SECOND WEEK OF DEVELOPMENT

NSOKO-NKWOR QUEEN ESTHER

The following events take place during the second week of embryonic development:

1) Completion of implantation of blastocyst.
2) Formation of bilaminar embryonic disc (epiblast and hypoblast)
3) Formation of extraembryonic structures (amniotic cavity, amnion, umblical vesicle (yolk sac), connecting stalk, and chorionic sac).

Day 8

Implantation is a complex biochemical and mechanical process that begins in the first week of gestation and extends into the second week. There are many influencing factors that affect the process. These are many influencing factors that affect the process there can be grouped into maternal and embryonal factors.

At the eight 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.

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

1) The hypoblast layer, which is made up of small cuboidal cells, and it is adjacent (nearer) to the blastocyst cavity.
2) The epiblast layer which is made up of high columnar cells, and is adjacent to the amniotic cavity.

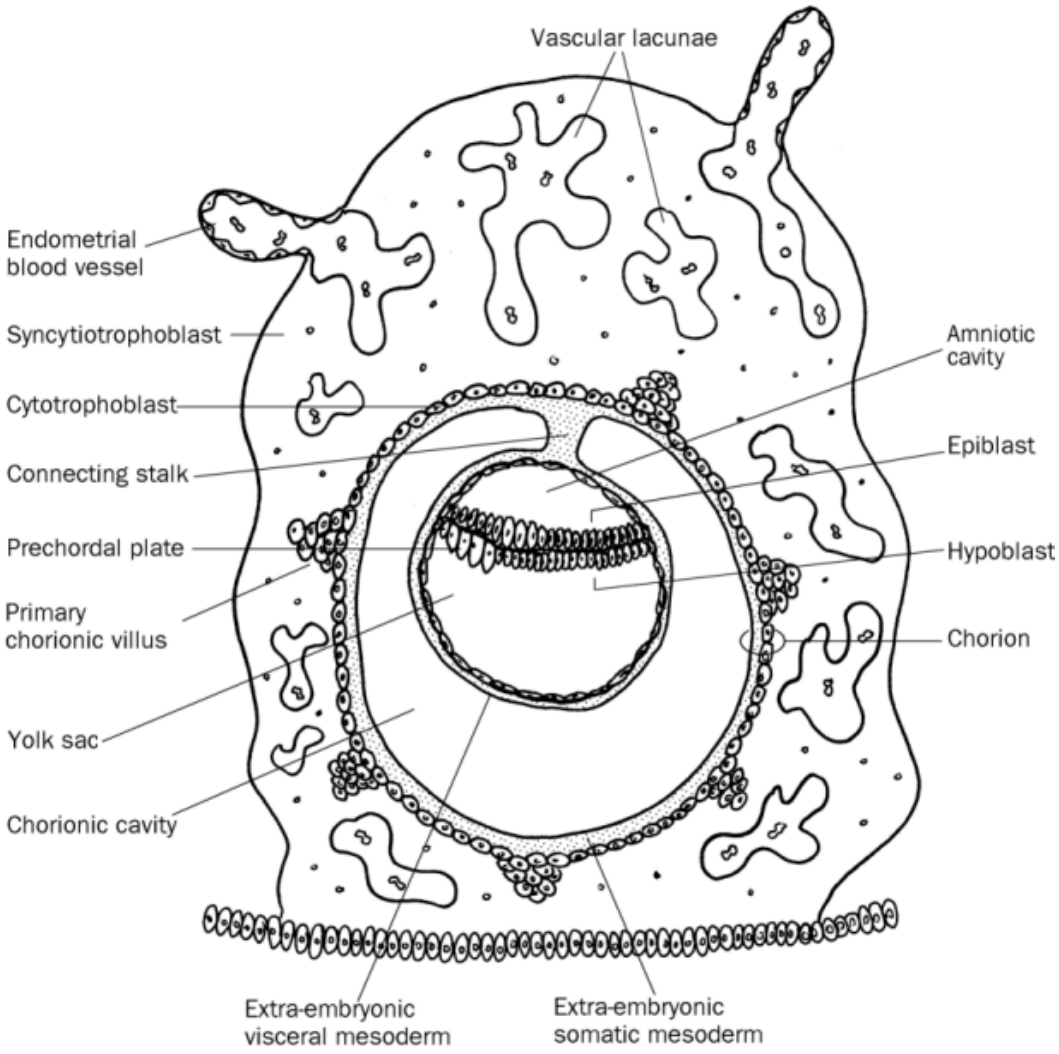
   The hypoblast and epiblast layers together form a flat ovoid shaped disc called the bilaminar embryonic disc.

   At the same time, a small cavity appears within the epiblast which enlarges to form the amniotic casvity.

   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.



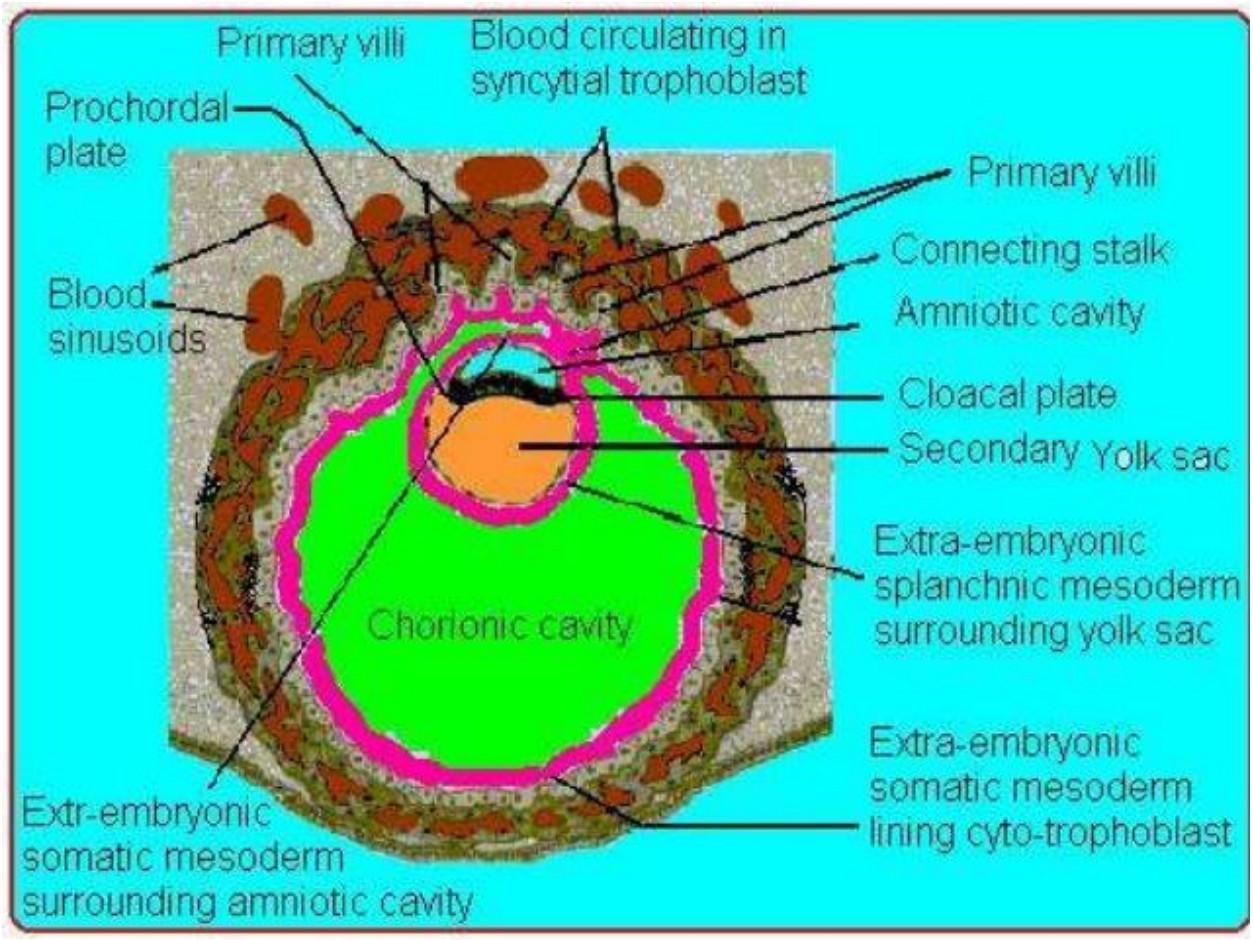
Day 9

The blastocyst is more deeply embedded in the endometrium, and the penetration defect in the surface epithelium is closed by a coagulum called Fibrin.

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 lucanar 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 umblical vesicle.



<u>11th -12th day of development</u>

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.

The cells of the syncytiotrophoblast penetrate deeper into the stroma and erode the endothelial lining of the endometrial capillaries.

These ruptured capillaries are called sinusoids.

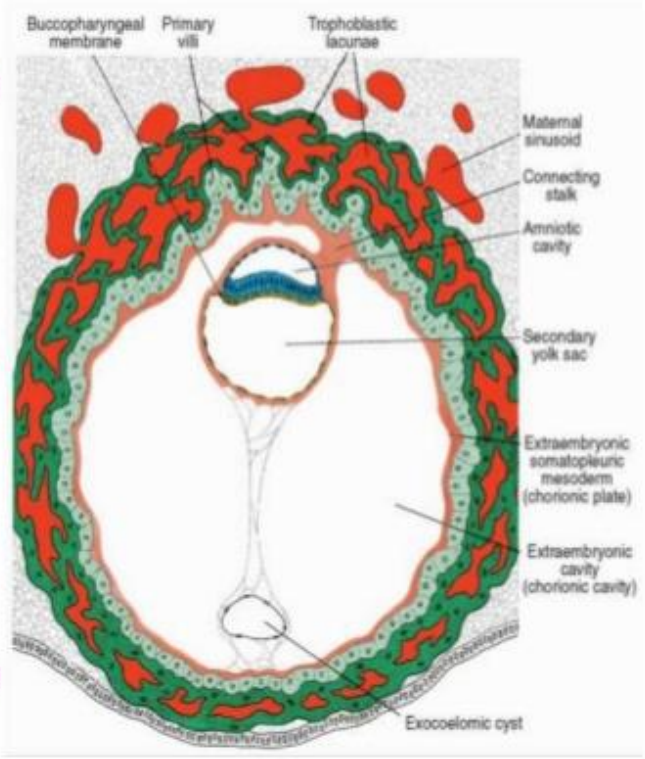
The lacunae then begin to communicate with the sinusoids, and maternal blood enters the lacunar system.

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.

HIGHLIGHTS of 2nd Week of Development

- **Bilaminar germ disc**
- complete implantation on uterine wall
- **Trophoblast** differentiated in 2 layers
- **2 cavities formed**- amniotic cavity, extraembryonic coelomic cavity (chorionic cavity)
- **2 layers of extraembryonic mesoderm**-somato & splanchnopleure
- Beginning of **uteroplacental** circulation



A new population of cells appears between the inner surface pf the cytotrophoblast and the outer surface of the exocoelomic cavity.

These cells which are derived from the yolk sac cells from a fine, loose connective tissue called the extraembryonic mesoderm.

Soon, large cavities develop in the embryonic mesoderm, and when these become confluent, they form a new space known as the extraembryonic cavity, or chorionic 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 umblical 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 splanhnic 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 conceptus.

13th Day of development

The surface epithelium has now healed or has been completely covered by the surface epithelium.

Occasionally bleeding occurs at the implantation site as a result of increased blood flow to lacunae space because this bleeding occurs near the 28th day of the menstrual cycle, it may be confused with the normal menstrual bleeding and, therefore may cause inaccuracy in determining the expected deliver date.

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 secondary yolk sac.

This new cavity is known as the secondary yolk sac or definitive yolk sac or the secondary umblical vesicle.

In humans the yolk sac contains no yolk but is important for the transfer of nutrients between 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.

hCG can be detected in maternal blood or urine as early as day 10 of pregnancy and is the basis for preganancy tests. Enough of this 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 the uterus.

These implantations result in ectopic pregnancies. 95% to 98% of ectopic implantations occur in the uterine tubes, mostly in the ampulla and isthmus.