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Department: - medicine and surgery Course Title: Embryology

Question

- 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

1. Ovulation is the release of eggs from the ovaries. In women, this event occurs when the ovarian follicles rupture and release the secondary oocyte ovarian cells

2.

Meiosis 1	Meiosis 2	
Starts as diploid; ends as haploid	Starts as haploid; ends as haploid	
Reductive division	Equational division	
Homologous chromosome pairs separate	Sister chromatids separate	
Crossing over happens	Crossing over does not happen	
Complicated division process	Simple division process	
Long duration	Short duration	
Preceded by S-phase and G-phase	Preceded only by G-phase	
Sister chromatids in prophase have convergent arms	Sister chromatids in prophase have divergent arms	
Equatorial plane is centered	Equatorial plane is rotated 90°	
Prophase split into 5 sub-phases	Prophase does not have sub-phases	
Ends with 2 daughter cells	Ends with 4 daughter cells	

3. 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 pellicida 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/oocyte 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

Note

Since all sperm mitochondria degenerate, all mitochondria within the zygote are of maternal origin (i.e., all mitochondrial DNA is of maternal origin). Morphologically, the male and female pronuclei are indistinguishable. The oocyte now contains 2 pronuclei, each having haploid number of chromosomes (23). The oocyte containing two haploid pronuclei is called an ootid

VI. Formation of the zygote

The chromosomes in the zygote become arranged on a cleavage spindle in preparation for cleavage of the zygote

4. Dizygotic are twins which result from the fertilization of 2 different eggs with 2 different sperms. Dizygotic twin pairs can be girl/girl, boy/boy, or girls/boy. Other words for dizygotic twins are also fraternal or non-identical twins. They normally don't look 100% alike and sometimes have appearances similar to each other in the same way non-twin siblings have.

Monozygotic twins result from the fertilization of one egg and one sperm. The fertilized embryo then splits within days after fertilization resulting in two individuals which usually share the same chromosomes. Monozygotic twins are also known as identical or maternal twins. Mostly they have very similar

appearances.

Monozvaotic vs Dizvaotic Twins			
More Information Online WWW.DIFFERENCEBETWEEN.COM			
	Monozygotic Twins	Dizygotic Twins	
DEFINITION	Monozygotic twins are the two offspring that develop from one zygote.	Dizygotic twins are the two offspring that develop from two separate zygotes.	
GENETIC COMPOSITION	Monozygotic twins originate from the same fertilized egg, and fertilized by the same sperm so, they share the same DNA.	Dizygotic twins originate from two fertilized egg and fertilized by two sperm; therefore, they do not share the same DNA.	
PLACENTA, AMNIOTIC SAC AND CHORION	Zygotes only share the outer layer of the amniotic sac and have the two placentas but changes if divided within 4-8 days	Have a separate placenta, amniotic sac and chorion.	
CAUSE	Due to the random splitting of the zygote into two embryos.	Due to two separate eggs fertilized by two sperms.	
GENDER	Same gender	Can be different or the same gender.	
APPEARANCE OF THE TWINS	Monozygotic twins almost have the same appearance.	Dizygotic twins may have the same appearance or different appearance.	
CHARACTERISTICS	Monozygotic twins have the chance for same characters, developments, etc.	Dizygotic twins don't have the same characters, developments, etc	
HEREDITARY	Not hereditary	Hereditary	