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1. DISCUSS OVULATION

Ovulation is the second change in the ovarian cycle and it is produced by the luteinizing hormone and the follicle stimulating hormone.

Ovulation is the release of secondary oocytes from the ovarian follicle. Before ovulation under the influence of luteinizing and follicle stimulating hormone the secondary follicle becomes the mature vesicular or grafian follicle. Along side this development there is a sudden increase in the luteinizing hormone which causes two things to happen. First is the completion of meiosis one of the primary oocyte and second is it causes the follicle to the pre ovulatory mature vesicular stages.

Meiosis two is initiated but the secondary oocyte is arrested at metaphase at approximately three hours before ovulation. The growth sprout produces a cystic swelling or bulge on the surfaces of the ovary a small avascular spot called stigma appears on the surface of the swelling.

For the release of the oocyte to occur two events must happen these events are as a result of the luteinizing hormone. The luteinizing hormone causes;

1. Increase of collagenase activity which results in digestion of collagen fibres surrounding the follicle [the major component of connective tissue is collagen]
2. Increase in prostaglandin levels as a response to the increase in the luteinizing hormone which causes a muscular contraction in the ovarian wall, this contraction leads to the release of the oocyte and together with its surrounding follicular cells form the region of the cumulus oophorus . some of the cunnulus oophorus cells then re arrange themselves around the zona pellucida of the secondary oocyte giving rise to corona radiate.

2 DIFFERENTIATE BETWEEN MEIOSIS 1 AND MEIOSIS 2

Meiosis 1 and meiosis 2 are two separate substages of meiosis. Meiosis 1 occurs by producing genetic recombination in the daughter cells while in meiosis 2 each of the four daughter cells will contain half the amount of chromosomes of the parent cell. Meiosis 1 has five phases including: prophase 1, metaphase 1, anaphase 1, telophase 1 and interphase. In meiosis 2, it varies. In some organisms, telophase 1, interphase, and prophase two does not occur. In plants and animals, meiosis two consists of four stages of cell division. Meiosis one prophase one stage has three important events that occur and they are 1. Synapses or pairing 2. Crossing over and 3. Chiasma formation this three events do not occur in the meiosis two prophase two stage. Another major difference between metaphase one and two is that, in metaphase 1, the spindle fibres get attached to two centromeres of each homologous chromosome whereas, in metaphase 2, the spindle fibres get attached to one centromere from both sides.

MEIOSIS ONE	MEIOSIS TWO
1. Occurs by producing genetic recombination in the daughter cells 2. Prophase one consists of synapses, crossing over and chiasma formation 3 in metaphase 1 paired homologous chromosome line up at the equator 4 in anaphase 1 paired homologous chromosomes separate and move to opposite poles	1Each daughter cell contains contains half of the chromosome of the parent cell 2 synapses, crossing over and chiasma formation do not occur 3 in metaphase 2 sister chromatids line up at the equator 4 in anaphase 2 sister chromatids separate and move to opposite poles

5. At the end of meiosis 1, and two haploid daughter cells are formed 6. a complex division which takes more time 7.individual chromosome are present in the daughter nuclei 8 Preceded by interphase 9. cohesion protein complexes at the arms of the homologous chromosomes are cleaved	5 at the end of meiosis 2, four haploid daughter cells are formed. 6. less complex division which takes less time 7 sister chromosomes are present at the daughter nuclei 8. no interphase takes place 9. cohesion at the centromeres are cleaved in order to separate the two sister chromatids

3. DISCUSS THE STAGES INVOLVED IN FERTILIZATION

Fertilization is defined as the fusion between the male and female gametes, that is, sperm and egg, thereby reestablishing the normal number of chromosomes in humans (46 chromosomes).

Ejaculation into the female vagina is essential for fertilization to occur. As sson as it happens the spermatozoa will start their journey inside the female reproductive tract until they reach the Fallopian tube where the egg cell is located.

Once the sperm reaches the Fallopian tube, they will be able to meet the egg provided that the woman is on her **fertile days** and ovulation has taken place. In that case, spermatozoa surround the egg cell in an attempt to fertilize it.

Stages of fertilization

Fertilization requires the activation of multiple mechanisms and changes in gamete cells for it to be possible.The following are the four main stages of fertilization in human beings:

1.Penetration of the corona radiata

The first stage of human fertilization is the penetration of spermatozoa into the **corona radiata** of the egg, a coat made of cells that surrounds the egg. Sperm cells are able to go through this first barrier thanks to the release of the hyaluronidase enzyme, and the

motion of their flagellum .sperm cells are able to go through this first barrier due to the release of the hyaluronidase enzyme, and the motion of their flagellum. When they cross this layer, spermatozoa encounter a second barrier: the **zona pellucida (ZP)**. It is an external layer that surrounds oocytes.

2.Penetration of the zona pellucida

More than a single sperm cell is required to degrade the Zona Pellucida. Nonetheless, in the end just one of them will pass through, that is, the one who fertilizes the egg.

In order to be able to cross this second barrier, the head of the sperm establishes contact with receptor ZP3 of the Zona Pellucida. This triggers the **acrosome reaction**, which involves the release of a series of hydrolytic enzymes (contents of the acrosome). These enzymes dissolve the Zona Pellucida to allow the passage of the sperm cell. The acrosome reaction causes a series of modifications of the sperm cell that allow its natural capacitation. Sperm capacitation, at the same time, allows it to get into the cell egg, causing the membranes of both reproductive cells to fuse together.

3.Fusion of membranes

When the egg cell makes it to the plasma membrane of the oocyte, it triggers three different processes in the female gamete:

- Formation of the **fertilization cone**
- Instant **depolarization** of the egg membrane
- **Release of cortical granules** from the egg

The formation of the fertilization cone enables fusion between the membranes of both the egg and the sperm, allowing passage of the sperm's head into the egg. Simultaneously, thanks to depolarization and the release of cortical granules, the **entrance of multiple sperm is prevented**.

4.Fusion of nuclei & zygote formation

Now that the passage of sperm has taken place, the oocyte activates itself to finish meiosis, the process whereby the number of chromosomes is reduced. With it, the second polar body is released, and chromosomes distribute themselves forming a structure called *female pronucleus*.

Pronuclei are the nuclei of gametes, which have the particularity of having half the chromosomes in comparison to the remainder of cells in the body, that is, 23 chromosomes.

On the other hand, the sperm continues the fertilization process until its head, which contains the nucleus, reaches the female pronucleus. The sperm will lose its tail at some point, and the nucleus will swell to create the male pronucleus.

When both pronuclei are **next to each other**, fusion occurs.

The fusion of pronuclei means that the membranes of both end up disappearing so that the chromosomes can fuse together. This allows the cell to reestablish its normal number of chromosomes, that is, 46 chromosomes.

The fertilization process of humans culminates with the formation of the **zygote**: the first cell of the organism, created after egg and sperm fuse into one.

n addition to all this, fertilization determines the gender of the baby-to-be based on sex chromosomes:

Male zygote

sex chromosomes are XY, so the unborn child is a boy.

Female zygote

sex chromosomes are XX, so the unborn child is a girl.

Egg cells always carry an X-chromosome. Thus, the sex of embryos is determined by the sperm, which can carry either an X or Y chromosome.

4. DIFFERENTIATE BETWEEN MONOZYGOTIC AND DIZYGOTIC TWINS

Monozygotic twins, more commonly called "identical twins," come from the same zygote (egg) fertilized by a single sperm. This fertilized egg then splits and produces two embryos which usually have identical chromosomes. Two fetuses will grow from the two embryos inside the same placenta. They are nearly always of the same sex although male-female monozygotic twins, an extremely rare occurrence, may result from a mutation during the early stages of development.

Dizygotic twins, also known as "fraternal twins," are produced from two zygotes or fertilized eggs that are fertilized by two different sperm cells. In other words, dizygotic twins are somewhat similar to ordinary siblings except that the former are born at the same time. They do not share the same chromosomes.

Dizygotic twins are developed in two different amniotic membranes and placenta. They may share the same genes, but only 50% of them. They may resemble each other or may be physically different from each other. Additionally, dizygotic twins can be of the same or different sex.

Monozygotic twins, or "identical twins," are developed from the same egg which is fertilized by a single sperm cell. Dizygotic twins, or "fraternal twins," are developed from two eggs that are fertilized by two different sperm cells. Monozygotic twins are developed in one placenta whereas dizygotic twins are developed in two separate placentas.

Monozygotic twins have genetic profiles that are almost identical to each other. They have the same blood type and may even share the same personalities. Most of the time, they are also of the same sex and share the same physical features. On the other hand, dizygotic twins have completely different genetic profiles and are just like regular siblings. They may be of the same or different gender, and they may look alike or different.

MONOZYGOTIC TWINS	DIZYGOTIC TWINS
1.Monozygotic twins are developed by the splitting of a fertilized embryo into two	1. dizygotic twins are developed by two separate simultaneous fertilization events
2. Causes of monozygotic twins are unknown.	2. it is caused by either IVF,certain fertility drugs or hereditary predisposition.
3. genetic codes of monozygotic twins are nearly identical	3. genetic codes are same as any other sibling
4.the genders are the same	4.The genders are different
5. Blood type of monozygotic twins is the same.	5. blood type of dizygotic twins is different
6. Appearances are extremely similar but may be affected by environmental factors.	6 appearance is different
7. Monozygotic twins may be either Di-Di, Mono-Di, or Mono-Mono twins	7 dizygotic twins are only Di-Di twins
8. monozygotic twins bear a high risk for TTTS	8 dizygotic twins bear low risk to TTTS