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**COURSE CODE:**

**COURSE NAME: EMBRYOLOGY**

**DISCUSS OVULATION**

Ovulation is the release of mature secondary oocyte from the ovarian follicle. Before ovulation, under the influence of Follicle Stimulating Hormone (FSH) and luteinizing hormone (LH), the secondary follicle grows to a diameter of about 25mm to become mature secondary follicle. For ovulation to occur there must be abrupt increase in Luteinizing hormone (LH). The final development of the vesicular follicle, there is an abrupt increase in Luteinizing Hormone which causes the primary oocyte to complete meiosis 1 and the follicle to enter the pre-ovulatory mature vesicular stage. Meiosis II is also initiated but the secondary oocyte is arrested in metaphase approximately 3hours before ovulation. The surface of the ovary starts to bulge at the apex, an avascular spot the stigma appears. For the mature secondary oocyte to be released after being arrested, LH has to come to play, that is, it will increase abruptly and is done in two stages:

1. It increases collagenase activity, resulting in digestion of collagen fibers (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.

These muscular contractions extrude the oocyte which together with its surrounding granular cells from the region of the cumulous oophorus. This therefore causes the ovulation in which the mature secondary oocyte floats out of the ovary. Some of the cumulous oophorus cells the re arrange themselves around the zona pellucida to form the corona radiate.

* Anovulation is the failure to ovulate due to low concentration of gonadotropins.
* Abdominal pain during ovulation is called mittelschmer.

**DIFFERENTIATE BETWEEN MEIOSIS 1 AND MEIOSIS 2**

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| **MEIOSIS 1** | **MEOSIS 2** |
| 1. Parent ell are diploid | Parent cells are haploid |
| 1. Preceded by interphase ( synapsis, crossing over and chiasma formation) | No interphase takes place ( no synapsis, crossing over and chiasma formation) |
| 1. Homologous chromosomes are present at the beginning | Individual, bivalent chromosomes are present at the beginning |
| 1. Reduces the number of chromosome number in the daughter cell | Equalizes the chromosome number of both parent and daughter cells. |
| 1. Two daughter cells are produced at telophase 1 | Four daughter cells are produced at the end of telophase 2 |
| 1. Homologous chromosomes separate but the centromere doesn’t split. | Sister chromatids separates by splitting the centromere |
| 1. Cohesion protein complexes at the arm of the homologous chromosomes are cleaved | Cohesions at the centromeres are cleaved in order to separate the two sister chromatids |
| 1. A complex division and takes more time | Comparatively less simple and takes less time |
| 1. A heterotypic division | A homotypic division |

**STAGES INVOLVED IN FERTILIZATION**

1. Passage of sperm through the corona radiate
2. Penetration of the zona pellucida
3. Fusion of the plasma membrane of the sperm and oocyte
4. Completion of the 2nd meiotic division and the formation of the female pronuclues
5. Formation of the male pronucleus
6. Formation of the zygote

**Passage of Sperm through the Corona Radiata**

For the sperm to pass through the corona radiate the sperm has to be capacitated that is, the removal of the gkycoprotein material and cellular plasma protein from the cell membrane.

**Penetration of the Zona Pellucida**

The acrosome binds with the receptor zona pellucida on the binding site of zona pellucida. The acrosome contains an enzyme called acrosin. After the acrosome binds it releases the acrosin which is a lysosomal enzyme and allows the sperm to penetrate the zona pellucida. As soon as the head of the sperm comes in contact with the oocyte surface, the permeability of the zona pellucida changes. When the sperm comes in contact with the oocyte surface, lysosomal enzymes are released from cortical granules lining the plasma membrane of the oocyte. These enzymes alter the zona pellucida to prevent sperm penetration and inactive binding sites for spermatozoa on the zona pellucida

**Fusion of Plasma Membrane of the Oocyte and the Sperm**

The plasma of the cell membrane of the oocyte and sperm fuse and break down at the area of fusion. The head and the tail of the sperm enter the cytoplasm of the oocyte but the sperms plasma membrane remains behind.

**Completion of 2nd Meiotic Division and the Formation of the Female Pronuclei**

When the head and tail of the sperm enter the cytoplasm of the oocyte, the 2nd meiotic division is completed and the female nucleus becomes the female pronucleus.

**Formation of Male Pronucleus**

The tail of the sperm degenerates and the male nucleus enlarges and becomes male pronucleus.

**Formation of Zygote**

The male and female pronucleus fuse to become an ootide which later develops into a zygote.

**DIFFERENTIATE BETWEEN MONOZYGOTIC AND DIZYGOTIC TWINS**

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| **MONOZYGOTIC TWINS** | **DIZYGOTIC TWINS** |
| Developed through a singular fertilized embryo, splitting into two | Developed through two independent but simultaneous fertilization events |
| They are always the same gender | They can be different gender |
| They always have the same blood group | They can have different blood groups |
| Not hereditary | Hereditary |
| They are genetically identical | They are genetically similar as would be the case of any other non identical sibling |
| Share the same placenta | Have separate placentas |