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MATRIC NUMBER: 18/MHS01/174

DEPARTMENT: MEDICINE AND SURGERY

COURSE TITLE: EMBRYOLOGY

ASSIGNMENT

1. Discuss Ovulation

Ovulation can be defined as the release of an oocyte from the ovarian follicle. The Follicle-stimulating Hormone (FSH) and the Luteinizing Hormone (LH) influences the secondary follicle to rapidly grow to a diameter of about 25mm a few days before ovulation to become a Graafian follicle or mature vesicular or mature secondary follicle. For the oocyte to be released, 2 events occur which are caused by Luteinizing Hormone increase:

- I. It causes an increase in collagenase activity, resulting in digestion of collagen fibers surrounding the follicle.
- II. Prostaglandin levels also increases in response to the LH increase and cause local muscular contractions in the ovarian wall
 - Those contractions extrude the oocyte, which together with its surrounding follicular or granulosa cells from the region of the cumulus oophorus,
 - this causes ovulation in which oocyte floats out of the ovary
 - Some of the cumulus oophorus cells then rearrange themselves around the zona pellucida to form the corona radiata.

The abrupt increase in Luteinizing Hormone causes;

- a. the primary oocyte to complete meiosis I
- b. then the follicle to enter the preovulatory mature vesicular stage

c. Meiosis II is then initiated, but the secondary oocyte is arrested in metaphase approximately 3 hours before ovulation.

2. Differentiate between Meiosis 1 and Meiosis 2

	Meiosis 1	Meiosis 2
1	In Prophase 1, synapsis (pairing) occurs	In Prophase 2, no synapsis occurs
2	Crossing over is present	Crossing over is absent
3	Chiasma formation occurs	Chiasma formation does not occur
4	In Metaphase 1, 46 homologous duplicated chromosomes align at the equator.	In Metaphase 2, 23 homologous duplicated chromosomes align at the equator.
5	In Anaphase 1, separation or disjunction occurs.	In Anaphase 2, the centromeres split
6	In Telophase 1, 2 daughter cells are formed	In Telophase 2, 4 daughter cells are formed

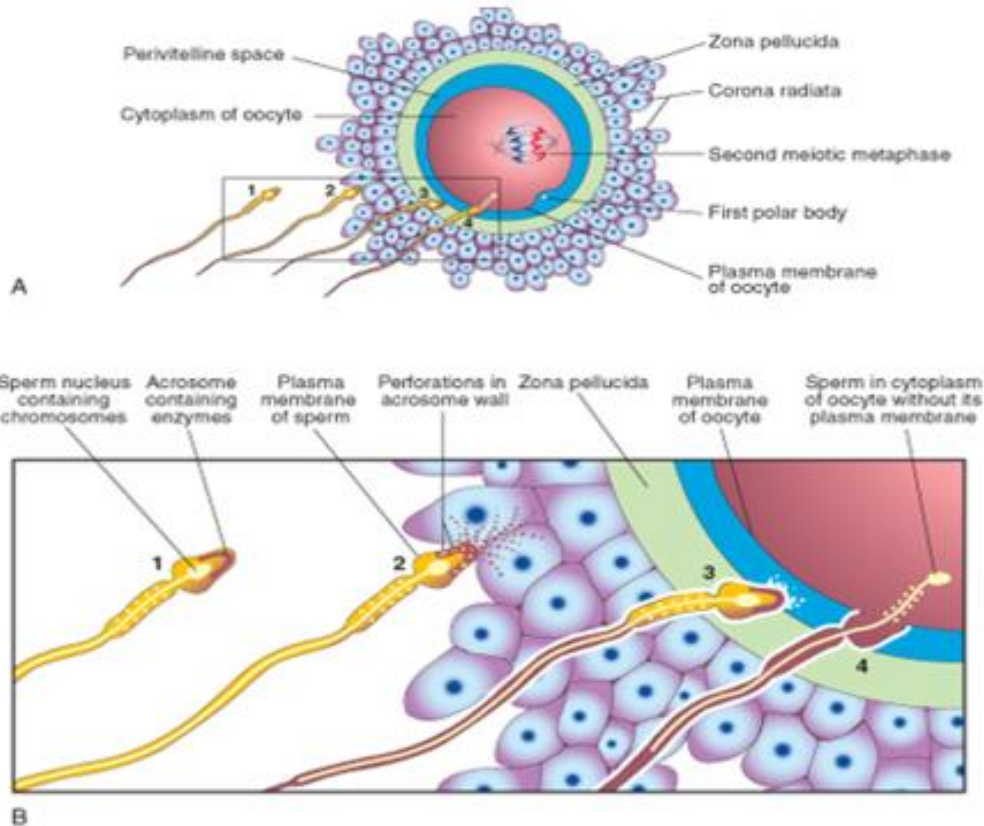
3. Discuss the stages involved in Fertilization.

Fertilization is the union of the sperm and the oocyte that usually occurs at the ampulla of the uterine tubes and takes place approximately 24 hours. The stages involved are:

- Passage of sperm through the corona radiata.
For this to occur, the sperm cells must have been capacitated (i.e. the removal of the glycoprotein coat and seminal plasma proteins from the plasma membrane that overlies the acrosomal region of the spermatozoa).
- 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 on the zona pellucida. The 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. Note that only one sperm would be able to penetrate the oocyte.



- Fusion of plasma membranes of the oocyte and sperm

The plasma 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 only the sperm's plasma membrane remains behind.

- 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 oocyte is now called the female pronucleus.

- 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.

Also, 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 and dizygotic twins.

	Monozygotic Twins	Dizygotic Twins
1	They result from the fertilization of one egg and one sperm	They result from the fertilization of 2 different eggs with 2 different sperms
2	They have very similar physical appearances	The similarity in their appearance is like that of normal siblings but not twins
3	They share the same placenta	They have different placentas
4	They can be the same sex or different sexes	They are always the same sex
5	They develop from a single fertilized egg that split	They develop from two different fertilized eggs