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CYCLIC CHANGES OF THE CERVIX.

The cervix changes position several times throughout the menstrual cycle. The cervix may rise alongside ovulation to prepare for conception or lower to allow menstrual tissue to pass through the vagina. Each change in positon is tied to a particular phase in the menstrual cycle or hormonal change. During menstruation, the cervix is typically open which allows menstrual blood and uterine tissue to leave the female body.

Several glands in the endocervix produce about 20-60mg of cervical mucus a day, which increases to about 600mg around the time of ovulation. These cervical mucus contains large proteins called mucins which makes them viscous. The viscosity and water content varies during the menstrual cycle, these changes allows the cervix to function as a barrier or transport medium spermatozoa. The cervical mucus contains electrolytes, organic components and soluble proteins, enzymes and prostaglandins. Its consistency is determined by the influence of the hormone estrogen and progesterone. During ovulation, which is a period of high estrogen levels the mucus is thin and serous. It is also high in electrolytes. Sometimes the mucus is thick and more acidic due to effects of progesterone.

A cervical mucus plug forms inside the cervical canal during pregnancy. The mucus plug also have antibacterial properties. The plug is released as the cervix, it is visible as a blood-tinged mucous discharge.

CYCLIC CHANGES OF THE BREAST

Hormones are responsible for the changes women may experience in their breats just before or during menstruation. These may include swelling, pain, soreness and in some cases changes in breast texture. The relationship between the menstrual stage and cyclic changes in the structure of the breast represents the effects of ovarian steroid activity on the cellular physiology of an endocrine sensitive organ.

Every month women go through series of hormonal changes that make up the menstrual cycle. The hormone estrogen produced by the ovaries in the first half of

the menstrual cycle stimulates the growth of milk ducts in the breast. The hormone progesterone is responsible in the second half of the cycle for the stimulation of the formation of the milk glands. The change in texture of the breasts which may lead to a lumpy feel of the breast may be as a result of the breast enlarging to get ready for a possible pregnancy. When this pregnancy does not happen, the breast returns back to its normal size. At the beginning of menstruation, the cyclic changes begins again.

MENSTRUAL CYCLE

Menstruation occurs on a monthly cycle throughout female reproductive life. Menarche (the first menstrual cycle) normally occurs between the ages of 11 and 15 and the menopause between the ages of 45 and 55. The normal duration of a single cycle is 21-35 days. In this article we will focus on the reproductive hormones, the ovarian cycle and the uterine cycle.

The Hypothalamic-Pituitary-Gonadal (HPG) Axis

The hypothalamus, anterior pituitary gland and gonads (ovaries) work together to regulate the menstrual cycle. Gonadotropin releasing hormone (GnRH) from the hypothalamus stimulates luteinising hormone (LH) and follicular stimulating hormone (FSH) release from the anterior pituitary gland. LH and FSH are gonadotropins that act primarily on the ovaries in the female reproductive tract:

FSH binds to granulosa cells to stimulate follicle growth, permit the conversion of androgens (from theca cells) to oestrogens and stimulate inhibin secretion

LH acts on theca cells to stimulate production and secretion of androgens

The menstrual cycle is controlled by feedback systems:

Moderate oestrogen levels: negative feedback on the HPG axis

High oestrogen levels (in the absence of progesterone): positively feedback on the HPG axis

Oestrogen in the presence of progesterone: negative feedback on the HPG axis

Inhibin: selectively inhibits FSH at the anterior pituitary

The Ovarian Cycle

Follicular Phase

The follicular phase marks the beginning of a new cycle as follicles (oocytes surrounded by stromal cells) begin to mature and prepare to release an oocyte.

At the start of a new cycle (menses) there is little ovarian hormone production and the follicle begins to develop independently of gonadotropins or ovarian steroids. Due to the low steroid and inhibin levels, there is little negative feedback at the HPG axis resulting in an increase in FSH and LH levels. These stimulate follicle growth and oestrogen production.

Only one dominant follicle can continue to maturity and complete each menstrual cycle. As oestrogen levels rise, negative feedback reduces FSH levels, and only one follicle can survive, with the other follicles forming polar bodies.

Follicular oestrogen eventually becomes high enough to initiate positive feedback at the HPG axis, increasing levels of GnRH and gonadotropins. However, the effect is only reflected in LH levels (the LH surge) due to the increased follicular inhibin, selectively inhibiting FSH production at the anterior pituitary. Granulosa cells become luteinised and express receptors for LH.

Ovulation

In response to the LH surge, the follicle ruptures and the mature oocyte is assisted to the fallopian tube by fimbria. Here it remains viable for fertilisation for around 24 hours.

Following ovulation, the follicle remains luteinised, secreting oestrogen and now also progesterone, reverting back to negative feedback on the HPG axis. This, together with inhibin (inhibits FSH) stalls the cycle in anticipation of fertilisation.

Luteal Phase

The corpus luteum is the tissue in the ovary that forms at the site of a ruptured follicle following ovulation. It produces oestrogens, progesterone and inhibin to maintain conditions for fertilisation and implantation.

At the end of the cycle, in the absence of fertilisation, the corpus luteum spontaneously regresses after 14 days. There is a significant fall in hormones, relieving negative feedback, resetting the HPG axis ready to begin the cycle again.

If fertilisation occurs, the syncytiotrophoblast of the embryo produces human chorionic gonadotropin (HcG), exerting a luteinising effect, maintaining the corpus luteum. It is supported by placental HcG and it produces hormones to support the pregnancy. At around 4 months of gestation, the placenta is capable of production of sufficient steroid hormone to control the HPG axis.