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MATRIC NUMBER: 18/MHS01/208

DEPARTMENT: MEDICINE AND SURGERY

COURSE: EMBRYOLOGY

QUESTION: DISCUSS THE SECOND WEEK OF HUMAN DEVELOPMENT

1. DAYS 6-12 (COMPLETION OF IMPLANTATION OF THE BLASTOCYST):

- DAY 8: The trophoblast differentiates into two; Syncytiotrophoblast (outer multinucleated layer) and cytotrophoblast (inner cellular layer). The syncytiotrophoblast invades the endometrial tissue and the blastocyst becomes partially embedded in the endometrium. The cells of the cytotrophoblast proliferate and migrate into the syncytiotrophoblast
- DAY 9: The blastocyst becomes more deeply embedded in the endometrium. The penetration defect in the surface epithelium is closed by a fibrin coagulum. Vacuoles develop in the syncytiotrophoblast and fuse to form several trophoblastic lacuna
- DAY 11-12: The blastocyst becomes fully embedded in the endometrium, and the surface epithelium is almost entirely healed. The syncytiotrophoblast begins to erode the lining of maternal capillaries in the endometrium, known as sinusoids, eventually becoming continuous with the capillaries. Blood from the sinusoids flows into the trophoblastic lacunae to provide nutrient supply to the developing embryo, establishing the utero-placental circulation.
- DAY 13: The surface epithelium is completely healed. Cells of the cytotrophoblast proliferate locally and project into the syncytiotrophoblast, forming cellular columns surrounded by syncytium. These cellular columns are known as primary chorionic villi.

2. DAYS 8-13 (FORMATION OF BILAMINAR GERM DISC AND EXTRA EMBRYONIC STRUCTURE):

- DAY 8: The cells of the embryoblast divide to form two layers; the epiblast comprised of high columnar cells adjacent to the cytotrophoblast, and the hypoblast comprised of

small cuboidal cells adjacent to the blastocystic cavity. Together, these two layers form the bilaminar germ disc. A small cavity appears within the epiblast and later develops to form the amniotic cavity. Epiblastic cells adjacent to the cytotrophoblast and above the amniotic cavity are called amnioblasts. The amnioblasts, along with the amniotic cavity and the epiblast collectively form the amnion.

- DAY 9: Cells of the hypoblast form a thin membrane called the exocoelomic/Heuser's membrane which lines the inner surface of the cytotrophoblast. The exocoelomic membrane, along with the hypoblast, forms the lining of the blastocystic cavity which then becomes the exocoelomic cavity/primitive yolk sac/umbilical vesicle.
- DAY 11-12: Primitive yolk sac cells in-between the exocoelomic membrane and the inner surface of the cytotrophoblast form a fine, loose connective tissue called the extra embryonic mesoderm. The extra embryonic mesoderm eventually fills all the space between the cytotrophoblast, the primitive yolk sac and the amnion. Large cavities then develop in the extra embryonic mesoderm and fuse to form a large space called the extra embryonic cavity/coelom which divides the extra embryonic mesoderm into two; the extra embryonic somatic mesoderm which lines the cytotrophoblast and amnion, and the extra embryonic splanchnic mesoderm which lines the exocoelomic cavity. The extra embryonic cavity covers the primitive yolk sac and the amnion, except where the bilaminar germ disc is joined to the cytotrophoblast by the connecting stalk.
- DAY 13: The hypoblast produces additional cells which migrate to the primitive yolk sac. These cells proliferate and gradually form a new cavity inside the primitive yolk sac known as the secondary/definitive yolk sac which is much smaller than the primitive yolk sac. During its formation, large portions of the exocoelomic cavity are pinched off in the form of exocoelomic cysts which are usually found in the extra embryonic cavity. During this time, the extra embryonic cavity enlarges to form a large cavity called the chorionic cavity. The extra embryonic somatic mesoderm becomes the chorionic plate and the connecting stalk, along with the development of blood vessels, becomes the umbilical cord.

3. DAYS 13-14 (DEVELOPMENT OF CHORIONIC SAC)

After the development of the primary chorionic villi, the chorionic plate and the two layers of the trophoblast form the wall of the chorionic sac. The embryo, amnion and secondary yolk sac are suspended in the chorionic sac by the connecting stalk.