Human Reproduction

Male Reproductive System

Testes - are the male gonads. They produce sperm and reproductive hormones. They are composed of seminiferous tubules, where meiosis takes place.

Penis - transfers sperm into the female's vagina during sexual intercourse

Scrotum - the sac of skin which holds the testes outside the body. Proper sperm production and storage must be at a lower temperature than the body.

Epididymis - coiled tubes on the testes which serve as a storage area for sperm to mature. This process takes about 18 hours

Vas deferens - sperm duct which consists of a tube leading from each testis to the urethra

Prostate gland - All
Cowper's gland- produce
Seminal vesicle - semen

Urethra - opening in the penis to allow for ejaculation

Female Reproductive System

Ovaries - the female gonads which make eggs and reproductive hormones. Once a month an egg is matured within a special cell called a **follicle** and released.

Fimbriae - fingerlike projections which sweep over the ovaries at ovulation and brush the ovum into the oviduct

Oviduct (Fallopian Tubes) - 'connects' ovary to uterus. This is the path the egg travels and also the location of fertilization if viable sperm are present

Uterus - a muscular pear-shaped organ where the fertilized egg will develop

Endometrium - the lining of the uterus, rich in blood supply to nourish the embryo. If there is no embryo, this lining is shed during menstruation (more on the menstrual cycle later)

Cervix - narrow neck of the uterus that opens into the vagina

Vagina - birth canal that leads to the outside of the body. Also site of sperm deposition during intercourse

Both the human male and female reproductive systems are controlled by several hormones. These hormones produce both primary and secondary sexual characteristics.
When adolescents reach puberty - about 10-12 for males and 10 for females, these hormones begin to produce the hormones.

Male :

FSH - released from the pituitary gland stimulates the process of spermatogenesis

inhibin - released by the seminiferous tubules of the testes, works in a negative feedback loop with FSH to control the rate of sperm production

LH (lutenizing hormone) - released by the pituitary gland, stimulates the cells that surround the seminiferous tubules of the testes to produce male sex hormones, especially testosterone.
Testosterone - produced by the testes, responsible for secondary sexual characteristics, which become evident at puberty:

- enlargement of the primary sexual characteristics - penis and testes
- enlargement of the larynx (Adam's apple), which deepens the voice
- promotes the development of muscle tissue
- stimulates the formation of hair on the face, chest, under the arms and around the genitals

Female:

FSH - Follicle stimulating hormone, secreted by the pituitary, causes the follicle in the ovary to mature an egg cell (ovum), which takes about 10 days

estrogen - produced by the follicle and works in a negative feedback with FSH. When estrogen levels are high, no more follicles will mature the eggs.

Estrogen is responsible for the building of the endometrium (uterine lining) with a rich blood supply. Estrogen is also responsible for the secondary sexual characteristics of females:

- breast development
- broadened pelvis
- redistribution of body fat

LH - luteinizing hormone, released by the hypothalamus in response to high levels of estrogen. This causes a process called ovulation when the follicle ruptures and the mature ovum is released.

Progesterone - following the rupture of the follicle at ovulation, the follicle becomes the corpus luteum, which secretes progesterone to keep the lining of the uterus rich with blood to support a pregnancy.

All these hormones work together to create the **Menstrual Cycle**:

Every 28 days, the ovaries produce one mature ovum and the uterine wall (endometrium) thickens in preparation for the implantation of the fertilized egg (zygote). If the egg is not fertilized, then the egg and the endometrium are shed through the vagina in a process called menstruation.

The menstrual cycle

- begins at puberty
- stops when a woman is pregnant
- stops permanently at menopause (45-50)

The cycle itself can be divided into four stages:

1. **The follicle stage** (10-14 days)

The pituitary gland secretes FSH. As levels of FSH increase, a follicle develops in the ovary. As the follicle matures it secretes estrogen.

Estrogen prepares the uterus for receiving the egg. As the estrogen levels increase, FSH will decrease in a negative feedback loop. No more FSH means no more follicles develop.

2. **Ovulation stage** (Minutes)

After the estrogen levels have increased sufficiently and FSH has decreased, the pituitary will release LH (luteinizing hormone).

This stimulates ovulation - the rupture of the follicle to expel the egg. The fimbriae will sweep over the surface of the ovary to send the egg along the oviduct.

Since there is no more follicle because it ruptured, there is no more estrogen, which is needed to maintain the uterus to receive the egg. LH therefore has another purpose, to develop and maintain the **corpus luteum**.

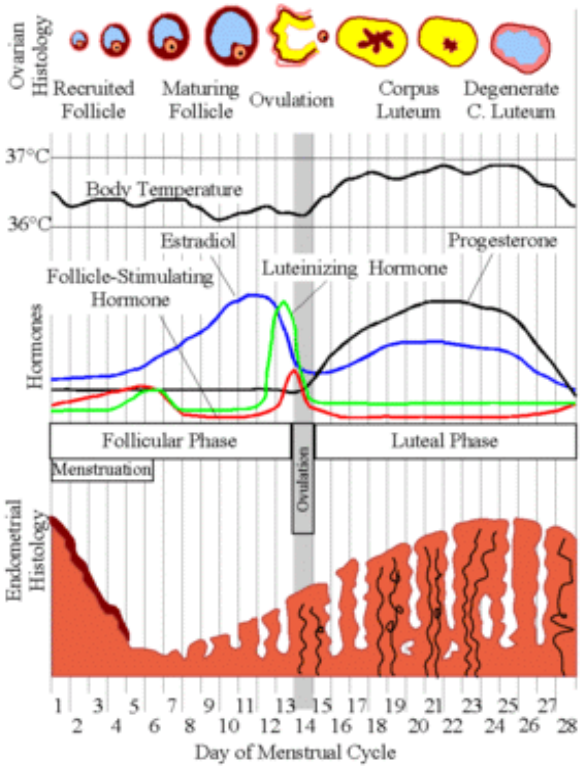
3. **Corpus luteum stage** (14 days) - The broken follicle fills with cells causing a yellow-bodied corpus luteum to form. The corpus luteum secretes **progesterone**, which maintains the uterine wall in preparation to receive the fertilized egg. If there is a fertilized egg it will develop in the uterus.

4. **Menstruation stage** (4 days)

If the egg is not fertilized, the levels of hormones cause the following effects:

Lack of estrogen causes:

- pituitary stops secreting LH
- corpus luteum breaks down because there is no LH
- progesterone secretion stops because there is no corpus luteum
- endometrium cannot be maintained, so it is shed along with the egg, if it has not yet disintegrated (**menstruation**)
- pituitary gland begins to secrete FSH again to begin a new cycle



(Average values. Durations and values may differ between different females or different cycles.)

SUMMARY OF MENSTRUAL CYCLE

PITUITARY → FSH - FOLLICLE

↓

ESTROGEN

↑ (FSH

DECREASE)

↓

MENSTRUATION

PITUITARY

RELEASES

↑ LH

NO EGG

↓

OVULATION

↓

PROGESTERONE ← CORPUS

LUTEUM