

Second week of development

Implantation of the blastocyst

The second week of human development is concerned with the process of implantation and the differentiation of the blastocyst into early embryonic and placental forming structures.

Morula

During the first week the zygote undergoes cleavage divisions, which is :

- * The process by which the zygote rapidly divides without any increase in the size it becomes multicellular (cells are termed blastomeres).

- * First division occurs about a day after fertilization, and subsequent divisions occur every 12-24hrs after that. When the cell's number is around sixteen the solid sphere of cells within the zona pellucida is referred to as a morula

- * About the time the morula enters the uterine cavity, fluids begin to penetrate through the zona pellucida into the intercellular spaces of the inner cell mass.

- * Gradually, the intercellular spaces become confluent, and finally, a single cavity, the blastocole forms.

- * Cleavage continues as cellular differentiation. and then a blastocyst, consisting of embryoblast and trophoblast.

- * During this week development is predominately associated with implantation of the blastocyst into the uterine wall to establish a source of nutrition. As it migrates towards the uterus, the zona pellucida surrounding the blastocyst prevents direct contact with the epithelial lining of the fallopian tubes, ensuring implantation in approximately 99% of pregnancies will occur within the uterus.

Oral histology

Second stage

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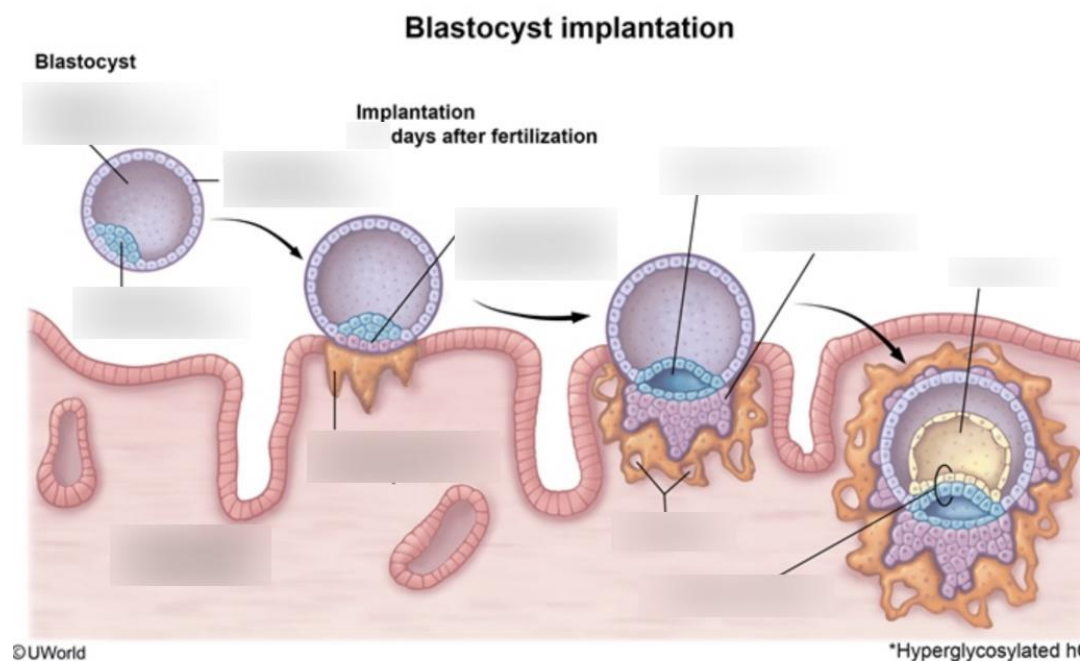
Implantation is a complex biochemical and mechanical process that begins in the first week of gestation and extends into the second week.

There are many influencing factors that affect the process.

The process of implantation can be subdivided into three phases:

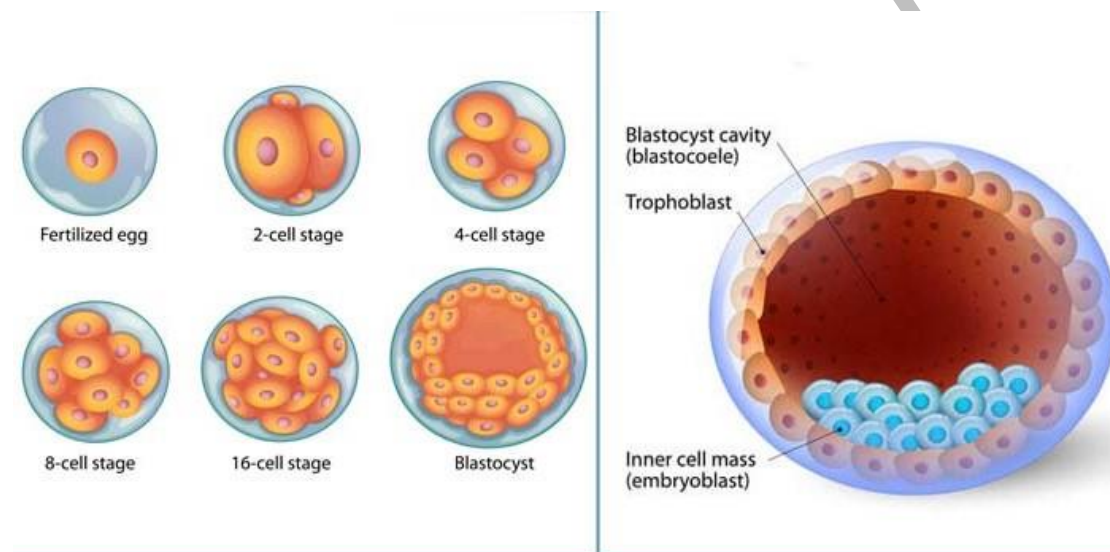
1. Period of apposition where the blastocyst establishes weak interactions with the uterine wall.
2. Attachment phase occurs when definitive binding of the blastocyst to the uterine epithelium is more established.
3. Invasion occurs when the blastocyst begins to burrow into the endometrium.

Once the blastocyst enters the uterus, the zona pellucida degenerates to expose the underlying trophoblast layer, thus enabling it to attach to the endometrium.



Blastulation(Blastocyst formation)

The blastocyst possesses an inner cell mass (ICM) which subsequently forms the embryo. The outer layer of the blastocyst consists of cells collectively called the trophoblast. This layer surrounds the inner cell mass and a fluid-filled cavity known as the blastocoel. Cells differentiate into an outer layer of cells called the trophoblast and an inner cell mass. The inner mass of cells differentiate to become embryoblasts and polarise at one end. The increase in size of the blastocyst causes it to hatch through the zone pellucida , which then disintegrates.



The embryoblast and the trophoblast will turn into two sub-layers.

* The embryoblast forms embryonic disc, which is a bilaminar disc of two layers, an upper layer called the epiblast (primitive ectoderm) and a lower layer called the hypoblast(primitive endoderm).

*The disc is stretched between what will become the amniotic cavity and the yolk sac.

* The trophoblast will develop two sub-layers: Cytotrophoblast
Syncytiotrophoblast

* Implantation: after ovulation, the endometrial lining becomes thickened, with its secretory glands becoming elongated, and is increasingly vascular in preparation for accepting the embryo. The placenta develops once the blastocyst is implanted, connecting the embryo to the uterine wall.

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* The syncytiotrophoblast will grow and will enter a phase called lacunar stage, in which some vacuoles will appear and be filled by blood in the following days.

*An erosion of the endothelial lining of the maternal capillaries by the syncytiotrophoblastic cells of the sinusoids will form where the blood will begin to penetrate and flow through the trophoblast to give rise to the uteroplacental circulation.

*The syncytiotrophoblast also produces human chorionic gonadotropin, a hormone that stimulates the release of progesterone from the corpus luteum.

* Progesterone enriches the uterus with a thick lining of blood vessels and capillaries so that it can oxygenate and sustain the developing embryo.

* The embryo is joined to the trophoblastic shell by a narrow connecting stalk that develops into the umbilical cord to attach the placenta to the embryo.

