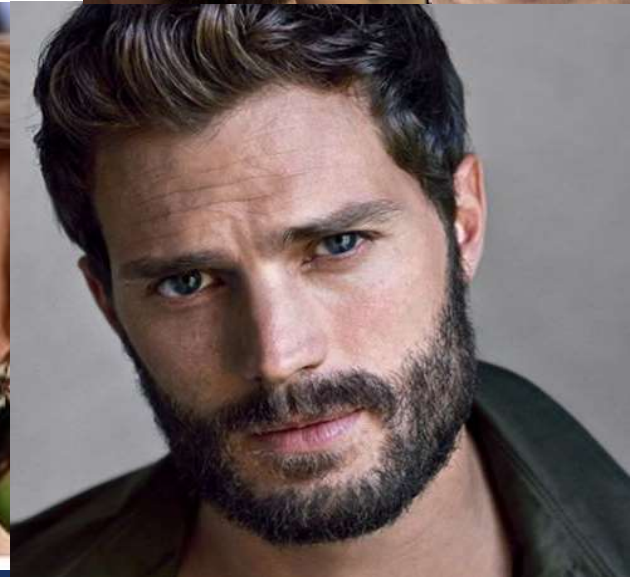
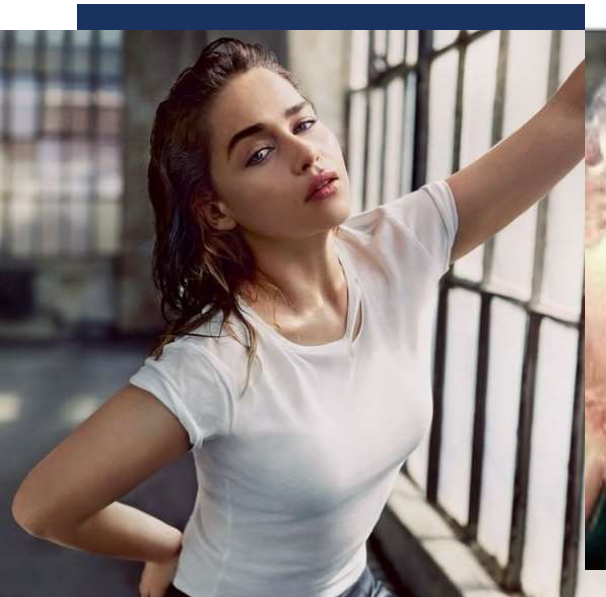


REPRODUCTIVE PHYSIOLOGY RESUMED

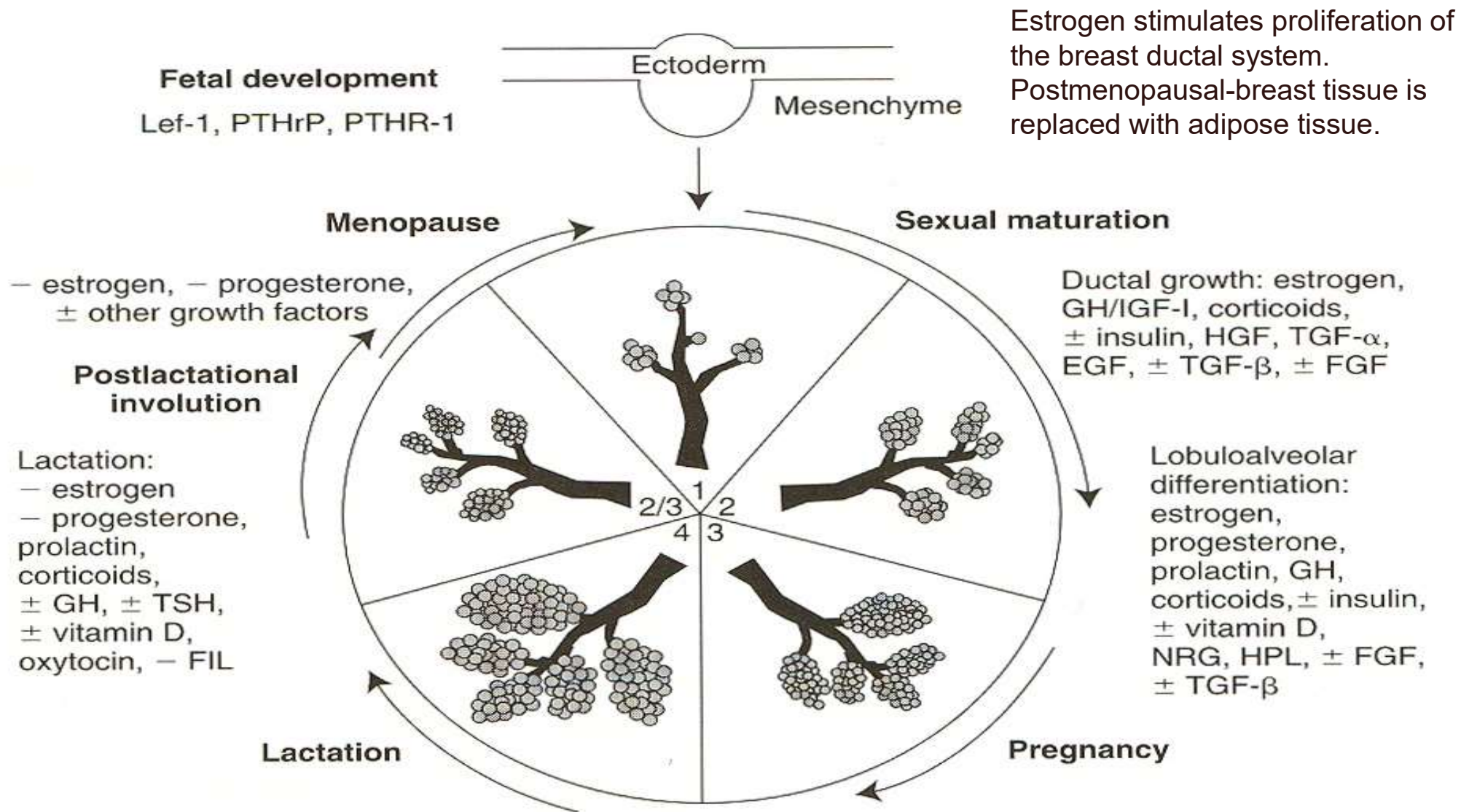
D.HAMMOUDI, MD



BREASTS

Modified apocrine gland

- The breasts of an adult woman are milk-producing, tear-shaped glands.
- They are supported by and attached to the front of the chest wall on either side of the breast bone or sternum by ligaments.
- They rest on the pectoralis major
- The breast has no muscle tissue.
- A layer of fat surrounds the glands and extends throughout the breast
- Organs of sexual arousal
- Contain mammary glands
- Consist of connective tissue that serves as support
- Each breast contain 15-25 clusters called lobes
- Each lobule is connected by ducts that open into the nipples
- The nipples are made up of erectile tissue
- The pigmented around the nipples are called the areola
- Breast size is determined primarily by heredity
- Size also depends on the existing fat and glandular tissue
- Breasts may exhibit cyclical changes, including increased swelling and tenderness prior to menstruation
- Benign breast changes refer to fibrocystic disease
- Lumps or masses that are noncancerous



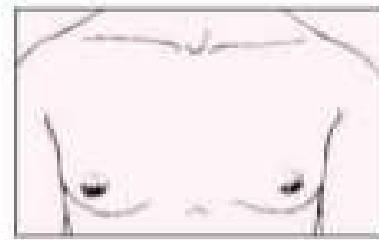
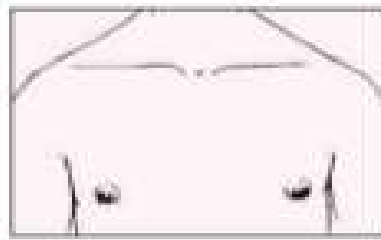
Tanner Staging

Estrogen

1. Growth of mammary glands
2. Deposition of fat in the breast

Progesterone

1. Additional growth of lobules
2. Budding of alveoli
3. Secretory changes just like in the endometrium



Breast Stage 1

Breast Stage 2

Breast Stage 3

Breast Stage 4

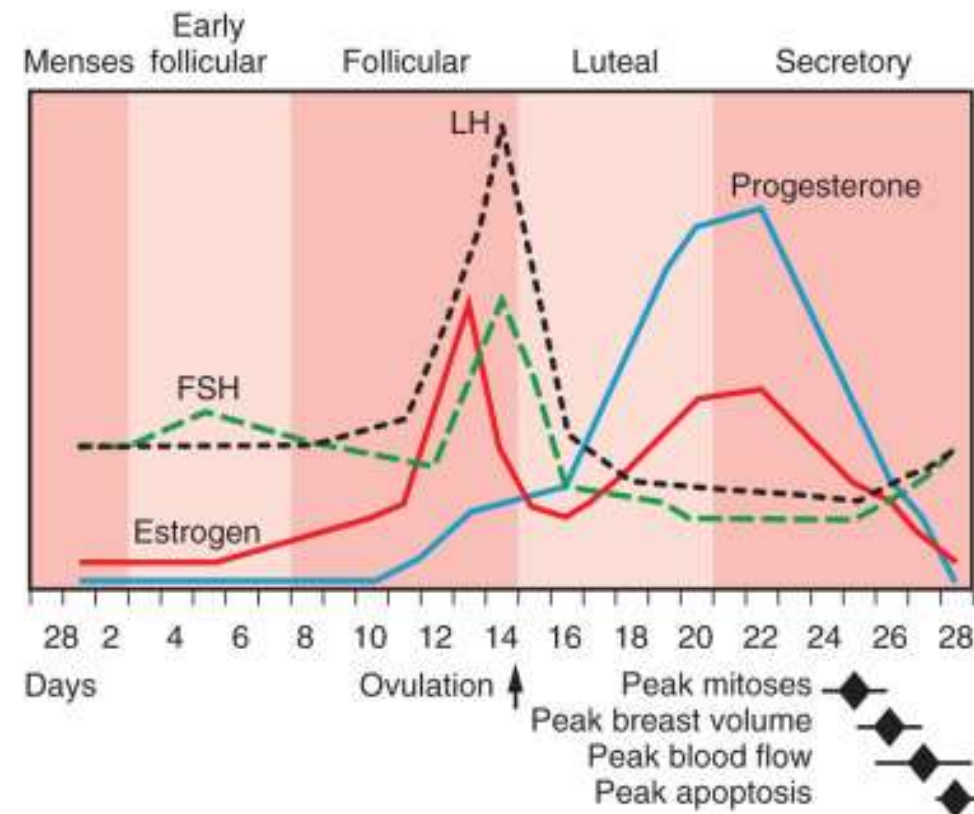
Breast Stage 5

PUBERTY MORPHOLOGY

- Thelarche: the beginning of adult breast development
- Ductal growth phase: Club-shaped terminal end buds (TEBs)
- Lobuloalveolar phase: TEBs form alveolar buds. 9-10 alveolar buds empty into terminal ductal lobular units (TDLUs)
- In early puberty, the TDLU is termed
- Under cyclic influence of ovarian hormones: some of the Lob1 will undergo further division and differentiate into a lobule type 2 (Lob 2).
- In Lob 2 the alveolar buds become smaller but four times more numerous than Lob1; these buds are termed ductules or alveoli.
- Lobs during late teens but then decline after the mid twenties.

PUBERTY MENSTRUAL CYCLE

- **Early follicular phase:** Day 3-7. dense stroma, only one epithelial type. Minimum volume in 5-7 days.
- **Follicular phase:** Day 8-14, progression of epithelial in to three cell type: luminal , myoeptithelial and intermediate cell.
- **Ovulation:** Increase alveoli volume and number.
- **Secretory phase:** Day 21-27, maximum size of the lobules
- **Menstrual phase:** Day 28-32



Three types of breast pain

Cyclical

Cyclical breast pain is hormonal, and is associated with

- Timing related to your menstrual cycle
- Pain is usually dull/heavy or aching
- Affects both breasts
- Gradually increases in pain leading up to your period
- More likely to affect pre-menopausal and perimenopausal women



Non-cyclical

Non-cyclical breast pain is non-hormonal, and is associated with

- Tightness, burning, and general soreness
- Is constant or intermittently painful
- Usually confined to a local area of one breast
- More commonly experienced by post-menopausal women



Extramammary (chest wall)

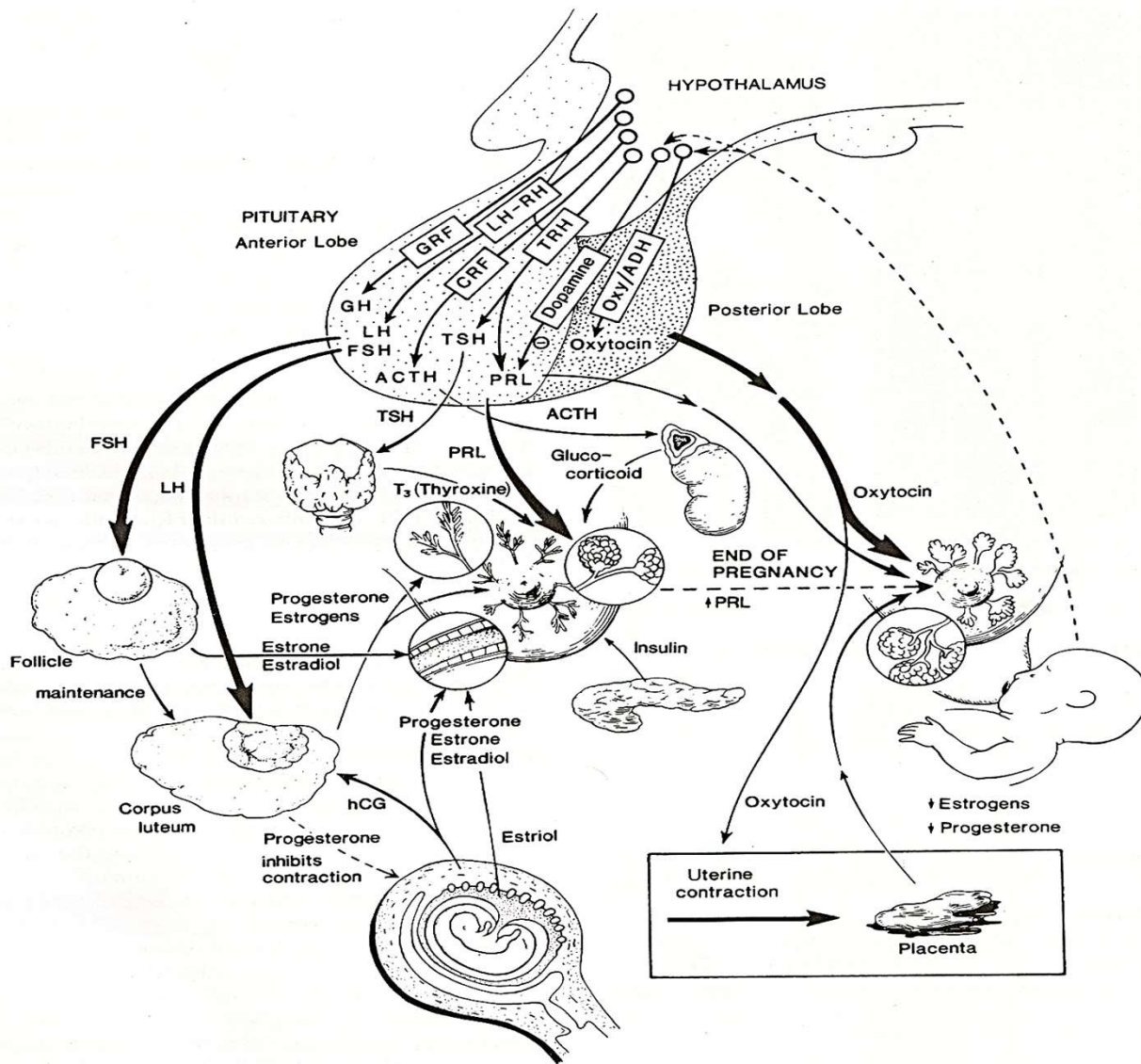
Extramammary breast pain (also known as chest wall pain) is unrelated to the breast, and could be caused by

- Rib injuries
- Torn muscles in the chest or shoulders
- Inflammation of costal cartilage

Sources

www.breastcancercare.org.uk/information-support/have-i-got-breast-cancer/benign-breast-conditions/breast-pain/chest-wall-pain

www.mayoclinic.org/diseases-conditions/breast-pain/symptoms-causes/dxc-20167381



Pregnancy

- diminution of fibrous stroma
- lobular hyperplasia
- Hormones active are est prog & prolactin

Lactation - prolactin & oxytocin

Menopause - irregularity & functional nodularity

■ **Estrogen receptor**

■ **Progesterone receptor**

- may present in tumour tissue
- activated when occupied by specific hormone ligand
- activation of estrogen rec leads to the induction of numerous cellular genes, which encode critical enzymes & secrete peptide growth factors.

Changes during lactation

CURRENT Diagnosis & Treatment: Obstetrics & Gynecology > Chapter 12. The Normal Puerperium > Lactation Physiology > Physiology >

Table 12–2. Multihormonal Interaction in Mammary Growth and Lactation.

Mammogenesis	Lactogenesis	Galactopoiesis
Estrogens	Prolactin	↓Gonadal hormones
Progesterone	↓Estrogens	Suckling (oxytocin, prolactin)
Prolactin	↓Progesterone	Growth hormone
Growth hormone	↓hPL(?)	Glucocorticoids
Glucocorticoids	Glucocorticoids	Insulin
Epithelial growth factor	Insulin	Thyroxine and parathyroid hormone

Arrows signify that lower than normal levels of the hormone are necessary for the effect to occur.

Prolactin




- The hormone prolactin promotes milk secretion
- During pregnancy the hormone concentration in blood rises steadily from the **5th week** of pregnancy until birth of the baby
- At full term prolactin level rises to **10 to 20 times** the normal non-pregnant level.
- Acini become dilated and engorged with colostrum and then milk.



Bartholin's glands

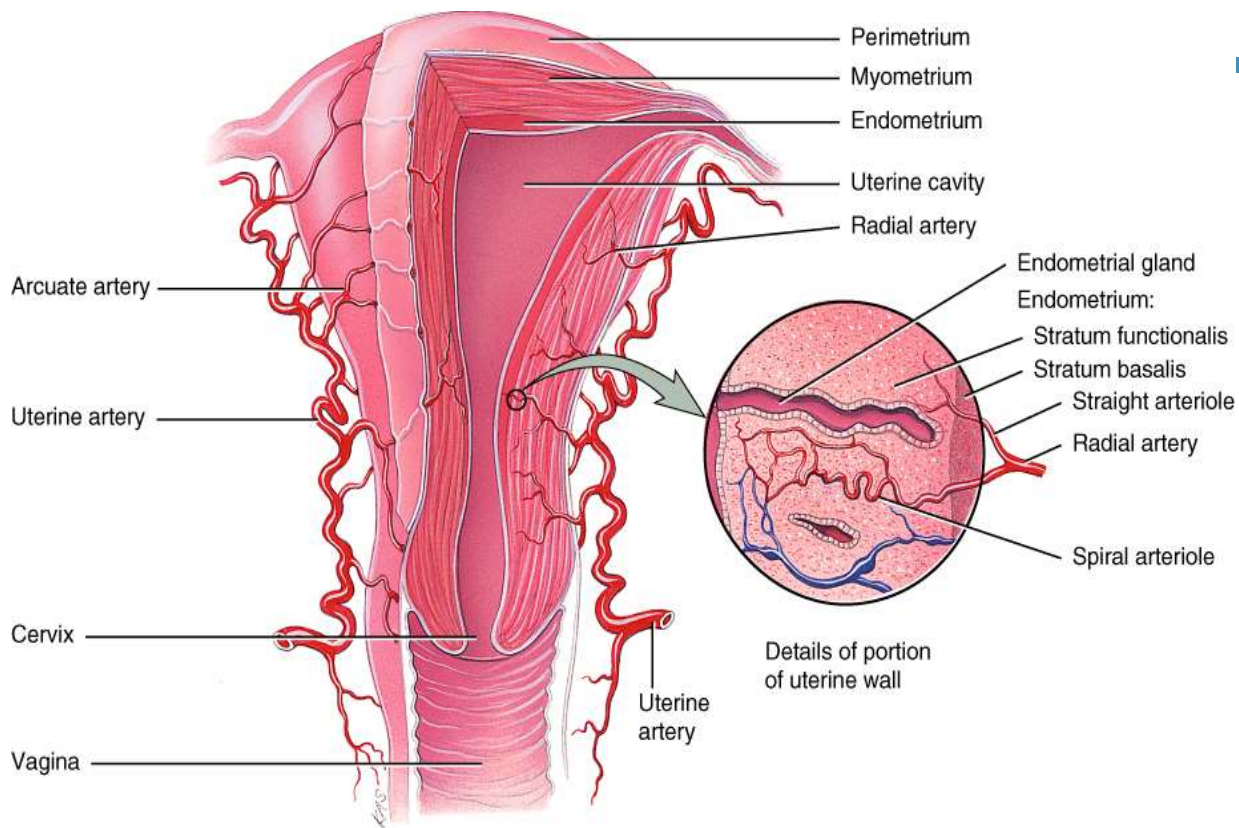
Function and purpose

- They secrete mucus to provide vaginal lubrication.
- Bartholin's glands secrete relatively minute amounts (one or two drops) of fluid just before a woman orgasms.
-
- The fluid may slightly moisten the labial opening of the vagina, serving to make contact with this sensitive area more comfortable for the woman

- 
- As in males, GnRH secreted by the hypothalamus triggers the release of FSH and LH from the pituitary; however, in females, this signals the ovaries to produce estradiol and progesterone.
 - FSH stimulates the growth and maturation of follicles on the ovaries, which house and nourish the developing eggs; the follicle, in turn, releases inhibin, which inhibits the production of FSH.
 - Progesterone stimulates the growth of the endometrial lining of the uterus in order to prepare it for pregnancy; a strong surge of LH at around day 14 of the cycle triggers ovulation of an egg from the most mature follicle.
 - After ovulation, the ruptured follicle becomes a corpus luteum, which secretes progesterone to either regrow the uterine lining or to support the pregnancy if it occurs.
 - During middle age, a woman's ovaries become less sensitive to FSH and LH and, therefore, cease to mature follicles and undergo ovulation; this is known as menopause.

Key Terms

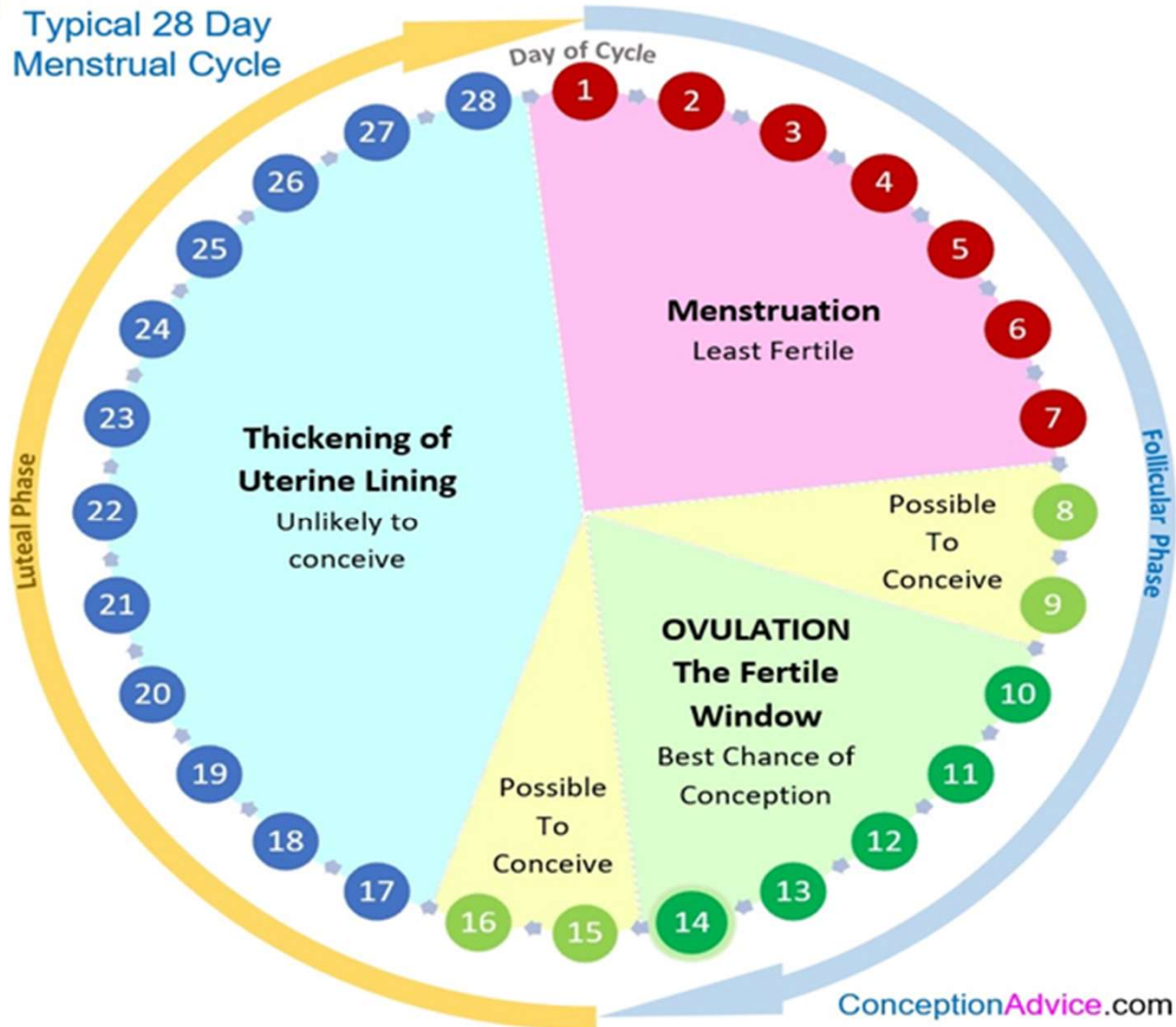
- corpus luteum**: a yellow mass of cells that forms from an ovarian follicle during the luteal phase of the menstrual cycle in mammals; it secretes steroid hormones
- menopause**: the ending of menstruation; the time in a woman's life when this happens
- endometrium**: the mucous membrane that lines the uterus in mammals and in which fertilized eggs are implanted
- estradiol**: a potent estrogenic hormone produced in the ovaries of all vertebrates; the synthetic compound is used medicinally to treat estrogen deficiency and breast cancer
- menstruation**: the periodic discharging of the menses, the flow of blood and cells from the lining of the uterus in females of humans and other primates



Uterine cycle

- Repeating series of changes in the endometrium
- Continues from menarche to menopause
 - **Menses**
 - Degeneration of the endometrium
 - Menstruation
 - **Proliferative phase**
 - Restoration of the endometrium
 - **Secretory phase**
 - Endometrial glands enlarge and accelerate their rates of secretion

Typical 28 Day Menstrual Cycle

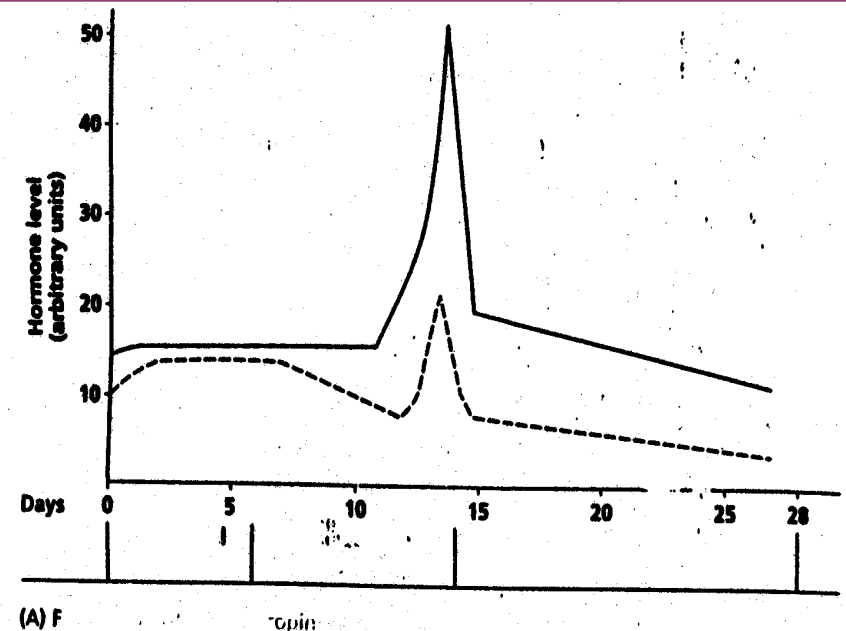
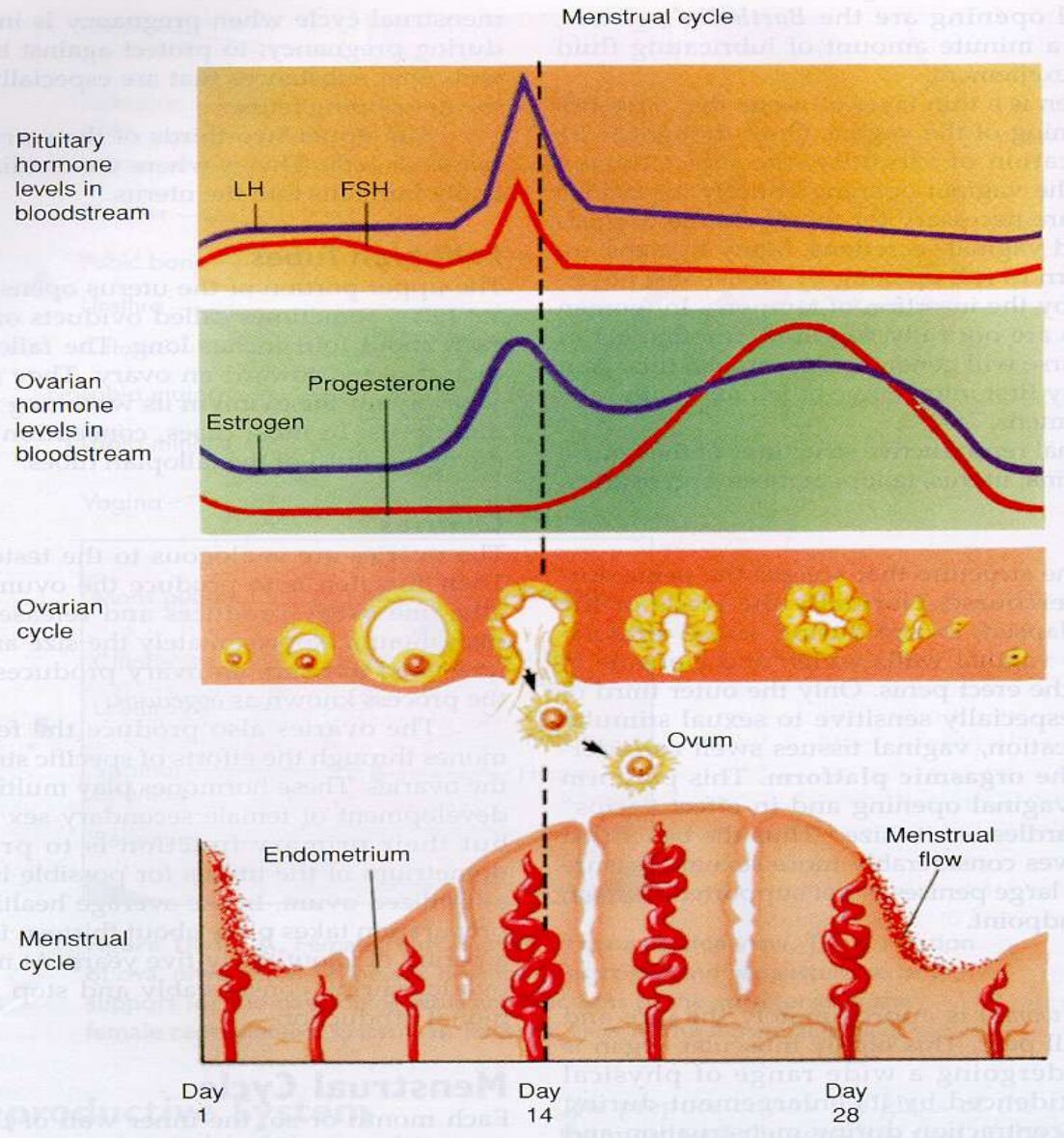


MENSTRUATION

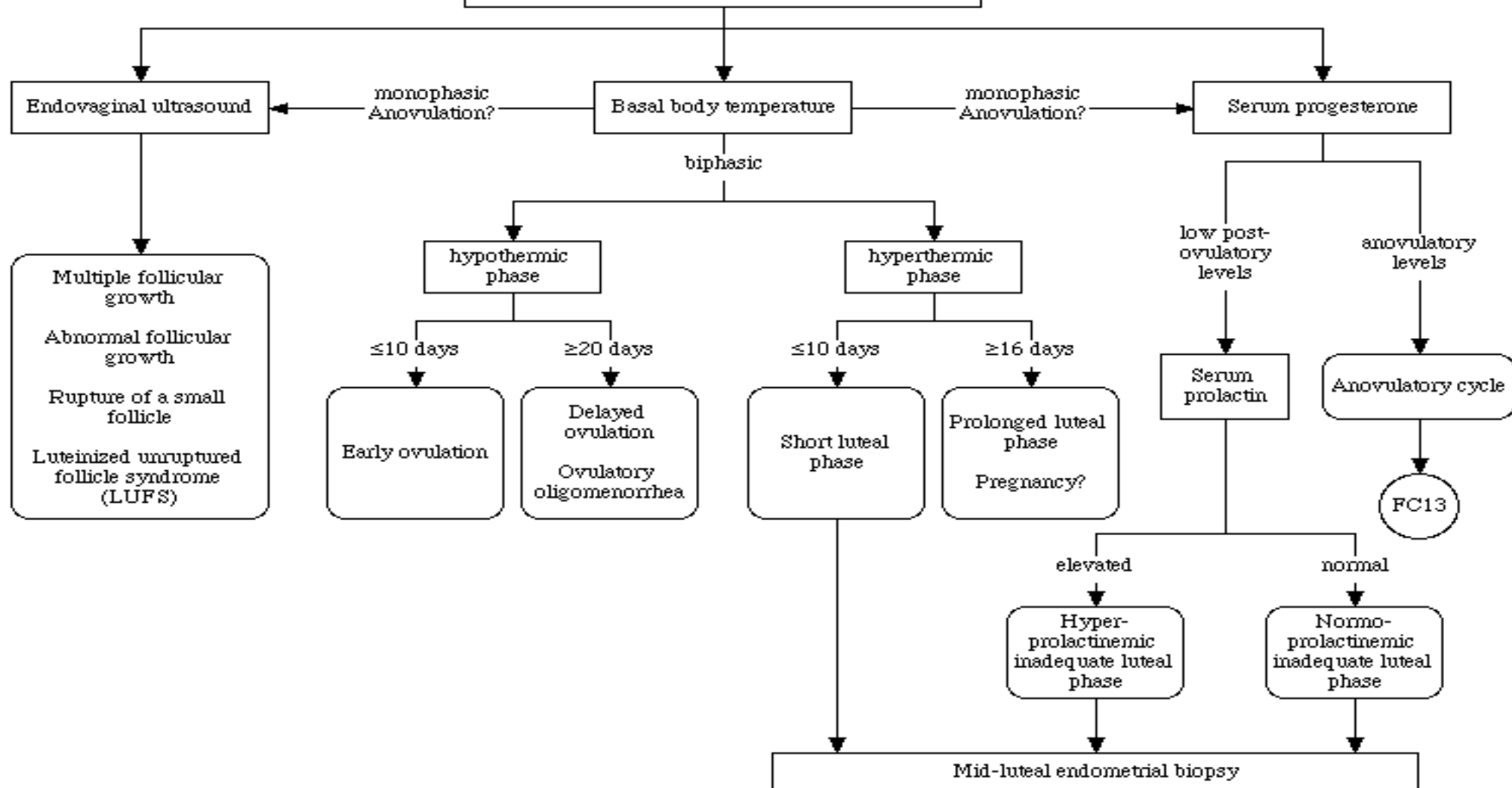
- Menarch, the onset of menstruation signals the bodily changes that transform a female body
- Average age is 12.8
- Amount of bleeding varies from woman to woman
- Expulsion of blood clots

- Blood color can vary from bright red to dark maroon
- Usually occurs every 25 to 32 days
- Women can experience fluid retention, cramping, mood swings, weight gain, breast tenderness, diarrhea, and constipation

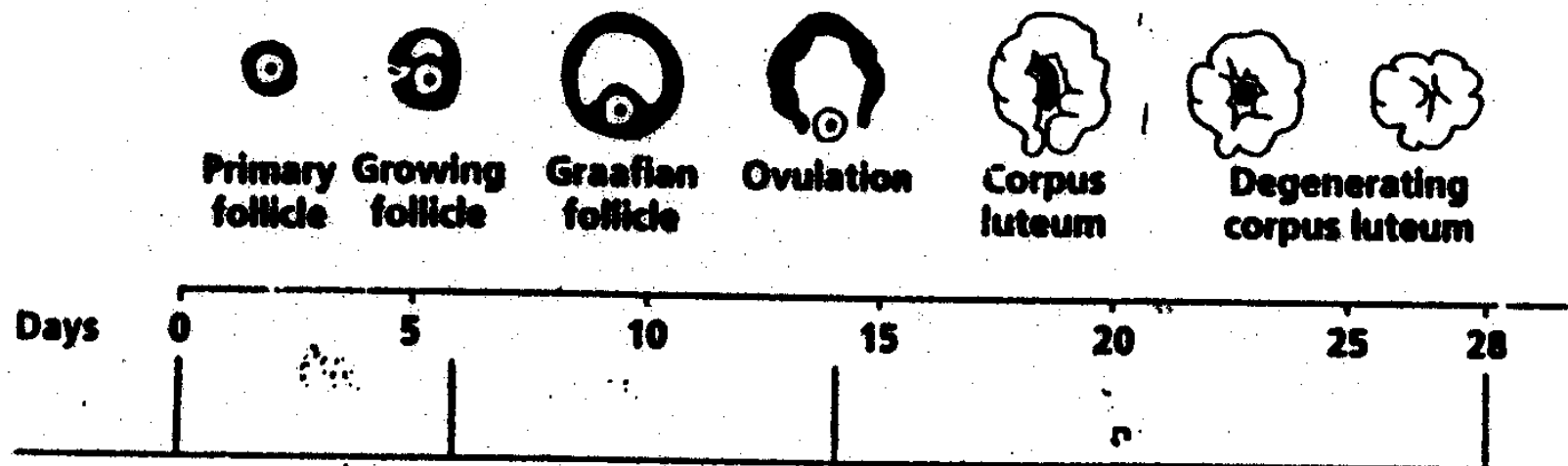
PITUITARY HORMONES



FLOW CHART 7. REGULAR MENSES



FOLLICLE DEVELOPMENT



(B)

FI

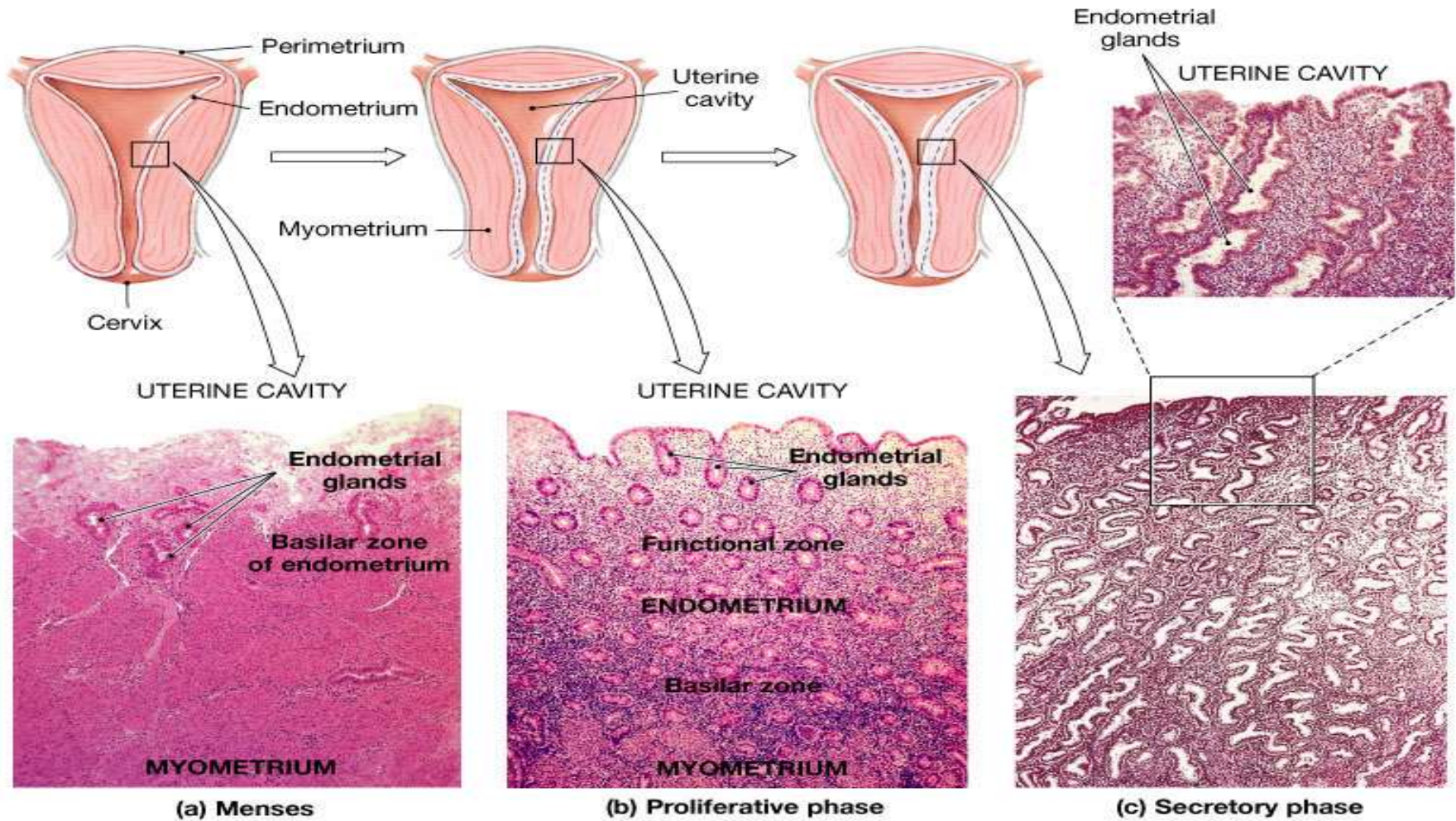
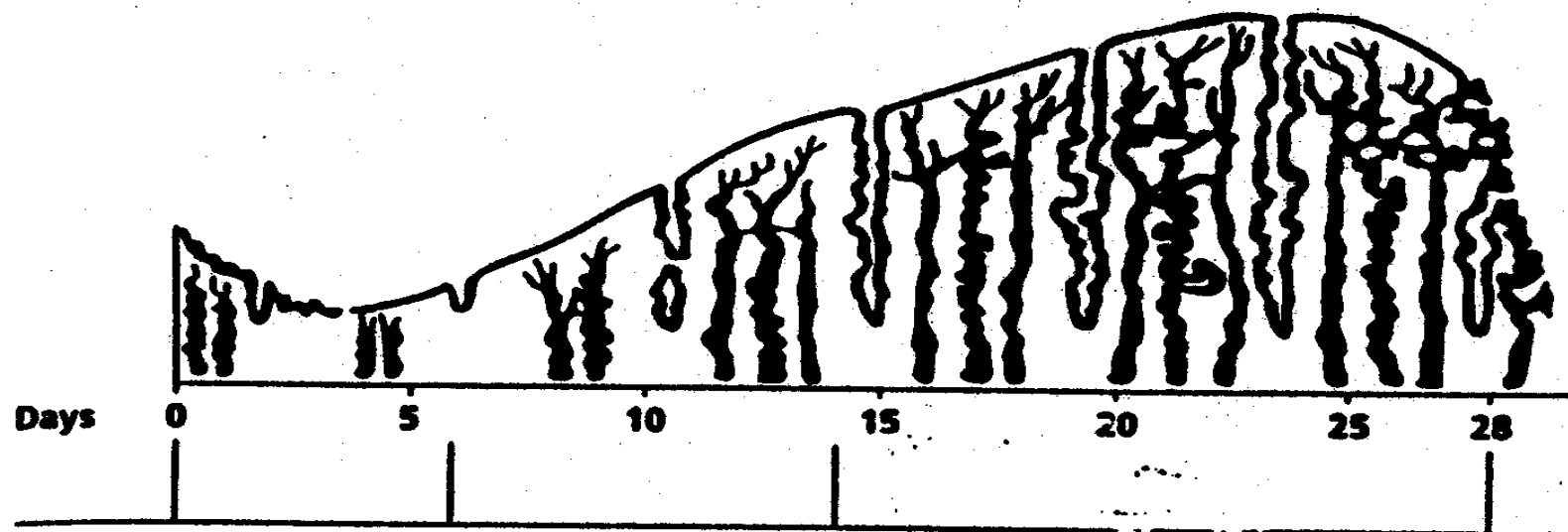


Figure 28.20

OVULATION



(C)

DEFINITION OF MENSTRUAL CYCLE

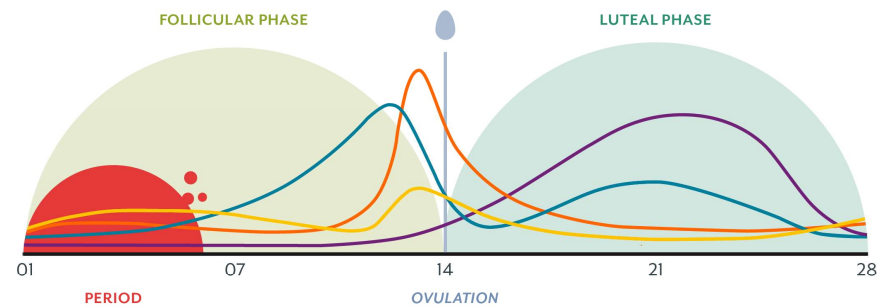
A menstrual cycle is defined as that period of time from the beginning of one menstrual flow to the beginning of the next menstrual flow. The menstrual cycles includes:

Follicular Phase



- approximately 14 days but highly variable and ending with ovulation.

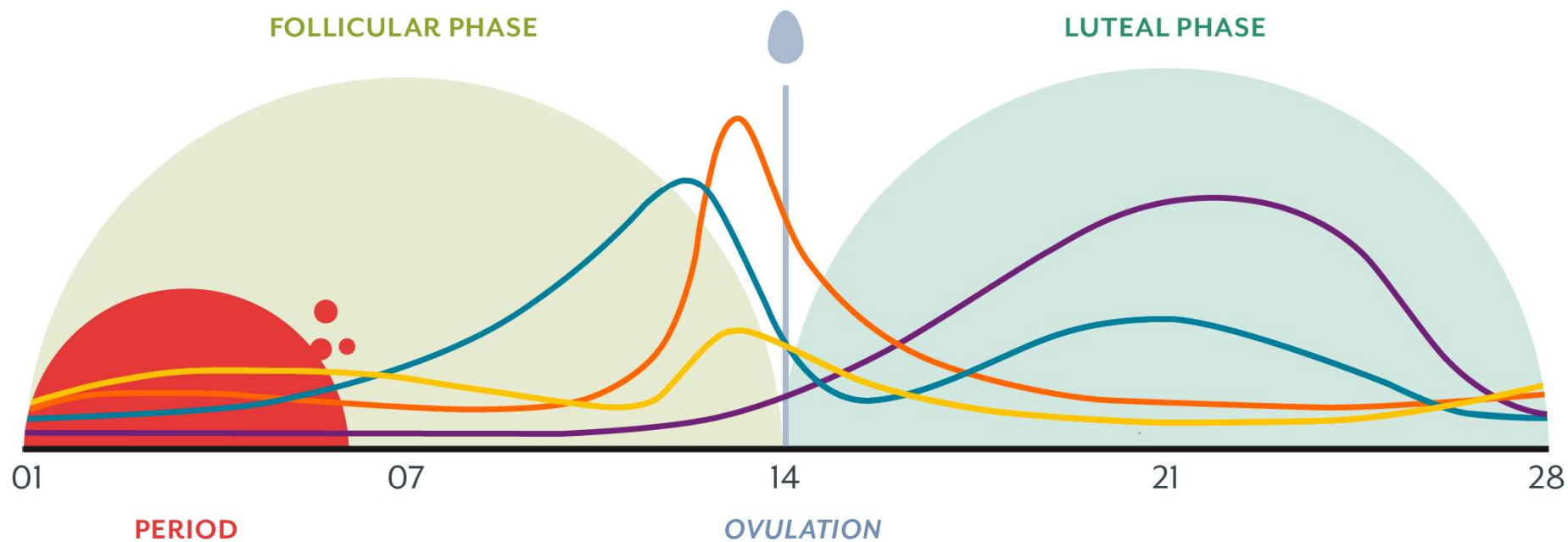
•After menstruation, low levels of estradiol and progesterone stimulate the hypothalamic release of GnRH with in turn increases the pituitary's release of FSH and LH.

- FSH stimulates the maturation of ovarian follicles
- LH stimulates theca cells of the ovary to produce androgens, which are then converted to estrogens in the granulosa cells of the ovary.
- Estrogen stimulates proliferation of the endometrial lining (proliferative phase).



Ovarian Cycle

Endocrine Gland	Hormone	Function
<u>Anterior Pituitary</u> 	FSH	<ul style="list-style-type: none"> Stimulates follicular growth in ovaries Stimulates estrogen secretion (from developing follicles)
	LH	<ul style="list-style-type: none"> Surge causes ovulation Results in the formation of a corpus luteum
<u>Ovaries</u> 	Estrogen	<ul style="list-style-type: none"> Thickens uterine lining (endometrium) Inhibits FSH and LH for most of cycle Stimulates FSH and LH release pre-ovulation
	Progesterone	<ul style="list-style-type: none"> Thickens uterine lining (endometrium) Inhibits FSH and LH



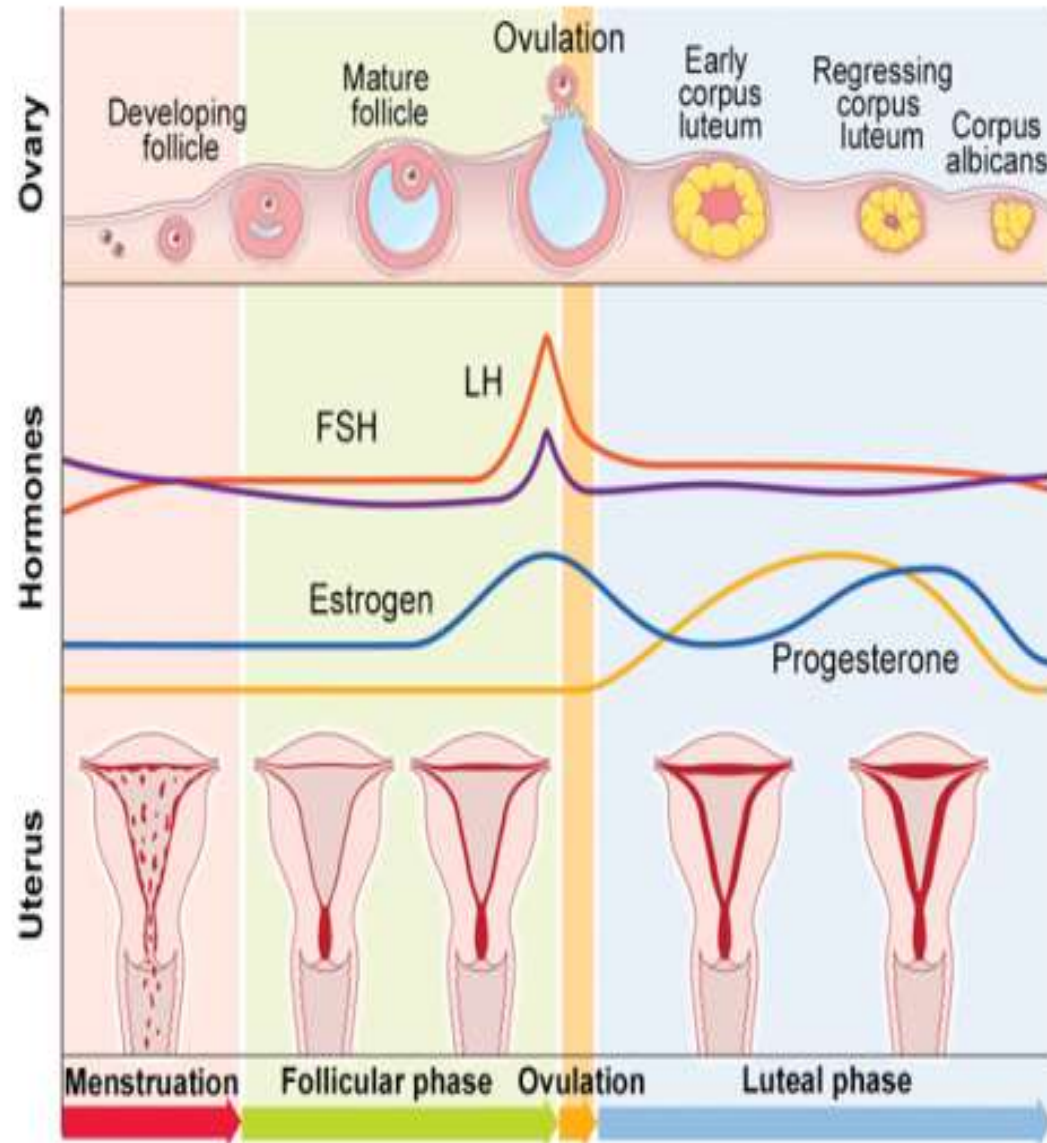
Ovarian Cycle

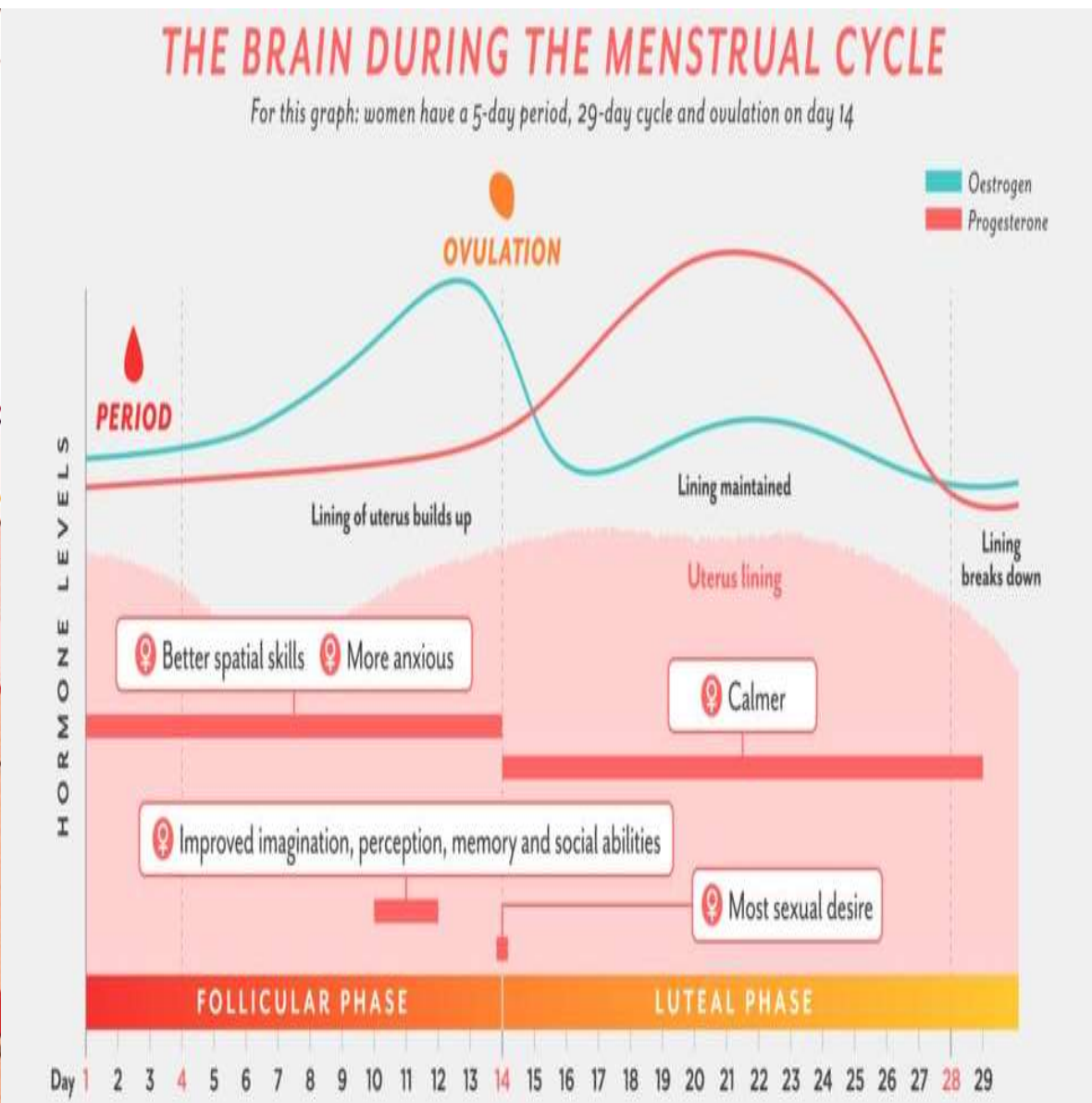
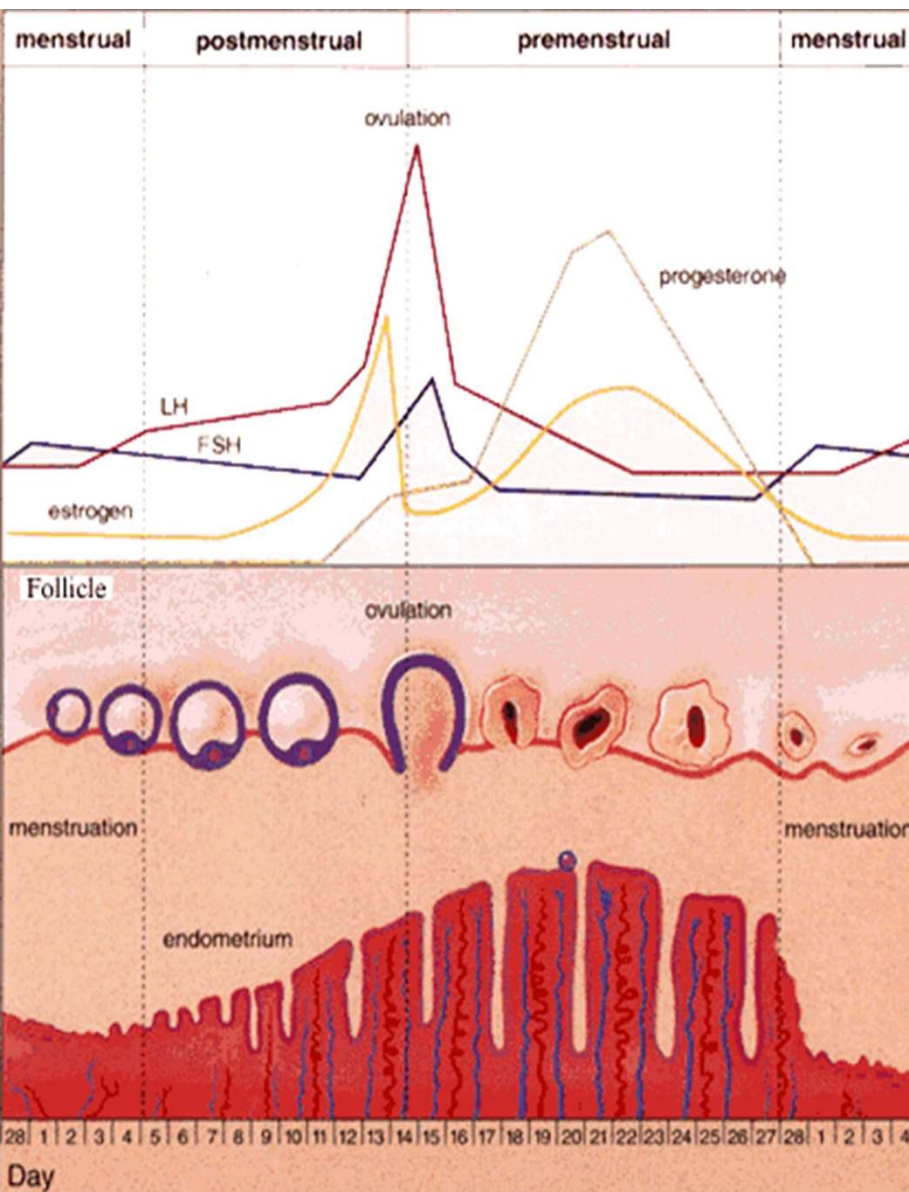
Ovulation

- A **preovulatory estradiol** surge leads to a **midcycle LH surge**, which **initiates ovulation**.
- A mature follicle releases an oocyte and becomes a functioning corpus luteum.

Luteal Phase

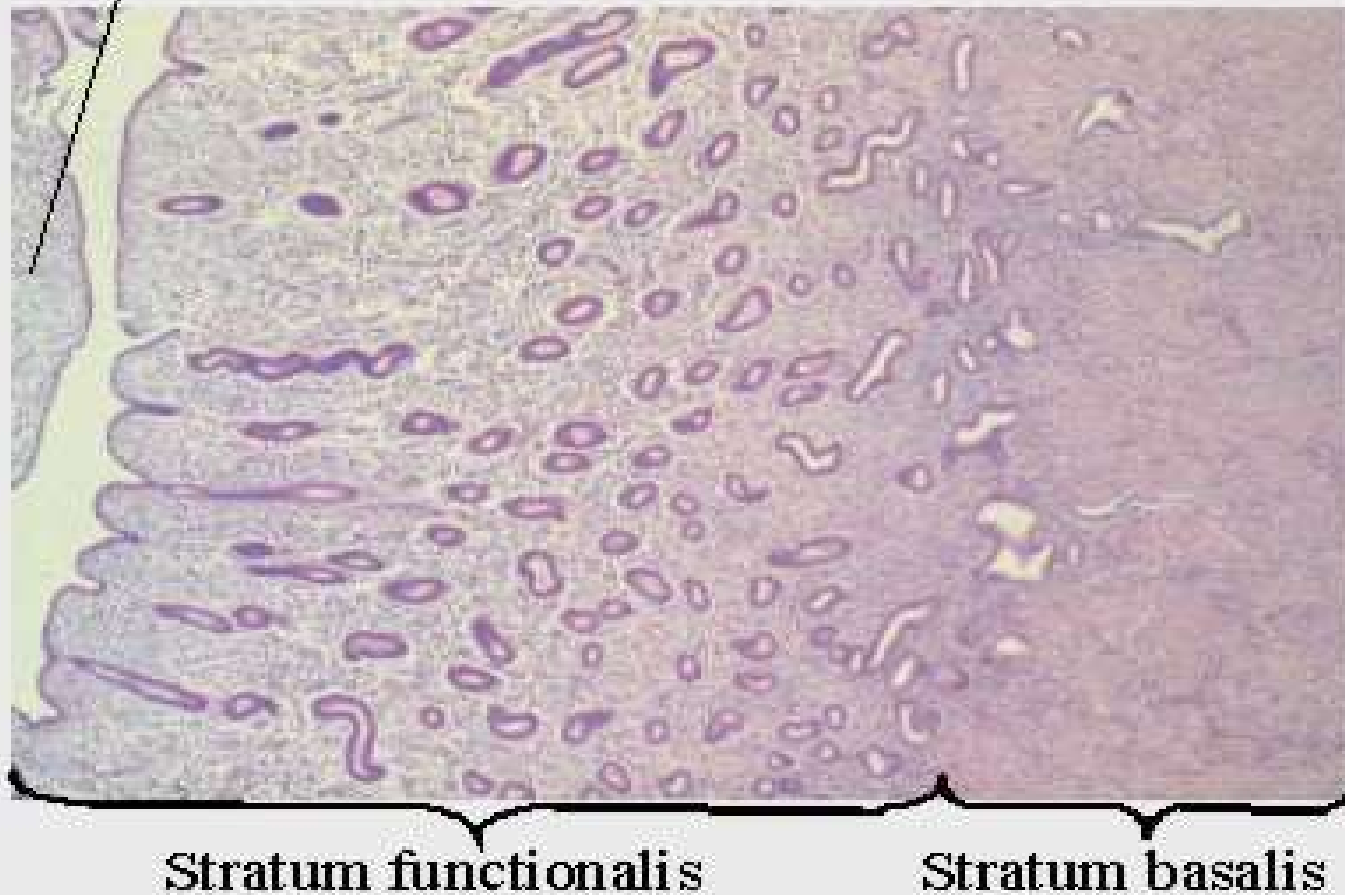
- The luteal phase begins with ovulation and ends with the menstrual flow and usually lasts 14 ± 2 days.**
- Large amounts of **progesterone** are produced by the **corpus luteum** as well as **estrogen**.
- Rising levels of estrogen and progesterone lead to falling levels of FSH and LH
- Progesterone stops the growth of the endometrium and stimulates differentiation of the endometrium into a **secretory endometrium**.
- Without fertilization and human chorionic gonadotropin production, the corpus luteum involutes after **about 10 - 12 days and sloughing of the endometrium**.
- Local prostaglandin release leads to vasoconstriction and uterine contractions





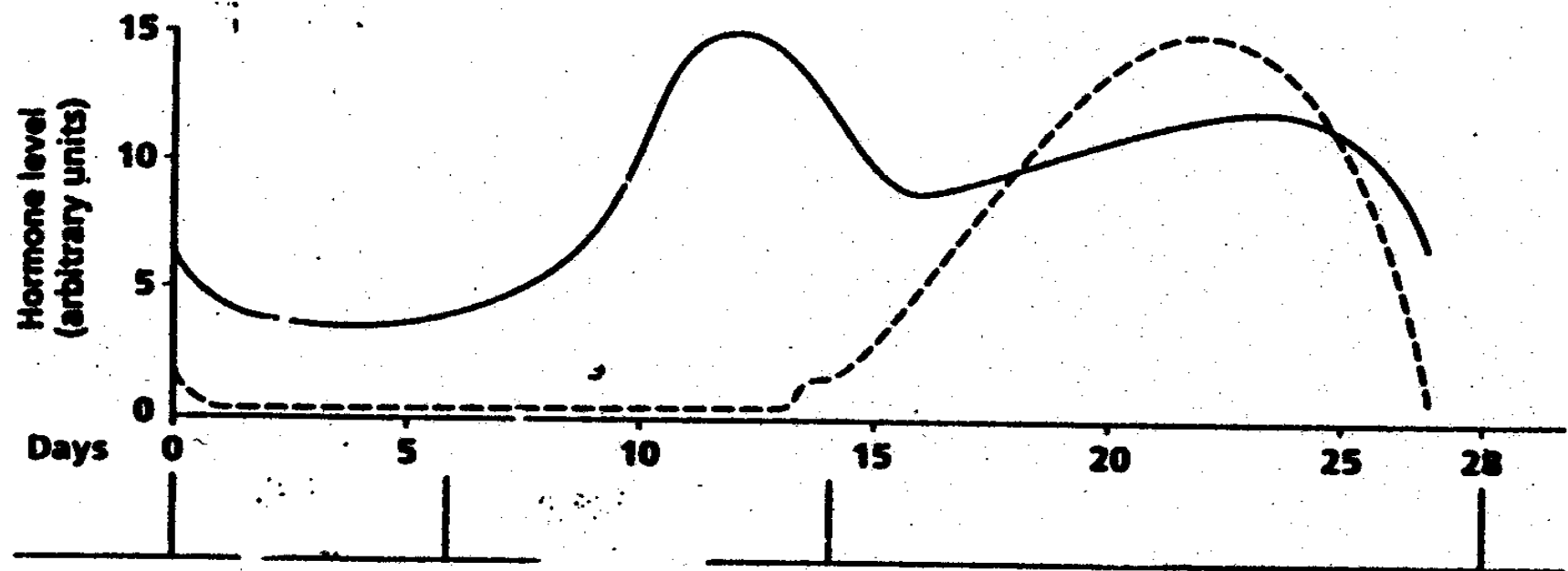
Uterus, Menstrual Phase

Exfoliating tissue



Breakdown of the corpus luteum in the absence of LH causes loss of estrogen and progesterone to maintain the endometrium.

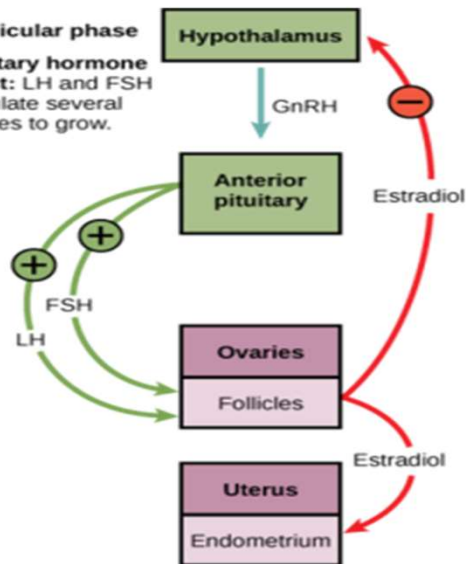
OVARIAN HORMONES



(D)

I Follicular phase

Pituitary hormone effect: LH and FSH stimulate several follicles to grow.

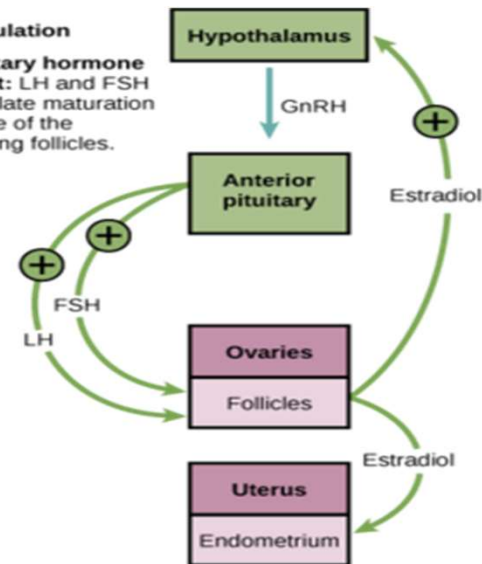


Ovarian hormone effects: Follicles produce low levels of estradiol that

- Inhibit GnRH secretion by the hypothalamus, keeping LH and FSH levels low.
- Cause endometrial arteries to constrict, resulting in menstruation.

II Ovulation

Pituitary hormone effect: LH and FSH stimulate maturation of one of the growing follicles.

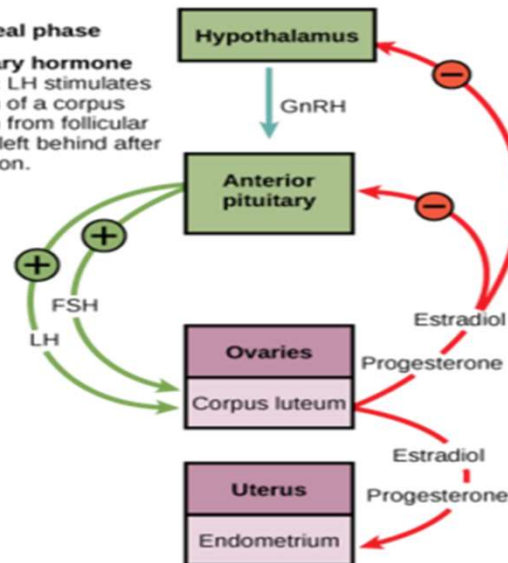


Ovarian hormone effects: Growing follicles begin to produce high levels of estradiol, which

- Stimulate GnRH secretion by the hypothalamus. LH and FSH levels rise, resulting in ovulation about a day later.
- Cause the endometrium to thicken.

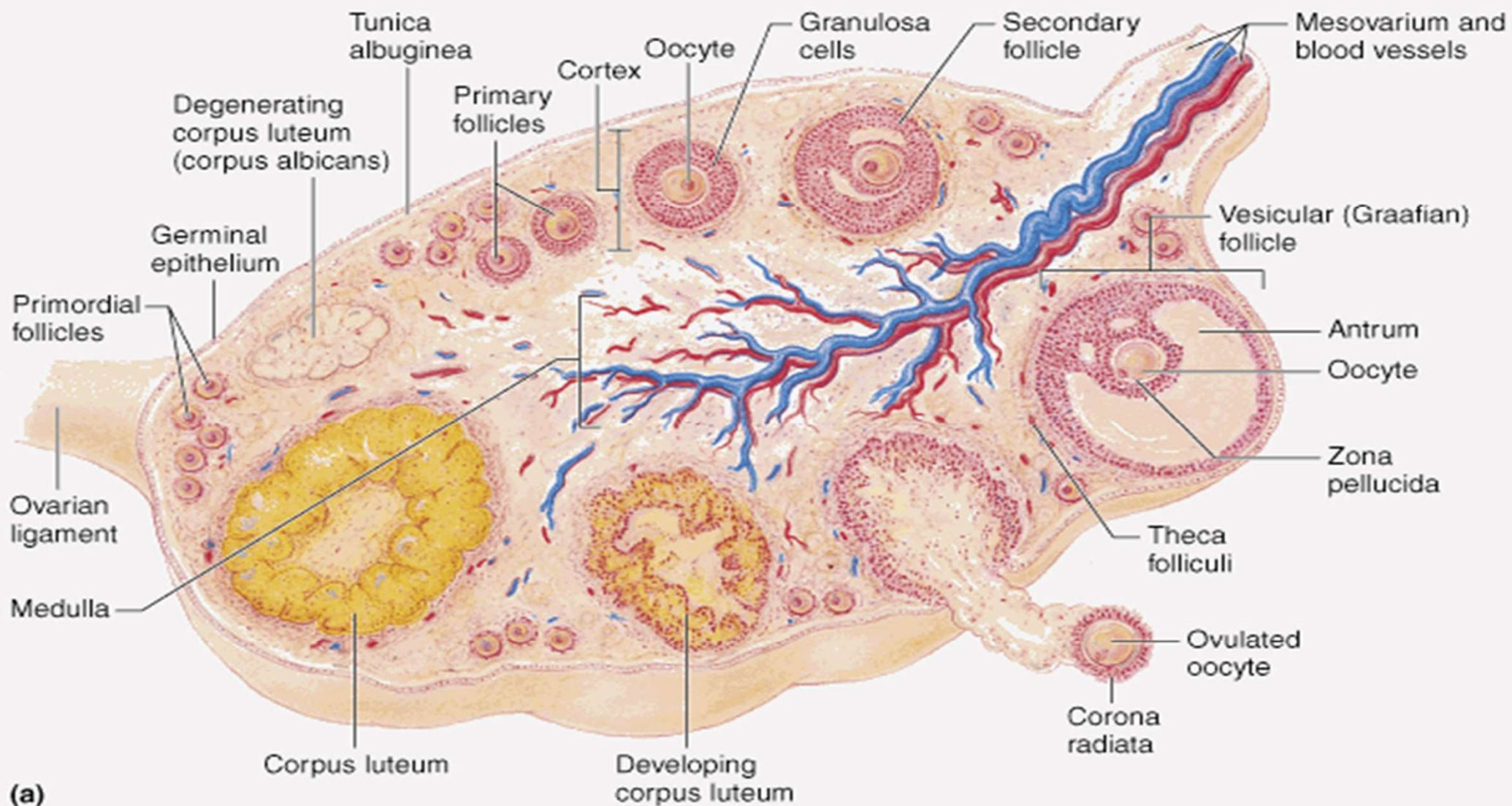
III Luteal phase

Pituitary hormone effect: LH stimulates growth of a corpus luteum from follicular tissue left behind after ovulation.



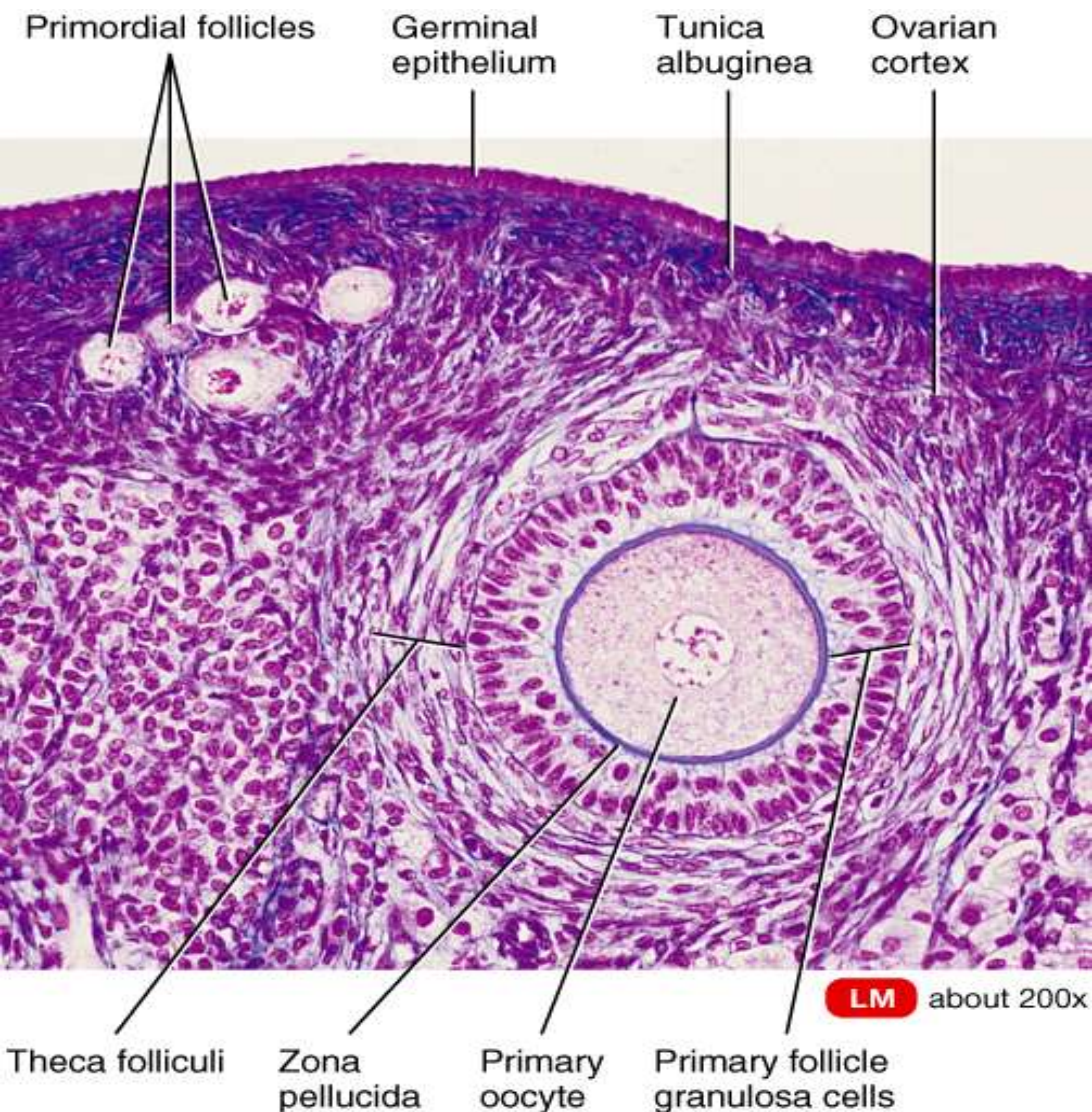
Ovarian hormone effects: The corpus luteum secretes estradiol and progesterone that

- Block GnRH production by the hypothalamus and LH and FSH production by the pituitary.
- Cause the endometrium to further develop.

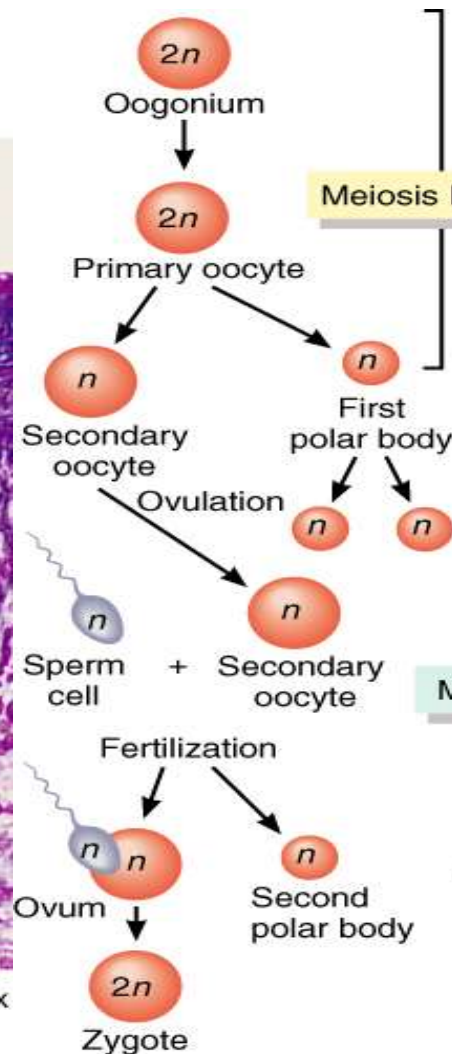


(a)

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(a) Ovarian cortex



During fetal development meiosis I begins.

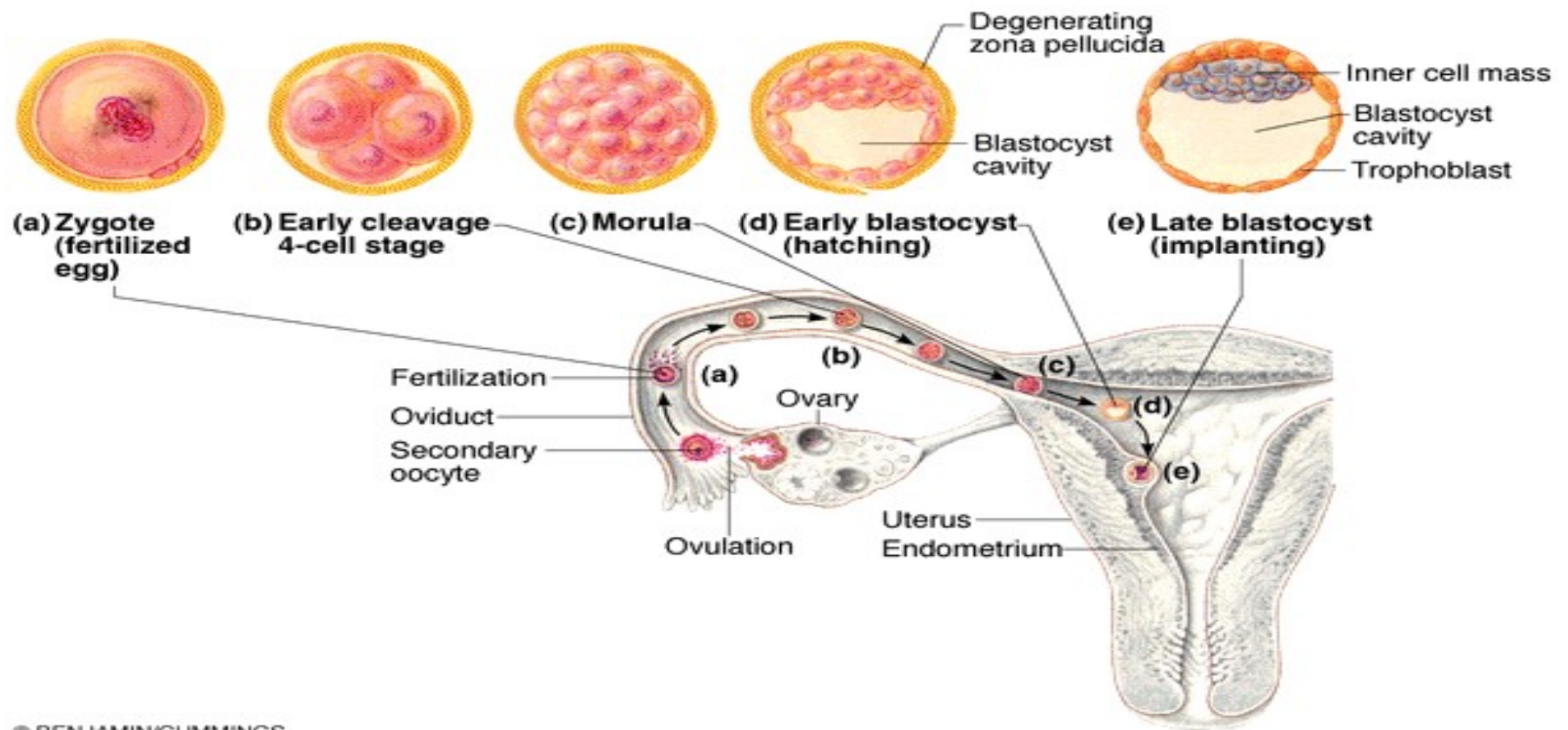
After puberty, primary oocytes complete meiosis I, which produces a secondary oocyte and a first polar body that may or may not divide again.

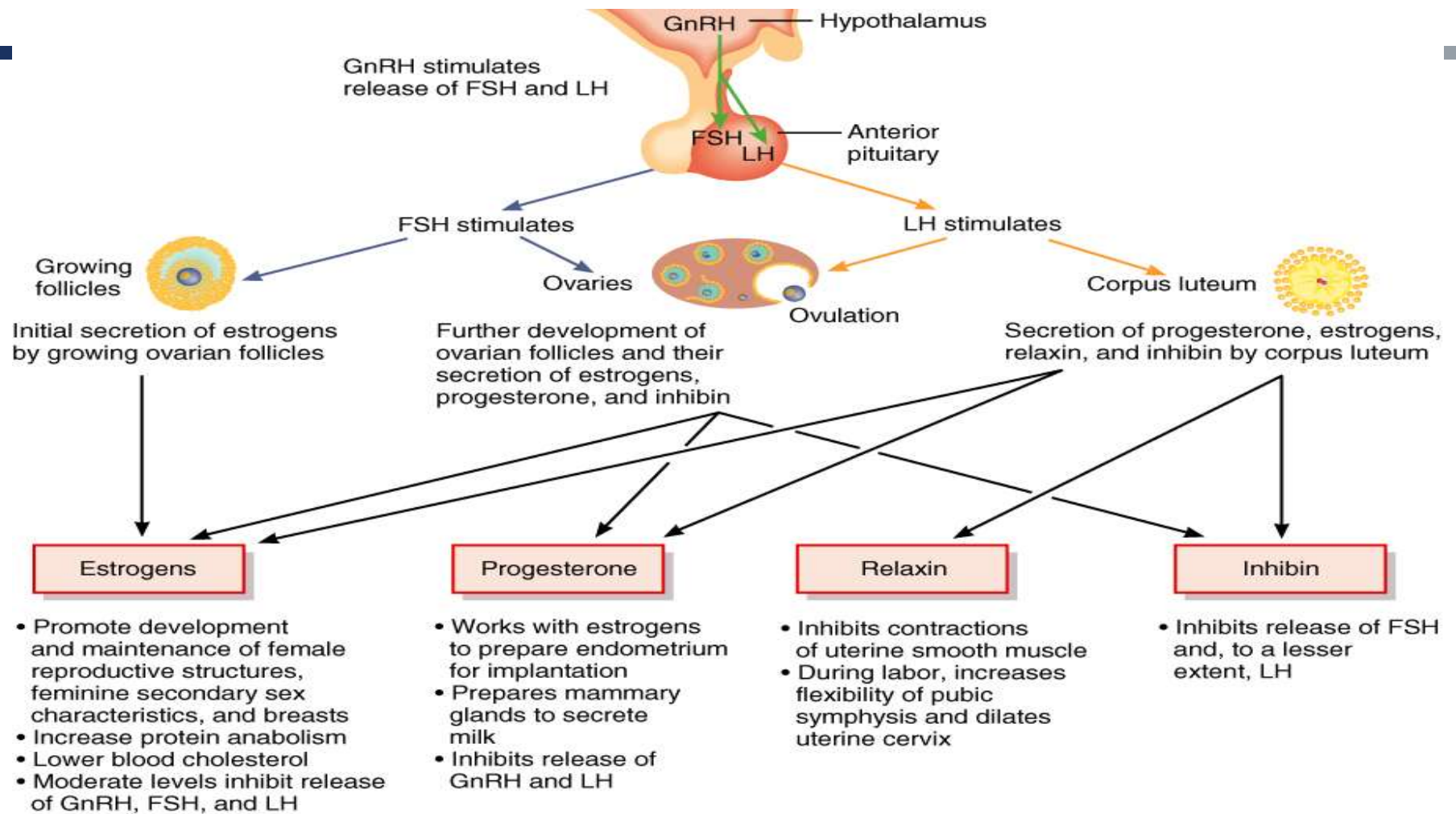
The secondary oocyte begins meiosis II.

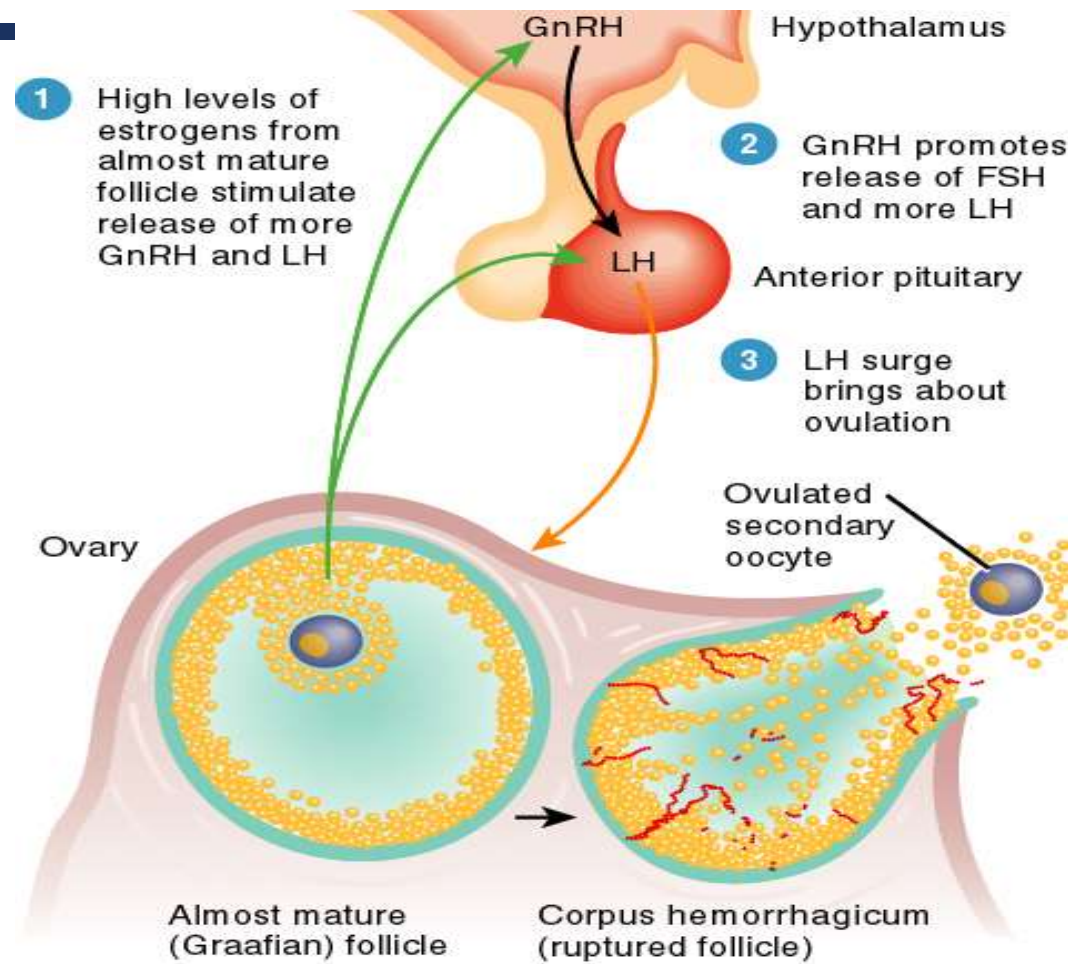
A secondary oocyte (and first polar body) is ovulated.

After fertilization, meiosis II resumes. The oocyte splits into an ovum and a second polar body.

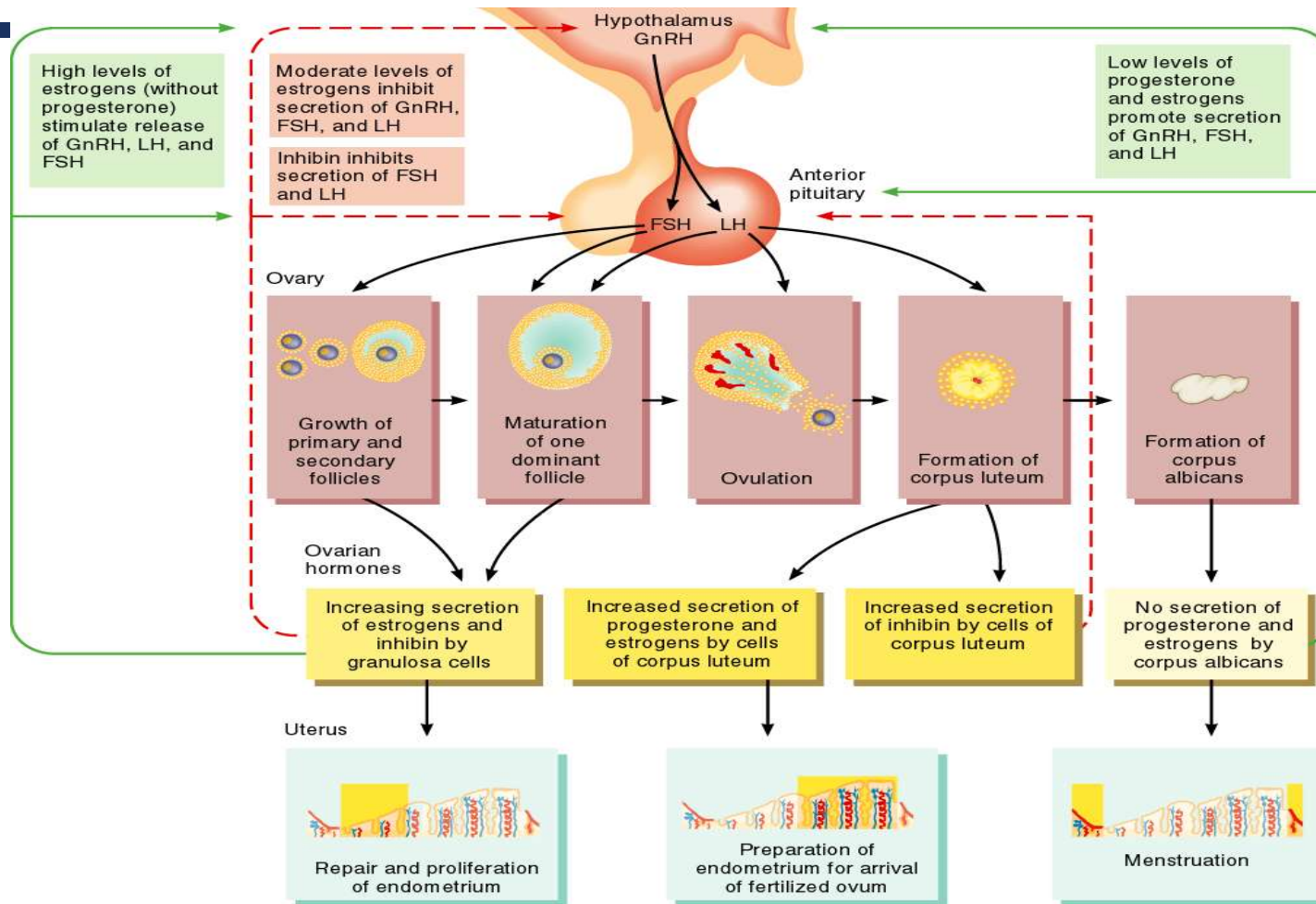
The nuclei of the sperm cell and the ovum unite, forming a diploid (2n) zygote.

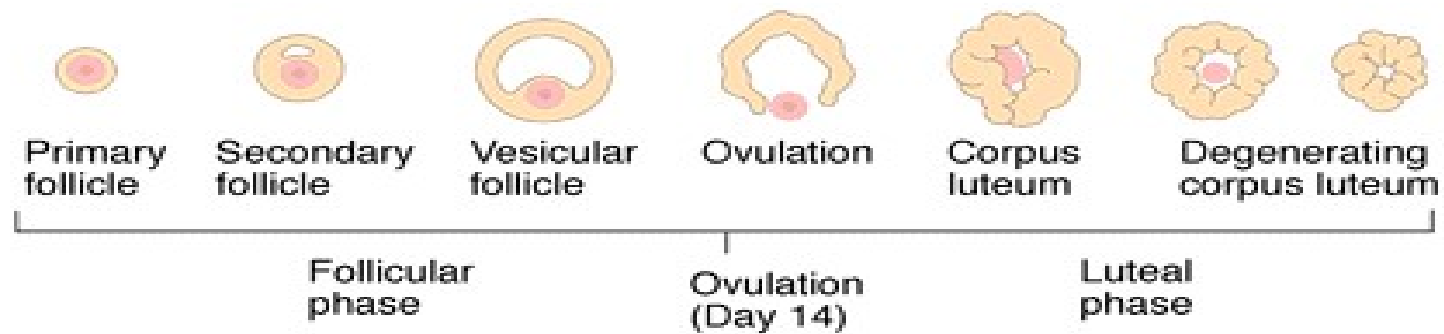




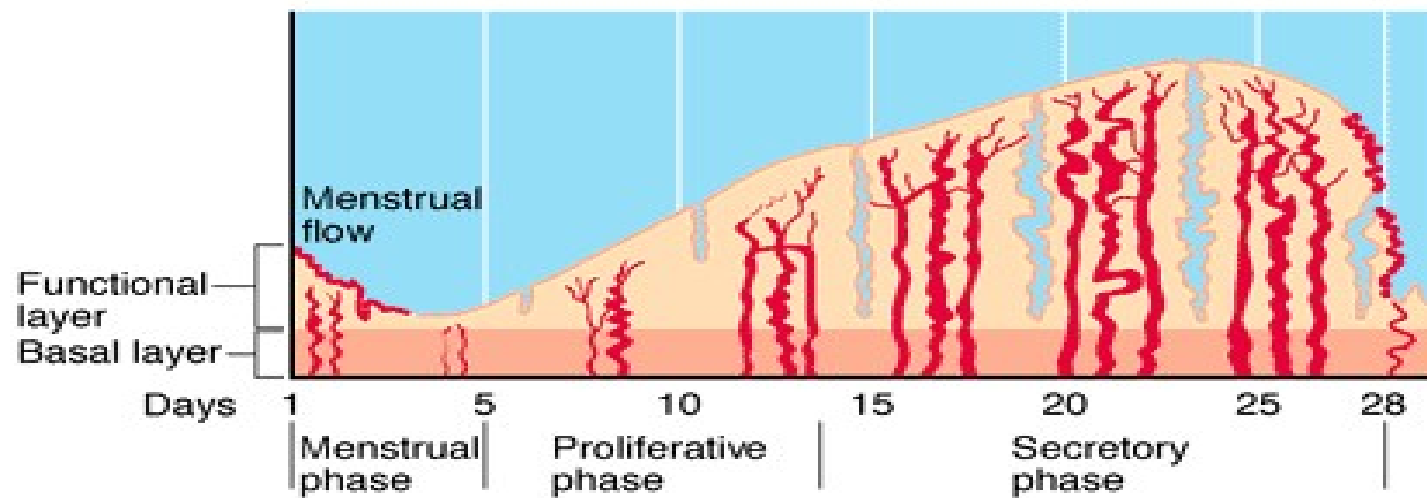


28.27.jpeg



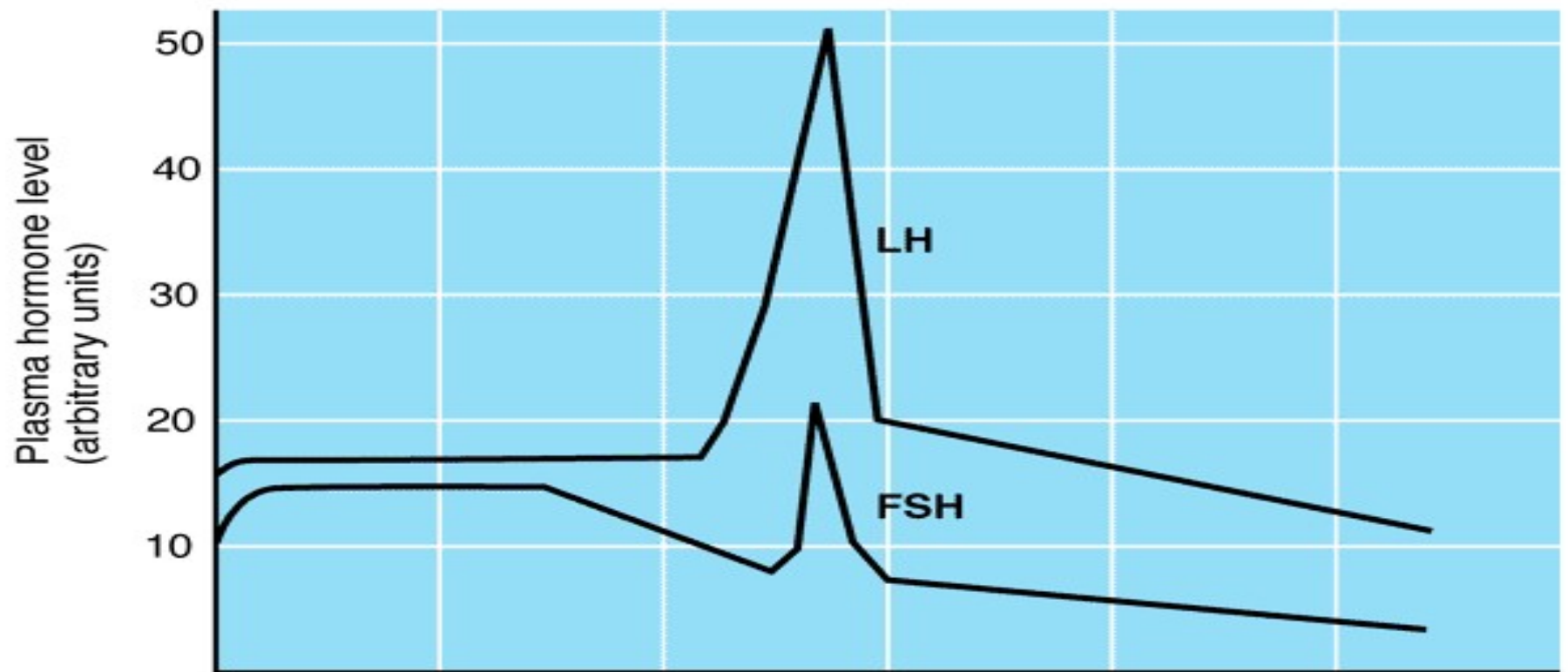


(c) Ovarian cycle



(d) Uterine cycle

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(a) Fluctuation of gonadotropin levels

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Age

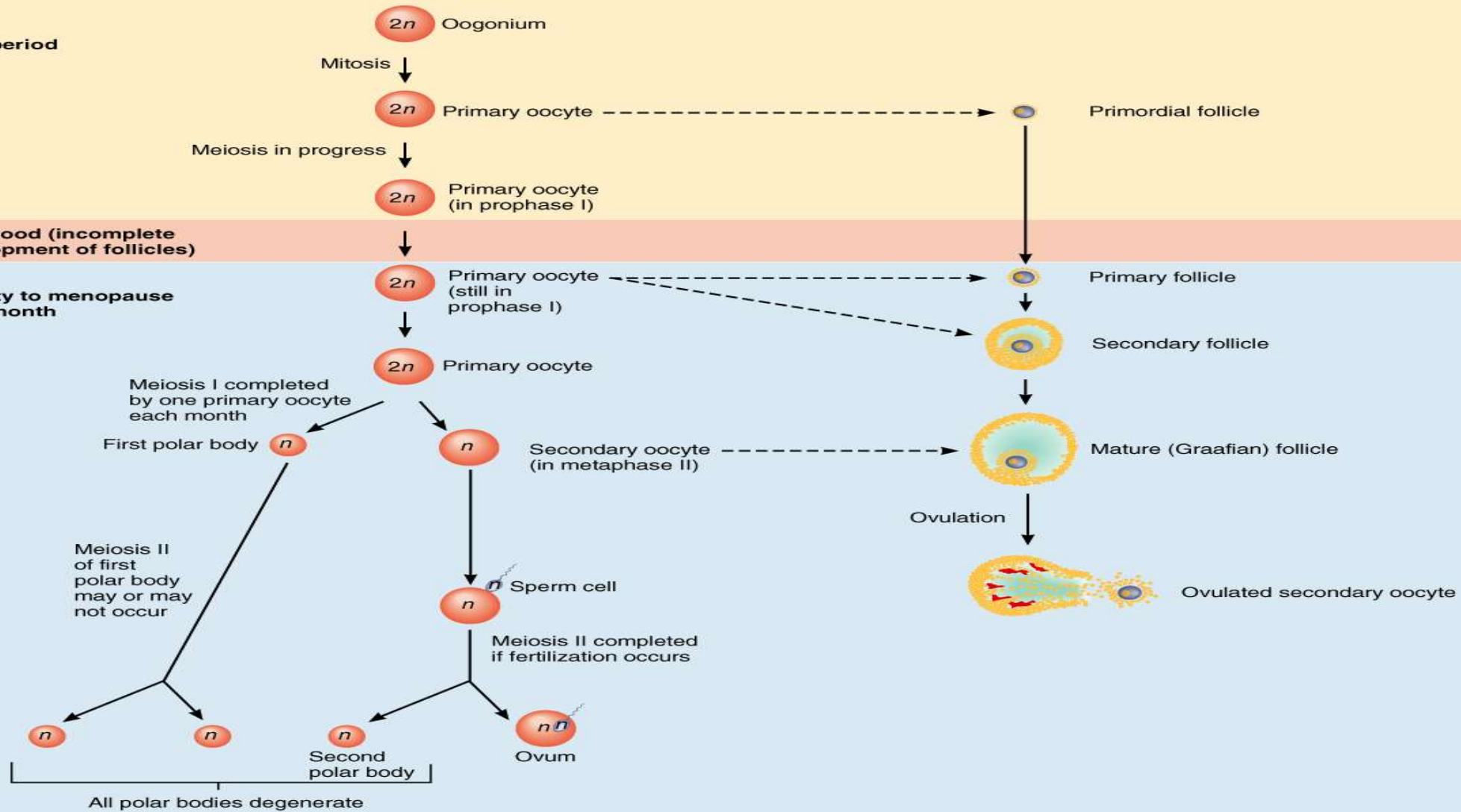
Oogenesis

Follicular development

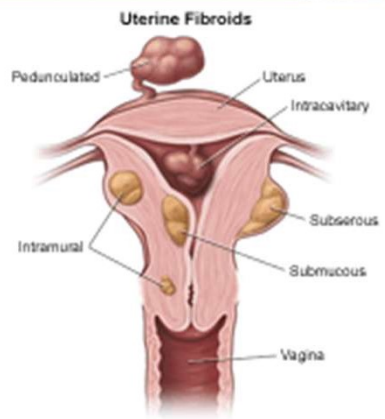
Fetal period

Childhood (incomplete development of follicles)

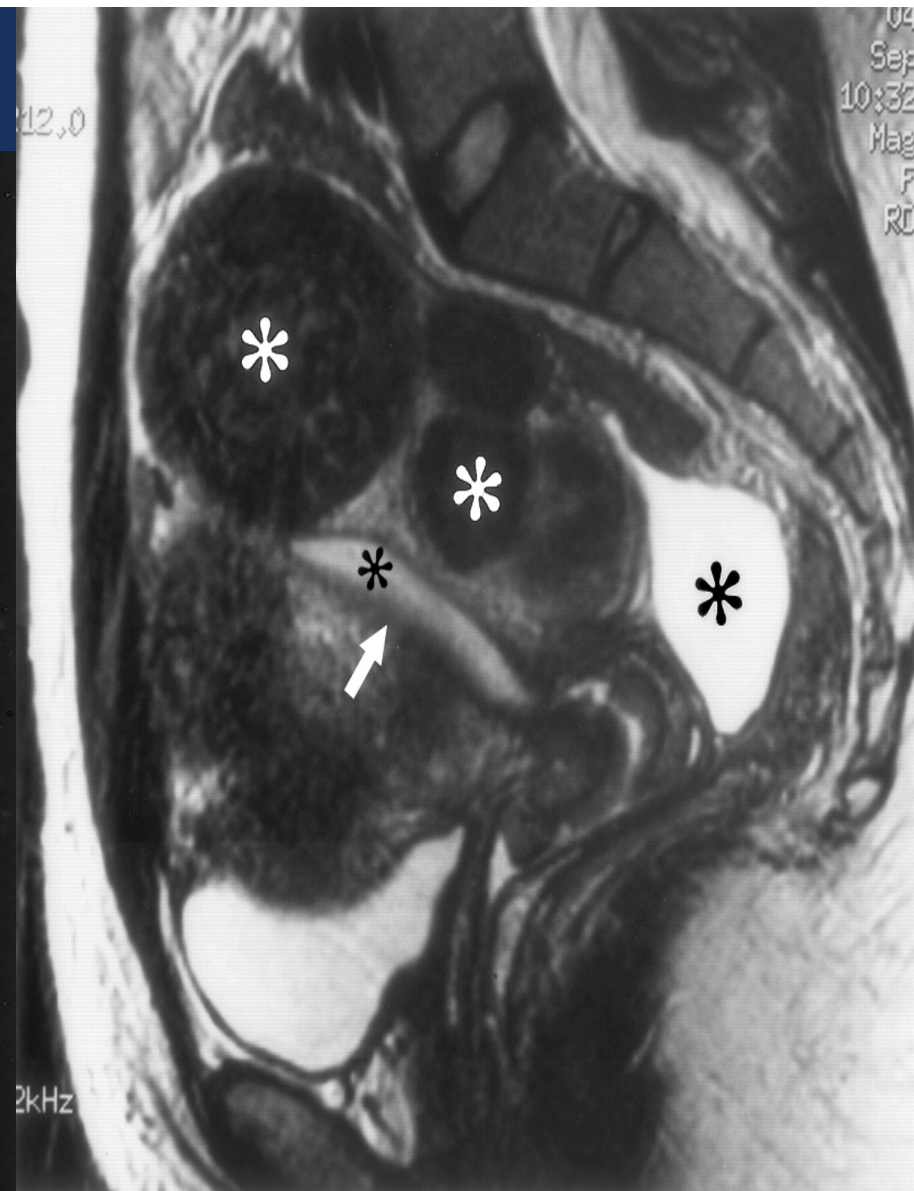
Puberty to menopause each month

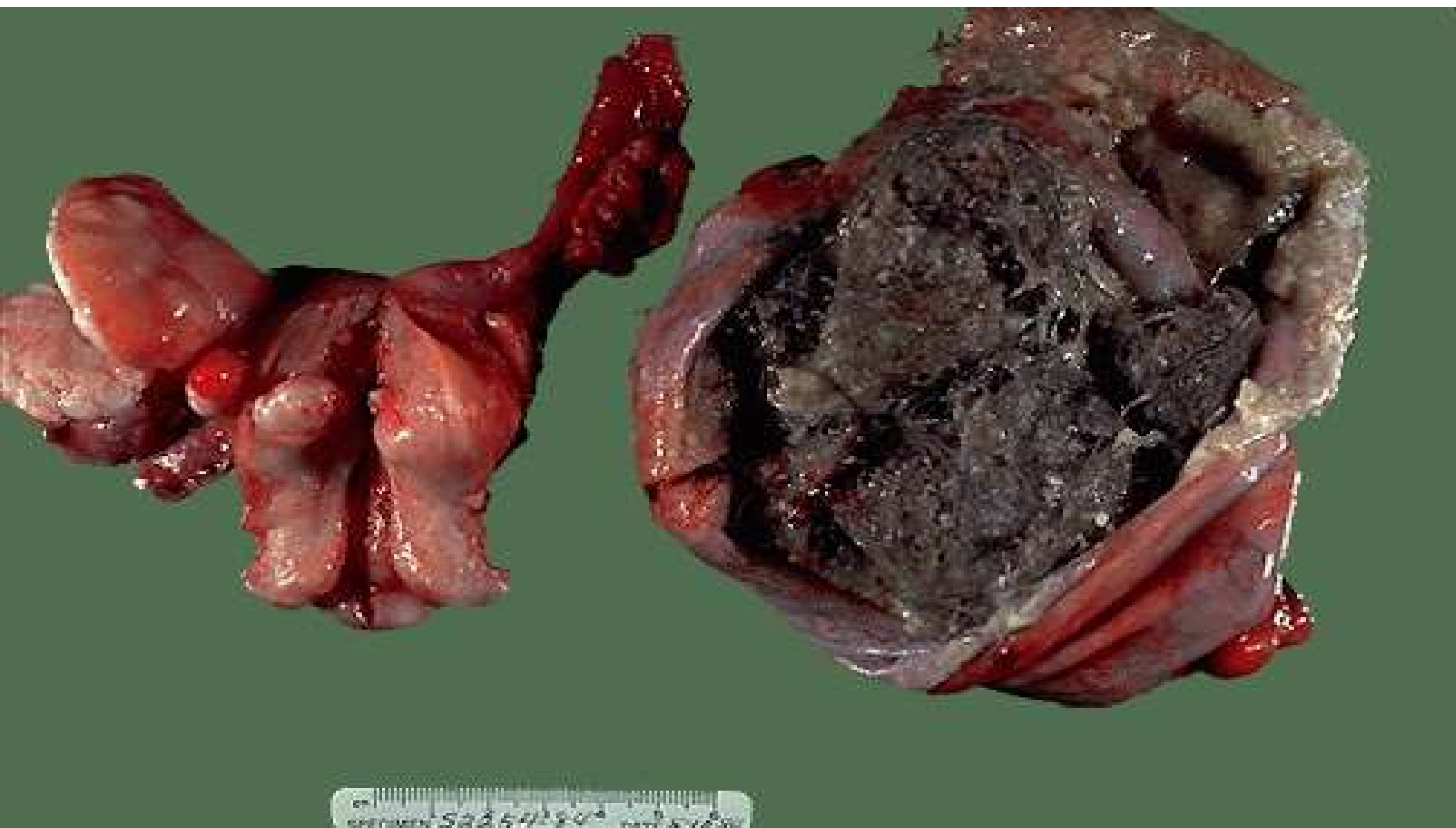


Ovarian teratoma



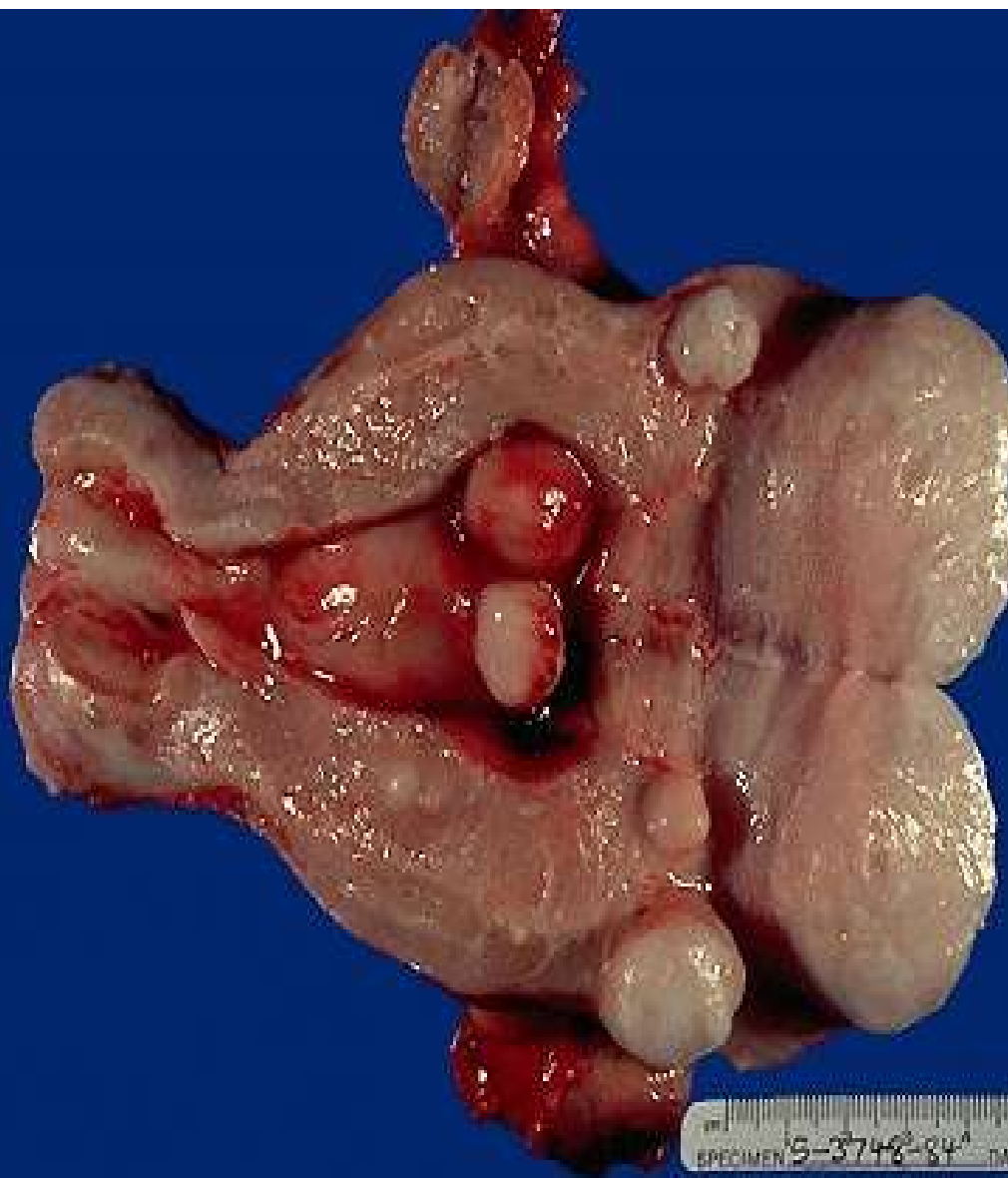
Large leiomyoma in the lower uterine segment in a 28-year-old woman







cm
SPECIMEN S-2667-83⁴ DATE 5-23-83



cm
SPECIMEN S-3748-84¹ DATE 8-6-84

DYSMENORRHEA

- Painful menstrual cramps
- Painful menses without evidence of a physical abnormality
- Believed to be normal body response to uterine contractions
- Other symptoms :
 - Nausea, vomiting, gastrointestinal disturbances, and fainting
 - Prostaglandins cause forceful, frequent uterine contractions called cramps
 - Fibroids, polyps, IUD, PID, or endometriosis

ENDOMETRIOSIS

- Common cause of dysmennorrhea, dyspareunia, and infertility
- Endometrium fragments and lodges in other parts of the pelvic cavity
- Causes inflammation, bleeding, scarring, and adhesions
- Causes are still being studied
- Treated through hormonal therapy, laparoscopic surgery, or major surgical management



MALE

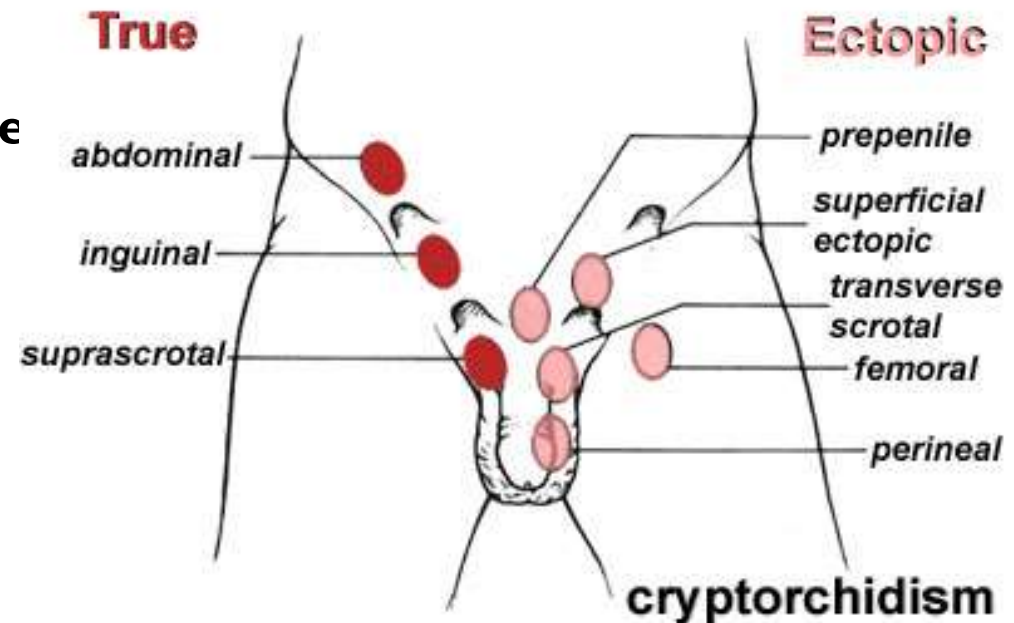


- **Testes are formed in abdomen and descend into scrotum at 7th month of development**

- **Temperature in scrotum is slightly lower than in body**

- **Spermatogenesis (formation of sperm)**
 - sperm-forming cells
 - Sertoli cells
 - interstitial cells-produce testosterone

- **Process takes about 9 weeks**



Control of erection

Hypothalamus (conscious control)

- Parasympathetic nerves
neurotransmitter- **nitric oxide**
promotes blood flow into penis
(Viagra- promotes vasodilation)
- Control of emission and ejaculation
sympathetic nerves- muscle contraction

- The man whose non-erect penis is smallish will usually achieve about a 100 per cent increase in length during sexual excitement.

- The man whose non-erect penis is on the largish size will probably manage about a 75 per cent increase.

- This means the great majority of penises measure between 15cm and 18cm (6-7 inches) when erect, with the average figure being about 16.5cm (6.5 inches).

BULBOURETHRALGLANDS (COWPER'S GLANDS)

- ☐ Pea-sized glands inferior to the prostate
- ☐ Produce thick, clear, alkaline mucus prior to ejaculation that neutralizes traces of acidic urine in the urethra

CONTENTS OF SEMEN

- The prostate gland contributes about 30 percent of the seminal fluid
- the constituents of its secretions are mainly citric acid, acid phosphatase, calcium, sodium, **zinc**, potassium, protein-splitting enzymes, and fibrolysin (an enzyme that reduces blood and tissue fibres).
- Typical ejaculate = 2-5 ml fluid
 - Contains between 20 – 100 million spermatozoa per ml
- Seminal fluid
 - A distinct ionic and nutritive glandular secretion

Colour	White, opalescent	
Specific Gravity	1.028	
pH	7.35-7.50	
Volume	3ml	
SPECIFIC COMPONENTS OF SEMEN		
Gland/Site	Volume in ejaculate	Features
Testis/Epididymis	0.15ml (5%)	Average approximately spermatozoa 80 million/ml
Seminal Vesicle	1.5-2ml (50-65%)	Fructose (1.5-6.5 mg/ml) phosphorylcholine ergothioneine, ascorbic acid, flavins prostaglandins, bicarbonate
Prostate	0.6-0.9ml (20-30%)	prostate, spermine, citric acid, cholesterol, phospholipids, Fibrinolysin, fibrinogenase, zinc acid, phosphatase, prostate-specific
Bulbourethral Glands	< 0.15ml (<5%)	Clear mucus

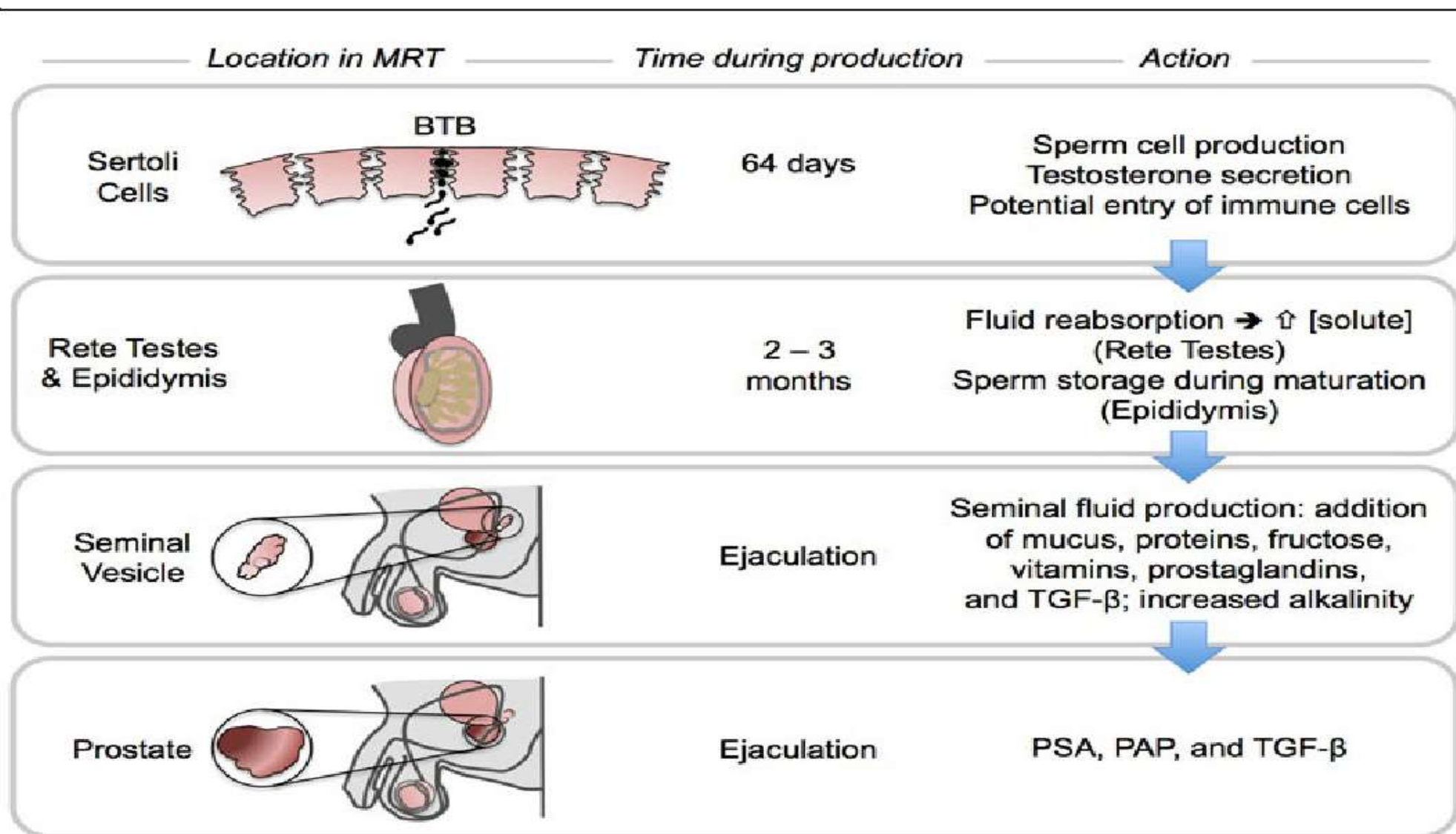
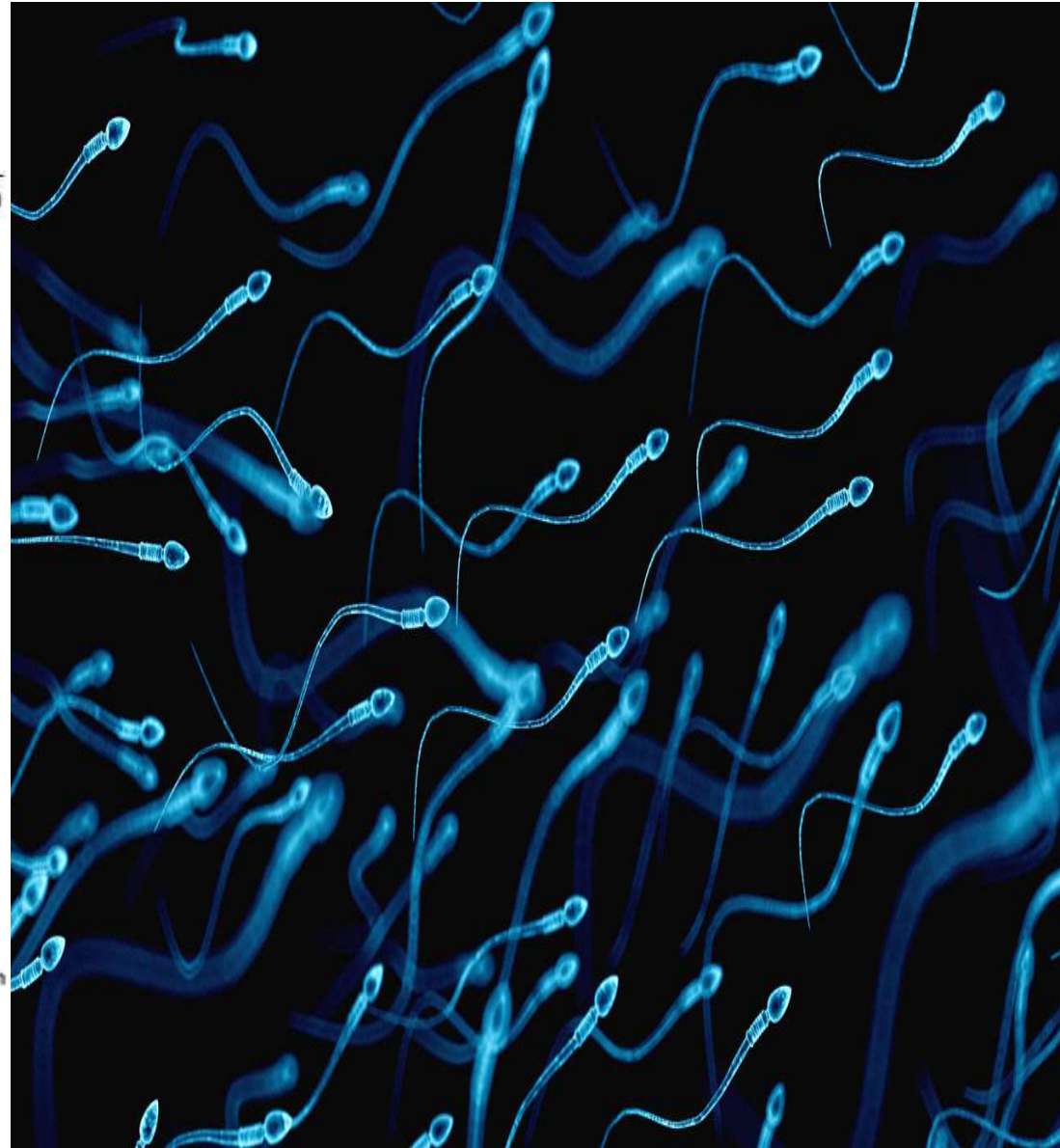
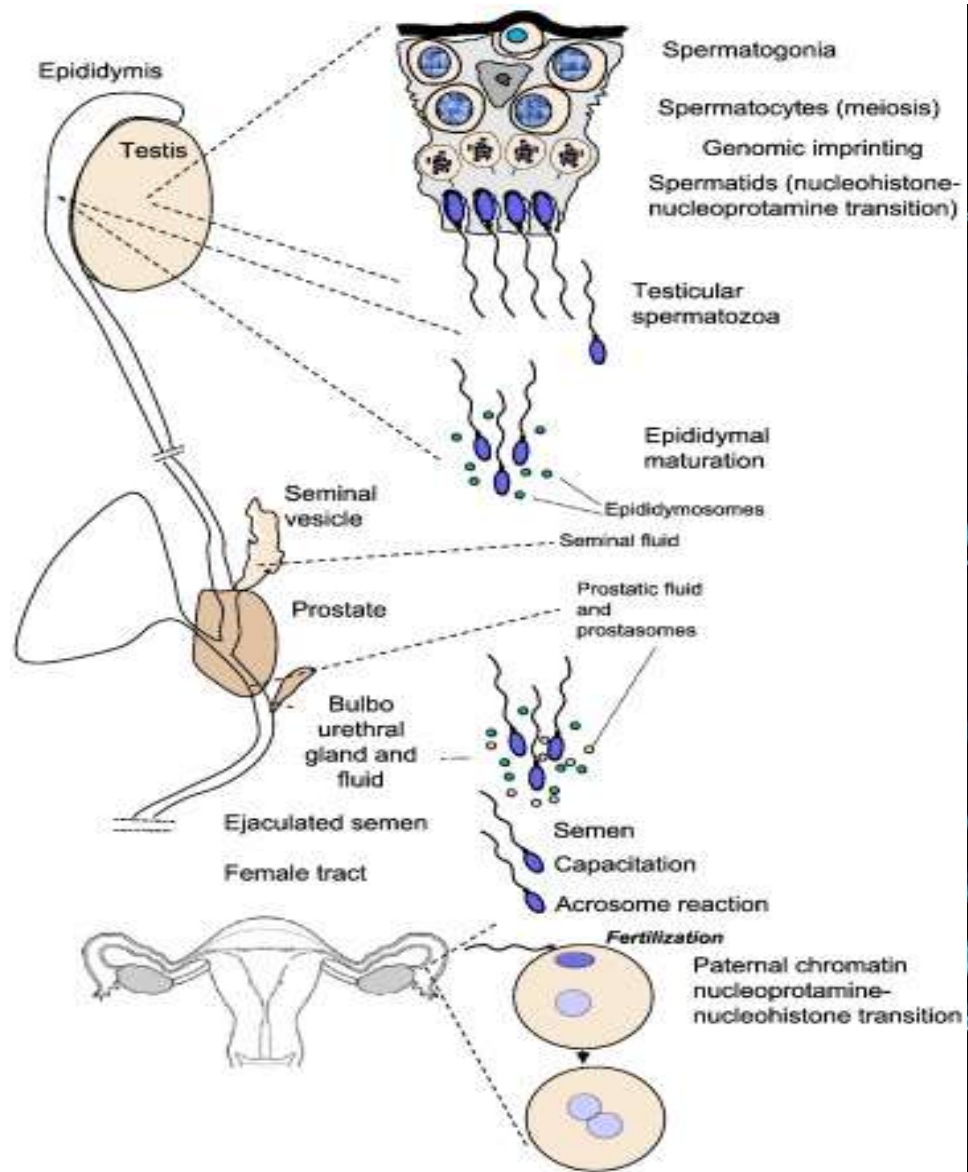


FIGURE 1. Flow Diagram of Components Contributing to the Human Male Reproductive Tract (MRT)



MALE REPRODUCTIVE SYSTEM

• TESTIS

SEMINIFEROUS TUBULES

SEMINIFEROUS EPITHELIUM

- complex stratified epithelium
containing two basic cell populations:

(1) SPERMATOGENIC CELLS

*stem cells which regularly replicate and
differentiate into mature sperm as they migrate
toward the lumen*

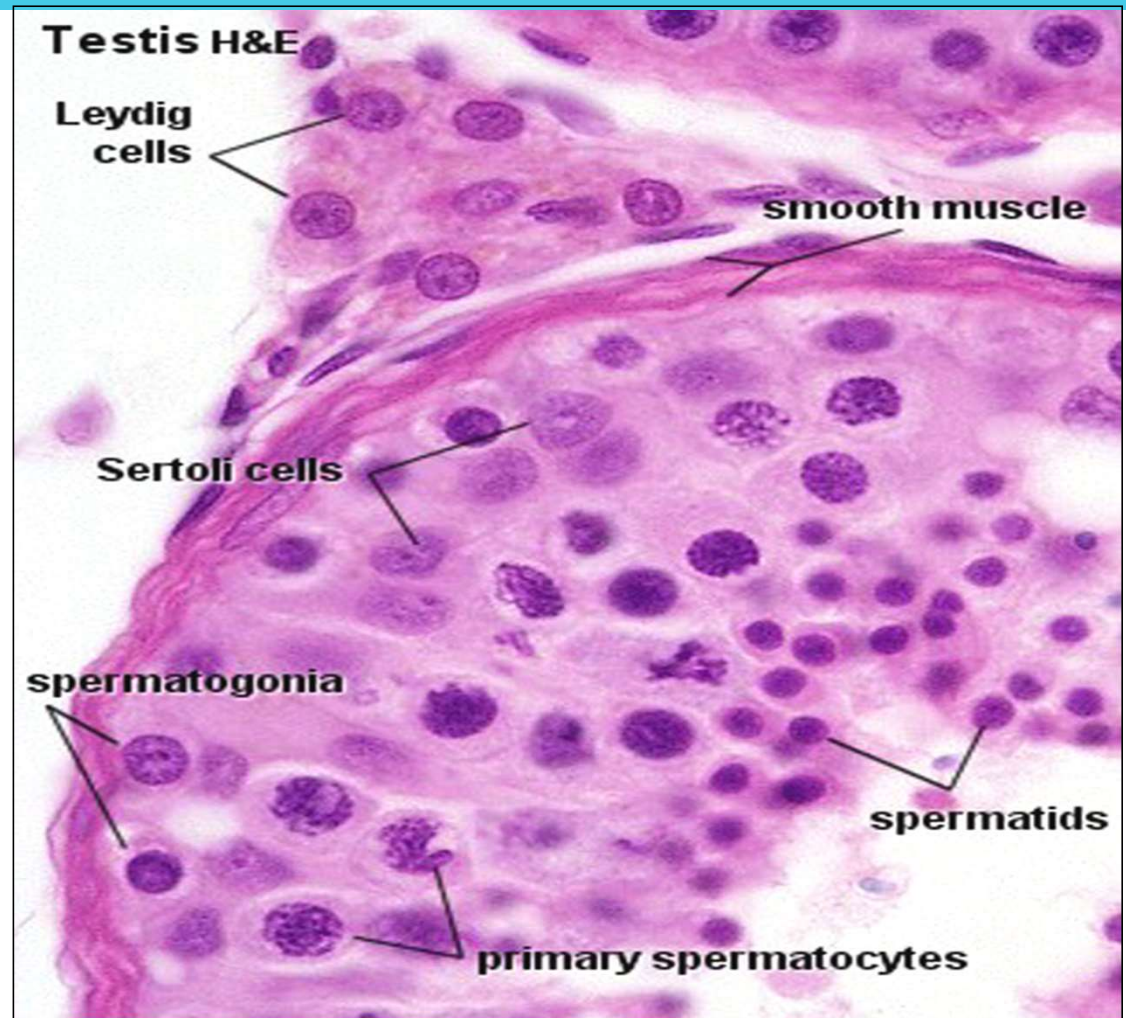
(2) SERTOLI CELLS

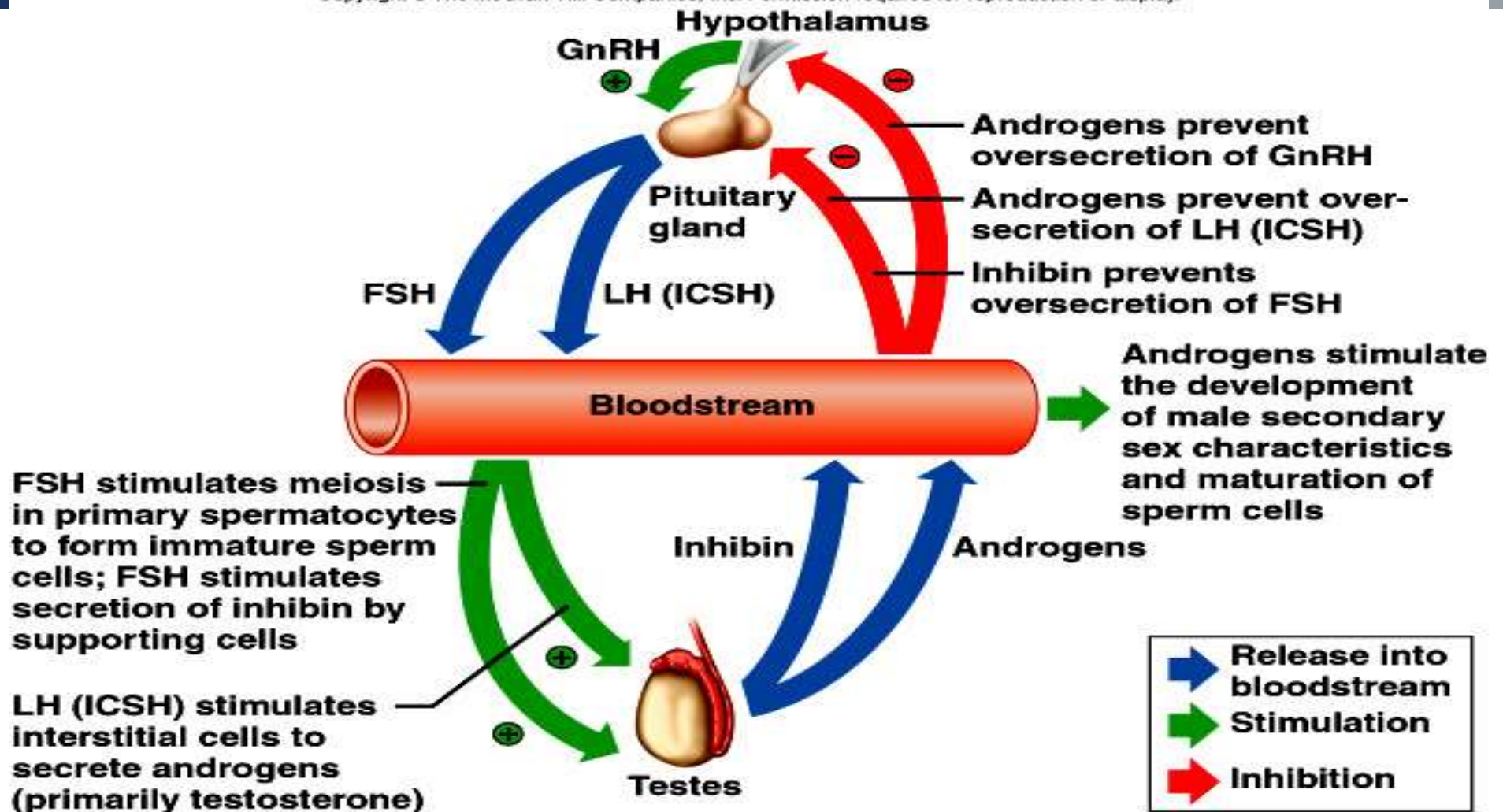
nonreplicating physical support cells

INTERSTITIAL CONNECTIVE TISSUE

(1) LEYDIG CELLS

produce and release testosterone





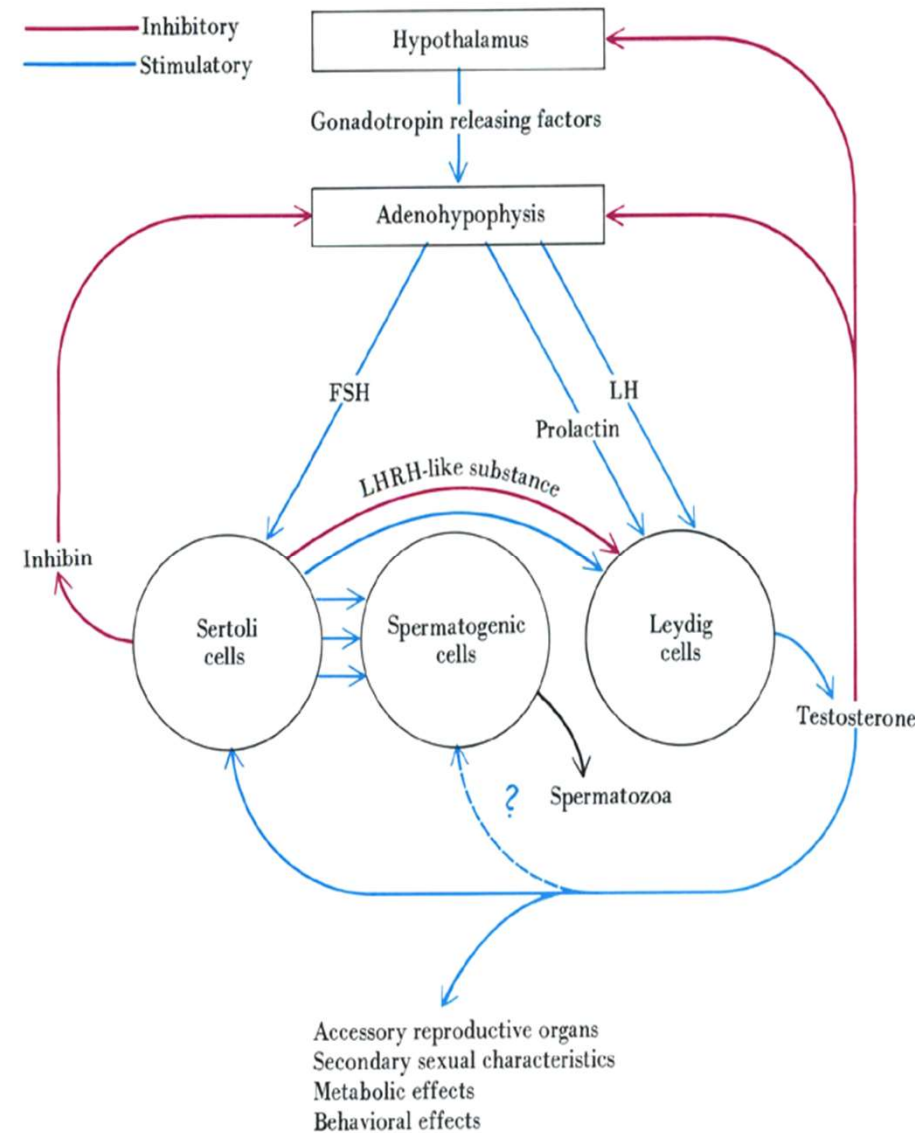
Luteinizing hormone, secreted by the anterior pituitary gland, stimulates the Leydig cells to secrete testosterone.

Follicle-stimulating hormone, also secreted by the anterior pituitary gland, stimulates the Sertoli cells; without this stimulation, the conversion of the spermatids to sperm (the process of spermiogenesis) will not occur.

Estrogens, formed from testosterone by the Sertoli cells when they are stimulated by folliclestimulating hormone, are probably also essential for spermiogenesis.

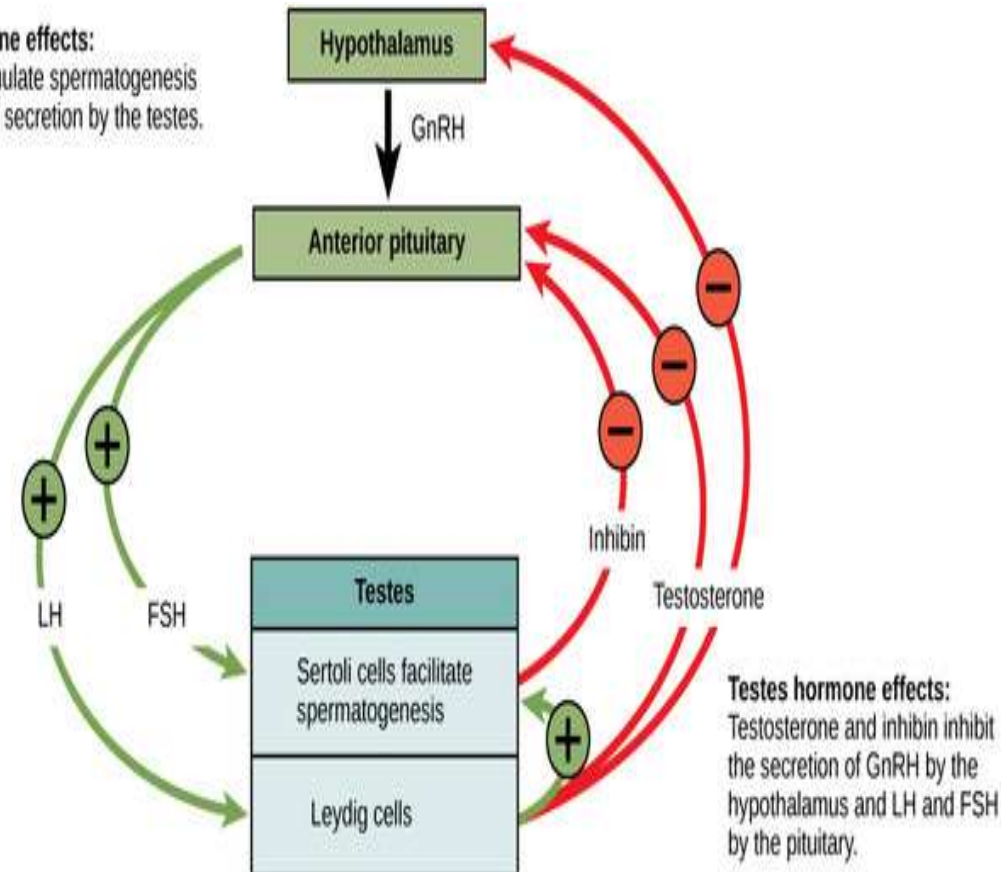
Growth hormone (as well as most of the other body hormones) is necessary for controlling background metabolic functions of the testes.

Growth hormone specifically promotes early division of the spermatogonia themselves; in its absence, as in pituitary dwarfs, spermatogenesis is severely deficient or absent, thus causing infertility.

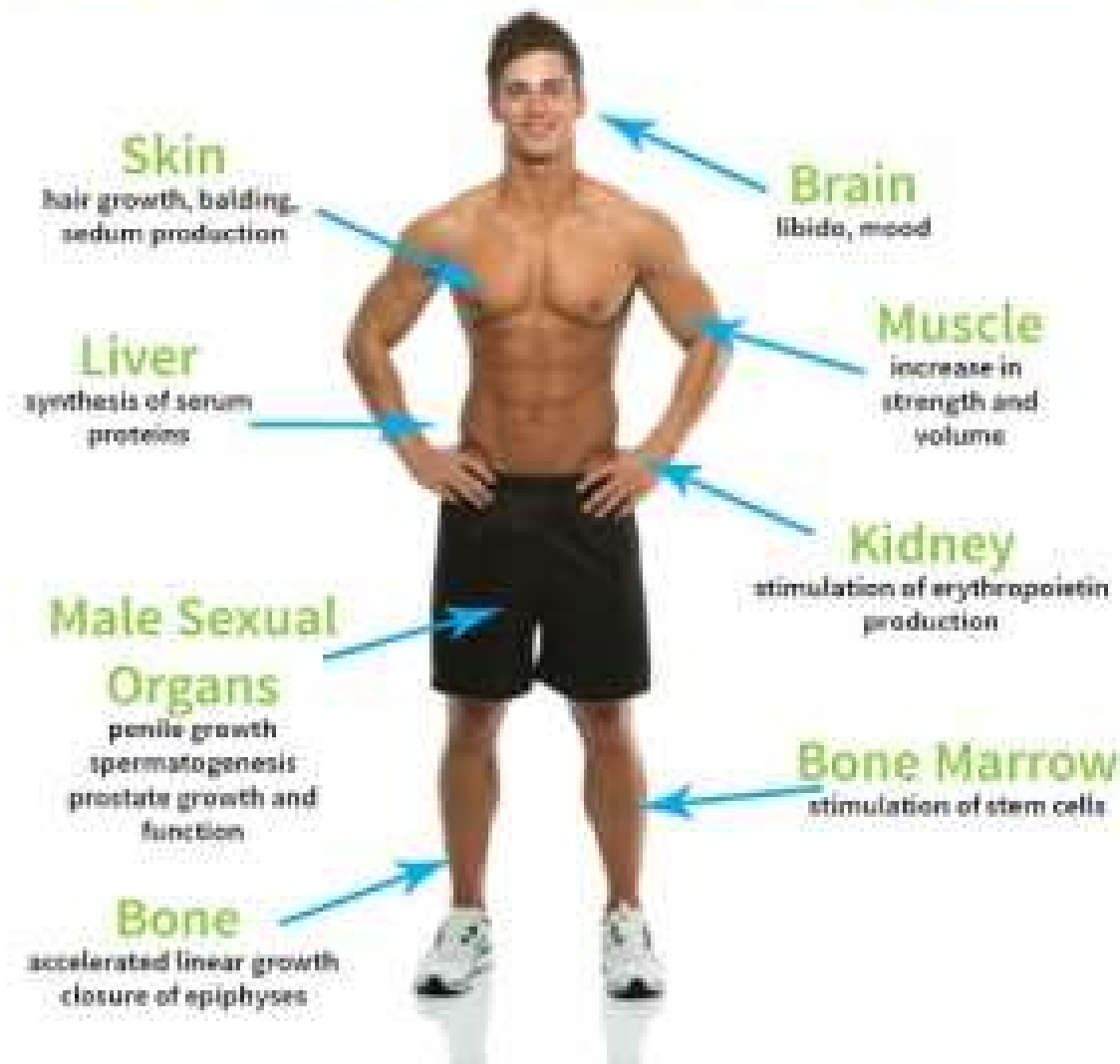


- The onset of puberty is signaled by high pulses of GnRH secreted by the hypothalamus; this in turn signals the release of FSH and LH from the pituitary gland.
- FSH causes the Sertoli cells of the testes (which help nurse developing sperm cells) to begin the process of spermatogenesis in the testes.
- LH triggers the production of testosterone from the Leydig cells of the testis; testosterone causes the development of secondary sex characteristics in the male.
- As spermatogenesis and testosterone production increase, the Sertoli cells produce inhibin, which, together with rising levels of testosterone, inhibit the release of FSH and LH from the pituitary gland.

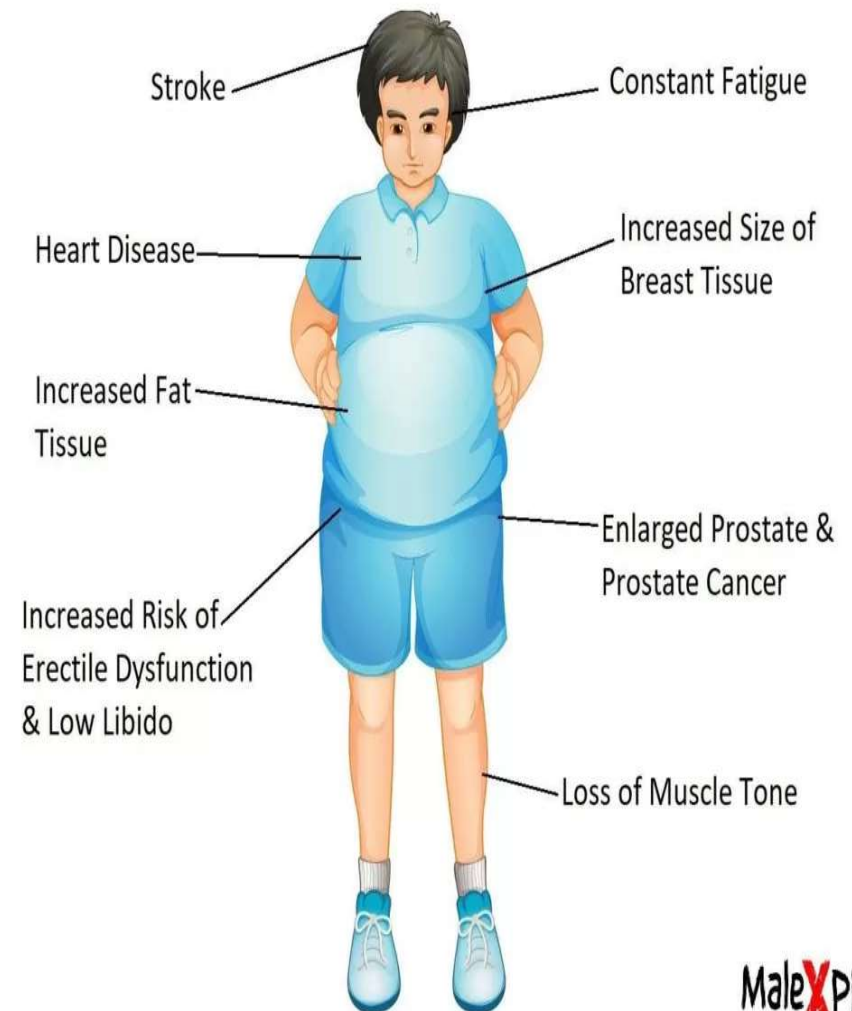
Pituitary hormone effects:
LH and FSH stimulate spermatogenesis and testosterone secretion by the testes.



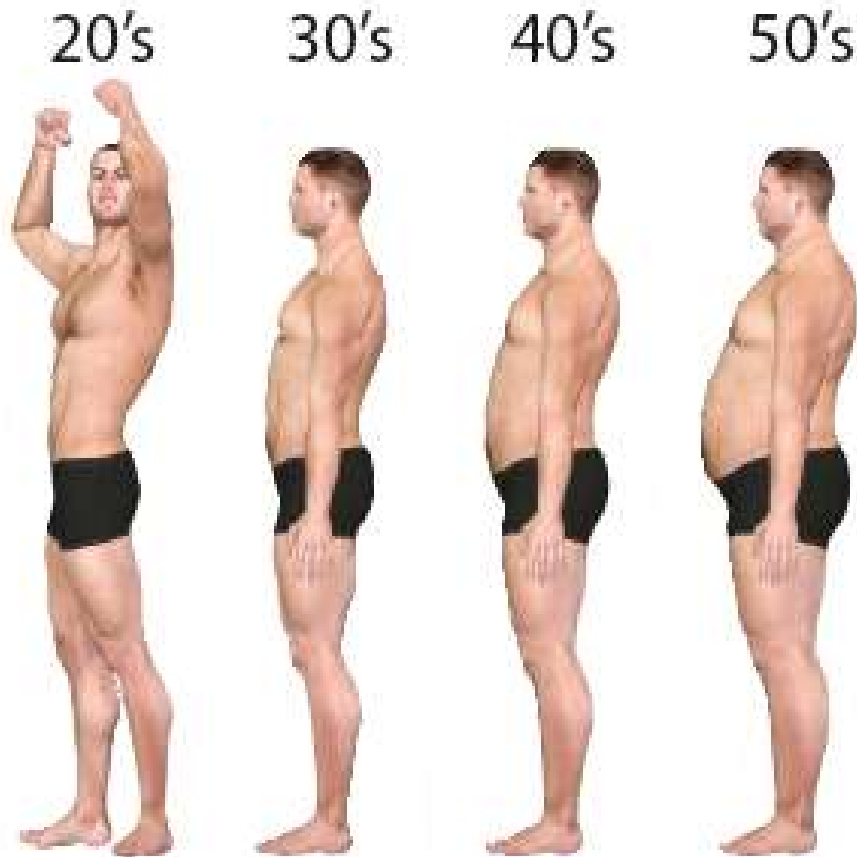
TARGET ORGANS OF TESTOSTERONE



Signs of **LOW TESTOSTERONE**



Safely Raise Testosterone Levels-Build Muscle-Increase Fat Loss.



**As men age they produce less Testosterone
and begin to store more fat.**

-
- puberty**: the age at which a person is first capable of sexual reproduction
 - Sertoli cell**: a kind of sustentacular cell which serves as a “nurse” cell of the testes and which is part of a seminiferous tubule
 - Leydig cell**: one of the interstitial cells, located next to the seminiferous tubules inside the testicle, that produce testosterone
 - follicle stimulating hormone**: a gonadotropic glycoprotein hormone, secreted in the anterior pituitary, that stimulates the growth of ovarian follicles in female mammals, and induces spermatogenesis in male mammals
 - luteinizing hormone**: a hormone, produced by part of the pituitary gland, that stimulates ovulation and the development of the corpus luteum in female mammals, and the production of androgens by male mammals
 - inhibin**: a peptide hormone, secreted by the gonads, which inhibits the secretion of follicle-stimulating hormone
 - testosterone**: steroid hormone produced primarily in the testes of the male; it is responsible for the development of secondary sex characteristics in the male

Function of the Seminal Vesicles

- Each seminal vesicle : **secretory epithelium that secretes a mucoid material containing an abundance of fructose, citric acid, and other nutrient substances, as well as large quantities of prostaglandins and fibrinogen.**
- During the process of emission and ejaculation, each seminal vesicle empties its contents into the ejaculatory duct shortly after the vas deferens empties the sperm.
- This adds greatly to the bulk of the ejaculated semen, and the fructose and other substances in the seminal fluid are of considerable nutrient value for the ejaculated sperm until one of the sperm fertilizes the ovum.

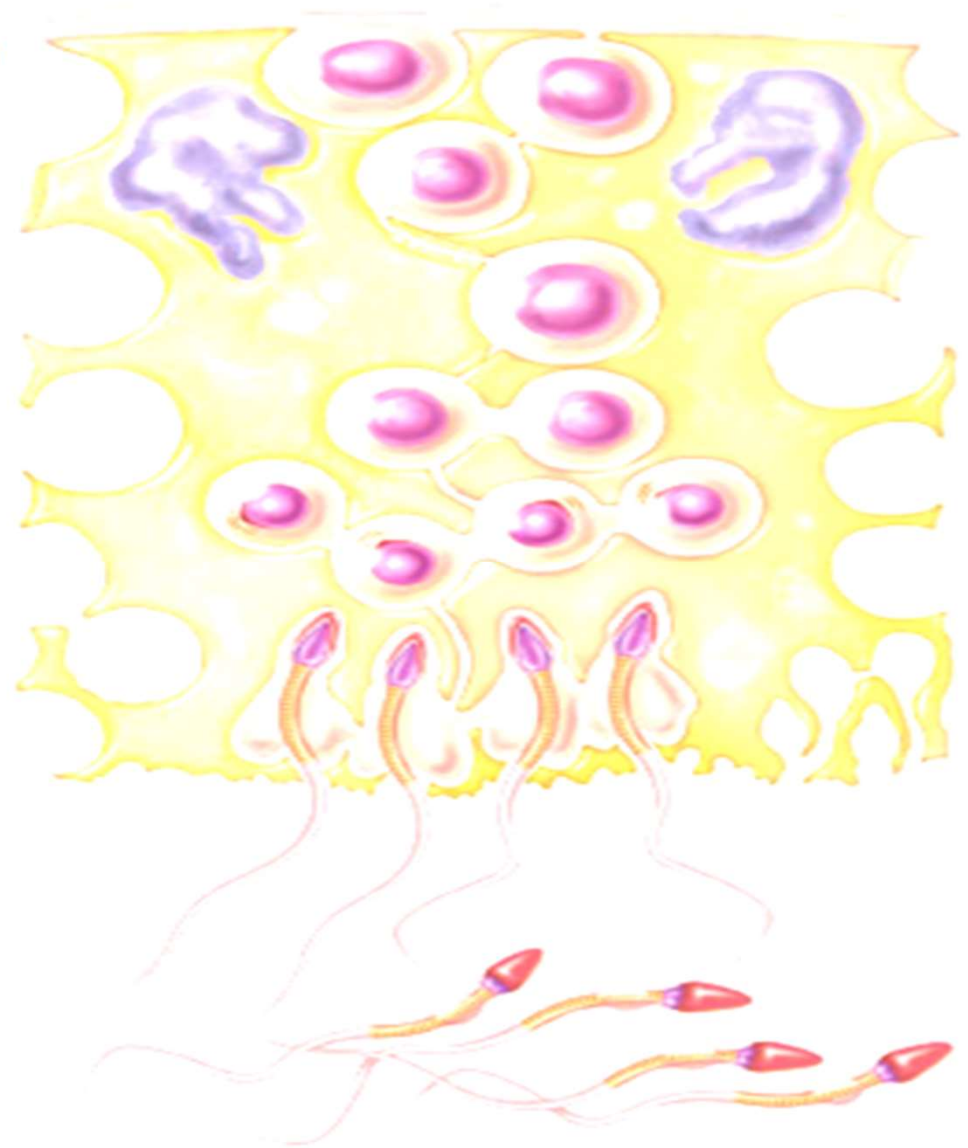
Prostaglandins are believed to aid fertilization in two ways:

(1) by reacting with the female cervical mucus to make it more receptive to sperm movement

(2) by possibly causing backward, reverse peristaltic contractions in the uterus and fallopian tubes to move the ejaculated sperm toward the ovaries (a few sperm reach the upper ends of the fallopian tubes within 5 minutes)

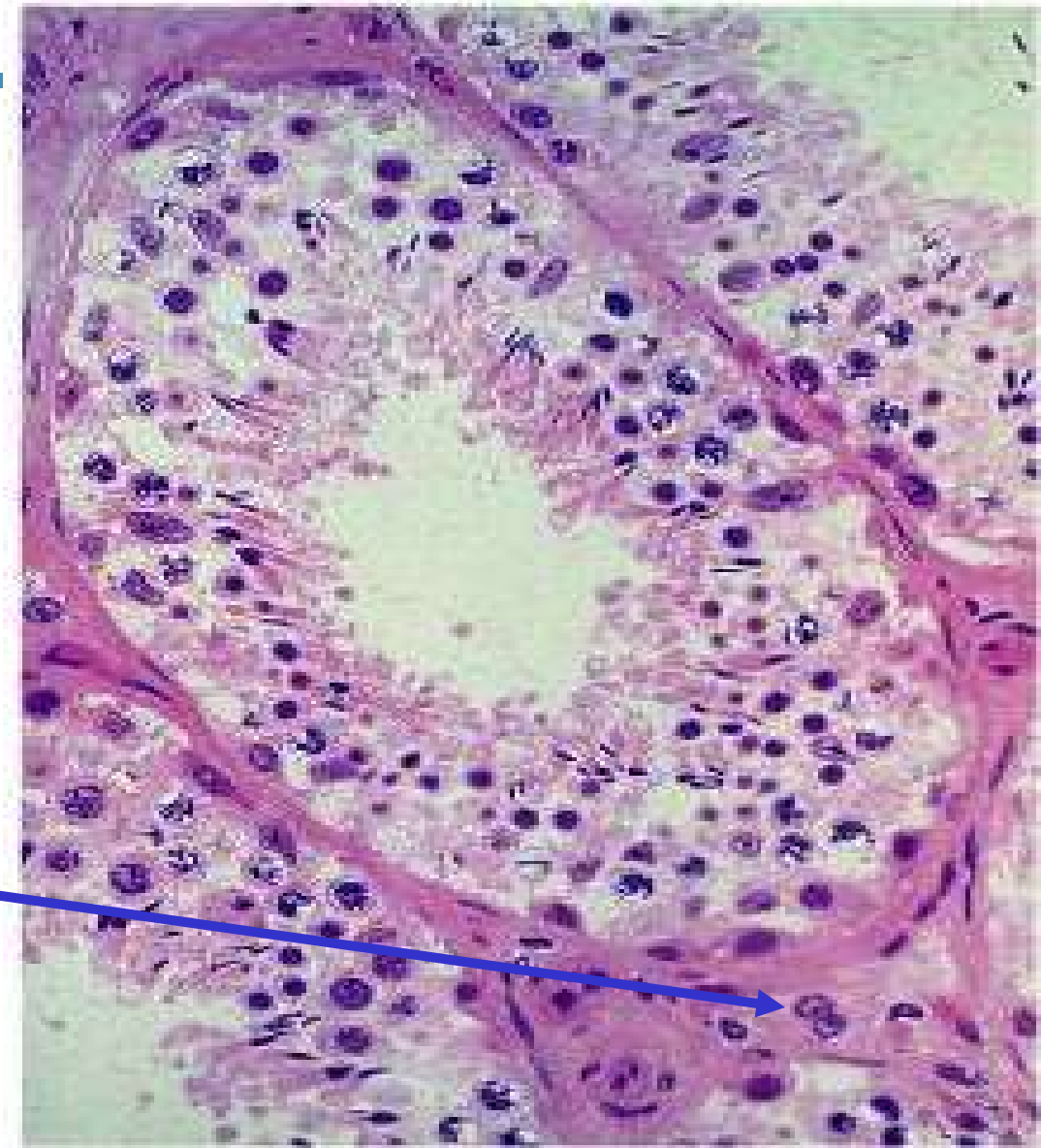
SUSTENTACULAR (SERTOLI) CELLS

- Nurse cells
- Extend from basal lamina to lumen
- Connected to each other by tight junctions
- Nourish spermatogenic cells
- Transport spermatogenic cells
- Phagocytize excess cytoplasm
- Secretions regulate spermatogenesis



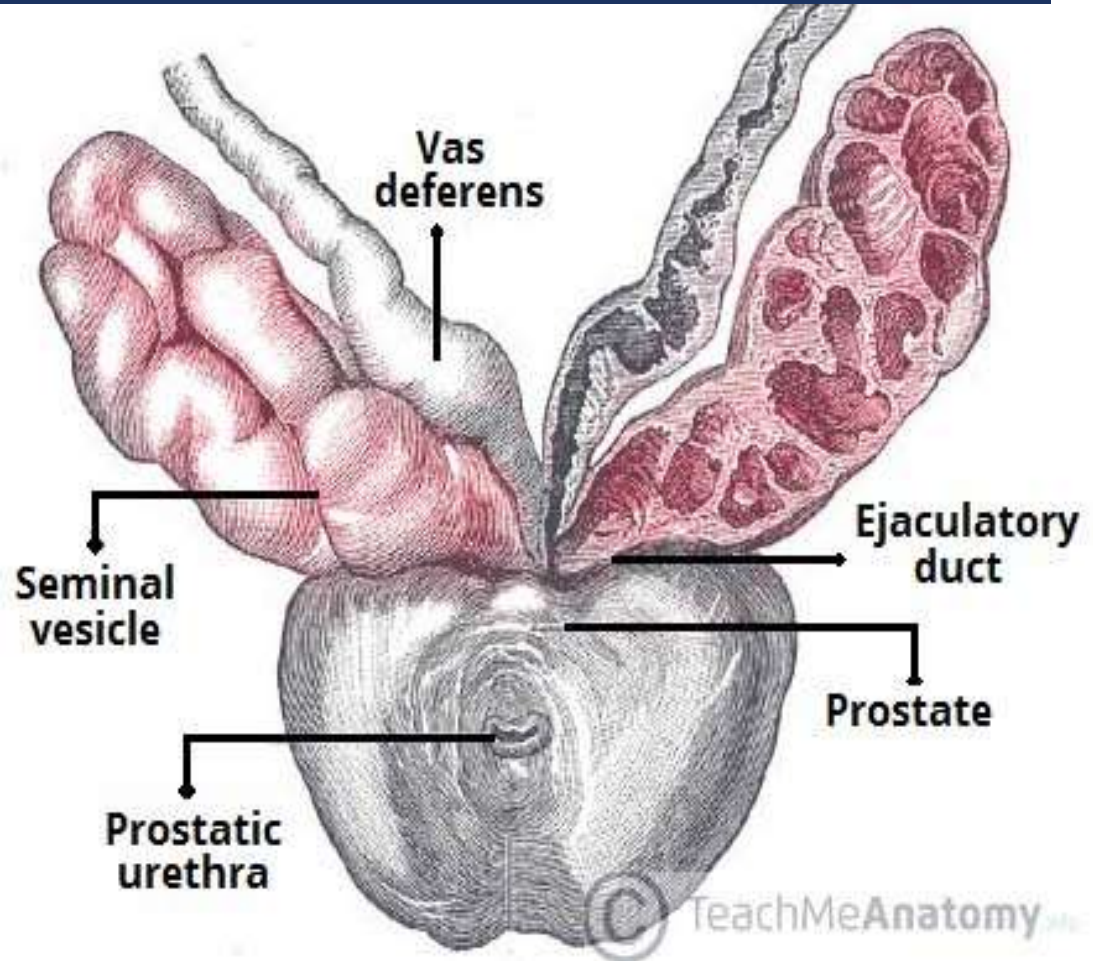
INTERSTITIAL (LEYDIG) CELLS

- Secretes testosterone
- sER for steroid production
- Controlled by LH from pituitary



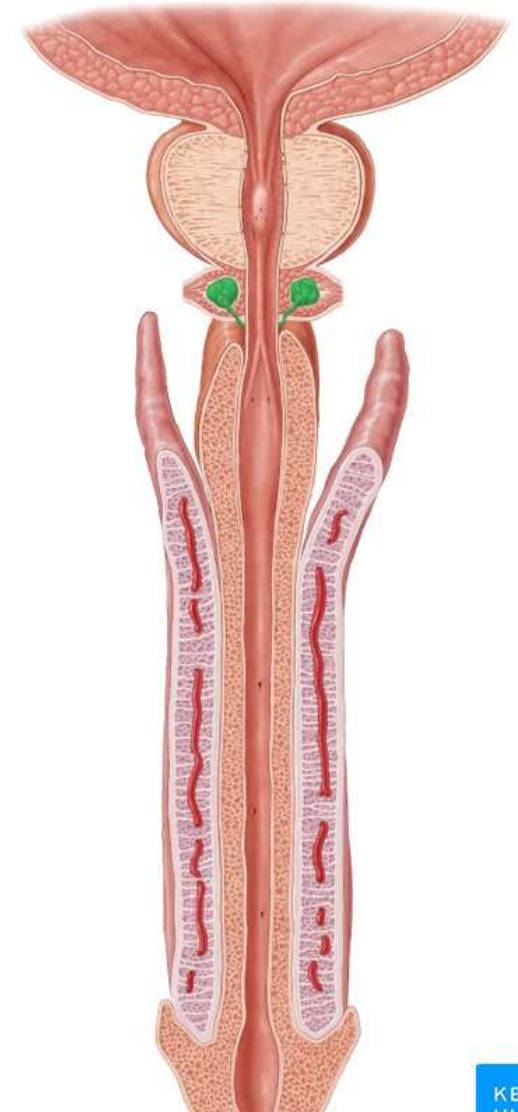
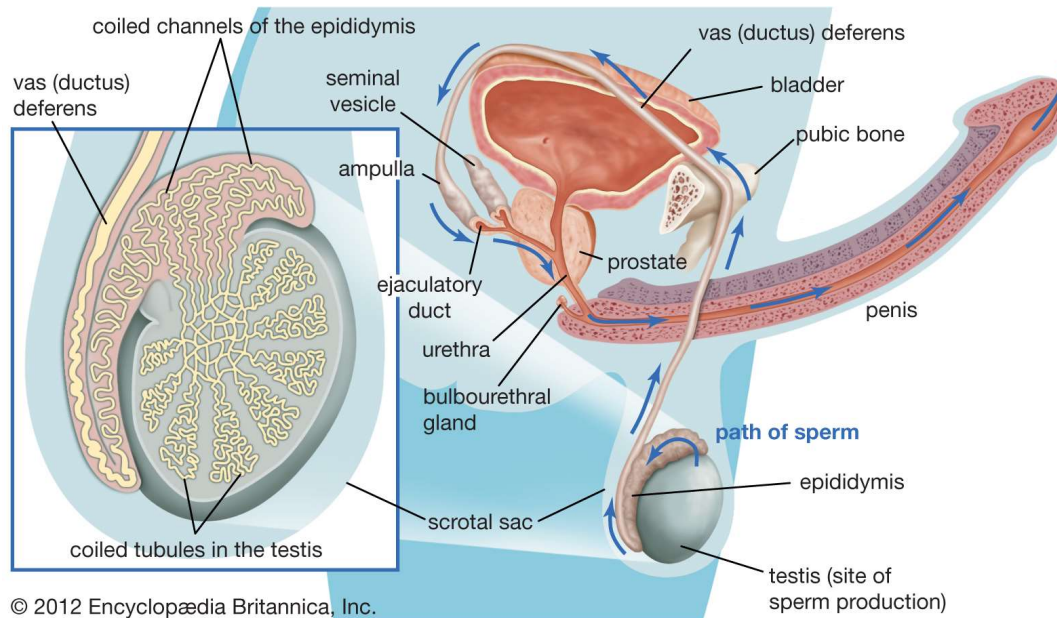
ACCESSORY GLANDS

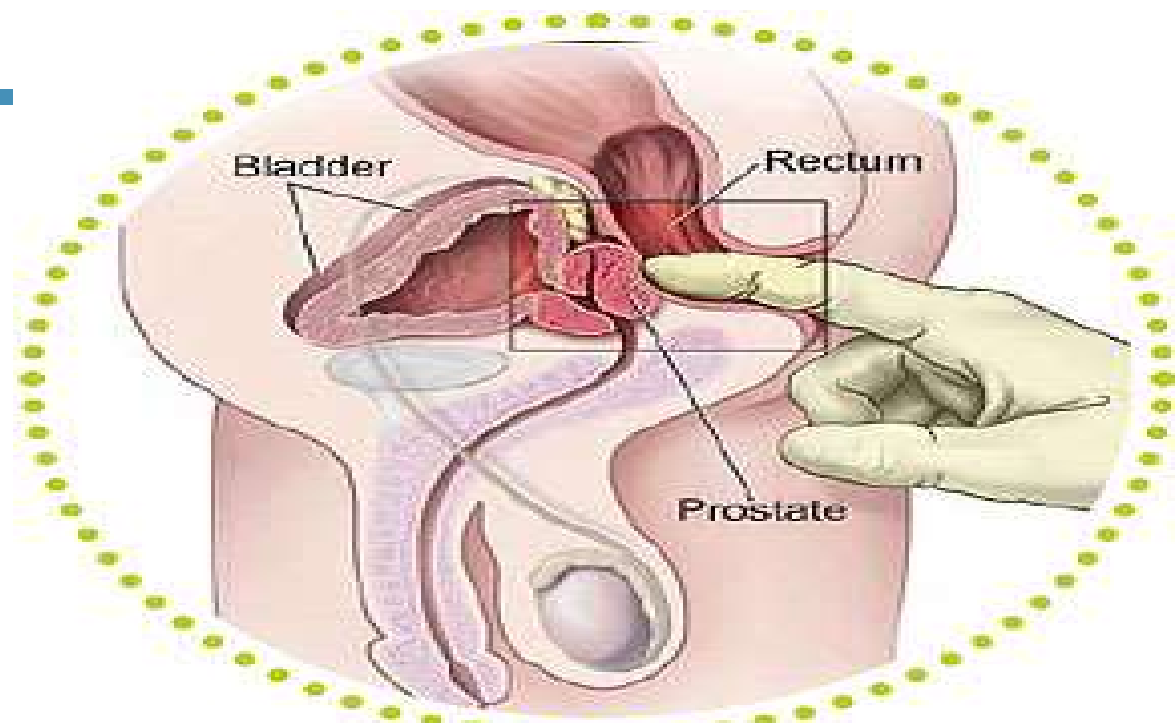
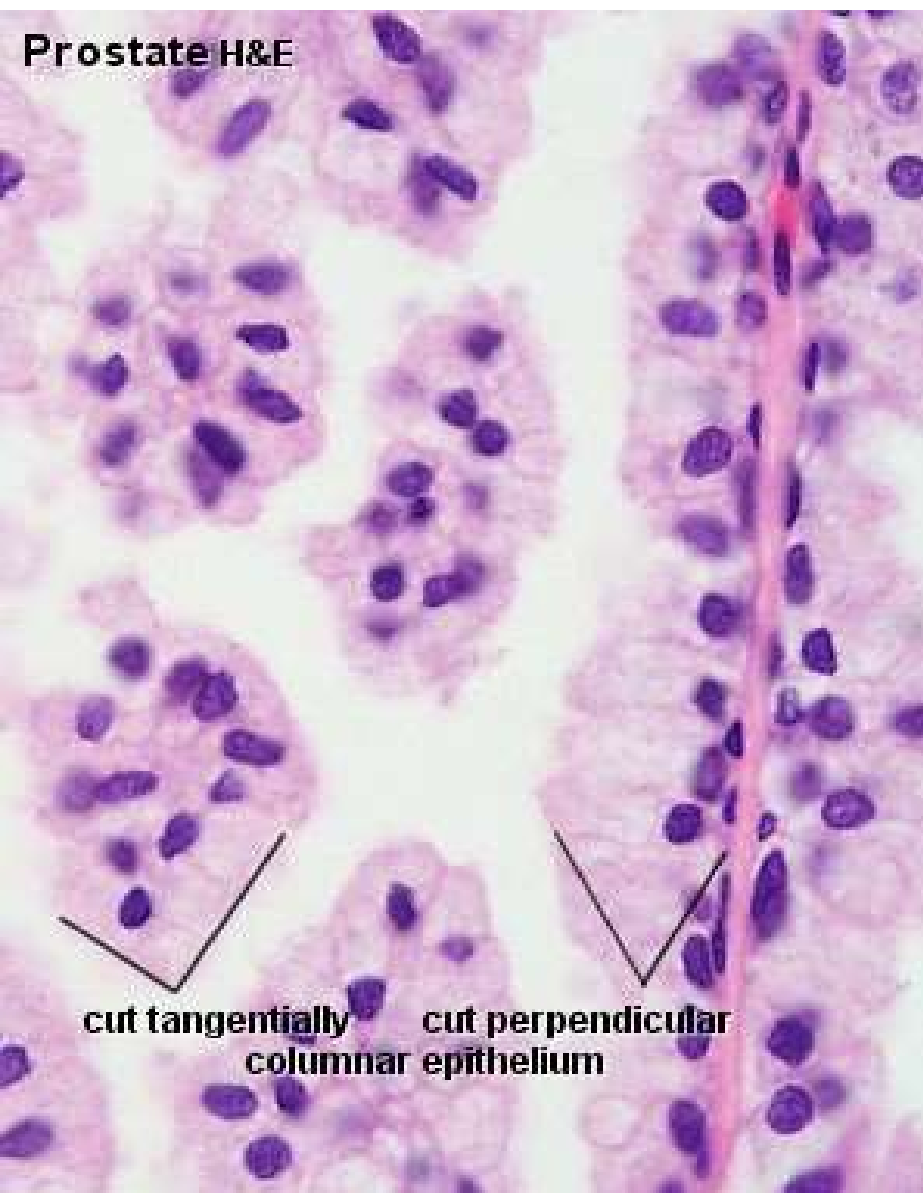
- **Seminal vesicles**
 - Active secretory gland
 - Contributes ~60% total volume of semen
 - Secretions contain fructose, prostaglandins, fibrinogen
 - 60% of semen
 - Fructose to nourish sperm



ACCESSORY GLANDS

- **Prostate gland**
 - Secretes slightly acidic prostate fluid
- **Bulbourethral glands**
 - Secrete alkaline mucus with lubricating properties



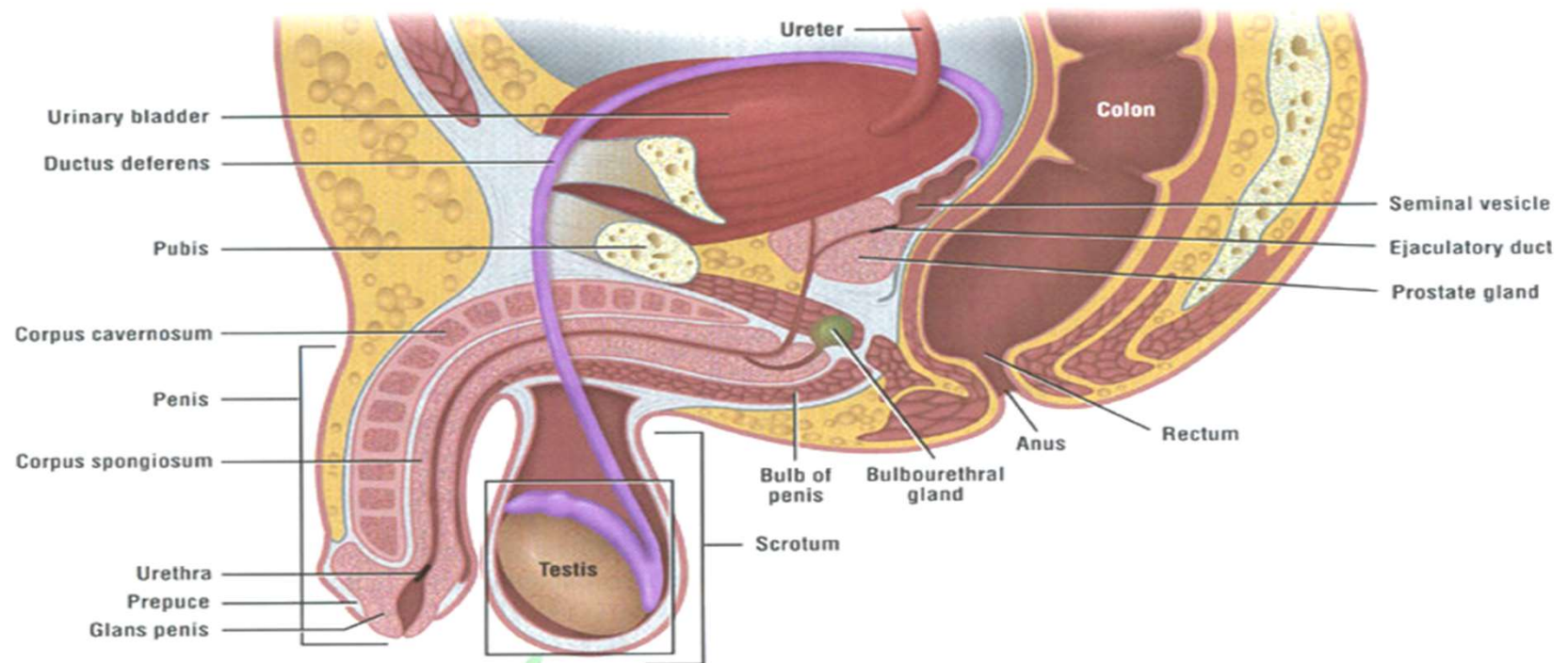


PS Level ng/mL	Condition
<4	Normal
4 to 10	Borderline
>10	Abnormally High

MALE REPRODUCTIVE SYSTEM

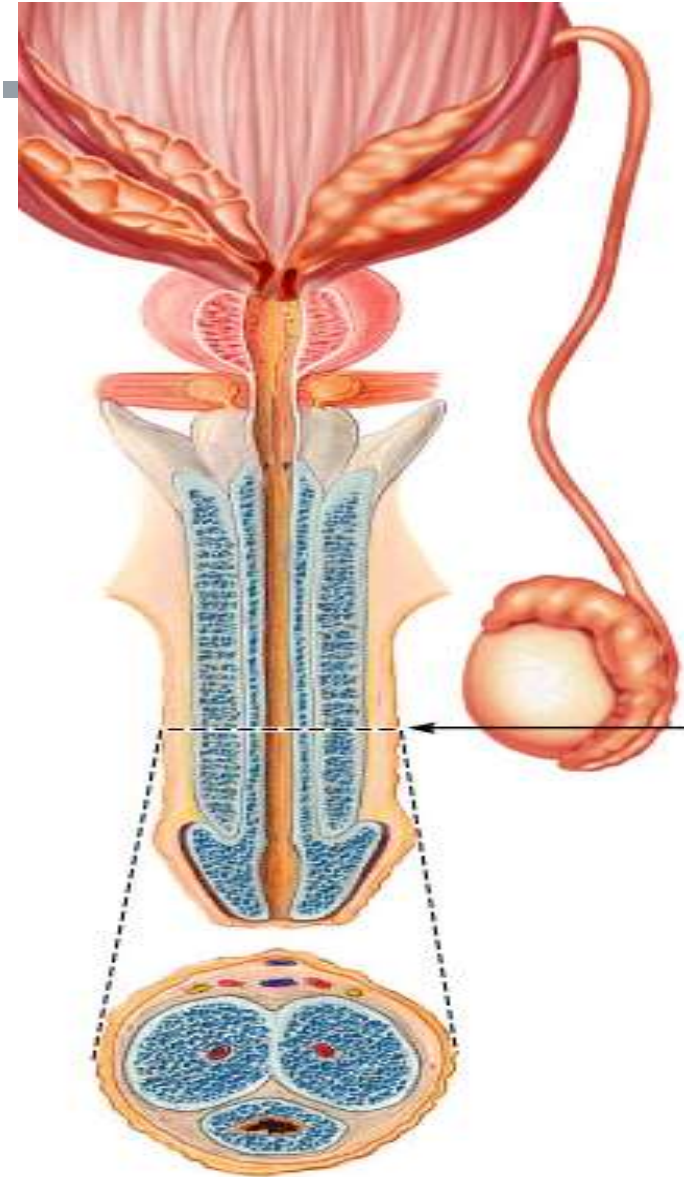
- URETHRA

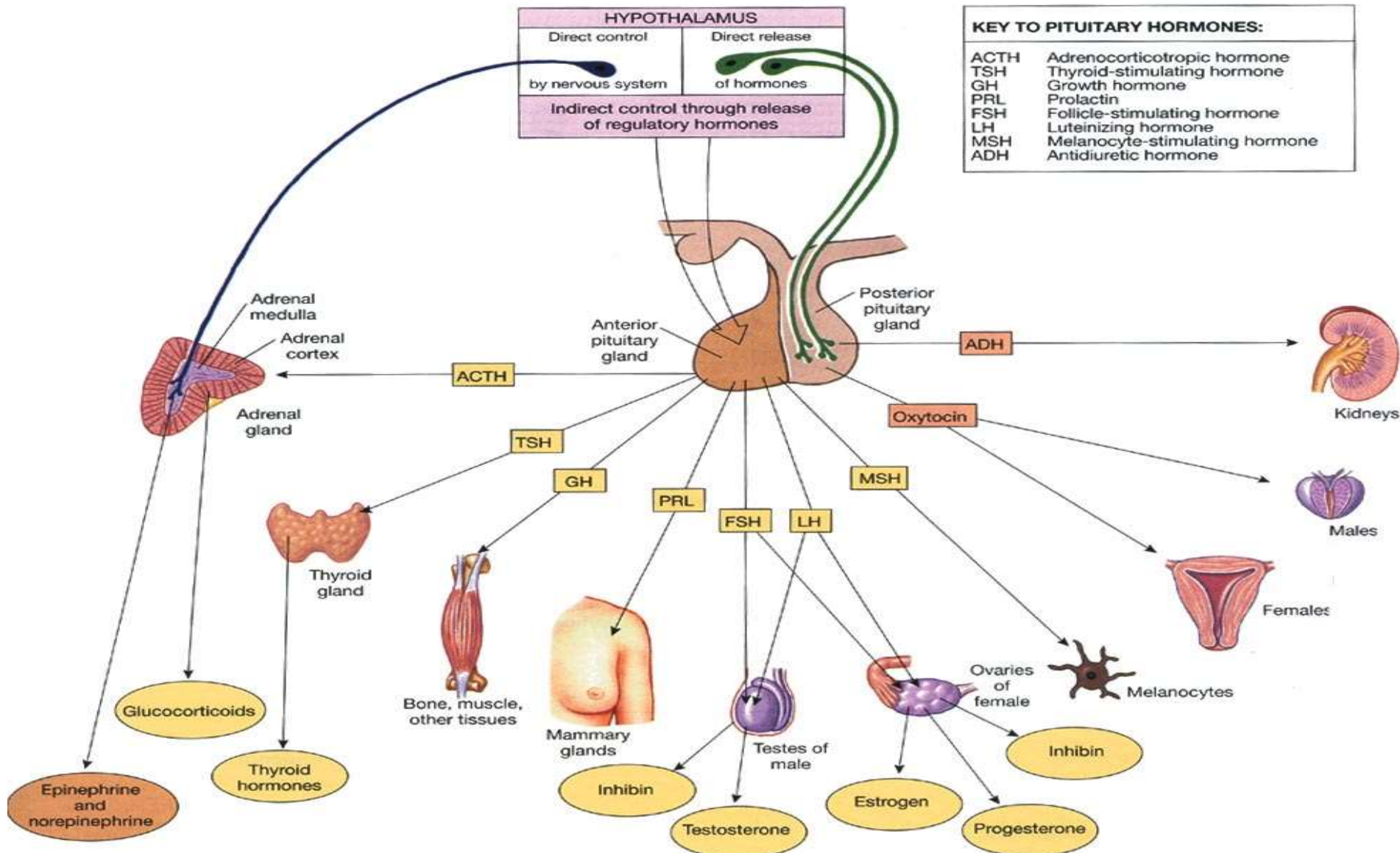
PROSTATIC, MEMBRANOUS, SPONGY
(PENILE)



EJACULATION

- Sympathetic activation
- Peristaltic contraction of smooth muscles in ducts and glands - ejaculation
- Constriction of arteries
- ↓ blood pressure in erectile bodies





KEY TO PITUITARY HORMONES:	
ACTH	Adrenocorticotrophic hormone
TSH	Thyroid-stimulating hormone
GH	Growth hormone
PRL	Prolactin
FSH	Follicle-stimulating hormone
LH	Luteinizing hormone
MSH	Melanocyte-stimulating hormone
ADH	Antidiuretic hormone

BRAIN-TESTICULAR AXIS

- ☐ Hormonal regulation of spermatogenesis and testicular androgen production involving the
 - **hypothalamus,**
 - **anterior pituitary gland,**
 - **the testes**
- ☐ Testicular regulation involves three sets of hormones:
 - **GnRH, from the hypothalamus stimulates the pituitary to produce gonadotropins:**
 - **Follicle stimulating hormone (FSH)**
 - **Luteinizing hormone (LH)**
 - **Gonadotropins, directly stimulate the testes**
 - **Testicular hormones, which exert negative feedback controls**

HORMONAL REGULATION OF TESTICULAR FUNCTION

- The hypothalamus releases gonadotropin-releasing hormone (GnRH)
- GnRH stimulates the anterior pituitary to secrete FSH and LH
- **FSH stimulates sperm production by** causing sustentacular cells to release androgen-binding protein (ABP)
- **ABP prompts spermatogenic cells to bind and concentrate testosterone**
- **LH stimulates interstitial cells to release testosterone**
 - **Stimulates spermatogenesis**
 - **Causes secondary sexual characteristics**

Feedback inhibition on the hypothalamus and pituitary results from:

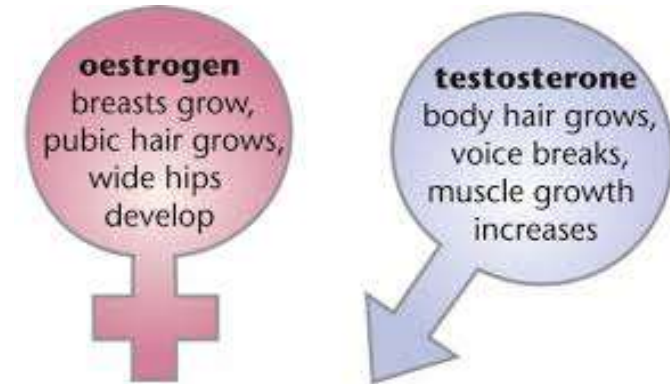
- **Rising levels of testosterone**
- **Increased inhibin**

MECHANISM AND EFFECTS OF TESTOSTERONE ACTIVITY

- Testosterone is synthesized from cholesterol
- It must be transformed to exert its effects on some target cells
- Prostate – it is converted into **dihydrotestosterone (DHT)** before it can bind within the nucleus
- Neurons – it is converted into estrogen to bring about stimulatory effects in certain neurons
- Testosterone targets all accessory organs and its deficiency causes these organs to atrophy

Male Secondary Sex Characteristics

- Male hormones make their appearance at puberty and induce changes in nonreproductive organs, including
- Appearance of pubic, axillary, and facial hair
- Enhanced growth of the chest and deepening of the voice
- Skin thickens and becomes oily
- Bones grow and increase in density
- Skeletal muscles increase in size and mass
- Testosterone is the basis of libido in both males and females



Primary & Secondary sex characteristics

MALES

Primary sex characteristics

Growth of scrotum & testes
Secretion of hormones related to sperm production
Growth of penis

Secondary sex characteristics

Body & facial hair
More muscle mass
Greater height than females
Broadening shoulders

SIMILARITIES

- Pubic hair
- Oily skin
- Voice deepens
- Acne
- Increase in height
- Increase in body odour

FEMALES

Primary sex characteristics

Increase in size of vagina & uterus
Ovaries produce hormones to start the menstrual cycle

Secondary sex characteristics

Hips widen
Development of breasts
Distribution of fat to hips
Body gets curvier