

Discuss the second week of development

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)

Day 8

At the eighth 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 2 layers:

the hypoblast layer, which is made up of small cuboidal cells, and it is adjacent(nearer) to the blastocyst cavity

the epiblast layer which is made up of high columnar cells, and it 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 cavity

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

Vacuoles appear at the region of the trophoblast and they fuse to form larger lacunae

this phase of trophoblast development is known as the lacunar 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 umbilical vesicle

11th - 12th day of development

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 Day 9

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cells of the syncytiotrophoblast penetrate deeper into the stroma (tissue) and erode the endothelial lining of the endometrial capillaries

These ruptured endometrial 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 a new population of cells appears between the inner surface of the cytotrophoblast and the outer surface of the exocoelomic cavity. These cells which are derived from yolk sac cells form a fine, loose connective tissue called the extraembryonic mesoderm

Soon, large cavities develop in the extraembryonic mesoderm, and when these become confluent, they form a new space known as the extraembryonic 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 umbilical 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 splanchnic 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 the conceptus

13th day of development

The surface defect in the endometrium has been completely covered by the surface epithelium

Occasionally bleeding occurs at the implantation site as a result of increased blood flow into the lacunar spaces 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 the secondary yolk sac

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

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

Exocoelomic cysts are often found in the extraembryonic cavity or chorionic cavity or extraembryonic coelom

Meanwhile, the extraembryonic coelom expands and forms a large cavity called 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 connecting stalk becomes the umbilical cord

Clinical correlate

The syncytiotrophoblast produces a hormone called the human chorionic gonadotrophin (hCG), which enters the maternal blood via lacunae keeps the corpus luteum secreting estrogens and progesterone

hCG maintains the hormonal activity of the corpus luteum in the ovary during pregnancy