

NAME: OLOYE OLUWASEYI BOLUWATIFE

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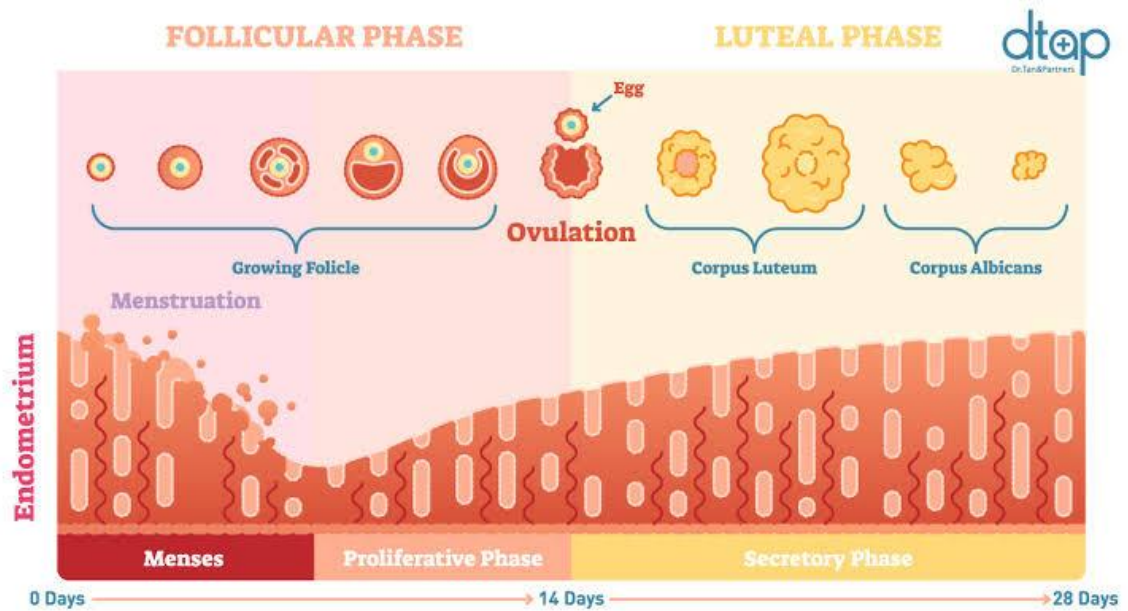
DEPARTMENT: MEDICINE AND SURGERY

QUESTION

1. DISCUSS OVULATION
2. DIFFERENTIATE BETWEEN MEIOSIS I AND MEIOSIS 2
3. DISCUSS THE STAGES INVOLVED IN FERTILIZATION
4. DIFFERENTIATE BETWEEN MONOZYGOTIC AND DIZYGOTIC TWINS

ANSWERS

1. Ovulation: this is the release of secondary oocyte from the ovarian follicle.
 - Few days before ovulation, under the influence of FSH and LH, the secondary follicle becomes mature vesicular follicle. During the development of vesicular follicle, there is abrupt increase in luteinizing hormone causing;
 - Primary oocyte to complete meiosis 1.
 - And the follicles enter the pre-ovulatory mature vesicular stage.
 - Meiosis 2 is then initiated but arrested at metaphase 2 approximately three hours before ovulation by **cytostatic factor**. The surface of the ovary starts to bulge locally and the apex, an avascular structure called stigma appears.
 - For the oocyte to be released, the luteinizing hormone surge causing;
 - Collagenase is secreted, the collagenase's activity is to increase the digestion of collagen fibers.
 - The prostaglandin level also increases causing local contraction of the ovarian wall.
 - The contraction causes the release of secondary oocyte together with the cumulus oophorus. These cumulus oophorus arrange themselves around the secondary oocyte then they become corona radiata immediate to the zona pellucida.
 - Ovulation is triggered by production of luteinizing hormone. Ovulation usually follows the luteinizing hormone peak after 12 to 24 hours. Luteinizing hormone surge then estrogen level in the elicited to cause the stigma to ballon out forming a vesicle.



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- CLINICAL APPLICATION
 - i. Mittelschmerz: this is a slight stomach pain experienced by some females during ovulation. This can also be called MIDDLE PAIN because it is middle of the menstrual cycle. At the middle of the ovulation, there is a slight bleeding of the peritoneal cavity which results in the pain. Mittelschmerz is a sign of ovulation.
 - ii. Signs of ovulation include: change in cervical mucus, increase libido, tenderness of the breast, swollen vagina and slight drop in the basal body temperature.
 - iii. Women that do not ovulate are said to be anovulating because of low concentration of gonadotropin-releasing hormone.

2. Difference between meiosis 1 and meiosis 2

	Meiosis 1	Meiosis 2
i.	Synapsis, chiasma formation and crossing over occurs at prophase 1 <p>Stages of Prophase I</p>	No synapsis, no crossing over and no chiasma formation at prophase 2
ii.	At metaphase 1, 46 homologous duplicated chromosomes are aligned at the equator.	At metaphase 2, 23 duplicated chromosomes align at the equator.

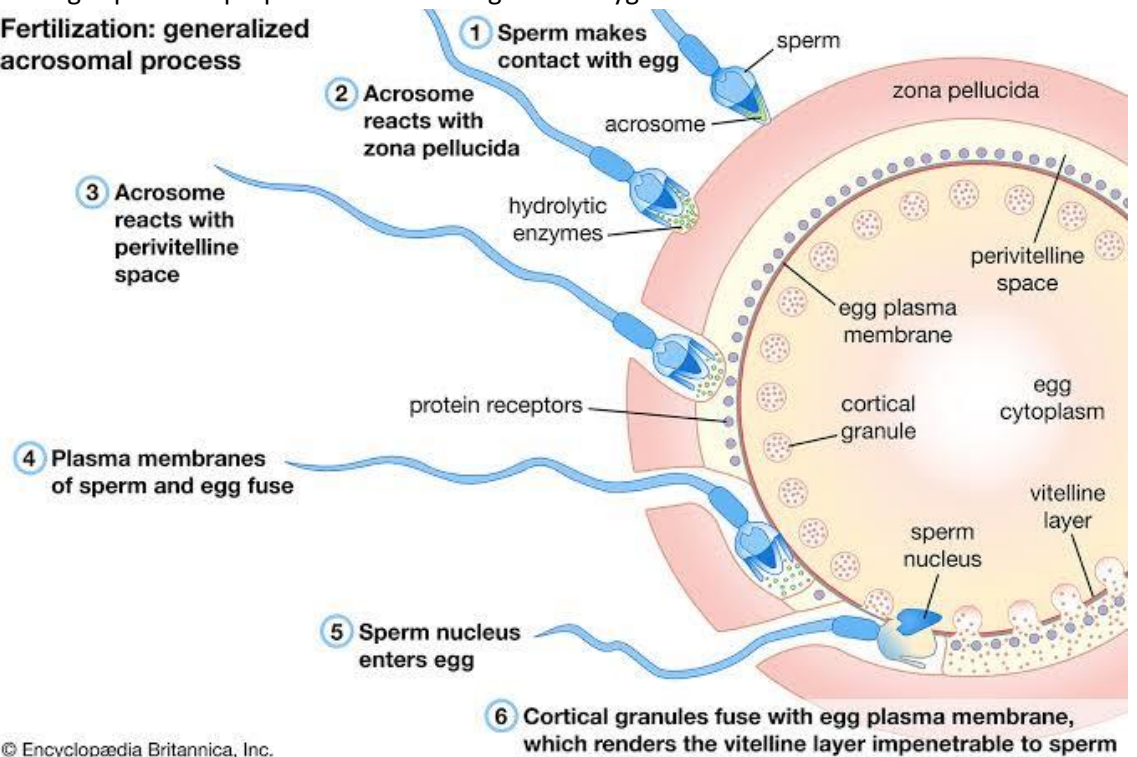
iii.	At anaphase 1, centromere do not split, the 46 homologous duplicated chromosomes separate from each other	At anaphase 2, centromere split causing the 23 duplicated chromosomes to become 23 single chromosome.
iv.	At telophase 1, two daughter cells are produced with 23 duplicated chromosome	At telophase 2, four daughter cells are produced with 23 single chromosomes.
v.	This is proceeded by interphase	Not proceeded by interphase
vi.	Meiosis 1 reduces the chromosome number in the daughter cell	Meiosis 2 equalizes the chromosome number of both parent and daughter cell
vii.	It has four stages; prophase 1, metaphase 1, telophase 1 and anaphase 1	It has four stages; prophase2, metaphase 2, telophase 2 and anaphase 2.

3. Stages involved in fertilization include:

- Passage of sperm through corona radiata.
 - Penetration of zona pellucida.
 - Fusion of the male and female plasma membrane.
 - Completion of second meiotic division and formation of female pronucleus.
 - Formation of male pronucleus.
 - Formation of zygote from ootid.
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- PASSAGE OF SPERM THROUGH CORONA RADIATA: for a sperm to pass through the corona radiata of the secondary oocyte, it must have been capacitated (i.e. the removal of glycoprotein coat and seminal protein from the plasma membrane around the acrosomal region). Only capacitated sperm can pass through the corona radiata.
 - PENETRATION OF ZONA PELLUCIDA: the zona is a glycoprotein shell covering the secondary oocyte that facilitate and maintain sperm binding and induces the acrosomal reaction. Zona glycoprotein binds with the intact acrosome of sperm on the zona pellucida. The acrosome produces an enzyme called acrosin which allows the sperm to penetrate the zona pellucida and thereby having contact with the surface of the secondary oocyte then the permeability of the zona pellucida changes and the cortical granules of the plasma membrane of the oocyte produces lysosomal enzymes that alter the activities of the zona pellucida by preventing sperm penetration and inactivation of the binding sites of the spermatozoa on the zona pellucida.
 - FUSION OF THE PLASMA MEMBRANE OOCYTE AND SPERMATOZOA: the cell membrane of the oocyte and sperm fuses and the plasma membrane of the sperm break down at the point of fusion. Only the head and tail of the sperm enter the cytoplasm of the oocyte.
 - COMPLETION OF THE SECOND MEIOTIC DIVISION AND FORMATION OF THE FEMALE PRONUCLEUS: When the secondary oocyte is penetrated by the sperm, it stimulates the completion of second meiotic division giving rise to a mature oocyte and a 2nd polar body. The nucleus of the mature oocyte becomes the female pronucleus.

- FORMATION OF THE MALE PRONUCLEUS: The nucleus of the sperm within the cytoplasm of the oocyte enlarges and becomes the male pronucleus with the degenerating tail.
- FORMATION OF ZYGOTE FROM OOTID: an ootid contains two nuclei i.e. the male and female pronuclei. When the two pronuclei fuse to give rise to a nucleus is then called a zygote with diploid number of chromosome and the chromosomes are arranged on the cleavage spindle in preparation for cleavage of the zygote.

Fertilization: generalized acrosomal process



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4. Difference between the monozygotic and dizygotic twins

	MONOZYGOTIC TWINS	DIZYGOTIC TWINS
1.	Requires just a sperm to fertilize an oocyte	Requires two sperms that fertilize two different oocytes
2.	They are genetically identical	They are not genetically identical
3.	They are usually same sex	They are usually different sexes or same sex in rare cases
4.	They can also be called conjoined twins	They are not seen as conjoined twins
5.	They have same chorion and placenta but different amnion	They have different placenta, amnion and chorion
6.	They are usually identical physically	Not identical physically
7.	The incidence rate is high	The incident rate is low