantation and 2nd week of the intrauterine life

Dr. Ahmed Salman
Associate professor of anatomy

III-Cleavage

Cleavage of the zygote leads to formation of morula and blastocyst

A. Formation of the morula :

- In the uterine tube the zygote divides by repeated ***mitotic*** divisions inside zona pellucida to form small blastomeres.

It forms 2, 4, 8 cells stages .

- The **morula** is a mass formed of 16 small blastomeres surrounded by zona pellucida .
- It reaches the uterine cavity by the 4th day after fertilization.

B. Formation of the blastocyst :

- ❖ The zona pellucida starts to degenerate at 5th day
- ❖ Uterine fluid passes through degenerative zona pellucida
- ❖ Many spaces appear between the central blastomeres of the morula
- ❖ These spaces fuse together to form a single cavity called the blastocoel.
- ❖ The morula is transformed into a blastocyst, formed of 50 - 60 blastomeres
- ❖ It lies in contact with the uterine endometrium at 5th- 6th day after fertilization.

- The blastocyst has the following features:

1. Two cell groups separated by the blastocoel:

- Outer cell layer, the trophoblast (It will form fetal membranes).
- Inner cell mass, the embryoblast (will form embryo).

2. Two poles:

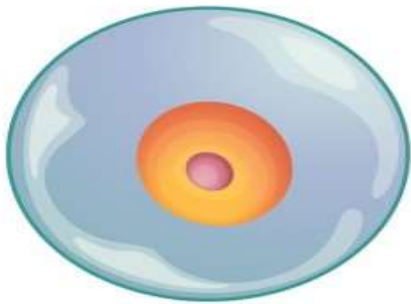
Embryonic pole: it is adjacent to the uterine endometrium.

Abembryonic pole: is away from the uterine endometrium.

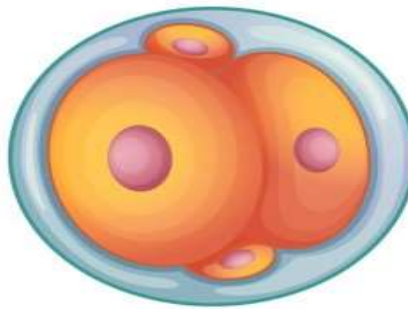
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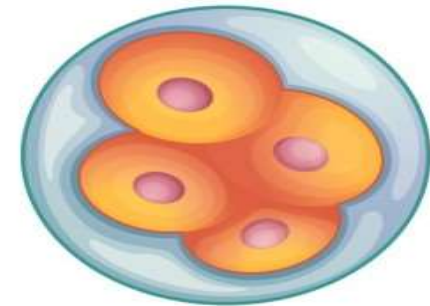
Human Embryonic Development



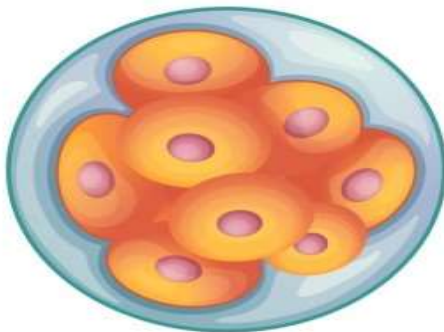
Fertilized egg



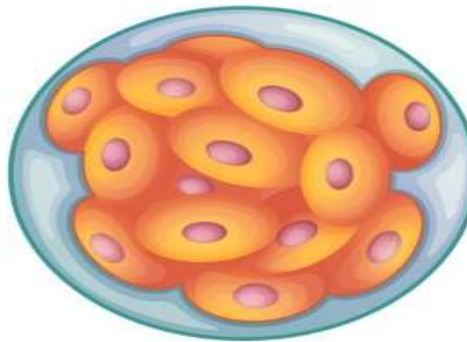
2-cell stage



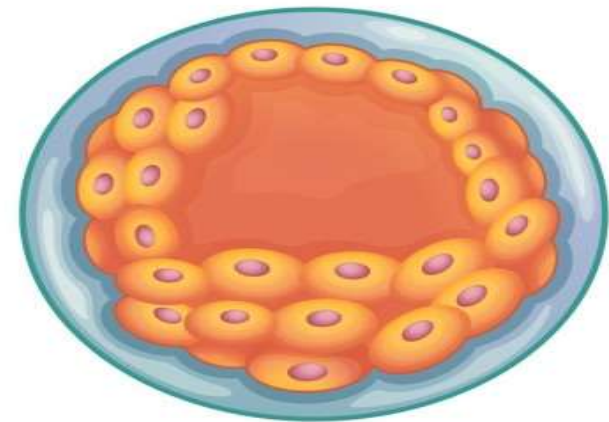
4-cell stage



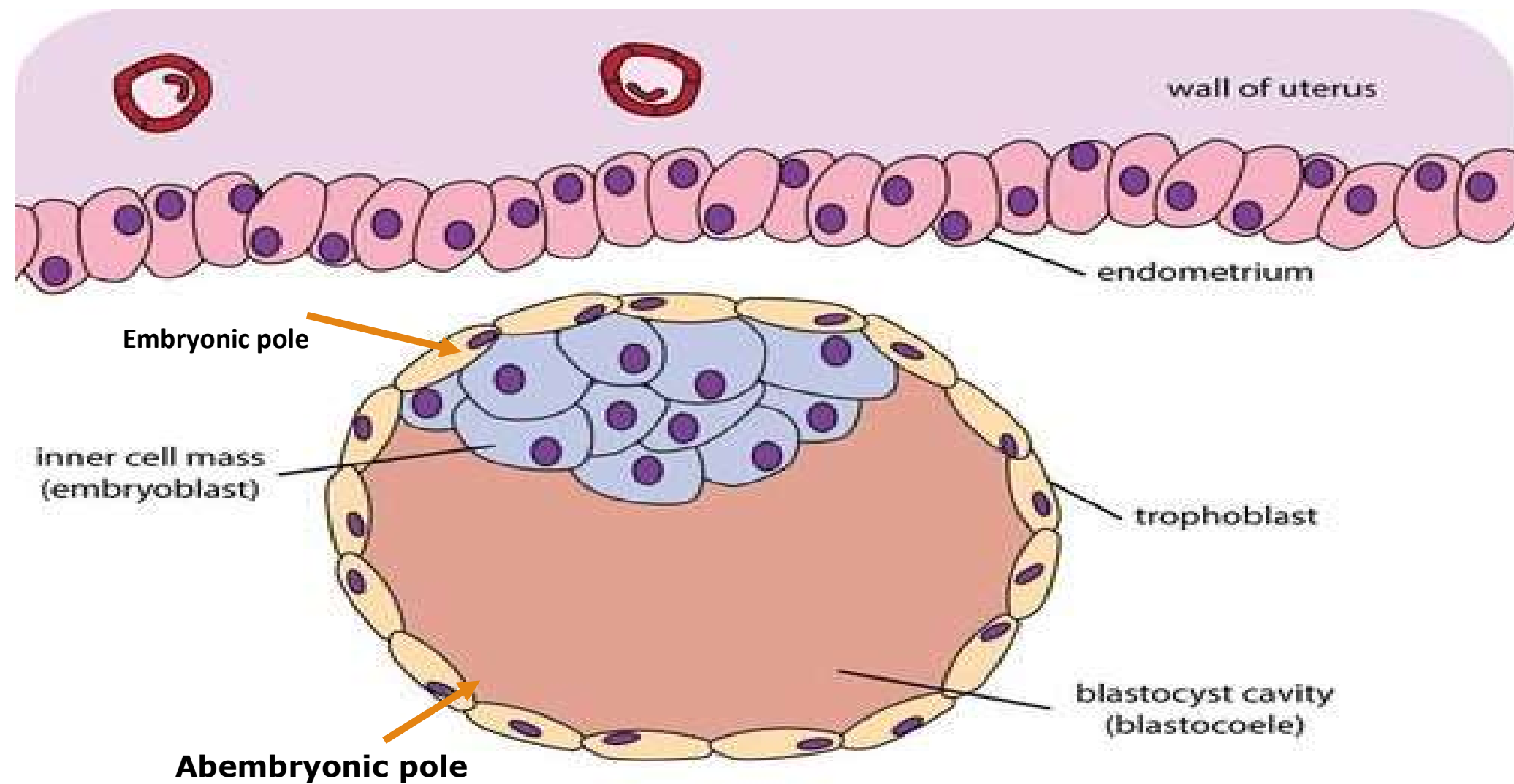
8-cell stage



16-cell stage



Blastocyst



IV-Implantation

Definition: It is the process of penetration of the superficial layer of the endometrium by the blastocyst.

Time: starts at the 6th or 7th day and is completed at the 11th or 12th day after fertilization.

Site: upper part of the posterior wall of the body of the uterus .

Mechanism of implantation :

- 1-The blastocyst comes in contact to the endometrium by its embryonic pole .
- 2- Erosion of the mucosa, by enzymes secreted by the trophoblast at the embryonic pole of the blastocyst , forming defect in the endometrium .
- 3- The blastocyst enter the endometrium , through the defect by its embryonic pole .
- 4- After complete embedding of the blastocyst into the endometrium, the defect in the endometrium is closed first by blood clot and later by proliferation of surrounding surface epithelium .

Abnormal sites of implantation :

A-Outside the uterus

❑ Tubal pregnancy : In the uterine tube

It usually ruptures within 1 – 2 months leading to internal hemorrhage.

❑ Ovarian pregnancy : In the ovary .

❑ Abdominal pregnancy : In the abdominal cavity close to the peritoneum or an omentum

B-Inside the uterus (placenta previa):

-Implantation occurs in the lower segment of the uterus, it called the placenta previa may be one of three types:

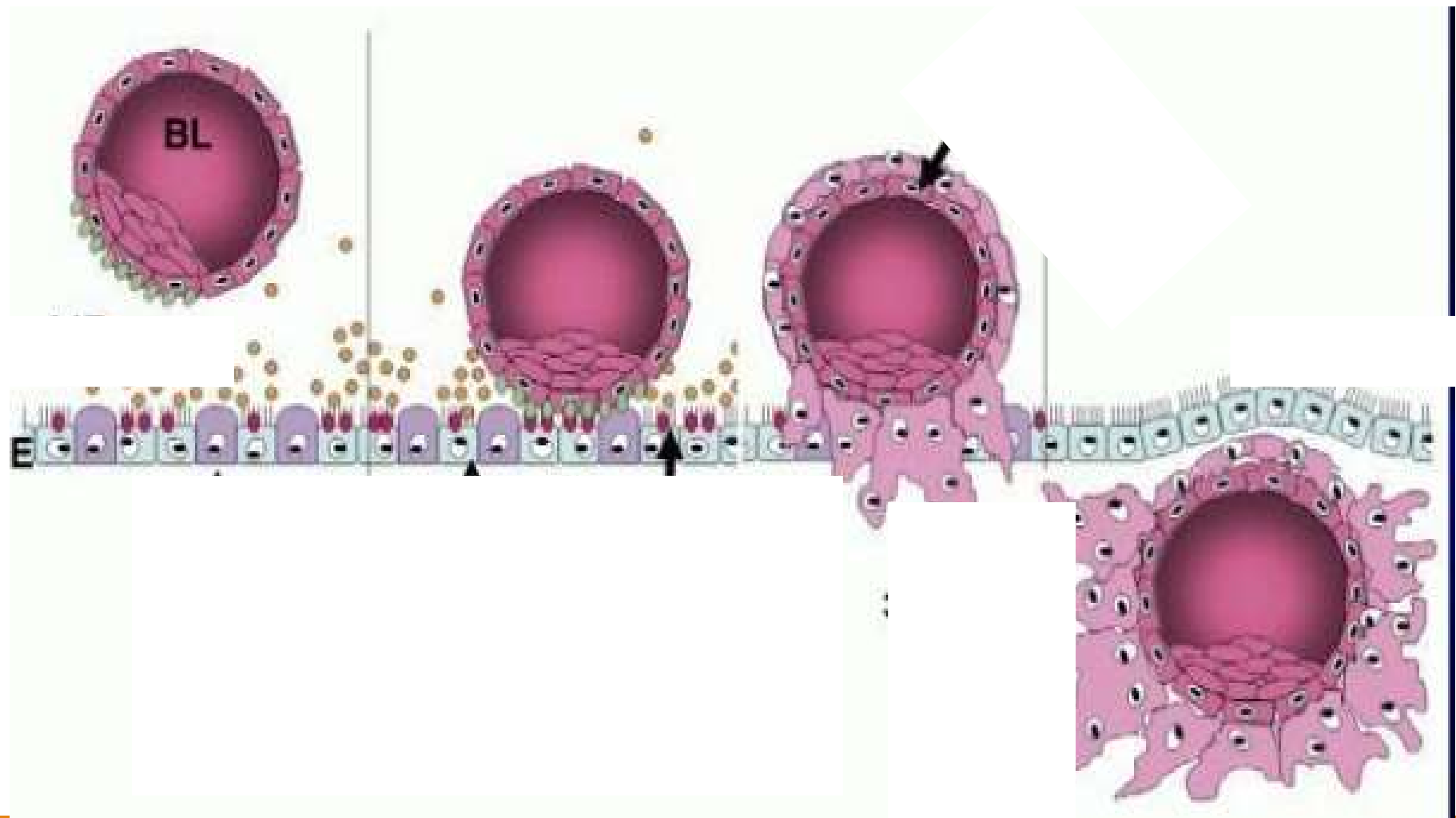
1-Placenta previa Partialis :The margin of placenta does not reach the internal os.

2-Placenta previa marginalis : The margin of the placenta reaches the internal os.

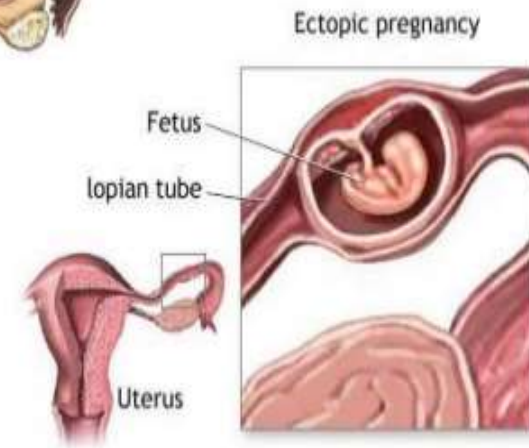
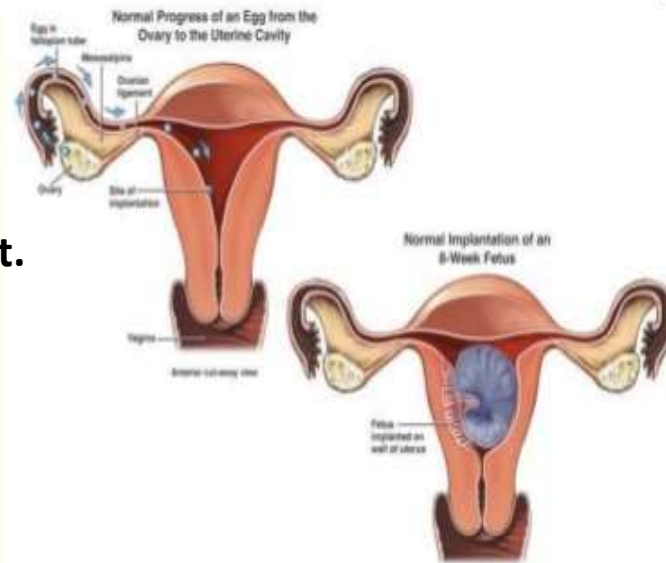
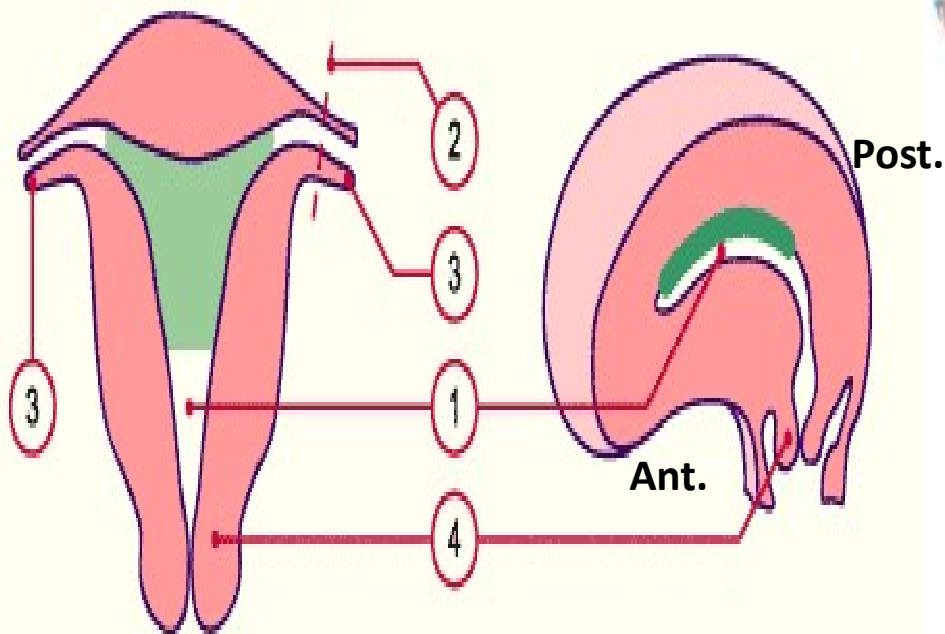
3-Placenta previa centralis : The placenta overlies internal os. It Is the most dangerous type.

The Placenta previa is life threading so caesarean section is recommended as :-

- It leads to antepartum(before delivery) maternal hemorrhage
- It may leads to fetal death



Sites of implantation of embryo

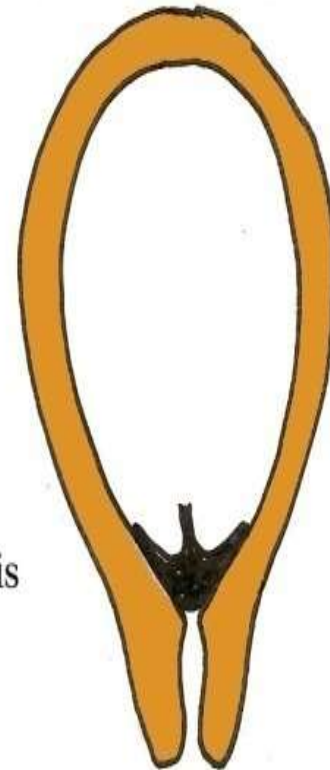




Marginalis



Parietalis



Centralis

Second Week of Development

The following changes occur during 2nd week of pregnancy :

1.Completion of implantation by 11th or 12th day

2.Changes in the embryoblast :

- Formation of the **bilaminar germ disc** :
- Epiblast*** adjacent to the trophoblast in floor of the amniotic cavity
- Hypoblast*** adjacent to the blastocele.
- The germ disc is **rounded or oval** in shape .

3.Changes in the trophoblast :

During 2nd. week ,the trophoblast shows **rapid rate of development** as compared to the slow rate of development of the bilaminar germ disc

- The trophoblast is differentiate into an outer syncytiotrophoblast and an inner cytotrophoblast.

A.Cytotrophoblast:

Its cells maintain their cell walls.

B.Syncytiotrophoblast:

- It is formed of a multinucleated zone without distinct cell boundaries.
- Small spaces appear & coalesce (at the 9th day) in the syncytiotrophoblast, at the embryonic pole first then spread all over the syncytiotrophoblast , to form **trophoblastic lacunae (lacunar stage)**.
- At the 11th & 12th days, the syncytiotrophoblast **erodes the maternal sinusoids** and its lacunae are filled with maternal blood & uterine secretions which begins to flow through the trophoblastic lacunae establishing the **utero-placental circulation** which allow nourishment of the germ disc & exchange of gases & metabolites.
- At the end of 2nd week , **1ry. Chrionic villi** appears at the embryonic pole

4 – Formation of 2 cavities :

A. Amniotic cavity : (8th day)

- It is a **space appears between** the epiblast and the cytotrophoblast
- The epiblast cells form a layer of flat cells called **amnioblasts** which form the **roof** of the amniotic cavity while its **floor** is formed by the epiblast .

A.Primary yolk sac : (9th day)

- The hypoblast cells form a layer of flat cells to form a membrane , which line the blastocele , called exocoelomic membrane (Heuser's membrane) .
- The space between the hypoblast and the Hauser's membrane is called the 1ry yolk sac , which replaces the blastocele

Its roof is the hypoblast and the remaining part of its wall is formed of Hauser's membrane .

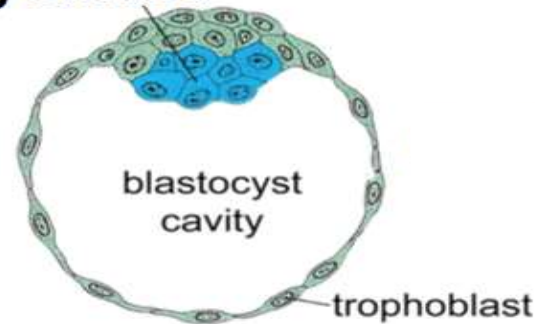
- The hypoblast produces additional **cells that migrate inside** the Heuser's membrane. These cells proliferate and gradually form a new cavity known as the **secondary yolk sac** (day 13).

5-Extraembryonic mesoderm:

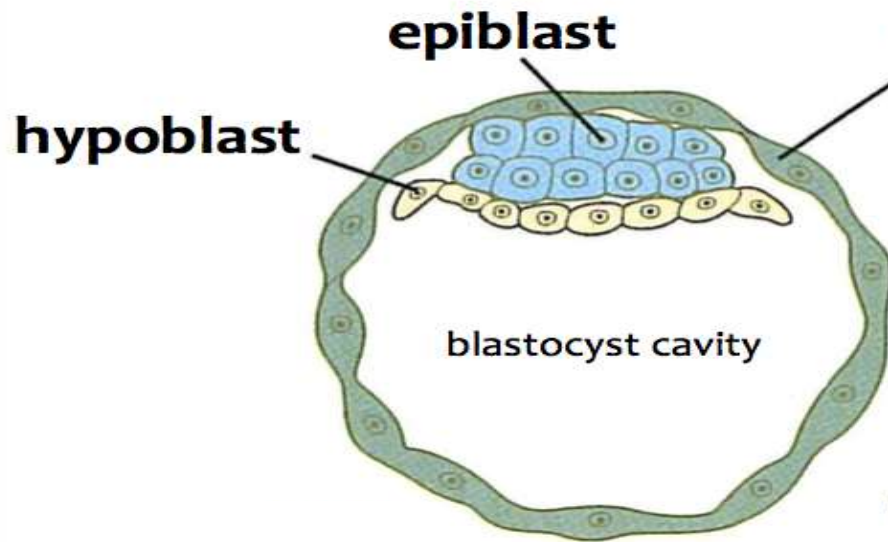
- These are cells derived from the yolk sac cells and form very loose tissues between the cytotrophoblast externally and the yolk sac internally.
- Cavities appear & coalesce , in the extra-embryonic mesoderm , forming a single large C shape cavity called the extra-embryonic coelom (or chorionic cavity).
- **Connecting stalk** : (future umbilical cord) It is the extra-embryonic mesoderm **connecting** the amniotic cavity with the over lying cytotrophoblas .

- The extra-embryonic mesoderm is **divided** by the extra-embryonic coelom (chorionic cavity) into:
 - a. Extraembryonic somatopleuric mesoderm** which line the cytotrophoblast
 - b. Extraembryonic splanchnopleuric mesoderm** which cover the yolk sac.
 - c. Connecting stalk :** (future umbilical cord) It is the extra-embryonic mesoderm **connecting** the roof of amniotic cavity with the over lying cytotrophoblasts . It is found **dorsal to the amniotic cavity**.
- The cytotrophoblast + Syncytiotrophoblast + Extraembryonic somatopleuric mesoderm are called Chorion .
- The blastocyst is now called the Chorionic vesicle (at the 12th day).

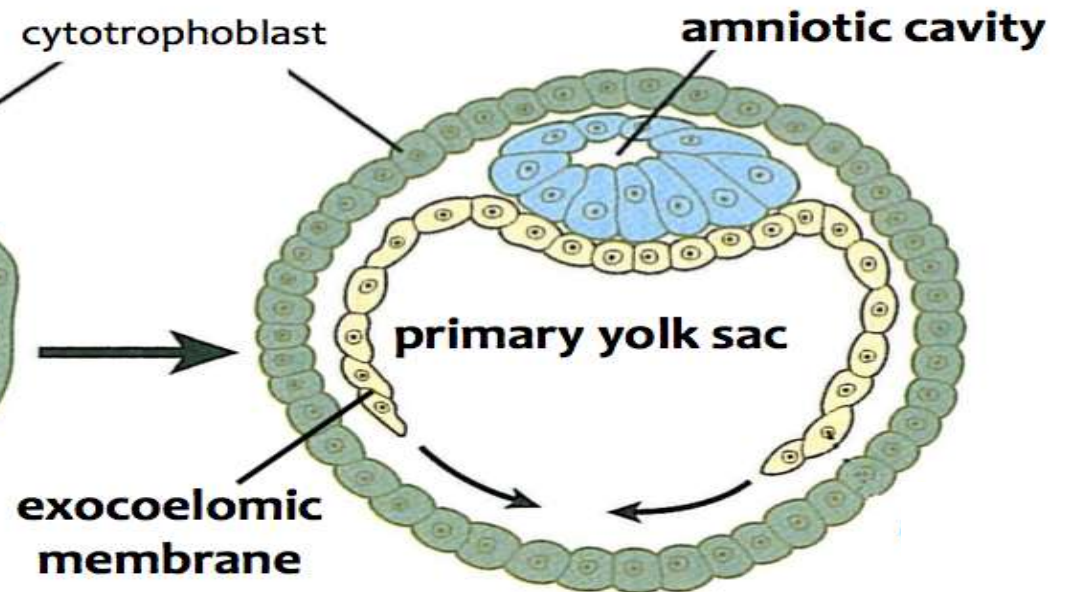
embryoblast

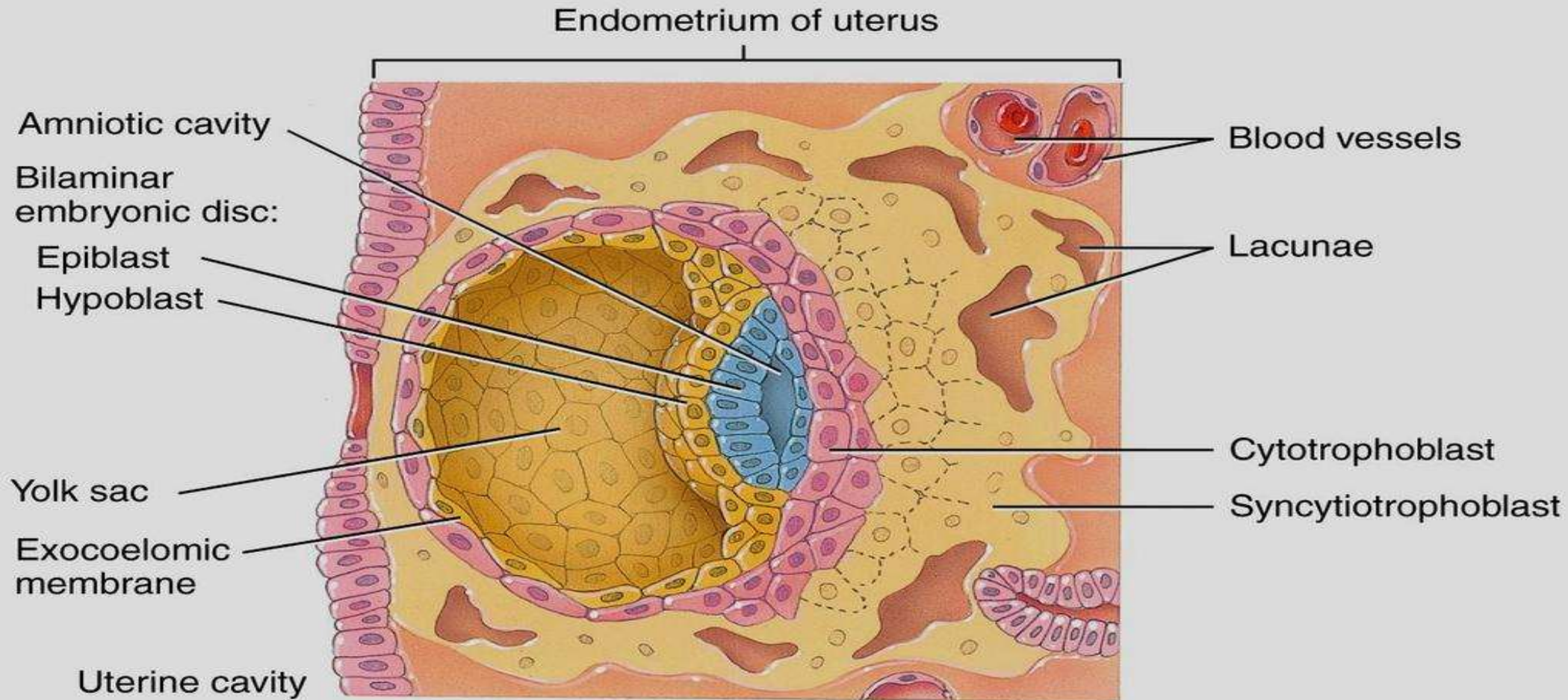


A. two layers (bilaminar germ disc)

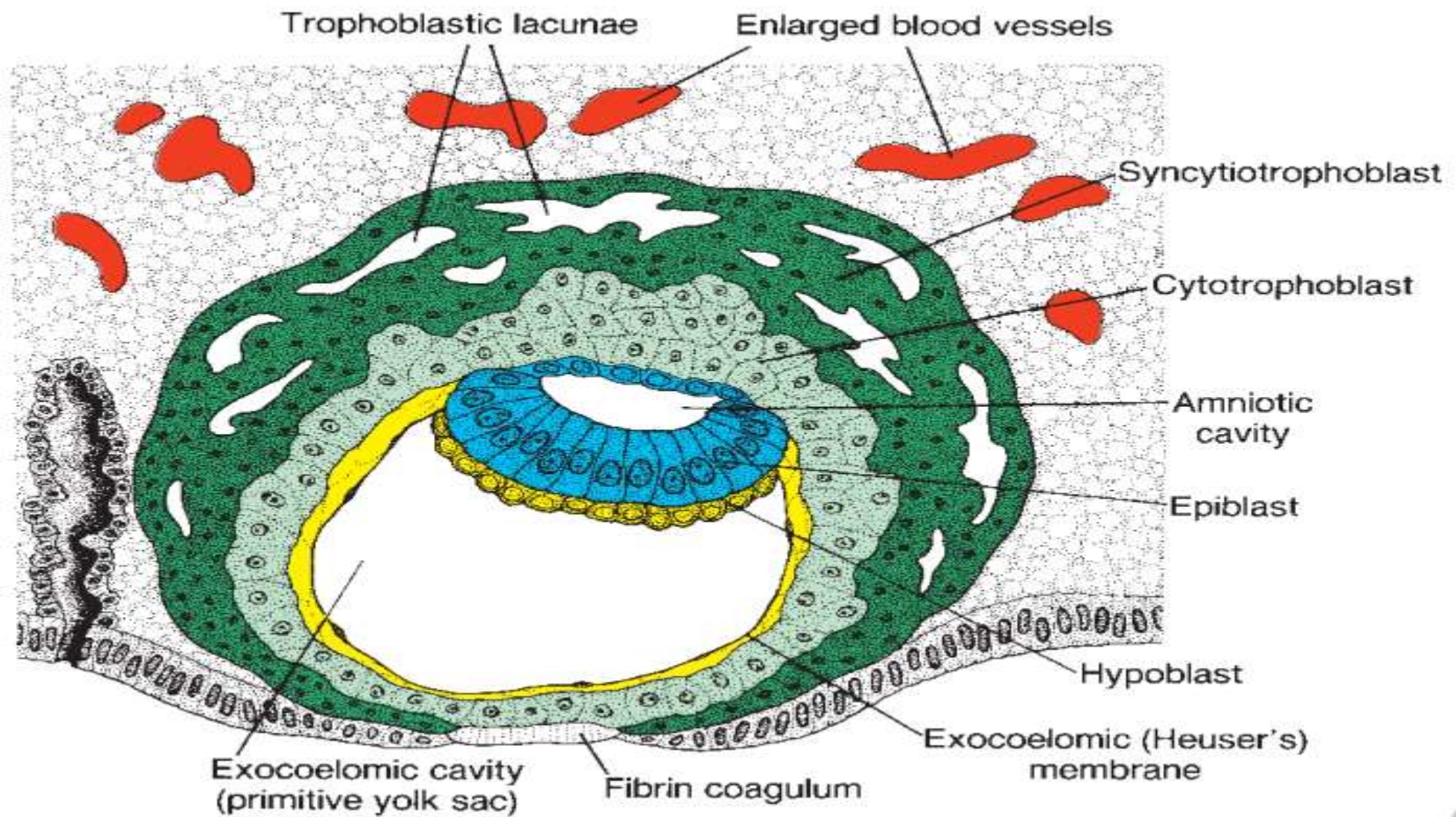


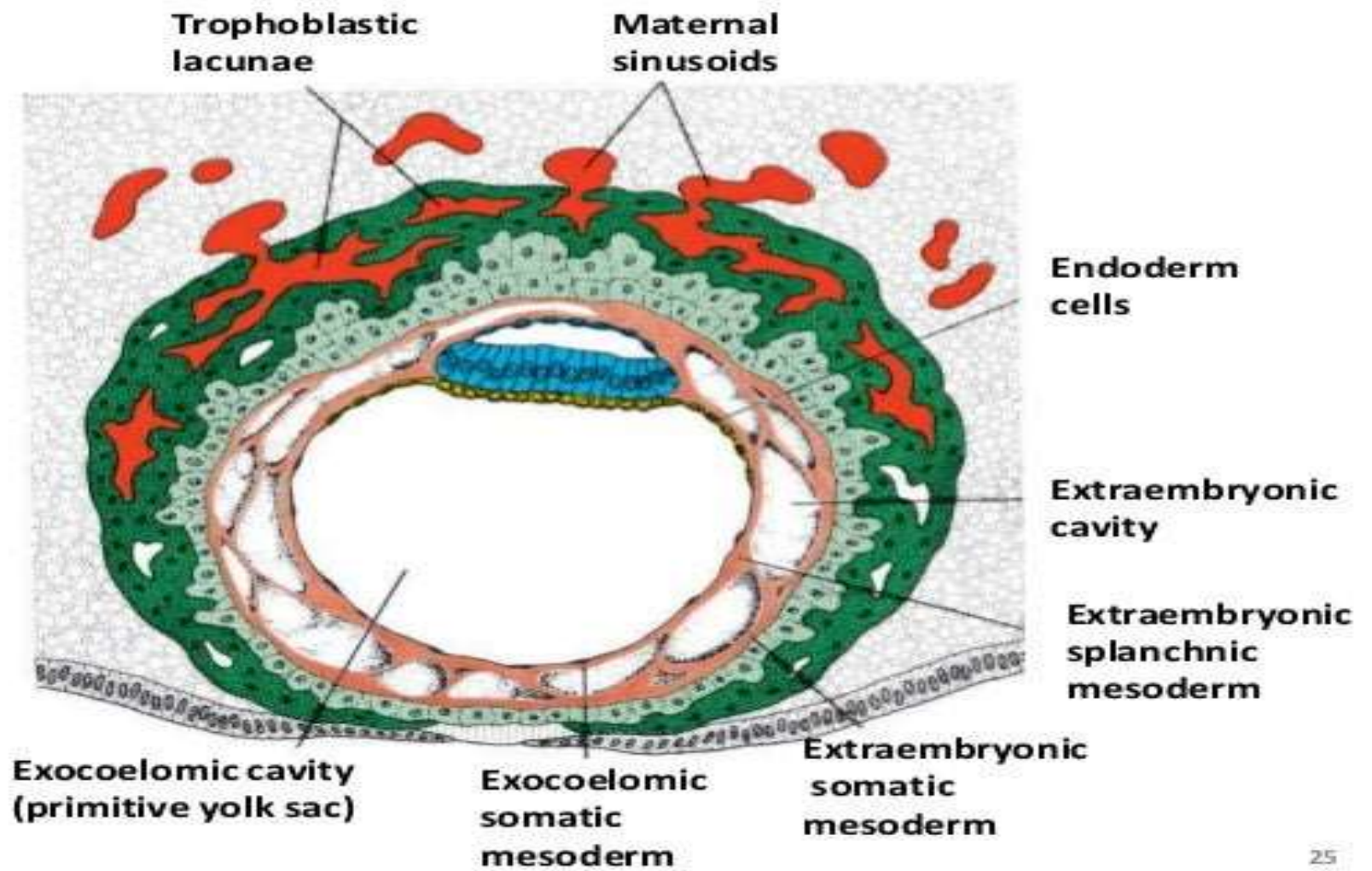
B. two cavities

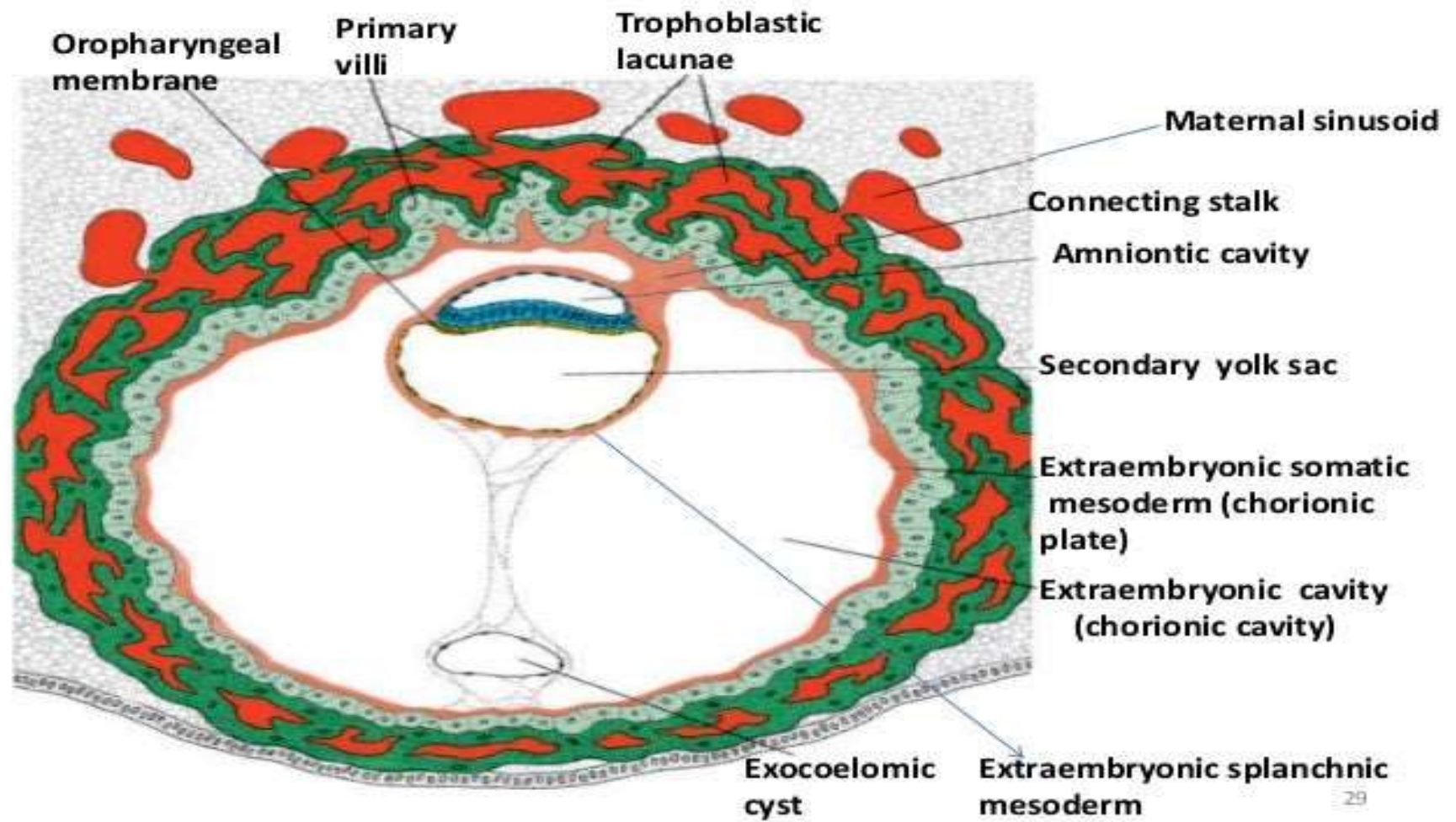


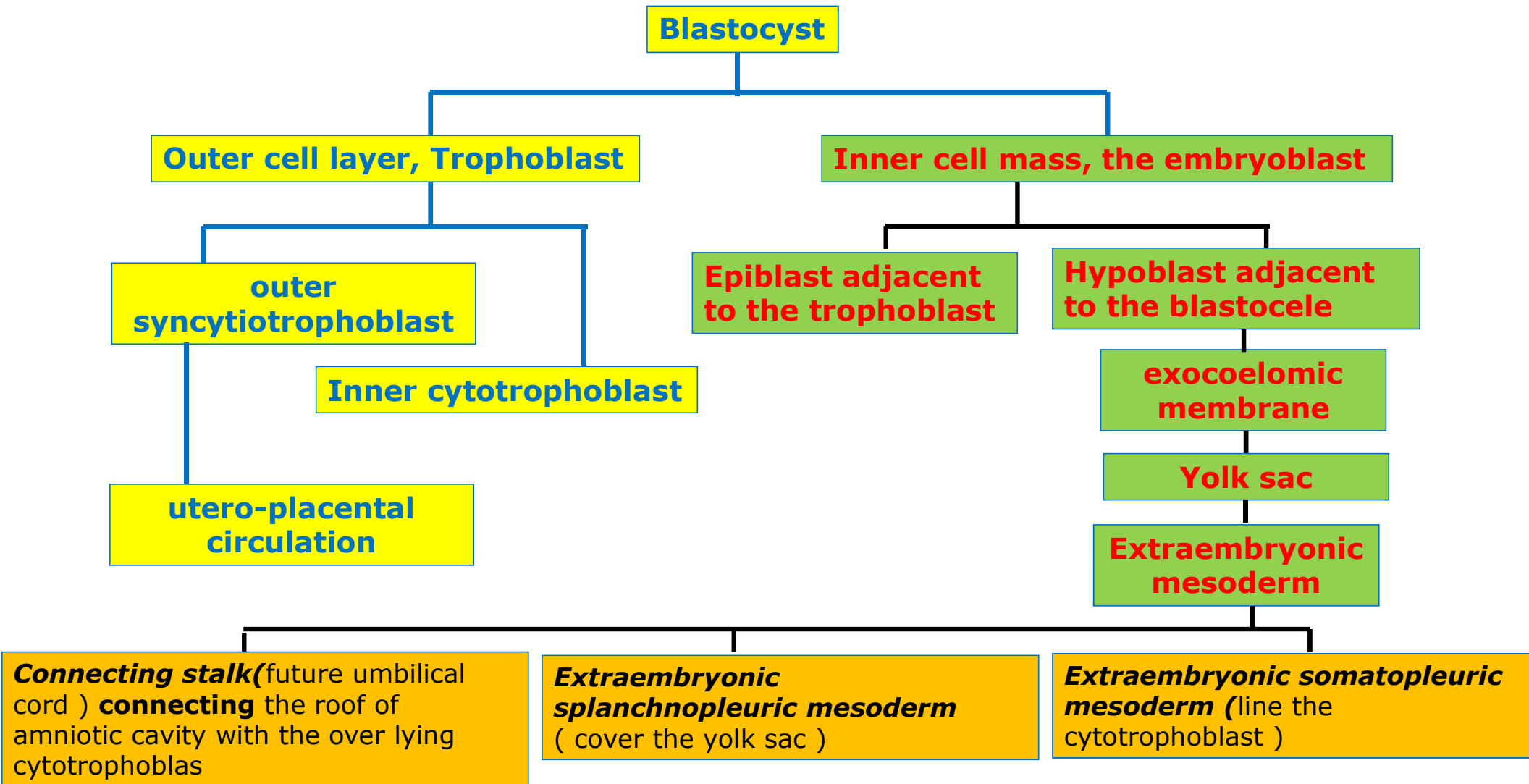


(b) Frontal section through endometrium of uterus showing blastocyst, about 9 days after fertilization









Watch this video

<https://www.youtube.com/watch?v=bldJOiXpp9g&t=85s>

A newborn baby is lying on its back, looking up at a bright, glowing light source in the sky. The baby's face is in focus, and its arms are slightly raised. The background is a soft, hazy sky with a large, bright sun or moon. The text "THANK YOU" is overlaid in large, white, serif capital letters.

THANK YOU

DR.AHMED SALMAN