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**LEVEL: 200**

**MATRIC NO.: 18/MHS01/215**

**COURSE: MEDICINE AND SURGERY**

**COURSE TITLE: EMBRYOLOGY I**

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**DISCUSS OVULATION**

Ovulation can simply be defined as the release of mature secondary oocytes from a mature graafian follicle. It occurs in an almond shaped, reproductive structure called the ovaries. In each female specie, they come in pairs and are characterized by their ability to produce estrogen and progesterone; hormones responsible for secondary sexual characters and pregnancy regulation. Ovulation itself takes place in space of a day as it barely only involves the release of graafian follicles however, the question now is what are the events that lead up to ovulation?

Firstly at the stage of puberty, the female specie begins to undergo sexual cycles involving specific parts of the brain which include the hypothalamus, pituitary gland, and the reproductive organs of the woman. To stimulate ovulation, the following occur: a special hormone called the gonadotropin releasing hormone is released by the hypothalamus and is sent to the anterior lobe of the pituitary gland by the hypophyseal capillary network, this in turn stimulates the release of two hormones by the pituitary gland which are the

* Luteinizing hormone (LH)
* Follicle stimulating hormone (FSH)

The Follicle stimulating hormone is responsible for the development of the ovarian follicles and for the release of the hormone estrogen. The Luteinizing hormone on the other hand is responsible for the final development stages of the ovarian follicle and serves as a specific trigger for ovulation and it also stimulates the corpus luteum to release and produce progesterone.

The maturation and release of a mature secondary oocyte all occurs in the ovarian follicle. It occurs at the middle of the ovarian cycle and usually on day 14 of the menstrual cycle. The mature graafian follicle undergoes a growth spurt under the influence of FSH and LH. A stigma appears and this is triggered by a surge in LH production. The stigma balloons out and bursts due to intrafollicular pressure or by contraction of smooth muscle in the theca externa of the follicle and in turn releases the secondary oocyte and the follicular fluid into the ampulla of uterus where it awaits fertilization. The released oocyte is surrounded by the zona pellucida and a small group of follicular cells called the corpus luteum which releases progesterone after fertilization or degenerates if oocyte is not fertilized.

**DIFFERENTIATE BETWEEN MEIOSIS I AND MEIOSIS II**

This is a special type of cell division that involves two meiotic divisions and occurs only in reproductive organs. The two stages involved all contribute to the reduction division of the cell however, the two stages are different in their own way i.e

|  |  |
| --- | --- |
| **MEIOSIS I** | **MEIOSIS II** |
| Synapsis occurs | Synapsis does not occur |
| Crossing over and chiasma formation occur | Crossing over and chiasma formation do not occur |
| Homologous chromosomes separate | Sister chromatids separate |
| 2 diploid daughter cells | 4 haploid cells |
| Centromeres split | Centromeres do not split |

**DISCUSS THE STAGES INVOLVED IN FERTILIZATION**

Fertilization in lay terms can be described as the fusion of male and female gametes to form a zygote. However, before a zygote is formed, there are 6 stages involved in fertilization and they are:

* **Passage of sperm through the corona radiata:** The corona radiata formed from the cumulus oophurus is a follicular cell that surrounds the secondary oocyte after release from the graafian follicle, the sperm undergoes capacitation which is the removal of the glycoprotein coat and seminal plasma proteins from the acrosomal region of the spermatozoa. The enzyme, hyaluronidase dispersed from the acrosome disperses the follicular cells from the oocyte.
* **Penetration of the Zona Pellucida:** Most important stage of fertilization. The enzyme acrosin is released by the acrosomes of the sperm and this enzyme lyses the glycoprotein component of the zona pellucida allowing passage for the responsible sperm. After this a zona reaction is formed and the extracellular glycoprotein coat changes so as to not allow entry of any other sperm and this is made possible by the lysosomes released by the cortical granules near the plasma membrane of oocyte.
* **Fusion of the cell membranes of the oocyte and the sperm:** The plasma membrane of the sperm and the oocyte fuse and only the head and tail of the sperm enters into that of the cell membrane of the oocyte. The mitochondria and the cell membrane however do not fuse and this is why all the mitochondria of a baby comes from the mother.
* **Completion of the second meiotic division and the formation of the female pro-nucleus:** The fusion of the oocyte and sperm completes the second meiotic division and the nucleus of the female sex cell becomes the pro-nucleus.
* **Formation of male pro-nucleus:** Within the cytoplasm of the oocyte, the male sex cell nucleus enlarges forming the male pro-nucleus while the tail degenerates.
* **Formation of ootid and zygote:** The pro-nuclei of both fuse. This chromosomes in the zygote become arranged on a cleavage spindle in preparation for cleavage of the zygote

**DIFFERENCES BETWEEN MONOZYGOTIC TWINS AND DIZYGOTIC TWINS**

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| --- | --- |
| **MONOZYGOTIC** | **DIZYGOTIC** |
| Originate from a single fertilized egg | Originate from two differently fertilized eggs |
| Share the same placenta | Have respective placenta |
| Have almost identical genetic profile | Have completely different genetic profile |
| Usually of the same sex | May be of different sex |
| May have same physical and mental attribute | Completely differ in this aspect |
| Called identical twins | Called fraternal twins |