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COLLEGE: MEDICINE AND HEALTH SCIENCES

# DEPARTMENT: MEDICINE AND SURGERY

## COURSE: EMBRYOLOGY

- 1) Discuss ovulation
- 2) Differentiate between meiosis 1 and meiosis 2
- 3) Discuss the stages involved in fertilization

4) Differentiate between monozygotic twins and dizygotic twins

#### Answer

1) Ovulation is the release of an oocyte from the ovarian follicle

# 2)

Meiosis 1	Meiosis 2
1)It reduces the chromosome number in the	Equalizes the chromosome number of both
daughter cell	parent and daughter cell
2)Individual chromosomes are present in the	Sister chromosomes are present in the
daughter nuclei	daughter nuclei
3)Synapsis is present	Synapsis is absent
4)Crossing over is present	Crossing over is absent
5)alignment of 46 homologous duplicated	alignment of 23 duplicated chromosomes at
chromosomes at the metaphase plate	the metaphase plate
6)Disjunction is the separation of 46	Disjunction is the separation of 23 duplicated
homologous duplicated chromosomes from	chromosomes to form 23 single
each other; centromeres do not split	chromosomes; centromeres split

# 3)Fertilization

#### I. Passage of a sperm through the corona radiata:

For sperms to pass through the corona radiata, they must have been capacitated (removal of the glycoprotein coat and seminal plasma proteins from the plasma membrane that overlies the acrosomal region of the spermatozoa).Only capacitated sperms can pass freely through the corona radiata

II.Penetration of the zona pellucida:

The zona is a glycoprotein shell surrounding the egg that facilitates and maintains sperm binding and induces the acrosome reaction. The intact acrosome of the sperm binds with a zona glycoprotein (ZP3/ zona protein 3) on the zona pellucida. Release of acrosomal enzymes (acrosin) allows sperm to penetrate the zona pellucida, thereby coming in contact with the plasma membrane of the oocyte. As soon as the head of a sperm comes in contact with the oocyte surface, the permeability of the zona pellucida changes. When a sperm comes in contact with the oocyte surface, lysosomal enzymes are released from cortical granules lining the plasma membrane of the oocyte

# III. Fusion of plasma membranes of the oocyte and sperm:

The plasma or cell membranes of the oocyte and sperm fuse and break down at the area of fusion. The head and tail of the sperm enter the cytoplasm of the oocyte, but the sperm's plasma membrane remains behind

# IV. Completion of the second meiotic division of oocyte and formation of female pronucleus:

Penetration of the oocyte by a sperm activates the oocyte into completing the second meiotic division and forming a mature oocyte and a second polar body. The nucleus of the mature ovum/oocyte is now called the female pronucleus.

## V Formation of the male pronucleus:

Within the cytoplasm of the oocyte, the nucleus of the sperm enlarges to form the male pronucleus and the tail of the sperm degenerates. Since all sperm mitochondria degenerate, all mitochondria within the zygote are of maternal origin (i.e., all mitochondrial DNA is of maternal origin). Morphologically, the male and female pronuclei are indistinguishable. The oocyte now contains 2 pronuclei, each having haploid number of chromosomes (23). The oocyte containing two haploid pronuclei is called an ootid.

VI. <u>The 2 pronuclei fuse into a single diploid aggregation of chromosomes, the ootid becomes a</u> <u>zygote:</u> The chromosomes in the zygote become arranged on a cleavage spindle in preparation for cleavage of the zygote

Monozygotic twins	Dizygotic twins
They arise from one sperm and oocyte	They arise from when two different sperms
	fertilize two different oocytes
They share the same amniotic sac, chorionic	They have separate amniotic sac, chorionic
sac, and placenta	sac, and placenta
They are genetically identical	They are genetically un-identical
They have similar facial appearance	They do not have similar facial appearance
They have the same sex	They can be of different sex

#### 4)