

Hormonal Interactions During the Ovarian Cycle

- Day 1 – GnRH stimulates the release of FSH and LH
- FSH and LH stimulate follicle growth and maturation, and low-level estrogen release
- Rising estrogen levels:
 - Inhibit the release of FSH and LH
 - Prod the pituitary to synthesize and accumulate these gonadotropins
- Estrogen levels increase and high estrogen levels have a positive feedback effect on the pituitary, causing a sudden surge of LH

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- The LH spike stimulates the primary oocyte to complete meiosis I, and the secondary oocyte continues on to metaphase II
- Day 14 – LH triggers ovulation
- LH transforms the ruptured follicle into a corpus luteum, which produces inhibin, progesterone, and estrogen

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- These hormones shut off FSH and LH release and declining LH ends luteal activity
- Days 26-28 – decline of the ovarian hormones
 - Ends the blockade of FSH and LH
 - The cycle starts anew

Feedback Mechanisms in Ovarian Function

Uterine (Menstrual) Cycle

- Series of cyclic changes that the uterine endometrium goes through each month in response to ovarian hormones in the blood
- Days 1-5: Menstrual phase – uterus sheds all but the deepest part of the endometrium
- Days 6-14: Proliferative (preovulatory) phase – endometrium rebuilds itself
- Days 15-28: Secretory (postovulatory) phase – endometrium prepares for implantation of the embryo

Menses

- If fertilization does not occur, progesterone levels fall, depriving the endometrium of hormonal support
- Spiral arteries kink and go into spasms and endometrial cells begin to die
- The functional layer begins to digest itself
- Spiral arteries constrict one final time then suddenly relax and open

wide

- The rush of blood fragments weakened capillary beds and the functional layer sloughs

Gonadotropins, Hormones, and the Ovarian and Uterine Cycles

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Extrauterine Effects of Estrogens and Progesterone

- Estrogen levels rise during puberty
- Promote oogenesis and follicle growth in the ovary
- Exert anabolic effects on the female reproductive tract
 - Uterine tubes, uterus, and vagina grow larger and become functional
 - Uterine tubes and uterus exhibit enhanced motility
 - Vaginal mucosa thickens and external genitalia mature

Estrogen-Induced Secondary Sex Characteristics

- Growth of the breasts
- Increased deposition of subcutaneous fat, especially in the hips and breasts
- Widening and lightening of the pelvis
- Growth of axillary and pubic hair

Sexually Transmitted Diseases: Gonorrhea

- Bacterial infection spread by contact with genital, anal, and pharyngeal mucosal surfaces
- Signs and symptoms
 - In males – painful urination, discharge of pus from the penis
 - In females – none (20%), abdominal discomfort, vaginal discharge, abnormal uterine bleeding
 - Left untreated, can result in pelvic inflammatory disease
 - Treatment: antibiotics, but resistant strains are becoming more prevalent

Sexually Transmitted Diseases: Syphilis

- Bacterial infection transmitted sexually or contracted congenitally
- Infected fetuses are stillborn or die shortly after birth
- A painless chancre appears at the site of infection and disappears in a few weeks

Sexually Transmitted Diseases: Syphilis

- Secondary syphilis shows signs of pink skin rash, fever, and joint pain

- A latent period follows, which may progress to tertiary syphilis characterized by gummas (lesions of the CNS, blood vessels, bones, and skin)
- Treatment: penicillin

Sexually Transmitted Diseases: Chlamydia

- Most common STD in the U.S.
- Responsible for 25–50% of all diagnosed cases of pelvic inflammatory disease
- Symptoms include urethritis; penile and vaginal discharges; abdominal, rectal, or testicular pain; painful intercourse; and irregular menses
- Can cause arthritis and urinary tract infections in men, and sterility in women
- Treatment is with tetracycline

Sexually Transmitted Diseases: Viral Infections

- Genital warts – caused by human papillomaviruses (HPV); infections increase the risk of penile, vaginal, anal, and cervical cancers
- Genital herpes – caused by Epstein-Barr virus type 2 and characterized by latent periods and flare-ups
 - Congenital herpes can cause malformations of a fetus
 - Has been implicated with cervical cancer
 - Treatment: acyclovir and other antiviral drugs

Developmental Aspects: Genetic Sex Determination

- Genetic sex is determined by the sex chromosomes each gamete contains
- There are two types of sex chromosomes: X and Y
- Females have two X chromosomes; males have one X and one Y
- Hence, all eggs have an X chromosome; half the sperm have an X, and the other half a Y