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200L

MEDICINE AND HEALTH SCIENCES

ANA 205 (EMBRYOLOGY)

Question 1

Ovulation can simply be referred to as the (monthly) release of secondary oocytes from the ovary. It's the second stage during the ovarian cycle, after the development of ovarian follicles.

At around the 14th day in an average 28-day menstrual cycle, a sudden growth sprut occurs in the ovarian follicles under the influence of the Follicle Stimulating Hormone (FSH) and Lutenizing Hormone (LH). This growth sprut causes a cystic swelling or bulge to appear in the ovary. A small avascular spot; stigma soon appears in the ovary. Ovulation occurs due to an increase in the production of LH which reaches its peak at about 12-36 hours prior to ovulation. A surge in LH in the blood causes the stigma to balloon out forming a vesicle. The vesicle soon ruptures expelling the secondary oocyte and follicular fluid into the funnel shaped infundibulum. This action is achieved via the contraction of the smooth muscles of the theca folliculi by prostaglandins.

The increase in LH production causes the:

- Primary oocyte to complete meiosis I; and
- Secondary oocyte to enter the preovulatory vesicular phase.

CLINICAL CORRELATES

Some women experience pain towards the middle of the ovarian cycle, this is referred to as '*Mittleschmerz*'; which means '*middle pain*'. It occurs as a result of bleeding in the peritoneal cavity which causes abdominal pain.

Some symptoms of ovulation may include:

- Changes in cervical mucus; the mucus may attain a sticky, raw egg-white consistency, may also stretch between fingers.

- Tenderness of breasts
- Swollen vulva or vagina
- Increased libido/ sex urge

A better symptom could be a slight drop in the basal temperature (temperature attained when the body is at rest)

Some women fail to ovulate, this is termed '*anovulation*', it can be corrected by administering agents that stimulate the gonadotropin-releasing hormone; hence stimulating ovulation. This can as well lead to multiple pregnancies in some cases.

Question 2

<i>Meiosis I</i>	<i>Meiosis II</i>
It's a reduction stage.	It's a division stage.
Reduces gametes from $4n$ to $2n$.	Divides gametes from $2n$ to n .
Results in the formation of 2 daughter cells.	Results in the formation of 4 daughter cells.
Presence of chiasma formation.	Absence of chiasma formation.
Crossing over occurs.	Absence of crossing over.

Question 3

Fertilization involves the union of the male gamete (sperm) and the female gamete (ovum) to form a zygote. Fertilization occurs within 24 hours after sexual intercourse. The following events occur during fertilization:

- Passage of sperm through the corona radiata; only capacitated sperms can do so.

Capacitation occurs within an average of 7 hours. Capacitation involves the removal of a glycoprotein coat and seminal plasma proteins from the plasmalemma overlying the acrosomal region of the sperm.

- Penetration of the zona pellucida.

The zona pellucida is an acellular, amorphous glycoprotein material which covers the surface of the oocyte. The intact acrosome of the sperm binds with a zona glycoprotein (ZP3) on the surface of the oocyte. The acrosome then releases an enzyme (acrosine) which helps it penetrate the zona pellucida. Once the sperm reaches the surface of the oocyte, lysosomal proteins are released by cortical granules lining the surface of the oocyte. These proteins alter the properties of the zona pellucida causing it to:

- i. Prevent sperm penetration.
 - ii. Inactivate binding sites for the sperm.
- Fusion of the plasmalemma of the male and female gametes; the plasma membrane of the male and female gametes fuse and break at the point of fusion.
 - Formation of the female pronucleus and completion of the second meiotic division; the nucleus of the female gamete enlarges to form the female pronucleus and the secondary oocyte completes its second meiotic division to form the mature secondary oocyte.

- Formation of the male pronucleus; the male nucleus enlarges in the cytoplasm of the oocyte to form the male pronucleus. The mitochondria of the zygote is of maternal origin.

The oocyte now contains two haploid pronuclei and is now referred to as an '*ootid*'.

- The 2 haploid pronuclei fuses to form a single diploid aggregation of chromosomes that arrange themselves on cleavage fibres. The '*ootid*' now becomes a zygote.

Question 4

<i>Monozygotic twins</i>	<i>Dizygotic twins</i>
Often seen as conjoined twins.	Not seen as conjoined twins.
A sperm fertilizes an oocyte.	Two sperms fertilize two oocytes individually.
Twins are of the same sex	Twins are of either the same or different sex.
Twins are identical.	Twins are not identical.
Presence of 2 amniotic cavities, 1 chorionic cavity, 1 placenta and 2 umbilical cords.	Presence of 2 chorionic cavities, 2 amniotic cavities, 2 placentas and 2 umbilical cords.

