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Question: Discuss the second week of development

At the end of the first week, the blastocyst comes in contact with the uterine wall and adheres to it, embedding itself in the uterine lining via the trophoblast cells. Thus begins the process of **implantation**, which signals the end of the pre-embryonic stage of development . Implantation can be accompanied by minor bleeding. The blastocyst typically implants in the fundus of the uterus or on the posterior wall. However, if the endometrium is not fully developed and ready to receive the blastocyst, the blastocyst will detach and find a better spot. Significant percentages (50–75 percent) of blastocysts fail to implant; when this occurs, the blastocyst is shed with the endometrium during menses. The high rate of implantation failure is one reason why pregnancy typically requires several ovulation cycles to achieve.

When implantation succeeds and the blastocyst adheres to the endometrium, the superficial cells of the trophoblast fuse with each other, forming the **syncytiotrophoblast**, a multinucleated body that digests endometrial cells to firmly secure the blastocyst to the uterine wall. In response, the uterine mucosa rebuilds itself and envelops the blastocyst. The trophoblast secretes **human chorionic gonadotropin (hCG)**, a hormone that directs the corpus luteum to survive, enlarge, and continue producing progesterone and estrogen to suppress menses. These functions of hCG are necessary for creating an environment suitable for the developing embryo. As a result of this increased production, hCG accumulates in the maternal bloodstream and is excreted in the urine. Implantation is complete by the middle of the second week. Just a few days after implantation, the trophoblast has secreted enough hCG for an at-home urine pregnancy test to give a positive result.

During the second week of development, with the embryo implanted in the uterus, cells within the blastocyst start to organize into layers. Some grow to form the extra-embryonic membranes needed to support and protect the growing embryo: the amnion, the yolk sac, the allantois, and the chorion.

The following describes what happens with the components of the blastocyst:

1. **Trophoblast**

As the blastocyst embeds itself in the endrometrium it differentiates into two layers:
the **cytotrophoblast** (inner) and **syncytiotrophoblast** (outer). The syncytiotrophoblast invades into the maternal endrometrium, and in this sense it is more invasive than any tumor tissue. As it comes into contact with blood vessels it creates **lacunae**, or spaces which fill with maternal blood. These lacunae fuse to form **lacunar networks**. The maternal blood that flows in and out of these networks exchanges nutrients and waste products with the fetus, forming the basis of a **primitive uteroplacental circulation**.

2. **Syncytiotrophoblast**

The syncytiotrophoblast is **acellular** and does not expand mitotically. The syncytiotrophoblast produces **human chorionic gonadotropin** (hCG), a glycoprotein hormone that stimulates the production of **progesterone** by the **corpus luteum**.

3. **Cytotrophoblast**

The **cytotrophoblast** is cellular and expands mitotically into the syncytiotrophoblast to form **primary chorionic villi**. Cells from these villi can be removed for early genetic testing at some risk to the fetus (**chorionic villus sampling**).

4. **Embryoblast**

After implantation, the **inner cell mass** subdivides into a bilaminar disc consisting of the **hypoblast** and **epiblast**.

5. **Hypoblast**

Hypoblast cells migrate along the inner surface of the cytotrophoblast and will form the **primary yolk sac**. The primary yolk sac becomes reduced in size and is known as the **secondary yolk sac**. In humans the yolk sac **contains no yolk** but is important for the transfer of nutrients between the fetus and mother.

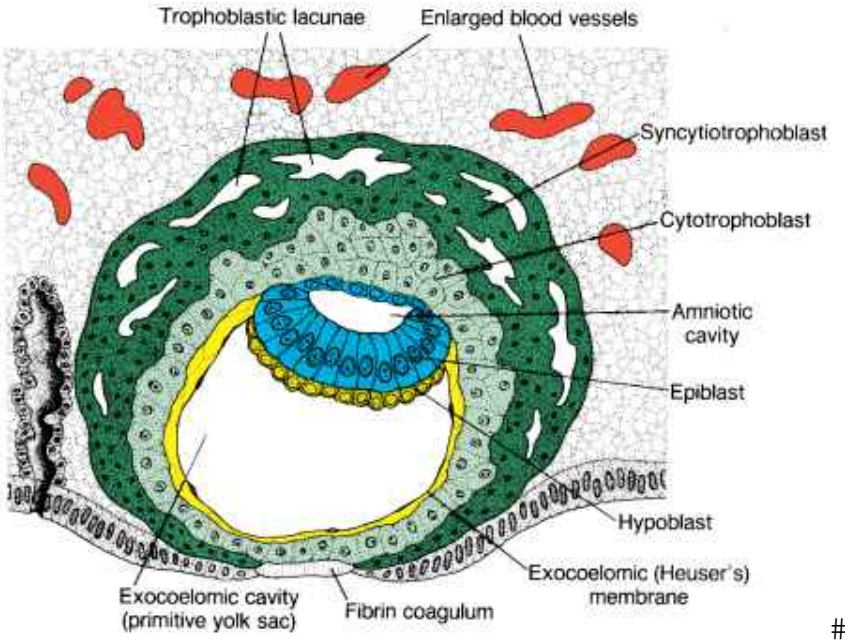
6. **Epiblast**

Epiblast cells cavitate to form the **amnion**, an extra-embryonic epithelial membrane covering the embryo and amniotic cavity. Cells from the epiblast will also eventually form the **body** of the embryo.

7. **Extra-embryonic mesoderm**

Extra-embryonic mesoderm cells migrate between the cytotrophoblast and yolk sac and amnion. **Extraembryonic somatic mesoderm** lines the cytotrophoblast and covers the amnion is. Extraembryonic somatic mesoderm also forms the **connecting stalk** that is the primordium of the **umbilical cord**. **Extraembryonic visceral mesoderm** covers the yolk sac.

At the end of the second week it is possible to distinguish the dorsal (amniotic cavity) from the ventral (yolk sac) side of the embryo.#



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<u>The image above depicts a 14-day old blastocyst</u>