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Course: Embryology

Assignment: Discuss the second week of development

2nd week of developmentThe following events take place during the 2nd week of development:Completion of implantation of the blastocystFormation of bilaminar embryonic disc(epiblast and hypoblast)Formation of extraembryonic structures(amniotic cavity, amnion, umbilical vesicle [yolk sac], connecting stalk, and chorionic sac)Day 8At the eighth day of development, the blastocyst is partially (slowly) embedded in the endometriumthe 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 membranesCells 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 discAt 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 amnioblastsAmnioblasts together with the rest of the epiblast, line the amniotic cavityThe 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 fibrinVacuoles appear at the region of the trophoblast and they fuse to form lager lacunaethis phase of trophoblast development is known as the lacunar stagethe cells of the hypoblast adjacent to the cytotrophoblast form a thin membrane called the exocoelomic (Heuser’s) membranethis membrane lines the inner surface of the cytotrophoblastthe 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 wallThe blastocyst now produces a slight protrusion into the lumen of the uterus cells of the syncytiotrophoblast penetrate deeper into the stroma(tissue) and erode the endothelial lining of the endometrial capillariesThese ruptured endometrial capillaries are called sinusoidsThe lacunae then begin to communicate with the sinusoids, and maternal blood enters the lacunar systemThe 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 embryoA new population of cells appears between the inner surface of the cytotrophoblast and the outer surface of the exocoelomic cavityThese cells which are derived from yolk sac cells form a fine, loose connective tissue called the extraembryonic mesodermSoon, large cavities develop in the extraembryonic 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 umbilical cord)The extraembryonic mesoderm lining the cytotrophoblast and amnion is called the extraembryonic somatic mesoderm. The 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 reactionDuring 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 cellsThe primary function of the decidual reaction is to provide nutrition for the early embryo and an immunologically privileged site for the conceptus13th day of development The surface defect in the endometrium has been completely covered by the surface epitheliumOccasionally bleeding occurs at the implantation site as a result of increased blood flow into the lacunar spacesCells of the cytotrophoblast proliferate locally and penetrate into the syncytiotrophoblast, forming cellular columns surrounded by syncytiumCellular columns with the syncytial covering are known as primary villiThe 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 vesicleIn humans the yolk sac contains no yolk but is important for the transfer of nutrients between the fetus and motherThis yolk sac is much smaller than the original exocoelomic cavity or primitive yolk sacDuring its formation, large portions of the exocoelomic cavity are pinched off to form exocoelomic cystsExocoelomic 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 cavityThe 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 cordClinical correlateThe syncytiotrophoblast produces a hormone called the human chorionic gonadotrophin (hCG), which enters the maternal blood via lacunae keeps the corpus luteum secreting estrogens and progesteronehCG maintains the hormonal activity of the corpus luteum in the ovary during pregnancyhCG can be detected in maternal blood or urine as early as day 10 of pregnancy and is the basis for pregnancy testsEnough hCG 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 pregnantExtrauterine Implantation Blastocysts may implant outside the uterus These implantations result in ectopic pregnancies 95% to 98% of ectopic implantations occur in the uterine tubes, most often in the ampulla and isthmus