

## **Discuss the second week of development.**

Three major events take place during the 2<sup>ND</sup> week of development:

- 1) Completion of implantation of the blastocyst.
- 2) Formation of bilaminar germ disc (epiblast and hypoblast).
- 3) Formation of extra-embryonic structures

### **Day 8**

On the eighth day of development, the blastocyst is partially embedded in the endometrium. The syncytiotrophoblast continues to invade the endometrium and the cells of the cytotrophoblast divide and migrate towards the region of the syncytiotrophoblast.

Cells of the inner cell mass or embryoblast also differentiate into 2 layers:

- The hypoblast layer made up of cuboidal cells and is adjacent to the blastocystic cavity.
- The epiblast layer made up of columnar cells, and is adjacent to the amniotic cavity

The hypoblast and epiblast layers together form 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.

### **Day 9**

The blastocyst is more deeply embedded in the endometrium. The syncytiotrophoblast continues to invade the endometrium and the cells of the cytotrophoblast divide and migrate towards the region of the syncytiotrophoblast. The penetration defect in the surface epithelium is closed by a fibrin coagulum. Vacuoles appear at the region of the trophoblast and they fuse and enlarge to form the trophoblastic 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. The exocoelomic membrane together with the hypoblast forms the lining of the exocoelomic cavity, or primitive yolk sac or primary umbilical vesicle.

## **Day 11- Day 12**

The blastocyst is completely embedded in the endometrium. The blastocyst now produces a slight protrusion into the lumen of the uterus. Cells of the syncytiotrophoblast penetrate deeper into the uterus 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 lacunae, establishing the primordial uteroplacental circulation.

New cells appear between the inner surface of the cytotrophoblast and the outer surface of the exocoelomic cavity. These cells are called the extraembryonic mesoderm. Large cavities develop in the extraembryonic mesoderm, and when these become larger, they form a new space known as the extraembryonic cavity or extraembryonic coelom. 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 while 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. The primary function of the decidual reaction is to provide nutrition for the early embryo and an immunologically privileged site for the conceptus.

## **Day 13**

The surface defect in the endometrium has been completely covered by the surface epithelium. Bleeding sometimes occurs at the implantation site due to increased blood flow into the lacunar spaces. Cells of the cytotrophoblast move into the region of 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 or definitive yolk sac or the secondary umbilical vesicle. The yolk 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.

The extraembryonic coelom expands and forms a large cavity called the chorionic cavity. The extraembryonic mesoderm lining the inside of the cytotrophoblast is then known as the chorionic plate. The only place where extraembryonic mesoderm traverses the chorionic cavity is in the connecting stalk. With development of blood vessels, the connecting stalk becomes the umbilical cord

### **Clinical correlate**

- The syncytiotrophoblast produces a hormone called the human chorionic gonadotrophin (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
- 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.