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Course: Embryology

Assignment

1. Discuss Ovulation

Ovulation is referred to as the release of a secondary oocyte from the ovarian follicle. And under the influence of FSH and LH the secondary follicle grows rapidly to a diameter of about 25mm, becoming the mature vesicular / mature secondary or grafian follicle. This occurs a few days before ovulation.

After the grafian follicle is formed there is an abrupt increase in LH and due to this increase the first thing that is completed is meiosis 1. After which 2 daughter cells are formed i.e the secondary oocyte and first polar body .

The follicle then enters into preovulatory mature vesicular stage. There is something like a bulge on the apex of the ovary, known as a stigma (an avascular spot) which appears. This occurs when the secondary oocyte is arrested in metaphase 3hours before ovulation.

In other for the oocyte to be released two events must occur which is due to LH surge.

1. An enzyme collagenase is produced, and an increase in collagenase activity will cause a breakdown of the collagen fibers(connective tissue) around the secondary oocyte, making the connective tissue weak.
2. Next is the increase in prostaglandin which will help in contraction of the ovary (local muscular contractions in the ovarian wall). Causing the extrusion of the secondary oocyte alongside the cumulus oophorus which will arrange themselves to form the corona radiate. It is rearranged around the zona pellucida.

Clinical correlates

* Mittleschmerz may be used as a symptom of ovulation. It is a variable amount of pain in the lower abdomen that is felt near the middle of the menstrual cycle.in some cases it results in slight bledding into the peritoneal cavity.
* Other signs of ovulation are: change in cervical mucus,
* Increase in libido /increased urge for sex
* Tenderness of breast
* Swollen vagina or vulva

2) Differenciate between meosis1 and meosis2

Meosis1 Meosis2

|  |  |
| --- | --- |
| Starts as diploid; ends as haploid | Starts as haploid; ends as haploid |
| Reductive division | Equational division |
| Homologous chromosome pairs separate | Sister chromatids separate |
| Crossing over happens | Crossing over does not happen |
| Complicated division process | Simple division process |
| Long duration | Short duration |
| Preceded by S-phase and G-phase | Preceded only by G-phase |
| Sister chromatids in prophase have convergent arms | Sister chromatids in prophase have divergent arms |
| Equatorial plane is centered | Equatorial plane is rotated 90° |
| Prophase split into 5 sub-phases | Prophase does not have sub-phases |
| Ends with 2 daughter cells | Ends with 4 daughter cells |

3) Discuss the stages involved in fertilization

Fertilization is the union of sperm and oocyte, the usual site of fertilization being the ampulla of the uterine tube. And this fertilization 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 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 which involves the acrosomal region of the spermatozoa. Noting that only capacitated sperms can pass freely through the corona radiate

1. **Penetration into the Zona Pellucida**

For the sperm to pass through the zona pellucida, the acrosome is needed. The acrosome will bind with the zona pellucida. Specifically what occurs is that the binding sites on the surface of the zona pellucida would act in receiving the acrosome allowing it to bind with receptors on the ZP. This acrosome contains enzymes called acrosine which are lysosomal enzymes. That is they function in breakdown. So with the help of the acrosine which is relaeased, the sperm is able to pass through the ZP. On the plasma membrane which is the next shield, there are cortical granules on the surface of the plasma membrane. So when the sperm passes through the ZP to the plasma membrane the cortical granules will send signals to the ZP to close their binding sites, ( i.e deactivation). Causing block to polyspermy.

1. **The fusion of the plasma membrane of the sperm and oocyte**

During this process the head and tail of the sperm will enter the region of the cytoplasm, leaving behind the plasma membrane of the head of and tail of the sperm. The plasma membrane or cell membrane of the oocyte and sperm fuse and break down at the area of fusion.

1. **Completion of 2nd meotic division and formation of the female pronucleus**

As soon as the sperm enters into the region of the oocyte the 2nd meotic division is completed. But the nucleus of the sperm and the nucleus of the oocyte are the major factors involved in this stage, here the female nucleus becomes the female pronucleus .

1. **Formation of the male pronucleus**

At this point, the tail will degenerate while the male nucleus that is left will enlarge to become the male pronucleus. Note that all the energy that the zygote possesses or will requireis from the materanal side because the mitochondria in the tail of the sperm is lost too.

1. **Formation of the zygote**

The male and female pronucleus will fuse to form an OOTID which will end up developing into a zygote

4) Differentiate between monozygotic and dizygotic

|  |  |
| --- | --- |
| **Monozygotic Twins** | **Dizygotic Twins** |
| Developed from a single egg which was fertilized by a single sperm cell | Developed from two eggs fertilized by two different sperm cells |
| Two fetuses have common chorionic, amniotic sacs and placenta | Two fetuses have separate placenta, chorionic sacs and amnion |
| Have almost identical genetic profile | Completely different genetic profile |
| Always of the same sex | May be of the same or opposite sex |
| May have the same physical and mental characteristics | May look alike or different; may behave similarly or differently |
| Also called “identical twins” | Also called “fraternal twins” |