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18/MHS01/109

ANATOMY

EMBRYOLOGY ASSIGNMENT

1. Discuss ovulation

OVULATION

Ovulation is the release of a secondary oocyte from the ovarian follicles. During the final development of the vesicular follicle there is an abrupt increase in Luteinizing Hormone (LH) that causes:

a.) Primary oocyte to complete meiosis I
b.) The primary follicle to enter Pre-Ovulatory Mature Vesicular Stage(POMVS)

For the oocyte to be released 2 events occur, caused by LH surge. They are:

a.) Increase in collagenase activity causing the breakdown of collagen fibers.
b.) Increase in prostaglandin level causing local muscular contraction in the ovarian wall.

These contractions extrude the oocyte which together with its follicular cells from the region of the cumulus oophorus cause ovulation in which the oocyte floats out of the ovary while some of the cumulus oophorus cells re-arrange themselves around the zona pellucida to form the corona radiata.

CLINICAL CORRELATES

a.) During ovulation some women experience a variable amount of abdominal pain called middle pain.
b.) Some women fail to ovulate this is called anovulation caused by low concentration of Gonadotropin.

2. Differentiate between meiosis I and meiosis II

MEIOSIS

This is a special type of cell division that involves two meiotic cell divisions, diploid germ cells give rise to haploid gametes (sperm and oocytes). The divisions are:

a.) Meiosis I
b.) Meiosis II

MEIOSIS I

a.) Prophase I
b.) Metaphase I
c.) Anaphase I
d.) Telophase I

Prophase I

Here, three major events occur. They are:

a.) Synapsis
b.) Crossing over
c.) Chiasma formation

In synapsis, the 46 homologous chromosomes lie side by side and pair.

In crossing over, genetic information is exchanged between paired homologous chromosomes.

Chiasma formation involves the formation of an X-like structure at the point of exchange.

Metaphase I

The 46 homologous duplicated chromosomes align at the centre(equator)

Anaphase I

The 46 homologous duplicated chromosomes separate from each other and migrate towards the pole.

Telophase I

2 daughter cells are formed (23 duplicated chromosomes, 2n)

MEIOSIS II

Prophase II

Here, there is no synapsis, no crossing over and no chiasma formation.

Metaphase II

The 23 duplicated chromosomes align at the center.

Anaphase II

The 23 duplicated chromosomes separate from each other and migrate towards the pole.

Telophase II

4 daughter cells are formed (23 single chromosomes, 1n)

STAGES	**MEIOSIS I**	**MEIOSIS II**
Prophase	Synapsis Crossing over Chiasma formation	No synapsis No crossing over No chiasma formation
Metaphase	Alignment of 46 homologous duplicated chromosomes at the center.	Alignment of 23 duplicated chromosomes at the center.
Anaphase	Separation of 46 homologous duplicated chromosomes from each other.	Separation of 23 duplicated chromosomes from each other.
Telophase	2 daughter cells	4 daughter cells

3. Discuss the stages involved in fertilization

FERTILIZATION

Fertilization is the union of sperm and mature oocyte. It takes place approximately 24 hours.

Stages of fertilization

a.) Passage of sperm through corona radiata
b.) Penetration of zona pellucida
c.) Fusion of plasma membrane of sperm and oocyte.
d.) Completion of meiosis II and formation of female pronuclei
e.) Formation of male pronucleus
f.) Formation of zygote

Passage of sperm through the corona radiata:

For sperms to pass through the corona radiata, they must have capacitated. Capacitation involves the removal of the glycoprotein coat and the seminal plasma protein from the plasma membrane that overlies the acromosal region of spermatozoa.

Penetration of zona pellucida

The zona is a glycoprotein shell surrounding the egg that facilitates and maintains sperm binding and induces acrosome reaction. The acrosome contains acrosin which allow sperm to penetrate the zona pellucida hence, coming in contact with the oocyte surface. Lysosomal enzymes are released from the cortical granules sending a message to the zona pellucida to close their binding sites so one sperm is able to penetrate the oocyte.

Fusion of plasma membrane of oocyte and sperm

The plasma membrane of the sperm and oocyte fuse. The head and tail region of the sperm enters the cytoplasm of the oocyte but the sperm's plasma membrane is left behind.

Completion of second meiotic division of oocyte and formation of female pronucleus

As soon as the sperm enters the region of oocyte second meiotic division is completed forming a mature oocyte and a second polar body. The nucleus of the mature oocyte is now called the female pronucleus.

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.

Formation of the zygote

The male pronucleus and the female pronucleus fuse into a single diploid, the ootid which proceeds to form the zygote.

4. Differentiate between monozygotic twins and dizygotic twins.

TWINNING

Twinning is a situation where two conceptus are formed at the same time. Twins can be monozygotic (identical) or dizygotic (fraternal). In monozygotic, the sperm fuses with the oocyte to produce a zygote. The zygote divides during blastocystic phase giving rise to a monozygotic twin. In dizygotic, two sperms fertilize two oocytes producing two zygotes.

MONOZYGOTIC TWIN	**DIZYGOTIC TWIN**
It is formed from one zygote	It is formed from two zygote
They are genetically identical	They are not genetically identical
They are of the same sex	They may be same sex or different sex
They share the same amnion, chorionic sac and placenta.	Their amnion, chorionic sac and placenta are separate
They look alike	They look like any two siblings