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1. Discuss ovulation?

Ovulation is the release of mature secondary oocyte from the ovarian follicle.

A few days before ovulation occurs, the follicle stimulating hormone [FSH] and Luteinizing hormone [LH], there is a rapid increase in diameter of the secondary follicle to about 25mm to become mature vesicular or mature secondary or Graafian follicle.

Correspondent with final development of the Graafian follicle there is an abrupt increase in luteinizing hormone that causes;

1. Completion of meiosis I by the primary oocyte.

2. Entry of pre-ovulatory mature vesicular stage by the follicle.

Meiosis II is also initiated, but the secondary oocyte is arrested at metaphase II approximately 3 hours before ovulation by cytostatic factor. Meanwhile, the surface of the ovary begins to bulge locally, and at the apex, the stigma which is an avascular spot appears.

2 events occur for the oocyte to be released which is;

• Increase in activity of collagenase which results in digestion of collagen fibers surrounding the follicle.

• Increase in prostaglandin level which causes local muscular contractions in ovarian wall. These contractions expel the oocyte, together with its surrounding granulosa cells from the region of the cumulus oophorus.

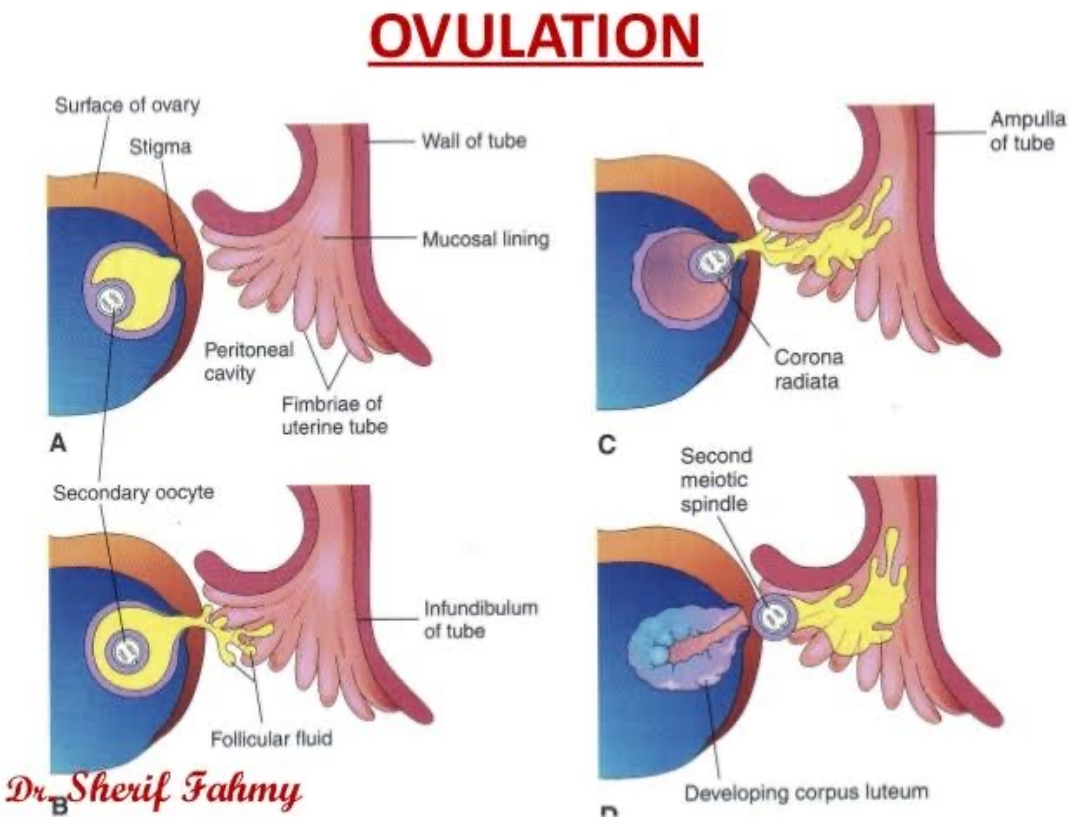
These 2 events are caused by luteinizing hormone surge.

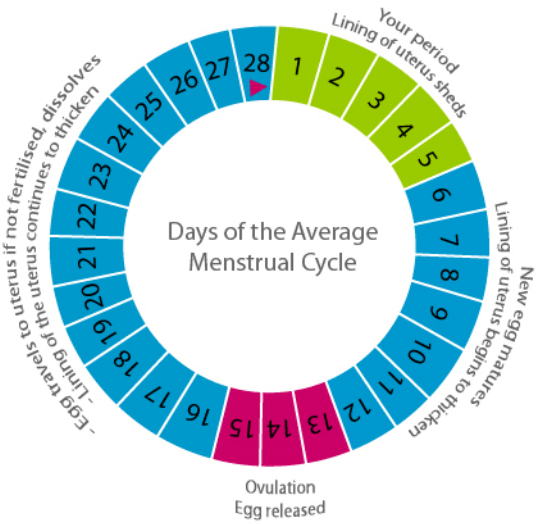
Some cells of the cumulus oophorus flows out with the mature secondary oocyte and re-arrange themselves around the mature secondary oocyte to give rise to the corona radiata.

NOTE:

- Ovulation is trigged by a surge in luteinizing hormone production.
- Ovulation usually follows the luteinizing hormone peak by 12-24 hours.
- The luteinizing hormone surge, elicited by the high estrogen level in the blood,

appears to cause the stigma to balloon out, forming the vesicle.





CLINICAL SIGNIFICANCE.

The start of ovulation can be detected by signs. These signs are not readily discernible by people other than females. These signs include:

- Mittelschmerz: the abdominal pain associated with ovulation. This is also known as middle pain because it occurs near the middle of the menstrual cycle.

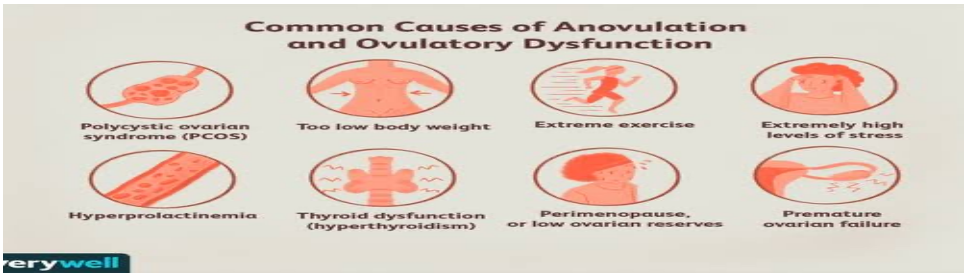
- Heightened sexual desire in the several days immediately before ovulation.
- Changes in the cervical mucus: When an individual isn't ovulating, cervical mucus may appear sticky, creamy, or may be entirely absent. However, as ovulation approaches, cervical mucus becomes more abundant, takes on a watery to raw-egg-white-like consistency (slippery egg white looking discharge), and stretches up to an inch or more between the fingers.
- Intense sense of smell.
- Tenderness of the breast.
- Swollen vagina/vulva.
- Slight fall in basal body temperature, then a rise in basal body temperature again.
- Light spotting.

Some women fail to ovulate as a result of low concentration of gonadotropin this condition is known as anovulation. In this case, human menopausal gonadotropin can be administered to stimulate gonadotropin release and hence ovulation can be employed.

OVULATION DISORDERS.

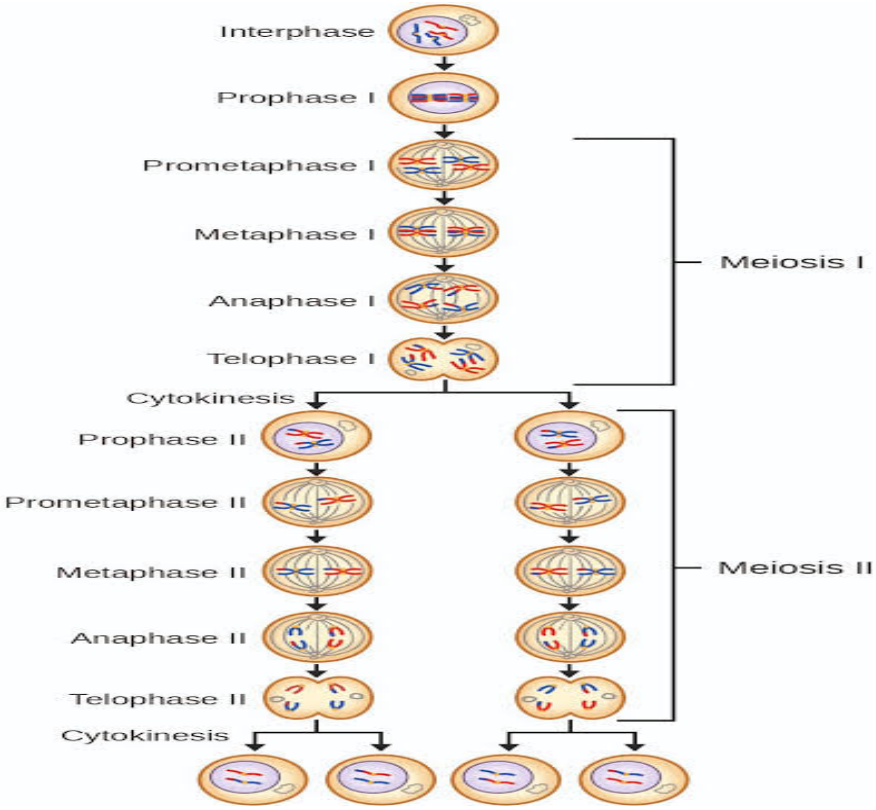
Problems with the regulation of reproductive hormones by the hypothalamus or the pituitary gland, or problems in the ovary, can cause ovulatory disorders. These include;

- Polycystic ovary syndrome (PCOS): This causes a hormone imbalance, which affects ovulation. PCOS is associated with insulin resistance and obesity, abnormal hair growth on the face or body and acne. It's the most common cause of female infertility.
- Hypothalamic dysfunction: Two hormones produced by the pituitary gland are responsible for stimulating ovulation each month- follicle stimulating hormone (FSH) and luteinizing hormone (LH). The most common signs are irregular or absent periods. Excess physical or emotional stress, a very high or very low body weight, or a recent substantial weight gain or loss can disrupt production of these hormones and affect ovulation.
- Premature ovarian failure: This is also called primary ovarian insufficiency; this disorder is usually caused by an autoimmune response or by premature loss of eggs from the ovary. The ovary no longer produces eggs, and it lowers estrogen production in women under age 40.



2. DIFFERENTIATE BETWEEN MEIOSIS 1 AND MEIOSIS 2.

S/N	MEIOSIS 1.	MEIOSIS 2.
1.	The end product of meiosis is 2 diploid daughter cells.	The end product of meiosis 2 is 4 haploid daughter cells.
2.	Prophase 1 involves synapsis, crossing over and chiasma formation.	In prophase 2 there is no synapsis, crossing over and chiasma formation.
3.	At metaphase 1 the 46 homologous duplicated chromosomes do not split at the centromere.	At metaphase 2 the 23 homologous duplicated chromosomes split at the centromere.
4.	During anaphase 1 homologous chromosome are separated.	During anaphase 2 sister chromatids are separated.
5.	At the end of telophase1 2 diploid daughter cells are produced.	At the end of telophase2, 4 haploid daughter cells are produced.
6.	This is a reductive division.	This is an equational division.
7.	Meiosis 1 is preceded by S-phase and G-phase.	Meiosis 2 is preceded only by G-phase.
8.	Meiosis 1 is preceded by interphase.	No interphase takes place at meiosis 2.
9.	Homologous chromosomes are present at the beginning of meiosis 1.	Individual bivalent chromosomes are present at the beginning of meiosis 2.
10.	Meiosis is complex and time consuming division.	Meiosis 2 is comparatively less simple and takes less time.
11.	The chromosome number becomes half in meiosis 1.	The chromosome number doesn't divide into half.
12.	This is a heterotypic division.	This is a homotypic division.


Interphase
Prophase I
Prometaphase I
Metaphase I
Anaphase I
Telophase I
Cytokinesis
Prophase II
Prometaphase II
Metaphase II
Anaphase II
Telophase II
Cytokinesis
Meiosis I
Meiosis II

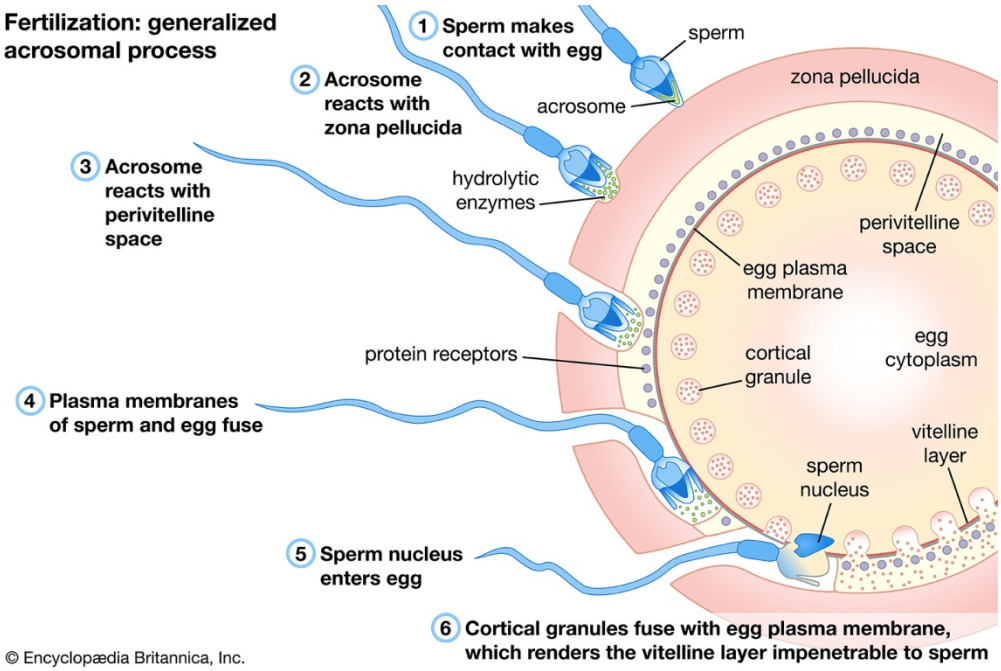
3. DISCUSS THE STAGES IN FERTILIZATION.

Fertilization is the union of sperm and oocyte. The usual site for fertilization is the ampulla of the uterine tube. This process takes approximately 24 hours. It is a sequence of coordinated events which include the following stages:

1. Passage of sperm through the corona radiata: for the sperm to pass through the corona radiata, it must have been capacitated. Capacitation is the removal of the glycoprotein coat and seminal plasma proteins from the plasma membrane of that lies over the acrosomal region of the spermatozoa. Only capacitated sperms can pass freely through the corona radiata.
2. Penetration of the zona pellucida: The zona is a glycoprotein shell surrounding the egg that facilitates and maintains sperm binding and induces the acrosome reactions. The intact acrosome of the sperm binds with a zona glycoprotein (ZP3) ON THE zona pellucida. Release of acrosomal enzymes (acrosin) allows sperm to penetrate the zona pellucida, thereby coming in contact with the membrane of the oocyte. As soon as the head of the 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 the cortical granules which send a signal to the zona pellucida to prevent sperm penetration (polyspermy) and inactivate binding sites for spermatozoa on the surface of the zons pellucida. This is to ensure that only one sperm fertilizes the oocyte.
3. Fusion of plasma membranes of sperm and oocyte: The plasma membrane of the sperm and oocyte fuse and break down at the area of fusion. The head and the tail of the sperm enter into the plasma membrane but the sperm's plasma membrane is left behind.
4. Completion of 2^{nd} meiotic division of oocyte and formation of female pronucleus: penetration of the oocyte by a sperm activates the oocyte into completion of 2^{nd} meiotic division hence the formation of mature oocyte and the 2^{nd} polar body. The nucleus of the mature ovum is now called the female pronucleus.
5. Formation of the male pro nucleus: Within the cytoplasm of the oocyte, the nucleus of the sperm enlarges to form the male pronucleus and the tail of the sperm degenerates. Since all sperm mitochondria degenerates, all mitochondria within the zygote are of maternal origin this means that all mitochondrial DNA are of maternal origin. Morphologically, the male and female pronucleus is identical. The oocyte now contains 2 pronuclei, each

having haploid number of chromosomes. The oocyte containing 2 haploid pronucleo is called an ootid.

6. The fusion of the two pronuclei into a single diploid aggregation of chromosomes, the ootid becomes a zygote: The chromosome in the zygote become arranged on a cleavage spindle in preparation for cleavage of the zygote.



4. Differentiate between monozygotic and dizygotic twins.

S/N	MONOZYGOTIC TWINS.	DIZYGOTIC TWINS.
1.	A sperm fertilizes an oocyte which gives rise to a zygote that divides at the region of the embryoblast into 2.	Two different sperms fertilize two different oocytes to form two zygotes.
2.	They are genetically identical.	They are genetically unidentical.
3.	They have physical resemblance.	There is no physical resemblance.
4.	They have the same sex: they can be either females or both males.	They can be of different sex.
5.	They have common amnion, chorionic sac, placenta but 2 umbilical cords.	They have 2 different placenta, chorionic sac, umbilical cord and amnion.
6.	They are also referred to as identical or maternal twins.	They are also referred to as fraternal or non-identical twins.
7.	One third of the twins in the world are monozygotic.	Two-thirds of twins in the world are dizygotic.
8.	The cause of monozygotic twin is currently unknown.	This can be caused through In vitro fertilization (IVF), a hereditary predisposition,

		or use of certain fertility drugs.
9.	There is a high risk of twin-to-twin transfusion syndrome in monozygotic twins.	There is a much lower twin-to-twin transfusion syndrome risk in dizygotic twin.
10.	It is hereditary in nature.	It is non hereditary in nature.