NAME: AKINSANYA MARIAM.

MATRIC NUMBER: 18/MHS01/056

COLLEGE: MEDICINE AND HEALTH SCIENCES

DEPARTMENT: MEDICINE AND SURGERY.

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QUESTION:

Discuss ovulation

2) Differentiate between meosis 1 and meosis 2

3) Discuss the stages involved in ferterlization

4) Differentiate between monozygotic twins and dizygotic twins

ANSWER

1. Ovulation is *This is the release of mature secondary oocyte from the ovarian follicle. In a few days before ovulation, under the influence of **FSH** and **LH**, the secondary follicle grows rapidly to a diameter of about 25 mm to become mature vesicular/ mature secondary or Graafian follicle*

- *Coincident with final development of the vesicular follicle, there is an **abrupt increase in LH** that causes.*
- *The primary oocyte to complete meiosis I*
- *The follicle to enter the preovulatory mature vesicular stage*
- *Meiosis II is also initiated, but the secondary oocyte is arrested in metaphase approximately 3 hours before ovulation the surface of the ovary begins to bulge locally, and at the apex, an avascular spot, the **stigma,*** appears

➢ *For the oocyte to be released, 2 events occur which are caused by LH surge:*

I. it increases **collagenase activity**, resulting in **digestion of collagen fibers** (connective tissue) surrounding the follicle

II. Prostaglandin levels also increase in response to the LH surge and cause local muscular contractions in the ovarian wall

- *Those contractions extrude the oocyte, which together with its surrounding follicular (granulosa) cells from the region of the cumulus oophorus,*
- *this causes **ovulation in which oocyte floats out of the ovary***
- *Some of the cumulus oophorus cells then rearrange themselves around the zona pellucida to form the **corona radiata***

❖ ***Note:***

- *Ovulation is triggered by a surge of LH production*
- *Ovulation usually follows the LH peak by 12 to 24 hours*
- *The **LH surge**, elicited by the high estrogen level in the blood, appears to cause the stigma to balloon out, forming a vesicle*

2.

MEOSIS 1	MEOSIS2

It starts at diploid and ends as haploid.	Starts as haploid, ends as haploid.
Centromere doesn't split.	Centromere splits.
Synapsis, crossing over & chisama formation occurs.	Synapsis, crossing over, chiasma formation doesn't occur
Homologous chromosome pairs separate.	Sister chromatids separate.
Reduction division occurs.	Equational division occurs.
Ends with 2 diploid daughter cells.	Ends with 4 haploid daughter cells.
Takes long duration.	Takes short duration.

3. ***Fertilization:*** *This is* the union *of the* ***sperm*** *and* ***oocyte.*** *The* usual site of fertilization *is the* ***ampulla*** *of the uterine tube. The fertilization process takes* ***approximately 24 hours***

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*

- *In turn, these enzymes alter properties of the zona pellucida to :*

✓ *prevent sperm penetration and*

✓ *inactivate binding sites for spermatozoa on the zona pellicida surface*

- *only one sperm seems to be able to penetrate 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*

Note

- ❖ *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. ***The 2 pronuclei fuse into a single diploid aggregation of chromosomes, the ootid becomes a zygote***

- ➢ *The chromosomes in the zygote become arranged on a* ***cleavage spindle*** *in preparation for cleavage of the zygote*

4.

MONOZYGOTIC TWINS.	DIZYGOTIC TWINS
Resemblance is similar.	Resemblance is just like any other sibling.
Genetically identical.	Genetically not identical.
Formed from one zygote.	Formed from two zygote.
Incidence is more common.	Incidence is less common.
Twins are of the same sex.	Twins are of the same sex or different sex.
Are often called conjoined twins	Not seen as conjoined.