The Female Menstrual Cycle

The **female menstrual cycle** is a complex event. It begins on the day of the menarche (first occurrence of menstruation/period), generally when the girl is around 11 or 12 years of age. It normally recurs in a regular rhythm until menopause, which usually happens to women over 45 years old.

The menstrual cycle is characterised by the functional synergy of the hormones, secreted by the body organs outlined below.

Hypothalamus
The hypothalamus is part of the diencephalon (interbrain), and serves the purpose of being the highest control system of the body. It regulates bodily functions such as breathing, circulation, fluid and food intake, as well as sexual behaviour. Due to this, a great number of hormones are distributed around the body, of which the Gonadotropin-Releasing-Hormone (GnRH) influences the menstrual cycle the most.

Pituitary
The hypophysis (pituitary gland) is a pea-sized structure located at the base of the brain, and is directly controlled by the hypothalamus, which lies above it. The pituitary gland is responsible for distributing the luteinising hormone (LH) and the follicle stimulating hormone (FSH).

Ovarian Hormones
The most significant hormones produced by the ovaries are oestradiol (most important oestrogen) and gestagens (progesterone).

In order to comprehend the complexity of the female menstrual cycle, knowledge of the effects of the individual hormones is essential, and given in more detail below.

Oestrogen
Oestrogen promotes the formation of the female secondary sexual characteristics, such as breast development and the distribution of female fatty tissue, especially in places like the buttocks, thighs and hips. In cooperation with androgens, pubic hair also emerges. Oestrogen has a positive growth-enhancing effect on vaginal epithelial cells, and is required for a healthy vaginal flora.

Follicle Stimulating Hormone (FSH)
FSH - also called follitropin - facilitates follicular growth and female oestrogen production, with the help of luteinising hormone (LH).

Luteinising Hormone (LH)
Together with FSH, luteinising hormone – also known as luteotropin – facilitates both follicle and oocyte maturation, as well as triggering ovulation. LH also takes part in the synthesis of oestrogen and progesterone.

Progesterone
Progesterone prepares the uterine environment for pregnancy. It is produced by the corpus luteum (hormone-secreting structure) after ovulation, and promotes growth of the female breasts. Additional roles of progesterone include the constriction of the uterine orifice and the cervix, as well as the reduction of tubal motility.

The female menstrual cycle serves the purpose of the continuous and recurring possibility of fertilisation – a pregnancy respectively – by the development of a mature oocyte, which can embed into the endometrium when fertilised.

Female’s oocytes have already made important developmental steps over the course of oogenesis (development/production of an ovum), which starts in the embryonic phase of life. During puberty,

especially with fertilisation, cell division is completed.

The menstrual cycle lasts approximately 28 days, counting from the first day of the menstrual bleeding (period).

The menstrual cycle consists of four phases:

- Follicular Phase
- Ovulation
- Luteal Phase
- Menstruation

Follicular Phase
The follicular phase is dominated by a rising FSH level in the blood. This hormone stimulates the so-called ‘dominant follicle’, which is furthest in development, and produces its enhanced growth.

Ovulation
Ovulation normally occurs between day 13 and day 15 of the menstrual cycle. Oestrogen production increases due to the follicular growth, and subsequently, LH is released. LH then causes ovulation and induces the development of the corpus luteum.

Luteal Phase
After the release of the oocyte, the follicle is transformed into the corpus luteum. Under the influence of LH, the luteal cells produce progesterone, which prepares the uterus for the nidation (implantation) of the fertilised oocyte.

If nidation of the oocyte doesn’t take place, the corpus luteum will degenerate around the 26th day of the menstrual cycle. This is naturally followed by the endometrium shedding and menstruation beginning.