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**ASSIGNMENT TITLE: Embryology**

**COURSE CODE: ICBS**

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**Discuss Ovulation**

What is ovulation?

This is the release of an Oocyte from the ovarian follicle.

Few days before ovulation, under the influence of Follicle – stimulating hormone(FSH) and Luteinizing hormone(LH), the secondary follicle grows rapidly to a diameter of about 25mm to become mature vesicular/ mature secondary or Graafian follicle.

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

* The primary Oocyte to complete meiosis 1
* The follicle to enter the preovulatory mature vesicular stage

Then the surface of the ovary begins to bulge locally and at the apex, an avascular spot, stigma appears. For the oocyte to be released, 2 events occur which are caused by the LH surge

1. It increases collagenase activity, resulting in digestion of collagen fibres( connective tissue) surrounding the follicle
2. Prostaglandin levels also increase in response to the LH surge and cause local muscular contractions in the ovarian wall

Those contractions extrude the oocyte, which together with its surrounding folliculare(granulosa) cells from the region of the cumulous oophorus which causes ovulation in which oocyte floats out of the ovary

Corona radiate is formed by the arrangement of thew cumulus oophorus cells around the zona pellucida.

**CLINICAL CORELATES**

* 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
* **Mittelschmerz** may be used as a symptom of ovulation, but there are better symptoms

2 Difference between meiosis 1 and meiosis 2

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| **MEIOSIS 1** | **MEIOSIS 2** |
| 1. **Homologous chromosomes separate** | sister chromatids separate |
| 1. 2diploid daughter cells are produced | 4 haploid daughter cells are produced |
| 1. Synapsis is present | Synapsis is absent |
| 1. Crossing over is present | Crossing over is absent |
| 1. Chiasma formation is present | Chiasma formation is absent |
| 1. Alignment of 46 homologous duplicated chromosomes at the metaphase plate | Alignment of 23 duplicated chromosomes at the metaphase plate |
| 1. Centromeres do not split | Centromeres splits |
|  |  |
|  |  |

3 Discuss the stages involved in fertilization

* Passage of a sperm through the corona radiate
* Penetration of the Zona pellucida
* Fusion of plasma membranes of the oocyte and sperm
* Completion of the second meiotic division of oocyte and formation of female pronucleus
* Formation of the male pronucleus
* The 2 pronucleus fuse into a single diploid aggregation of chromosomes, the ootid becomes a zygote

PASSAGE OF A SPERM THROUGH THE CORONA RADIATA

For sperms to pass through the corona radiate, they must have been capacitated.

Only capacitated sperms can pass freely through the corona radiate.

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 hand 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.

FUSION OF PLASMA MEMBRANE 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

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 a mature oocyte and a second polar body
* The nucleus of the mature ovum/oocyte is now called the female pronucleus

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

THE 2 PRONUCLEI FUSE INTO A SINGLE DIPLOID AGGREGATION OF CHROMOSOMES, THE OOTID BECOMES A ZYGOTE

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

4 DIFFERENTIATE BETWEEN MONOZYGOTIC TWINS AND DIZYGOTIC TWINS

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| --- | --- |
| MONOZYGOTIC | DIZYGOTIC |
| Form from single zygote | Form from two zygotes |
| Incidence is more common | Incidence is less common |
| Genetically identical | Genetically not identical |
| Twins are of the same sex | Twins are of the same sex or different sex |
| Are often called conjoined twins | Not seen as conjoined twins |
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