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COURSE TITLE: Integrated Core Basic Sciences- Physiology, Anatomy, Biochemistry

COURSE CODE: ICBS

Question

(1.) Write on the 2nd week of embryonic development.

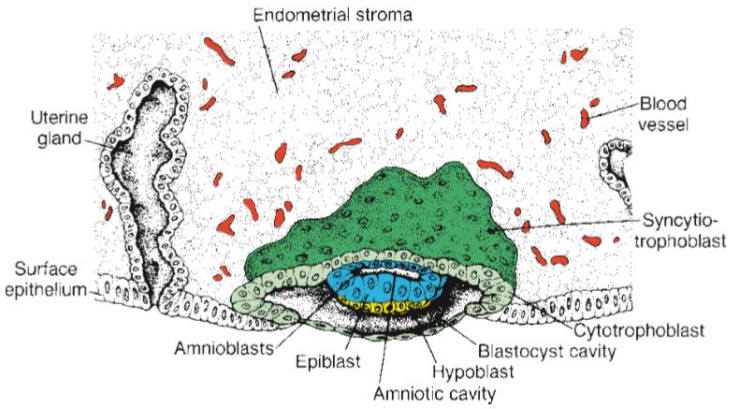
There are stages involved in the second week of embryonic development, they include:

1) Completion of implantation of the blastocysts,

2) Formation of the bilaminar embryonic disc (epiblast and hypoblast)

3) Formation of extra embryonic structures (amniotic cavity, yolk sac (amnion umbilical vessel), connecting stalk and chorionic sac)

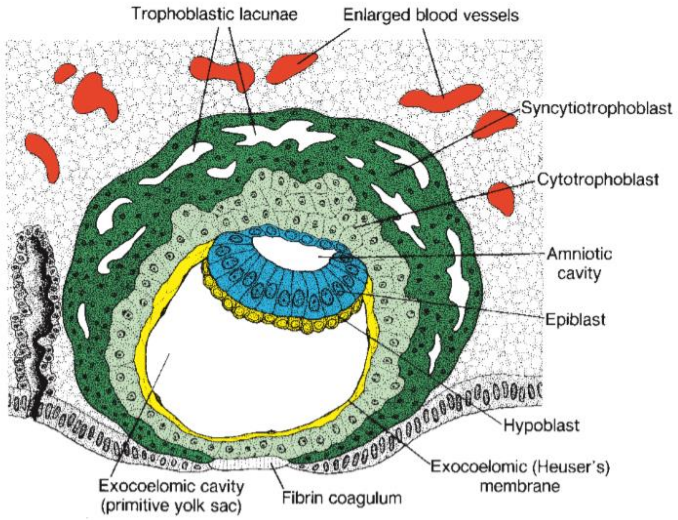
On the 8th day the blastocysts continues to embed partially into the endometrium, with the syncytiotrophoblast continues to invade into the endometrium eroding endometrial blood vessels and glands and the cells of the cytotrophoblast divide and migrate into the syncytiotrophoblast. The cells of the embryoblast are differentiated into 2 layers: an epiblast layer made of high columnar cells adjacent to the amniotic cavity and a hypoblast layer made of small cuboidal cells and nearer to the blastocyst cavity. The epiblast and hypoblast for the bilaminar germ disc a flat ovoid shaped disc, small cavities form in the epiblast which enlarge to form the amniotic cavity. Epiblast cells adjacent to the cytotrophoblast are called amnioblast and the rest of the epiblast and the amnioblast line the amniotic cavity. The endometrium adjacent to the implantation site is highly vascularized and edematous.



A pictorial representation of the 8th day of embryonic development

Source: T.W. Sadler (2012) Langman's Medical Embryology 12th Edition

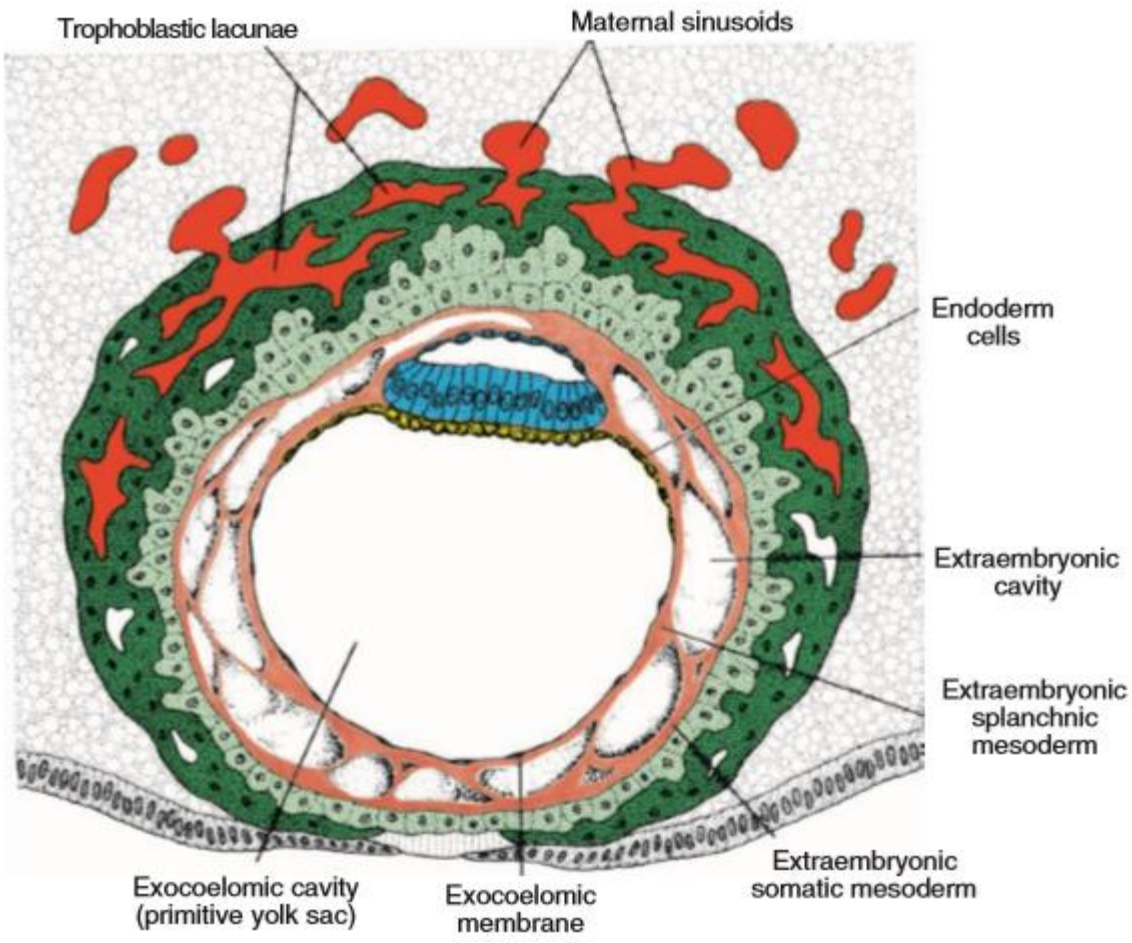
On the 9th day the blastocysts continues to go deeper into the endometrium and the penetration defect on the surface epithelium is covered by a coagulum fibrin. Vacuoles appear at the region of the trophoblast and fuse to form the lacunae, this phase is called a lacunae stage. Hypoblast cells adjacent to the cytotrophoblast form a thin membrane named exocoelomic (heuser's) membrane which lies in the inner surface of the cytotrophoblast. This membrane fuses with the hypoblast to form the lining of the exocoelomic cavity/primitive yolk sac/primitive umbilical vesicle.



A pictorial representation of the 9th day of embryonic development

Source: T.W. Sadler (2012) Langman's Medical Embryology 12th Edition

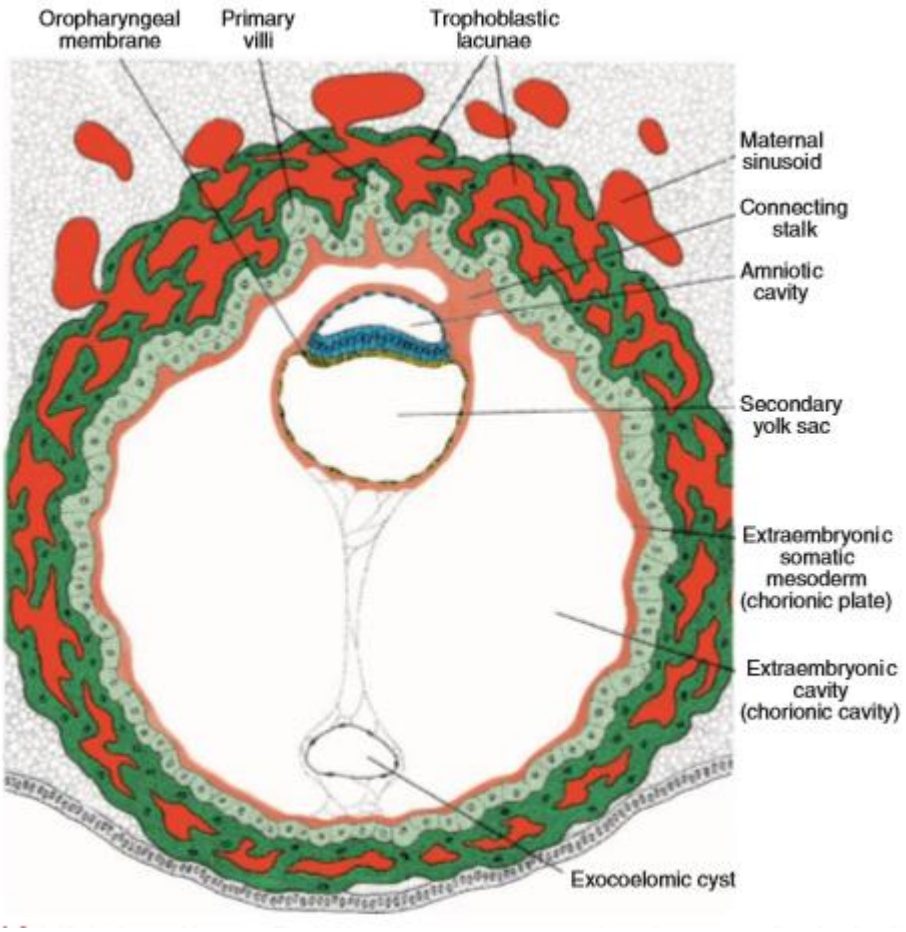
On the 11^{th} & 12^{th} day the blastocyst is completely embedded into the endometrium and the surface epithelium almost covers the original defect of the uterine wall, with the blastocysts producing a slight protrusion on the lumen of the uterus, the syncytiotrophoblast continues to move deeper into the tissue and erodes endothelial lining of endometrium capillaries such ruptured capillaries are called sinusoids which communicates with the lacunae and maternal blood enters the lacunae system (the primordial uteroplacental circulation) which avail oxygen and nutrients for the embryo. New cells are formed from the yolk sac between the cytotrophoblast and the outer surface of the exocoelomic cavity, these cells form a loose connective tissue called extraembryonic mesoderm. Large cavities begin to develop in the extraembryonic mesoderm which form spaces called extraembryonic cavity/extrembryonic coeloem. These spaces surround the primitive yolk sac and amniotic cavity except in a case where the germ disc is connected to the trophoblast by the connecting stalk (which develops into the umbilical cord). The extracoelomic mesoderm lining the cytotrophoblast and amnion is called exocoelomic somatic mesoderm (which forms the connecting stalk). The exocoelomic mesoderm lining the yolk sac is known as the exocoelomic splanchic mesoderm. The endodermal connective cells undergoes a transformation called decidual reaction, as the conceptus implants. The endometrial cells swell due to the presence of glycogen and lipid in the cell during this transformation, they are known as decidual cells. The function of this decidual reaction is to provide nutrient for the embryo and an immunologically privileged site for the conceptus.



A pictorial representation of the 11th and 12th day of embryonic development

Source: T.W. Sadler (2012) Langman's Medical Embryology 12th Edition

On the 13th day the surface defect on the endometrium has been fully covered by the epithelial surface, occasional bleeding occurs due to increased blood flow into the lacunae spaces at the implantation site, cells of the cytotrophoblast divide and move into the syncytiotrophoblast and form cellular columns surrounded by the syncytium, cellular columns with syncytial lining are known as primary villi. The primary yolk sac reduces in size to for the secondary yolk sac, the cavity is known as secondary yolk sac/definitive yolk sac/secondary umbilical vesicle. Although the yolk sac contains no yolk in humans, it however important for the transfer of nutrients between fetus and mother. The secondary yolk sac is much smaller than the exocoelomic cavity/primitive yolk sac. Large portions of exocoelomic cavity are pinched of to form exocoelomic cysts, during its formation. Exocoelomic cysts are found in the extraembryonic cavity or chorionic cavity or extraembryonic coelom. The extraembryonic coelom forms a large cavity called chorionic cavity. Extraembryonic mesoderm lining the inside of the cytotrophoblast is then known as the chorionic plate, the place where the extraembryonic mesoderm traverses the chorionic cavity is known as the connecting stalk, which becomes the umbilical cord with the development of blood vessels.



A pictorial representation of the 13th day of embryonic development

Source: T.W. Sadler (2012) Langman's Medical Embryology 12th Edition

CLINICAL CORRELATES

1) Human chorionic gonadotropin (hCG): which enters the maternal blood via the lacunae that keeps the corpus luteum secreting estrogen and progesterone is produced by the syncytiotrophoblast. hCG maintains the hormonal activity of the corpus luteum in the ovary during pregnancy. hCG is the basis of the pregnancy tests as it becomes visible in the blood and urine of a pregnant woman after ten days of pregnancy and detection of this hormone confirms a positive result for pregnancy.

2) Extrauterine Implantation: This occurs when the blastocyst implants outside the uterus usually in the ampulla or isthmus. This condition is called ectopic pregnancy.