Second Week of Development
Bilaminar Germ Disc

a day-by-day
The major events of the second week of Development

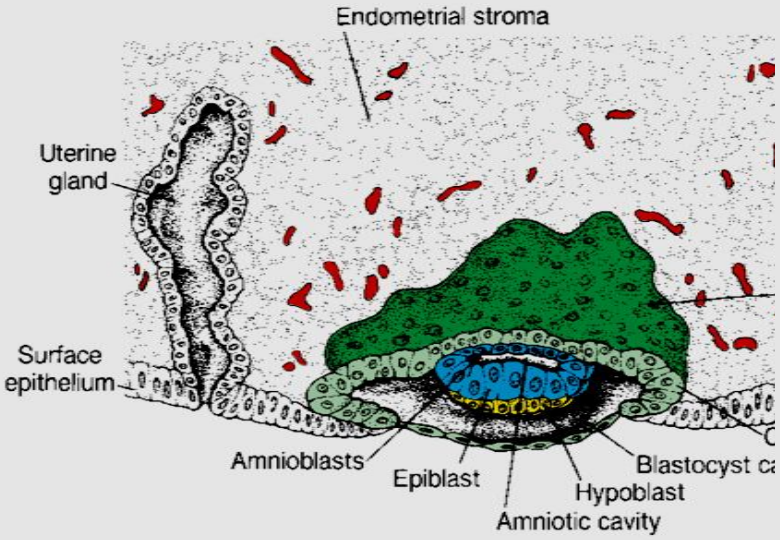
Dr. Saeednia

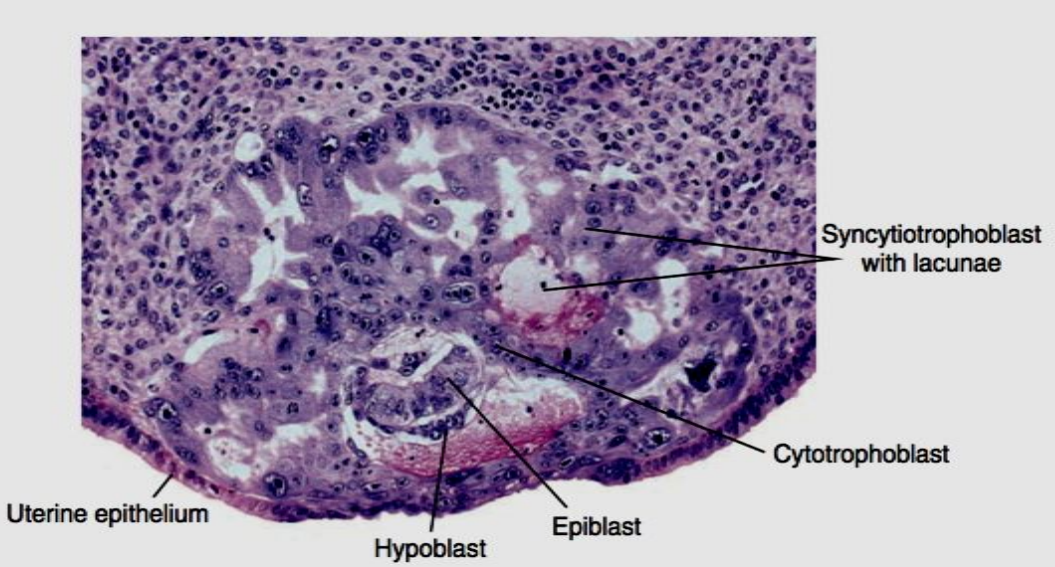
8th day

- the **blastocyst** is partially embedded in the endometrial stroma.

- the **trophoblast** over the embryoblast, **has differentiated into two layers**:
- **(1) cytotrophoblast** (a mononucleated cells inner layer / with mitotic division)
- **(2) syncytiotrophoblast** (an outer multinucleated zone without distinct cell boundaries)

- **Mitotic figures** are only found in the **cytotrophoblast / then migrated to syncytiotrophoblast / lost cell membrane**





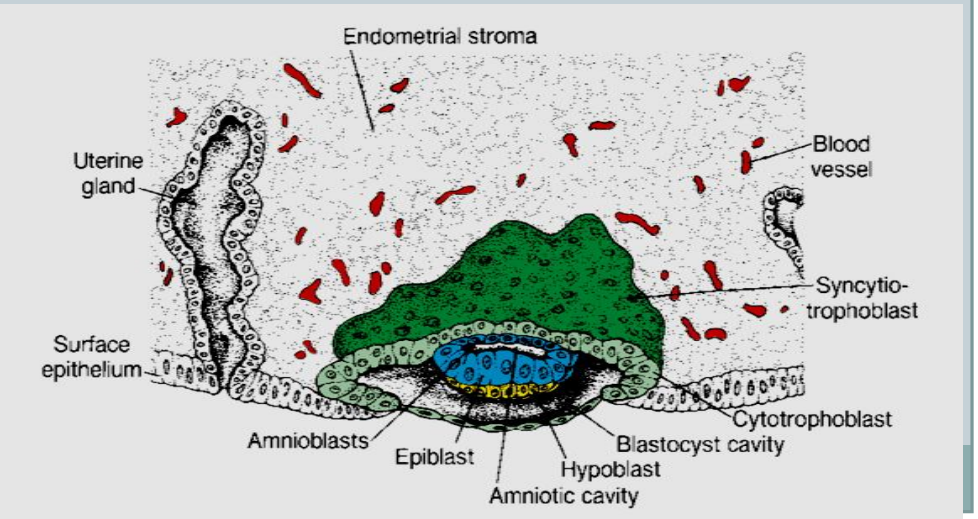
8th day

- Cells in the inner cell mass **or** **embryoblast differentiate into two layers:**
- **(1) hypoblast layer** (a layer of small cuboidal cells adjacent to the blastocyst Cavity)
- **(2) epiblast layer** (a layer of high columnar cells adjacent to the amniotic Cavity)

- Together,the layers form a flat disc
- **Amniotic Cavity =** a small cavity appears within the epiblast
- **amnioblasts =** Epiblast cells adjacent to the cytotrophoblast

The endometrial stroma adjacent to the implantation site is :

edematous and highly vascular The large, tortuous glands secrete abundant glycogen and mucus.



9th day

- **The blastocyst is more deeply embedded in endometrium (a fibrin coagulum)**

The trophoblast development, (particularly at the embryonic pole)

- vacuoles appear in the syncytium
- vacuoles fusion & large lacunae formation = lacunar stage

At the embryonic pole

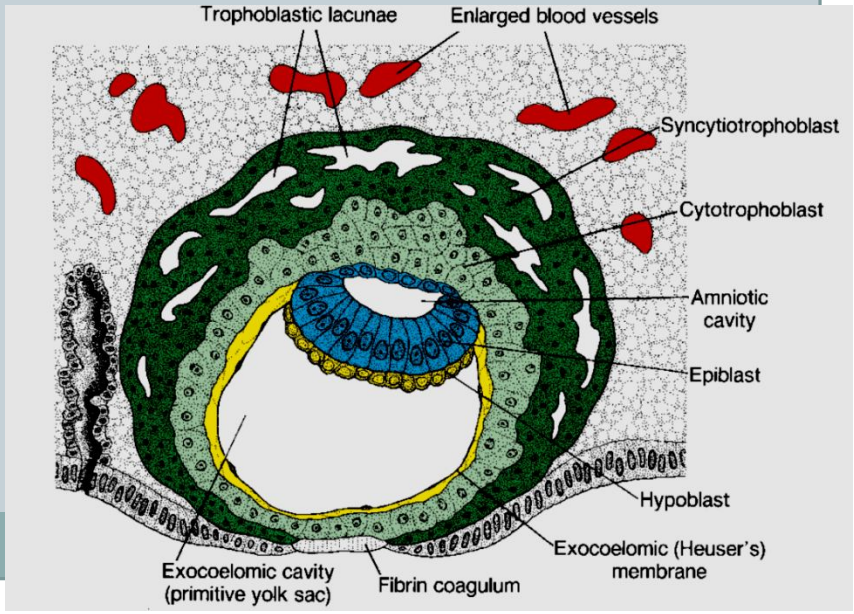
- **flattened cells =**

  the exocoelomic (Heuser's) membrane /

  Originated from hypoblast

- **exocoelomic cavity (primitive yolk sac) =**

Cover with Hypoblast + the exocoelomic (Heuser's) membrane



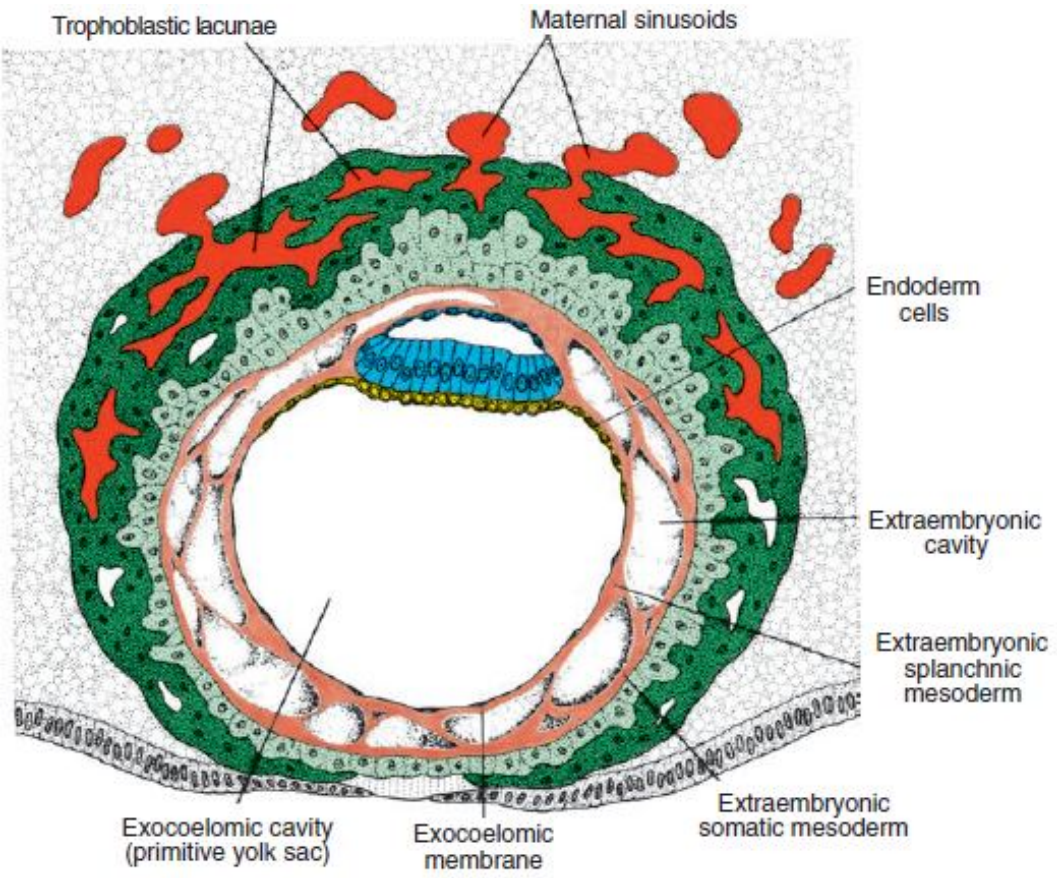
11th & 12th days

- blastocyst is completely embedded in the endometrial stroma
- slight protrusion into the lumen of the uterus

Sinusoids = maternal capillaries, which are congested and dilated

uteroplacental circulation = maternal blood begins to flow through the trophoblastic system

Extraembryonic mesoderm = a new population of cells appears between the inner surface of the cytotrophoblast and the outer surface of the exocoelomic cavity / **derived from yolk sac cells**



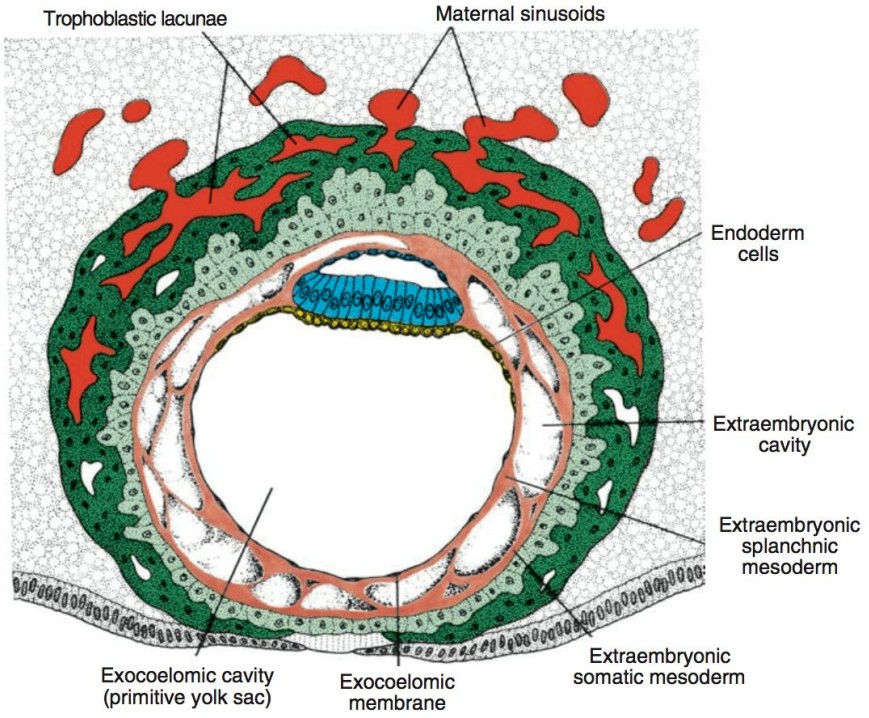
11th & 12th days

extraembryonic cavity (chorionic cavity) = large cavities develop in the extraembryonic mesoderm,

extraembryonic cavity (chorionic cavity) = surrounds the primitive yolk sac and amniotic cavity, except where the germ disc is connected to the trophoblast by the connecting stalk

extra embryonic somatic mesoderm = The extraembryonic mesoderm lining the cytotrophoblast and amnion

extra embryonic splanchnic mesoderm = covering the yolk sac

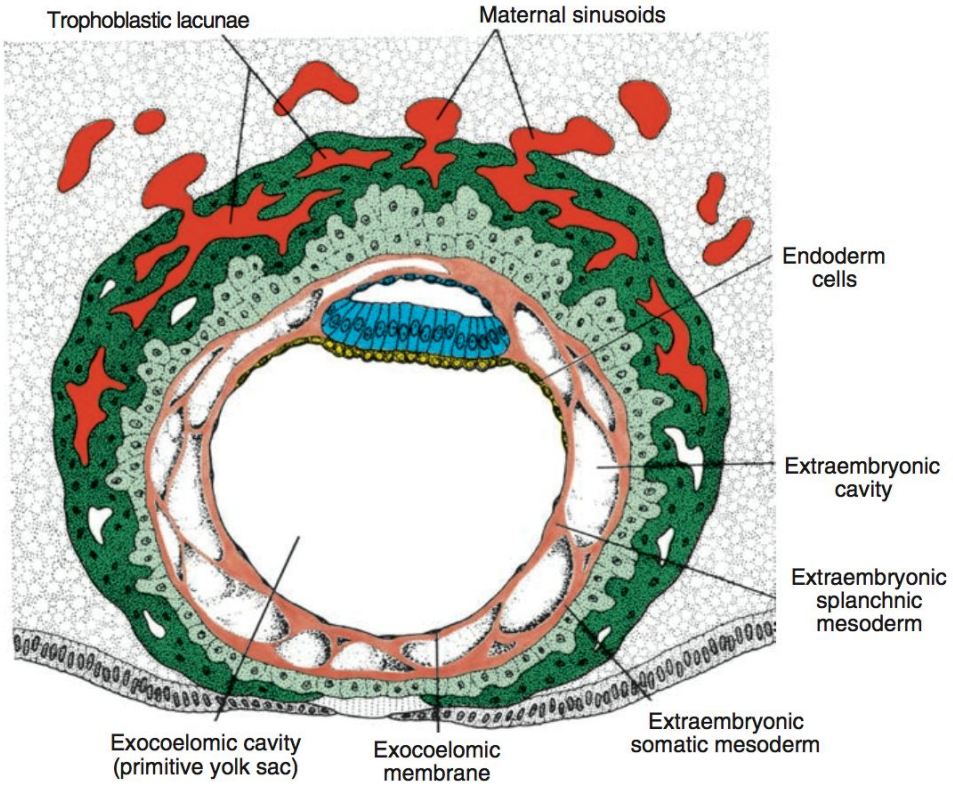


11th & 12th days

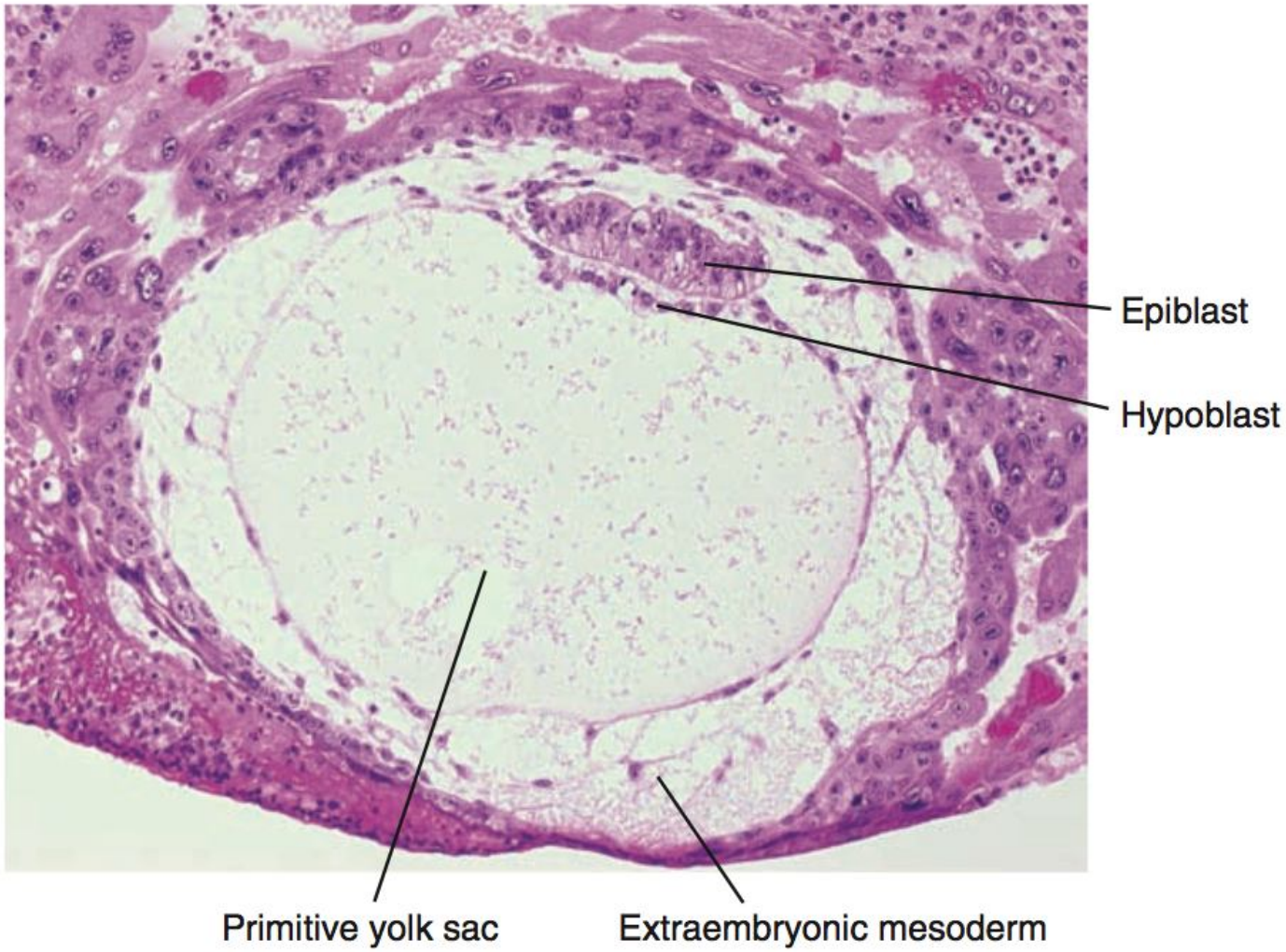
decidua reaction =

Cells of the endometrium become :

- Polyhedral
- loaded with glycogen and lipids
- intercellular spaces are filled with extravasate
- the tissue is edematous



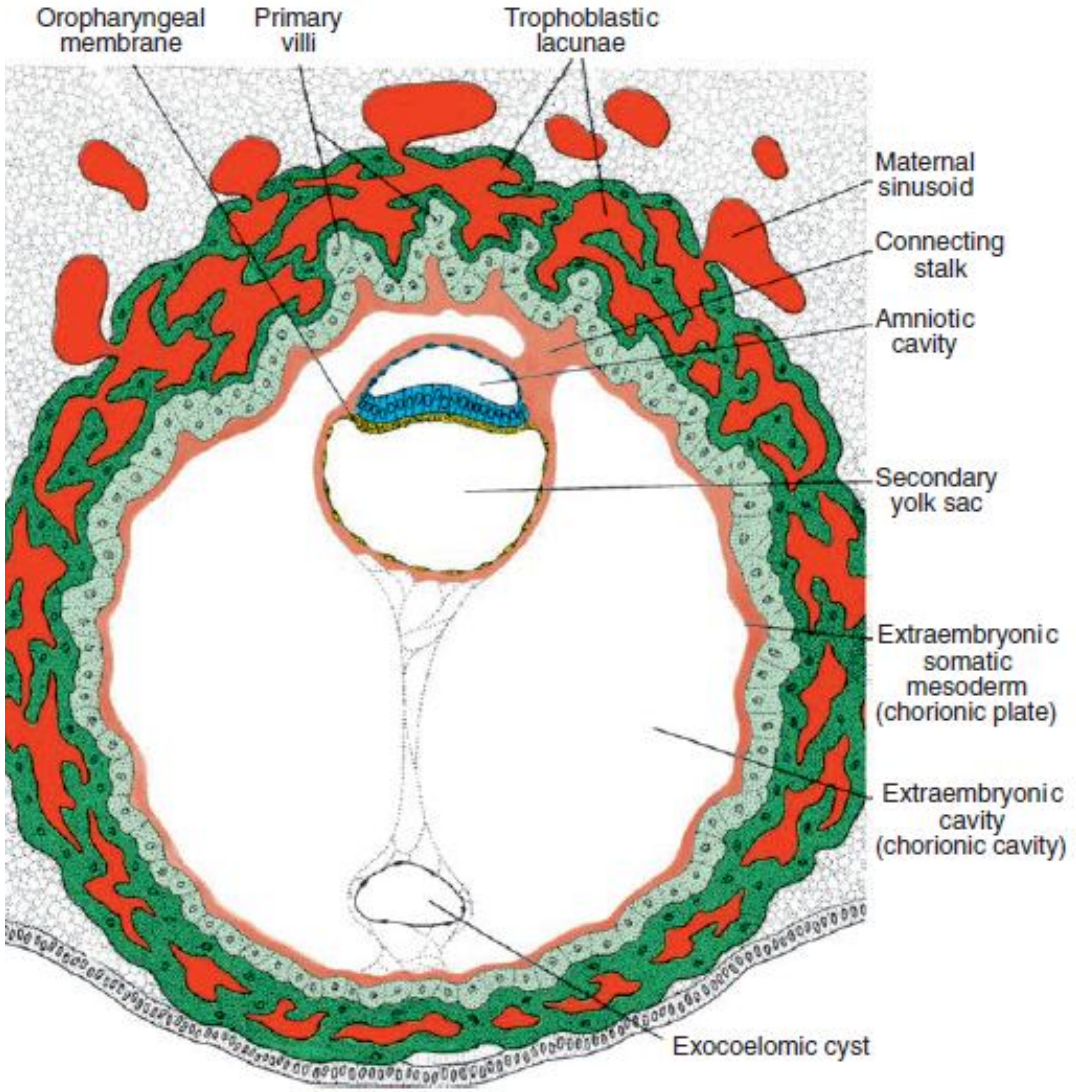
11th & 12th days



13th day

- the surface endometrium has healed
- Occasionally, bleeding occurs at the implantation blood flow in lacunar spaces

- Formation of villus structure = **cytotrophoblast** + **syncytiotrophoblast**
- Primary villi



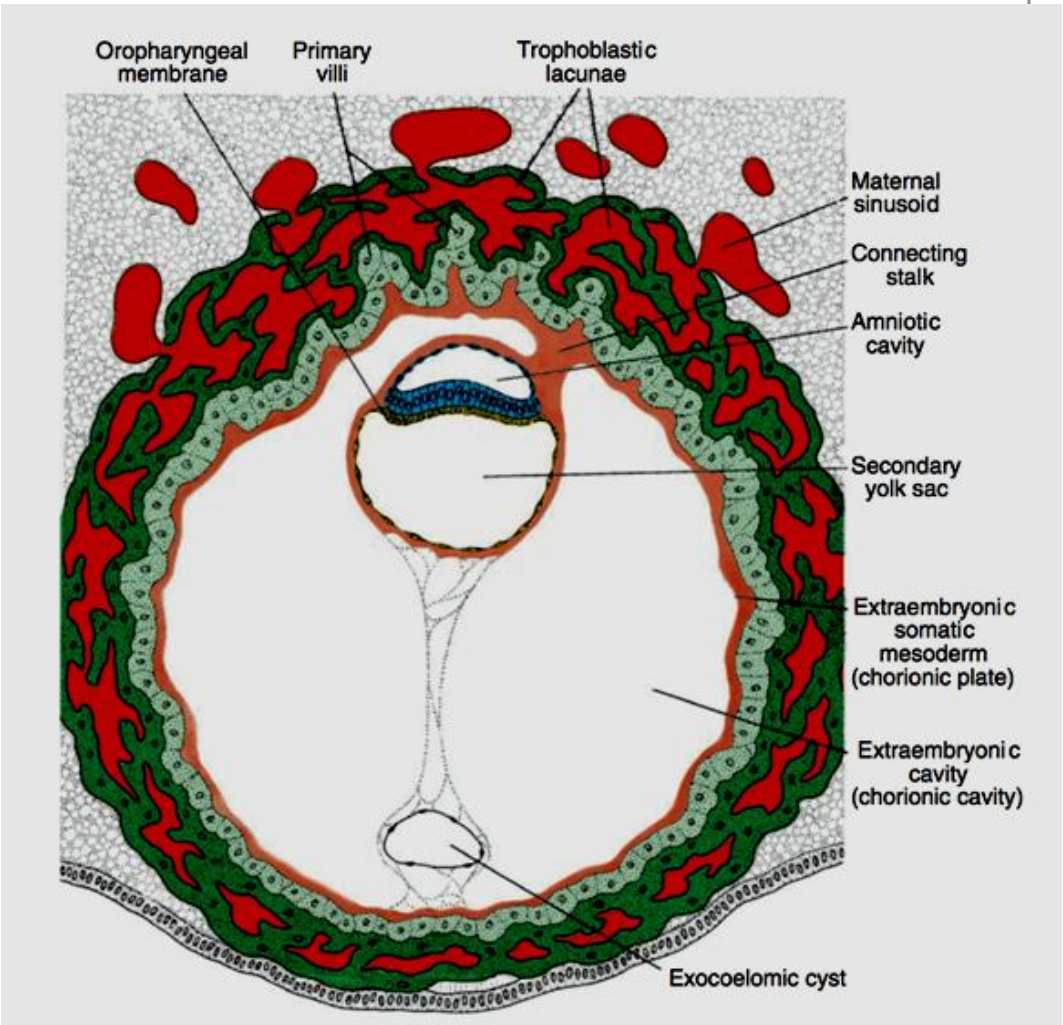
Secondary (definitive) yolk sac formation = **hypoblast** produce additional cell inside the exocoellomic membrane

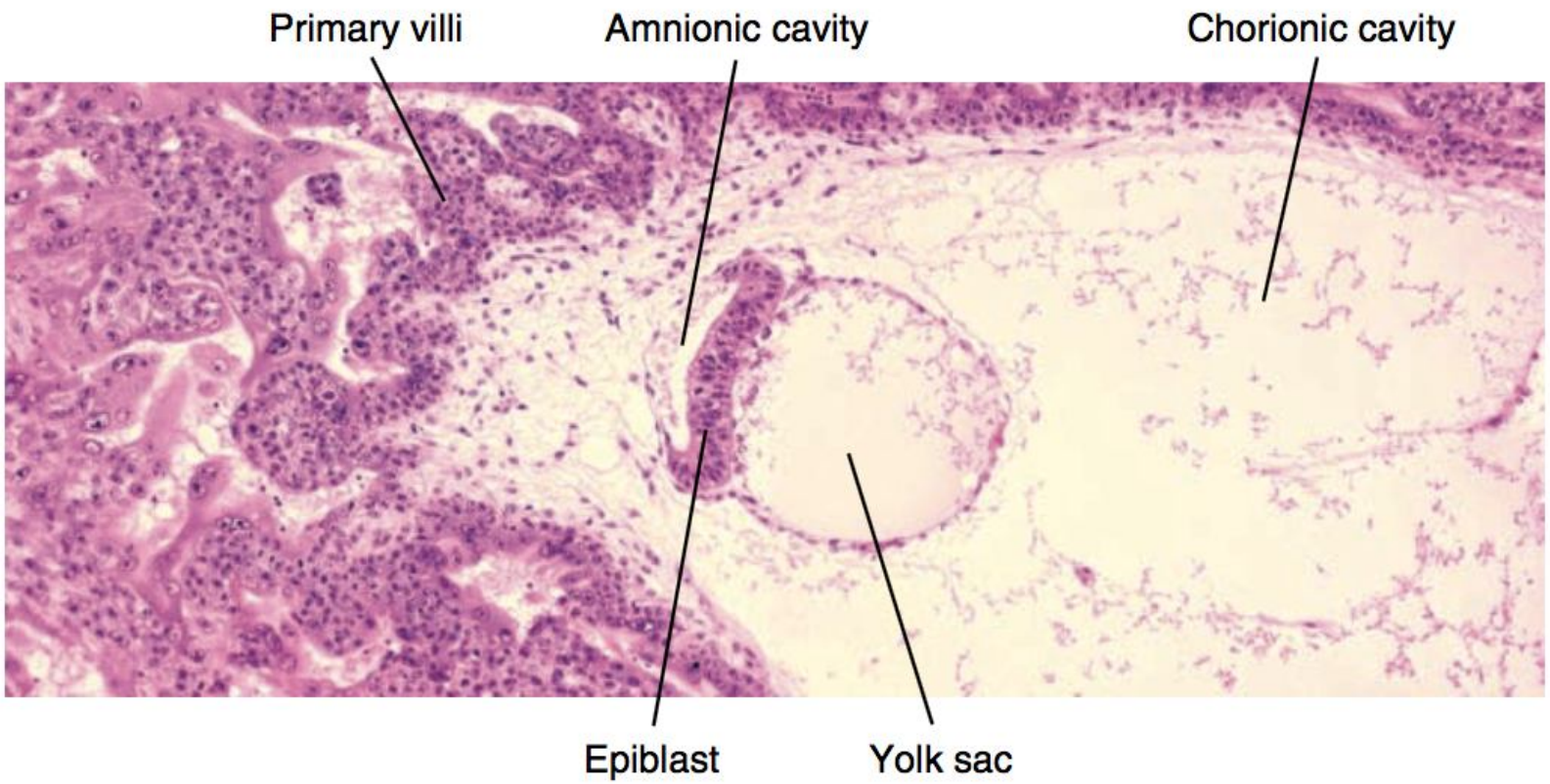
Exocoelomic syst = large portion of exocoelomic cavity pinched off

Chorionic plate = extra embryonic somatic mesoderm that cover inside the cytotrophoblast

chorionic cavity = Extraembryonic coelom expand

Connective stalk form umbilical cord




Primary villi
Amnionic cavity
Chorionic cavity
Epiblast
Yolk sac

Clinical correlations

The syncytiotrophoblast is responsible for hormone production (see Chapter 8,p.105), including **human chorionic gonadotropin (hCG)**. By the end of the second week, quantities of this hormone are sufficient to be detected by radioimmunoassays, which serve as the basis for pregnancy testing.

Clinical correlations

Because 50% of the implanting embryo's genome is derived from the father, it is a **foreign body** that potentially should be rejected by the maternal system, similar to rejection of a transplanted organ. A pregnant woman's immune system needs to change in order for her to tolerate the pregnancy. How this occurs is not well understood, but it appears that a shift from cell-mediated immunity to humoral (antibody mediated) immunity occurs and that this shift protects the embryo from rejection. However, the immune system alterations place pregnant women at increased risk for certain infections, such as influenza, which explains the increased risk of death from these infections in pregnant women. In addition, manifestations of autoimmune disease may change during pregnancy. For example, multiple sclerosis and rheumatoid arthritis, primarily cell-mediated conditions, show improvement during pregnancy, whereas women with systemic lupus erythrematosis (a predominantly antibody-mediated immune disorder) are more severely affected when pregnant.

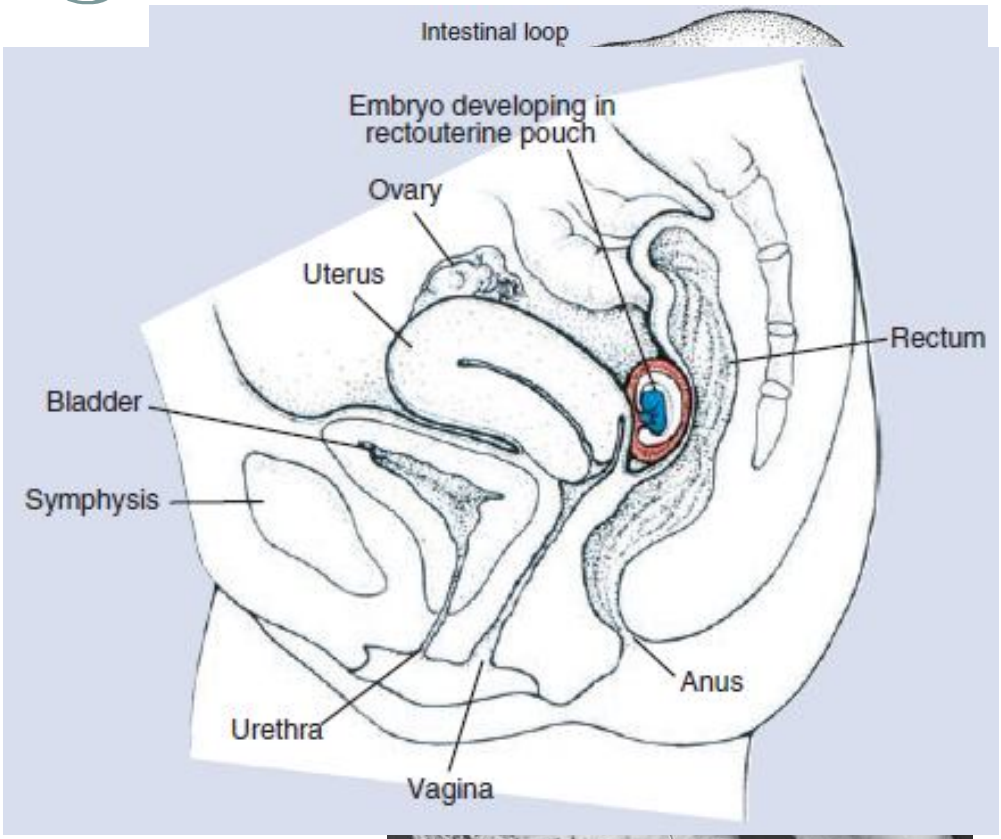
Abnormal implantation

Normally:

- Anterior or posterior wall of uterus
- Cervix internal os (placenta previa)

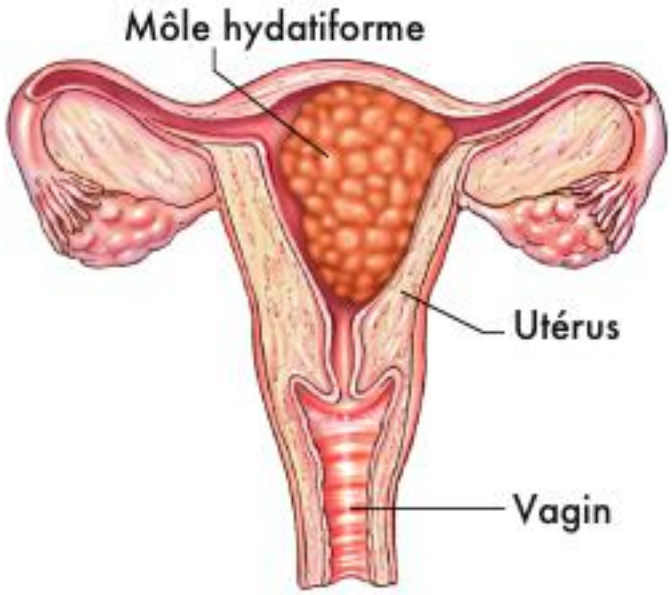
- Ectopic pregnancy (2%) (9% mortality) =

  - Abdominal cavity (rectouterine cavity)
  - Ovary
  - Uterine tube (95%)



Hydatidiform mole (choriocarcinoma)
Paternal origine

15% of oocyte no fertilization
10-15% cleavage but no implantation
From 70-75% impantation
Only 58% survive to second week (16% abnormal)
Only 42% of fertilized oocytes survived



Genomic imprinting
Bar body