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 Ovulation is the release of the secondary oocyte from the ovarian follicle, before ovulation under the influence of follicle-stimulating hormone and luteinizing hormone, the secondary follicles grows rapidly to a diameter of 25mm to become a Graafian follicles coincident with the final development of the follicle there is an abrupt increase in luteinizing hormone which causes;

1] The primary oocyte to complete meiosis

2] The follicle to enter the pre-ovulatory mature vascular stage

Meiosis II is also initiated but the secondary oocyte is arrested in metaphase approximately three hours before ovulation occurs

In the meantime, the surface of the of ovary begins to bulge locally and at the apex an avascular spot known as the stigma appears

For the oocyte to be released two events must occur this events are caused by Luteinizing hormone surge

It increases collagen activity resulting in the digestion of collagen Fibers surrounding the follicle

Prostaglandin levels also increases in response to the luteinizing hormone surge and causes local muscular contractions in the ovarian wall

These contractors extrude the oocyte together with its surroundings follicular cells from the region of the cumulus oophorus. This causes ovulation in which the oocyte floats out of the ovary some of the cumulus oophorus cells then rearrange themselves around the zona pellucida to form the corona radiata

In humans, ovulation occurs about midway through the menstrual cycle, after the follicular phase. The few days surrounding ovulation (from approximately days 10 to 18 of a 28-day cycle), constitute the most fertile phase. The time from the beginning of the last menstrual period (LMP) until ovulation is, on average, 14.6 days, but with substantial variation among females and between cycles in any single female, with an overall 95% prediction interval of 8.2 to 20.5 days.

The process of ovulation is controlled by the hypothalamus of the brain and through the release of hormones secreted in the anterior lobe of the pituitary gland, luteinizing hormone (LH) and follicle-stimulating hormone (FSH). In the pre-ovulatory phase of the menstrual cycle, the ovarian follicle will undergo a series of transformations called cumulus expansion, which is stimulated by FSH. After this is done, a hole called the stigma will form in the follicle, and the secondary oocyte will leave the follicle through this hole. Ovulation is triggered by a spike in the amount of FSH and LH released from the pituitary gland. During the luteal (post-ovulatory) phase, the secondary oocyte will travel through the fallopian tubes toward the uterus. If fertilized by a sperm, the fertilized secondary oocyte or ovum may implant there 6–12 days later.

CLINICAL CORROLATES

1.During ovulation, some women feel a variable amount of abdominal pain called mittelschmerz, also known as middle pain because it normally occurs near the middle of the mestral cycle . it may be used as a symptom of ovulation , other signs maybe

a. change in cavical mucus

b. drop in basal body temperature

2.Anovulation – when women fail to ovulates because of a low concertation of gonadotropins

Q2. Differentiate between meiosis 1 and 2.

Meiosis I Starts as diploid and ends as haploid while Meiosis II Starts as haploid and ends as haploid

Meiosis I has Reductive division while Meiosis II has Equational division

Meiosis I Homologous chromosome pairs separate while Meiosis II Sister chromatids separate

Meiosis I Crossing over happens while Meiosis II Crossing over does not happen

Meiosis I has a Complicated division process while Meiosis II has a Simple division process

Meiosis I has a Long duration while Meiosis II has a Short duration

Meiosis I is Preceded by S-phase and G-phase while Meiosis II is Preceded only by G-phase

Meiosis I Sister chromatids in prophase have convergent arms while Meiosis II Sister chromatids in prophase have divergent arms

Meiosis I Equatorial plane is centered while Meiosis II Equatorial plane is rotated 90°

Meiosis I Prophase split into 5 sub-phases while Meiosis II Prophase does not have sub-phases

Meiosis I Ends with 2 daughter cells while Meiosis II Ends with 4 daughter cells.

Q3. Discuss the stages involved in fertilization.

Fertilization the union of the sperm and the oocyte. It occurs in the ampulla of the Fallopian tube or uterine tube. The stages that include in fertilization are:

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 reactionThe intact acrosome of the sperm binds with a zona glycoprotein (ZP3/ zona protein 3) on the zona pellucidaRelease of acrosomal enzymes (acrosin) allows sperm to penetrate the zona pellucida, thereby coming in contact with the plasma membrane of the oocyteAs soon as the head of a sperm comes in contact with the oocyte surface, the permeability of the zona pellucida changesWhen a sperm comes in contact with the oocyte surface, lysosomal enzymes are released from cortical granules lining the plasma membrane of the oocyte. The enzyme alters properties of the zona pellucida to

A. Preventspermpenetration

B. Inactivate binding sites for the spermatozoa

III.

The plasma or cell membranes of the oocyte and sperm fuse and break down at the area of fusion ofThe 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 female 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 degenerate.

Since all sperm mitochondria degenerate, all mitochondria within the zygote are of maternal origin (i.e., all mitochondrial DNA is of maternal origin)

a) Morphologically, the male and female pronuclei are indistinguishable b) c)

b) The oocyte now contains 2 pronuclei, each having haploid number of chromosomes(23)

c) The oocyte containing two haploid pronuclei is called an ootid

VI. The 2 pronuclei fuse into a single diploid aggregation of chromosomes, the ootid becomes a zygoteThe chromosomes in the zygote become arranged on a cleavage spindle in preparation for cleavage of the zygote

Q4. Differentiate between monozygotic twin and dizygotic twins.

Monozygotic Twins are developed by the splitting of a fertilized embryos into two while Dizygotic Twins are developed by two separate simultaneous fertilization events

 The cause of Monozygotic Twins is not known while the cause of Dizygotic twins is either by IVF, certain fertility drugs or hereditary predisposition.

The Genetic codes of Monozygotic Twins are nearly identical while in Dizygotic twins’ genetic codes are same as any other sibling

Monozygotic Twins gender is the same while Dizygotic twins gender is different

Monozygotic Twins blood types are the same while Dizygotic twins blood types are different

The appearance of Monozygotic Twins is extremely similar but may be affected by environmental factors while in Dizygotic twins the appearance is similar as any other sibling

1/3 of the Monozygotic twins in the world are monozygotic while 2/3 of the Dizygotic twins in the world are dizygotic

Monozygotic Twins beer high-risk of TTTS while Dizygotic twins’ beer a low -risk of TTTS

Monozygotic Twins are not hereditary while Dizygotic twins are hereditary

Monozygotic Twins can be either Di-/Di, mono Di or mono mono twins while Dizygotic twins are only Di-Di twins