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## **EMBRYOLOGY ASSIGNMENT**

### **1) DISCUSS OVULATION**

Ovulation is the release of an oocyte from the ovarian follicle.

In a few days before ovulation, under the influence of FSH and LH the secondary follicle grows rapidly to a diameter of about 25mm to become mature vesicular or mature follicle.

Coincident with final development of the vesicular follicle, there is an abrupt increase in LH that causes:

- a) the primary oocyte to complete meiosis 1
- b) the follicle to enter the pre-ovulatory mature vesicular stage

Meiosis 2 is also initiated but the secondary oocyte is arrested in metaphase approximately 3 hours before ovulation and in the meantime the surface of the ovary begins to bulge locally and at the apex, an avascular spot called STIGMA appears on the swelling.

For the oocyte to be released, two (2) events occur as a result of the LH surge

- a) LH surge increases collagenase activity, resulting in the digestion of collagen fibers surrounding the follicle.
- b) Prostaglandin levels also increase in response to the LH surge and cause local muscular contractions in the ovarian wall.

The contractions in the ovarian wall extrude the oocyte, which together with its surrounding follicular cells from the region of the cumulus oophorus and 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 radiate.

**NOTE: LH MEANS LUTEINIZING HORMONE**

**FSH MEANS FOLLICLE STIMULATING HORMONE**

**CLINICAL CORRELATES**

**MITTELSCHMER:** During ovulation, some women feel a variable amount of abdominal pain called MITTELSCHMER also known as middle pain because it normally occurs near the middle of the menstrual cycle. In these cases, ovulation results in slight bleeding into the peritoneal cavity which results in sudden constant pain in the lower abdomen

**ANOVULATION:** Inability of a woman to ovulate because of low concentrations of gonadotropins

**2) DIFFERENTIATE BETWEEN MEIOSIS 1 AND MEIOSIS 2**

MEIOSIS 1	MEIOSIS 2
1) There is separation of homologous chromosomes	There is separation of sister chromatids
2) Two diploid daughter cells are produced	Four haploid daughter cells are produced
3) Crossing over (genetic recombination) occurs	No crossing over (genetic recombination) takes place
4) Starts as diploid and ends as haploid	Starts as haploid and end as haploid
5) It is a complicated division process	It is a simple division process
6) Equatorial plane is centered	Equatorial plate is rotated 90 degree
7) It is a reduction division	It is an equational division
8) It takes long duration	It takes short duration

**3) DISCUSS THE STAGES INVOLVED IN FERTILIZATION**

Fertilization is the union of sperm and oocyte, which takes approximately 24 hours.

It is a coordinated event which include 6 stages

- a) Passage through the corona radiata
- b) Penetration of the zona pellucida

- c) Fusion of plasma membrane of sperm and oocyte
- d) Completion of second meiotic division and formation of female pronucleus
- e) Formation of male pronucleus
- f) Formation of zygote

### **PASSAGE 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 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 and 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.

On the region of the plasma membrane, there are structures called CORTICAL GRANULES, so when a sperm comes in contact with the oocyte surface, lysosomal enzymes are released from the cortical granules and in turn these enzymes alter the properties of zona pellucida and in activate binding sites for spermatozoa to prevent polyspermy.

### **FUSION OF THE PLASMA MEMBRANE OF SPERM AND OOCYTE**

The region of the head and tail of the sperm enters into the plasma membrane of the oocyte leaving behind the plasma membrane of the sperm. The plasma or cell membranes of the oocyte and sperm fuse and breakdown at the area of fusion.

### **COMPLETION OF SECOND MEIOTIC DIVISION AND FORMATION OF FEMALE PRO NUCLEUS**

Penetration of the oocyte by the sperm activates the oocyte into completing second meiotic division and forming a mature oocyte and a second polar body. The nucleus of the mature oocyte is now called the female pro nucleus.

### **FORMATION OF THE MALE PRO NUCLEUS**

Within the cytoplasm of the oocyte, the nucleus of the sperm enlarges and form the male pro nucleus and the tail of the sperm degenerates.

### **FORMATION OF THE ZYGOTE**

The female pro nucleus and male pronucleus fuses and gives rise to a structure called an OOTID which later become the zygote.

### **4) DIFFERENTIATE BETWEEN MONOZYGOTIC TWINS AND DIZYGOTIC TWINS**

<b>MONOZYGOTIC TWINS</b>	<b>DIZYGOTIC TWINS</b>
1) It is formed from a single zygote	It is formed from two zygotes
2) The twins are of the same sex	The twins are of the same sex or different sex
3) They are genetically identical	They are genetically not identical
4) Their incidence is more common	Their incidence is less common
5) Their resemblance is similar	Their resemblance is just like any other two siblings
6) They are often called conjoined twins	They are not seen as conjoined twin
7) They are mostly diamniotic, monochorionic, with single placenta	They mostly have two amnions, two chorions and two placentas