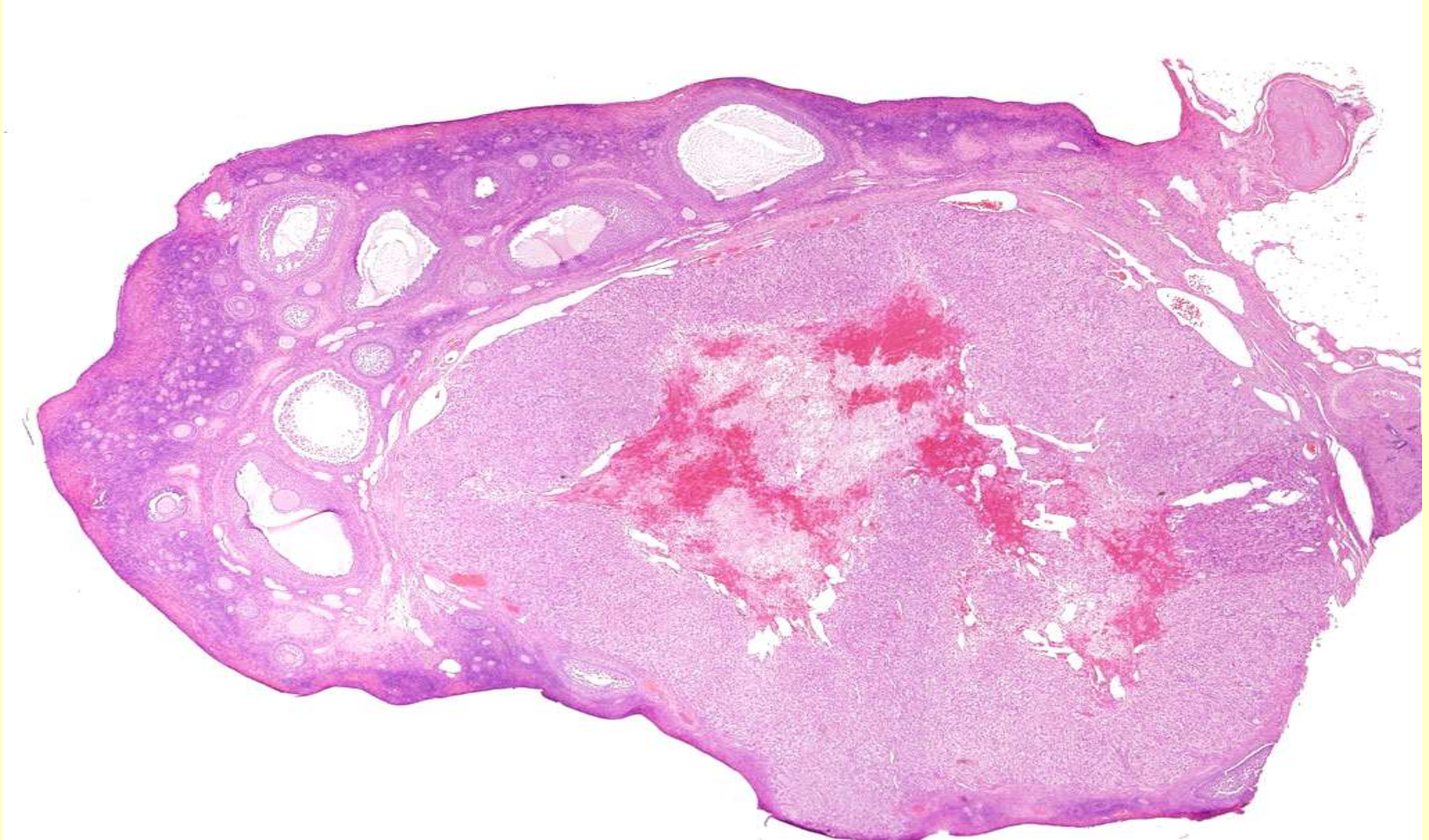


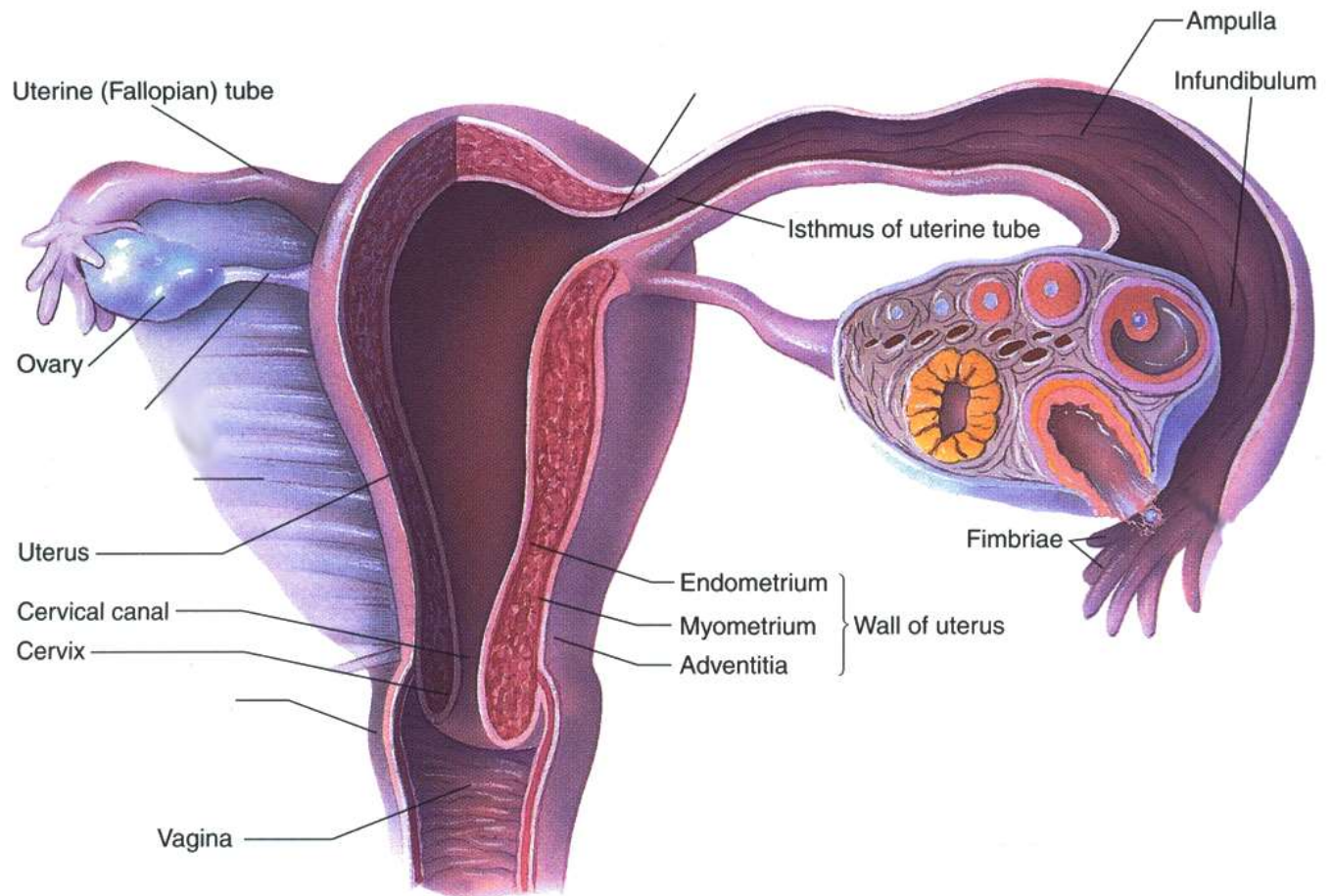
HORMONAL REGULATION OF GAMETOGENESIS

FEMALE REPRODUCTIVE SYSTEM



FEMALE REPRODUCTIVE SYSTEM

- OVARIES
- OVIDUCT (UTERINE TUBES)
- UTERUS
- VAGINA





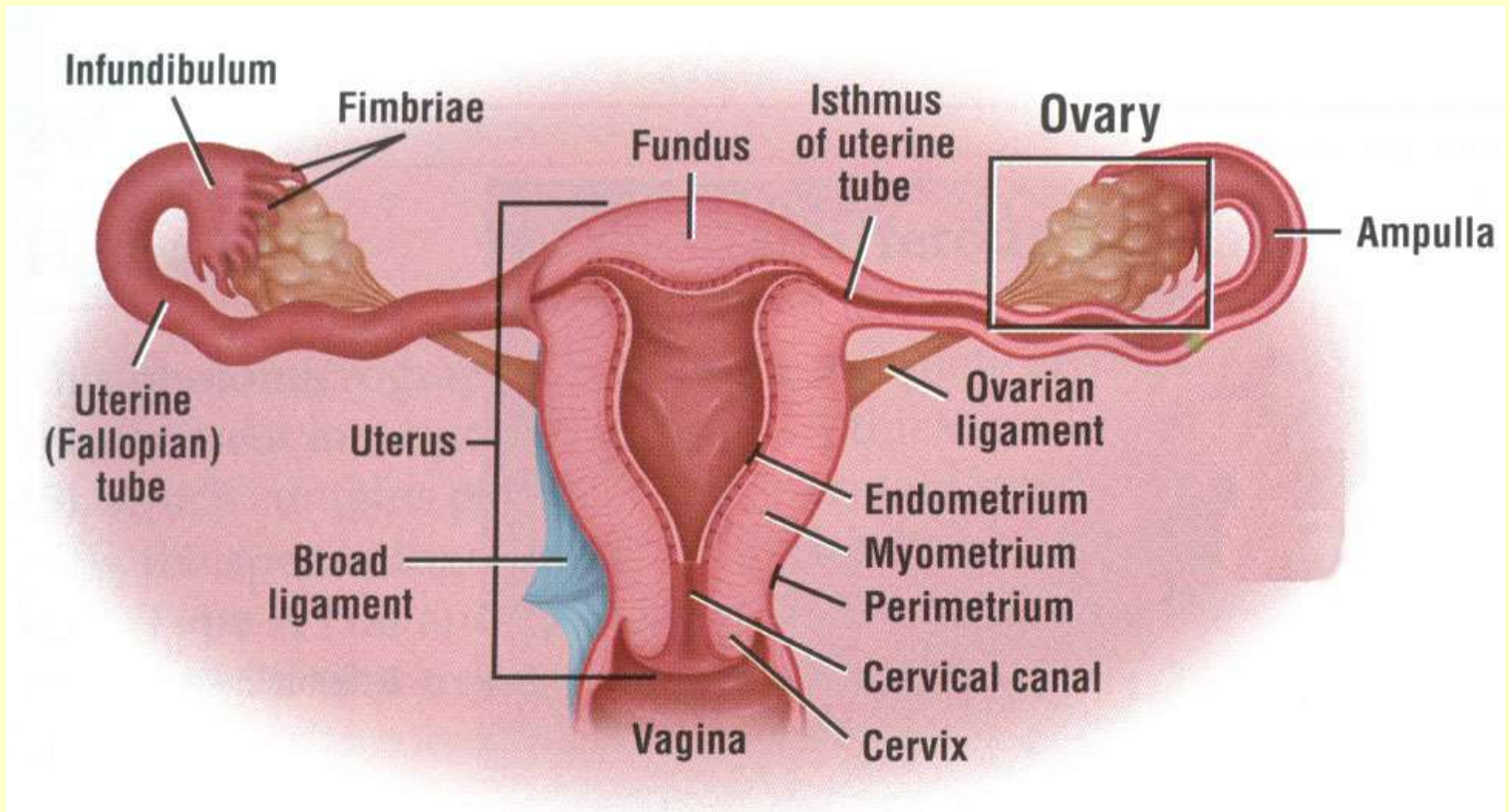
FEMALE REPRODUCTIVE SYSTEM

- **OVIDUCT (UTERINE TUBES)**

INFUNDIBULUM, AMPULLA, ISTHMUS, UTERINE

- **UTERUS**

FUNDUS, BODY (CORPUS), CERVIX





FEMALE REPRODUCTIVE SYSTEM

• OVARY

GERMINAL EPITHELIUM

TUNICA ALBUGINEA

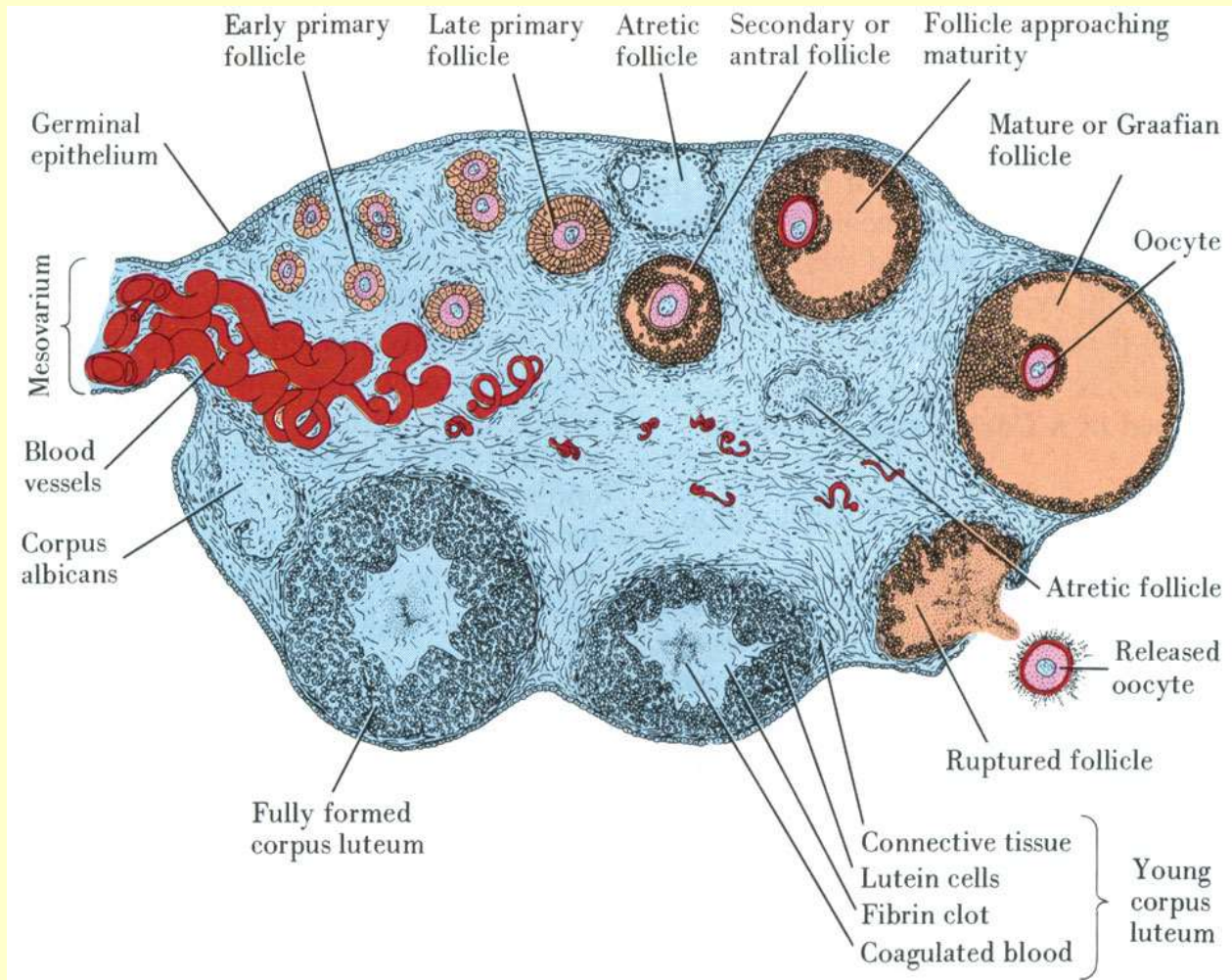
- thin connective tissue capsule underlying germinal epithelium

CORTEX

- surrounds the medulla and contains maturing follicles

MEDULLA

- central connective tissue containing vascular supply and nervous innervation





FEMALE REPRODUCTIVE SYSTEM

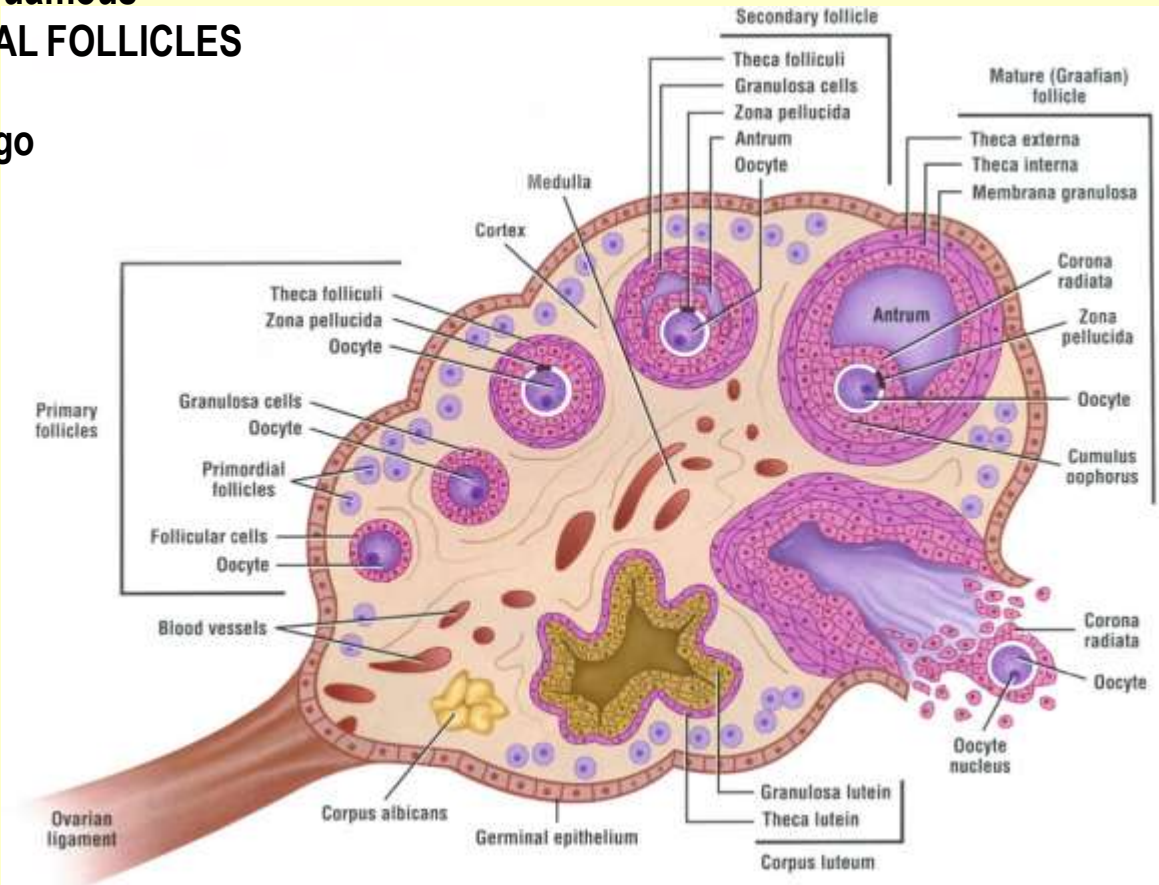
● OVARY

3 to 5 million OOGONIA differentiate into PRIMARY OOCYTES during early development

OOCYTES becomes surrounded by squamous (follicular) cells to become PRIMORDIAL FOLLICLES

most PRIMORDIAL FOLLICLES undergo *atresia* leaving 400,000 at birth

oocytes at birth arrested at Meiosis I (prophase)





FEMALE REPRODUCTIVE SYSTEM

● OVARY

THREE STAGES OF OVARIAN FOLLICLES CAN BE IDENTIFIED FOLLOWING PUBERTY:
(each follicle contains one oocyte)

(1) PRIMORDIAL FOLLICLES

- very prevalent; located in the periphery of the cortex
- a single layer of squamous follicular cells surround the oocyte

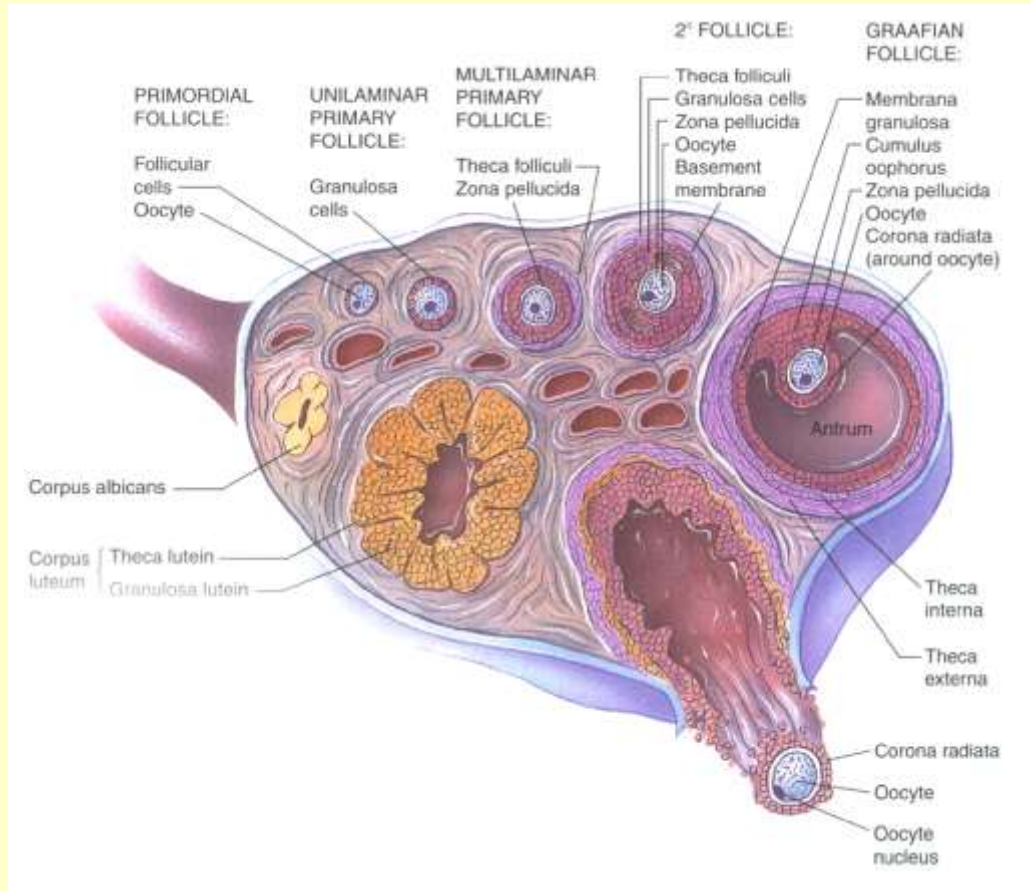
(2) GROWING FOLLICLES

- three recognizable stages:
 - early primary follicle*
 - late primary follicle*
 - secondary (antral) follicle*

(3) MATURE (GRAAFIAN) FOLLICLES

- follicle reaches maximum size

OOGENESIS





FEMALE REPRODUCTIVE SYSTEM

● OVARIAN FOLLICLES

(1) PRIMORDIAL FOLLICLES

(2) GROWING FOLLICLES

(a) *early primary follicle*

- follicular cells still *unilaminar* but now are cuboidal in appearance
- oocyte begins to enlarge

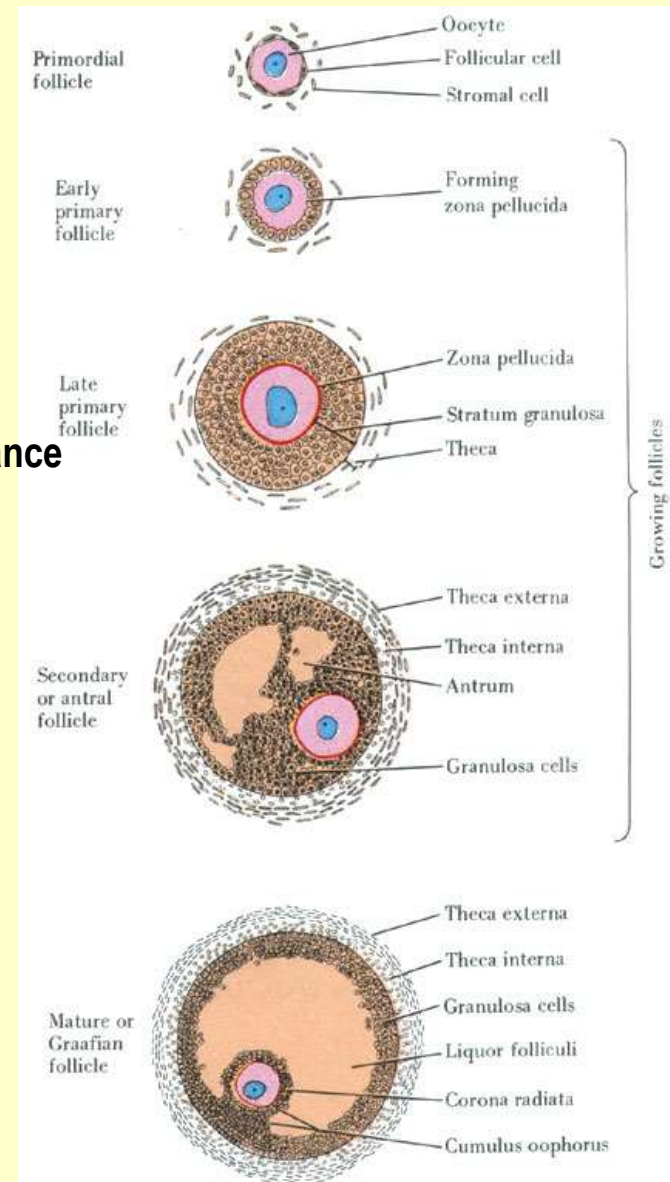
(b) *late primary follicle*

- *multilaminar* follicular layer; cells now termed *granulosa cells*
- *zona pellucida* appears; gel-like substance rich in GAGs
- surrounding *stromal cells* differentiate into *theca interna* and *theca externa*

(b) *secondary (antral) follicle*

- cavities appear between granulosa cells forming an *antrum*
- follicle continues to grow
- formation of *cumulus oophorus* and *corona radiata*

(3) MATURE (GRAAFIAN) FOLLICLES

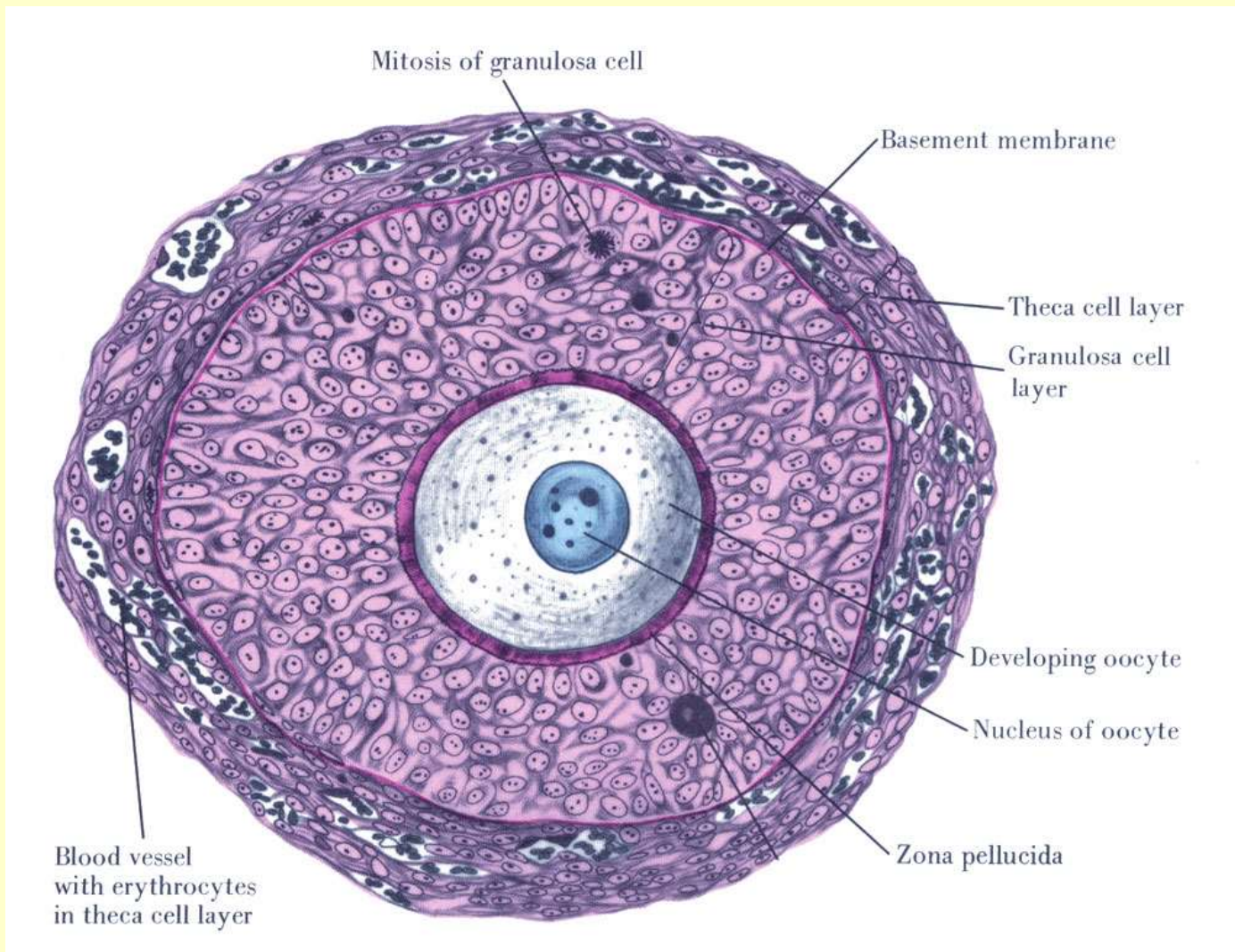




FEMALE REPRODUCTIVE SYSTEM

- OVARIAN FOLLICLES

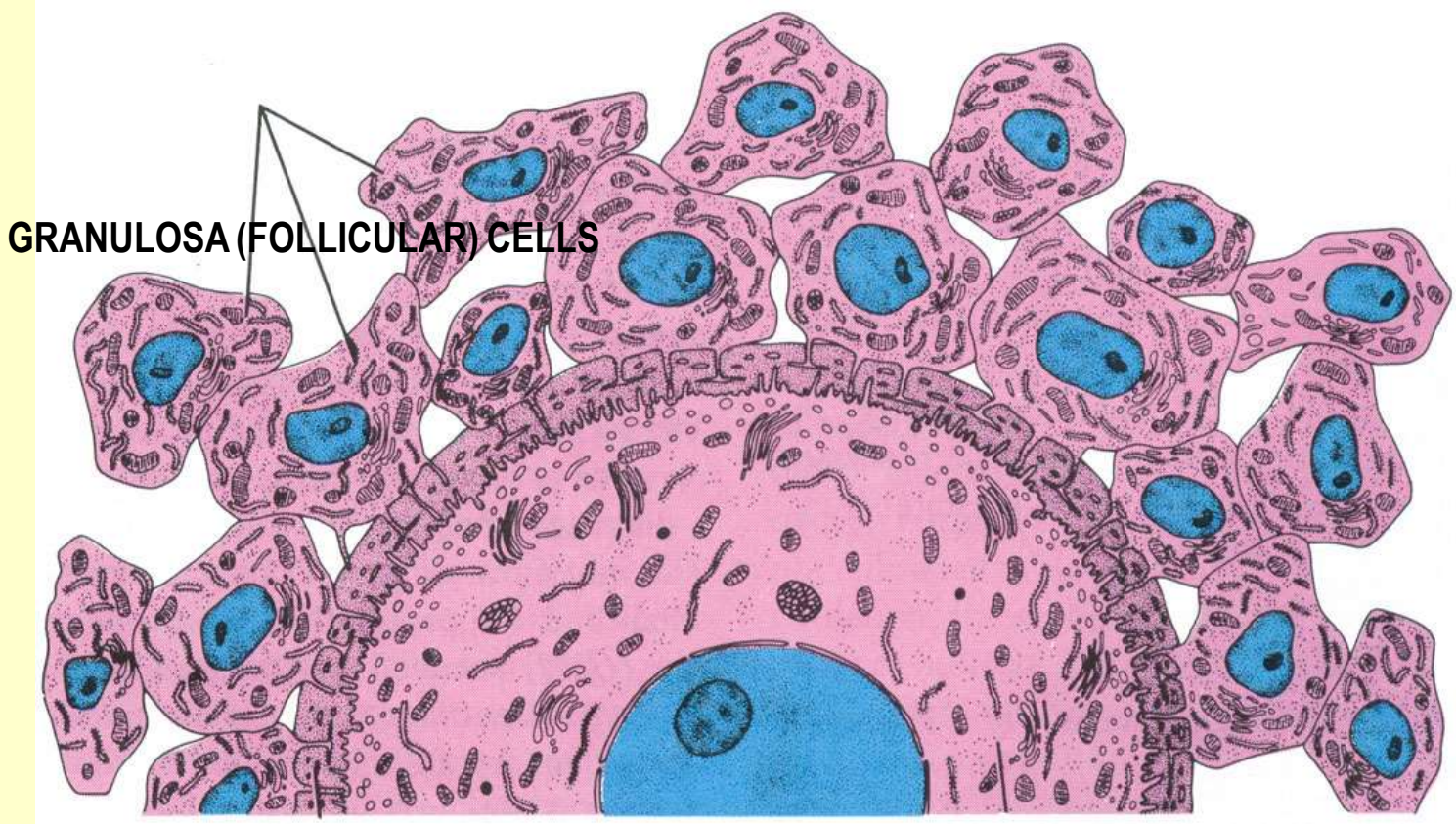
late primary follicle





FEMALE REPRODUCTIVE SYSTEM

- OVARIAN FOLLICLES



GRANULOSA (FOLLICULAR) CELLS

OOCYTE

ZONA PELLUCIDA



FEMALE REPRODUCTIVE SYSTEM

● OVARY

MATURE (GRAAFIAN) FOLLICLE

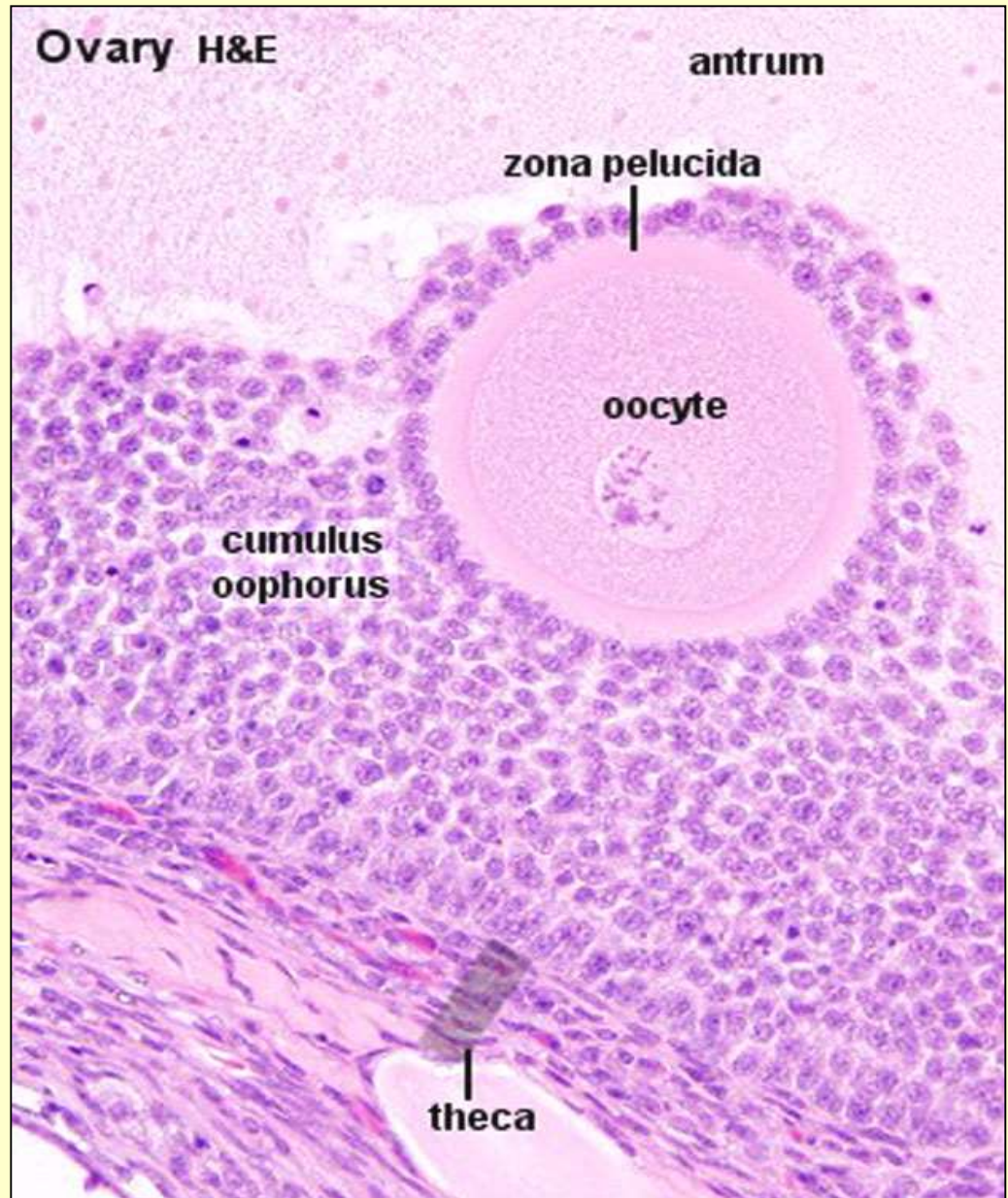
zona pellucida

cumulus oophorus

corona radiata

theca interna and externa

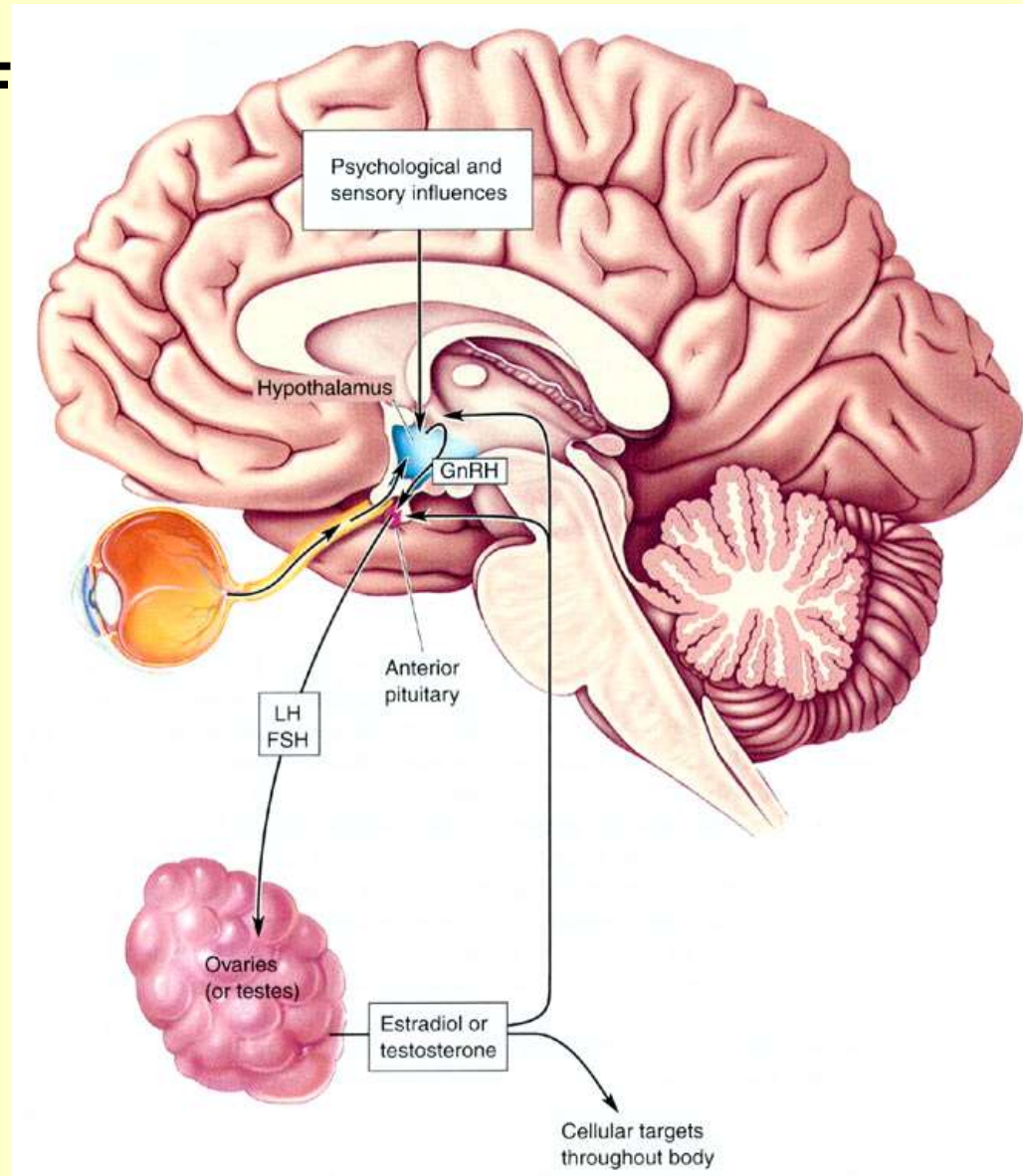
theca interna cells begin to produce androgens that are converted to estrogens



FEMALE REPRODUCTIVE SYSTEM

- **HORMONAL REGULATION OF OOGENESIS AND OVULATION**

HYPOTHALAMUS release of GnRH which stimulates release of LH and FSH from the **adenohypophysis (ANTERIOR PITUITARY)**





FEMALE REPRODUCTIVE SYSTEM

● HORMONAL REGULATION OF OOGENESIS AND OVULATION

OVULATION

FOLLICULAR PHASE

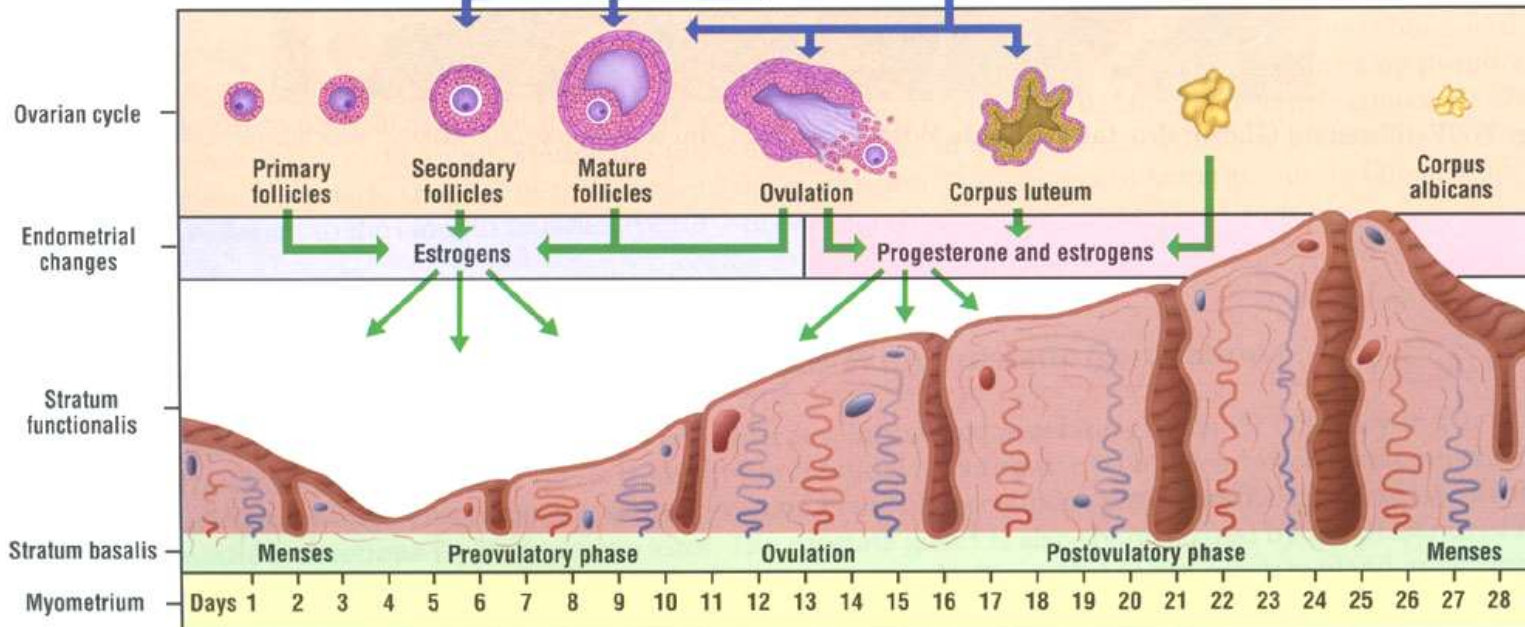
LUTEAL PHASE

10-20 primordial follicles begin to develop in response to FSH and LH levels

theca and granulosa cells transform into the corpus luteum and secrete large amounts of progesterone

*FSH and LH stimulate theca and granulosa production of estrogen and progesterone
surge of LH induces ovulation*

if fertilization does not occur, corpus luteum degenerates ... if fertilization does occur, HCG released from the embryo maintains corpus luteum





FEMALE REPRODUCTIVE SYSTEM

• HORMONAL REGULATION OF OOGENESIS AND OVULATION

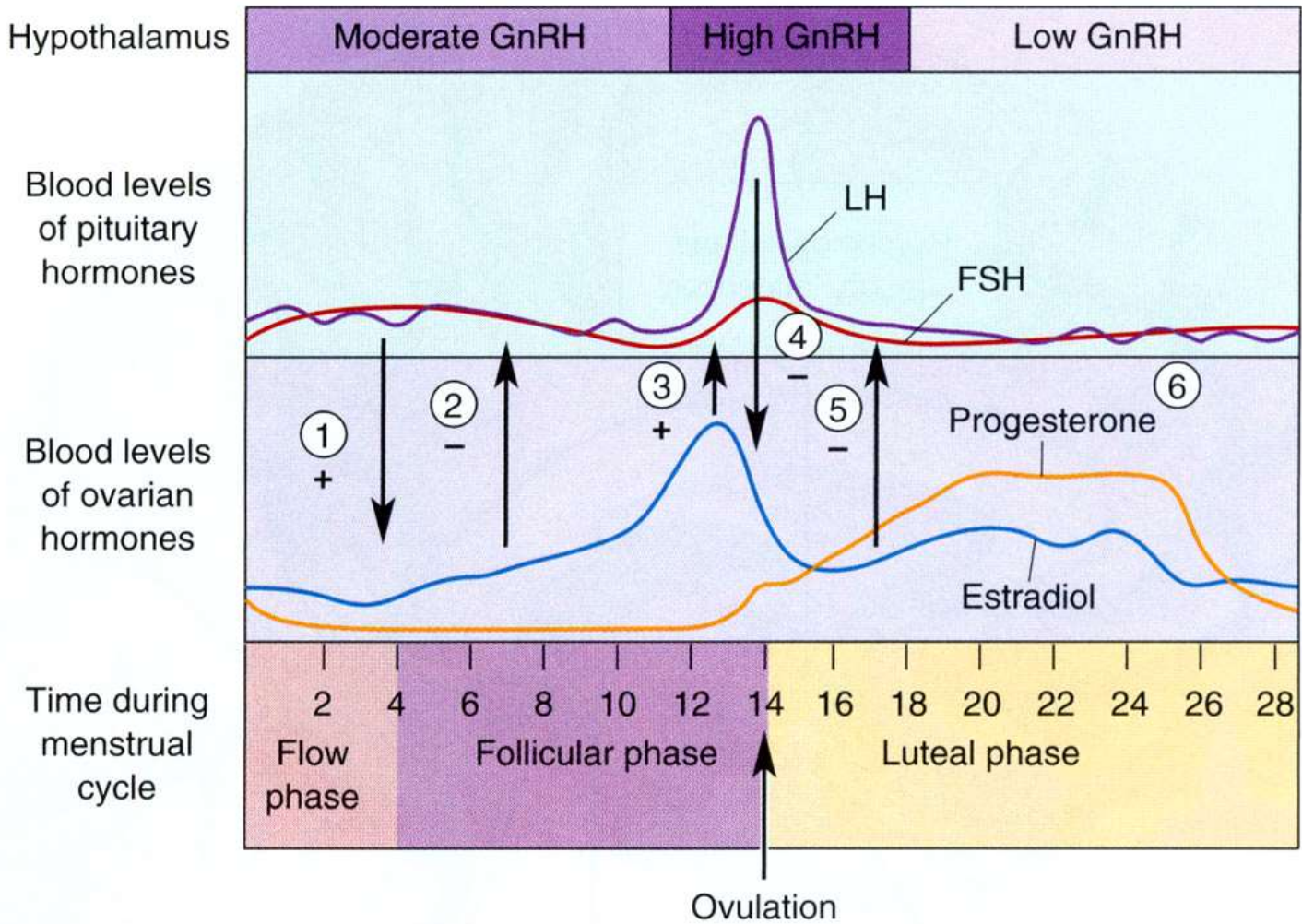
OVULATION:

sharp surge in LH
with simultaneous
increase in FSH

Meiosis I resumes;
oocyte and surrounding
cumulus break away and
are extruded

oocyte passes into
oviduct

**ECTOPIC
IMPLANTATIONS**





FEMALE REPRODUCTIVE SYSTEM

● CORPUS LUTEUM

FORMED FROM FOLLICLE WALL WHICH REMAINS FOLLOWING OVULATION

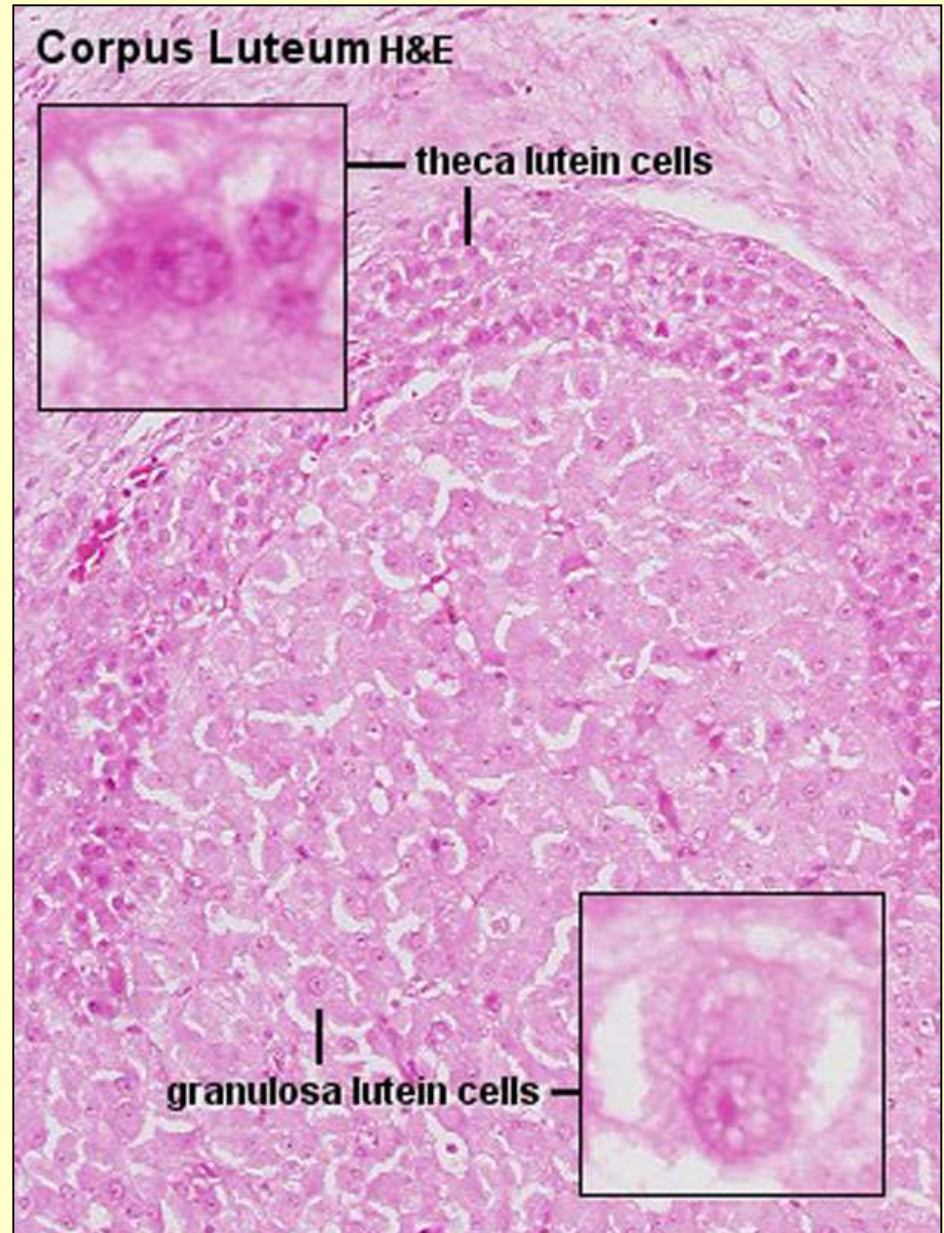
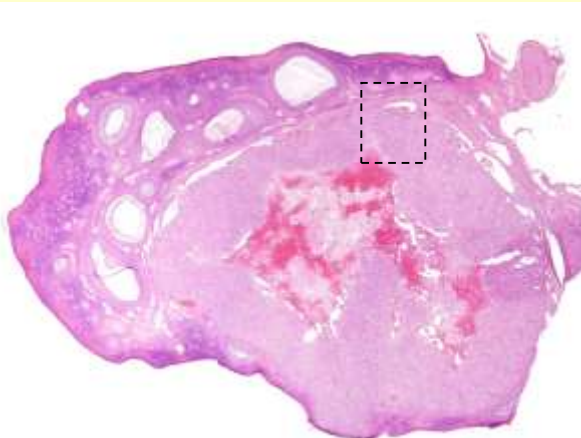
TRANSFORMED CELLS SECRETE ESTROGENS AND PROGESTERONE:

(1) GRANULOSA LUTEIN CELLS

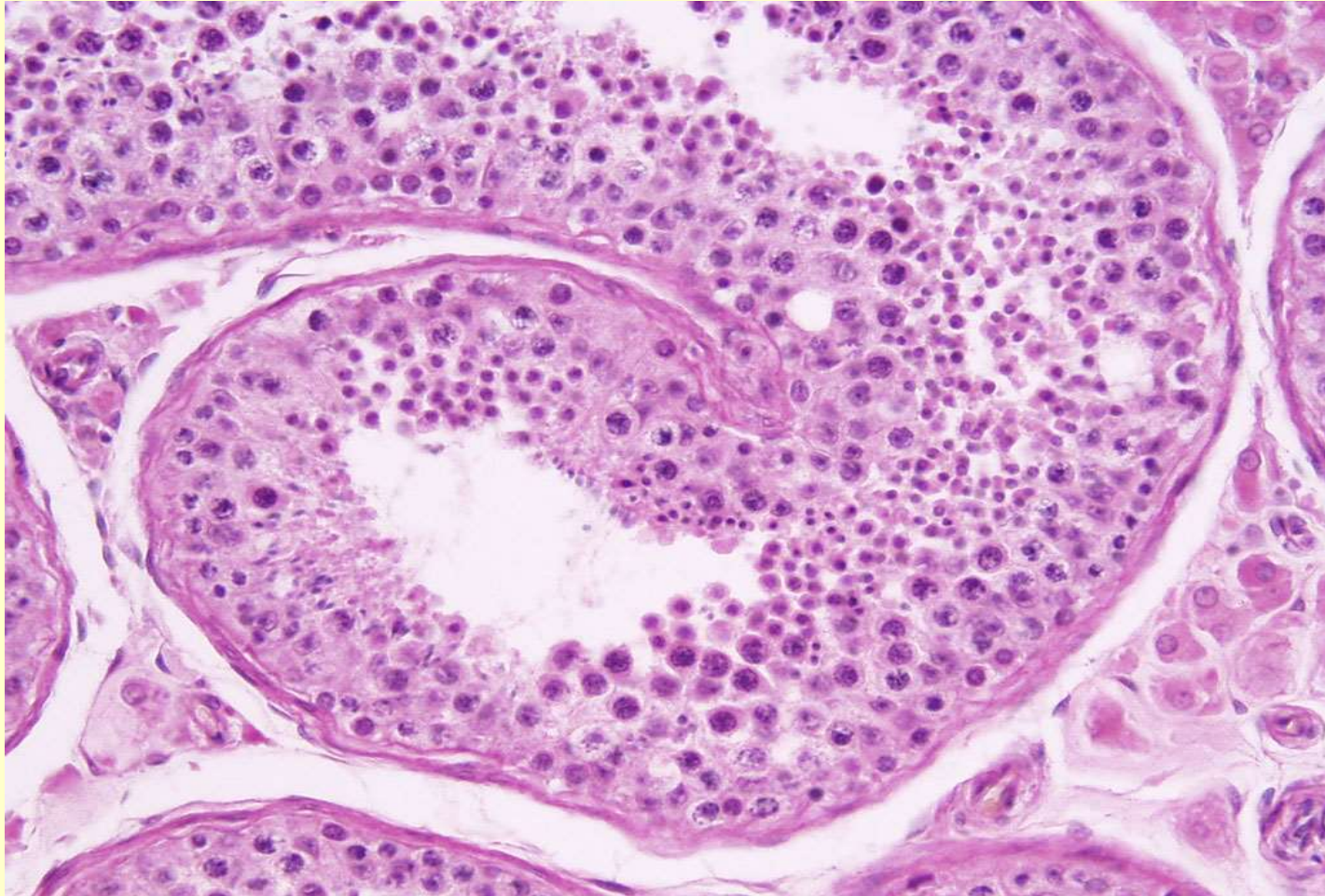
- large, light cells derived from granulosa cells

(2) THECA LUTEIN CELLS

- strands of small cells derived from theca interna



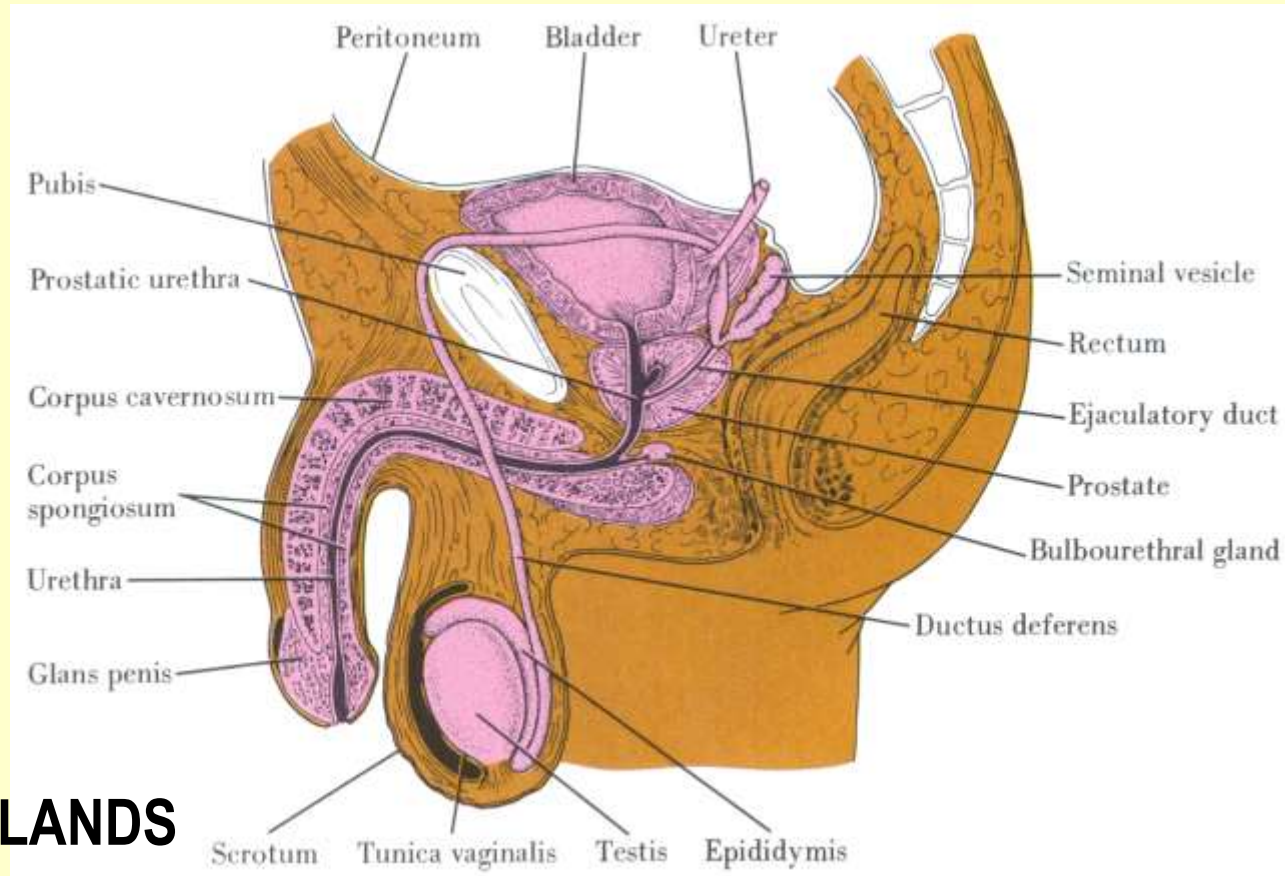
MALE REPRODUCTIVE SYSTEM



MALE REPRODUCTIVE SYSTEM



- TESTES
- EPIDIDYMIS
- VAS DEFERENS
- SEMINAL VESICLES
- PROSTATE
- BULBOURETHRAL GLANDS
- URETHRA



MALE REPRODUCTIVE SYSTEM



● TESTIS

TUNICA ALBUGINEA

- thick connective tissue capsule
- connective tissue septa divide testis into 250 lobules
- each lobule contains 1-4 seminiferous tubules and interstitial connective tissue

(1) SEMINIFEROUS TUBULES

- produce sperm

INTERSTITIAL TISSUE

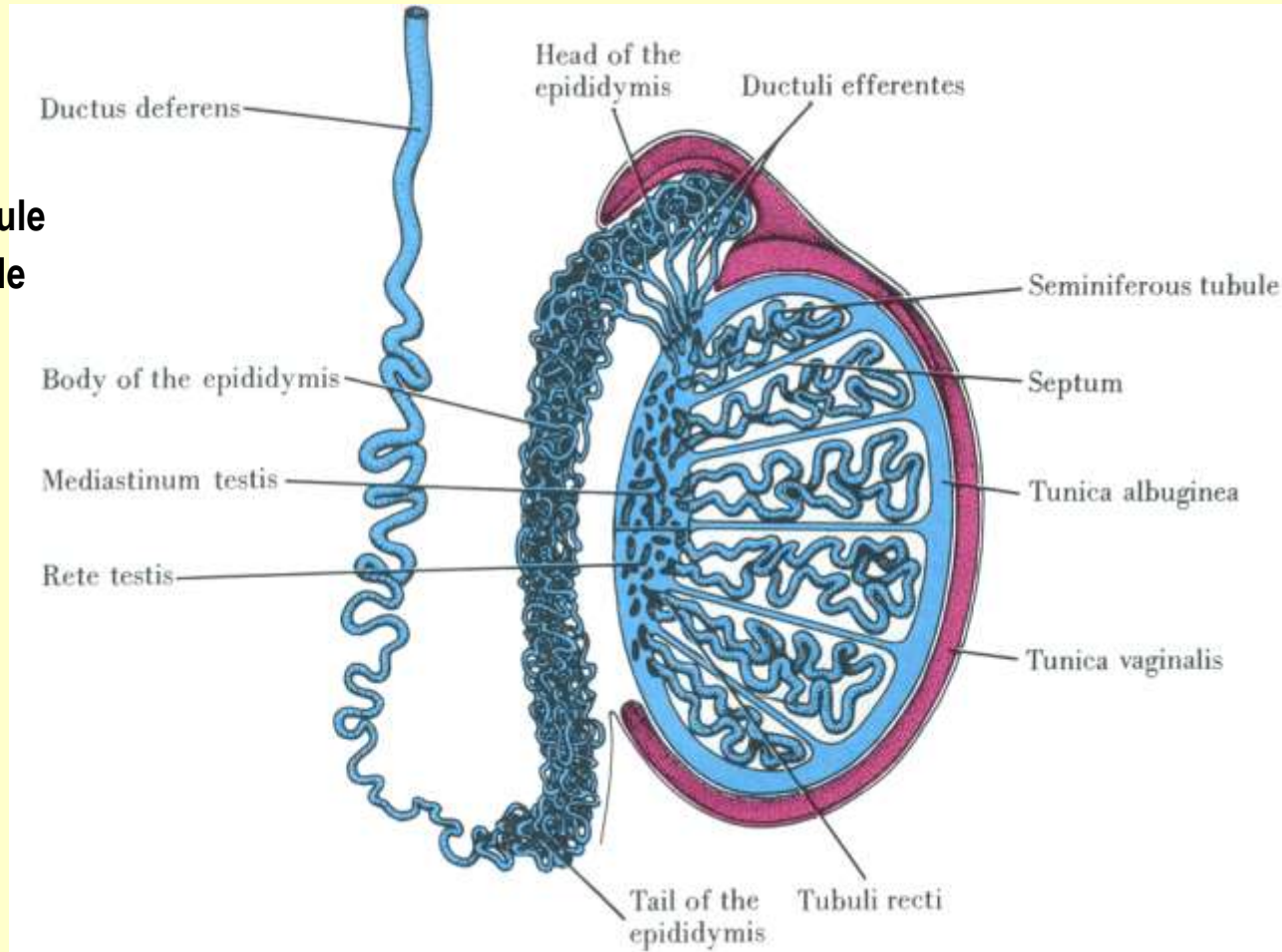
- contains Leydig cells which produce *testosterone*

(2) RECTUS TUBULES

(3) RETE TESTIS

(4) EFFERENT DUCTULES

(5) EPIDIDYMIS



MALE REPRODUCTIVE SYSTEM



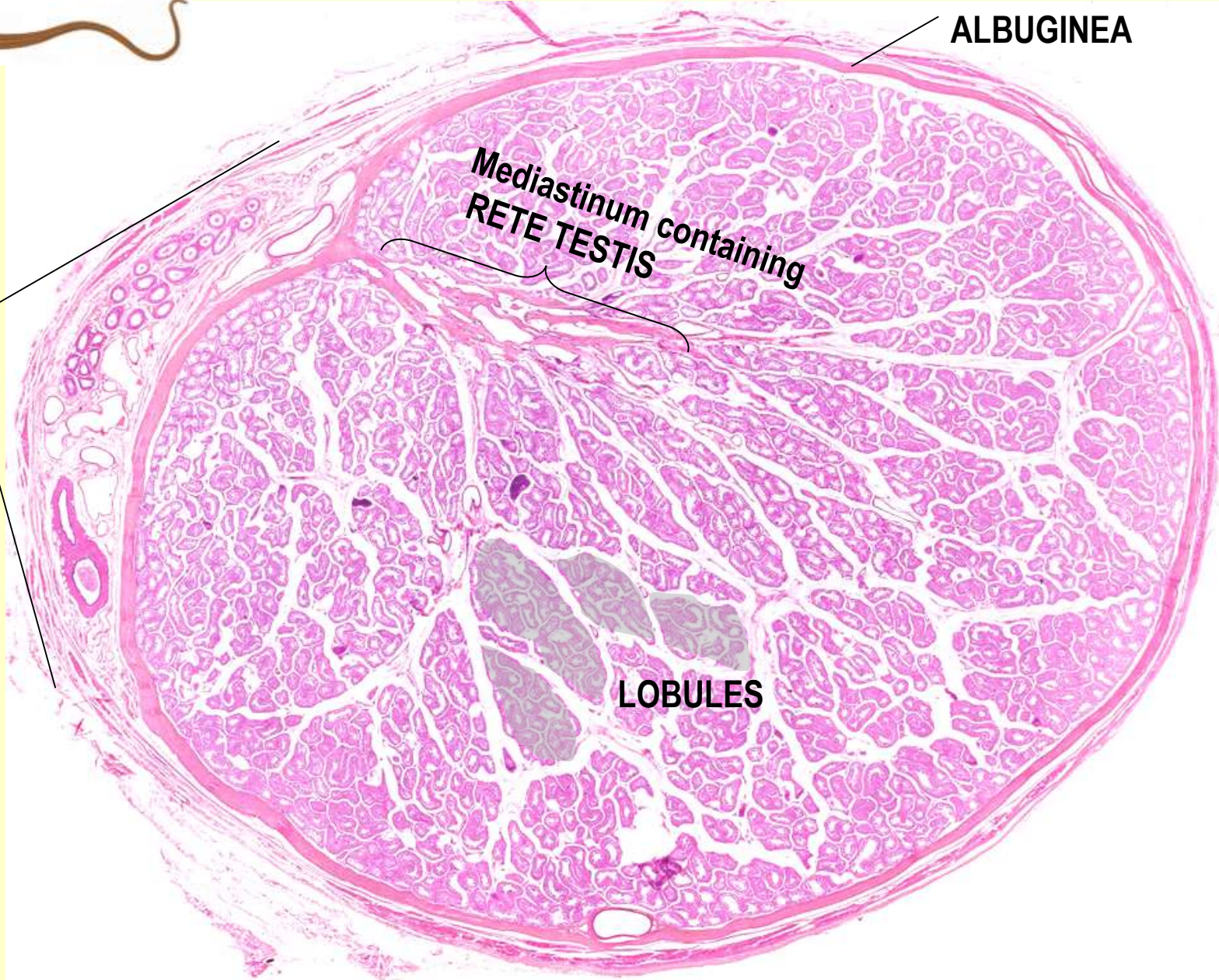
TUNICA
ALBUGINEA

● TESTIS

Mediastinum containing
RETE TESTIS

EPIDIDYMIS

LOBULES



TESTIS H&E

SEMINIFEROUS TUBULES

**SEMINIFEROUS
TUBULES**

**INTERSTITIAL
CONN. TISSUE**



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

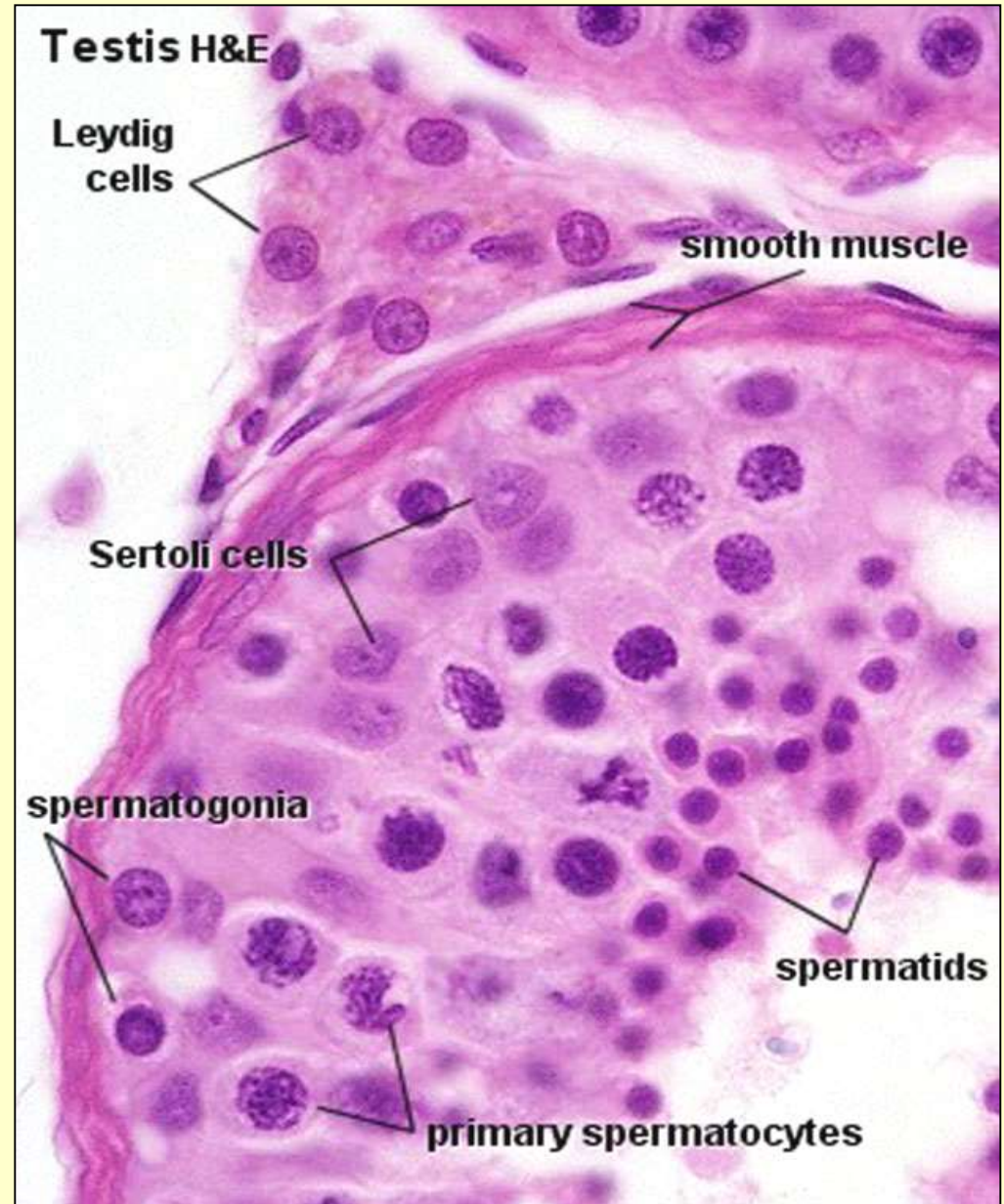
(2) SERTOLI CELLS

nonreplicating physical support cells

INTERSTITIAL CONNECTIVE TISSUE

(1) LEYDIG CELLS

produce and release testosterone



MALE REPRODUCTIVE SYSTEM



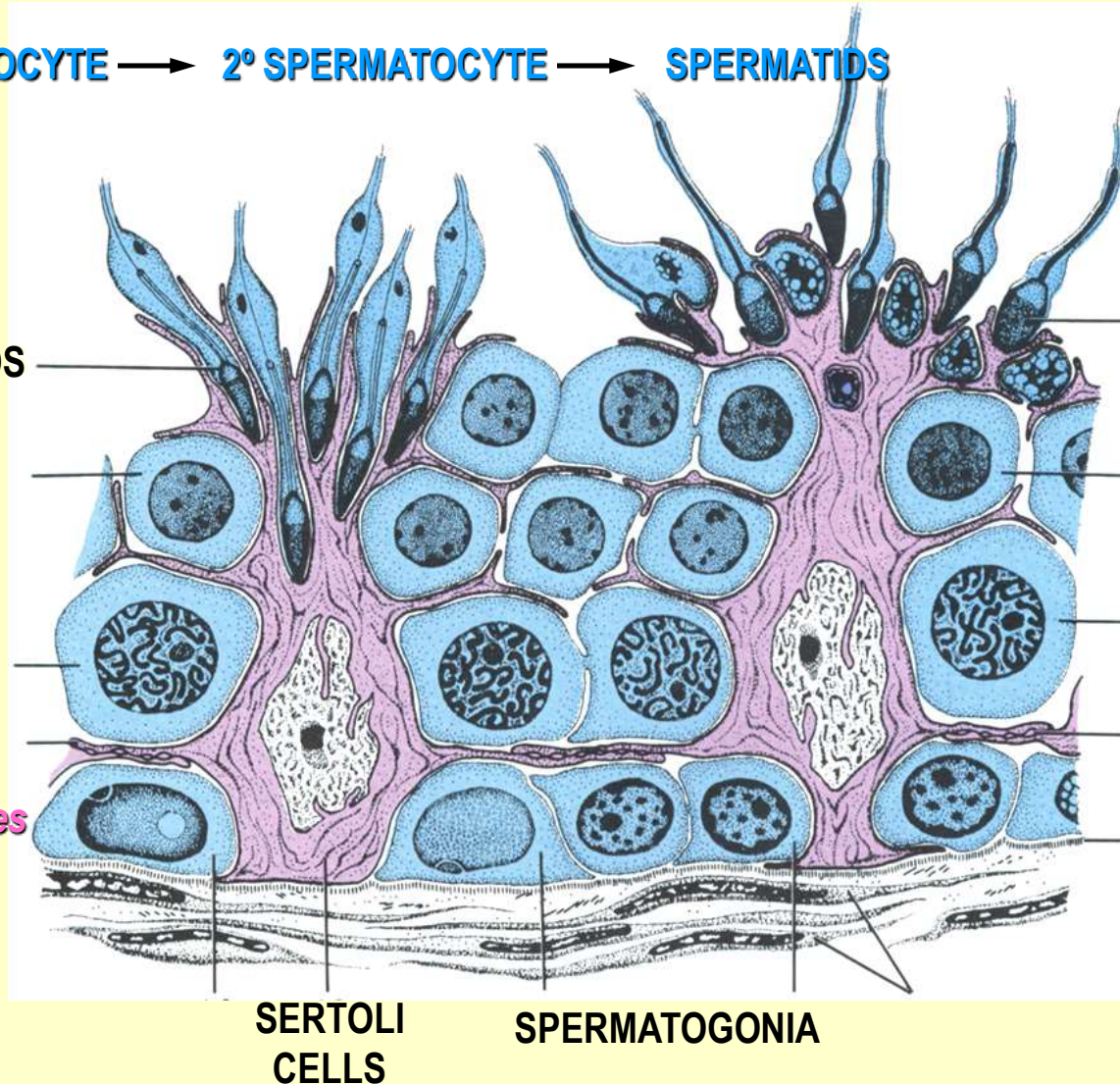
• SPERMATOGENESIS

SPERMATOGONIA → 1° SPERMATOCYTE → 2° SPERMATOCYTE → SPERMATIDS

SPERMATIDS
2° SPERMATOCYTE
1° SPERMATOCYTE

SERTOLI CELLS:

- columnar with adjoining lateral processes
- extend from basal lamina to lumen
- Sertoli-Sertoli junctions divide seminiferous tubules into basal and adluminal compartments



MALE REPRODUCTIVE SYSTEM



● SPERMATOGENESIS

THREE PHASES:

(1) Spermatogonial Phase (Mitosis)

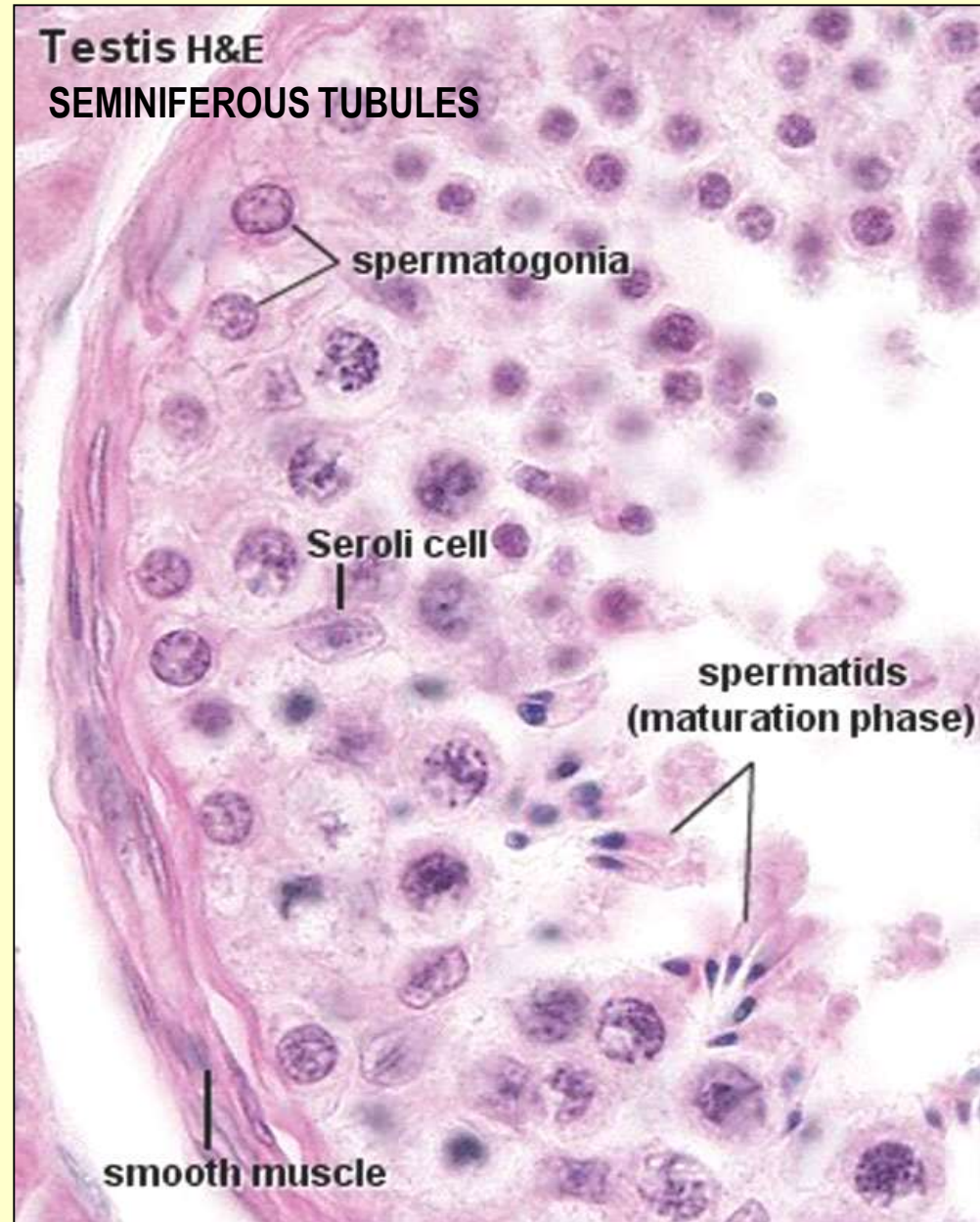
- spermatogonia proliferate by mitotic divisions to provide *stem cells* and cells which will proceed through spermatogenesis (*1° spermatocytes*)

(2) Spermatocyte Phase (Meiosis)

- diploid cells ($2n$) created in spermatogonial phase give rise to haploid cells ($1n$)
- Meiosis I (reduction division) & Meiosis II (equatorial division)
- 1° spermatocytes enter Meiosis I to form 2° spermatocytes which then enter Meiosis II and result in spermatids

(3) Spermatid Phase (Spermiogenesis)

- spermatid differentiation into spermatozoa



MALE REPRODUCTIVE SYSTEM

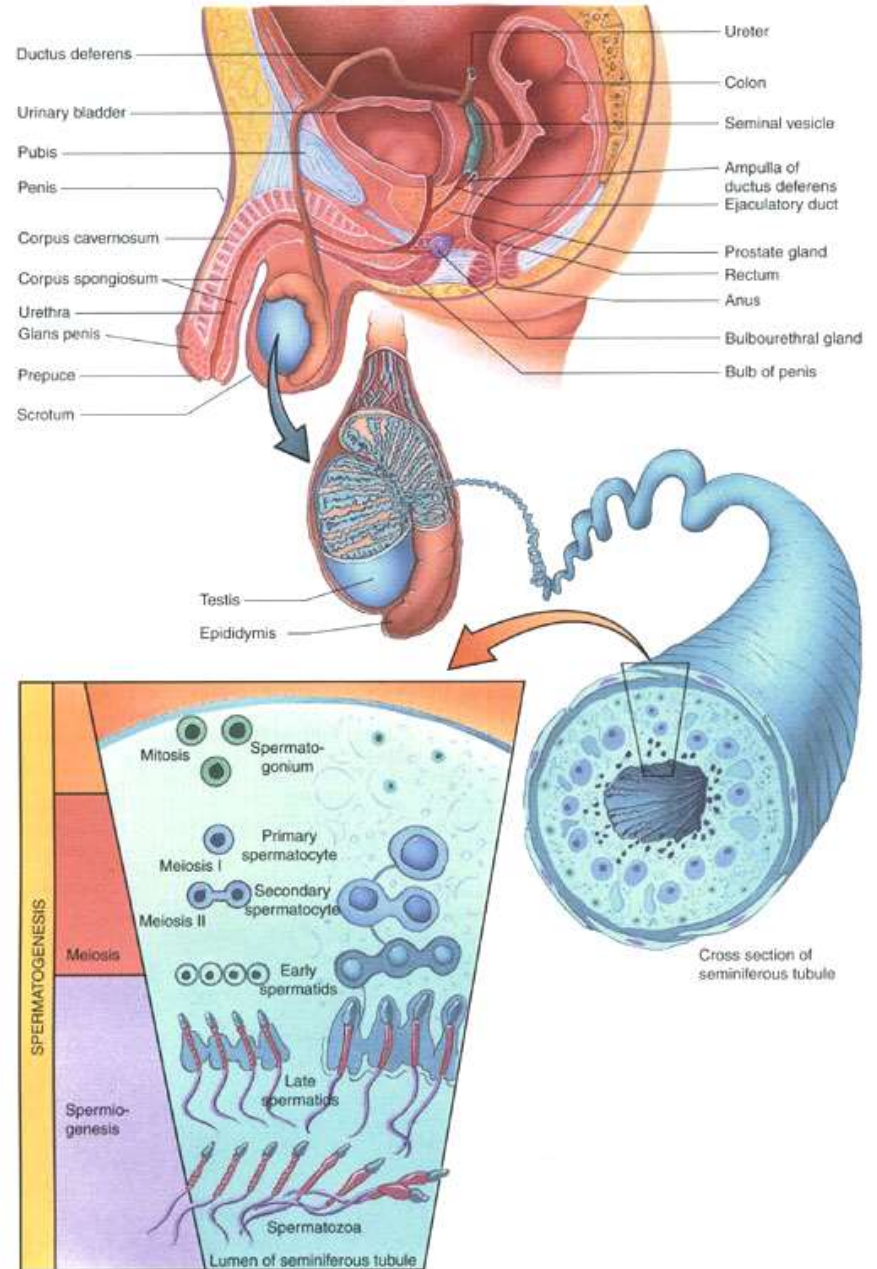


● SPERMATOGENESIS

THREE PHASES:

- (1) Spermatogonial Phase (Mitosis)
- (2) Spermatocyte Phase (Meiosis)
- (3) Spermatid Phase (Spermiogenesis)

- **acrosome** formation; golgi granules fuse to form acrosome that contains hydrolytic enzymes which will enable the spermatozoa to move through the investing layers of the oocyte
- **flagellum** formation; centrioles and associate axoneme (arrangement of microtubules in cilia)
- changes in size and shape of nucleus; chromatin condenses and shedding of residual body (cytoplasm)



MALE REPRODUCTIVE SYSTEM



● HORMONAL REGULATION OF MALE REPRODUCTIVE FUNCTION

HYPOTHALAMUS REGULATES ACTIVITY OF ANTERIOR PITUITARY (ADENOHYPOPHYSIS)

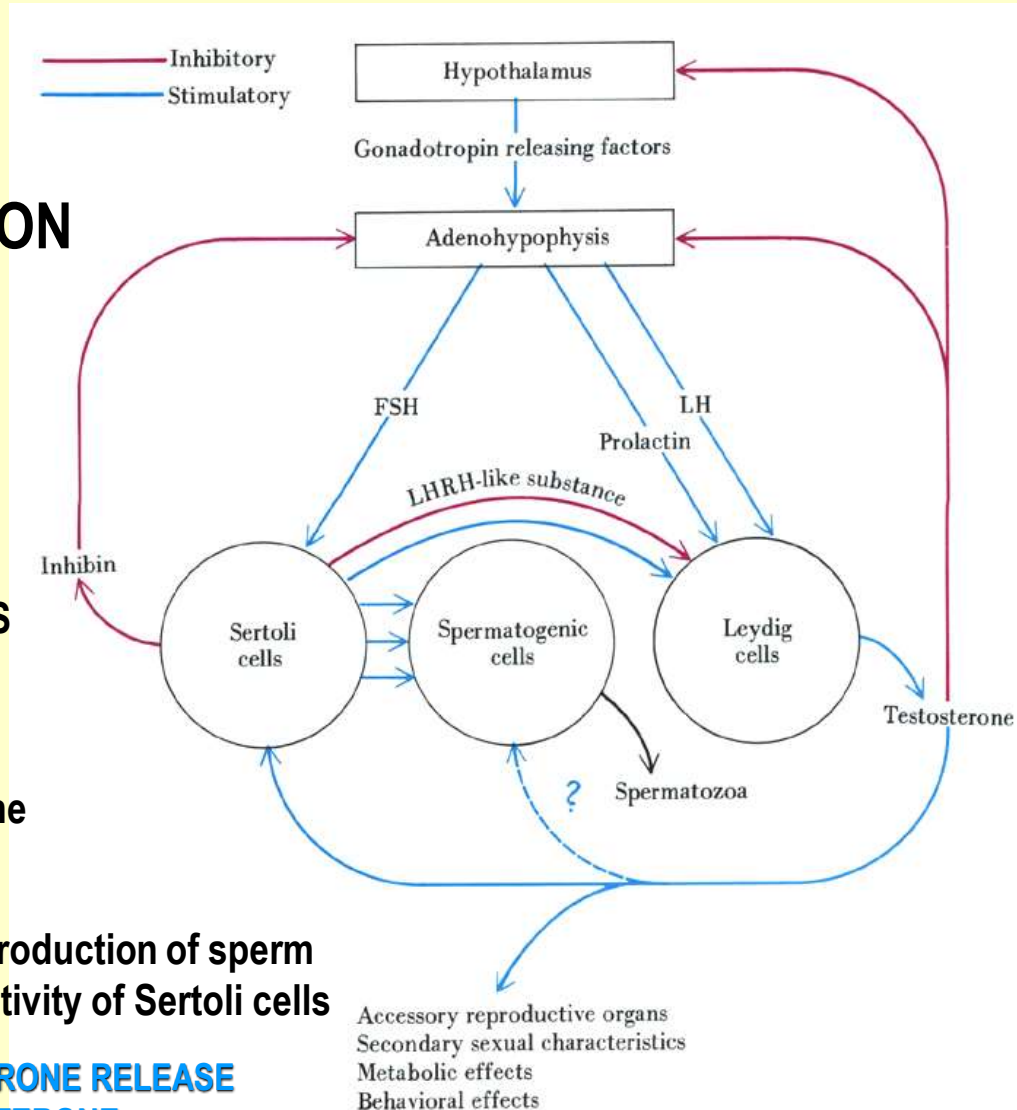


ADENOHYPOPHYSIS SYNTHESIZES HORMONES (LH and FSH) THAT MODULATE ACTIVITY OF SERTOLI AND LEYDIG CELLS

Luteinizing Hormone (LH): stimulates testosterone production by Leydig cells

Follicle Stimulating Hormone (FSH): stimulates production of sperm in conjunction with testosterone by regulating activity of Sertoli cells

SERTOLI CELLS STIMULATED BY FSH AND TESTOSTERONE RELEASE ANDROGEN BINDING PROTEIN WHICH BINDS TESTOSTERONE; THEREBY INCREASING TESTOSTERONE CONCENTRATION WITHIN THE SEMINIFEROUS TUBULES AND STIMULATING SPERMATOGENESIS



THANK YOU