WALE-KARIGIDI OLUWATUMISE VICTORY

18/MHS01/372

EMBRYOLOGY

1. Ovulation

Ovulation is the release of an oocyte from the ovarian follicle. It is triggered by a surge of luteinizing hormone (LH). However, a few days before ovulation, under the influence of LH and follicle-stimulating hormone (FSH), the secondary follicle grows rapidly to become a mature vesicular/secondary/Graafian follicle. With this final development of the vesicular follicle, there is an abrupt increase in LH which cause the first meiotic division of the primary oocyte to be completed and the follicle to enter the preovulatory mature vesicular stage. Also, meiosis II starts but the secondary oocyte is arrested in metaphase approximately 3 hours before ovulation. Ovulation usually follows the LH peak by 12 to 24 hours. Under the influence of LH and FSH, the ovarian follicle undergoes a sudden growth spurt, producing a cystic bulge on the surface of the ovary. A small avascular spot, stigma, appears on the swelling. The LH surge causes increase in collagenase activity, resulting in digestion of collagen fiber surrounding the follicle. Also, the prostaglandin level increases and causes local muscular contractions in the ovarian wall. The secondary oocyte and some cells of the cumulus oophorus detach from the interior of the distended follicle due to the contractions. The stigma ruptures and the secondary oocyte is expelled with the follicular fluid. Some of the cumulus oophorus cells rearrange themselves to form the corona radiata surrounding the zona pellucida.

2. Differences between meiosis I and meiosis II

Meiosis I	Meiosis II
This brings about reduction of the 46 homologous duplicated chromosomes to 23 duplicated chromosomes.	This brings about division of the 23 duplicated chromosomes to form 23 single chromosomes.

At prophase I, synapsis occur leading to crossing over which leads to chiasma formation.	At prophase II, synapsis does not occur, therefore there is no crossing over nor chiasma formation.
At anaphase I, centromere does not split.	At anaphase II, centromere splits.
At telophase I, two gametocytes are formed.	At telophase II, four gametes are formed.

3. Stages of fertilization

   Fertilization is a complex sequence of coordinated molecular events that begins with contact between a sperm and an oocyte and ends with the intermingling of maternal and paternal chromosomes at metaphase of the first meiotic division of the zygote, a unicellular embryo. Fertilization is the first event that takes place during the 1st week of development. The fertilization process takes approximately 24 hours. There are 6 major events that take place during fertilization, they include;

   - Passage of sperm through the corona radiata: the cell membrane (the glycoprotein and cellular plasma protein) of the sperm is removed leaving only the acrosome to pass through. The dispersal of the follicular cells of the corona radiata surrounding the oocyte and zona pellucida is as a result of the action of the enzyme produced by the acrosome. The tail also aids the penetration of the corona radiata.
   - The penetration of the zona pellucida: the acrosome binds with the zona pellucida. The zona pellucida has receptors on its surface. The acrosome binds with these receptors and releases acrosin which enables the sperm to pass through the zona pellucida. On the plasma membrane of the

oocytes, there are granules called cortical granules. Once the sperm enters the zona pellucida, the permeability changes and the cortical granules send a signal to the zona pellucida to block and inactivate the binding site.

- Fusion of plasma membrane of sperm and oocyte: the nucleus and tail of the sperm enter into the cytoplasm of the oocyte leaving behind the plasma membrane of the sperm (the neck region). The cell membrane of the oocyte and sperm fuse and breakdown at the area of fusion.
- Completion of the second meiotic division of oocyte and formation of female pronucleus: once the sperm enters the cytoplasm of the oocyte, the second meiotic division is completed. A mature oocyte and a second polar body is formed. The nucleus of the mature oocyte becomes the female pronucleus.
- Formation of the male pronucleus: the nucleus of the sperm enlarges to form the male pronucleus while the tail degenerates.
- Formation of zygote: the male and female pronuclei float towards each other and fuse together to form a structure called ootid which give rise to the zygote.

4. Differences between monozygotic and dizygotic twins.

Monozygotic twins	Dizygotic twins
One sperm fuses with an oocyte to form a zygote which divides into two zygotes.	Two sperms fertilize two different oocytes which form two different zygote.
The twins are genetically identical.	They are genetically unidentical.
Twins are of the same gender.	Twins may or may not be of the same gender.
They share the same chorionic sac,	The chorionic sac, amniotic sac,

amniotic sac and placenta but the umbilical cords are separate.	placenta and umbilical cords are separate.