

Name: Pepple, Bietonye Apiafi

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Embryology Assignment

1. Discuss ovulation.

Ovulation is the release of the secondary oocyte from the ovarian follicle. A few days before ovulation, under the influence of Follicle Stimulating Hormone (FSH) and luteinizing Hormone (LH), the secondary follicle grows rapidly to a diameter of about 25mm to become a graafian follicle.

Ovulation is triggered by the LH surge.

Due to the abrupt increase in LH:

1. Meiosis 1 is completed
2. The follicle enters the pre-ovulatory mature vesicular stage

Meiosis 2 is initiated, the secondary oocyte is arrested in metaphase 2. Which is approximately 3 hours before ovulation, it is arrested by cytostatic factor.

In the meantime, the surface of the ovary begins to bulge locally to form an avascular stigma at its apex.

The LH surge helps in the release of the oocytes.

FOR THE OOCYTE TO BE RELEASED:

1. There would be an increase in collagenase activity, resulting in digestion of collagen fibers (connective tissue) surrounding the follicle.
2. Prostaglandin levels also increase in response to the LH surge and cause local muscle contraction in the ovarian wall. The contractions extrude the oocyte alongside the follicular (granulosa) cells from the region of the cumulus oophorus.

This causes OVULATION, in which the oocyte floats out of the ovary.

Some of the cumulus oophorus cells then rearrange themselves around the zona pellucida to form the corona radiata.

After Ovulation, the corpus luteum is formed (pregnancy or menstruation)

CLINICAL CORRELATES

Abdominal pain during ovulation is called mittelschmerz or middle pain

SIGNS OF OVULATION

1. Changes in cervical mucus
 2. Increased libido / urge for sex
 3. Tenderness of breasts
 4. Swollen Vulva
- Better symptoms, such as the slight drop in basal body temperature (temperature when the body is at rest). Close to ovulation, one may have a slight decline but after a while it would be followed by a sharp increase after ovulation.

Anovulation: failure to ovulate due to low concentration of Gonadotropin hormone.

Drugs can be administered to stimulate gonadotropin, the drugs increase the risk of multiple pregnancy 10 times

2. Differentiate between meiosis 1 and meiosis 2

S/N	MEIOSIS 1	MEIOSIS 2
1.	Homologous Chromosomes separate	Sister chromatids separate
2.	2 daughter cells are formed	4 daughter cells are formed
3.	There is crossing over(genetic recombination)	No crossing over occurs
4.	Synapsis is present	Synapsis is absent
5.	There is chiasma formation	There is no chiasma formation
6.	Diploid daughter cells are formed	Haploid daughter cells are formed

3. Discuss the stages involved in fertilization

Fertilization refers to the union of the sperm and oocyte at the ampulla, Fertilization takes approximately 24 hours. It is the first thing that occurs in the first week of human development.

There are 6 stages involved in fertilization

1. Passage through the corona Radiata: the corona radiata is the first gate the sperm passes through, first it must be capacitated (glycoprotein coat and seminal plasma proteins are removed from the plasma membrane that overlies the sperm's acrosomal region)
2. Penetration of the zona pellucida: the sperm proceeds to the zona pellucida. The binding sites on the zona pellucida has receptors that help the acrosome bind to it. The acrosome then releases acrosine (a lysine enzyme) to enable it pass through the zona pellucida. When the sperm reaches the plasma membrane, the cortical granules are released to prevent the passage of other sperm (block to polyspermy)
3. Fusion of the plasma membrane of the sperm and oocyte: the region of the head (no acrosome and cell membrane) and the tail minus the plasma membrane would enter the cytoplasm of the oocyte, leaving behind the plasma membrane.
4. Completion of the 2nd meiotic division and the formation of the female pro-nucleus: once the sperm enters the cytoplasm, the 2nd meiotic division is completed. The structures needed for fertilization are the nuclei only. The female nucleus becomes the female pro-nucleus.
5. Formation of the male pro-nucleus: The tail would degenerate and nucleus in the head would enlarge to form the male pro-nucleus.
6. Formation of the zygote: The 2 pro-nuclei would fuse to form an ootid which would in turn form a zygote.

4. Differentiate between monozygotic twins and dizygotic twins

S/N	Monozygotic twins	Dizygotic twins
1.	1 sperm	2 sperms
2.	1 oocyte	2 oocytes
3.	Genetically identical	Genetically identical
4.	Look alike	Don't look alike
5.	Same sexes	Different sexes
6.	Same placenta	Different placentas
7.	Same chorionic sac	Different chorionic Sacs
8.	Same amniotic sac	Different amniotic sacs