Embryology Assignment

Ovulation

Ovulation is the release of eggs from the ovaries. In women, this event occurs when the ovarian follicles rupture and release the secondary oocyte ovarian cells. After ovulation, during the luteal phase, the egg will be available to be fertilized by sperm

Around the middle of the ovarian cycle,the ovarian follicle,under the influence of FSH and LH, undergoes a sudden growth spurt, producing a cystic swelling or bulge on the surface of the ovary.A small avascular spot,the stigma soon appears on the swelling.Before ovulation,the secondary oocyte and the cumulus oophorus detach from the interior of the distended follicle.

Ovulation is triggered by a surge in LH production.Ovulation usually follows the LH peak by 12 to 24 hours.The LH surge,elicited by the high estrogen level in the blood, appears to cause the stigma to balloon out forming a vessicle .The stigma soon ruptures, expelling the secondary oocyte with the follicular fluid.Expulsion of the oocyte is the result of intrafollicular pressure,and possibly by contraction of smooth muscle in theca externa(sheath) owing to stimulation by prostaglandin

'Mitogen activated protein Kinases 3 and 1also known as extracellular signal regulated kinases 1 and 2 in ovarian follicular cells seems to regulate signalling pathways that control ovulation.Plasmins and matrix metalloproteins appear also to play a role in controlling rupture of the follicle'

The expelled secondary oocyte is surrounded by the zona pellucida and one or more layers of follicular cells,which are radially arranged as the Corona Radiata forming the oocyte-cumulus complex.The LH surge also seems to induce resumption of the first meiotic division of the primary oocyte.Hence,mature ovarian follicles contain secondary oocytes.The zona pellucida is composed of three glycoproteins ZPA,ZPB&ZPC,which usually forms a network of filaments with multiple pores. Binding of the sperm to the Zona pellucida is a complex and critical event during fertilization

Ovulation Symptoms

Cervical Mucus Changes. ...

Heightened Sense of Smell. ...

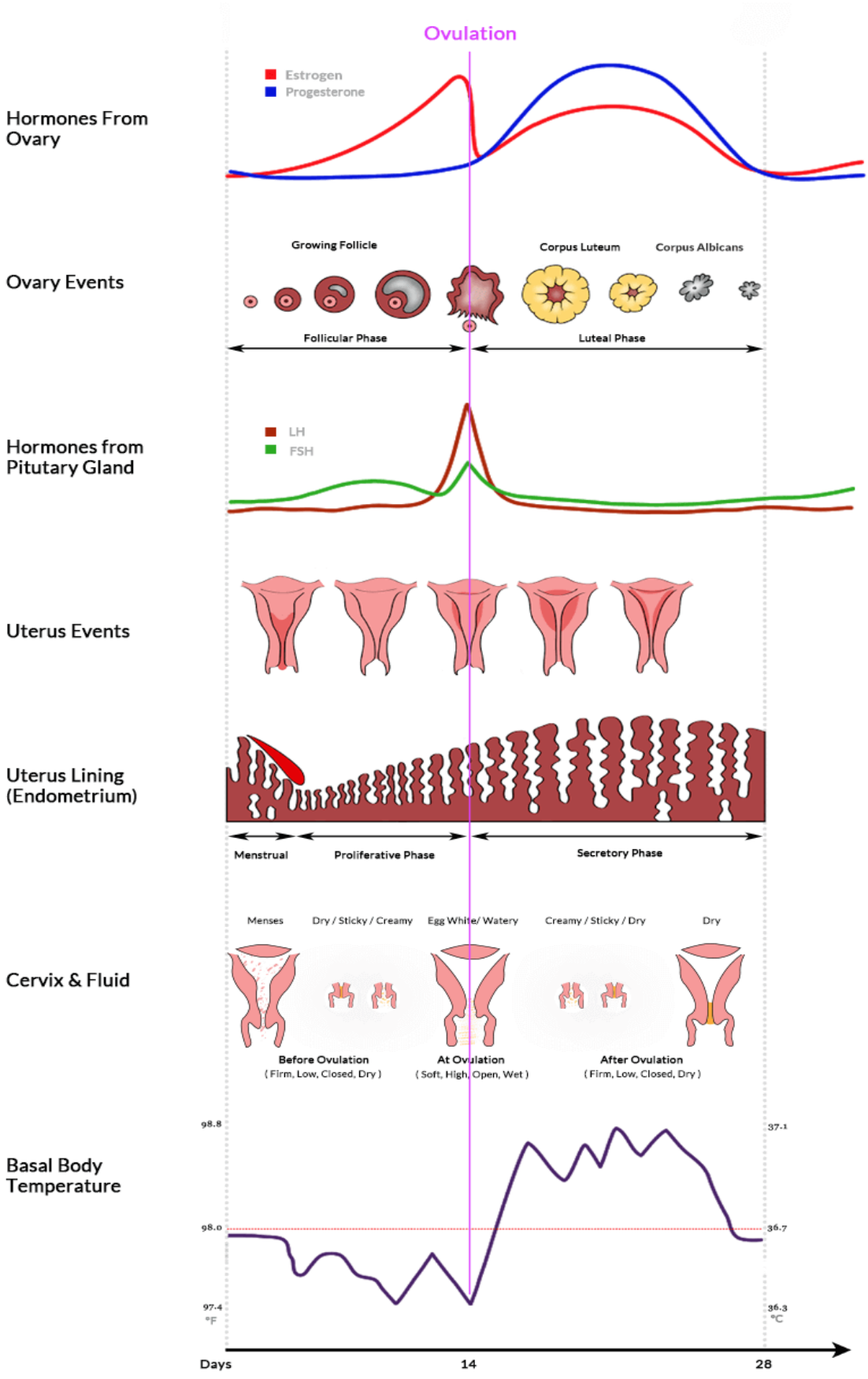
Breast Soreness or Tenderness. ...

Mild Pelvic or Lower Abdominal Pain. ...

Light Spotting or Discharge. ...

Libido Changes. ..

Changes in the Cervix.



Clinical Importance of Ovulation

Mittelschmerz Pain (Ovulation Pain)

Some women get ovulation pain every month. Research has found that mid-cycle pain (also known as mittelschmerz, German for “middle pain”) occurs just before you ovulate, which would be when you're most fertile. For most, ovulation pain is a temporary sharp pain in the lower abdomen.

Anovulation

Anovulation is when the ovaries do not release an oocyte during a menstrual cycle. Therefore, ovulation does not take place. However, a woman who does not ovulate at each menstrual cycle is not necessarily going through menopause

	Meiosis I	Meiosis II
DEFINITION	Meiosis I is the first cell division of meiosis.	Meiosis II is the second cell division of meiosis.
SUBPHASES	Prophase I, metaphase I, anaphase I and telophase I.	Prophase II, metaphase II, anaphase II and telophase II.
NUMBER OF CELLS PRODUCED	Two	Four
CHROMOSOME NUMBER	Becomes half	Does not divide into half
CHROMOSOME SEPARATION	Homologous chromosomes separate from each other.	Sister chromatids separate from each other.
NATURE	Heterotypic division	Homotypic division
CROSSING OVER AND GENETIC RECOMBINATION	Crossing over and genetic recombination occur.	Crossing over and genetic recombination do not occur.
DURATION	Longer	Shorter
SPLITTING OF CENTROMERES OF CHROMOSOMES	Does not take place	Centromeres split and sister chromatids separate.
INTERPHASE BEFORE I	There is interphase before meiosis I.	There is no interphase between meiosis I and II.

Fertilization

Fertilization is the fusion of female and male gametes to give rise to a new cell.

Stages of Fertilization

1.Passage of a sperm through the Corona Radiata

Dispersal of the follicular cells of the Corona Radiata surrounding the oocyte and Zona pellucida appears to result mainly from the action of the enzyme hyaluronidase released from the acrosome of the sperm.

2. Penetration of the Zona Pellucida

Passage of a sperm through the Zona Pellucida is the most important phase in the initiation of formation of a pathway also results from the action of enzymes released from the acrosome.The enzymes esterase,acrosin and neuraminidase appear to cause lysis (dissolution of the Zona Pellucida) to form a path for the sperm to enter the oocyte.The most important enzyme is acrosin,a proteolytic enzyme.

Zona reaction

Once the sperm penetrates the zona pellucida,a zona reaction, a change in the properties of the Zona Pellucida,a change in the properties of the Zona pellucida,occurs that makes it impermeable to other sperms.The composition of this extracellular glycoprotein coat changes after fertilization.The Zona reaction is believed to result from the action of lysossomal enzymes released by cortical granules near the plasma membrane of the oocyte.The contents of these granules, which are released into the perivitelline space also cause changes in the plasma membrane that makes it impermeable to other sperms.

3.Fusion of cell membrane of the oocyte and sperm

The plasma or cell membrane of the oocyte and sperm fuse and break down in the area of fusion.The head and tail of the sperm enter the cytoplasm of the oocyte but the sperm's cell membrane and mitochondria are left behind.

4.Completion of the second meiotic division of the oocyte and formation of the 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.Following decondensation of maternal chromosomes,the nucleus of the mature oocyte becomes female pronucleus.

5.Formation of the male pronucleus

Within the cytoplasm of the oocyte,the nucleus enlarges to form the male pronucleus and the tail of the sperm degenerates.Morphologically,the male and female pronucleus are

indistinguishable.During the growth of the pronuclei,they replicate their DNA haploid,two chromatids.The oocyte containing the two haploid pronuclei is called an ootid,the nearly mature oocyte after the first meiotic division has been completed.

6.As the 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.

.The zygote is genetically unique because half of it's chromosomes come from the mother and half from the father .The zygote contains a new combination of chromosomes that is different from that of either parent . This mechanism forms the basis of bi parental inheritance and variation of the human specie

Fertilization

-Stimulates the penetrated oocyte to complete the second meiotic division

-Restores the normal diploid number of chromosomes (46)in the zygote

-Results in the variation of the human species through mingling of maternal and paternal chromosomes

-Determines the chromosomal sex of the embryo

-Causes metabolic activation of the ootid (nearly mature oocyte) and initiates cleavage of the oocyte.

MONOZYGOTIC TWINS
VERSUS
DIZYGOTIC TWINS

MONOZYGOTIC TWINS	DIZYGOTIC TWINS
Monozygotic twins are developed by the splitting of a fertilized embryo into two	Dizygotic twins are developed by two separate simultaneous fertilization events
Cause is not known	Caused either by IVF, certain fertility drugs or hereditary predisposition
Genetic codes are nearly identical	Genetic codes are same as any other sibling
Gender is the same	Gender is different
Blood types are the same	Blood types are different
Appearance is extremely similar but may be affected by environmental factors	Appearance is similar as any other siblings
Can be either Di-Di, Mono-Di or Mono-Mono twins	Only Di-Di twins
One-third of the twins in the world are monozygotic	Two-thirds of the twins in the world are dizygotic
Bear a high risk for TTTS	Bear a low risk for TTTS