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**DEPARTMENT: MEDICINE
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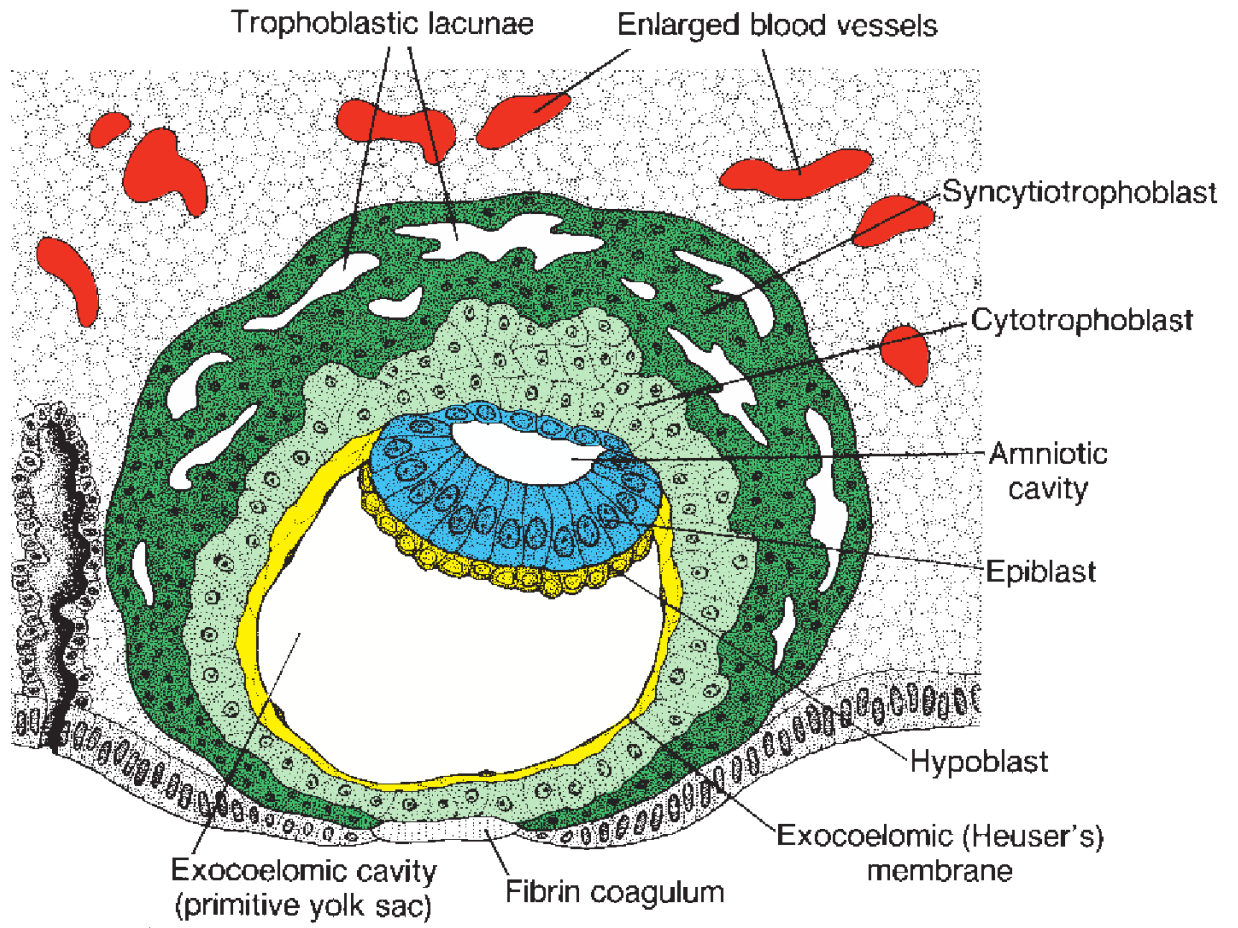
COURSE: EMBRYOLOGY

DAY 8

- At the eighth day of development, the blastocyst is partially (slowly) embedded in the endometrium
- the syncytiotrophoblast continues its invasion of the endometrium, thereby eroding endometrial blood vessels and endometrial glands
- More cells in the cytotrophoblast divide and migrate into the syncytiotrophoblast, where they fuse and lose their individual cell membranes
- The Cells of the inner cell mass or embryoblast also differentiate into 2 layers:
 - a. the **hypoblast** layer, which is made up of small cuboidal cells, and it is adjacent(nearer) to the blastocyst cavity
 - b. the **epiblast** layer which is made up of high columnar cells, and it 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**
 - ✓ **Amnioblasts** together with the rest of the epiblast, line the amniotic cavity
 - ✓ The endometrium adjacent to the implantation site is edematous and highly vascular

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**



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 of the syncytiotrophoblast penetrate deeper into the stroma(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 **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**

- **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**
- 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
- 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**
- **Exocoelomic cysts** are often found in the extraembryonic cavity or chorionic cavity or extraembryonic coelom
- Meanwhile, 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
- 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**

**Exocoelomic cavity
(primitive yolk sac)**

**Exocoelomic
somatic
mesoderm**

**Extraembryonic
somatic
mesoderm**

**Extraembryonic
cavity**

**Extraembryonic
splanchnic
mesoderm**