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DEPARTMENT: MEDICINE AND SURGERY

COURSE: ICBS- EMBRYOLOGY

ASSIGNMENT

- 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.**

ANSWERS

QUESTION 1- OVULATION

Ovulation is the release of an oocyte from the ovarian follicle. After the egg is released, it travels down the fallopian tube, where fertilization by sperm may occur. The egg may or may not be fertilized by sperm. If fertilized, the egg may travel to the uterus and implant to develop into a pregnancy. If left unfertilized, the egg disintegrates and the uterine lining is shed during menstruation.

Ovulation occurs when the ovarian follicles rupture and release the secondary oocyte ovarian cells. Ovulation typically occurs in the middle of the menstrual cycle, about two weeks before menstruation.

The process of ovulation begins with the release of Follicle-Stimulating Hormone (FSH), typically between the 6th day and 14th day of the menstrual cycle. This hormone helps the egg in the ovary to mature in preparation to release the egg later on. Once the egg is mature, a surge of Luteinizing Hormone (LH) is released, triggering the egg's release. Ovulation may happen in the 28th-36th hour after the LH surge.

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

- It increases the collagenase activity, which results in the digestion of collagen fibers surrounding the follicle.
- Prostaglandin level also increases in response to the LH surge and causes local muscular contractions in the ovarian wall.

These contractions which extrude the oocyte, together with its surrounding

follicular cells cause ovulation.

QUESTION 2- DIFFERENCES BETWEEN MEIOSIS 1 AND MEIOSIS 2

MEIOSIS 1	MEIOSIS 2
a. Separation of homologous chromosomes occurs.	a. Separation of sister chromatids occurs.
b. Meiosis 1 produces 2 diploid daughter cells.	b. Meiosis 2 produces 4 haploid daughter cells.
c. Genetic recombination (crossing over) only occurs in meiosis 1.	c. Genetic recombination (crossing over) doesn't occur.
d. Synapsis occurs in meiosis 1.	d. Synapsis doesn't occur in meiosis 2.
e. Chiasma formation occurs in meiosis 1.	e. Chiasma formation doesn't occur in meiosis 2.
f. Meiosis 1 is a complicated division process.	f. Meiosis 2 is a simple division process.
g. Meiosis 1 has a long duration.	g. Meiosis 2 has a short duration.
h. Meiosis 1 is a reductive division process.	h. Meiosis 2 is an equational division process.

QUESTION 3- STAGES INVOLVED IN FERTILIZATION

The following stages take place during fertilization:

- I. **Passage of sperm to the corona radiata:** For sperm to be able to pass through the corona radiata, the sperm has to be capacitated (this is the removal of glycoprotein coat and seminal plasma proteins from the plasma membrane that overlies the acrosomal region of the spermatozoa). After the sperm has been capacitated, the sperm passes through the corona radiata.
- II. **Penetration of the zona pellucida:** The zona is a glycoprotein shell surrounding the egg that helps facilitate and maintain sperm binding and induce acrosome reaction. The acrosome of the sperm binds with a zona on the zona pellucida. Release of acrosin allows sperm to penetrate the zona pellucida. As soon as the head of the sperm comes in contact with the oocyte surface, the permeability of the zona pellucida changes, thereby enhancing the penetration of the zona pellucida and making it impossible for another sperm to penetrate.
- III. **Fusion of the plasma membranes of the oocyte and sperm:** The plasma membrane of the oocyte and sperm fuse together. The head and tail of the sperm enters the cytoplasm of the oocyte, but the plasma membrane of the sperm is left behind.
- IV. **Completion of 2nd meiotic division of oocyte and formation of female pronucleus:** Penetration of the oocyte by the sperm activates the oocyte into completing the 2nd meiotic division which forms a mature oocyte and second polar body. The nucleus of the mature oocyte is

what is referred to as the female pronucleus.

- V. **Formation of male pronucleus:** Within the cytoplasm of the oocyte, the nucleus of the sperm enlarges to form the male pronucleus while the tail of the sperm degenerates.
- VI. **Fusion of the pronuclei to form a zygote:** The male and female pronuclei fuse together to form an ootid (an oocyte containing two haploid pronuclei) which later becomes a zygote.

QUESTION 4- DIFFERENTIATE BETWEEN MONOZYGOTIC AND DIZYGOTIC TWINS

Twins are the set of two offspring produced in the same pregnancy. They can be monozygotic or dizygotic.

Monozygotic twins are produced from the same zygote, that is, a single zygote divides to give rise to two embryos. They are usually identical.

Dizygotic twins are formed when a female releases two eggs that are fertilized by two different sperms and result in the formation of two zygotes, and eventually two embryos.

The major difference between monozygotic and dizygotic twins is that monozygotic twins are developed from one embryo, splitting into two embryos while dizygotic twins are developed from two different eggs, which are fertilized by sperms separately.