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MATRIC NUMBER: 18/MHS01/262

DEPARTMENT: MEDICINE AND SURGERY

COURSE: EMBRYOLOGY

LECTURER: MR OGEDENGBE

ASSIGNMENT: DISCUSS THE 2<sup>ND</sup> WEEK OF  
EMBRYONIC DEVELOPMENT

## **Second (2<sup>nd</sup>) week of development**

The following events take place during the 2<sup>nd</sup> week of development:

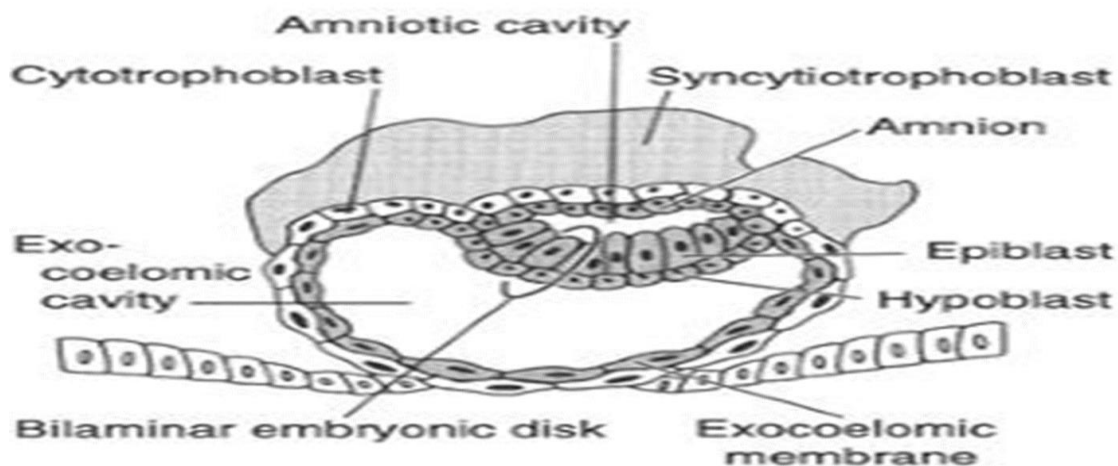
- I. Completion of implantation of the blastocyst on the endometrium of the uterus.
- II. Formation of bilaminar embryonic (germ) disc (composed of the epiblast and hypoblast layers).
- III. Formation of extraembryonic structures i.e. amniotic cavity, amnion, umbilical vesicle [yolk sac], connecting stalk, and chorionic sac.

### **Day 8**

- At the eighth day of embryonic development, the blastocyst is partially (slowly) embedded in the endometrium of the uterus.
- The syncytiotrophoblast continues its invasion of the endometrium, thereby invading the endometrial vessels and glands.
- More cells in the cytotrophoblast divide and migrate into the region of the syncytiotrophoblast, where they fuse and lose their individual cell membranes.
- As development continues, Cells of the inner cell mass or **embryoblast** also differentiate into 2 layers:

- I. *The hypoblast layer, which is made up of small cuboidal cells, and it is adjacent to the blastocyst cavity.*
  - II. *The epiblast layer, which is made up of high columnar cells, and it is adjacent to the amniotic cavity.*
- The hypoblast and epiblast layers **together** form a flat ovoid shaped disc called the **bilaminar embryonic disc**.
  - At the same time, a small cavity appears within the epiblast which enlarges to form the amniotic cavity.
  - Epiblast cells adjacent to the cytotrophoblast are called **amnioblasts**. *The amnioblasts together with the rest of the epiblast, line the amniotic cavity.*

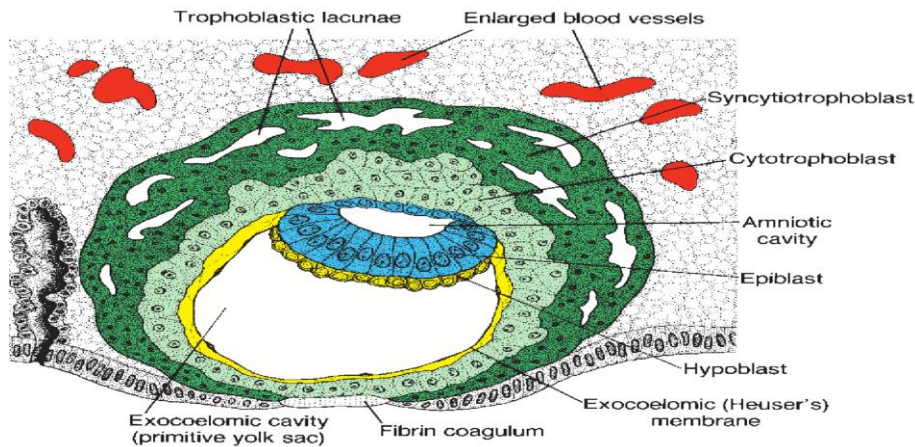
### Diagrammatic representation of day 8



## DAY 9

- The blastocyst is more deeply embedded in the endometrium, and the penetration defect in the surface epithelium is closed by a coagulum called **fibrin**
- Vacuoles appear at the region of the trophoblast and they fuse to form larger lacunae. *This phase of trophoblast development is known as the lacunar stage.*
- The cells of the hypoblast adjacent to the cytotrophoblast form a thin membrane called the **exocoelomic (Heuser's) membrane**. This membrane lines the inner surface of the cytotrophoblast
- The **exocoelomic (Heuser's) membrane** together with the hypoblast forms the lining of the **exocoelomic cavity**, or **primitive yolk sac** or **primary umbilical vesicle**

## Diagrammatic representation of day 9



## Day 11 - 12 of development

- The blastocyst is completely embedded in the endometrium, and the surface epithelium almost entirely covers the original defect in the uterine wall
- The blastocyst now produces a slight protrusion into the lumen of the uterus
- Cells deeper into the tissue and erode the endothelial lining of the endometrial capillaries. *These ruptured endometrial capillaries are called sinusoids*
- The lacunae then begin to communicate with the sinusoids, and maternal blood enters the lacunar system
- The communication of the eroded endometrial capillaries with the lacunae establishes the *primordial uteroplacental circulation*

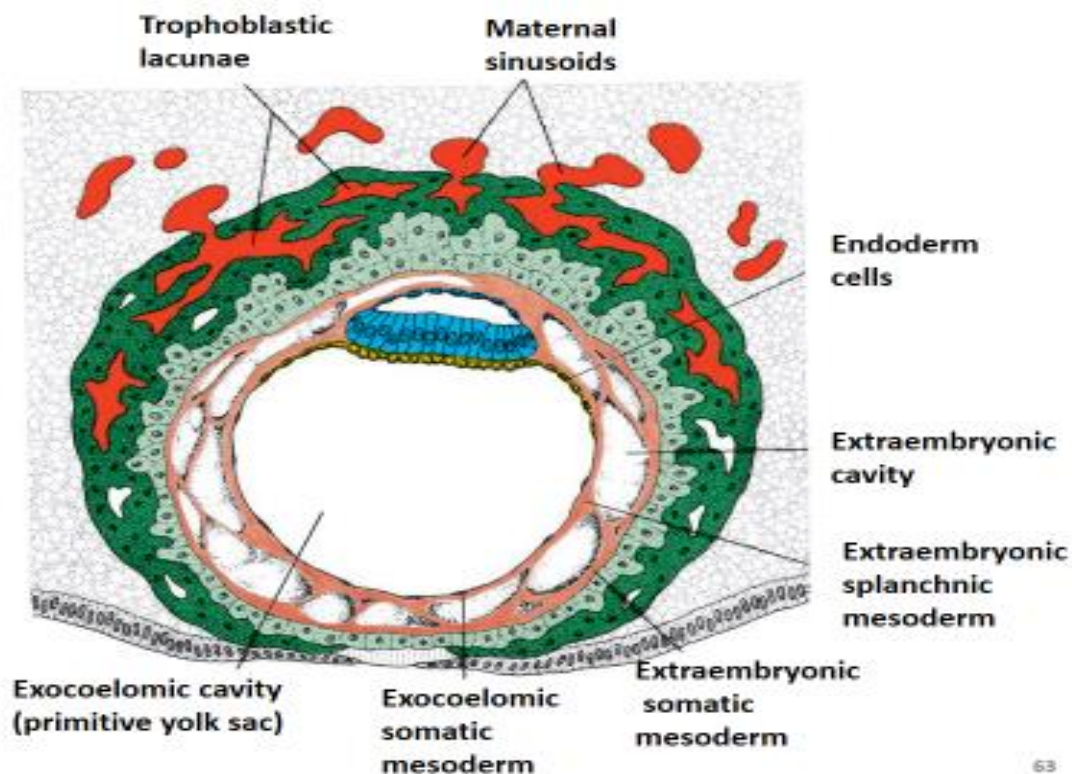
- When maternal blood flows into the lacunae, oxygen and nutritive substances are available to the embryo
- A new population of cells appears between the inner surface of the cytotrophoblast and the outer surface of the exocoelomic cavity
- These cells which are derived from yolk sac cells form a fine, loose connective tissue called the **extraembryonic mesoderm**
- Soon, large cavities develop in the extraembryonic mesoderm, and when these become confluent, they form a new space known as the **extraembryonic cavity**, or **chorionic cavity** or **extraembryonic coelom**

*Note: This space surrounds the primitive yolk sac and amniotic cavity, except where the germ disc is connected to the trophoblast by the connecting stalk (which develops into the umbilical cord)*

- The extraembryonic mesoderm lining the cytotrophoblast and amnion is called the **extraembryonic somatic mesoderm**. Extraembryonic somatic mesoderm also forms the connecting stalk
- The lining covering the yolk sac is known as the **extraembryonic splanchnic mesoderm**

- As the conceptus implants, the endometrial connective tissue cells undergo a transformation, called **decidual reaction**
- During this transformation, the cells of the endometrium swell because of the accumulation of glycogen and lipid in their cytoplasm, and they are known as **decidual cells**
- **Primary function of decidual reaction**  
The primary function of the decidual reaction is to provide nutrition for the early embryo and an immunologically privileged site for the conceptus

### Diagrammatic representation of day 11-12



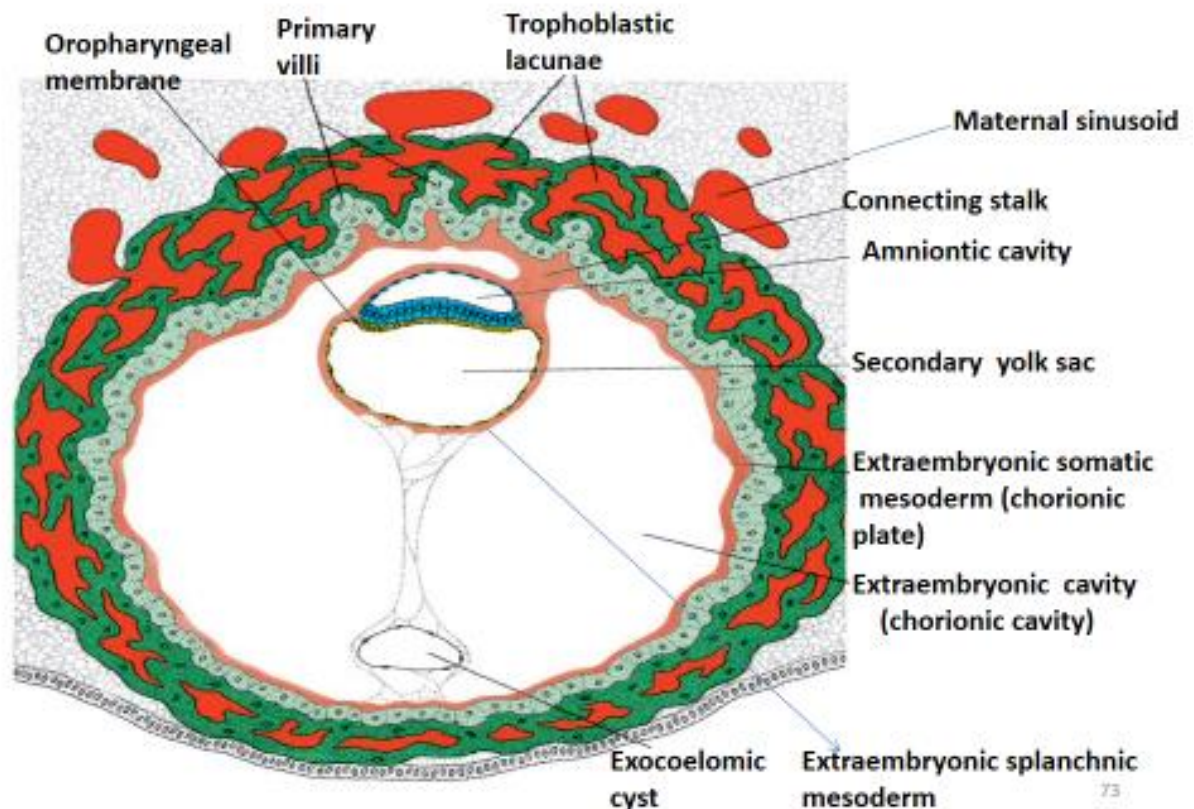
## Day 13 of embryonic development

- The surface defect in the endometrium has been completely covered by the surface epithelium
- Occasionally bleeding occurs at the implantation site as a result of increased blood flow into the lacunar spaces
- Cells of the cytotrophoblast proliferate locally and penetrate into the syncytiotrophoblast, forming cellular columns surrounded by syncytium
- Cellular columns with the syncytial covering are known as **primary villi**
- The primary yolk sac becomes reduced in size and is known as the **secondary yolk sac**
- This new cavity is known as the **secondary yolk sac** or **definitive yolk sac** or the **secondary umbilical vesicle**
- In humans the yolk sac **contains no yolk** but is important for the transfer of nutrients between the fetus and mother
- This yolk sac is much smaller than the original exocoelomic cavity or primitive yolk sac



- During its formation, large portions of the exocoelomic cavity are pinched off to form **exocoelomic cysts**
- Meanwhile, the extraembryonic coelom expands and forms a large cavity called the **chorionic cavity**
- The only place where extraembryonic mesoderm traverses the chorionic cavity is in the **connecting stalk** and with the development of blood vessels, the connecting stalk becomes the **umbilical cord**

### Diagrammatic representation of day 13



## Clinical correlate

### HCG

- The syncytiotrophoblast produces a hormone called the **human chorionic gonadotropin (hCG)**, which enters the maternal blood via lacunae keeps the corpus luteum secreting estrogens and progesterone
- hCG maintains the hormonal activity of the corpus luteum in the ovary during pregnancy
- hCG can be detected in maternal blood or urine as early as **day 10** of pregnancy and is the basis for pregnancy tests
- Enough hCG is produced by the syncytiotrophoblast at the end of the second week to give a positive pregnancy test, even though the woman is probably unaware that she is pregnant

### **Extrauterine Implantation**

- Blastocysts may implant outside the uterus
- These implantations result in **ectopic pregnancies**
- 95% to 98% of ectopic implantations occur in the uterine tubes, most often in the **ampulla** and **isthmus**