Contraception

Physiology

The female menstrual cycle is divided into four functional phases:

- Follicular
- Ovulatory
- Luteal
- Menstrual

The follicular phase begins the cycle, and ovulation generally occurs around day 14. The luteal phase then begins and continues until menstruation occurs (see figure 1).

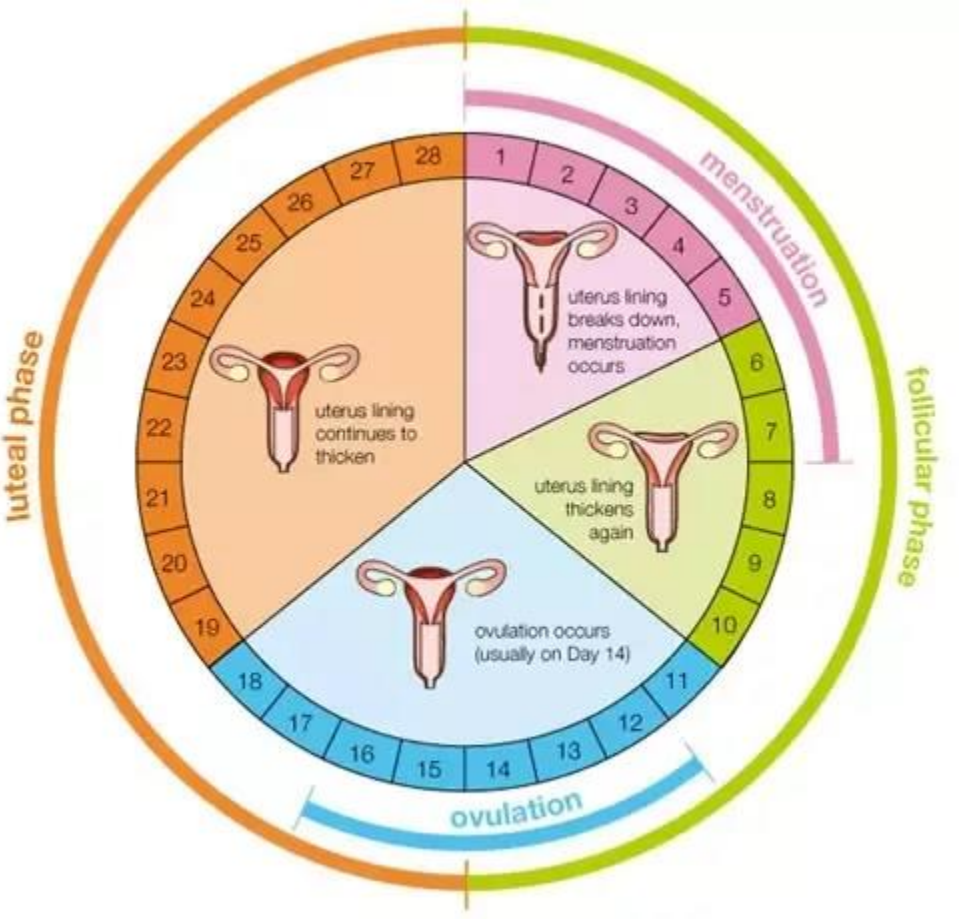

Figure 1: different phases of menstrual cycle

The menstrual cycle is regulated by a negative-feedback hormone loop between the hypothalamus, anterior pituitary gland, and ovaries.

Initially, the hypothalamus releases gonadotropin-releasing hormone (GnRH), which stimulates the anterior pituitary to produce follicle-stimulating hormone (FSH) and luteinizing hormone (LH).

The levels of FSH and LH released vary depending on the phase of the menstrual cycle. Just prior to ovulation, FSH and LH both are at their peak levels.

- The FSH helps to promote growth of the follicle in preparation for ovulation by causing granulosa cells lining the follicle to grow and produce estrogen.
- ***LH promotes androgen production by theca cells in the follicle, promotes ovulation and oocyte maturation, and converts granulosa cells to cells that secrete progesterone after ovulation.***

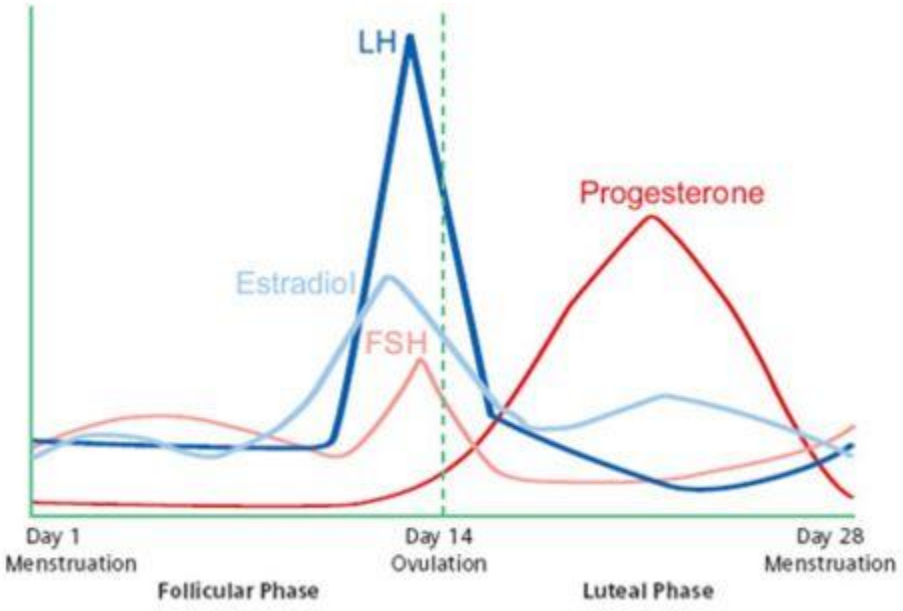

Figure 2: change in hormones during menstrual cycle

Conception is most likely to occur when viable sperm are present in the upper region of the reproductive tract at the time of ovulation.

Fertilization occurs when a spermatozoan penetrates an ovum. Approximately 6 to 8 days after ovulation, attachment of the early embryo to the lining of the uterine cavity—implantation—occurs.

PREVENTION OF PREGNANCY: CONTRACEPTIVES AND DEVICES

Goals of Contraception/Desired Outcome

The most common goal of contraception is ***the prevention of pregnancy***.

However, some patients use contraceptive methods for other benefits, such as:

- menstrual cycle regulation
- reduction of premenstrual symptoms
- treatment of acne

Choice of Contraceptives: Important Considerations

When helping a patient with contraceptive selection, **the most important goal** is finding an option the patient is comfortable with and the clinician feels is beneficial for the patient.

Fertility goals vary for each patient. It must be determined whether the goal is to:

- postpone conception
- space out the next pregnancy
- or avoid further pregnancy altogether

Oral Contraceptives (Combination)

COCs contain a synthetic **estrogen** and one of several steroids with **progestational** activity.

Most oral contraceptives contain one of three types of estrogen:

1. **ethinyl estradiol (EE)**, which is pharmacologically active
2. **mestranol**, which is converted by the liver to EE
3. **estradiol valerate**, which is metabolized to estradiol and valeric acid.

Many different progestins are found in the various oral contraceptives. These include:

1. norethindrone
2. norethindrone acetate
3. ethynodiol diacetate
4. norgestrel
5. levonorgestrel
6. desogestrel
7. norgestimate
8. drospirenone
9. dienogest

The **primary mechanism** by which COCs prevent pregnancy is through:

"inhibition of ovulation"

- FSH and LH regulate the production of estrogen and progesterone by the ovaries.
- Secretion of estrogen and progesterone by the ovaries occurs in a cyclic manner, which determines the regular hormonal changes that occur in the uterus, vagina, and cervix associated with the menstrual cycle.
- Cyclic changes in the levels of estrogen and progesterone in the blood, together with FSH and LH, modulate the development of ova and the occurrence of ovulation.

The estrogen component of COCs is most active in inhibiting FSH release. However, at sufficiently high doses, estrogens also may cause ***inhibition of LH release***.

In low-dose COCs, the progestin component causes suppression of LH.

Ovulation is prevented by this suppression of the midcycle surge of both FSH and LH and mimics the physiologic changes that occur during pregnancy.

Other mechanisms by which COCs prevent ovulation:

1. reduced penetration of the egg by sperm
2. reduced implantation of fertilized eggs
3. thickening of cervical mucus to prevent sperm penetration into the upper genital tract
4. slowed tubal motility, which may delay transport of sperm

In an attempt to minimize the undesirable androgenic side effects associated with the progestins of COCs, the original synthetic progestins were modified to create **"third generation" progestins** (eg, desogestrel and norgestimate), and **newer progestins with antiandrogenic properties** (eg, drospirenone) have been discovered.

Most traditional COCs are packaged as 21/7 cycles (ie, 21 days of active pills and 7 days of placebo).

Noncontraceptive Benefits of Combination Oral Contraceptives

1. Reduction in the Risk of Endometrial Cancer
2. Reduction in the Risk of Ovarian Cancer
3. Improved Regulation of Menstruation and Reduction in the Risk of Anemia
4. Reduction in the Risk of Fetal Neural Tube Defects
5. Relief from Symptoms Associated with Premenstrual Dysphoric Disorder
6. Relief of Benign Breast Disease
7. Decrease in Symptoms Related to Endometriosis
8. Improvement in Acne Control

Potential Risks of Combination Oral Contraceptives

1. Sexually Transmitted Infections
2. Cardiovascular Events and Hypertension
3. Venous Thromboembolism
4. Gallbladder Disease
5. Hepatic Tumors
6. Cervical Cancer

Nonoral Hormonal Contraceptives

As an alternative to oral contraceptive pills, which must be taken daily in order to reliably prevent pregnancy, nonoral contraceptives in the form of:

- Transdermal preparations
- Transvaginal preparations
- injectable preparations

It offers patients safe and effective alternatives to the pills for prevention of pregnancy. These formulations also do not require daily administration, making them more convenient than the pill formulations.

An example frequently seen in the market is **Depo-Provera** is a progestin-only, injectable contraceptive that contains ***depot medroxyprogesterone acetate***. Depo-Provera is administered intramuscularly as a 150-mg injection ***once every 3 months***. An advantage of Depo-Provera is that it provides an estrogen-free method of contraception either for:

1. women in whom estrogens are contraindicated
2. women who cannot tolerate estrogen-containing preparations

Depo-Provera is extremely effective in preventing pregnancy. However, the incidence of menstrual irregularities (including amenorrhea) and weight gain appears to be much greater than that seen with COCs. The use of Depo-Provera also has been demonstrated to result in significant loss of bone mineral density (BMD). Although the effect is known to be reversible following product discontinuation.

It is important to note that on discontinuation of Depo-Provera, ***the return of fertility can be delayed*** by approximately 10 to 12 months (range 4–31 months)