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DEPARTMENT: MEDICINE AND SURGERY

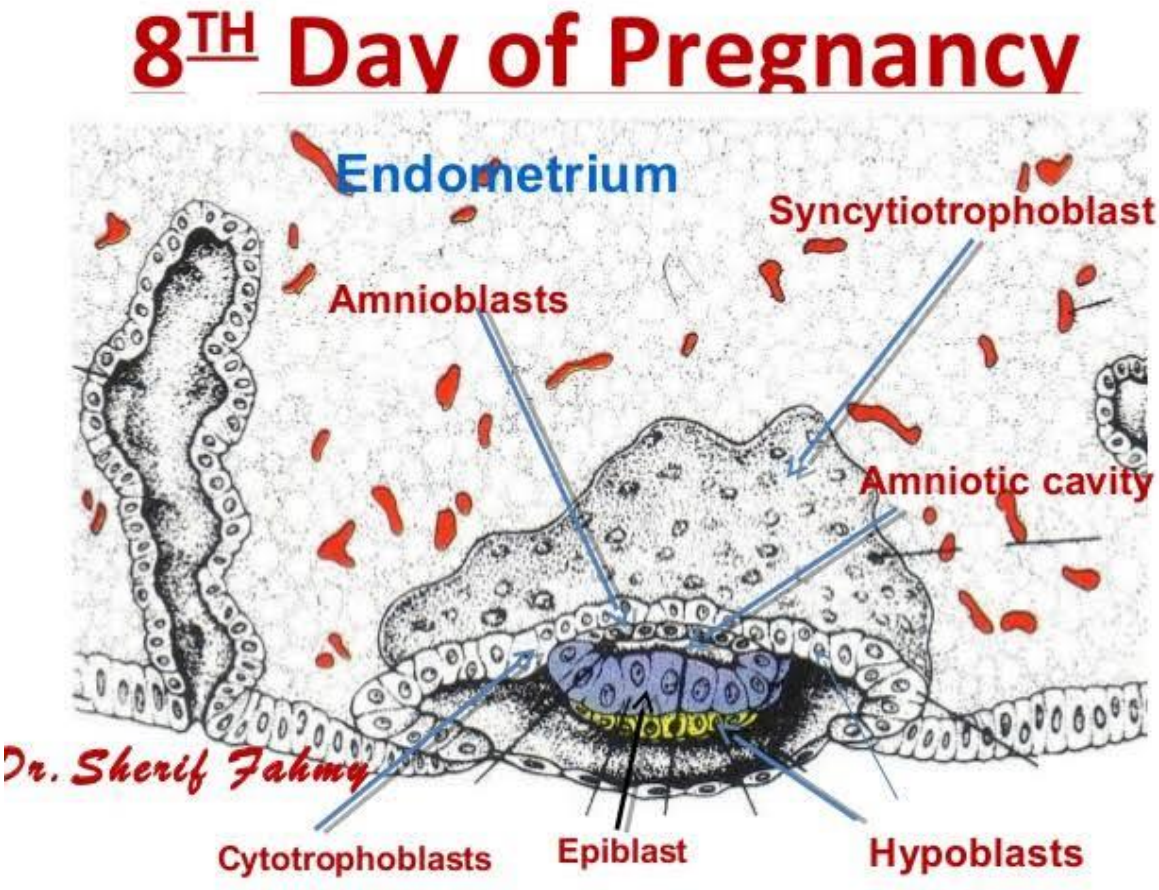
COURSE: EMBRYOLOGY

ASSIGNMENT: DISCUSS SECOND WEEK OF EMBRYONIC DEVELOPMENT

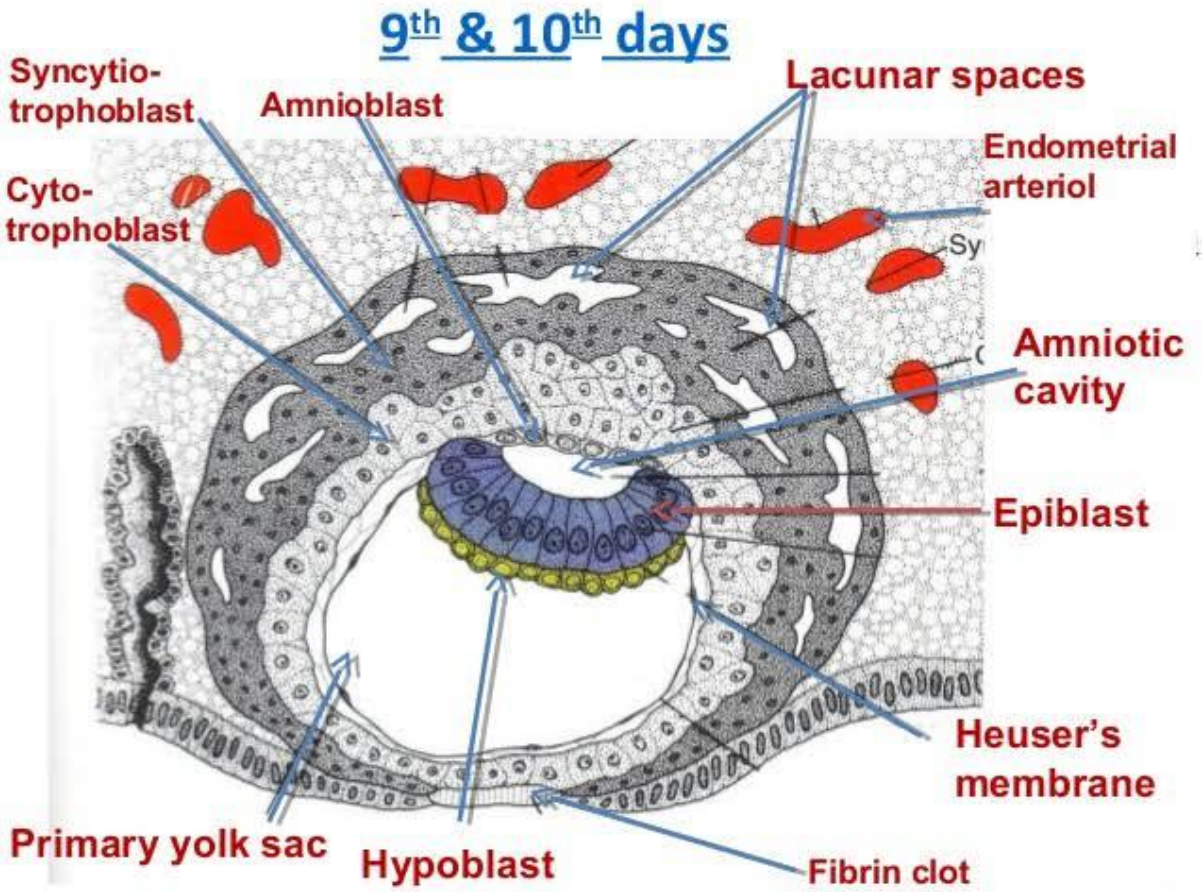
ANSWER

During the second week of development, three events take place and they are;

- Completion of implantation of the blastocyst
- The formation of the bilaminar embryonic disc which are the epiblast and the hypoblast
- Formation of extra embryonic structures such as the yolk sac, amniotic cavity, amnion, chorionic sac and connecting stalk.
  On the eight day of embryonic development, the blastocyst gets slowly embedded in the endometrium the endometrial blood vessels and glands are eroded by the continuous invasion of the syncytiotrophoblast. After this, more cells in the cytotrophoblast divide and go into the syncitiotrophoblast where they later fuse and lose their individual cell membrane. The embryoblast then differentiate into two layers which are the epiblast and the hypoblast, which when they come together, they form a flat ovoid shaped disc called the bilaminar disc and this is the second event that takes place in the second week of development. The hypoblast is an epithelial layer made up of small cuboidal cells and it faces towards the blastocyst cavity. The hypoblast is replaced in week 3 by the gastrulation migrating endoderm cells. The epiblast layer is made up of high columnar cells which lie adjacent to the amniotic cavity. When an epiblast cell is adjacent to the cytotrophoblast, it is called the amnioblast. Amnioblast is what lines the amniotic cavity alongside the rest of the epiblast.



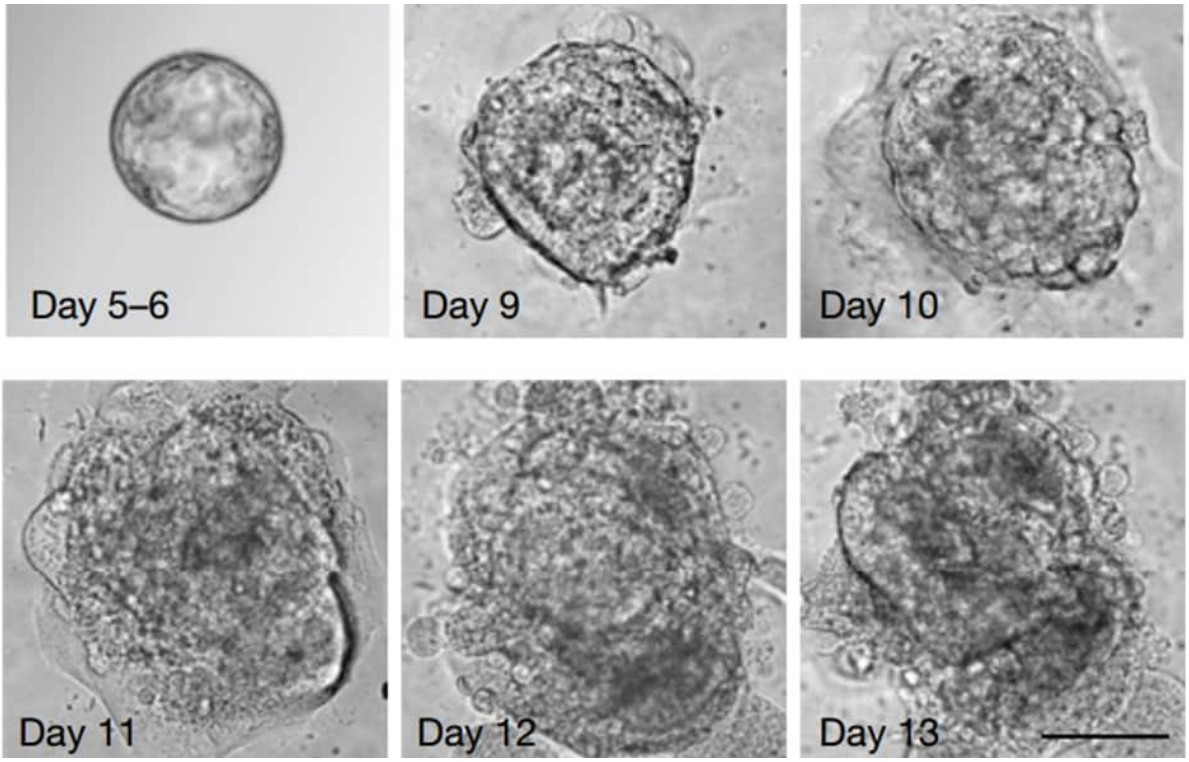
In the 9th day of development, the blastocyst becomes more embedded in the endometrium and the penetration defect becomes closed by a coagulum called fibrin. Vacuoles then appear at the region of the trophoblast and they fuse to form a large lacunae and this phase is called the lacunar stage. After that, the cells of the hypoblast which lie adjacent to the cytotrophoblast form a thin membrane called the exocoelomic membrane also known as heuser's membrane.



Within the 11th to 12th day, the blastocyst is already fully embedded and the original defect in the uterine wall is already almost covered by the surface epithelium. At this point, the blastocyst protrudes slightly into the lumen of the uterus and the cells of the syncytiotrophoblast penetrate deeper into the stroma and erode the endothelial lining of the endometrial capillaries. The ruptured endometrial capillaries are called sinusoids. After that, the lacunae start to communicate with the sinusoids and then maternal blood enters into the lacunar system. The communication between the sinusoids and the lacuna brings about the primordial uteroplacental circulation. When maternal blood flows into the lacunae, the embryo becomes provided with oxygen and other nutritive substances. After, new populations of cells appear between the inner surface of the cytotrophoblast and the outer surface of the exocoelomic cavity. These cells are derived from yolk sac cells and they form a loose connective tissue called the extraembryonic mesoderm. Shortly after, large cavities develop into the extraembryonic mesoderm and when they join, they form a new space called the extraembryonic cavity also known as the chorionic cavity or the extraembryonic coelom. This cavity is what surrounds the primitive yolk sac and the amniotic cavity, except when the

connecting stalk joins the gem disc to the trophoblast. The extraembryonic mesoderm which lines the cytotrophoblast is called the extraembryonic somatic mesoderm. This also form the connecting stalk. The lining covering the yolk sac is known as the extraembryonic splanchnic mesoderm. As the conceptus implants, the endometrial cells undergo a transformation process called decidual reaction. During this transformation, the cells of the endometrium swell due to the accumulation of glycogen and lip in their cytoplasm and they are called decidual cells. The main function of the decidual reaction is to provide nutrition for the early embryo and an immunologically privileged site for the conceptus.

On the 13^{th} day of development, the surface epithelium completely covers the surface defect in the endometrium. Bleeding occurs occasionally at the implantation site as a result of increased blood flow into the lacunar spaces. The cells of the cytotrophoblast proliferate locally and penetrate into the syncytiotrophoblast thereby forming cellular columns surrounded by syncytium. Cellular columns with syncytial covering are known as the secondary yolk sac. This new cavity is called the secondary yolk sac or definitive yolk sac or the secondary umbilical vesicle. The yolk sac of humans contains no yolk but it is important for the transfer of nutrients between the fetus and the mother. This yolk sac is smaller than the primitive yolk sac. During the formation of the yolk sac, great amounts of exocoelomic cavity are pinched off to form exocoelomic cysts. They are mostly found in the extraembryonic cavity. With development of blood vessels, the connecting stalk becomes the umbilical cord.



CLINICAL SIGNIFICANCE

1) HUMAN CHORIONIC GONADOTROPHIN: This is produced by the syncytiotrophoblast and enters the maternal blood through the lacunae to keep the corpus luteum secreting estrogen and progesterone. This maintains the hormonal activity of the corpus luteum in the ovary. It can be detected in the urine as early as 10 days of the pregnancy.
2) Extrauterine implantation: this is when the blastocyst implants outside of the uterus. This is what is known as ectopic pregnancy. Most ectopic pregnancies occur in the uterine tube, mainly in the ampulla and isthmus.