

FIRST WEEK OF DEVELOPMENT

DR. NAJEEB LECTURE NOTES

BY FATIMA HAIDER

KGMC

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OVERVIEW OF FIRST WEEK

Day 1: Fertilization

Day 2: Two-cell stage, four-cell stage

Day 3: Early morula stage

Day 4: Blastocyst formation

Day 5: Zona pellucida disintegrates

Day 6: Implantation begin

TWO CELL STAGE

As both pro-nuclei inside the zygote come in contact to each other, both membranes dissolve and both chromosomes will arrange on spindle fibers. Each chromatid from both maternal and paternal chromosome will move to opposite pole and each daughter cell contain male and female haploid chromosomes and we say that cleavage took place in the zygote to form a two-cell stage.

MORULA

At day 2, the two-cell stage will convert into four-cell stage and further into 8-cell stage.

The embryo on further cleavage then forms a morula. The early morula forms in the fallopian tube and around 3rd day will move into the uterine cavity.

COMPACTION

Around 8th cell stage, the central cells called inner cells compact together by a process of compaction and form morula. At multiple points, cell membranes fuse together and form small holes called **gap junctions** through which cells communicate with each other.

The inner cells will form the embryo proper are called **inner cell mass**.

The **outer cell mass** will develop placenta and supporting structures around embryo proper.

BLASTOCYST

As the morula enters the uterine cavity, fluid begins to penetrate through the zona pellucida into the intercellular spaces of inner cell mass. These intercellular spaces combine to form a single cavity, the **blastocoel**. At this time, the embryo is called **blastocyst**. Cells of the inner cell mass, now called the **embryoblast** move to one pole, and those of the outer cell mass, or **trophoblast**, flatten and form the epithelial wall of the blastocyst. The zona pellucida disintegrates allowing implantation to begin.

Progesterone coming from the corpus luteum vascularize the endometrium and makes it more glandular. The endometrium is in its secretory stage and is getting ready for conceptus.

UTERINE LINING

1. Endometrium (innermost)
2. Myometrium
3. Perimetrium (outermost)

Endometrium further divided into:

1. Compact layer (zona compacta)
2. Spongy layer
3. Basal layer (towards the myotrium)

The compact layer and spongy layer are together called the functional layer of endometrium. It is this functional layer which sheds off during menstruation. The blastocyst also implants in the functional layer of endometrium.

Some arterial branches come off from basal layer towards the uterus and are called **spiral arteries**.

IMPLANTATION

Most common site for implantation of embryo is the body of the uterus (Body is the area between the fallopian tube and cervix). The blastocyst implants into mucosal lining of endometrium.

Trophoblast cells express special adhesion molecules called **L-selectins** and its carbohydrate receptors on uterine mucosal epithelium mediate initial attachment of blastocyst to uterus. The blastocyst gets loosely attached to uterus with the help of L-selectins. Then, the blastocyst expresses **integrins** which help the blastocyst to integrate into the uterus. **Fibronectin** and **laminin** help the blastocyst to migrate within endometrium.

DECIDUAL REACTION

Meanwhile, the blastocyst induce programmed cell death of endometrial cells due to which blastocyst penetrate deeper into the uterine epithelium. The death of endometrial cells provide nutrition to the blastocyst. Some endometrial cells at the time of implantation become polyhedral and loaded with glycogen and lipids and this change is called **decidual reaction**. This decidual reaction spreads into the whole endometrium.

As the blastocyst goes deep into the endometrium, the endometrium lining gets closed by a fibrin plug and further by mucosal lining.