

FERTILIZATION

Q Describe the various steps of fertilization in Human ?

Ans. - "The fusion of the male gamete (sperm) and the female gamete (ovum) to form zygote is called fertilization."

There are two types of fertilization. The fertilization occurs outside the body of female (generally in waters) in egg laying animals (oviparous animals) is called external fertilization and the fertilization takes place inside the body of female in viviparous animals is called internal fertilization. In the human female, like other mammals, fertilization takes place in the fallopian tube. During sexual intercourse, semen containing millions of sperms is deposited in the vagina. This process is called insemination. Approximately 300 million sperms are deposited in the vagina during an ejaculation but rarely to more than a few hundred reach the site of fertilization. The sperms move actively in female genital tract by swimming. The rate of active movement of sperm is 1.5 to 3.0mm per minute. Fertilizins are the substances emitted from mature eggs, which are present on the surface of egg. The acrosome of sperm released a spermlysin called antifertilizin which reacts with the fertilizin of the ovum and dissolves the egg envelopes like zona pellucida to make a path for the sperm to reach the surface of the ovum. The mature egg is surrounded by a layer of follicular cells called corona radiata. These cells are held together by an adhesive cementing substance, called hyaluronic acid. Acrosome of mammalian sperm produces an enzyme called hyaluronidase enzyme which disperse the cells of corona radiata. When the acrosome of the spermatozoa touches the surface of the egg, the cytoplasm of the egg bulges forward forming receptive zone or fertilization zone called animal pole through which sperm enters the egg. Finally the plasma membrane of egg also dissolves and the nucleus of sperm reaches to female nucleus to fuse and form zygote. All such changes in a sperm for fertilization are called capacitation. Immediately after fertilization a new membrane develops around the egg called fertilization membrane which present the entrance of late arriving sperms in the ovum. On the basis of above feature we conclude that the fertilization is a physico-chemical phenomenon.

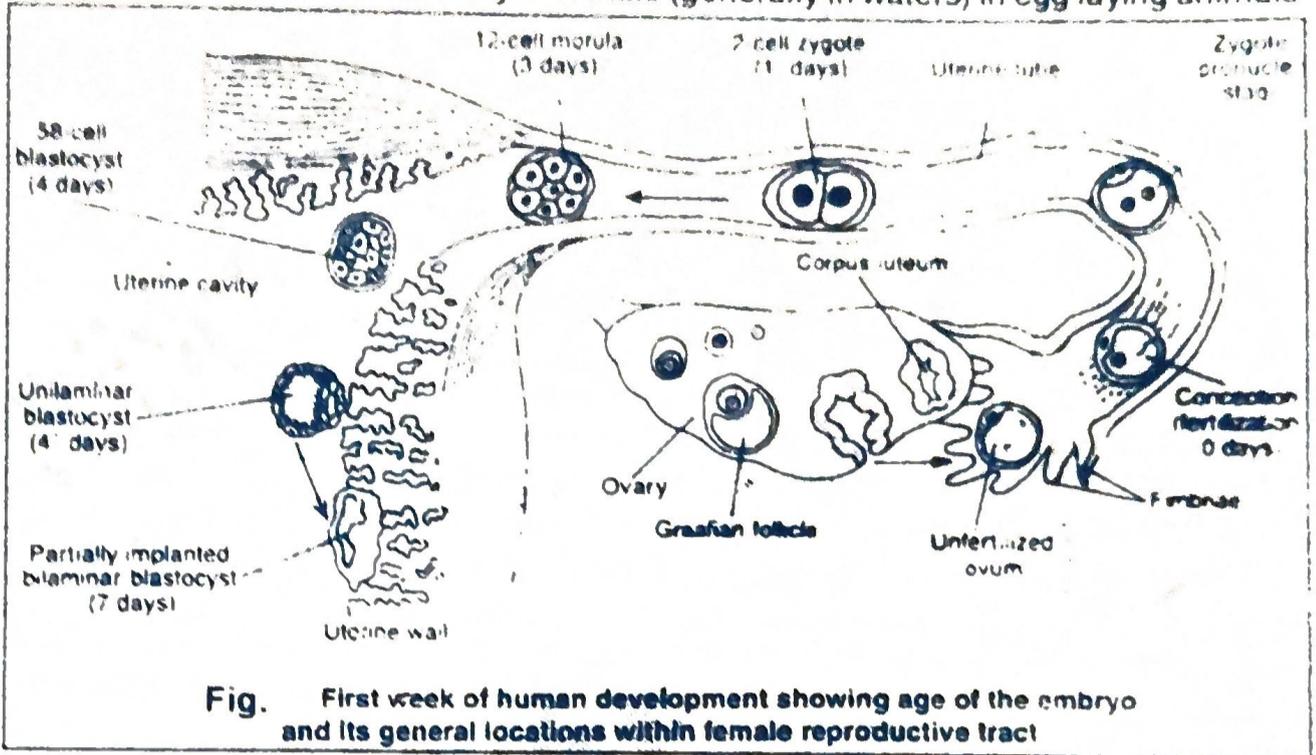


Fig. First week of human development showing age of the embryo and its general locations within female reproductive tract

EMBRYONIC DEVELOPMENT IN MAMMALS

Q. - Describe the different steps of embryonic development in mammals upto the formation of 3 germinal layers ?

Ans. :- "The structural changes in a zygote for the formation of new individual are called embryonic development."

These changes may be studied under following headings :-

1. Cleavage

2. Formation of Blastula

3. Gastrulation and formation of germinal layers

(1) **CLEAVAGE or SEGMENTATION or CELLULATION** :-

The phenomenon of splitting or division of a fertilized egg (zygote) by a series of mitosis cell division is called cleavage or segmentation. Mammalian egg is very small in size in which yolk is absent hence such type of egg is called **alecithal egg**, but according to recent discoveries, it is found that the egg is **microlecithal** i.e. small amount of yolk is present. Yolk is distributed uniformly in the ooplasm of egg hence it is also called **homolecithal** or **isolecithal egg**. In humans the cleavage is of **holoblastic type** i.e. the entire zygote divides completely with each cleavage. The cells produced by cleavage are called **blastomeres**. In human, cleavage takes place during its passage through the fallopian tube to the uterus. The plane of the first cleavage division runs through the **median axis (animal-vegetal pole axis)** of the egg as a result two blastomeres are produced. The second division occurs at right angle to the first, so that four blastomeres are formed. After some cleavage division 12-16 blastomeres are produced and appear in the form of compact ball of cells. It's shape is similar to **mulberry** hence this compact ball is called **morula**. The zona pellucida of egg remains intact throughout the cleavage division, hence, there is no increase in the protoplasmic mass of the morular blastomeres. Therefore embryo does not show any appreciable increase in it's size but there is marked increase in the DNA contents of it's cells. The morula reaches to uterine cavity and gets implanted into **endometrium** uterine walls.

