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COURSE: EMRYOLOGY

ASSIGNMENT

1. Discuss Ovulation

Ovulation is the release of an oocyte from a woman’s ovary. This happens when the ovarian follicles rupture and release the secondary oocyte ovarian cells. Ovulation usually occurs midway through the menstrual cycle, after the follicular phase. 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). Ovulation is triggered by a spike in the amount of FSH and LH released from the pituitary gland. This causes the primary oocyte to complete meiosis 1.Meiosis 2 is also initiated but the secondary oocyte is arrested in metaphase approximately 3 hours before ovulation. In the preovulatory 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. The secondary oocyte leaves the ruptured follicle and moves out into the peritoneal cavity through the stigma, where it is caught by the fimbriae at the end of the fallopian tube. After entering the fallopian tube, the oocyte is pushed along by cilia, beginning its journey toward the uterus. The ovulatory period is usually the most fertile period in women. 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. During ovulation some women experience an abdominal pain called mittelschmer or middle pain. Some women fail to ovulate ecause of a low concentration of gonadotropin release; this is referred to as anovulation. Gonadotropin releasing administrators can be administered in these cases.

1. DIFFERENTIATE BETWEEN MEIOSIS 1 AND MEIOSIS 2

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| Meiosis1 | Meiosis 2 |
| Starts as diploid; ends as haploid | Starts as haploid; ends as haploid |
| Synapses, crossing over and chiasma formation occurs | Synapses, crossing over and chiasma formation doesn’t occur |
| Sister chromatids in prophase have convergent arms | Sister chromatids in prophase have divergent arms |
| Reductive division | Equational division |
| Equatorial plane is centered | Equatorial plane is rotated 90° |
| Homologous chromosome pairs separate | Sister chromatids separate |
| Ends with 2 daughter cells | Ends with 4 daughter cells |

1. DISCUSS THE STAGES INVOLVED IN FERTILIZATION

Fertilization is the union of an oocyte and a sperm and this process usually occurs at the ampulla. There are six stages in fertilization;

1. Passage of a sperm through the corona radiata: The corona radiata is an outer layer of follicular (granulosa) cells that form around a developing oocyte in the ovary and remain with it upon ovulation. The sperm needs to pass through the corona radiata in order to get to the underlying zona pellucida.
2. Penetration of the zona pellucida: Binding of the sperm to the zona pellucida creates an acrosomal reaction, zona pellucida protein ZP3 serves as a receptor for sperm; contents of the acrosome, which are hydrolytic enzymes, spill out and degrade the zona pellucida near the sperm head. This forms a tunnel in the zona, through which the sperm begins to move towards the oocyte. Immediately a sperm successfully passes through the zona pellucida signals are sent to stop other sperms from passing through to prevent polyspermy
3. Fusion of the plasma membrane of the sperm and the oocyte: The plasma membrane of the sperm and oocyte fuse together upon contact and this is regulated by two integral membrane proteins, Izumo1 on the sperm plasma membrane and Cd9 on the egg plasma membrane, regulate sperm-egg fusion, and a new study has found a novel Izumo1 receptor, Juno, on the egg plasma membrane.
4. Completion of second meiotic division and formation of the female pronucleus: As soon as the sperm enters the cytoplasm of the secondary oocyte, Metaphase promoting factor (MPC) dissolves and Anaphase promoting factor (APC) is formed. The second meiotic didvision is completed as soon as the sperm enters the cytoplasm of the secondary oocyte. The female pronucleus is the female egg cell once it has become a haploid cell; it is formed beside the male pronucleus at the centrally located perinuclear plasm domain, by fusion and remodelling of karyomeres that have descended from the animal pole at the tip of an ooplasmic process (centripetal ooplasmic flow).
5. Formation of the male pronucleus: While the sperm develops inside of the male testes, the sperm does not become a pronucleus until it decondenses quickly inside of the female egg, the male pronucleus forms when the sperm enters into the female egg.
6. Formation of zygote: The combination of the male and female pronuclei leads to the formation of zygote. Since both pronuclei are haploid, the zygote's genome is a combination of the DNA in each gamete, and contains all of the genetic information necessary to form a new individual. This is the end of the fertilization process after which the zygote undergoes a process called cleavage.
7. DIFFERENTIATE BETWEEN MONOZYGOTIC TWINS AND DIZYGOTIC TWINS.

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|  | MONOZYGOTIC TWINS | DIZYGOTIC TWINS |
| DEFINITION | They are two offspring that develop from one zygote. | They are two offspring that develop from two separate zygotes. |
| GENETIC COMPOSITION | Originate from the same fertilized egg and fertilizes by the same sperm so they share the same DNA. | Originate from two fertilized eggs and fertilized by two sperms so they do not share the same DNA. |
| PLACENTA, AMNIOTIC SAC AND CHORION | Zygotes only share the outer layer of the amniotic sac and have the two placentas but changes if divided within 4-8 days. | Have a separate placenta, amniotic sac and chorion. |
| CAUSE | Due to the random splitting of the zygote into two embryos. | Due to two separate eggs fertilized by two sperms. |
| GENDER | Same gender.  | Can be different or the same gender. |
| APPEARANCE | Have almost the same appearance. | May have the same or different appearance. |
| CHARACTERISTICS | Have the chance for the same characters, developments, etc. | Don’t have the same characters, developments, etc. |