

Embryology

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Second Week of Development: Bilaminar Germ Disc

Day 8

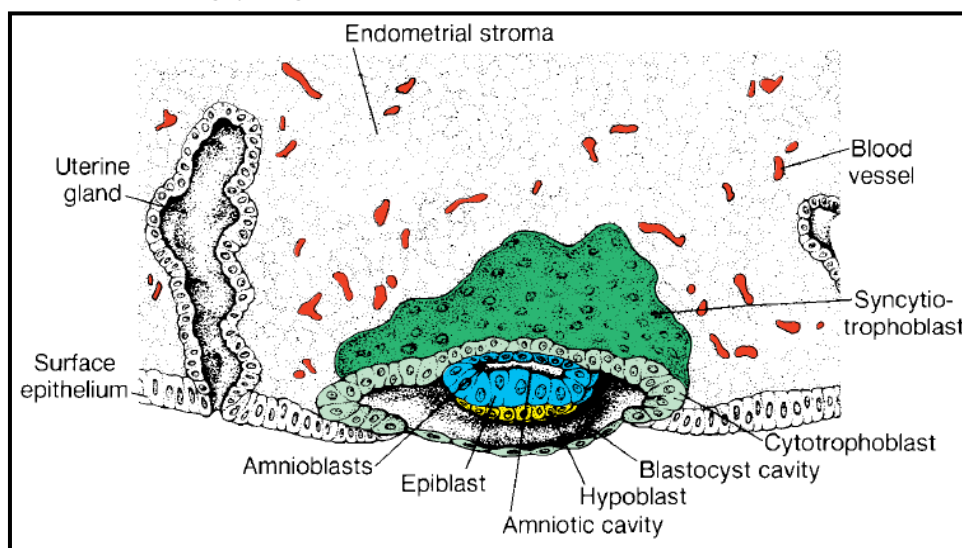
At the eighth day of development, the blastocyst is partially embedded in the endometrial stroma. The **trophoblast** has differentiated into two layers:

- An inner layer of mononucleated cells, the **cytotrophoblast**, and
- An outer multinucleated zone without distinct cell boundaries, the **syncytiotrophoblast**. Mitotic figures are found in the cytotrophoblast but not in the syncytiotrophoblast. Thus, cells in the cytotrophoblast divide and migrate into the syncytiotrophoblast, where they fuse and lose their individual cell membranes.

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

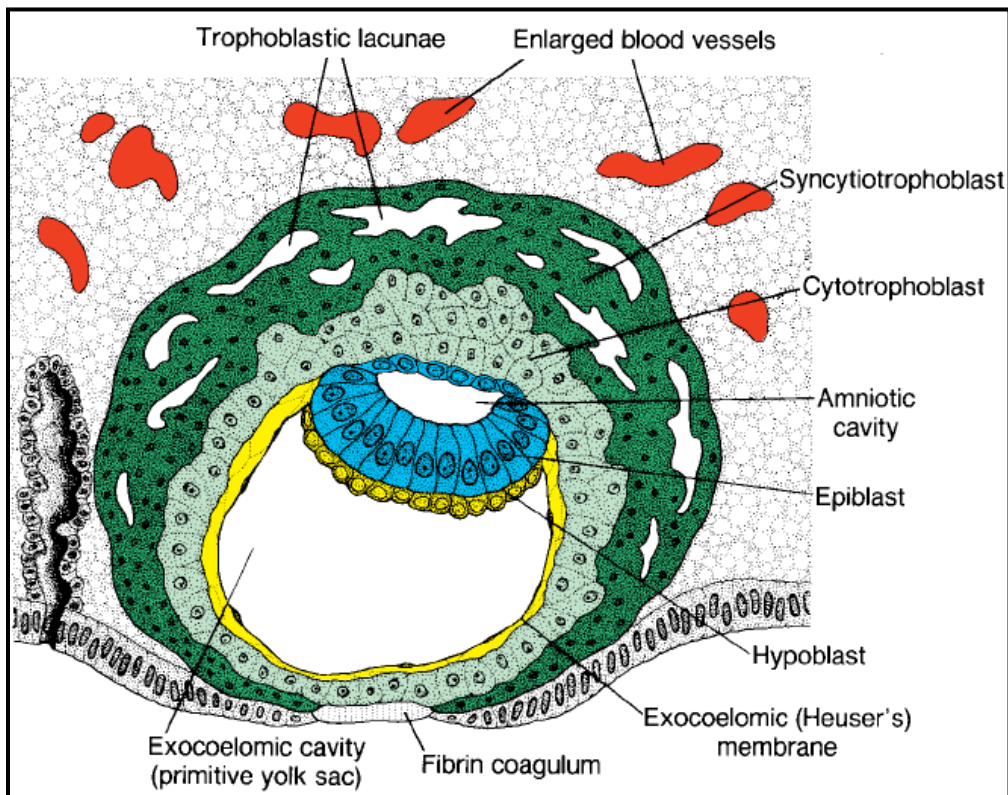
- A layer of small cuboidal cells adjacent to the blastocyst cavity, known as the **hypoblast layer**, and
- A layer of high columnar cells adjacent to the amniotic cavity, the **epiblast layer**. At the same time, a small cavity appears within the epiblast. This cavity enlarges to become the **amniotic cavity**.

Epiblast cells adjacent to the cytotrophoblast are called **amnioblasts**; together with the rest of the epiblast, they line the **amniotic cavity**. The endometrial stroma adjacent to the implantation site is edematous and highly vascular. The large, tortuous glands secrete abundant glycogen and mucus.



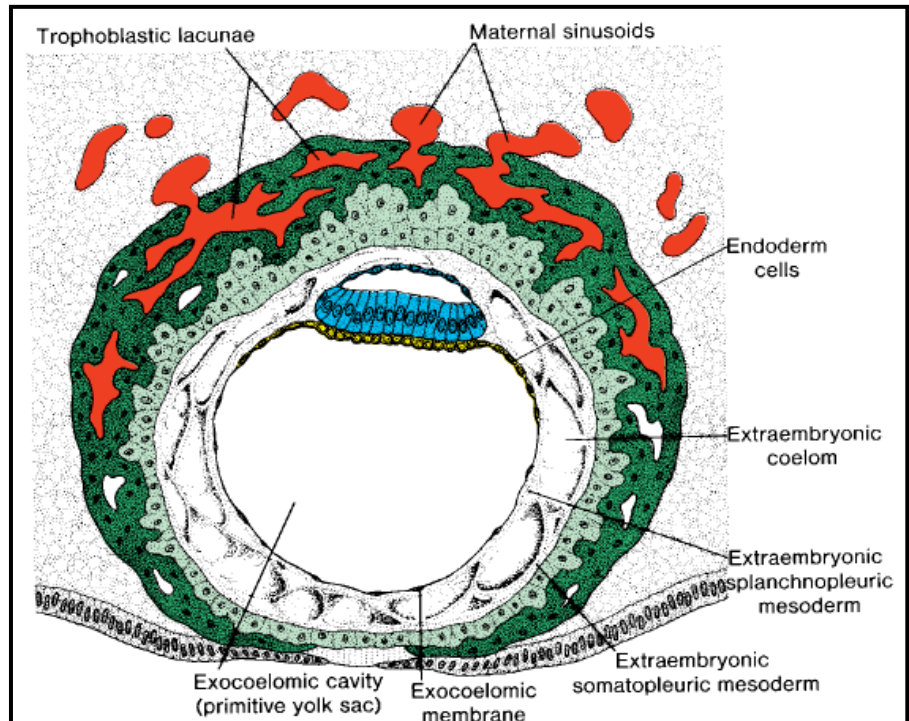
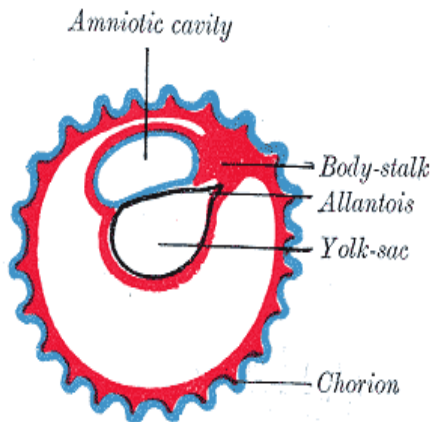
Day 9

1. The blastocyst is more deeply embedded in the endometrium, and the penetration defect in the surface epithelium is closed by a fibrin coagulum.
2. The trophoblast shows considerable progress in development, particularly at the embryonic pole, where vacuoles appear in the syncytium. When these vacuoles fuse, they form large lacunae, and this phase of trophoblast development is thus known as the **lacunar stage**.
3. At the abembryonic pole, meanwhile, flattened cells probably originating from the hypoblast form a thin membrane, the exocoelomic membrane that lines the inner surface of the cytotrophoblast. This membrane, together with the hypoblast, forms the lining of the **exocoelomic cavity**, or **primitive yolk sac**.



Days 11 and 12

1. The blastocyst is completely embedded in the endometrial stroma, and the surface epithelium almost entirely covers the original defect in the uterine wall.
2. The blastocyst now produces a slight protrusion into the lumen of the uterus.
3. The trophoblast is characterized by lacunar spaces in the syncytium that form an intercommunicating network. This network is particularly evident at the embryonic pole; at the abembryonic pole, the trophoblast still consists mainly of cytotrophoblastic cells.
4. Cells of the syncytiotrophoblast penetrate deeper into the stroma and erode the endothelial lining of the maternal capillaries. These capillaries, which are congested and dilated, are known as **sinusoids**.
5. The syncytial lacunae become continuous with the sinusoids and maternal blood enters the lacunar system. As the trophoblast continues to erode more and more sinusoids, maternal blood begins to flow through the trophoblastic system, establishing the **uteroplacental circulation**.
6. In the meantime, a new population of cells appears between the inner surface of the cytotrophoblast and the outer surface of the exocoelomic cavity. These cells, derived from yolk sac cells, form a fine, loose connective tissue, the **extraembryonic mesoderm**, which eventually fills all of the space between the trophoblast externally and the amnion and exocoelomic membrane internally.
7. Soon, large cavities develop in the extraembryonic mesoderm, and when these become confluent, they form a new space known as the **extraembryonic coelom**, or **chorionic cavity**. This space surrounds the primitive yolk sac and amniotic cavity except where the germ disc is connected to the trophoblast by the connecting stalk.
8. The extraembryonic mesoderm lining the cytotrophoblast and amnion is called the **extraembryonic somatopleuric mesoderm**; the lining covering the yolk sac is known as the **extraembryonic splanchnopleuric mesoderm**.
9. Cells of the endometrium, meanwhile, become polyhedral and loaded with glycogen and lipids; intercellular spaces are filled with extravasate, and the tissue is edematous. These changes, known as the **decidua reaction**, at first are confined to the area immediately surrounding the implantation site but soon occur throughout the endometrium.



Day 13

- The surface defect in the endometrium has usually healed. Occasionally, however, bleeding occurs at the implantation site as a result of increased blood flow into the lacunar spaces. Because this bleeding occurs near the 28th day of the menstrual cycle, it may be confused with normal menstrual bleeding and, therefore, cause inaccuracy in determining the expected delivery date.
- The trophoblast is characterized by villous structures. 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**.
- Meanwhile, the extraembryonic coelom expands and forms a large cavity, 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 stalk becomes the **umbilical cord**.

