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**Question**

**Briefly discuss the CYCLIC CHANGES in any two of the following:**

**a) CERVIX** (**b) VAGINA**         (**c) BREASTS**

**Explicate any one of the following:**

**1) Menstrual cycle**

**2) Hormonal regulation of the menstrual cycle**

Answer

C) BREASTS

CYCLIC CHANGES THAT OCCUR IN THE BREAST DURING MENSTRUAL CYCLE

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.

CYCLIC CHANGES THAT OCCUR TO THE BREASTS DURING PREGNANCY AND MILK PRODUCTION

The breasts are not fully mature until a woman has given birth and made milk. Breast changes are one of the earliest signs of pregnancy. This is a result of the hormone progesterone. In addition, the dark areas of skin around the nipples (the areolas) begin to swell. This is followed by the rapid swelling of the breasts themselves. Most pregnant women feel soreness down the sides of the breasts, and nipple tingling or soreness. This is because of the growth of the milk duct system and the formation of many more lobules.

By the fifth or sixth month of pregnancy, the breasts are fully capable of producing milk. As in puberty, estrogen controls the growth of the ducts, and progesterone controls the growth of the glandular buds. Many other hormones also play vital roles in milk production. These include follicle-stimulating hormone (FSH), luteinizing hormone (LH), prolactin, oxytocin, and human placental lactogen (HPL).

Other physical changes happen as well. These include the blood vessels in the breast becoming more visible and the areola getting larger and darker. All of these changes are in preparation for breastfeeding the baby after birth.

CYCLIC CHANGES THAT OCCUR IN THE BREASTS DURING MENOPAUSE

By the time a woman reaches her late 40s and early 50s, perimenopause is starting or is well underway. At this time, the levels of estrogen and progesterone begin to change. Estrogen levels dramatically decrease. This leads to many of the symptoms commonly linked to menopause. Without estrogen, the breast’s connective tissue becomes dehydrated and is no longer elastic. The breast tissue, which was prepared to make milk, shrinks and loses shape. This leads to the "saggy" breasts associated with women of this age.

Women who are taking hormone therapy may have some of the premenstrual breast symptoms that they had while they were still menstruating, such as soreness and swelling. But if a woman’s breasts were saggy before menopause, this will not change with hormone therapy.

B) VAGINA

The vagina and vulva of the ferret undergo well‐marked cyclical changes in correlation with those of the ovaries and uterus.

During the anœstrum the vulva is small and the connective tissue of which it is mainly composed is compact. The vagina during this period is lined by a low columnar epithelium consisting of only two or three rows of cells and without a cornified layer.

During the pro‐œstrum and œstrus the vulva swells up to about fifty times its anœstrous size, the submucous connective tissue becoming spongy and the nuclei of the cells widely separated. The vaginal epithelium is several layers in thickness, and in the deeper part the cells become high and squamous. There is a pronounced cornified layer. Later, during cestrus, the cornified layer begins to slough, the process being continued over some time. The entire period represents the “follicular stage” of LOEB and other authors, and is presumably brought about by the action of œstrin. The vulval swelling serves the purpose of facilitating effective copulation which in the ferret is very prolonged.

During pregnancy and pseudo‐pregnancy (the latter condition in the ferret only occurring under experimental conditions as after copulation with a vasectomised male) the vulva is reduced to its ancestrous size. The reduction is accompanied by lymphoid degeneration and an invasion of leucocytes. The vaginal epithelium becomes reduced to a low columnar or cubical structure. There is no cornified layer, this being completely shed during œstrus. This period clearly represents the “luteal phase” in the ovarian cycle.

It is to be noted that the vulval swelling and other characteristics of the follicular stage terminate with ovulation just as does the swelling of the sexual skin in the Primate, as described by ZUCKERMAN and PARKES.

The description of the changes here recorded are in general agreeument with the observations by PARKES (1930) on the vaginal smear at different stages of the cycle in the ferret.

The vaginal cycle in the ferret is in a general way similar to that of the dog, as described by EVANS and COLE. It may be again remarked, however, that pseudo‐pregnancy only occurs under experimental conditions in the ferret, yet under the influence of pro‐gestin secreted by the corpus luteum the vagina and vulva undergo similar changes during both pregnancy and pseudo‐pregnancy.

1. MENSTRUAL CYCLE

The menstrual cycle is complex and is controlled by many different glands and the hormones that these glands produce. A brain structure called the hypothalamus causes the nearby pituitary gland to produce certain chemicals, which prompt the ovaries to produce the sex hormones oestrogen and progesterone.

The menstrual cycle is a biofeedback system, which means each structure and gland is affected by the activity of the others.

## Phases of the menstrual cycle

The four main phases of the menstrual cycle are:

* menstruation
* the follicular phase
* ovulation
* the luteal phase.

### Menstruation

Menstruation is the elimination of the thickened lining of the uterus (endometrium) from the body through the vagina. Menstrual fluid contains blood, cells from the lining of the uterus (endometrial cells) and mucus. The average length of a period is between three days and one week.

Sanitary pads or tampons are used to absorb the menstrual flow. Both pads and tampons need to be changed regularly (at least every four hours). Using tampons has been associated with an increased risk of a rare illness called toxic shock syndrome(TSS).

### Follicular phase

The follicular phase starts on the first day of menstruation and ends with ovulation. Prompted by the hypothalamus, the pituitary gland releases follicle stimulating hormone (FSH). This hormone stimulates the ovary to produce around five to 20 follicles (tiny nodules or cysts), which bead on the surface.

Each follicle houses an immature egg. Usually, only one follicle will mature into an egg, while the others die. This can occur around day 10 of a 28-day cycle. The growth of the follicles stimulates the lining of the uterus to thicken in preparation for possible pregnancy.

### Ovulation

Ovulation is the release of a mature egg from the surface of the ovary. This usually occurs mid-cycle, around two weeks or so before menstruation starts.

During the follicular phase, the developing follicle causes a rise in the level of oestrogen. The hypothalamus in the brain recognises these rising levels and releases a chemical called gonadotrophin-releasing hormone (GnRH). This hormone prompts the pituitary gland to produce raised levels of luteinising hormone (LH) and FSH.

Within two days, ovulation is triggered by the high levels of LH. The egg is funnelled into the fallopian tube and toward the uterus by waves of small, hair-like projections. The life span of the typical egg is only around 24 hours. Unless it meets a sperm during this time, it will die.

When you want to have a baby you can improve your chance of getting pregnant if you know about ovulation and the ‘fertile window’ in the menstrual cycle.

### Luteal phase

During ovulation, the egg bursts from its follicle, but the ruptured follicle stays on the surface of the ovary. For the next two weeks or so, the follicle transforms into a structure known as the corpus luteum. This structure starts releasing progesterone, along with small amounts of oestrogen. This combination of hormones maintains the thickened lining of the uterus, waiting for a fertilised egg to stick (implant).

If a fertilised egg implants in the lining of the uterus, it produces the hormones that are necessary to maintain the corpus luteum. This includes human chorionic gonadotrophin (HCG), the hormone that is detected in a urine test for pregnancy. The corpus luteum keeps producing the raised levels of progesterone that are needed to maintain the thickened lining of the uterus.

If pregnancy does not occur, the corpus luteum withers and dies, usually around day 22 in a 28-day cycle. The drop in progesterone levels causes the lining of the uterus to fall away. This is known as menstruation. The cycle then repeats.

## Common menstrual problems

Some of the more common menstrual problems include:

* premenstrual syndrome – hormonal events before a period can trigger a range of side effects in women at risk, including fluid retention, headaches, fatigue and irritability. Treatment options include exercise and dietary changes
* dysmenorrhoea – or painful periods. It is thought that the uterus is prompted by certain hormones to squeeze harder than necessary to dislodge its lining. Treatment options include pain-relieving medication and the oral contraceptive pill
* Heavy menstrual bleeding (previously known as menorrhagia) – if left untreated, this can cause anaemia. Treatment options include oral contraceptives and a hormonal intrauterine device (IUD) to regulate the flow
* amenorrhoea – or absence of menstrual periods. This is considered abnormal, except during pre-puberty, pregnancy, lactation and postmenopause. Possible causes include low or high body weight and excessive exercise.

1. Hormonal regulation of the menstrual cycle

The menstrual cycle is regulated by the coordinated functions of the hypothalamus, pituitary, ovaries, and endometrium. The pulsatile secretion of gonadotrophin-releasing hormone from the hypothalamus stimulates the anterior pituitary to secrete follicle-stimulating hormone (FSH) and luteinizing hormone (LH), which in turn stimulates the development of ovarian follicles and the production of ovarian steroids. A negative feedback mechanism is crucial for its control and regulation. During the follicular phase, the recruited follicle prepares for ovulation. After the LH surge and ovulation, the luteal phase begins. The follicular and luteal phases correspond to the proliferative and secretory phases of the endometrium, which develops during the proliferative phase and is maintained during the secretory phase to prepare for implantation of the fertilized embryo. The endometrium is shed during menses in the early follicular/proliferative phase, and the cycle continues.