

## **Anatomy & Physiology of the Male & Female Reproductive System**

**The aim of this lecture is the students will know about the following :**

1. Anatomy and physiology of the female and male reproductive system
2. The organs of each system
3. How this organs is work
4. The functions of each organ in the system

### **Content of the Literature:**

1. Female Reproductive System
2. The Normal Menstrual Cycle
3. Breasts
4. Male reproductive system
5. Endocrine system and male reproduction
6. Spermatogenesis

## Reproductive System

Human reproduction is a complex and fascinating process. The male and female reproductive system functioning together produce a new life.

### Female Reproductive System

#### External Genitalia:

##### 1. Vulva

The female external reproductive organs consist of the mons pubic, which is covered with pubic hair; two folds of tissue, called the labia majora and labia minora, which surround a space called vestibule.

##### 2. Mons Pubis

The mons pubis is formed at the upper margin of the symphysis pubis and is shaped like an inverted triangle. It is located over the two pubic bones of the pelvis. This structure is composed of fatty tissue lying beneath the skin and from puberty on, is covered with varying amount of hair. The mons pubis surrounds delicate tissue and protects it from injury.

##### 3. Labia Majora and Labia Minora

**The labia majora** : are two folds of fatty tissue that form the lateral boundaries of the vulva. They are covered with coarse skin and pubic hair on the outer aspect and are smooth and moist on the inner aspect, where the openings of numerous small glands are found.

**The labia minora** : are soft folds of skin that are rich in sebaceous glands. The labia minora are moist and are composed of erectile tissue containing loose connective tissue, blood vessels, and involuntary muscles. The functions of the labia minora are to lubricate and waterproof the vulvar skin and to provide bactericidal secretion that help prevent infections.

#### 4. Clitoris

The clitoris is a small, sensitive structure that, like the penis, is composed of erectile tissue, nerves, and blood vessels; it is covered at the tip with very sensitive tissue. It exists primarily for female sexual enjoyment.

#### 5. Vaginal Vestibule

The vaginal vestibule is a boat shaped depression enclosed by the labia minora and is visible when the labia minora are separated. The vestibule contains the vaginal opening ( introitus ), which is located between the external and internal genitalia. The vestibule contains the openings of five structures that drain into it the ureteral meatus, skene's ducts, and the ducts from Bartholin's glands that are located on each side of the vagina. The vestibule ends with the formation of the fourchette.

#### 6. Urethra

The opening to the urethra is just below the clitoris. Although it is not related to sex or reproduction, it is included in the vulva. The urethra is actually used for the passage of urine. The urethra is connected to the bladder. In females the urethra is 1.5 inches long, compared to males whose urethra is 8 inches long.

#### 7. Hymen

The hymen is a thin, elastic, mucous membrane that partially covers the vagina in young females. Does not seem to have a specific physiological function or purpose. Many shapes are possible. Normal variations of the hymen range from thin and stretchy to thick and somewhat rigid; or it may also be completely absent

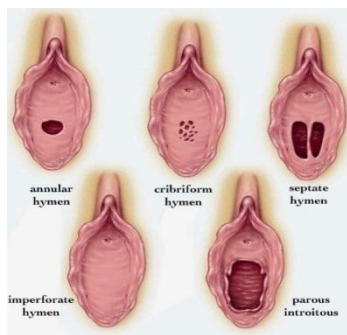


Figure (1) Types of hymen

## 8. Perineum

The perineum is the short stretch of skin starting at the bottom of the vulva and extending to the anus. It is a diamond shaped area between the symphysis pubis and the coccyx. This area forms the floor of the pelvis and contains the external sex organs and the anal opening. The perineum in some women may tear during the birth of an infant and this is apparently natural. Some physicians may cut the perineum preemptively on the grounds that the "tearing" may be more harmful than a precise cut by a scalpel. If a physician decides the cut is necessary, they will perform it. The cut is called an episiotomy.

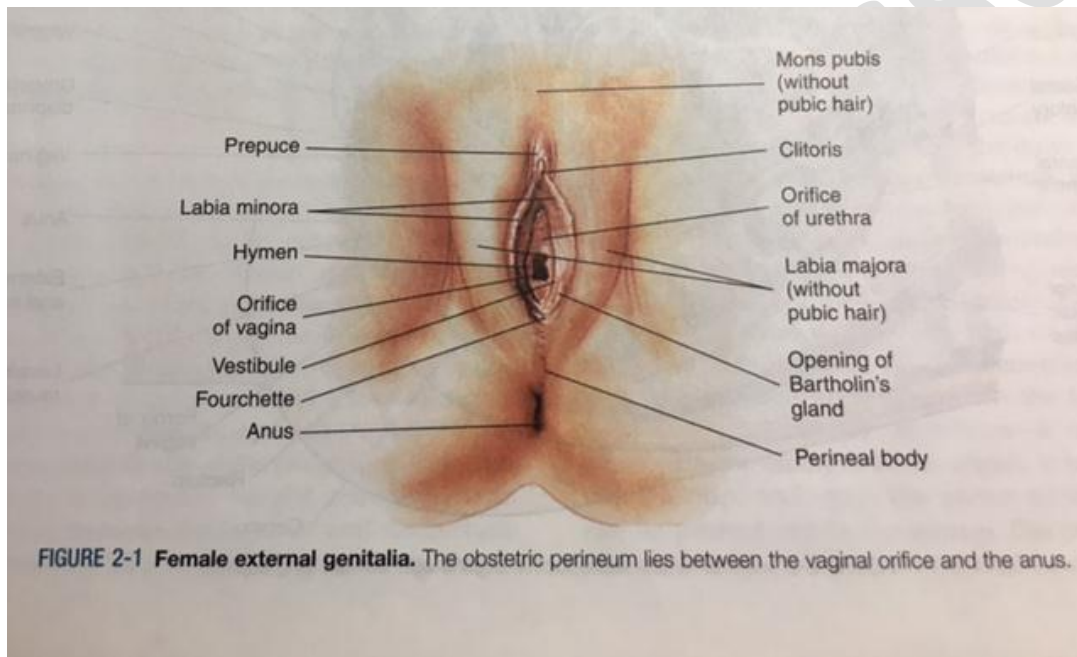


Figure (2) female external genitalia

## Internal Reproductive Organs

### 1. Vagina

The vagina is a curved tube leading from the uterus to the external opening at the vestibule. It lies between the urinary bladder and the rectum. Because it meets at a right angle with the cervix, the anterior wall is about 2.5cm(1inch) shorter than posterior wall, which varies from 7-10cm (approximately 2.8 to 4 inches).it consist of muscle and connective tissue and is lined with epithelial tissue , which contains folds called rugae. These folds allow the vagina to stretch considerably during childbirth. The epithelial cells lining the vagina show cyclic changes related to estrogens, progestins, and androgens. Doderlein's bacilli, which are normally present in the vagina, act on glycogen from the epithelial cells to produce lactic acid. This maintains the acidity of the vagina and is the reason that the vagina is resistant to most infection .a change in the PH of the vagina , which can be caused by frequent douching , antimicrobial therapy, or deodorant tampons, can increase the vagina's susceptibility to invading pathogens.

#### Purposes of the Vagina

- Receives a males erect penis and semen during sexual intercourse.
- Pathway through a woman's body for the baby to take during childbirth.
- Provides the route for the menstrual blood (menses) from the uterus, to leave the body.
- May hold forms of birth control, such as a diaphragm or female condom.

### 2. Cervix

The cervix consist of a cervical canal with an internal opening near the uterine corpus called the internal os and an opening in to the vagina called external os the mucosal lining of the cervix has four functions:

1. Providing lubrication for the vagina
2. Acting as bacteriostatic agent

3. Providing an alkaline environment to shelter the sperm from the acidic vagina
4. Producing a mucous plug in the cervical canal during pregnancy

### **3. Uterus**

The uterus (womb) is a hollow, pear-shaped, muscular organ. It is approximately 2.5 cm (1 inch) thick, 5cm (2inch) wide, and 7.5cm (3inch) long. During pregnancy, the uterus can stretch and enlarge considerably. the weight of the non-pregnant uterus is approximately 75g ; it increase to approximately 907 g during pregnancy, the uterus increase in vascularity , which allows sufficient blood supply for its growth , and can stretch and enlarge to a considerable size . After pregnancy, it returns almost entirely to its former weight, size, and shape. The uterus lies between the bladder and the rectum. It is supported by two important pairs of ligaments, the round and broad ligaments. The uterus divided into three parts : fundus (upper portion) , the corpus (body), the cervix . The uterus have three layers ( perimetrium ,myometrium , endometrium ).



**Figure (3) layers of the uterus**

The following three functions of the uterus:

1. Menstruation: the uterus sloughs off of the endometrium or lining of the uterus.
2. Pregnancy: the uterus supports the fetus and allows fetus to grow.
3. Labor and birth: the uterine muscle contract and the cervix dilates during labor to expel the fetus

#### 4. Fallopian Tube

The fallopian tubes extend laterally from the uterus, one to each ovary. They are small, narrow and approximately 10cm (4inch) long. The tubes carry the ovum from the ovary to the uterus by the contraction of the cilia: hair like projections found in the lining of the tubes. Extending from the ends of the fallopian tubes are small, fingerlike projection called fimbriae. Their movement sweeps the ovum in to the tube, after which the ovum travels to the uterus. It takes approximately 5 days for the ovum to travel the 10cm from the ovary to the uterus. Fertilization of the ovum with sperm normally takes place in the outer third of the fallopian tube.

The four functions of the fallopian tube:

1. A passageway in which sperm meet the ovum
2. A site of fertilization
3. A safe nourishing environment for the ovum or zygote (fertilized ovum)
4. A means of transport ting the ovum or zygotes to the corpus of the uterus
- 5. Ovaries**

The ovaries in the female and the testes in the male are similar in embryologic origin. The ovaries are two small, almond shaped organs located on each gland. Approximately 2 million ova are present at birth. Many ova degenerate until puberty, when a few thousand remain. During the course of a women's reproductive life, only about 400 ova mature enough to be fertilized. During each menstrual cycle one follicle matures into what is called a graafin follicle, which contains the ovum that is released each month during ovulation. Estrogen released by the ovary stimulates the development of secondary sexual characteristics such as the breasts. Progesterone is responsible for preparing and maintaining the lining of the uterus for implantation of the ovum.

The ovaries have two functions:

1. The development and maturation of and later expulsion of the ovum ( ovulation )
2. The secretion of hormones (estrogen & progesterone )

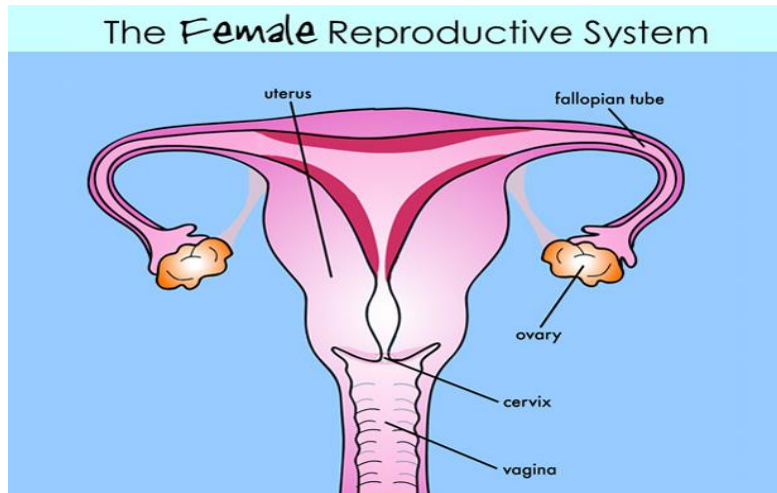


Figure (4) female internal reproductive organs

### The Normal Menstrual Cycle

The menstrual cycle is a predictable event normally occurs monthly. The typical monthly menstrual cycle is influenced by ovarian follicle maturation, ovulation and corpus luteum formation and ends with menstrual bleeding. The changes that occur depend on the changes occurring simultaneously in the ovaries. The development of endometrium occurs at the precise time of the month that the release of a mature ovum occurs. Ovulation occurs 14 days before the beginning of the next menstrual cycle. And the ovum remains fertile for 24 hours. The sperm can survive up to 5 days. Fertilization most often occurs in the first few hours after ovulation.

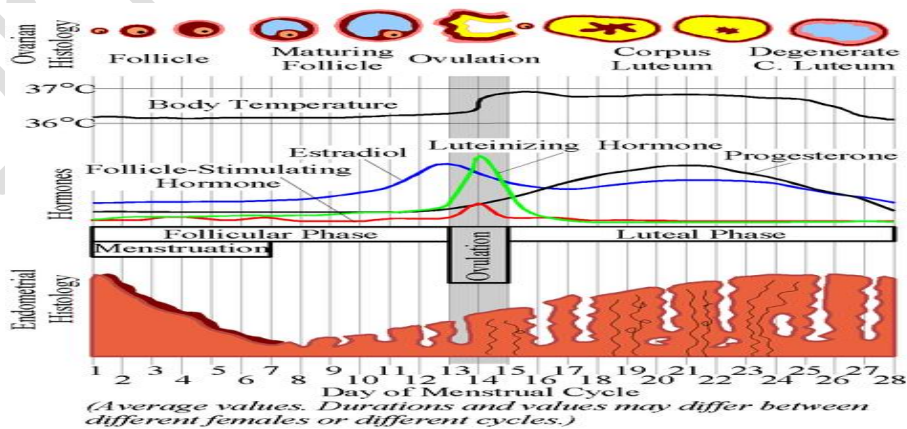


Figure (5) menstrual cycle



## Breasts

The breast is composed of glandular, ductal, connective, and adipose tissue. Embedded in the fibrous tissue are fat and lobules which make up the mammary glands, accessories to reproduction in women, but rudimentary and functionless in men. In men, little fat is present in the breast, and the glandular system normally does not develop. In women, the breasts are the most prominent superficial structure on the anterior thoracic wall, and the amount of fat in the glandular tissue determines the size of the breasts. A small part of the mammary gland often extends into the axilla, forming the axillary tail of Spence.

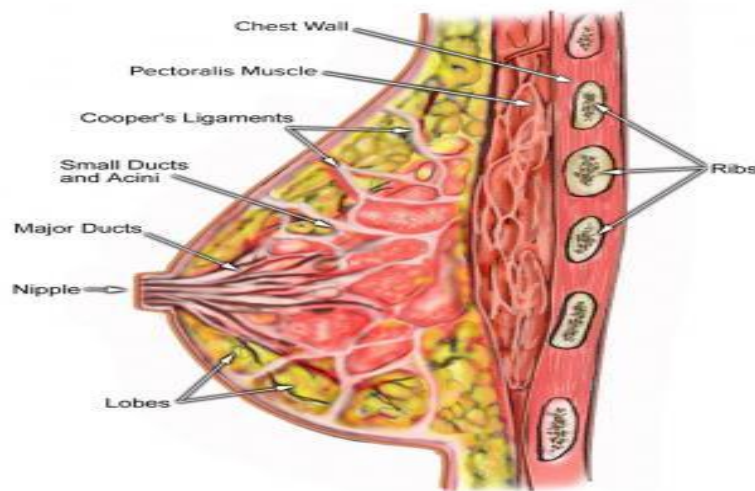


Figure (6) female breast

The mammary glands are modified sweat glands and are composed of 15-20 lobules, each drained by a lactiferous duct. Each lactiferous duct independently drains on the nipple and is preceded by a small dilated portion known as the lactiferous sinus. It is in the sinus that milk collects during nursing and is "let down" by the suckling action of the infant the process is called lactation the nipple in the center of breasts is surrounding by pigmented areola, which darkens during pregnancy . Each breast consists of 10-20 lobes each lobe divided in to 20-40 lobules each lobule divided into 20-80 alveoli.

During pregnancy high level of estrogen and progesterone produced by the placenta inhibit milk secretion after the expulsion of the placenta there is abrupt

change in estrogen and progesterone levels. This allows a hormone called prolactin to be released from the anterior pituitary gland when the infant sucks. Prolactin stimulates the production of milk. Infant sucking also stimulates the release of oxytocin hormone from the posterior pituitary gland that causes the ejection of milk from the alveoli into the ductal system. The size of breast depends on the amount of fatty tissue in the breast.

## Pelvis

### The composition of hip bone

The hip bone is made up of the three parts – the ilium, pubis and ischium. The superior part of the hip bone is formed by the ilium, the widest and largest of the three parts. The pubis is the most anterior portion of the hip bone. The posteroinferior part of the hip bone is formed by the ischium. The pelvic cavity is divided into sections, the false and true pelvic, the two ilia form the upper part of the pelvic known as the false pelvic. The ischial spines sharp projections that form the posterior border of the ischium are important landmarks and represent the shortest distance of the pelvic cavity. The true pelvic (lower part) consist of inlet, pelvic cavity and outlet and is most important during birth.

### Pelvic measurements

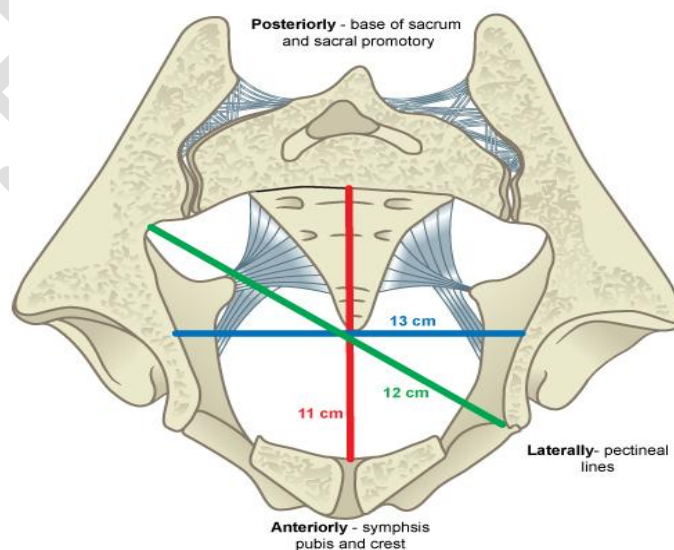


Figure (7) measurement of the pelvic

## Types of the pelvic

The pelvic is divided into four types:

1. Gynaecoid (50%) : normal female –type pelvic which is round
2. Anthropoid (20%) : which has a long anteroposterior outlet
3. Android (20%) : male –type pelvic which has heart shaped outlet
4. Platypelloid (5%): which has a wide transvers outlet and not favorable to a vaginal delivery.

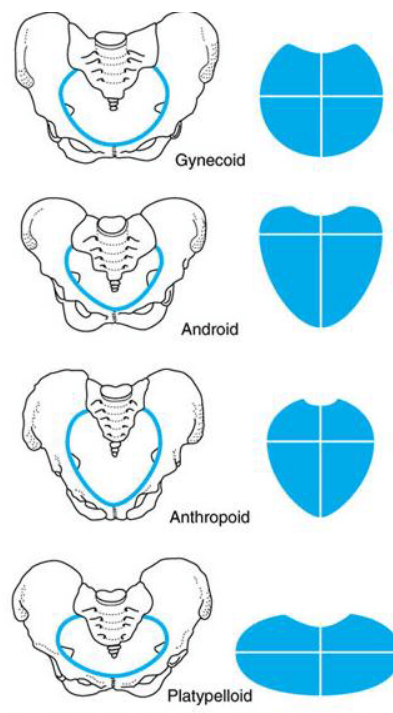


Figure (8) types of the pelvic

## Male reproductive system

### External male Genitalia

#### 1. Penis

The penis is the male organ for sexual intercourse. It has three parts: the root, which attaches to the wall of the abdomen; the body, or shaft; and the glans, which is the cone-shaped end of the penis. The glans, which also is called the head of the penis, is covered with a loose layer of skin called foreskin. (This skin is sometimes removed in a procedure called circumcision.) The opening of the urethra, the tube that transports semen and urine, is at the tip of the glans penis. The penis also contains a number of sensitive nerve endings. The body of the penis is cylindrical in shape and consists of three internal chambers. These chambers are made up of special, sponge-like erectile tissue. This tissue contains thousands of large spaces that fill with blood when the man is sexually aroused. As the penis fills with blood, it becomes rigid and erect, which allows for penetration during sexual intercourse. The skin of the penis is loose and elastic to allow for changes in penis size during an erection.

#### 2. Semen

Semen is a fluid which contains sperm, is expelled (ejaculated) through the end of the penis when the man reaches sexual climax (orgasm). When the penis is erect, the flow of urine is blocked from the urethra, allowing only semen to be ejaculated at orgasm.

#### 3. Scrotum

The scrotum is the loose pouch-like sac of skin that hangs behind the penis. It contains the testicles (also called testes), as well as many nerves and blood vessels. The scrotum has a protective function and acts as a climate control system for the testes. For normal sperm development, the testes must be at a temperature slightly cooler than the body temperature. Special muscles in the wall of the scrotum allow it to contract (tighten) and relax, moving the testicles

closer to the body for warmth and protection or farther away from the body to cool the temperature.

#### **4. Testicles (testes)**

The testes are oval glands about the size of 5cm long and 2.5cm wide that lie in the scrotum, secured at either end by a structure called the spermatic cord. The testes are responsible for making testosterone, the primary male sex hormone, and for producing sperm. Within the testes are coiled masses of tubes called seminiferous tubules. These tubules are responsible for producing the sperm cells through a process called spermatogenesis.

#### **The internal male reproductive organs (accessory organs)**

##### **1. Epididymis**

The epididymis is a long, coiled tube that rests on the backside of each testicle. It functions in the carrying and storage of the sperm cells that are produced in the testes. It also is the job of the epididymis to bring the sperm to maturity, since the sperm that emerge from the testes are immature and incapable of fertilization. During sexual arousal, contractions force the sperm into the vas deferens.

##### **3. Vas deferens**

The vas deferens is a tube 45cm long, that travels from the epididymis into the pelvic cavity, to just behind the bladder. The vas deferens transports mature sperm to the urethra in preparation for ejaculation.

##### **4. Ejaculatory ducts**

These are formed by the fusion of the vas deferens and the seminal vesicles. The ejaculatory ducts empty into the urethra.

##### **5. Urethra**

The urethra is the tube that carries urine from the bladder to outside of the body. In males, it has the additional function of expelling (ejaculating) semen when the

man reaches orgasm. When the penis is erect during sex, the flow of urine is blocked from the urethra, allowing only semen to be ejaculated at orgasm.

### **6. Seminal vesicles**

The seminal vesicles are sac-like pouches that attach to the vas deferens near the base of the bladder. The seminal vesicles produce a sugar-rich fluid (fructose) that provides sperm with a source of energy and helps with the sperms' motility (ability to move). The fluid of the seminal vesicles makes up most of the volume of a man's ejaculatory fluid, or ejaculate.

### **7. Prostate gland**

The prostate gland is a walnut-sized structure that is located below the urinary bladder in front of the rectum. The prostate gland contributes additional fluid to the ejaculate. Prostate fluids also help to nourish the sperm. The urethra, which carries the ejaculate to be expelled during orgasm, runs through the center of the prostate gland.

### **8. Bulbourethral glands**

The bulbourethral glands, or Cowper's glands, are pea-sized structures located on the sides of the urethra just below the prostate gland. These glands produce a clear, slippery fluid that empties directly into the urethra. This fluid serves to lubricate the urethra and to neutralize any acidity that may be present due to residual drops of urine in the urethra.

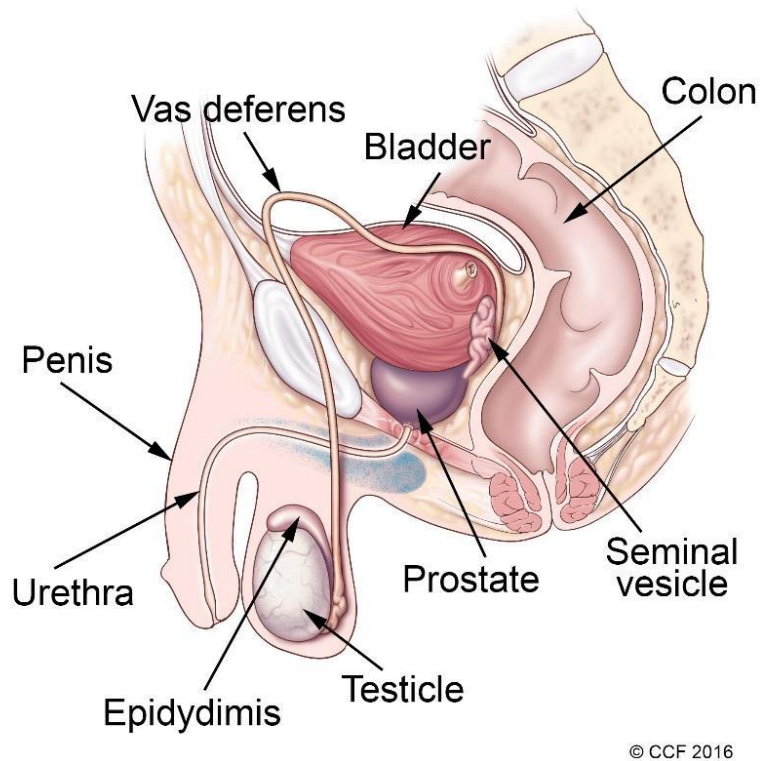


Figure (9) male reproductive system

### Endocrine system and male reproduction

The entire male reproductive system is dependent on hormones, which are chemicals that stimulate or regulate the activity of cells or organs. The primary hormones involved in the functioning of the male reproductive system are follicle-stimulating hormone (FSH), luteinizing hormone (LH) and testosterone.

FSH and LH are produced by the pituitary gland located at the base of the brain. FSH is necessary for sperm production (spermatogenesis), and LH stimulates the production of testosterone, which is necessary to continue the process of spermatogenesis. Testosterone also is important in the development of male characteristics, including muscle mass and strength, fat distribution, bone mass and sex drive.

## Spermatogenesis

It is the formation of sperm process begins at puberty and continues during the male's life. A sperm's fertile life is 5 days after ejaculation. Sperm are much smaller than ova. Sperm cells resemble tadpoles in shape with oval heads and long tails. During each ejaculation approximately 300 million sperm are deposited in to the vagina .only few reach the ova and just one sperm penetrates and fertilizes the ovum.

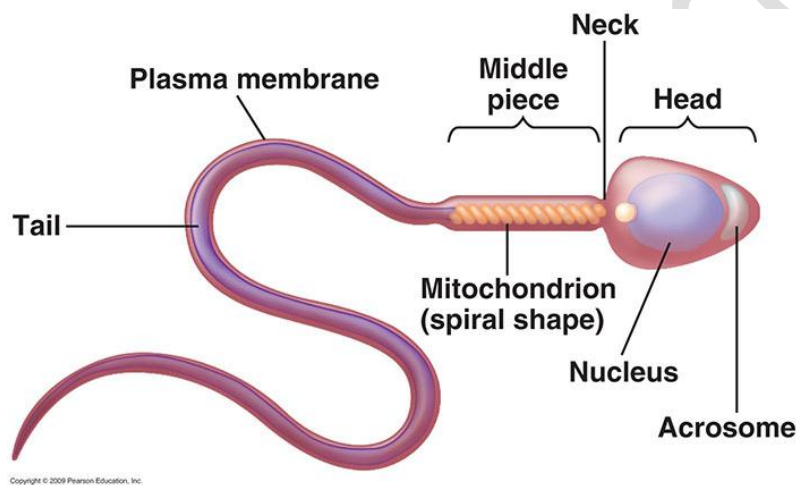


Figure (10) the sperm



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