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TOPIC: DISCUSS THE SECOND WEEK OF EMBRYONIC
DEVELOPMENT

THE SECOND WEEK OF EMBRYONIC DEVELOPMENT

This week the embryo nestles in the wall of the uterus. The tissue on the periphery, the nutritive trophoblast, grows fast. From the inner cell mass, the embryoblast, the embryonic disc will be formed. The embryonic disc becomes largely disconnected from the trophoblast. Differences in growth rate are responsible for this process.

The following events take place during the 2nd week of development:

- Completion of implantation of the blastocyst
- Formation of bilaminar embryonic disc (epiblast and hypoblast)
- Formation of extraembryonic structures (amniotic cavity, amnion, umbilical vesicle [yolk sac], connecting stalk, and chorionic sac)
- **Completion of Implantation**

The embryo (the blastula) is out of its rigid zona pellucida and has arrived in the uterus. It can now grow and it implants itself on the side of the embryoblast into the wall of the uterus. Enzymes of the embryo digest the maternal uterus tissue. The

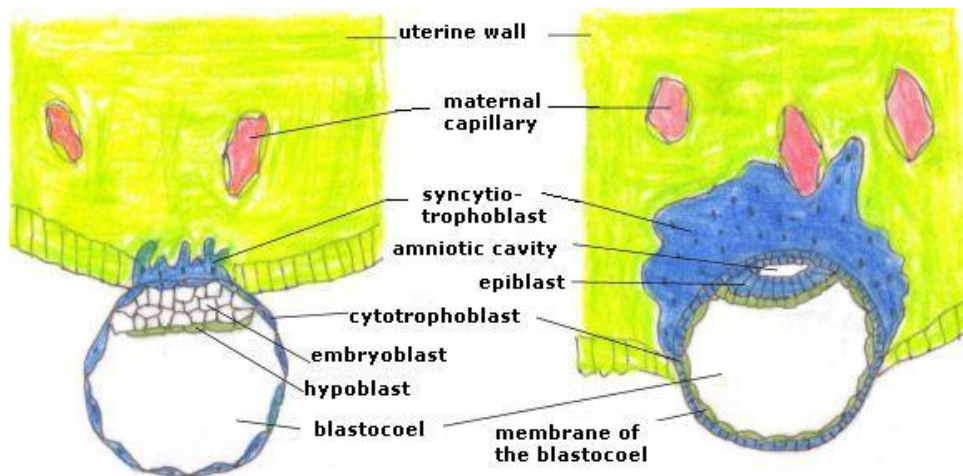
embryo invades; it eats into the wall of the uterus. The embryo behaves aggressively.

The trophoblast grows fast, so fast that it causes a proliferative tissue with many nuclei and without cell membranes (called syncytiotrophoblast. A layer of 'normal' (cyto)trophoblast cells remains present between the syncytiotrophoblast and the embryoblast.

In the syncytiotrophoblast gaps arise, called lacunae, through which maternal blood starts to flow. Only one membrane exists between maternal blood and embryonic tissue, and there is just one barrier for the exchange of substances. Embryonic tissue also surrounds capillaries and maternal glands. In this way, the embryo can be supplied with oxygen and nutrients and waste products can be disposed of. However, substances that are bad for the embryo can also get through.

The embryo eats into the maternal tissue. On the other hand, the mother gives room to the embryo in her own tissue. She allows a strange creature to grow in her own body. This is a wonderful process, because strange creatures (which is what the embryo is to the mother because of the fusion of egg and sperm) normally are fought against. A hormone of the embryo (human chorionic gonadotrophin) ensures that the mother accepts the embryo.

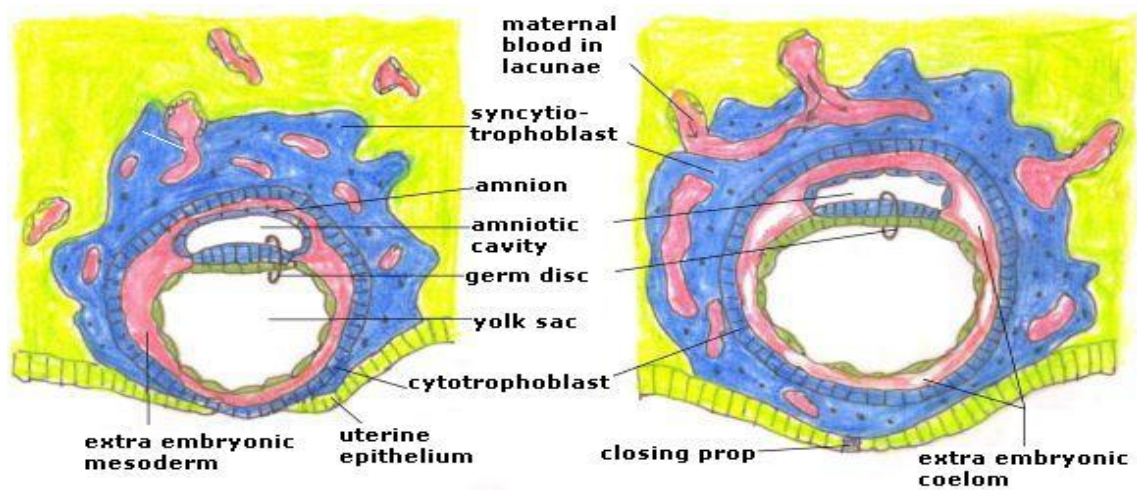
On day 10 the embryo is completely inside the maternal tissue and a ball or wad is formed to close the wall of the uterus. Now this wall is completely closed. Around the embryo is the trophoblast, later called chorion, uterine tissue and the uterine wall.



On the Left: on day 7-8. The embryo lies against the uterine wall on the side of the embryoblast. The syncytiotrophoblast expands into the maternal tissue. The hypoblast is ligated from cells of the embryoblast.

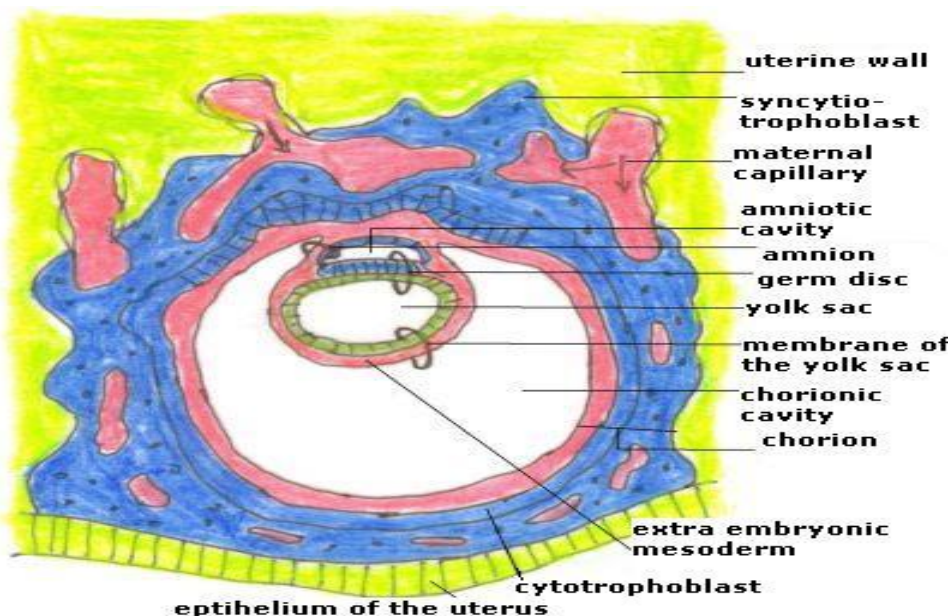
On the Right: on day 8-9. The embryo eats further into the uterine wall, the hypoblast (flat cells) has extended all the way down and forms, together with the cytotrophoblast, the membrane of the blastocoele. In the embryoblast the amnion

arises. The epiblast (high cells) is located above the hypoblast and the amnion is formed from epiblast and cytotrophoblast cells. The syncytiotrophoblast lies against a maternal blood vessel (capillary).



On the Left on day 9. The embryo eats further into the uterine wall. The syncytiotrophoblast proliferates in the maternal tissue and lies around capillaries and makes holes (lacunae) where maternal blood can flow. Maternal blood and tissues remain separated from embryonic tissue. The amniotic cavity develops, by which the two-cells-thick embryonic disc arises. The tissue of the hypoblast covers the blastocoel membrane, now called yolk sac. Between the trophoblast and the membrane of the yolk sac a thick tissue develops: the extra-embryonic mesoderm.

On the Right on day 12. The embryo is completely enclosed by the tissue of the uterine wall. The syncytiotrophoblast is still rapidly expanding. The extra-embryonic mesoderm is thicker and holes in the extra embryonic coelom are developing.



On the day 13: The holes in the extra-embryonic mesoderm have joined together to form the chorionic cavity, its membrane is the chorion. The syncytiotrophoblast is growing all around the embryo, it is thicker on the inside of the uterine tissue than near the epithelium. The embryonic disc is on the backside attached to the chorion. All around the chorion cavity

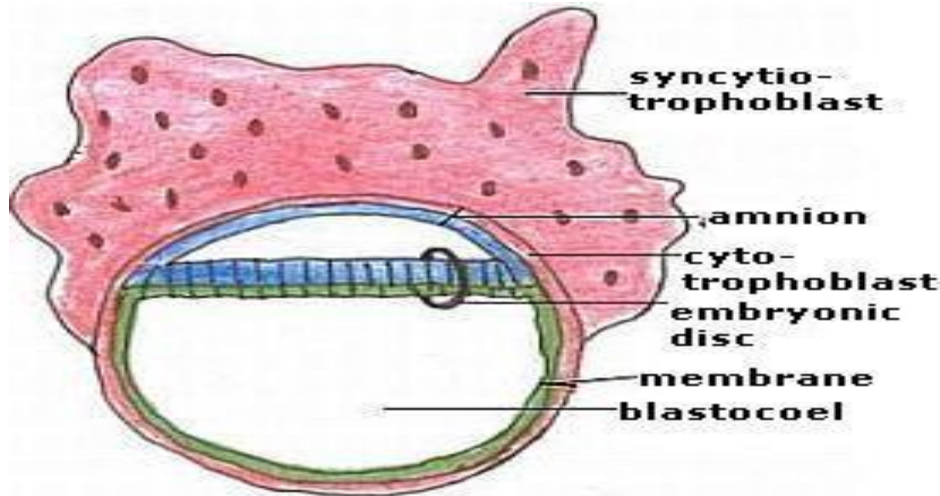
lies the syncytiotrophoblast with the lacunae containing maternal blood.

- **Formation of bilaminar embryonic disc**

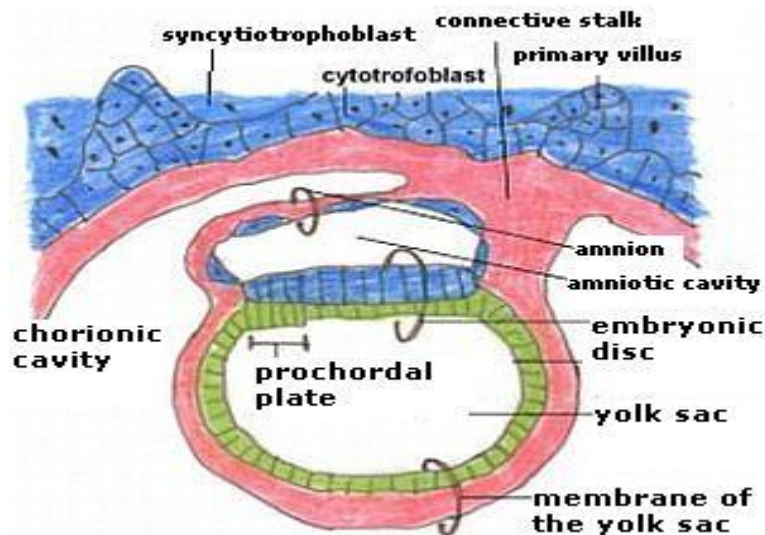
Flat, square cells are ligated from the embryoblast on the side of the blastocoele. These cells are called the hypoblast. The hypoblast expands on the inside of the trophoblast, too, and covers it. The blastocoele is now called yolk sac.

In the embryoblast a small cavity develops, called the amniotic cavity, its roof is called the amnion. The cells adjacent to the hypoblast become cylinder - or elongated cube-shaped; these cells form the epiblast.

Through the formation of the yolk sac and the amniotic cavity a round, flat embryonic - or germ disc is formed, existing of two layers. At the end of the week the prochordale plate (a spot of different shaped cells) develops in the embryonic disc.



The embryonic disc consists of two cell layers and is round and flat. At the tail-side the embryo is attached to the chorion and the cyto- and syncytiotrophoblast by the connective stalk. It hangs free in the fluid-filled chorion cavity. The prochordal plate is formed in the embryonic disc at the side where the head will develop. Epiblast cells are high, hypoblast cells are flat.



- **Formation of extraembryonic structure**

Origin of the chorion cavity and the connective stalk

From day 9 on, the tissue between trophoblast and embryonic disc, amnion and yolk sac thickens. This tissue is called extra-embryonic mesoderm. A confusing name, because the tissue lies within the embryo. The name only indicates that the tissue lies outside the embryonic disc. Because the syncytiotrophoblast and the cytotrophoblast grow much faster than the germ disc, in this mesoderm tissue crevices and cavities arise (called the extra-embryonic coelom. From day 12 on they unite and form the chorionic cavity. The trophoblast is now called chorion.

First, the germ disc with amnion and yolk sac is connected to the chorion (12 days) on the posterior side. This attachment moves to the tail (or better: the place where the tail will develop) and becomes narrower. This attachment is called the connective stalk.

The round, flat germ disc, amniotic cavity and yolk sac are attached to the connective stalk, like two halves of a ball, and they hang freely in a large spherical space (the chorionic cavity) with the chorion as a surrounding wall.

Size of the embryo at second week

The embryo grows. At the beginning of the second week its size was approximately 0.3 mm, at the end 3 - to 3.5 mm. In a one

week period it grew to 10 times its size. The germ disc is still small: 0.5 mm.