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**COURSE:ANATOMY(EMBRYOLOGY)**

**QUESTIONS;:DISCUSS THE SECOND WEEK OF DEVELOPMENT**

**Embryology: 2nd week of development**

There are three major events that will take place at the 2nd week of development

1 completion of implantation

2 formation of bilaminal disk

3 development of extra embryonic structures

**Implantation completed**

Week 2 is often referred to as the week of twos. It’s the week when the embryo blast, extra embryonic mesoderm and trophoblast each separate into two distinct layers. Additionally, there are two cavities that develop within the embryonic unit at this time as well.

While every step is integral for adequate foetal development, one of the most important features of the second week is the completion of implantation and establishment of fetomaternal interactions. This article will follow the developing embryo through the completion of implantation and development of the non-embryonic components of the conceptus. It will also discuss some complications associated with implantation.

The second week of human development is concerned with the process of [implantation](https://embryology.med.unsw.edu.au/embryology/index.php/Implantation) and the differentiation of the blast cyst into early embryonic and placental forming structures.

* implantation commences about day 6 to 7
* Ad plantation - begins with initial adhesion to the uterine epithelium blast cyst then slows in motility, "rolls" on surface, aligns with the inner cell mass closest to the epithelium and stops
* Implantation - migration of the blast cyst into the uterine epithelium, process complete by about day 9
* coagulation plug - left where the blast cyst has entered the uterine wall day 1

By the 10th day following fertilization, the embryo is completely embedded in the endometrial. There is a small defect in the epithelium that is sealed by a fibrin-based blood clot known as the closing plug. By day 12, the area is completely healed. The 14 day embryo maintains the form of a flat bilaminar embryonic disc at the end of second week. The thickened prechordal plate develops as a localized thickening of hypoblast and indicates the future site of mouth and organizer head region.

**DAY 8**

The blastocyte is partially embedded in the endometrium .The syncytiotrophoblast will continue to erode the region of the endometrium.The size of the cytotrophoblast will continue to divide and move to the region of syncytiotrophoblast. The embryoblast will differentiate into two types of cell. It is an inner mass. The epiblast is columnar in shape while the hypoblast is cuboidal in shape.The cells of the epiblast that are adjacent to the syncytiotrophoblast are called amnion.these cells surround the amniotic cavity.The cells of the epiblast and hypoblast come together to form the bilaminal embryonic disk.

**DAY 9**

The blastocyst is more deeply embedded in the endometrial, and the penetration defect in the surface epithelium is closed at the trophoblast (at the embryonic pole) vacuoles appear in the syncytium. hese vacuoles fuse and form large lacunae, and this phase of trophoblast development is known as the lacunar stage.At the embryonic pole the hypoblast give raise to a thin membrane the exocoelomic membrane.This membrane, together with the hypoblast, lines the primitive yolk sac.A penetration defect in the surface epithelium is closed by a coagulum called fibrin.

**DAY 10-12**

this is completely embedded in the endometrial stroma at the trophoblast

The syncytiotrophoblast start to penetrate deeper into the stroma and eroding the maternal capillaries known as sinusoids. The syncytial lacunae become continuous with the sinusoids, and maternal blood enters the lacunar system .Thus establishing the primordial uteroplacental circulation

The extra embryonic mesoderm lining the cytotrophoblast and amnion is called the extra embryonic somatopleuric mesoderm; the lining covering the yolk sac is known as the extra embryonic splanchnicpleuric mesoderm

The yolk sac cells, form a fine, loose connective tissue, theextra embryonic mesoderm, which fills all of the space between the trophoblast externally and the amnion and exocoelomic membrane internally Soon, large cavities develop in the extra embryonic mesoderm, and when these become confluent, they form a new space known as THE EXTRAEMBRYONIC COELOM, or CHORIONIC CAVITY

**DAY 13**

The surface defect in the endometrial has usually healed. Occasionally, however, bleeding occurs .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 villa

At the trophoblast

The hypoblast produces cells that migrate along the inside of the exocoelomic membrane these cells proliferate and gradually form a new cavity within the exocoelomic cavity. This new cavity is known as the secondary yolk sac or definite yolk sac. At the ember ionic pole

The extra embryonic coelom expands and forms a large cavity, the chronic cavity The extra embryonic mesoderm lining the inside of the cytotrophoblast is then known as the chronic plate. The only place where extra embryonic mesoderm traverses the chorionic cavity is in THE connected stalk .With development of blood vessels, the stalk becomes the umbilical cord While the aforementioned cavities and bilaminar disc develop, the syncytiotrophoblast began to lacunae (I.e. form lacunae). The lacunae are filled with an amalgam of cellular debris and maternal blood, known as the embryotroph. This fluid gains access to the embryonic disc via diffusion and delivers nutrients as well as oxygen to the embryo. The lacunae subsequently become confluent, forming lacunar networks, which serves as the primordial uteroplacental circulation. As the networks continue to fuse, the syncytiotrophoblast has a sieve-like appearance, particularly around the embryonic pole of the concepts. This will subsequently give rise to the intervillous spaces of the placenta.

The capillaries around the implanted embryo become engorged, dilated and their walls become thin. From here onwards, they are known as sinusoids. The syncytiotrophoblast continues to erode the walls of the sinusoids, resulting in more maternal blood flowing freely into the lacunar networks. Much of the derived nutrients are conveyed to the embryo by the trophoblast. However, the trophoblast grows a lot faster than the embryo in the early phases. As such, it is likely to have a higher nutritional requirement than the embryo.

DEVELOPMENT OF SOME EXTRA EMBRYONIC STRUCTURES

Amniotic cavity

While implantation ensues, the embryoblast also undergoes differentiation to form a bilaminar disc. The flat, circular disc is comprised of a thicker epiblast with high columnar cells and a thinner hypoblast with small cuboidal cells. A small space develops relative to the epiblast; it is the precursor of the amniotic cavity.

Epiblastic cells forming the floor of the cavity subsequently separate to form amnioblasts that will form the amnion (surrounding the amniotic cavity). The sac and cavity will eventually become filled with amniotic fluid later on in the pregnancy. They provide shock absorption and facilitate movement of the foetus during development.

Umbilical vesicle

Peripherally, the hypoblast is continuous with another structure known as the exocoelomic (Heuser’s) membrane. It also forms the roof of the enclosed exocoelomic cavity. Combined, the membrane and the hypoblast form the visceral lining of the yolk sac. However, since the human embryo does not possess a yolk, it is more appropriate to refer to it as the primary umbilical vesicle.

Endodermal cells arising from the exocoelomic membrane extends circumferentially to enclose the embryonic disc and both cavities. It is subsequently referred to as the extraembryonic mesoderm. Both cavities facilitate embryonic folding as growth and morphological changes occur. The umbilical vesicle may play a role in nutrient transfer to the embryo. Furthermore, it is an important source of primordial germ cells.

Chorionic sac

As time progresses, the extraembryonic mesoderm increases in size. Numerous cavities known as the extraembryonic coelomic spaces begin to appear deep to the cytotrophoblast and superficial to the exocoelomic membrane. These spaces coalesce to form the extraembryonic coelom. This coincides with a decrease in the volume of the primary umbilical vesicle; which is then referred to as the secondary umbilical vesicle. The cells of the secondary umbilical vesicle arise from migratory extraembryonic endodermal cells of the hypoblast. There is a remnant of the primary umbilical vesicle within the extraembryonic coelom that is referred to as an exocoelomic cyst.

Cellular columns, lined with syncytial coverings, extending into the syncytiotrophoblast indicate the ending of the second gestational week. This phenomenon marks the formation of the primary chorionic villi. Splanchnic and somatic derivatives of the extraembryonic mesoderm line the umbilical vesicles, and the trophoblast and amnion, respectively. The somatic extraembryonic mesoderm, along with both trophoblastic layers, gives rise to the chorion. The space enclosed by the chorion is the chorionic sac; it contains the embryo, as well as the amniotic sac and umbilical vesicle. The latter three structures are attached to the chorion by the connecting stalk. The former extraembryonic coelom is now referred to as the chorionic cavity.

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