

2.1. Hormonal regulation of the female reproductive cycle (Fig 2):

The menstrual and ovarian cycles are controlled by GnRH from the hypothalamus, which stimulates the release of FSH and LH by the anterior pituitary gland. FSH stimulates the initial development of ovarian follicles and secretion of estrogens by the ovaries. LH stimulates further development of ovarian follicles, ovulation, and the secretion of estrogens and progesterone by the ovaries. At least six different estrogens have been isolated from the plasma of human females, with three in significant quantities: beta-estradiol, estrone, and estriol. Estrogens have three main functions:

- Promotion of the development and maintenance of female reproductive structures, secondary sex characteristics, and the breasts.
- Regulation of fluid and electrolyte balance. Stimulation of protein synthesis.
- Moderate levels of estrogens in the blood inhibit the release of GnRH by the hypothalamus and secretion of LH and FSH by the anterior pituitary gland.

Progesterone works with estrogens to prepare the endometrium for implantation and the mammary glands for milk synthesis. A small quantity of relaxin is produced monthly to relax the uterus by inhibiting contractions (making it easier for a fertilized ovum to implant in the uterus). During pregnancy, relaxin relaxes the pubic symphysis and helps dilate the uterine cervix to facilitate delivery. Inhibin inhibits secretion of FSH and GnRH and, to a lesser extent, LH. It might be important in decreasing secretion of FSH and LH toward the end of the uterine cycle.

2.2. Phases of the Female Reproductive Cycle (Fig 2, A and B)

The female reproductive cycle may be divided into three phases:

- The menstrual cycle (menstruation) lasts for approximately the first 5 days of the cycle. During this phase, small secondary follicles in each ovary begin to develop. Also during this phase, the stratum functionalis layer of the endometrium is shed, discharging blood, tissue fluid, mucus, and epithelial cells.
- The preovulatory phase, or proliferative phase, is the time between menstruation and ovulation. This phase is more variable in length than the other phases, lasting from days 6-13 in a 28-day cycle.

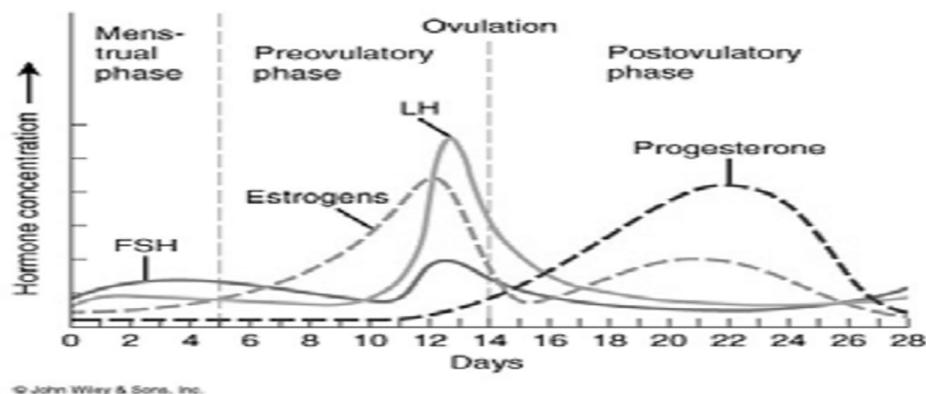


Fig 2.A. Phases of the Female Reproductive Cycle -Source: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission.

Ovulation is the rupture of the vesicular ovarian (Graafian) follicle with release of the secondary oocyte into the pelvic cavity, usually occurring on day 14 in a 28-day cycle.

- The postovulatory phase is the most constant in duration and lasts from days 15-28 in a 28-day cycle, the time between ovulation and onset of the next menstrual period. With reference to the ovaries, this phase of the cycle is also called the luteal phase, during which both estrogen and progesterone are secreted in large quantities by the corpus luteum. If fertilization and implantation do not occur, the corpus luteum degenerates and becomes the corpus albicans, or white body. The decreased secretion of progesterone and estrogens then initiates another menstrual phase (uterine and ovarian cycle). If fertilization and implantation do occur, the corpus luteum is maintained until the placenta takes over its hormone-producing function. During this time, the corpus luteum, maintained by human chorionic gonadotropin (hCG) from the developing placenta, secretes estrogens and progesterone to support pregnancy and breast development for lactation.

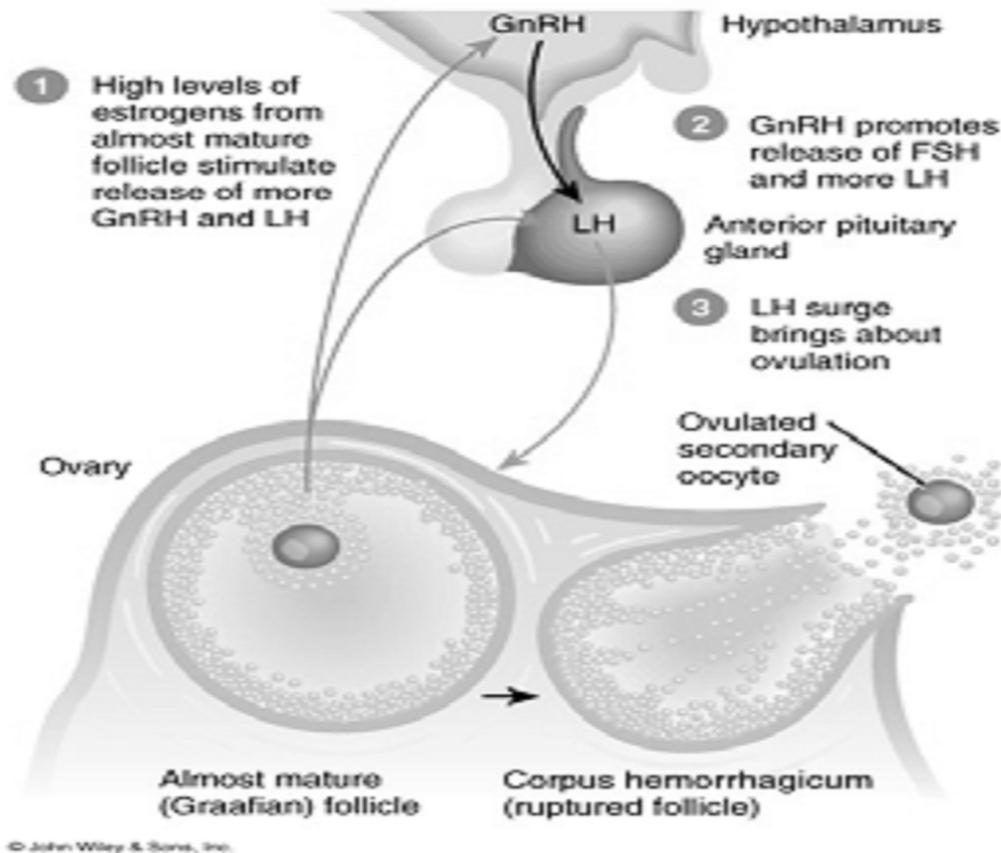


Fig.3.B. phases of female Reproductive cycle.

2.3. Aging of the reproductive system

Between the ages of 40 and 50 the ovaries become less responsive to the stimulation of gonadotropic hormones from the anterior pituitary. As a result, estrogen and progesterone production decline, and follicles do not undergo normal development. In addition to the symptoms of menopause, such as hot flashes, copious sweating, headache, vaginal dryness, depression, weight gain, and