NAME: JOSEPH JESSICA NNEOMA

LEVEL: 200

DEPARTMENT: MEDICINE AND SURGERY

MATRICULATION NO: 18/MHS01/197

COURSE TITLE: EMBRYOLOGY

ASSIGNMENT

EMBRYOLOGY ASSIGNMENT

QUESTIONS

1. Discuss Ovulation?

Ovulation is the release of a secondary oocyte from the ovarian follicle. In a few days before ovulation, under the influence of FSH (Follicle stimulating hormone) and LH (Luteinizing hormone) the secondary follicle grows rapidly to a diameter of about 25mm to become Mature Vesicular or Mature Secondary or Graafian follicle. The abrupt increase in LH causes the primary oocyte to complete meiosis I and the follicle to enter the preovulatory mature vesicular stage. Here the meiosis II is also initiated but the secondary oocyte is arrested at metaphase approximately 3 hours before ovulation. During this period, 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 surrounding the follicle.
ii. The prostaglandin levels increase in response to LH surge and cause local muscular contractions in the ovarian wall.

Those contractions extrude the oocyte which cause OVULATION in which oocytes floats out of the ovary.

2. Differentiate between meiosis I and meiosis II

i. Meiosis I reduces the ploidy level from 2n to n(reduction)

WHILE

Meiosis II divides the remaining set of chromosomes.

ii. Meiosis I: In Prophase I, the chromatin condenses into chromosomes, the nucleolus dissolves, nuclear membrane is disassembled, the spindle apparatus forms, synapsis and crossing over are present.

WHILE

Meiosis II: In Prophase II, the nuclear envelope dissolves, spindle fibers reform, synapsis and crossing over are absent.

iii. Meiosis I: In Metaphase I, alignment of 46 homologous duplicated chromosomes at the metaphase plate (equatorial plate).

WHILE

Meiosis II: In Metaphase II, alignment of 23 duplicated chromosomes at the metaphase plate.

iv. Meiosis I: In Anaphase I, separation of 46 homologous duplicated chromosomes from each other (centromeres do not split).

WHILE

Meiosis II: In Anaphase II, separation of 23 duplicated chromosomes to form 23 single chromosomes (centromeres split).

v. Meiosis I: In Telophase I, formation of two secondary gametocytes.

WHILE

Meiosis II: In Telophase II, formation of four gametes.

3. Discuss the stages involved in fertilization

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
- It is a sequence of coordinated events which include the following stages

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).

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 pellucida 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 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
- 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. Differentiate between monozygotic twins and dizygotic twins

i. Monozygotic twins are formed from one single zygote

WHILE

Dizygotic twins are formed from two zygotes.

ii. In monozygotic twins, resemblance is similar

WHILE

In dizygotic twins, resemblance is just like any other two siblings.

iii. Monozygotic twins are genetically identical

WHILE

Dizygotic twins are not genetically identical

iv. Monozygotic twins are of same sex or different sex

WHILE

Dizygotic twins are of same sex and also of different sex

v. In monozygotic twins, incidence is more common

WHILE

In dizygotic twins, incidence is less common.

vi. Monozygotic twins are often seen as conjoined twins

WHILE

Dizygotic twins are not seen as conjoined twins .