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MATRIC NO: 18/MHS01/337

COURSE TITLE: EMBRYOLOGY

1. Discuss Ovulation

Ovulation is the release of a secondary oocyte from the ovarian follicle. Ovulation is the process when hormone changes trigger an ovary to release an egg. Ovulation usually happens 12 to 16 days before your next period starts. The eggs are contained in the ovaries. During the first part of each menstrual cycle, one of the eggs is being grown and matured. As one approaches ovulation, the body produces increasing amounts of a hormone called estrogen, which causes the lining of the uterus to thicken and helps create a sperm friendly environment.

These high estrogen levels trigger a sudden increase in another hormone called luteinizing hormone, the LH surge causes the release of the mature egg from the ovary. Ovulation normally occurs approximately 24 to 36 hours after the luteinizing hormone (LH) surge, so identifying this LH surge helps one to determine when one is to ovulate. This is why the LH surge is a good predictor of peak fertility. The egg can only be fertilized for up to 24 hours after ovulation. If it is not fertilized for up to 24 hours after ovulation the lining of the womb is shed (the egg is lost with it) and your period begins. This marks the start of the next menstrual cycle.

2. Differentiate between Meiosis 1 and Meiosis II

	Meiosis 1	Meiosis II
Definition	Meiosis 1 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, Telophase II
Interphase before I	There is interphase before meiosis I	There is no interphase between meiosis I and II
Duration	Longer	Shorter
Crossing Over Genetic Recombination	Crossing over and genetic recombination occur	Crossing over and genetic recombination do not occur
Number of cells produced	Two	Four

Chromosome Number	Becomes half	Does not divide into half
Nature	Heterotypic division	Homotypic division
Splitting Centromeres of chromosomes	Does not take place	Centromeres split and sister chromatids separate
Chromosome separation	Homologus separate from each other	Sister Chromatids separate from each other

3. Discuss the stages involved in fertilization

Fertilization is the union of the sperm and the oocytes. The usual site of fertilization is the ampulla of the uterine tube. Fertilization process takes approximately 24 hours.

a. Passage of sperm through the Corona radiata:

This involves removal of the glycoprotein coat and seminal plasma proteins from the plasma membrane that overlies the acrosomal region of the spermatozoa. Only capacitated sperms can pass freely through the corona radiate. Movements of the tail of the sperm are also important in its penetration of the corona radiata.

b. Penetration of Zona pellucida:

Release of acrosomal enzymes allows sperm to penetrate the zona pellucid, thereby coming in contact with the plasma membrane of the oocyte. Formation of a pathway results from the action enzymes released from the acrosome. The enzymes appear to cause lysis (dissolution or loosening) of the zona pellucid, thereby forming a pathway for the sperm to enter the oocyte. As soon as the head of a sperm comes in contact with the oocyte surface, the permeability of the zona pellucida changes.

c. Fusion of plasma membrane of the sperm and oocyte:

The plasma or cell membrane of the sperm and oocyte fuse and breakdown at the area of fusion. The head and tail of the sperm enter the cytoplasm of the oocyte but the sperm's cell membrane and mitichondria remains behind.

d. Completion of the second meiotic division 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 matur chromosome becomes female pronucleus.

e. Formation of 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.

f. Formation of 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 its chromosomes came from the mother and half from the father.

4. Differentiate between monozygotic twins and dizygotic twins

	Monozygotic	Dizygotic
Definition	Developed through a singular fertilized embryo, splitting into two	Developed two independent but simultaneous fertilization events.
Cause	It is due to random splitting of the zygote into two embryos	Due to two separate eggs fertilized by two sperms
Names	They are also called identical twins	Also known as fraternal twins
Blood type	They always have the same blood type	They have different blood types
World-wide population	One third of all twins are monozygotic	Two third of all twins worldwide are dizygotic
Genetic composition	Monozygotic are generally identical	Dizygotic twins are as generally similar aas would be the case with any other, non-identical sibling

Physical appearance	Extremely similar, if not identical appearance but can be affected by some environmental factors	Similar appearance, as would be expected with any other non-identical siblings
Hereditary	Not hereditary	Hereditary
Twin Type (inside the uterus)	Either, Mono-Di, Di-Di, or Mono-Mono twins	Di-Di only twins
Gender	They are always the same gender	They can be different gender