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1. Discuss ovulation

Answer:

This is the release of an oocyte from the ovarian follicle. Around midcycle, due to the influence of the Leutinizing hormone and the Follicle stimulating hormone, the ovarian follicle undergoes a sudden growth spurt and produces a cystic swelling on the surface of the ovary. On this bulge, an avascular spot known as the stigma soon appears. Before ovulation the secondary oocyte and some of the cells of cumulus oophorus detach from the interior of the distended follicle. A surge of LH triggers ovulation, this surge of LH is elicited by high level of estrogen in the blood. This LH surge causes the stigma to balloon out forming a vesicle, this vesicle soon ruptures letting out the secondary oocyte and the follicular fluid. This rupturing is as a result of intrafollicular pressure and partly from the contraction of smooth muscles in the theca interna. The expelled secondary oocyte is surrounded by the zona pellucida and one or more layers of the follicular cells which are radially arranged forming the CORONA RADIATA, forming the *oocyte-cumulus complex*. The LH surge also induces the resumption of the first meiotic division, therefore the ovarian follicle contain secondary oocytes. The zona pellucida is composed of three glycoproteins (ZPA, ZPB, ZPC) which usually form a network of filaments with multiple pores.

2. Differentiate between meiosis one and meiosis two

MEIOSIS 1	MEIOSIS 2
1. At the beginning of meiosis 1 there are 46 duplicated homologous chromosomes.	At the beginning of meiosis 2 there are 23 double stranded chromosomes.
2. Here, crossing over and chiasma formation occurs	Here, crossing over and chiasma formation does not occur
3. Here, there is paring and separation of homologues	There is no pairing and separation of homologues(sister chromatids are separated instead).
4. Centromere is not split	Centromere is split
5. End products are two double stranded haploid daughter cells	End products are four single stranded haploid chromosomal daughter cells

3. Discuss the stages involved in fertilization

Answer: Fertilization is the union of the sperm and oocyte. There are six stages involved in fertilization;

- i. **Passage of the sperm through the corona radiata:** For sperms to pass through the corona radiata they must have been capacitated (removal of glycoprotein coat and seminal plasma protein from the plasma membrane overlying the acrosomal region of the spermatozoon).
 - ii. **Penetration of the zona pellucida:** The zona pellucida is a glycoprotein coat that surrounds the oocyte and facilitates the sperm binding and induces acrosome reaction. The intact acrosome binds with a zona glycoprotein (ZPC). There is then release of acrosomal enzymes-ACROSIN which allows the sperm to penetrate the zona pellucida, thereby coming in contact with the plasma membrane of the oocyte. When the sperm comes in contact with the plasma membrane of the oocyte, lysosomal enzymes are released from the cortical granules in the plasma membrane of the oocyte. In turn these enzymes alter properties of the zona pellucida to:
 - Prevent penetration of sperm (polyspermy)
 - Inactivate binding sites for sperm on the zona pellucida
 - iii. **Fusion of plasma membrane of the sperm and the oocyte:** The plasma membrane of the oocyte and the sperm fuse and break down at the area of fusion. Only the head and the tail of the sperm enter the cytoplasm of the oocyte leaving the sperm's plasma membrane behind.
 - iv. **Completion of the second meiotic division and formation of the female pronucleus:** As the sperm enters the oocyte's cytoplasm it activates the completion of the second meiotic division and a mature oocyte and second polar body are formed. The nucleus of the mature oocyte is known as the female pronucleus.
 - v. **Formation of the male pronucleus:** Within the oocyte's cytoplasm the nucleus of the sperm enlarges and its tail degenerates. Since all the tail of the sperm degenerates including its mitochondria, all mitochondria of the zygote are of maternal origin. The mature oocyte containing the two pronuclei is known as the OOTID.
 - vi. **Fusion of the male and female pronuclei:** the two pronuclei fuse into a single diploid aggregation of chromosomes, the ootid becomes a ZYGOTE.
4. Differentiate between monozygotic twins and dizygotic twins:

MONOZYGOTIC TWINS	DIZYGOTIC TWINS
1. They form from a single zygote	They form from two different zygote
2. They are genetically alike	They are not genetically alike
3. They look alike	They do not look alike
4. They are always of the same sex	They can be of different sex or of the same sex
5. They are mostly diamniotic, mono chorionic with single placenta.	They are mostly two amnions, two chorions and two placentas.
6. They are often called conjoined twins	They are not seen as conjoined twins.