

The Ovarian Cycle

It begins with the release of the hypothalamus of GnRH or gonadotropin-releasing hormone, which stimulates the pituitary to secrete small amounts of FSH and LH. FSH stimulates follicles growth, aided by luteinizing hormone and the cells of the follicle start to make oestrogen.

There is a slow rise of oestrogen secreted during the **follicular phase**, where the follicles are growing and oocytes are maturing. The low level of oestrogen inhibits secretion of the pituitary hormones, keeping FSH and LH levels low. These shoot up when the secretion of the oestrogen by the growing follicle rises sharply.

The high level of oestrogen stimulates the secretion of the gonadotropins by acting on the hypothalamus to increase the output of GnRH, which stimulates secretion of FSH and LH. LH secretion is especially high, because the high concentration of oestrogen increases the sensitivity of LH-releasing cells in the pituitary to GnRH.

LH induces **ovulation**. The follicle and adjacent wall of the ovary rupture, releasing the secondary oocyte. During the **luteal phase**, LH stimulates the transformation of the follicle into the corpus luteum, a glandular structure.

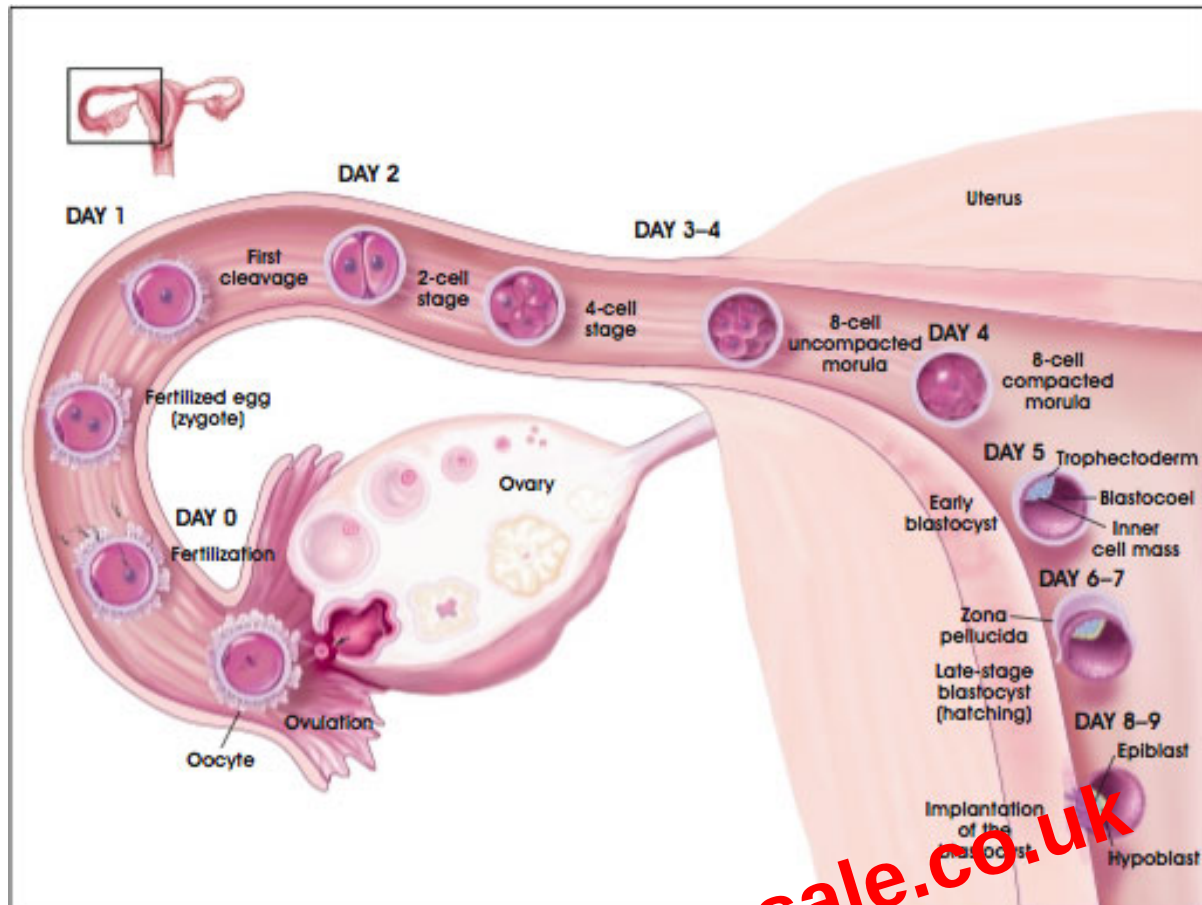
Under the continued stimulation by LH, the corpus luteum secretes progesterone and oestrogen. As these increase in level, they exert negative feedback on the hypothalamus and pituitary, inhibiting secretion of LH and FSH.

The corpus luteum disintegrates, causing concentrations of progesterone and oestrogen to decline. The pituitary and hypothalamus are liberated from the inhibitory effects. Therefore they begin to secrete FSH which stimulates the growth of new follicles, initiating the next ovarian cycle.

The Uterine/Menstrual Cycle

The follicular phase is coordinated with the **proliferative phase** of the menstrual cycle. Secretion of oestrogen during the follicular phase stimulates the endometrial to thicken. The oestrogen and progesterone in the luteal phase stimulate development and maintenance of the endometrium, including the enlargement of arteries and the growth of endometrial glands, which secrete a nutrient fluid that can sustain an early embryo before it implants in the uterine lining. Therefore they are also coordinated with the **secretory phase** of the uterine cycle.

When the corpus luteum disintegrates, it causes spasms in the uterine lining, depriving it of blood. The upper 2/3 of the endometrium disintegrates, resulting in menstruation of the **menstrual flow phase** of the uterine wall and the beginning of a new cycle, since ovarian follicles begin to grow.



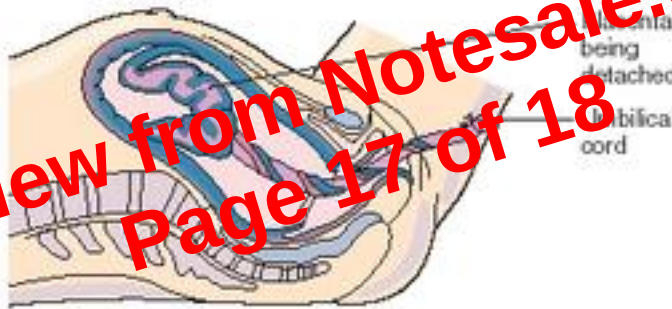
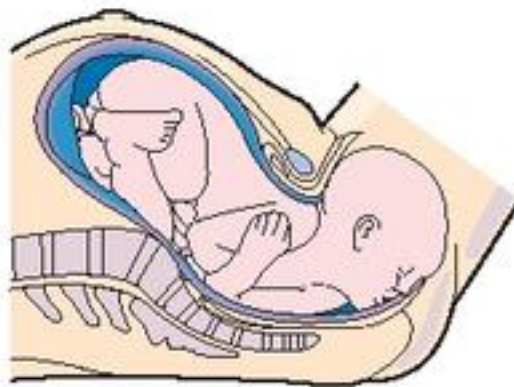
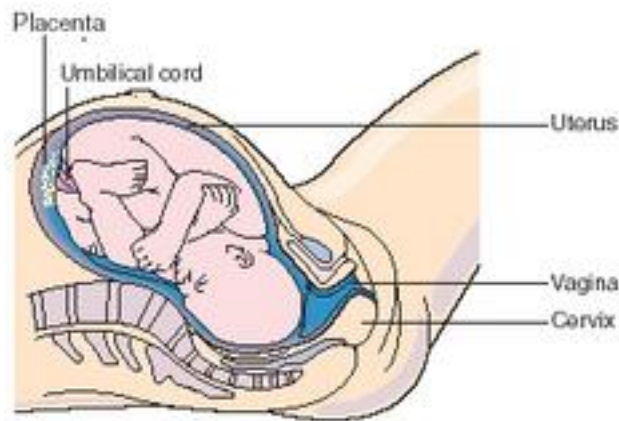
The embryo secretes hormones to signal its presence and control the mother's reproductive system. Human chorionic gonadotropin (HCG) acts like pituitary LH to maintain secretion of progesterone and oestrogen by the corpus luteum for the 1st week of pregnancy. Some is excreted in the urine, which gives a positive pregnancy test.

Human gestation is divided into three **trimesters** of three months each

1st trimester

The first 2-4 weeks of development, the embryo obtains nutrients from the endometrium. The outer layer of the blastocyst called the **trophoblast** invades the endometrium, eventually helping to form the placenta. This allows diffusion of material between maternal and embryonic circulations, providing nutrients, exchanging respiratory gases and disposing of metabolic wastes for the embryo.

Blood from the embryo travel to the placenta via the umbilical vein. The blood of the mother and embryo never mix since the mother has a higher blood pressure which would damage the fragile veins and the blood groups do not necessarily match.



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Lactation

After birth, decreasing levels of progesterone free the anterior pituitary from negative feedback and allow prolactin secretion. Prolactin stimulates milk production 2-3 days after birth. The release of milk from mammary glands is controlled by oxytocin.

Immune Tolerance

The trophoblast may inhibit a maternal immune response against the embryo by releasing signal molecules with immunosuppressive effects. These include HCG, a variety of protein factors, prostaglandins, several interleukins and an interferon.