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MATRIC NO: 18/MHS01/318

DEPARTMENT: MEDICINE AND SURGERY

COURSE: EMBRYOLOGY

ASSIGNMENT:

Questions

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

1.

Ovulation is the release of eggs from the ovaries. In women, this event occurs when the ovarian follicles rupture and release the secondary oocyte ovarian cells. After ovulation, during the luteal phase, the egg will be available to be fertilized by sperm. The uterine lining becomes thickened to be able to receive a fertilized egg. If conception does not occur, the uterine lining alongside blood is shed during menstruation. Ovulation occurs midway through the menstrual cycle, after the follicular phase. The process of ovulation is controlled by the hypothalamus of the brain and through the release of hormones secreted in the anterior lobe of the pituitary gland, luteinizing hormone (LH) and follicle-stimulating hormone (FSH). In the pre-ovulatory phase of the menstrual cycle, the ovarian follicle undergoes a series of transformations called cumulus expansion, stimulated by FSH. After this, a small avascular spot called the stigma forms in the follicle, and the secondary oocyte leaves the follicle through the stigma. Ovulation is triggered by a spike in the amount of FSH and LH released from the pituitary gland. During the luteal (post-ovulatory) phase, the secondary oocyte will travel through the fallopian tubes toward the uterus. If fertilized by a sperm, the fertilized secondary oocyte or ovum may be implanted 6–12 days later.

2.

Differences between meiosis 1 and meiosis 2

MEIOSIS 1	**MEIOSIS 2**
Meiosis I is dedicated to forming two haploid cells from one diploid cell	Meiosis II is meant to split the sister chromatids in the haploid cells produced in meiosis I creating four daughter cells.
Meiosis is preceded by interphase	No interphase takes place.
Individual chromosome are located in the daughter nuclei	Sister chromosome are located in the daughter nuclei
Meiosis 1 occurs by producing genetic recombination in the daughter cells	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 2 does not occur. In plants and animals, meiosis 2 consists of four stages of cell division.

3.

STAGES INVOLVED IN FERTILISATION

- **Penetration of the corona radiata**
  The first stage of human fertilization is the penetration of spermatozoa into the corona radiate 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 (the tail). When they cross this layer, spermatozoa encounter a second barrier: the zona pellucida (ZP). It is an external layer that surrounds oocytes.
- **Penetration of the zona pellucida**
  In order to be able to cross this second barrier, the head of the sperm establishes contact with receptor 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.
- **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:
  - **I.** Formation of the fertilization cone
  - **II.** Instant depolarization of the egg membrane
  - **III.** 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.

- **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. 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.

4. DIFFERENCES BETWEEN MONOZYGOTIC TWINS AND DIZYGOTIC TWINS

MONZYGOTIC TWINS	DIZYGOTIC TWINS
Monozygotic twins are identical since they develop from one zygote	Dizygotic twins are non-identical since they develop from two separate zygotes.
Monozygotic twins originate due to the splitting of the zygote into two halves randomly	Dizygotic twins originate due to fertilization of two eggs from two separate sperms.
Monozygotic twins are identical	Dizygotic twins are non-identical.
Monozygotic twins are not hereditary	Dizygotic twins are hereditary.