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1. Discuss ovulation.

Introduction

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

Occurrence

Ovulation usually occurs at mid cycle in the ovarian cycle or at day 14 in a 28 day cycle.

Events

- The secondary follicle grows rapidly at a diameter of about 25mm to become mature secondary follicle few days before ovulation.
- During the rapid growth of the secondary follicle there is an abrupt increase in luteinizing hormone(LH) which causes:
  - Primary oocyte to complete meiosis 1(M1)
  - The follicle to enter pre-ovulatory mature vesicular stage.

- Meiosis 2 is initiated but the secondary oocyte is arrested at metaphase 2 approximately 3 hours before ovulation.

- The surface of the ovary begins to bulge locally and at the apex an avascular spot, the stigma appears.
- For the oocytes to be released 2 events caused by **luteinizing hormone(LH)** must occur which are:

1`. Luteinizing hormone (LH) surge increases collagenase activity which leads to the digestion of collagen fiber surrounding the follicle.

2. Prostaglandin level also increase and causes local muscular contraction in the ovarian wall.

- These contractions extrude oocytes and its surrounding follicle cells from the region of the cumulus oophorous
- **This cause ovulation in which the secondary oocyte floats on the ovary.**

<u>Clinical correlates</u>

- **Mittelschmerz or Middle pain-** this is a pain that sometimes accompany ovulation.
- **Anovulation** –this is the inability to ovulate, i.e. the inability to release a mature secondary oocyte from the ovarian cycle.

2. Differentiate between meiosis 1 and meiosis 2

Meiosis 1(M1)	Meiosis 2(M2)

1. M1 produces 2 diploid daughter cells. 2. In M1, 46 homologous duplicated chromosomes separate. 3. Crossing over occurs. 4. Synapsis occurs. 5. There is chiasma formation.	M2 produces 4 haploid daughter cells. In M2, 23 homologous duplicated chromosomes separate. Crossing over does not occur. Synapsis does not occur. There is no chiasma formation.

3. Discuss the stages in fertilization.

Introduction

Fertilization is a complex sequence of coordinated molecular events that begins with contact between the sperm and an oocyte and ends with the intermingling of maternal and paternal chromosomes at the metaphase stage of the first meiotic division.

Duration

Fertilization takes about 24 hours and usually occurs in the ampulla of the fallopian tube.

Stages

1. **Passage of the sperm through the corona radiata:** in order for the sperm to pass through the corona radiate it must first be decapitated (Removal of the glycoprotein coat and seminal plasma protein from the plasma protein from the

plasma membrane overlying the acrosomal region of the sperm.

2. **Penetration of the zona pellucida:**
   - Release of acrosin allows the sperm to penetrate the zona pellucida thereby coming in contact with the plasma membrane of the oocyte.
   - Immediately the head of the sperm comes in contact with the oocyte surface, the permeability of the zona pellucida changes.
   - Lysosomal enzymes are released from the cortical granules lining he plasma membrane of the oocytes, these prevent sperm penetration and deactivation of the binding sites for the spermatozoa on the zona pellucida.

3. **Fusion of the plasma membrane of the sperm and oocyte:**

The plasma membrane of the oocyte fuse with the head and sperm, the sperm plasma membrane remains behind.

4. **Completion of M2 and formation of male pronucleus:**

As the head and neck of the sperm enters the cytoplasm the female nucleus becomes the female pronucleus.

5. **Formation of male pronucleus:** the tail of the sperm degenerates and the nucleus enlarges to form the male pronucleus.

6. **Fusion of the male and female pronucleus**: the male and female pronucleus fuses to form ootid which later develop to a zygote.

Clinical correlates

- Intra cytoplasmic sperm injection: a sperm is injected directly into the cytoplasm of a mature oocyte. This technique has been successfully used for the treatment of couples for whom in vitro fertilization failed or in cases where too sperms for in vitro insemination.

4. Differentiate between monozygotic and dizygotic twins.

Monozygotic twins	Dizygotic twins
1. They result from the fertilization of one oocye.	They result from the fertilization of two oocytes.
2. They develop from one zygote.	They develop from two zygotes.
3. They are of the same sex.	They may be of the same or different sex.
4. they are genetically identical	They are not alike genetically.
5. they have similar physical	They may not have similar

appearance. 6. they develop within the same chronic sac and share common placenta.	physical appearance. They have two amnions and two chorions.