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1. Briefly discuss the cyclic changes that occur in the following

CERVIX

Several hundred glands in the endocervix produce 20–60 mg of cervical mucus a day, increasing to 600 mg around the time of ovulation. It is viscous because it contains large proteins known as mucins. The viscosity and water content varies during the menstrual cycle, mucus is composed of around 93% water, reaching 98% at midcycle. These changes allow it to function either as a barrier or a transport medium to spermatozoa. It contains electrolytes such as calcium, sodium, and potassium; organic components such as glucose, amino acids, and soluble proteins; trace elements including zinc, copper, iron, manganese, and selenium; free fatty acids; enzymes such as amylase and prostaglandins. Its consistency is determined by the influence of the hormones estrogen and progesterone. At midcycle around the time of ovulation a period of high estrogen levels—the mucus is thin and serous to allow sperm to enter the uterus and is more alkaline and hence more hospitable to sperm. It is also higher in electrolytes, which results in the "ferning" pattern that can be observed in drying mucus under low magnification; as the mucus dries, the salts crystallize, resembling the leaves of a fern. The mucus has a stretchy character described as Spinnbarkeit most prominent around the time of ovulation.

At other times in the cycle, the mucus is thick and more acidic due to the effects of progesterone. This "infertile" mucus acts as a barrier to keep sperm from entering the uterus. Women taking an oral contraceptives pill also have thick mucus from the effects of progesterone. Thick mucus also prevents pathogens from interfering with a nascent pregnancy.

A cervical mucus plug called the operculum, forms inside the cervical canal during pregnancy. This provides a protective seal for the uterus against the entry of pathogens and against leakage of uterine fluids. The mucus plug is also known to have antibacterial properties. This plug is released as the cervix dilates, either during the first stage of childbirth or shortly before. It is visible as a blood-tinged mucous discharge.

BREAST

Each month, women go through changes in the hormones that make up the normal menstrual cycle. The hormone estrogen is produced by the ovaries in the first half of the menstrual cycle. It stimulates the growth of milk ducts in the breasts. The increasing level of estrogen leads to ovulation halfway through the cycle. Next, the hormone progesterone takes over in the second half of the cycle. It stimulates the formation of the milk glands. These hormones are believed to be responsible for the cyclical changes that many women feel in their breasts just before menstruation. These include swelling, pain, and soreness.

During menstruation, many women also have changes in breast texture. Their breasts may feel very lumpy. This is because the glands in the breast are enlarging to get ready for a possible pregnancy. If pregnancy does not happen, the breasts go back to normal size. Once menstruation starts, the cycle begins again.

2. Explicate the hormonal regulation of the menstrual cycle.

HORMONAL REGULATION OF THE MENSTRUAL CYCLE

The menstrual cycle is regulated by hormones. Luteinizing hormone and follicle-stimulating hormone, which are produced by the pituitary gland, promote ovulation and stimulate the ovaries to produce estrogen and progesterone. Estrogen and progesterone stimulate the uterus and breasts to prepare for possible fertilization.

The menstrual cycle has three phases:

- Follicular (before release of the egg)
- Ovulatory (egg release)
- Luteal (after egg release)

The menstrual cycle is regulated by the complex interaction of hormones: luteinizing hormone, follicle-stimulating hormone, and the female sex hormones estrogen and progesterone.

The menstrual cycle has three phases:

- Follicular (before release of the egg)
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- Luteal (after egg release)

The menstrual cycle begins with

menstrual bleeding (menstruation), which marks the first day of the follicular phase.

When the follicular phase begins, levels of estrogen and progesterone are low. As a result, the top layers of the thickened lining of the uterus (endometrium) break down and are shed, and menstrual bleeding occurs. About this time, the follicle-stimulating hormone level increases slightly, stimulating the development of several follicles in the ovaries. Each follicle contains an egg. Later in this phase, as the follicle-stimulating hormone level decreases, only one follicle continues to develop. This follicle produces estrogen.

The ovulatory phase begins with a surge in luteinizing hormone and follicle-stimulating hormone levels. Luteinizing hormone stimulates egg release (ovulation), which usually occurs 16 to 32 hours after the surge begins. The estrogen level decreases during the surge, and the progesterone level starts to increase.

During the luteal phase, luteinizing hormone and follicle-stimulating hormone levels decrease. The ruptured follicle closes after releasing the egg and forms a corpus luteum, which produces progesterone. During most of this phase, the estrogen level is high. Progesterone and estrogen cause the lining of the uterus to thicken more, to prepare for possible fertilization.

If the egg is not fertilized, the corpus luteum degenerates and no longer produces progesterone, the estrogen level decreases, the top layers of the lining break down and are shed, and menstrual bleeding occurs (the start of a new menstrual cycle).

If the egg is fertilized, the corpus luteum continues to function during early pregnancy. It helps maintain the pregnancy.