

REPRODUCTION

Chapter

20

Major Concept

In this Unit you will learn:

- ▶ Human Reproductive System
- ▶ Disorders of Reproductive System
- ▶ Sexually Transmitted Diseases



We know that living things come from other living things and only life beget life. The older ones are called parents and the newly formed are called **progeny**. The process by which living things produce more of their own kind is called **reproduction**. Reproduction is not only vital for the life of an organism itself but it is much more important for the continuity of its race. It is the process of continuation of life with a fresh start. It performs yet another important function of transmission of genetic information from one generation to the next.

Through natural selection, over millions of years, a variety of ways evolved in which organisms reproduce their own kinds. There are, however two main ways. Asexual reproduction which requires only one parent and sexual reproduction which requires two parents.

Asexual reproduction is the primitive method of reproduction by which a new organism is formed from just one parent without the participation of mate, gamete or fertilization. The offspring produced by this method are the exact copies and thus identical to their parents and no variations are seen because all the offspring are genetically identical to their parents.

Sexual reproduction involves sex cells, the gametes. A male gamete, the sperm, fused with a female gamete, the ovum, to form zygote which undergoes development and a new individual is formed. Sexual reproduction leads to genetic diversity and adaptability. Alternatively, asexual reproduction allows a single parent to generate genetically identical or similar offspring without specialized reproductive cells. The reproductive process involves stages such as gametogenesis, mating, fertilization, embryonic development, and the birth or hatching of new individuals. Hormones, cellular differentiation, and morphological changes regulate these events.

20.1 HUMAN REPRODUCTIVE SYSTEM:

The human reproductive system is a complex network of organs and tissues that work together to facilitate reproduction. Human beings are **unisexual** or **dioecious** or **heterophrodite**, they are either male or female having testes and ovaries respectively in body, each with distinct structures and functions that contribute to the reproductive process. The male reproductive system generates and delivers sperm to the female reproductive system, while the

female reproductive system produces and prepares eggs for fertilization and provides support for fetal development during pregnancy.

20.1.2 Male reproductive system

The male reproductive system consists of internal and external genitalia, internal genitalia includes, the paired gonads (organs that produce sex cells), the testes (singular, testis) where sperms are produced, and accessory structures that store the sperm, produce secretions that activate and nourish them. The penis and scrotum are the external genitalia.

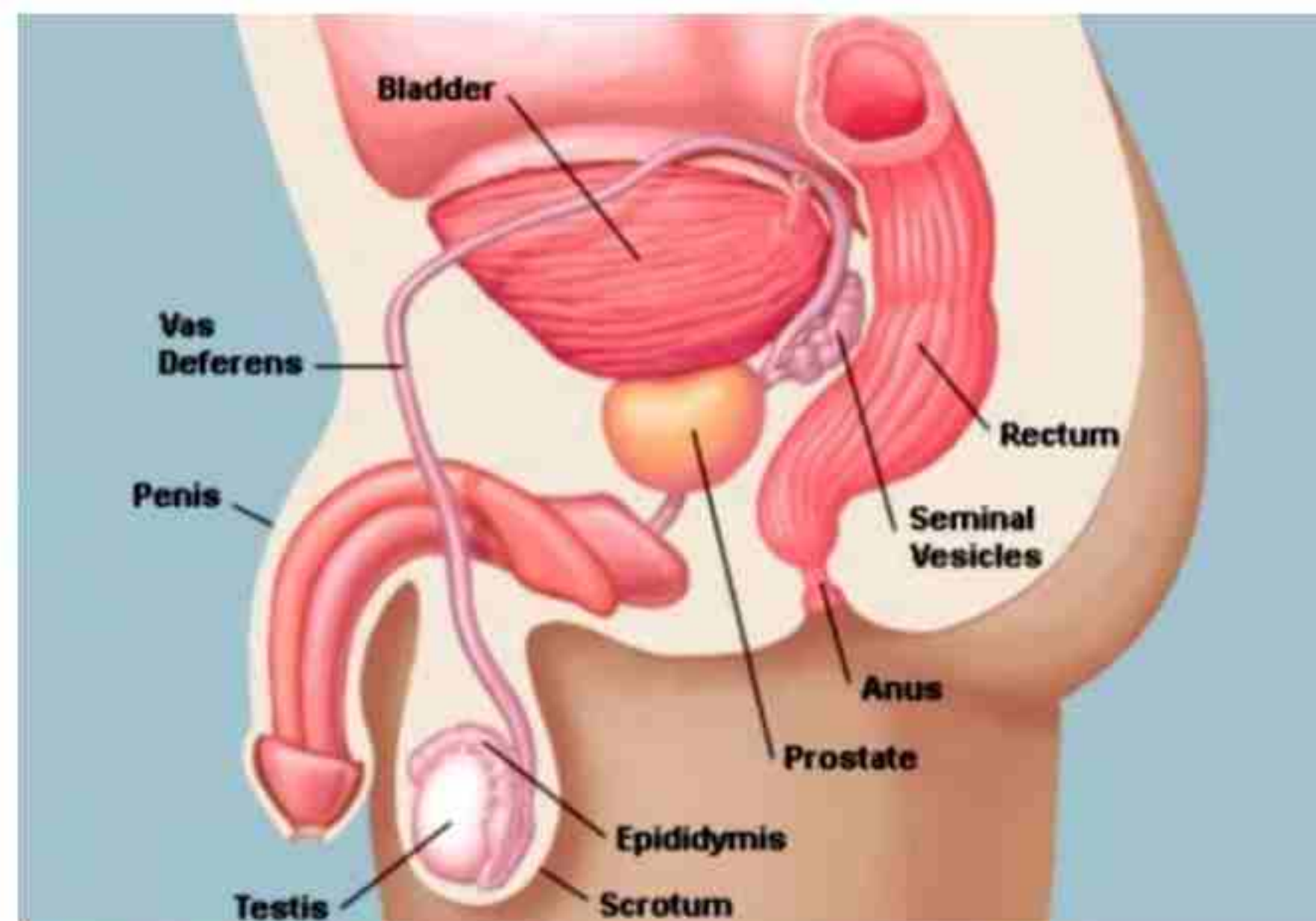


Fig. 20.1
Human male reproductive system

Gonads (testes)

The testes produce both sperm and male sex hormones. Though they develop inside the abdomen but come to lie, before birth in scrotum a pouch of skin located outside of the abdomen between the thighs. Since the sperms are unable to develop at body temperature. The scrotum maintains the testes at around 34°C, slightly lower than the body temperature (37 °C).

The **testis** is composed of lobules, which contain tightly coiled seminiferous tubules,

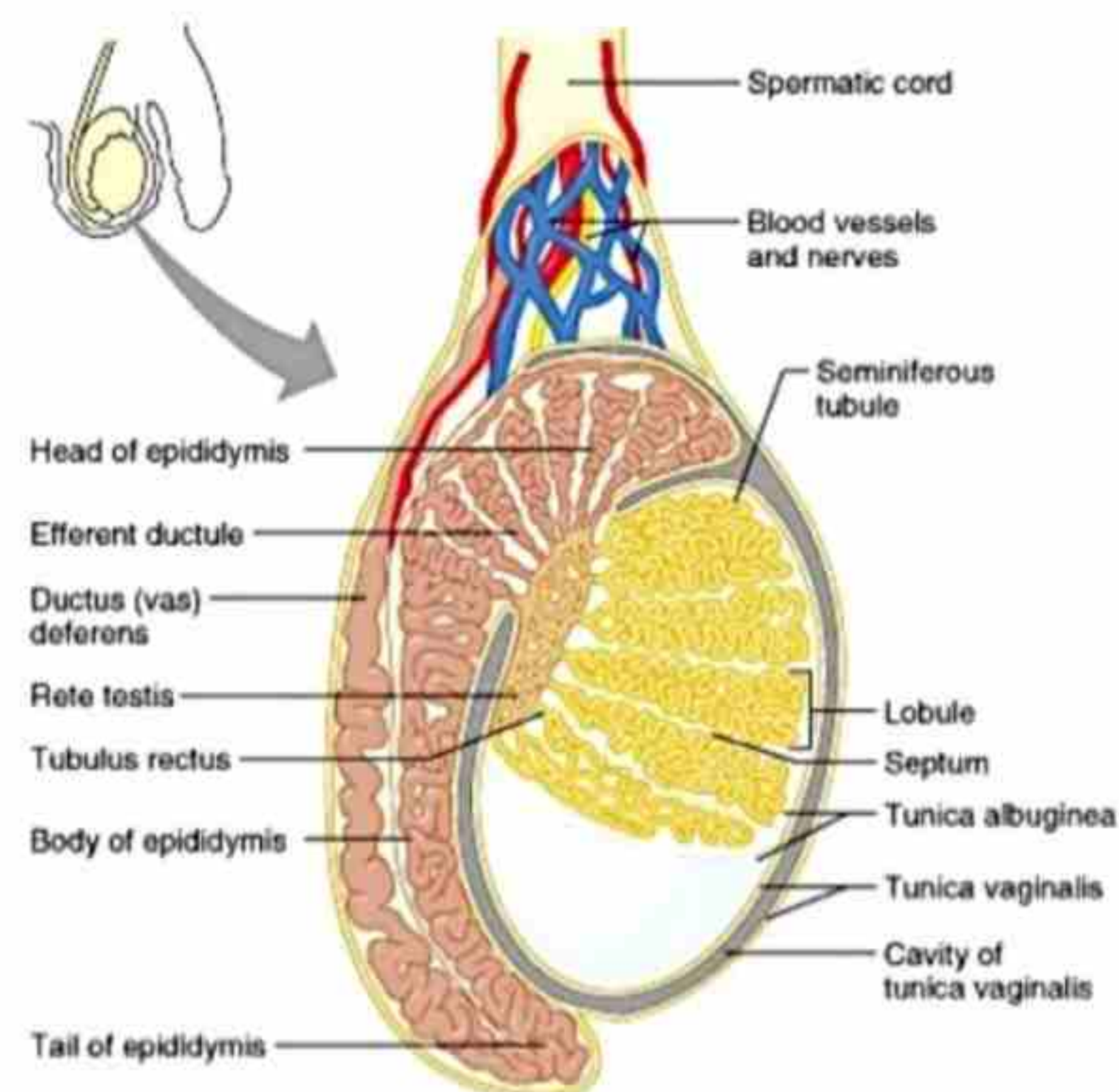


Fig. 20.2 Anatomy of testis

which make up most of each testis. The sertoli cells in the tubules responsible for the production of sperm, process of sperm production is called **spermatogenesis**.

Accessory ducts

Sperm cells move towards the **epididymis** through the **rete testis** after being produced in the seminiferous tubules. The epididymis and rete testis are connected by a network of tubes known as the **efferent ducts**. Sperm cells are kept in the epididymis until they are ready for ejaculation and are fully developed.

Ductus deferens or **vas deferens** is a thick-walled tube that carries sperm from the epididymis, where the sperm are stored before being released during ejaculation. Each ductus deferens has an ampulla, which is an expanded part that serves as a reservoir. **Ejaculatory duct** one of two hollow tubes created by joining the excretory duct of a **seminal vesicle** and the ampulla of a ductus deferens.

The ducts serve to combine the sperm deposited in the ampulla with the fluids generated by the seminal vesicles and transfer these substances to the prostate. They enter into the urethra about halfway through the prostate gland. The urethra also called **urinogenital duct** is a common tube for the urinary and reproductive discharge.

Penis: The male external genitalia and copulatory organ consists of **Glans** or head or tip of penis, the glans is very sensitive and contains the opening of the urethra. In some men, a fold of skin that called the

Testicular cancer is the most common type of cancer in young men between the ages of 15 and 34, but it has a high cure rate with early treatment.

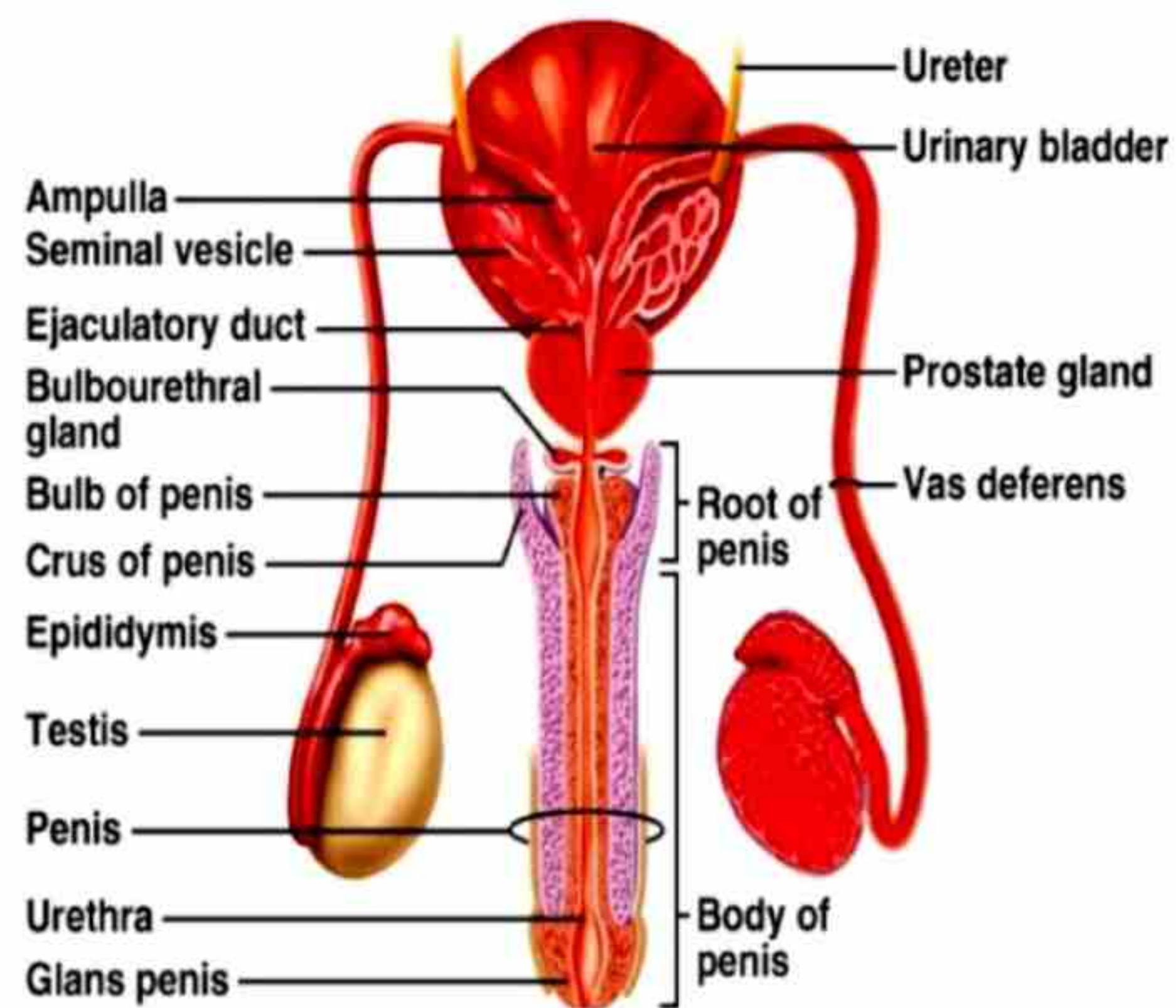


Fig. 20.3 Human male duct system

foreskin may cover the glans. **Shaft** Contains layers of erectile tissues. **Root** is where the penis attaches to the pelvic area. **Scrotum:** The male external genitalia, like penis. It protects the testes and keeps them at a temperature several degrees below the normal body temperature.

Three sets of accessory glands (the seminal vesicles, prostate and bulbourethral glands). A pair of **seminal vesicles** contributes about 60% of total volume of semen. The **prostate gland** is the largest of the semen-producing glands. It secretes its products directly into the urethra. The **bulbourethral glands** are a pair of small glands along the urethra below the prostate. Before ejaculation they secrete clear mucus that neutralizes any acidic urine remaining in the urethra.

Each ejaculation of human male averages between 2 and 5 ml. Normally it contains 200 to 300 million sperms

Table 20.1 Male Reproductive System and its Physiology

Organ	Function
Testes	Produce sperm and sex hormones
Epididymides	Sites of maturation and some storage of sperm
Vasa deferentia	Conduct and store sperm
Seminal vesicles	Add fluid to semen
Prostate gland	Add fluid to semen
Urethra	Conducts sperm (and urine)
Bulbourethral glands	Add fluid to semen

Spermatogenesis: The Process of Sperm production is called spermatogenesis. It takes place within the seminiferous tubules, found within the testes. Let's explore the stages of spermatogenesis and unravel the intricacies of this essential biological process.

The journey begins with undifferentiated germ cells called **spermatogonia (2n)**. These cells undergo mitosis to produce identical daughter cells, ensuring a continuous supply of cells for future development. Spermatogonia, triggered by hormonal signals, transform into **primary spermatocytes (2n)**. During this phase,

each primary spermatocyte undergoes DNA replication, resulting in two identical sets of chromosomes.

Meiosis I: This critical phase involves the division of primary spermatocytes into **secondary spermatocytes (n)**. Meiosis I reduce the chromosome number by half, ensuring genetic diversity in the resulting sperm cells.

Meiosis II: Secondary spermatocytes undergo further division in meiosis II, yielding four haploid cells known as **spermatids (n)**. Each spermatid contains half the number of chromosomes as the original primary spermatocyte.

Spermatids undergo a dramatic transformation in **spermiogenesis**, as they morph into mature **sperm cells**. This intricate process involves the reshaping of the nucleus, the formation of the **acrosome** (containing enzymes crucial for fertilization), and the development of the flagellum, which enables sperm motility. Finally, the fully developed sperm cells, called spermatozoa, are released into the lumen of the seminiferous tubules. From there, they continue their journey through the epididymis, where they acquire the ability to swim and gain the necessary maturity for fertilization.

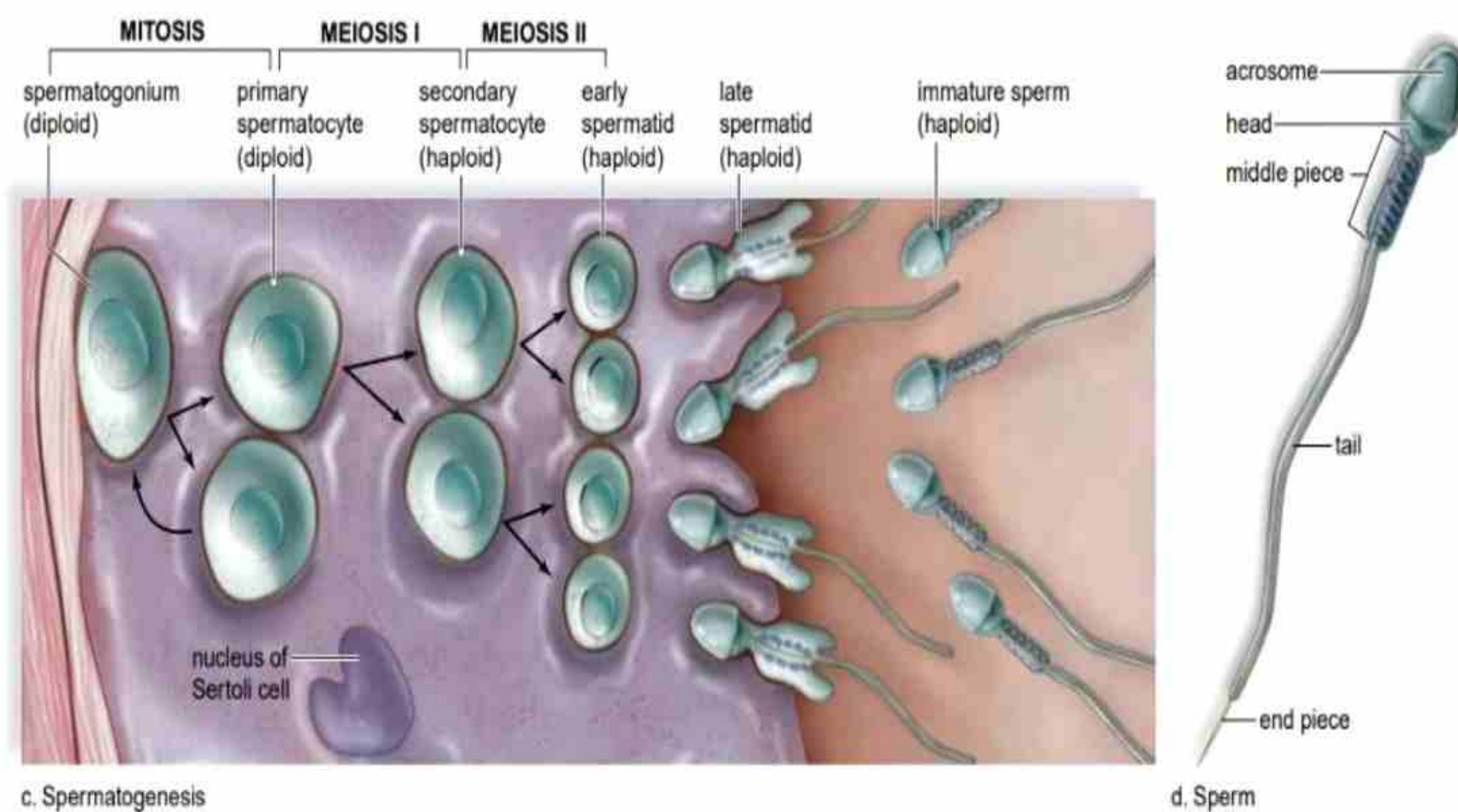


Fig. 20.4 Spermatogenesis

20.1.2 Hormonal Regulation in Males

Reproductive system of male maintains and regulates its functions through certain hormones. The main hormones involved in the male reproductive system are testosterone, follicle-stimulating hormone (**FSH**), luteinizing hormone (**LH**), inhibin and gonadotropin-releasing hormone (**GnRH**). Let's explore the hormonal role in the male reproductive system:

Testosterone: Testosterone is the primary male sex hormone produced by the testes. It plays a crucial role in the development and maintenance of male reproductive tissues, including the testes, prostate gland, and seminal vesicles. It is responsible for the development of male secondary sexual characteristics, such as facial and body hair growth, deepening of the voice, and muscle mass development. It also stimulates the production of sperm.

Follicle-Stimulating Hormone (FSH): FSH is produced by the pituitary gland and acts on the testes. In males, it promotes the development and maturation of sperm cells within the seminiferous tubules of the testes. It also stimulates the production of proteins necessary for sperm production.

Inhibin: A peptide hormone, release from sertoli cells of testes, which inhibits the secretion of follicle stimulating hormone.

Luteinizing Hormone (LH): LH is also produced by the pituitary gland and acts on the testes. In males, it stimulates the production of testosterone by the **Leydig cells** in the testes. It triggers the release of testosterone into the bloodstream.

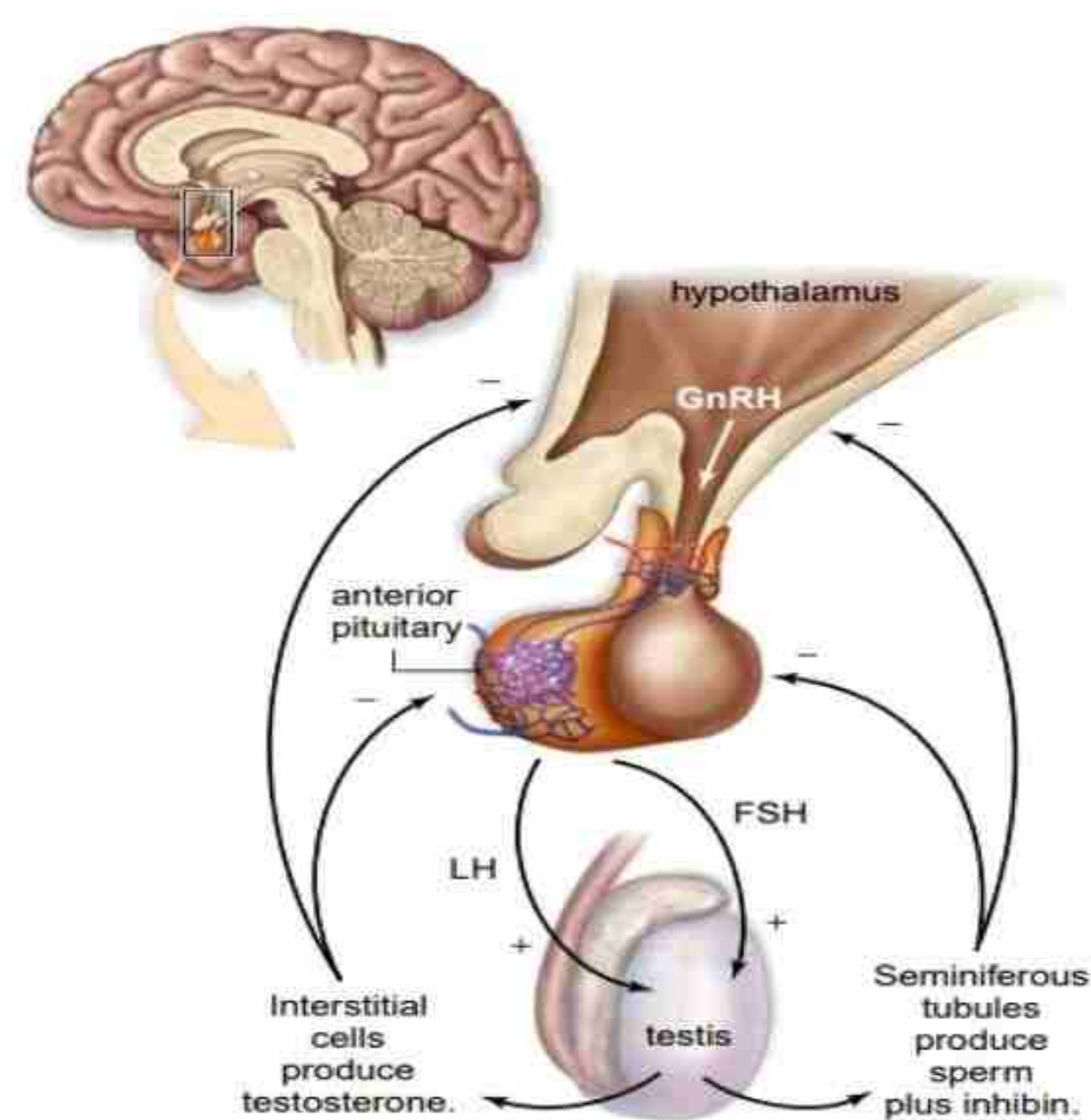


Fig. 20.5
Hormonal control of male reproductive system

Gonadotropin-Releasing Hormone (GnRH): GnRH is produced in the hypothalamus of the brain. It stimulates the release of FSH and LH from the pituitary gland. GnRH secretion is regulated by a negative feedback loop, where low levels of testosterone stimulate the release of GnRH, leading to increased production of FSH and LH, which in turn stimulates testosterone production. As testosterone levels rise, they inhibit the release of GnRH, resulting in a decrease in FSH and LH production.

20.1.3 Female reproductive system

The female reproductive system comprises four main parts: the ovaries, oviducts, uterus, and vagina.

Gonads (Ovaries)

The female ovaries lie in the abdominal cavity, flanking, and attached with a mesentery to, the uterus. Each ovary is enclosed in a tough protective capsule and contains many follicles. A follicle consists of one egg cell surrounded by one or more layers of follicle cells, which nourish and protect the developing egg cell. Each female ovary potentially contains 200,000 follicles. Formed before her birth, of these, only several hundred will release egg cells during the female reproductive years. Starting at puberty and continuing until menopause, usually one follicle matures and releases its egg cell during each menstrual cycle. The cells of the follicle produce female sex hormone called **estrogen**.

Oviducts (fallopian tube or uterine tube)

The female duct system begins with the **oviduct**. The open end of the oviduct is fringed with ciliated “fingers” called **fimbriae** that nearly surround the ovary. It has cilia on the inner epithelial linings they are where fertilization typically takes place and where the ovulated oocyte is received. The oviducts, which carry eggs from the ovary to the uterus, are each around 10 cm long.

Uterus

The uterus or womb is a muscular organ with an inverted pear form that lies between the bladder and the rectum. The uterus has three major regions: The **fundus**, the **body** and the **cervix**. The body,

the main portion of the uterus, starts below the level of the fallopian tubes and continues downward until the uterine walls and cavity start to narrow. The lowest section, the cervix, extends downward from the isthmus until it opens into the vagina. The uterine wall is composed of three layers which are endometrium, myometrium and perimetrium. The **endometrium** is the inner epithelial layer, along with its mucous membrane it is richly supplied with blood vessels. The **myometrium** is the middle muscular layer of the uterine wall. The **perimetrium** is the outermost thin layer covers the uterus. The **cervix** is a narrow opening provides passage between the vaginal cavity and the uterine cavity.

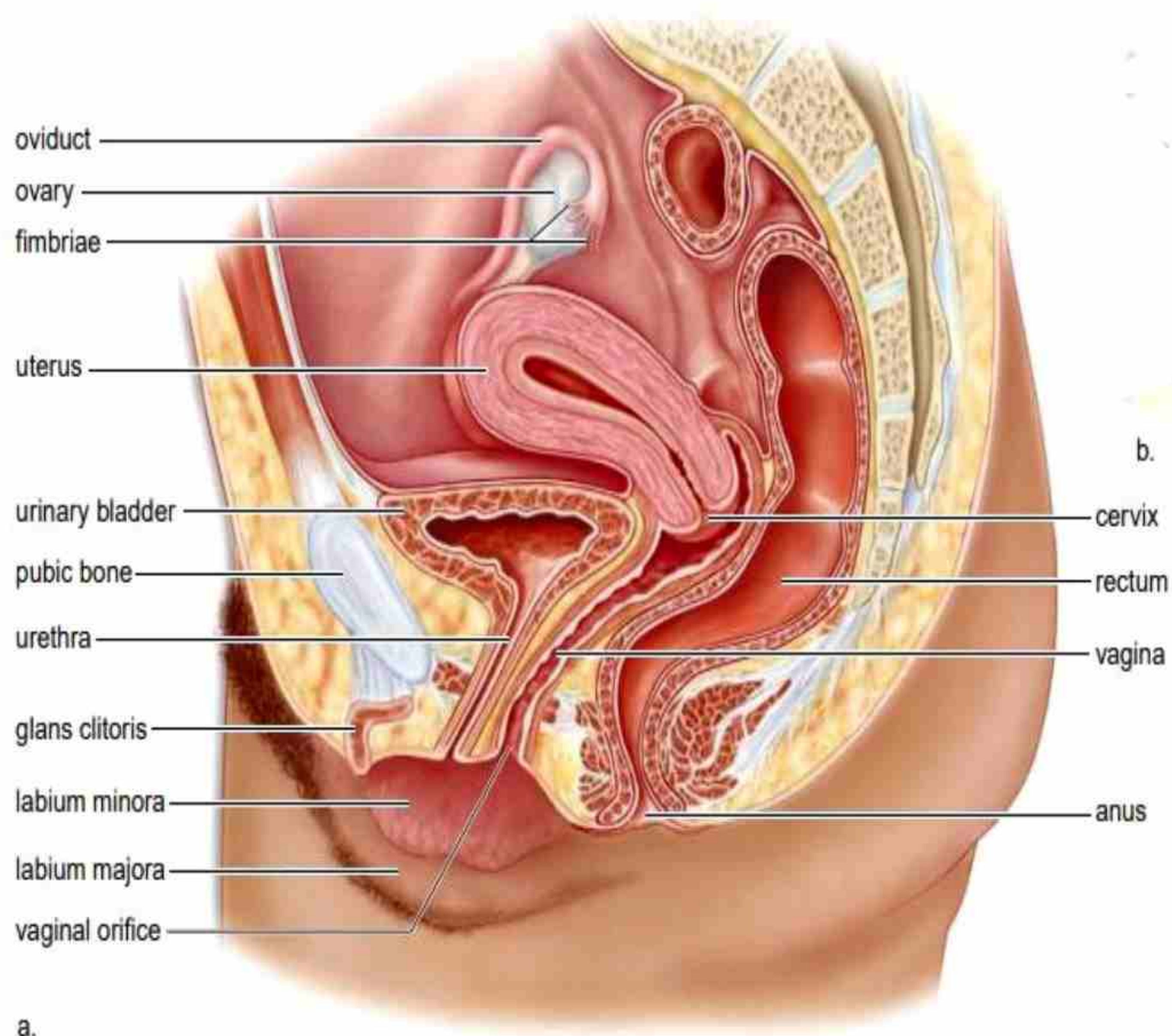


Fig. 20.6 Female reproductive system

Vagina

The **vagina** is muscular tube used for the reception of sperms and delivery of foetus so called **birth canal**.

Table 20.2 Female Reproductive system and its physiology

Organ	Function
Ovaries	Produce egg and sex hormones
Oviducts (fallopian tubes)	Conduct egg; location of fertilization
Uterus (womb)	Houses developing embryo & fetus
Vagina	Receives sperm & serves as birth canal
Ovaries	Produce egg and sex hormones
Oviducts	Conduct egg; location of fertilization

20.1.4 The Ovarian Cycle

Human females do not undergo a seasonal oestrous cycle as lower mammals do, instead one egg is released from an ovary once about every 28 days. This is often called **ovarian cycle**.

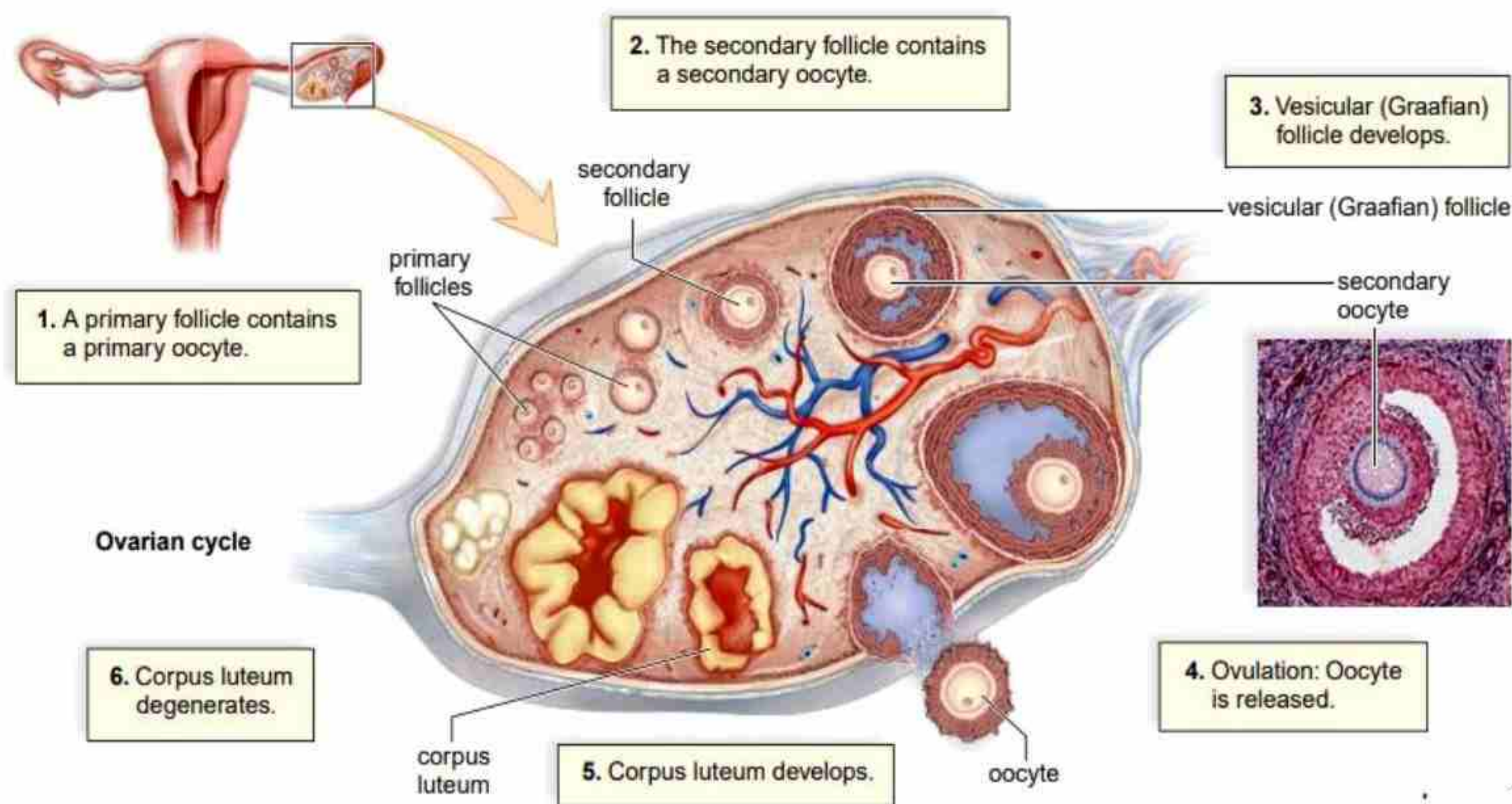


Fig. 20.7 Ovarian cycle

Ovarian cycle includes changes in ovarian follicles to secondary follicle and finally to a **vesicular** or **Graafian follicle**. It is under the regulation of follicle-stimulating hormone (**FSH**) and luteinizing hormone (**LH**) which are secreted by the anterior pituitary gland. The primary follicle is comprised of a primary oocyte that is enveloped by epithelial cells. On the other hand, the secondary follicle is characterized by the presence of follicular fluid pools that surround the oocyte. The vesicular follicle is characterized by the presence of a cavity that is filled with fluid, which gradually increases in size until the follicle wall protrudes outwardly on the surface of the ovary.

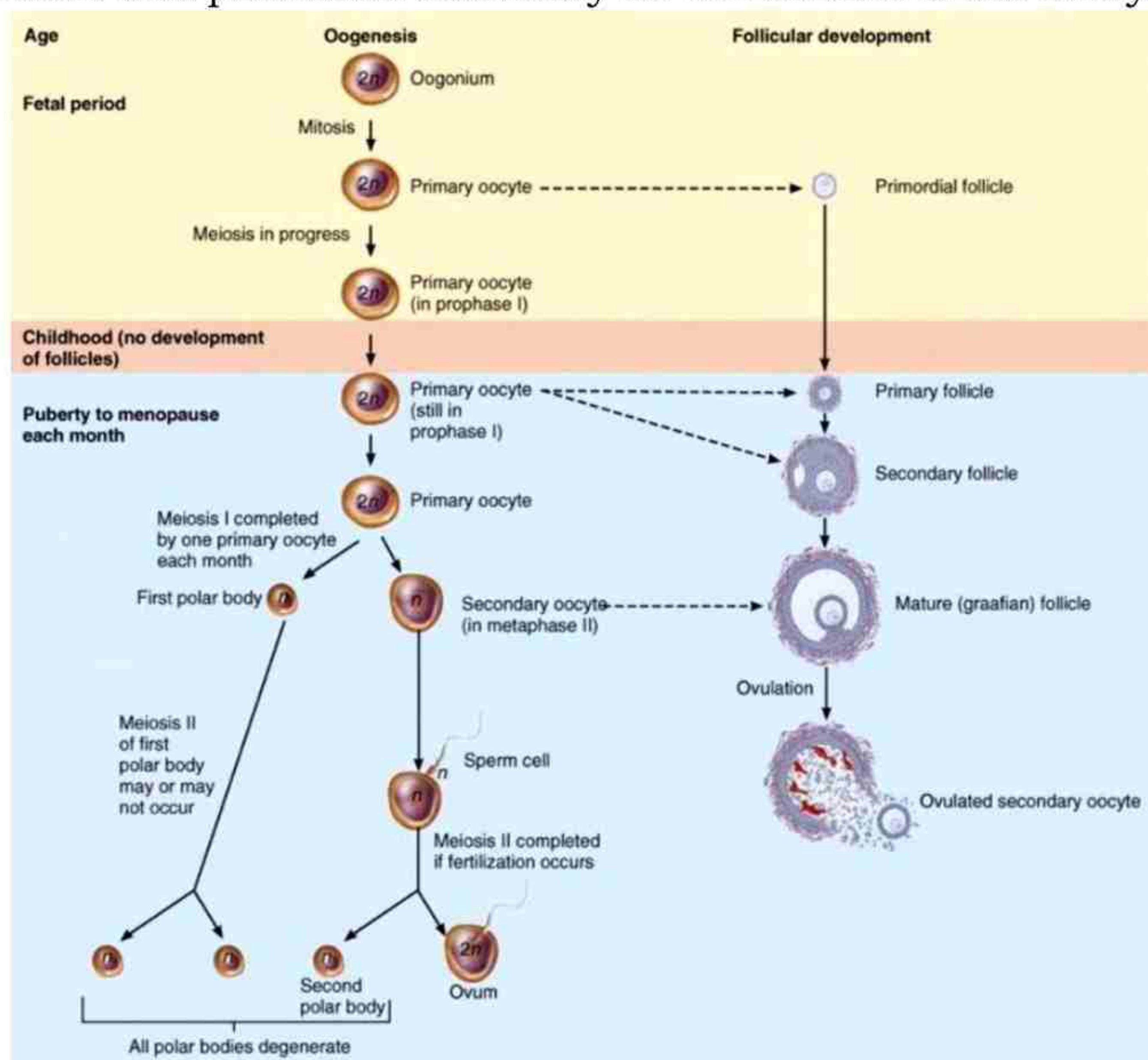


Fig. 20.8 Oogenesis

Oogenesis

It is a process of cell division by which ova (egg) are formed from germ cells present in the female gonads, the ovaries. Germ cells in ovary divide mitotically to form **oogonia** ($2n$) which develop into **primary oocyte** ($2n$). The latter undergo first meiotic division to

form two unequal cells, a larger **secondary oocyte** (n) and a smaller **polar body** (n). The expulsion of the secondary oocyte occurs simultaneously with ovulation, which is triggered by the rupture of the graafian follicle release of the secondary oocyte, the graafian follicle undergoes transformation into a glandular tissue known as the **corpus luteum**.

After ovulation, the secondary oocyte travels to the oviduct. If fertilization occurs, a sperm penetrates the secondary oocyte and triggers the completion of meiosis, resulting in the formation of **mature egg** and a second polar body. The egg contains 23 chromosomes. When the sperm (n) and egg (n) nuclei unite, they form a **zygote** (2n) with 46 chromosomes. However, if fertilization and pregnancy do not occur, the corpus luteum begins to degenerate.

The Uterine Cycle: The uterine cycle, influenced by the hormones estrogen and progesterone, involves a series of cyclic changes in the endometrium of the uterus. In the first phase (days 1-5), low hormone levels lead to the shedding of the endometrium, resulting in menstrual bleeding. From days 6-13, higher estrogen levels stimulate the growth of the endometrium in the proliferative phase. Ovulation typically occurs on day 14. From days 15-28, increased progesterone from the corpus luteum causes the endometrium to thicken and mature in the secretory phase, preparing for potential implantation. If pregnancy doesn't occur, hormone levels decrease, leading to the breakdown and shedding of the endometrium during menstruation.

Table 20.3 The Ovarian & Uterine Cycle Events

Ovarian Cycle	Events	Uterine Cycle	Events
Follicular phase—Days 1-13	FSH Follicle maturation Estrogen	Menstruation—Days 1-5	Endometrium breaks down
Ovulation—Day 14*	LH spike	Proliferative phase—Days 6-13	Endometrium rebuilds
Luteal phase—Days 15-28	LH Corpus luteum Progesterone	Secretory phase—Days 15-28	Endometrium thickens and glands are secretory

Menstrual cycle

The menstrual cycle is a complex physiological process that occurs in reproductive-aged individuals with uteruses. It involves a series of hormonal changes and physiological events that prepare the body for possible pregnancy. The cycle typically lasts around 28 days, although variations in cycle length are common.

The menstrual cycle is primarily regulated by four key hormones: follicle-stimulating hormone (FSH), luteinizing hormone (LH), estrogen, and progesterone.

Menstruation Phase (days 1-5)

Menstruation starts with bleeding that is the discharge of blood and debris of discarded tissues of the uterus through the vagina. Menstruation takes place when the body becomes aware chemically that no fertilization or pregnancy has occurred following the last ovulation. The progesterone secretion is stopped by the corpus luteum, and as a result, the soft spongy vascular lining of the uterus called the endometrium breaks off and starts flowing along with blood, out of the vagina in the form of menstrual flow. The first day of menstrual flow is taken as the beginning of the menstrual cycle. The stage lasts about five days and extends from day 1 to day 5.

Proliferative/pre-ovulatory phase (days 6-14)

During the initial days of the menstrual cycle, the increase in follicle-stimulating hormone (FSH) leads to the stimulation of a few ovarian follicles. These follicles engage in a competitive process to establish dominance. Consequently, all the follicles, except for one, cease to grow and eventually disintegrate through a process known as follicle atresia. Meanwhile, a single dominant follicle in the ovary continues to mature and develops into a mature follicle (also known as a Graafian or vesicular follicle), where oogenesis takes place.

FSH also induces the Graafian follicle to produce estrogen, which plays a crucial role in regulating the blood supply to the inner lining of the uterus known as the endometrium. As a result, the endometrium becomes lush, thick, and well supplied with blood vessels. Ordinarily, cervical mucus is dense and adhesive, but increasing levels of estrogen cause it to become more fluid and transparent, forming pathways that assist the movement of sperm.

through the cervix and into the uterus. Estrogen exerts negative feedback on FSH, resulting in a decrease in FSH levels as estrogen concentration rises. This decrease in FSH serves as a signal for the pituitary gland to release LH.

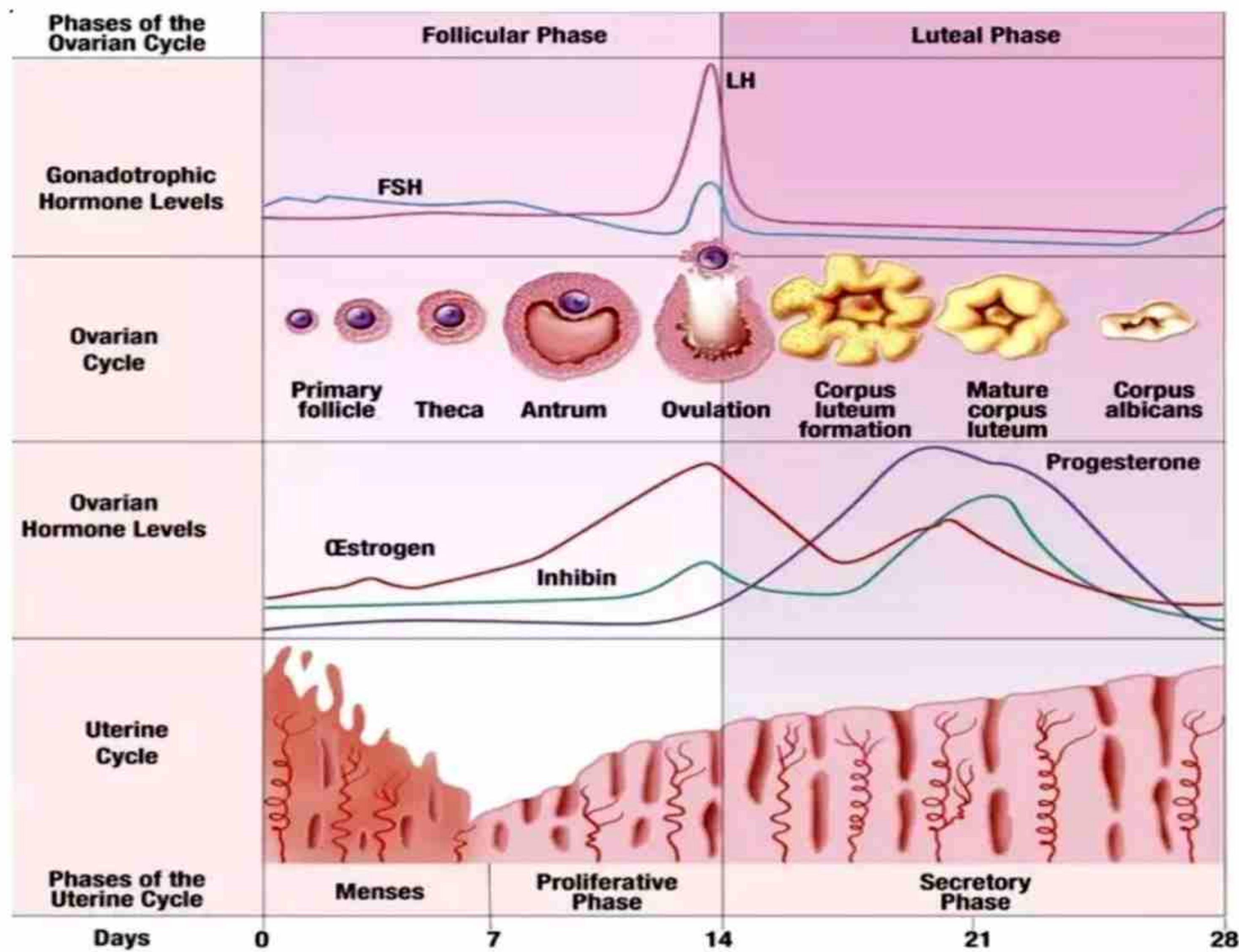


Fig. 20.9 Uterine and ovarian cycles

Towards the end of the proliferative stage, when LH is suddenly released from the anterior pituitary, it triggers the release of a developing egg from the mature follicle into the oviduct. This event, known as ovulation, typically occurs within a span of less than five minutes. Additionally, LH converts the ruptured follicle into a yellowish glandular mass known as the corpus luteum.

Secretory / Post ovulatory phase (days 15- 28)

The secretory phase, also known as the post-ovulatory phase, is the third phase of the menstrual cycle. It follows the proliferative phase (or follicular phase) and occurs after ovulation has taken place. The secretory phase is primarily regulated by the hormone

progesterone, which is produced by the corpus luteum, a temporary structure formed in the ovary after the release of an egg.

During this phase, the lining of the uterus (endometrium) thickens in preparation for a possible pregnancy. Progesterone promotes the growth and development of blood vessels and glands in the endometrium, making it a suitable environment for a fertilized egg to implant and develop into an embryo. The glands in the endometrium also produce nutrients that can support the early stages of pregnancy.

If fertilization and implantation do not occur, the corpus luteum begins to regress, leading to a decline in progesterone levels. This drop in hormone levels causes the endometrium to start breaking down, leading to the start of the menstrual period and the beginning of a new menstrual cycle.

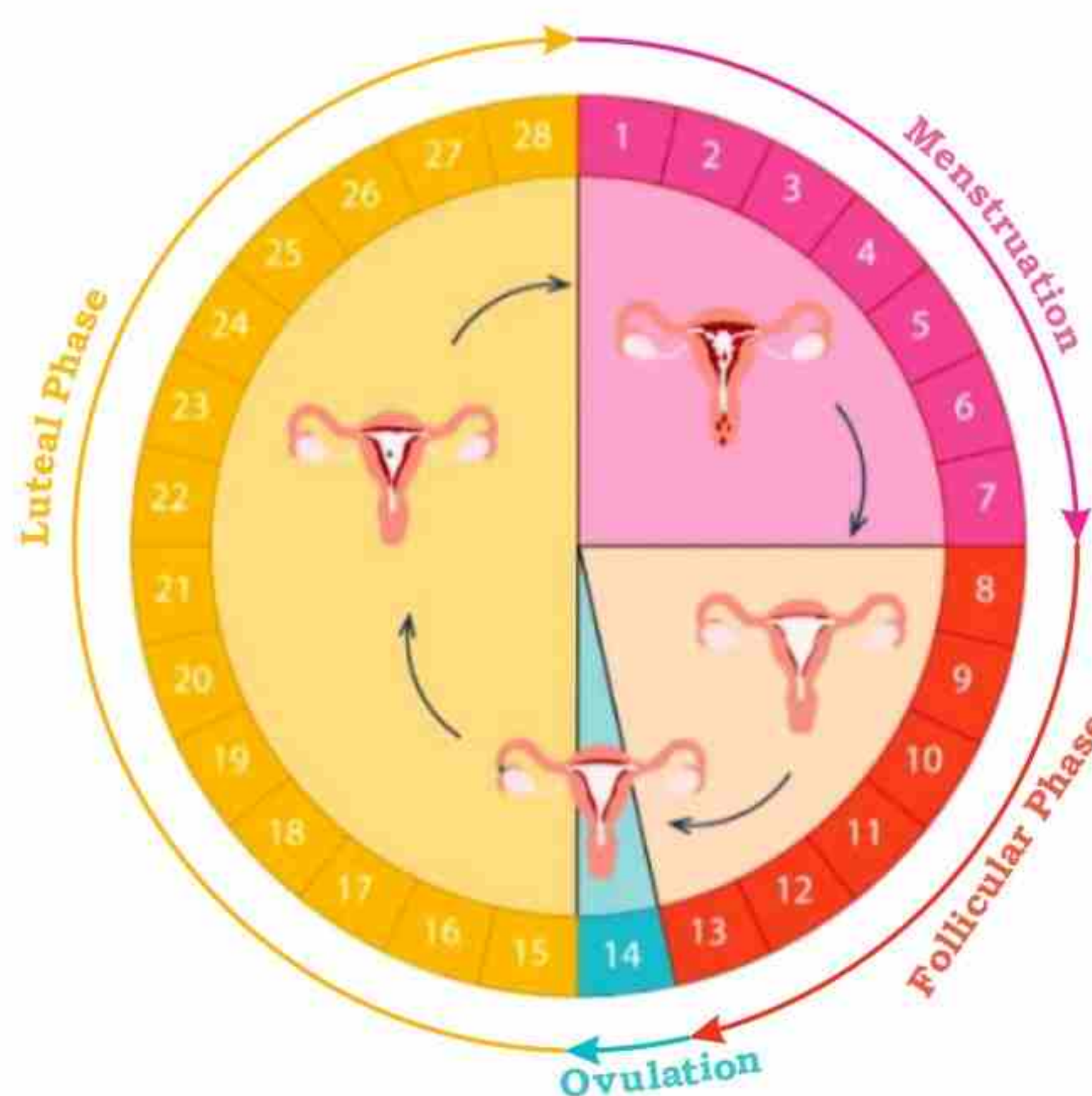


Fig. 20.10 Menstrual cycle

Fertilization and pregnancy:

After fertilization, the embryo undergoes development and migrates through the oviduct towards the uterus. The embryo then implants itself in the prepared endometrial lining of the uterus.

The placenta, which is formed by both maternal and embryonic tissues, serves as a discoid organ and facilitates the exchange of gases and nutrients between the fetal and maternal circulations. Initially, the corpus luteum, a temporary structure formed in the ovary after ovulation, is sustained by human chorionic gonadotropin (HCG) produced by the placenta. Later on, the placenta takes over the production of progesterone and estrogen.

Progesterone and estrogen have dual functions, inhibiting the activity of the anterior pituitary gland to prevent the maturation of new

follicles and sustaining the endometrial lining of the uterus, thus eliminating the need for the corpus luteum. During pregnancy, menstruation ceases to occur

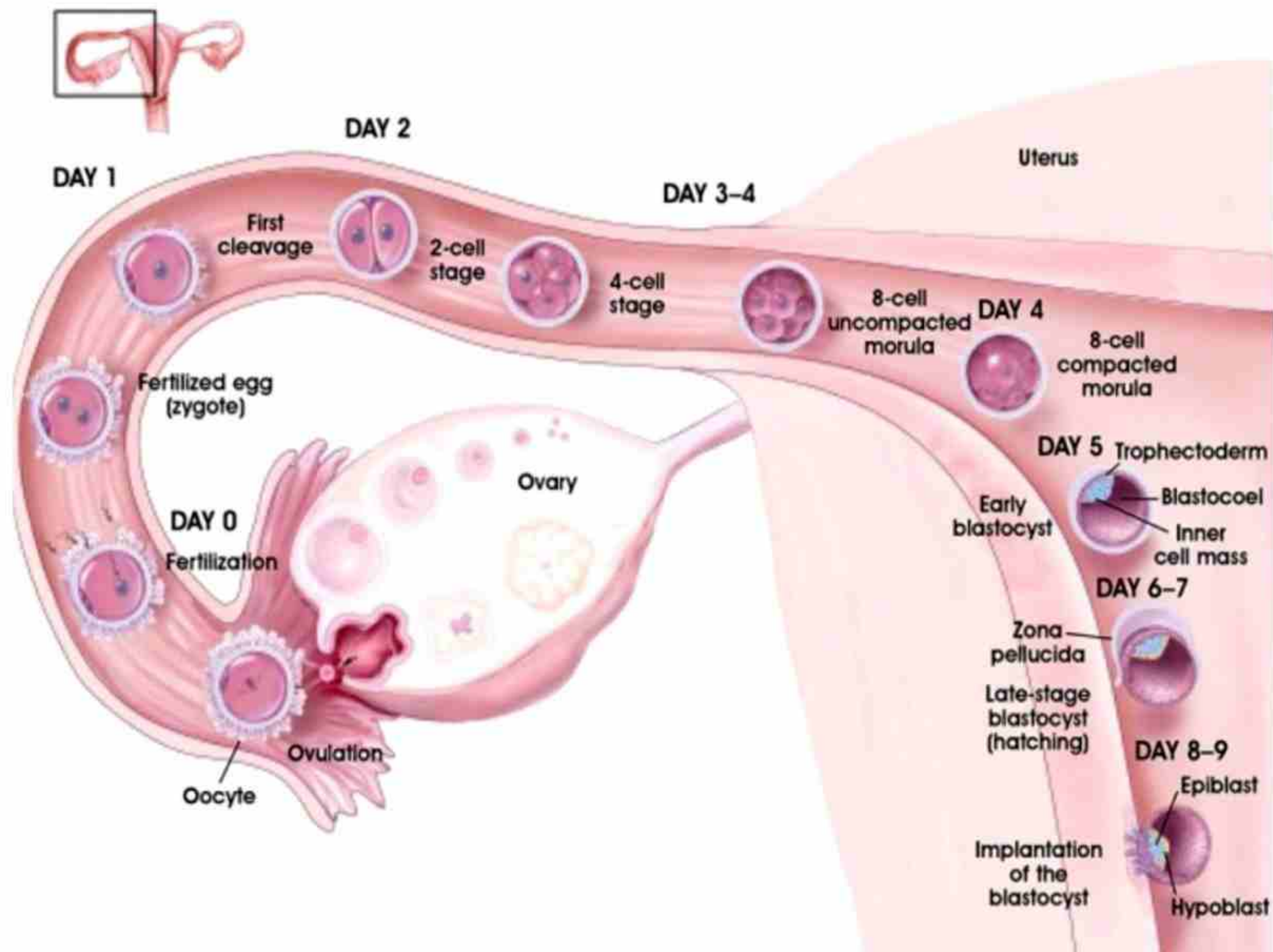


Fig. 20.11 Fertilization and implantation

Estrogen and progesterone

The hormones estrogen and progesterone play a crucial role in the proper development and functioning of the female reproductive system, as well as in the manifestation of secondary sexual characteristics. Estrogen is a vital hormone that plays a pivotal role in the development of female reproductive organs and is accountable for the manifestation of female body characteristics, including the distribution of body hair and fat, as well as breast development. The female body typically exhibits a curvaceous physique in comparison to the male body, primarily due to the increased deposition of

subcutaneous adipose tissue and a wider pelvic girdle. The hormone progesterone is a requisite factor in the process of breast development.

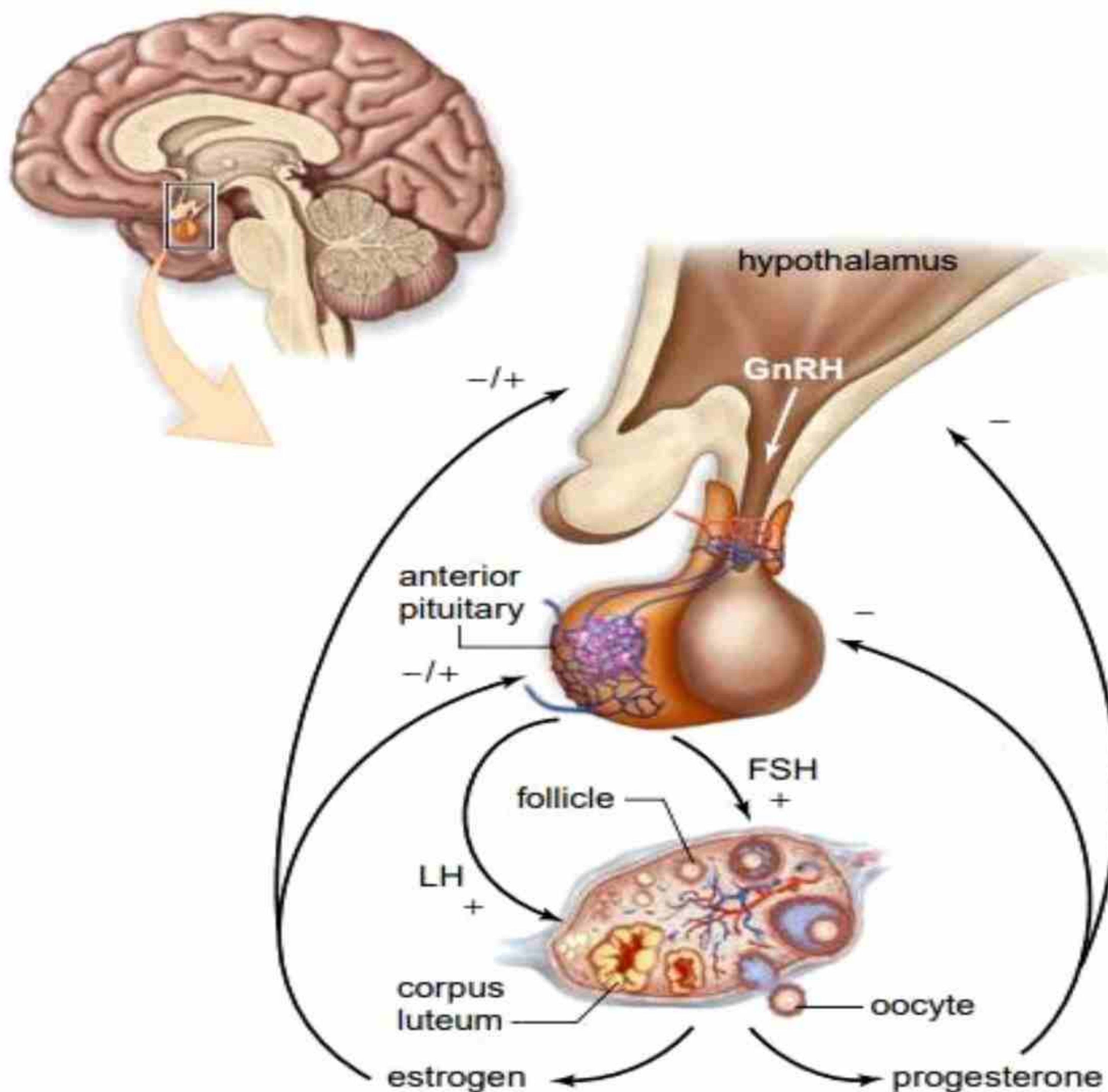


Fig. 20.12 Hormonal Control of Female Reproductive System

20.2 DISORDERS OF REPRODUCTIVE SYSTEM:

The human reproductive system is a complex network of organs and hormones that work together to ensure proper reproduction. However, various disorders can affect the functioning

of the male and female reproductive systems, leading to infertility, sexual dysfunction, and other health problems. These disorders can be caused by genetic, environmental, or lifestyle factors, and can affect people of all ages. As experts in the field of reproductive biology, it is important to understand the various disorders that can occur and their underlying causes, in order to develop effective treatments and preventative measures. In this chapter, we will explore the most common disorders of the male and female reproductive systems, including their symptoms, diagnosis, and treatment options.

Infertility

Infertility is the inability to conceive a child after one year of regular, unprotected sexual intercourse. It can affect both males and females.

20.2.1 Causes of Male Infertility

a) Abnormal Sperm Production or Function:

A microscopic examination of the semen is typically used to determine the sperm's **quantity**, **concentration**, **motility**, and **morphology** (form). The total amount of sperm in the ejaculate is known as the sperm count; counts can vary greatly, but numbers below 20 million are typically regarded as low. **Oligospermia** is the common name for low sperm count. A disease known as **azoospermia**, which results in a complete lack of spermatozoa in the ejaculate, can sometimes be the cause of male infertility.

b) Ejaculation Disorders:

Problems with ejaculation, such as retrograde ejaculation (semen entering the bladder instead of being expelled), or erectile dysfunction can result in infertility.

c) Obstruction:

Blockages in the male reproductive tract, such as congenital absence of the vas deferens or scarring from previous infections or surgeries, can prevent the transport of sperm.

d) Lifestyle Factors:

Certain lifestyle choices can contribute to male infertility, including excessive alcohol consumption, smoking, drug use, obesity, exposure to environmental toxins, or prolonged exposure to high temperatures (e.g., saunas or hot tubs).

20.2.2 Causes of Female Infertility:

a) Ovulation Disorders:

Irregular or absent ovulation can prevent the release of eggs necessary for fertilization. This can be caused by hormonal imbalances, polycystic ovary syndrome (PCOS), thyroid disorders, or premature ovarian failure.

b) Fallopian Tube Blockage:

Blockages or damage to the fallopian tubes can hinder the transport of eggs and sperm, making fertilization difficult or impossible. Common causes include pelvic inflammatory disease, endometriosis, or previous pelvic surgeries.

c) Uterine or Cervical Issues:

Abnormalities in the uterus or cervix can interfere with implantation of a fertilized egg or affect the passage of sperm. Conditions such as uterine fibroids, polyps, or cervical stenosis can contribute to infertility.

d) Endometriosis:

This condition occurs when the tissue lining the uterus grows outside of the uterus, often affecting the ovaries, fallopian tubes, and other pelvic organs. Endometriosis can cause inflammation, scarring, and structural abnormalities, leading to fertility problems.

e) Age-related Factors:

As women age, the quality and quantity of their eggs decline, making it more challenging to conceive. Advanced maternal age is associated with a higher risk of infertility and pregnancy complications.

20.2.3 In Vitro Fertilization (IVF)

In vitro fertilization (IVF), also called test-tube conception, medical treatment in which mature egg cells are taken from a woman, fertilized with male sperm outside the body, and put into the uterus of the same or another woman for proper gestation.

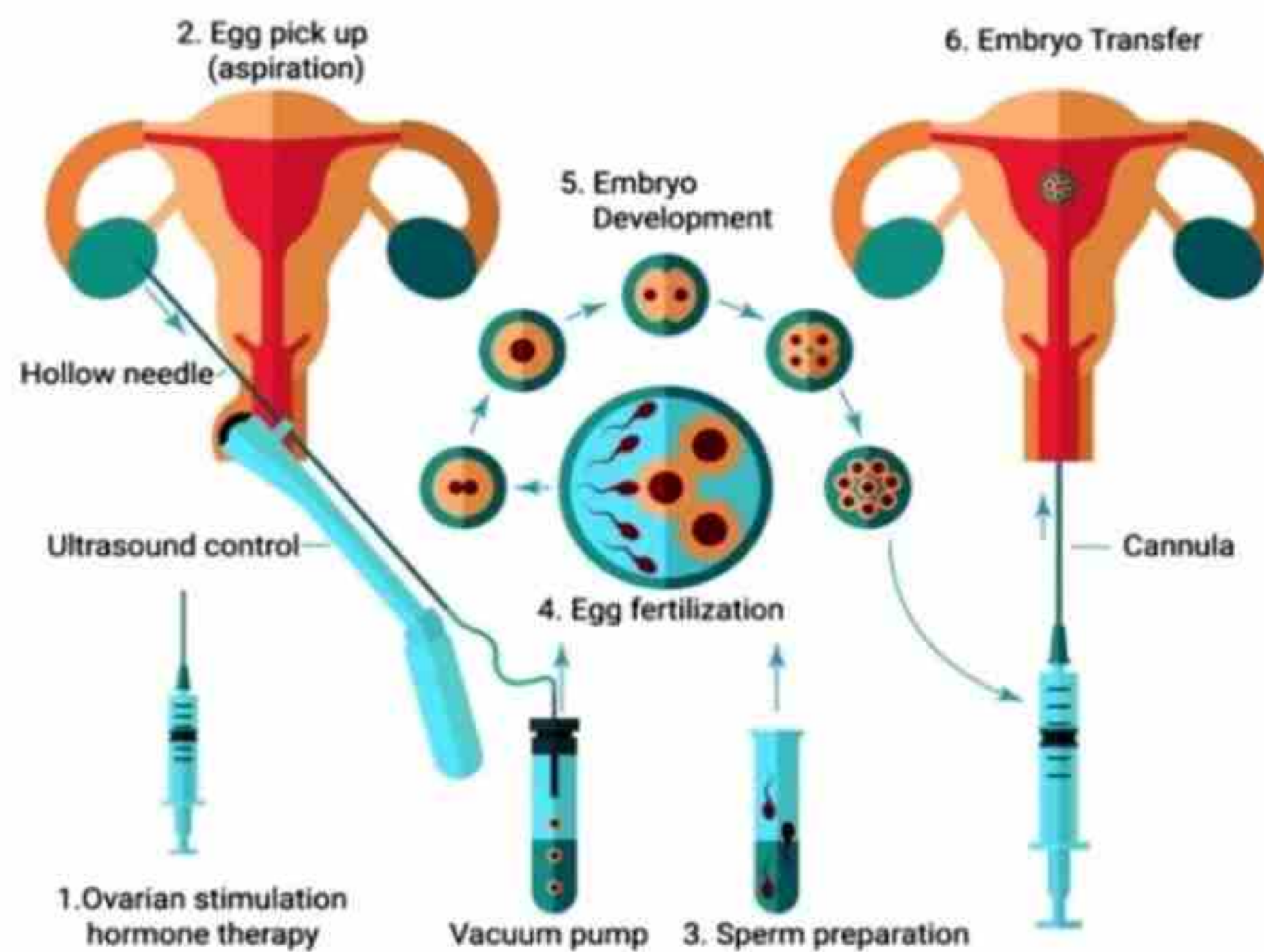


Fig. 20.13 In-vitro fertilization

20.2.4 Miscarriage

A **miscarriage** is the loss of a pregnancy before 20 weeks of gestation. Pregnancy loss occurs when the foetus stops developing. The pregnant tissue will eventually leave the body.

Causes of miscarriage

The embryo might place itself close to the cervix. In this situation, the placenta may partially or entirely cross the internal cervical opening as it expands. The area of the placenta over the cervical opening may tear, and bleeding may happen, when the uterus extends as the embryo and placenta continue to grow. Second, a haemorrhage caused by a normal position placenta can cause it to separate from the uterine wall. Both of these situations put the mother's life in danger and have the potential to cause miscarriage.

Miscarriage versus abortion

Abortion and miscarriage are two completely distinct events. Miscarriage can occur for a number of causes, including issues with the uterus or placenta. Contrarily, **abortion** is the deliberate termination of a pregnancy. It may be done for a number of reasons, including as an unintended pregnancy or a mother or child's health issues.

20.3 SEXUALLY TRANSMITTED DISEASES (STDs)

Sexually transmitted diseases are a group of ailments that may infect a healthy person during sexual contact with an infected person. A few of these are discussed below

20.3.1 Gonorrhea

Gonorrhea is a sexually transmitted disease, caused by the bacterium *Neisseria gonorrhoeae*. It primarily affects the reproductive system

Causes of Gonorrhea:

Gonorrhea is primarily transmitted through sexual contact, usually through genital and oral contact, with an infected person. The bacteria can infect the genital tract, mouth, throat, and rectum.

Symptoms of Gonorrhea:

- Painful or burning sensation during urination.
- Increased vaginal discharge in females and discharge
- Pain or swelling in the testicles (in males).
- Painful bowel movements or rectal itching.
- Sore throat or difficulty swallowing.

Treatment of Gonorrhea:

Gonorrhea can be effectively treated with antibiotics. However, due to increasing antibiotic resistance, it is crucial to follow the prescribed treatment regimen and complete the entire course of antibiotics as directed by a healthcare professional.

20.3.2 Syphilis:

Syphilis is a sexually transmitted disease caused by the bacterium *Treponema pallidum*. It is a serious health concern that can affect various organs and systems if left untreated.

Causes of Syphilis:

Syphilis is primarily transmitted through sexual contact, usually through genital and oral contact

Symptoms of Syphilis:

Syphilis progresses through distinct stages. The primary stage is characterized by the presence of a painless sore called a chancre at the infection site. In the secondary stage, a rash, along with flu-like symptoms, develops. The latent stage is symptom-free, but the infection can still be transmitted. If left untreated, syphilis can progress to the tertiary stage, which can cause severe complications affecting various organs, including the heart, brain, and bones. Symptoms during this stage can range from neurological problems to cardiovascular issues.

Treatment of Syphilis:

Syphilis can be effectively treated with antibiotics. The specific antibiotic and treatment duration depend on the stage and severity of the infection.

20.3.3 (AIDS)

Acquired immunodeficiency syndrome (AIDS) is caused by the **human immunodeficiency virus** (HIV), which attacks helper T cells, a type of lymphocyte.

Global Impact:

AIDS has had a profound impact on a global scale. Since the onset of the epidemic, millions of people worldwide have been infected with HIV, leading to substantial morbidity and mortality. It has disproportionately affected regions with limited access to healthcare, education, and resources, exacerbating social and economic disparities. Sub-Saharan Africa has been particularly affected, accounting for the majority of HIV infections and AIDS-related deaths globally. However, it is crucial to note that AIDS is a global concern, affecting people of all ages, genders, and geographical locations.



SUMMARY

- The male reproductive system includes structures like the testes, epididymis, vas deferens, prostate gland, and penis, each playing a specific role in sperm production, transportation, and ejaculation.
- Reproductive hormones in males, such as testosterone, FSH, and LH, regulate the development of reproductive organs, sperm production, and the manifestation of secondary sexual characteristics.
- The female reproductive system consists of the ovaries, fallopian tubes, uterus, cervix, and vagina, responsible for egg production, fertilization, implantation, and childbirth.
- Estrogen and progesterone are key hormones in females, regulating the menstrual cycle, the growth of the uterine lining, ovulation, and the preparation of the uterus for potential pregnancy.
- Infertility can occur in both males and females due to factors such as low sperm count, hormonal imbalances, ovulation disorders, and age-related factors.
- Miscarriage is the spontaneous loss of a pregnancy and can be caused by genetic abnormalities, hormonal imbalances, infections, or lifestyle factors.
- Miscarriage should not be confused with abortion, as miscarriage is a natural occurrence beyond the control of the individual, while abortion refers to the deliberate termination of a pregnancy based on personal, medical, or ethical reasons.
- Gonorrhea and syphilis are bacterial STDs transmitted through sexual contact, causing symptoms like discharge, pain during urination, and genital sores.
- AIDS is a global STI caused by HIV, weakening the immune system and making individuals vulnerable to infections. It spreads through unprotected sex, sharing contaminated needles, and from mother to child during childbirth or breastfeeding.

EXERCISE

1. Encircle the correct choice.

- i) Ovarian cycle includes changes in ovarian follicles to secondary follicle and finally to
 - (a) Graafian follicle
 - (b) Primary follicle
 - (c) Vesicular follicle
 - (d) Both "a" and "c"
- ii) In males, FSH promotes the development and maturation of?
 - (a) Testosterone
 - (b) Sperm cells
 - (c) Egg cells
 - (d) Polar cells
- iii) The menstrual cycle is primarily regulated by all of the following except:
 - (a) FSH
 - (b) Estrogen
 - (c) Androgen
 - (d) Progesterone
- iv) FSH induces the Graafian follicle to produce
 - (a) LH
 - (b) Estrogen
 - (c) Androgen
 - (d) Progesterone
- v) Key hormones in female reproductive system that regulates menstrual cycle.

I. Estrogen	II. Progesterone	III. Testosterone
(a) I only	(b) II only	
(c) I and II	(d) III only	
- vi) What is the medical term for a miscarriage?
 - (a) Spontaneous abortion
 - (b) Induced abortion
 - (c) Ectopic pregnancy
 - (d) Both "a" and "b"
- vii) Syphilis is a sexually transmitted disease caused by
 - (a) Bacteria
 - (b) Virus
 - (c) Protozoan
 - (d) Yeast
- viii) Structure that protects the testes and keeps them at a temperature several degrees below the normal body temperature.
 - (a) Epididymis
 - (b) Scrotum
 - (c) Penis
 - (d) All of the above
- ix) In-vitro fertilization (IVF) is a method used to:
 - (a) Treat infertility
 - (b) Enhance hormones
 - (c) Prevent STDs
 - (d) None of the above
- x) Which of the following is a potential cause of female infertility?
 - (a) Polycystic ovary syndrome (PCOS)
 - (b) Endometriosis
 - (c) Fallopian tube blockage
 - (d) All of these

2. Write short answer of the following questions:

- i) Why urethra in male is called urinogenital duct?
- ii) Why hormonal system of female is better than male?
- iii) Why testes descend down in human male foetus before birth?
- iv) What are symptoms of gonorrhea?
- v) Why inner uterine wall thicken during secretory phase?
- vi) Enlist causes of male and female infertility.
- vii) Differentiate between the following
 - (a) Testes and Ovaries
 - (b) Spermatogenesis and Oogenesis

3. Write detailed answers to the following questions.

- i) Describe the structures of male reproductive system identifying their functions.
- ii) Explain the principal reproductive hormones of human male and explain their role in the maintenance and functioning of reproductive system
- iii) Explain the structures of female reproductive system and describe their functions.
- iv) Describe phases of menstrual cycle.