AMAECHI KELECHI OMEIRE

18/MHS01/074

EMBRYOLOGY ASSIGNMENT

1. Discuss ovulation

Ovulation refers to release of an egg during menstruation in females. Part of the ovary called the ovarian follicle discharges an egg.
The egg is also known as an ovum, oocyte, or female gamete. It is only released on reaching maturity.

After release, the egg travels down the fallopian tube, where it may be met by a sperm and become fertilized.

Ovulation and hormonal release during the menstrual cycle are controlled by a part of the brain called the hypothalamus. It sends signals instructing the anterior lobe and pituitary gland to secrete luteinizing hormone (LH) and follicle-stimulating hormone (FSH).

It is useful to know when ovulation is likely to occur, as a woman is most fertile during this time, and more likely to conceive.

Phases

Ovulation is the release of an egg, or ovum, which may then be fertilized by a sperm cell or dissolved during menstruation.

The ovulation process is defined by a period of elevated hormones during the menstrual cycle. It can be divided into 3 phases:

- **The periovulatory or follicular phase**: A layer of cells around the ovum begins to mucify, or become more like mucus, and expand. The uterus lining begins to thicken.
- **The ovulatory phase**: Enzymes are secreted and form a hole, or stigma. The ovum and its network of cells use the stigma to move into the fallopian tube. This is the period of fertility and usually lasts from 24 to 48 hours.
- **The postovulatory or luteal phase**: LH is secreted. A fertilized egg will be implanted into the womb, while an unfertilized egg slowly stops producing hormones and dissolves within 24 hours.

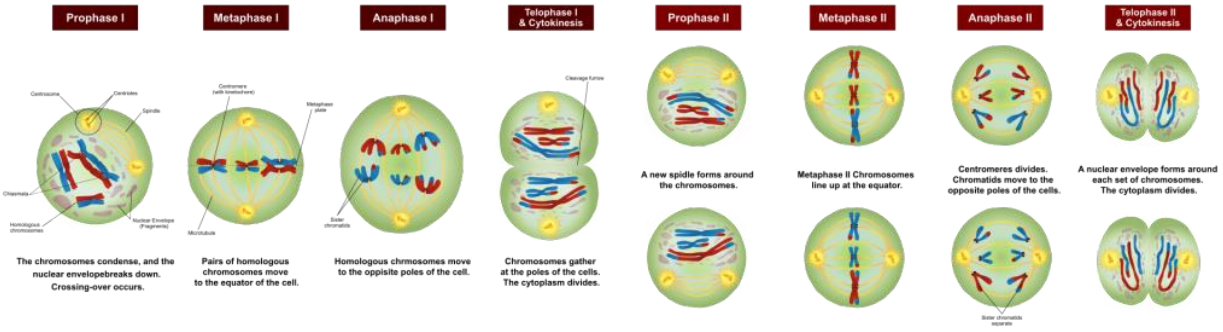
The lining of the uterus also begins to break down and prepares to exit the body during menstruation, or menses.

It occurs when;

A woman's menses lasts on average between 28 and 32 days. The beginning of each cycle is considered to be the first day of the menses. Release of the egg generally occurs 12 to 16 days before the next period is due. Most women begin to menstruate between the ages of 10 to 15 years. At the same time, they begin to ovulate and become able to conceive. This is a time referred to as the menarche. Ovulation typically stops after menopause, between the ages of around 50 to 51 years on average, but it still occurs in the time leading up to menopause. This is referred to as peri-menopause.

2. Differentiate between meiosis1 & II

- In meiosis I, homologous chromosomes separate, while in meiosis II, sister chromatids separate.
- Meiosis II produces 4 haploid daughter cells, where as Meiosis I produce 2 diploid daughter cells.
- Genetic recombination (crossing over) only occurs in meiosis I
- No synapsis in meiosis 2, synapsis in meiosis 1
- No chiasma formation in meiosis 1,chiasma formation in meiosis
- Meiosis I is the first stage of this cell division, where pairs of chromosomes are split up. We can see how the process occurs in the following diagram:



3. Discuss the stages involved in fertilization

Fertilization

This is defined as the fusion of male and female gamete.

The stages of fertilization include;

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)

II. **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

IV. 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 f**emale pronucleus**

V. **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

Note

- ❖ Since all sperm mitochondria degenerate, all mitochondria within the zygote are of maternal origin (i.e., all mitochondrial DNA is of maternal origin)
- Morphologically, the male and female pronuclei are indistinguishable

- The oocyte now contains 2 pronuclei, each having haploid number of chromosomes (23)
- The oocyte containing <u>two haploid pronuclei</u> is called an **ootid**

VI. **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

4. Differentiate between monozygotic twins and Dizygotic twins

Dizygotic are twins which result from the fertilization of 2 different eggs with 2 different sperms. Dizygotic twin pairs can be girl/girl, boy/boy, or girls/boy. Other words for dizygotic twins are also fraternal or non-identical twins They normally don't look 100% alike and sometimes have appearances similar to each other in the same way non-twin have.

Monozygotic twins result from the fertilization of one egg by one sperm which then splits giving two separate embryos. The separated embryos result in two individuals who usually share the same chromosomes. Monozygotic twins are also known as Maternal or identical twins. Most they have the same physical appearance and gender.