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200 Level Medicine And Surgery

18/MHS01/043

EMBRYOLOGY ASSIGNMENT 1

**Discuss Ovulation**

Ovulation is the release of an oocyte from the ovarian follicle. Ovulation usually follows the Luteinizing Hormone peak, by 12-24 hours. Ovulation occurs in the middle of a woman’s menstrual cycle about 2 weeks before she expects to get her period. The timing of the process varies for each woman, and depends on the length of her menstrual cycle. In ovulation, the eggs are released from the ovarian follicle of the ovaries.

Process of ovulation

* Before the oocyte can be released, be released, 2 events occur which are caused by LH surge:
* it increases collagenase activity, resulting in digestion of collagen fibers (connective tissue) surrounding the follicle
* Prostaglandin levels also increase in response to the LH surge and cause local muscular In a few days before ovulation, under the influence of Follicle Stimulating Hormone and Luteining Hormone, the secondary follicle grows rapidly to a diameter of about 25 mm to become mature vesicular/ mature secondary or Graafian follicle
* Coincident with final development of the vesicular follicle, there is an abrupt increase in the Luteinizing Hormone that causes;

1. the primary oocyte to complete meiosis I
2. and the follicle to enter the preovulatory mature vesicular stage

* Meiosis II is also initiated, but the secondary oocyte is arrested in metaphase approximately 3 hours before ovulation
* In the meantime, the surface of the ovary begins to bulge locally, and at the apex, an avascular spot, the stigma, appears
* For the oocyte to contractions in the ovarian wall
* Those contractions extrude the oocyte, which together with its surrounding follicular (granulosa) cells from the region of the cumulus oophorus,
* 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 radiata

**DIFFERENCES BETWEEN MEIOSIS 1 AND MEIOSIS 2**

* + - Synapsis: Present in meiosis 1 and absent in meiosis 2
    - Crossing over: Present in meiosis 1 and absent in meiosis2
    - Alignment: In meiosis1, 46 homologous duplicated chromosomes are aligned at the metaphase plate, while in meiosis 2, 23 homologous duplicated chromosomes align at the metaphase plate
    - Chiasma formation: Chiasma is formed in meiosis 1, but not in meiosis 2.

**STAGES OF FERTILIZATION**

**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)

1. **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

1. **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

1. **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

1. **The 2 pronuclei fuse into a single diploid aggregation of chromosomes, the ootid becomes a zygote**

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

**THE DIFFERENCE BETWEEN MONOZYGOTIC TWINS AND DIZYGOTIC TWINS**

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| --- | --- |
| **MONOZYGOTIC TWINS** | **DIZYGOTIC TWINS** |
| Develop from the same fertilized egg | Develop from different fertilized eggs |
| They have the same hereditary material | They have different hereditary materials |
| They look familiar, except a few changes | They look different from each other |
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