**NAME: UMUTEME EFEMENA FAVOUR**

**DEPARTMENT: NURSING**

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**ASSIGNMENT**

1 Briefly discuss the cyclic changes in any of the following:

1. Cervix
2. Vagina
3. Breasts

**CYCLIC CHANGES OF THE VAGINA.**

The **vaginal epithelium** is the inner lining of the vagina consisting of multiple layers of (squamous) cells. The basal membrane provides the support for the first layer of the epithelium-the basal layer. The intermediate layers lie upon the basal layer and the superficial layer is the outermost layer of the epithelium. Anatomists have described the epithelium as consisting of as many as 40 distinct layers. The mucus found on the epithelium is secreted by the cervix and uterus. The rugae of the epithelium create an involuted surface and result in a large surface area that covers 360 cm³ This large surface area allows the trans-epithelial absorption of some medications via the vaginal route.

In the course of the reproductive cycle, the vaginal epithelium is subject to normal, cyclic changes, that are influenced by estrogen: with increasing circulating levels of the hormone, there is proliferation of epithelial cells along with an increase in the number of cell layers. As cells proliferate and mature, they undergo partial cornification. Although hormone induced changes occur in the other tissues and organs of the female reproductive system, the vaginal epithelium is more sensitive and its structure is an indicator of estrogen levels. Some Langerhans cells and melanocytes are also present in the epithelium.

The epithelium of the ectocervix is contiguous with that of the vagina, possessing the same properties and function. The vaginal epithelium is divided into layers of cells, including the basal cells, the parabasal cells, the superficial squamous flat cells, and the intermediate cells. The superficial cells exfoliate continuously and basal cells replace the superficial cells that die and slough off from the stratum corneum. Under the stratus corneum is the stratum granulosum and stratum spinosum. The cells of the vaginal epithelium retain a usually high level of glycogen compared to other epithelial tissue in the body. The surface patterns on the cells themselves are circular and arranged in longitudinal rows. The epithelial cells of the uterus possess some of the same characteristics of the vaginal epithelium.

**CYCLIC CHANGES OF THE BREASTS.**

The master regulators of breast development are the steroid hormones, estrogen and progesterone, growth hormone (GH), mostly via its secretory product, insulin-like growth factor 1 (IGF-1), and prolactin. These regulators induce the expression of growth factors, such as amphiregulin, epidermal growth factor (EGF), IGF-1, and fibroblast growth factor (FGF), which in turn have specific roles in breast growth and maturation.

At puberty, gonadotropin-releasing hormone (GnRH) is secreted in a pulsatile manner from the hypothalamus. GnRH induces the secretion of the gonadotropins, follicle-stimulating hormone (FSH) and luteinizing hormone (LH), from the pituitary gland. The secreted gonadotropins travel through the bloodstream to the ovaries and trigger the secretion of estrogen and progesterone in fluctuating amounts during each menstrual cycle. Growth hormone (GH), which is secreted from the pituitary gland, and insulin-like growth factor 1 (IGF-1), which is produced in the body in response to GH, are growth-mediating hormones. During prenatal development, infancy, and childhood, GH and IGF-1 levels are low, but progressively increase and reach a peak at puberty, with a 1.5- to 3-fold increase in pulsatile GH secretion and a 3-fold or greater increase in serum IGF-1 levels being capable of occurring at this time. In late adolescence and early adulthood, GH and IGF-1 levels significantly decrease, and continue to decrease throughout the rest of life. It has been found that both estrogen and GH are essential for breast development at puberty – in the absence of either, no development will take place. Moreover, most of the role of GH in breast development has been found to be mediated by its induction of IGF-1 production and secretion, as IGF-1 administration rescues breast development in the absence of GH. induction of IGF-1 production and secretion occurs in almost all types of tissue in the body, but especially in the liver, which is the source of approximately 80% of circulating IGF-1, as well as locally in the breasts. Although IGF-1 is responsible for most of the role of GH in mediating breast development, GH itself has been found to play a direct, augmenting role as well, as it increases estrogen receptor (ER) expression in breast stromal (connective) tissue, while IGF-1, in contrast, has been found to not do this. In addition to estrogen and GH/IGF-1 both being essential for pubertal breast development, they are synergistic in bringing it about.

Despite the apparent necessity of GH/IGF-1 signaling in pubertal breast development however, women with Laron syndrome, in whom the growth hormone receptor (GHR) is defective and insensitive to GH and serum IGF-1 levels are very low, puberty, including breast development, is delayed, although full sexual maturity is always eventually reached. Moreover, breast development and size are normal (albeit delayed) in spite of GH/IGF-1 axis insufficiency, and in some the breasts may actually be large in relation to body size. The relatively large breasts in women with Laron syndrome have been suggested to be due to increased secretion of prolactin (which is known to produce breast enlargement) caused by a drift phenomenon from somatomammotrophic cells in the pituitary gland with a high GH secretion. An animal model of Laron syndrome, the GHR knockout mouse, shows severely impaired ductal outgrowth at 11 weeks of age. However, by 15 weeks, ductal development has caught up with that of normal mice and the ducts have fully distributed throughout the mammary fat pad, although the ducts remain narrower than those of wild-type mice. In any case, female GHR knockout mice can lactate normally. As such, it has been said that the phenotypes of women with Laron syndrome and GHR knockout mice are identical, with diminished body size and delayed sexual maturation accompanied by normal lactation. These data indicate that very low circulating levels of IGF-1 can nonetheless allow for full pubertal breast development.

2 Explicate any one of the following

1. Menstrual cycle
2. 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.

FSH is secreted in greatest amount in the first half of the menstrual cycle, and LH has its peak of secretion at mid-cycle. It is believed that the sequential action of FSH and LH causes ripening of the follicle and ovulation. In some animals LTH is necessary for maintenance of the corpus luteum, but in women under treatment for infertility ovulation has been successfully induced with FSH and LH alone. Multiple births, as the result of multiple ovulation, have occurred after excessive doses of FSH have been given.

The pituitary gland stimulates the ovary to produce estrogens and progesterone, but there is a “negative feedback” by which the estrogens inhibit the output of FSH from the pituitary gland (and probably stimulate the output of LH). In addition, progesterone is believed to inhibit the further output of LH. In this process, in which the pituitary first stimulates the ovary, and the ovary then inhibits the pituitary, the basic rhythm is under the control of the hypothalamus; nevertheless, ovulation can be inhibited by oral contraceptives, which contain estrogens and progestogens—modifications of progesterone.

The anterior lobe of the pituitary gland is connected by its stalk to the hypothalamic region of the brain. The anterior lobe secretes many important hormones, including those that control the activity of the adrenal and thyroid glands, the growth hormone, and the gonadotropic hormones. From the hypothalamus substances are carried in the veins in the pituitary stalk that cause release of hormones from the pituitary, including FSH and LH, but also a factor that inhibits release of LTH. The higher brain centres no doubt affect the hypothalamic function; this explains the temporary disturbances of menstruation that may follow emotional stress.