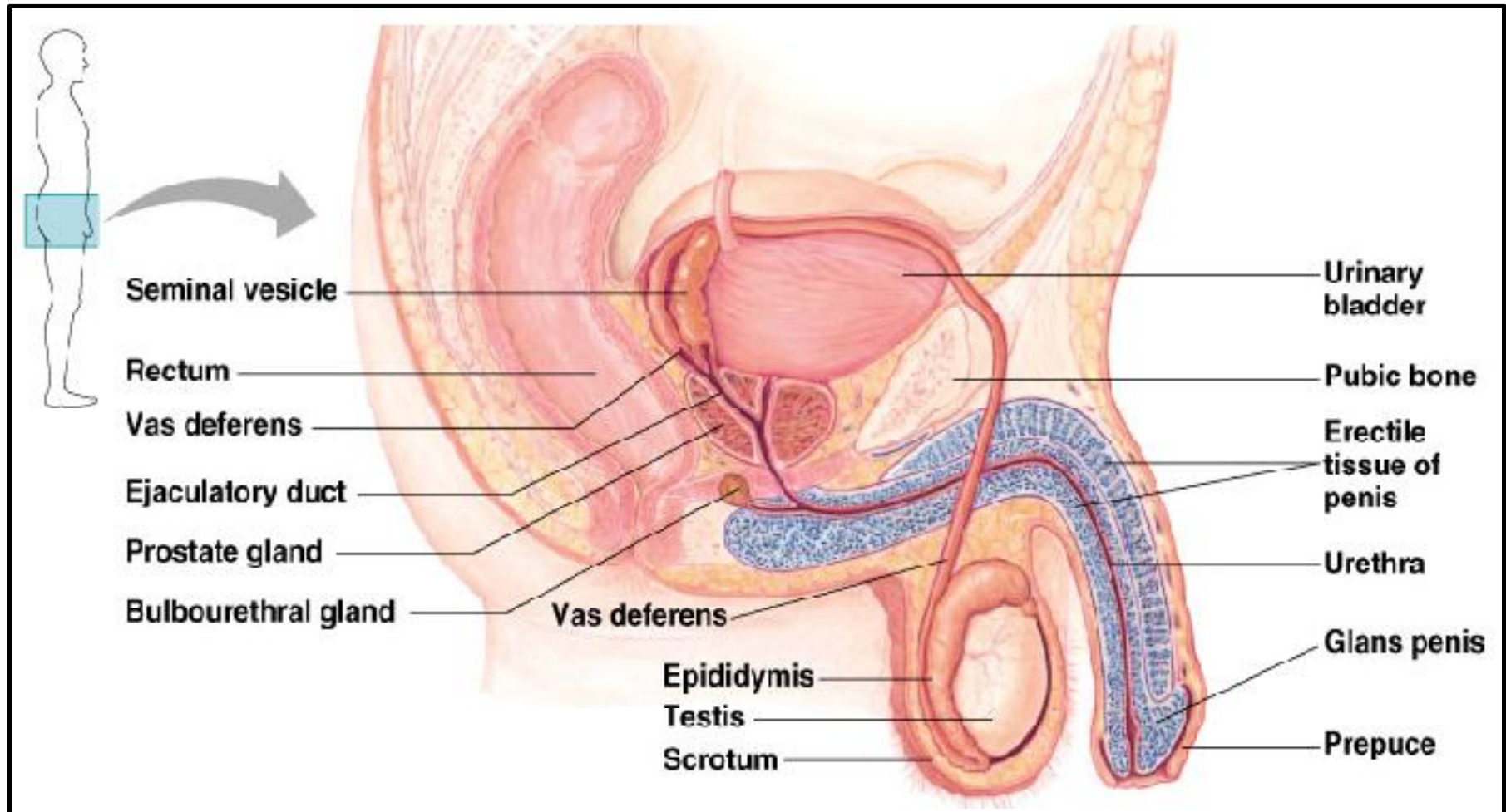


Male Reproductive System: Hormonal Control of Spermatogenesis

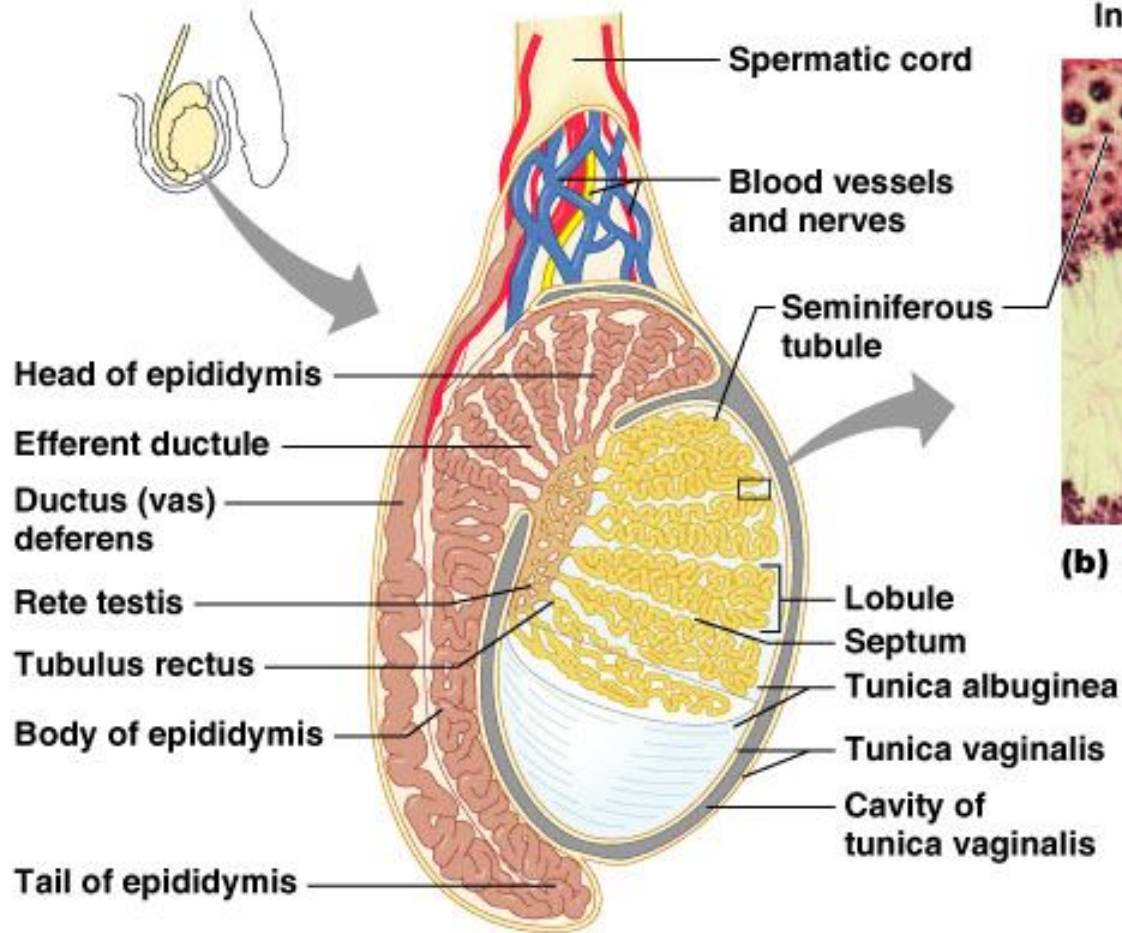
Dr. R. Debnath
Associate Professor
Deptt. of Zoology
MBB College, Agartala

07/03/2019

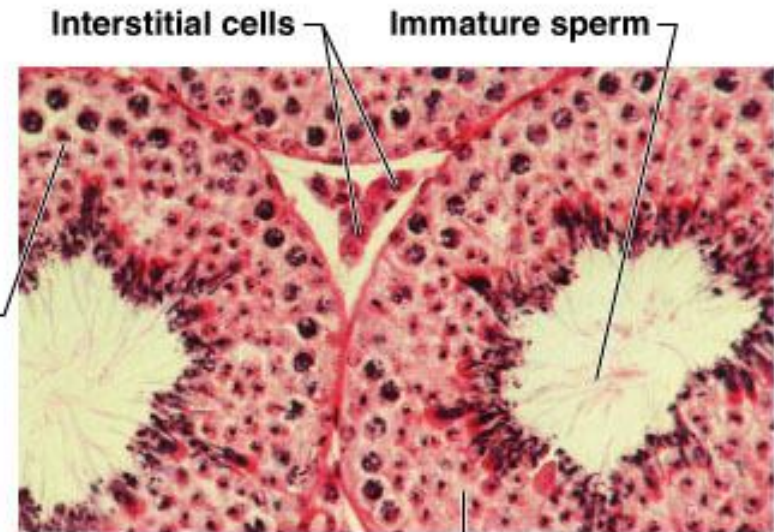
Male Reproductive System



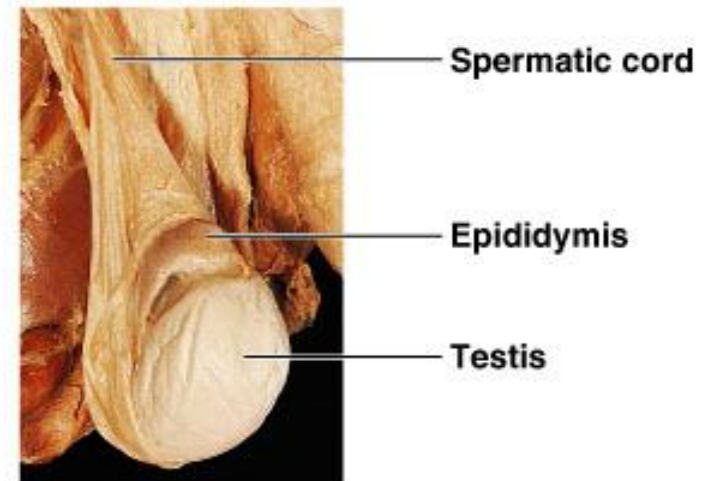
Testes



(a)

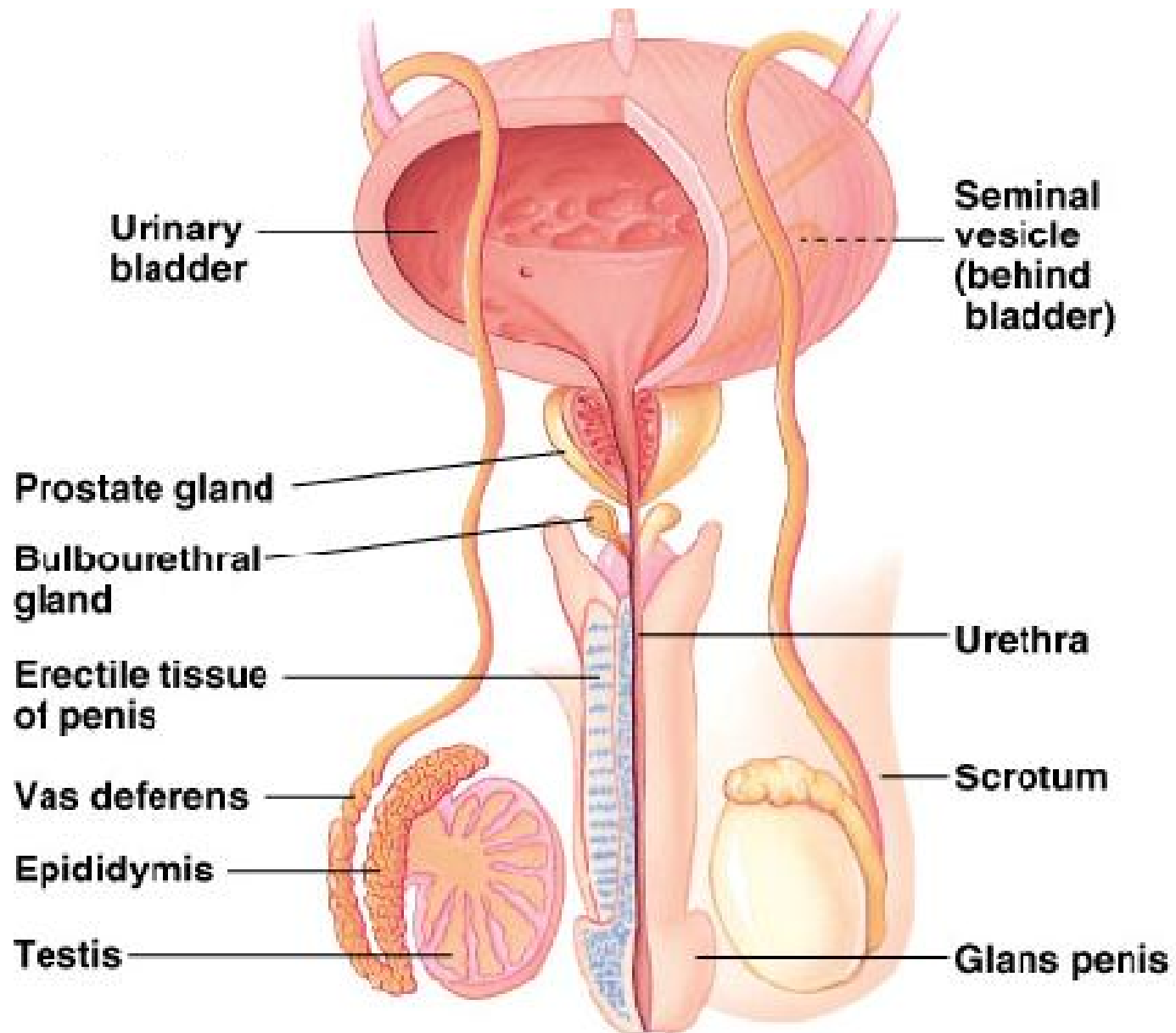


(b)

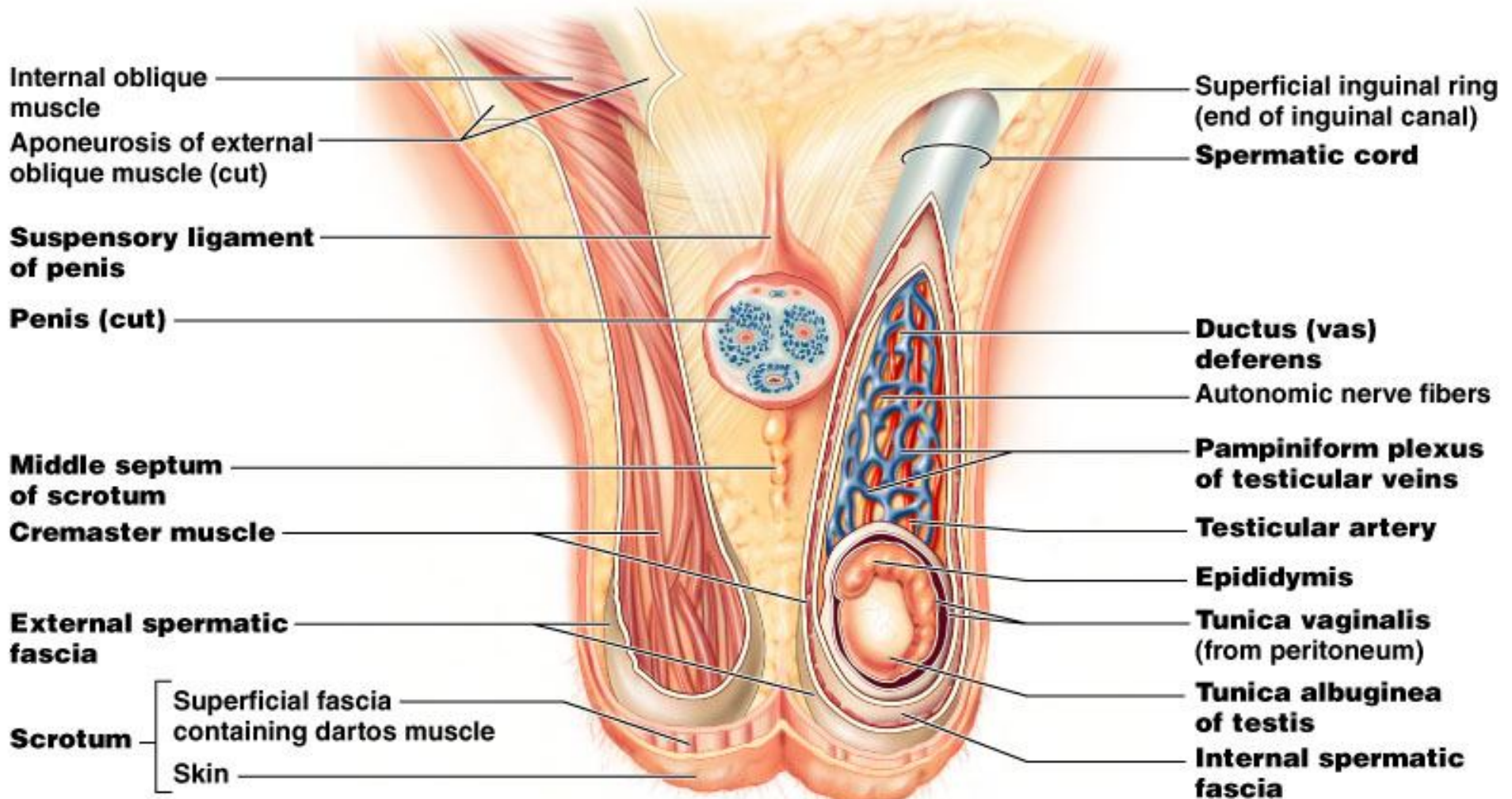


(c)

Male Reproductive System



Male Reproductive System



The Male Reproductive System in Midsagittal View

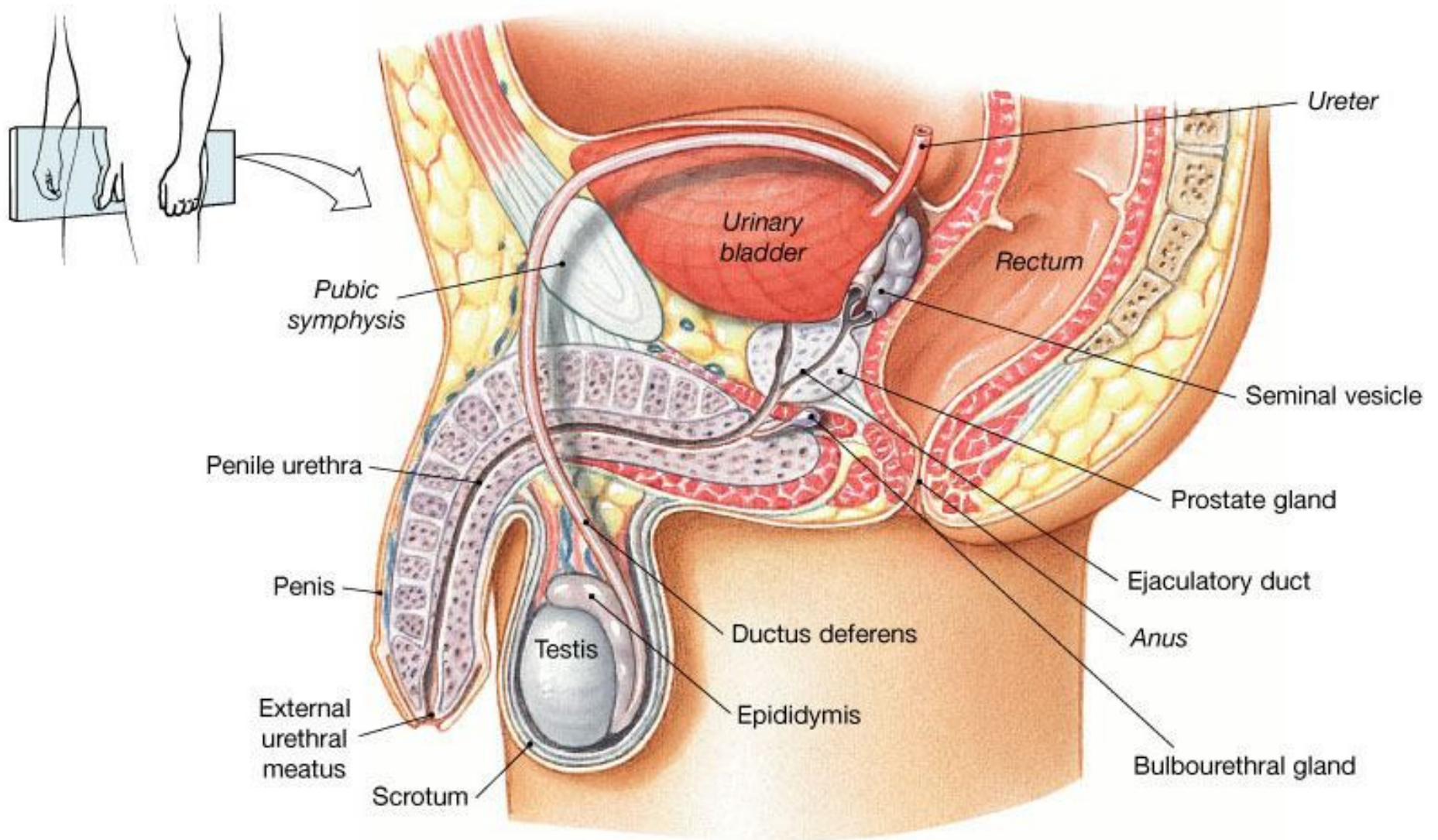


Figure 28.1

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

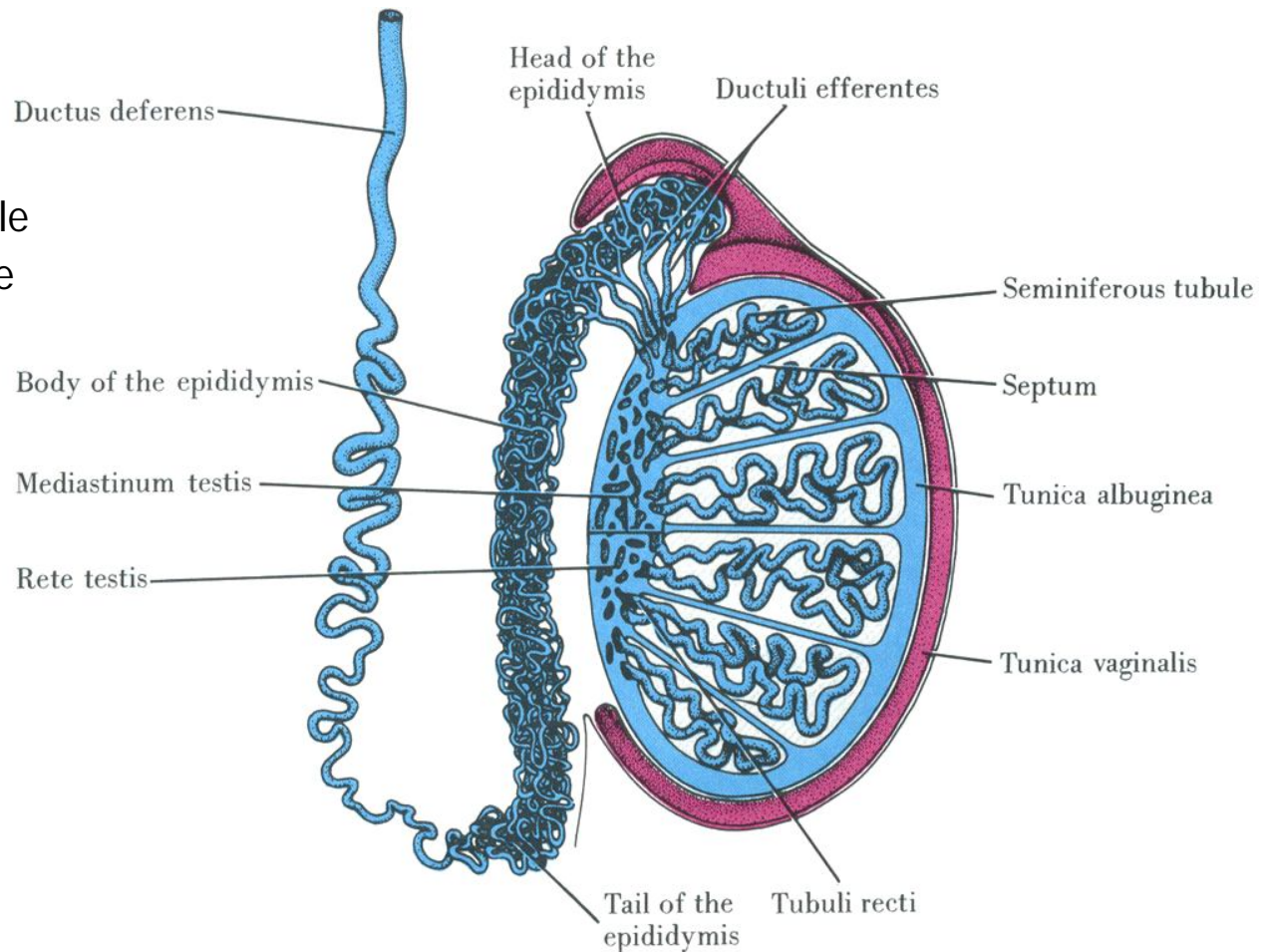
- contains Leydig cells which produce *testosterone*

(2) RECTUS TUBULES

(3) RETE TESTIS

(4) EFFERENT DUCTULES

(5) EPIDIDYMIS





MALE REPRODUCTIVE SYSTEM

• HORMONAL REGULATION OF MALE REPRODUCTIVE FUNCTION

HYPOTHALAMUS REGULATES ACTIVITY OF ANTERIOR PITUITARY (ADENOHYPOPHYSIS)

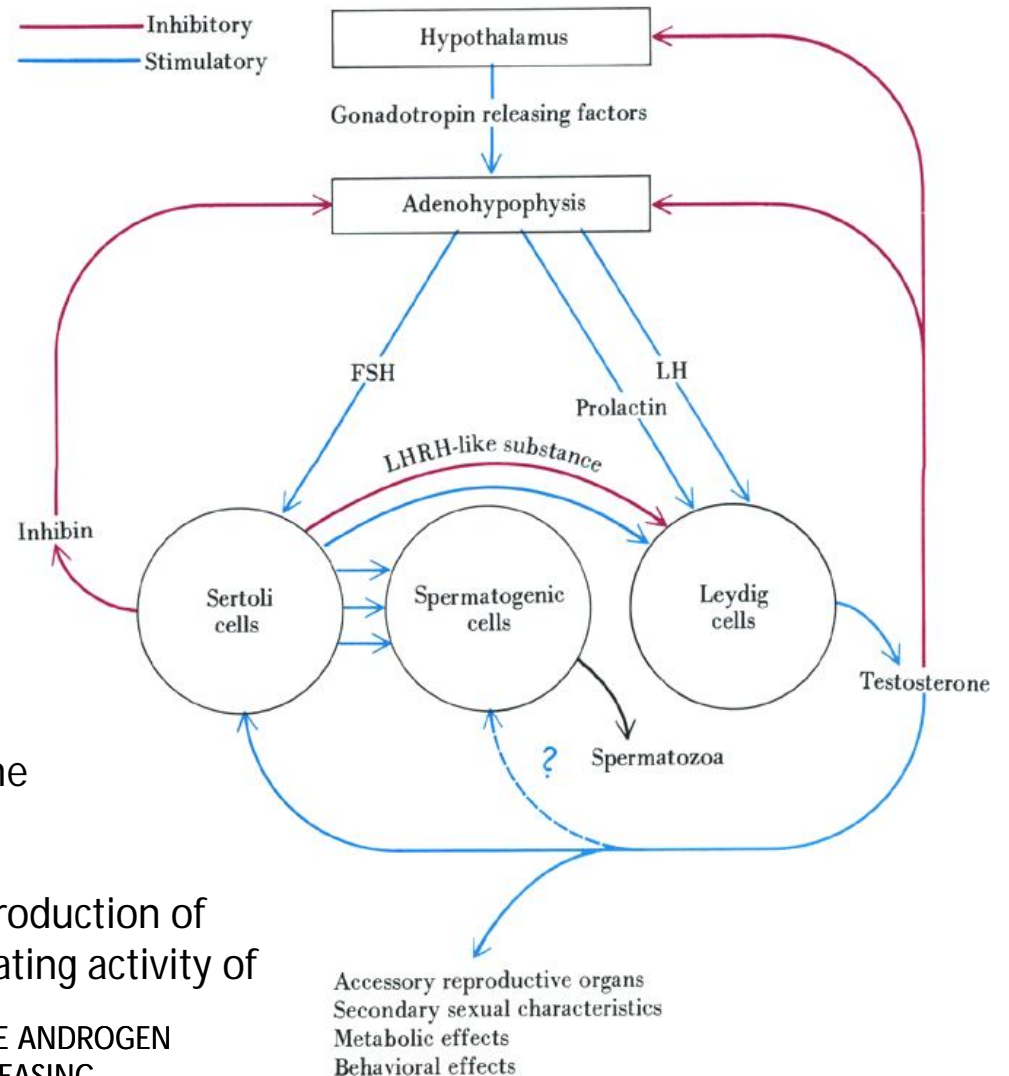


ADENOHYPOPHYSIS SYNTHESIZES HORMONES (LH and FSH) THAT MODULATE ACTIVITY OF SERTOLI AND LEYDIG CELLS

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

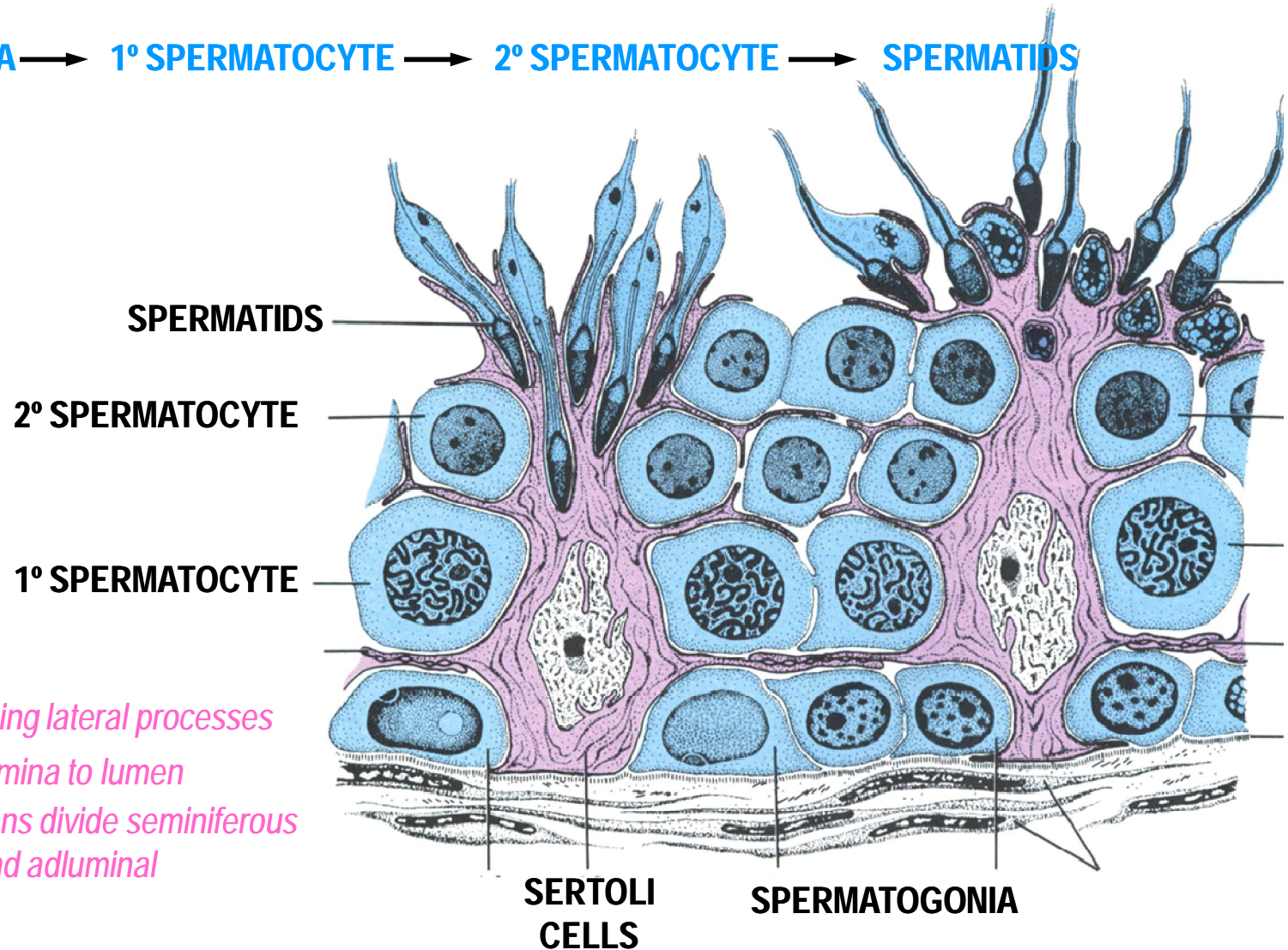


MALE REPRODUCTIVE SYSTEM



• SPERMATOGENESIS

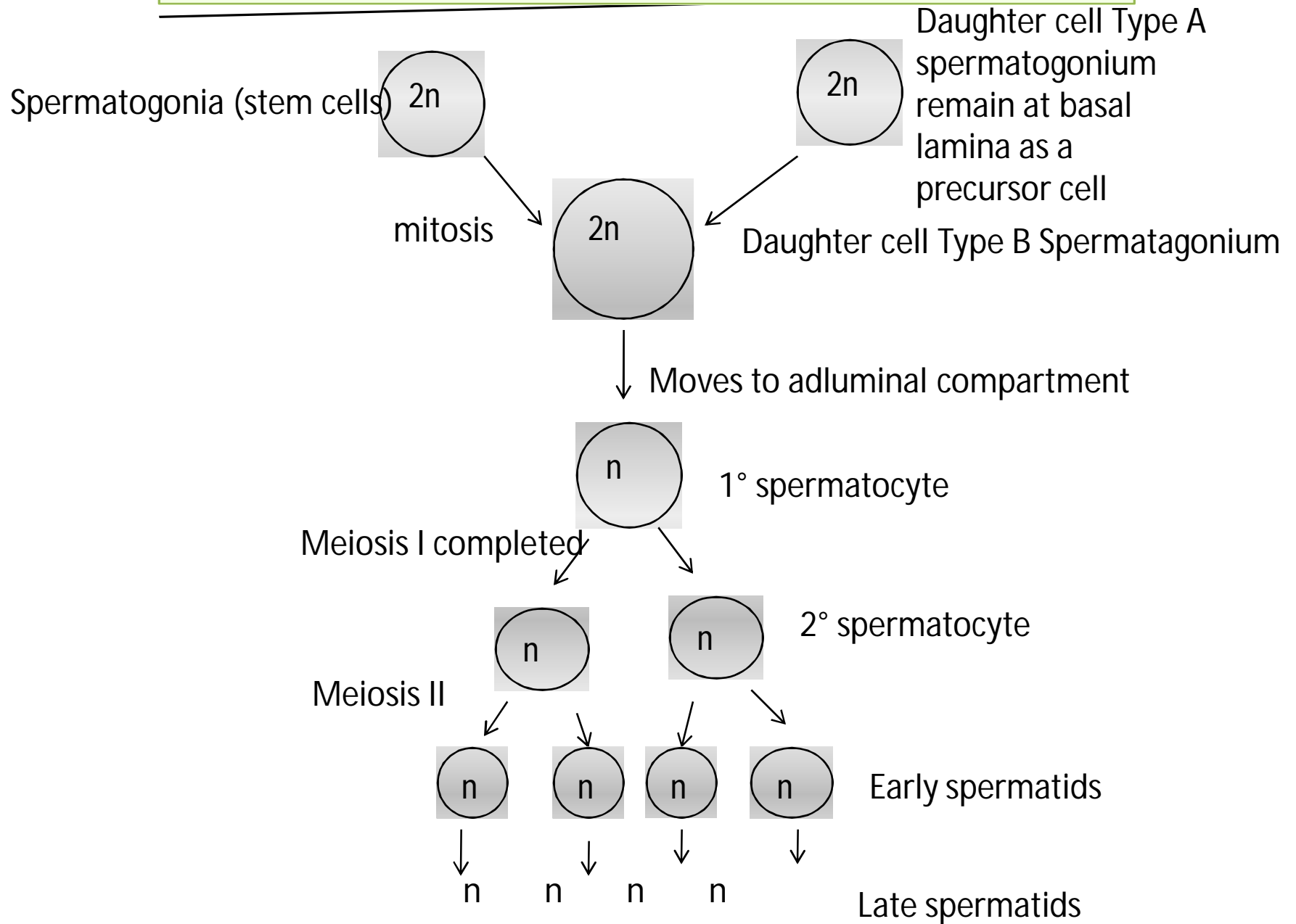
SPERMATOGONIA → 1° SPERMATOCYTE → 2° SPERMATOCYTE → SPERMATIDS



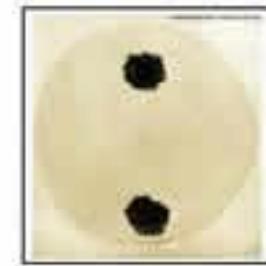
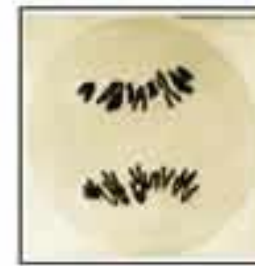
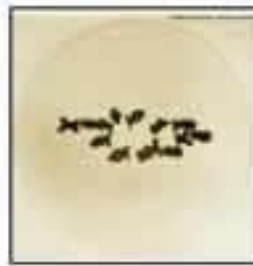
SERTOLI CELLS:

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

Basal Lamina



Meiosis I



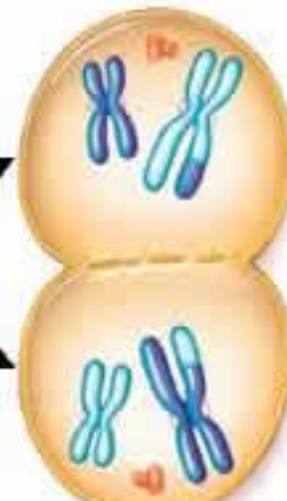
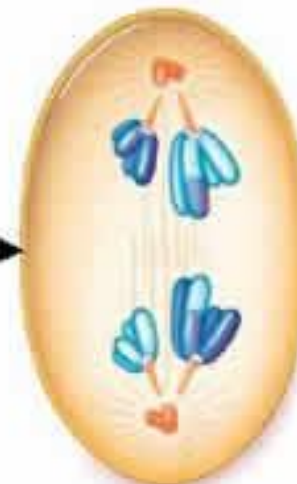
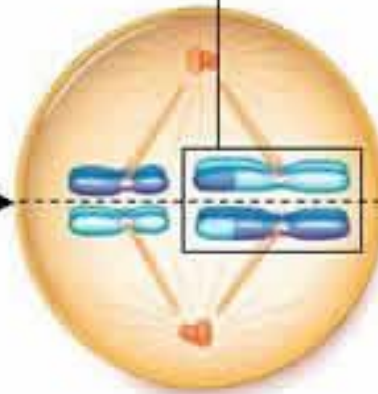
One pair of
homologous
chromosomes
(homologues)

Homologues
Condense
and cross
over

Homologues
Align

Homologues
Separate

Meiosis I result:
homologues
separated into 2
cells



©2001 Brooks/Cole - Thomson Learning

Interphase

Prophase I

Metaphase I

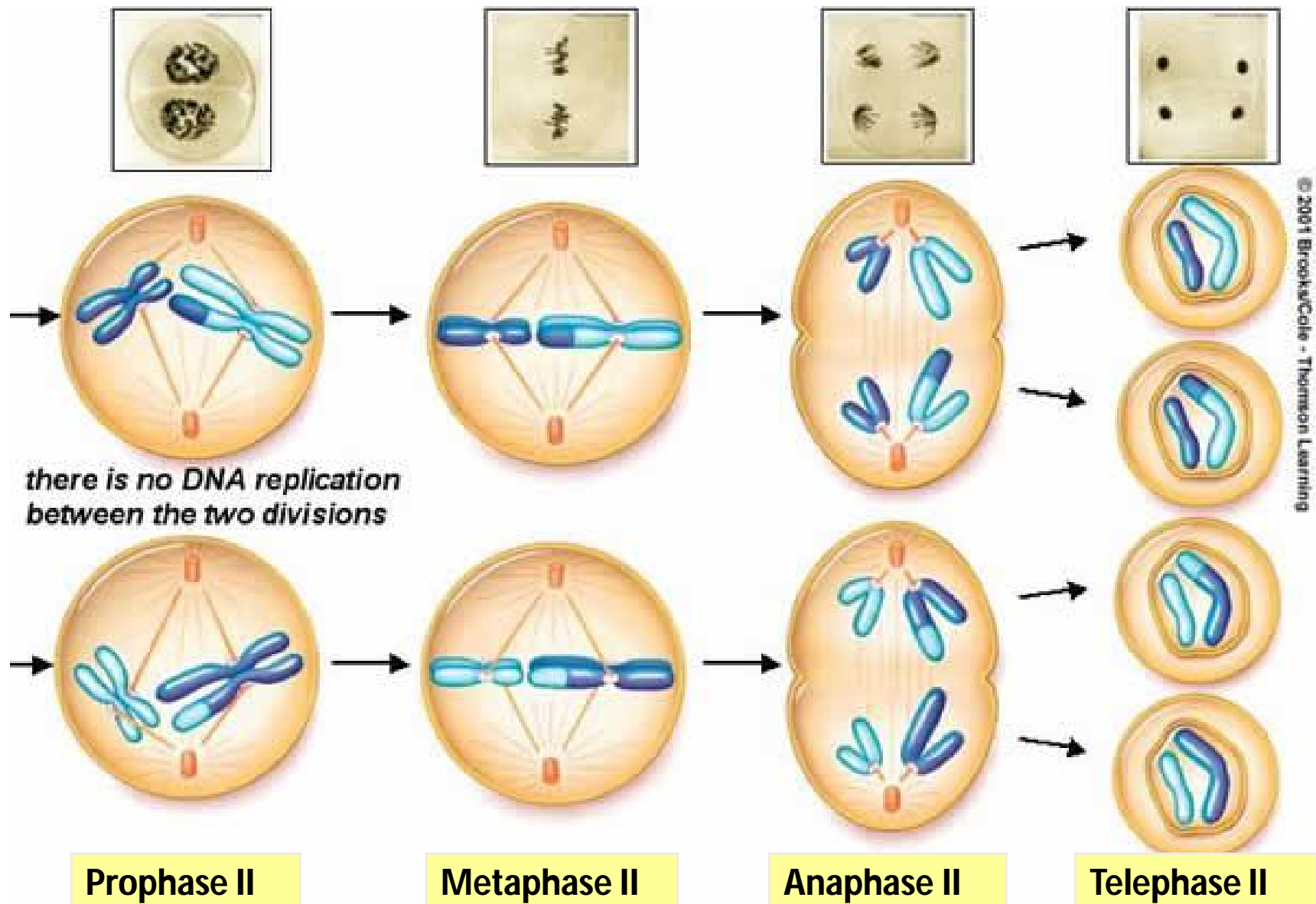
Anaphase I

Telephase I

MEIOSIS I: Separate the Homologues

Slide 5

Meiosis II



MEIOSIS II: Separate the Sister Chromatids (by mitosis)

MALE REPRODUCTIVE SYSTEM



• SPERMATOGENESIS

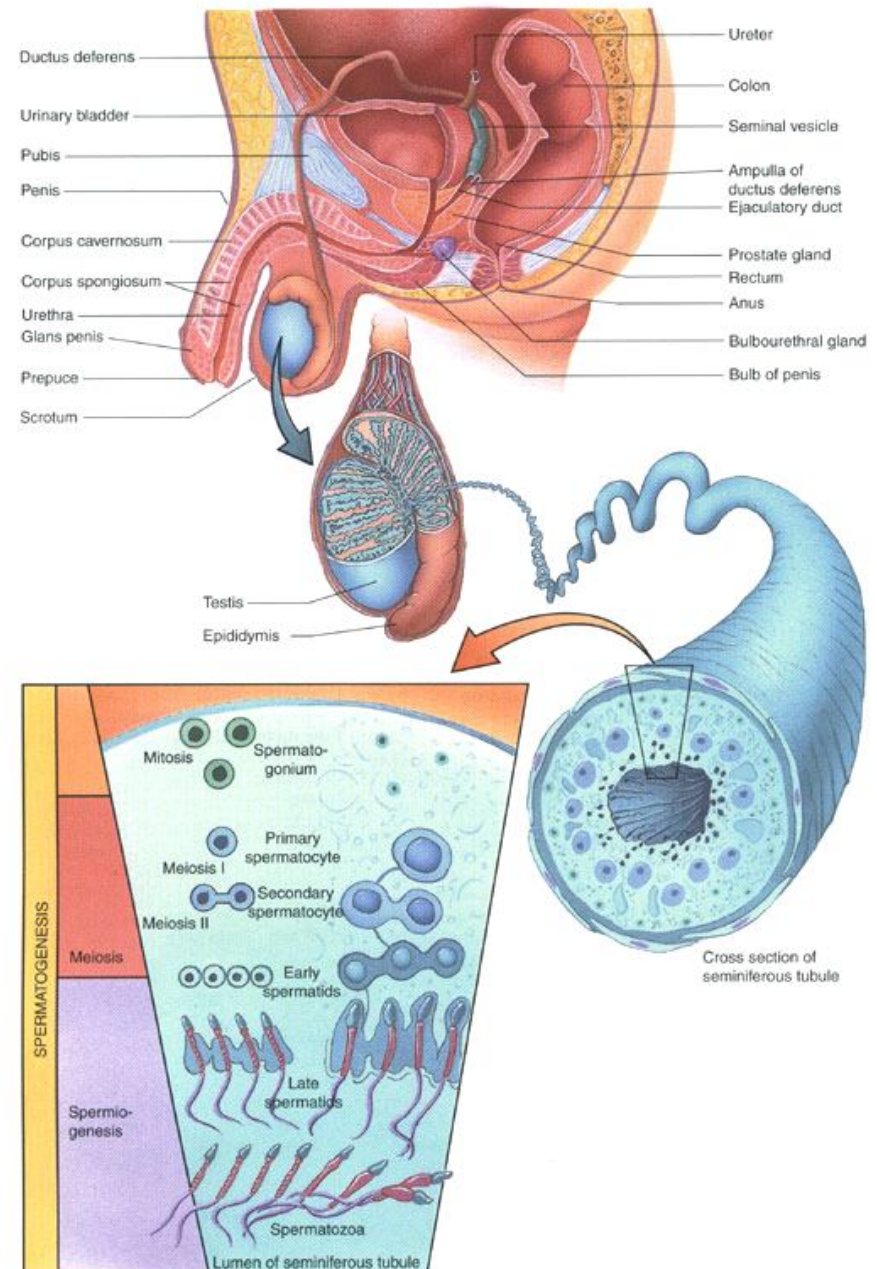
THREE PHASES:

(1) Spermatogonial Phase (Mitosis)

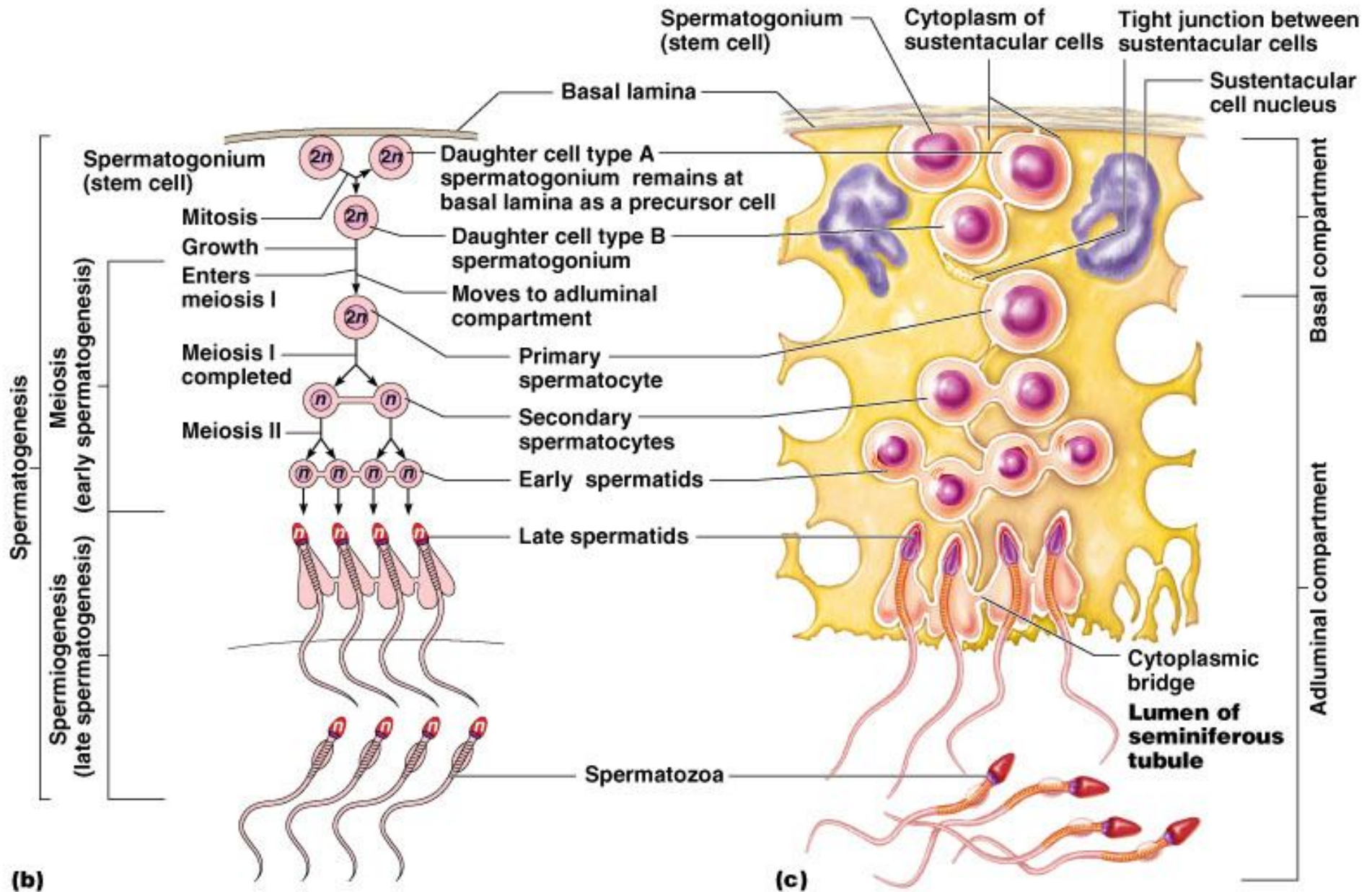
(2) Spermatocyte Phase (Meiosis)

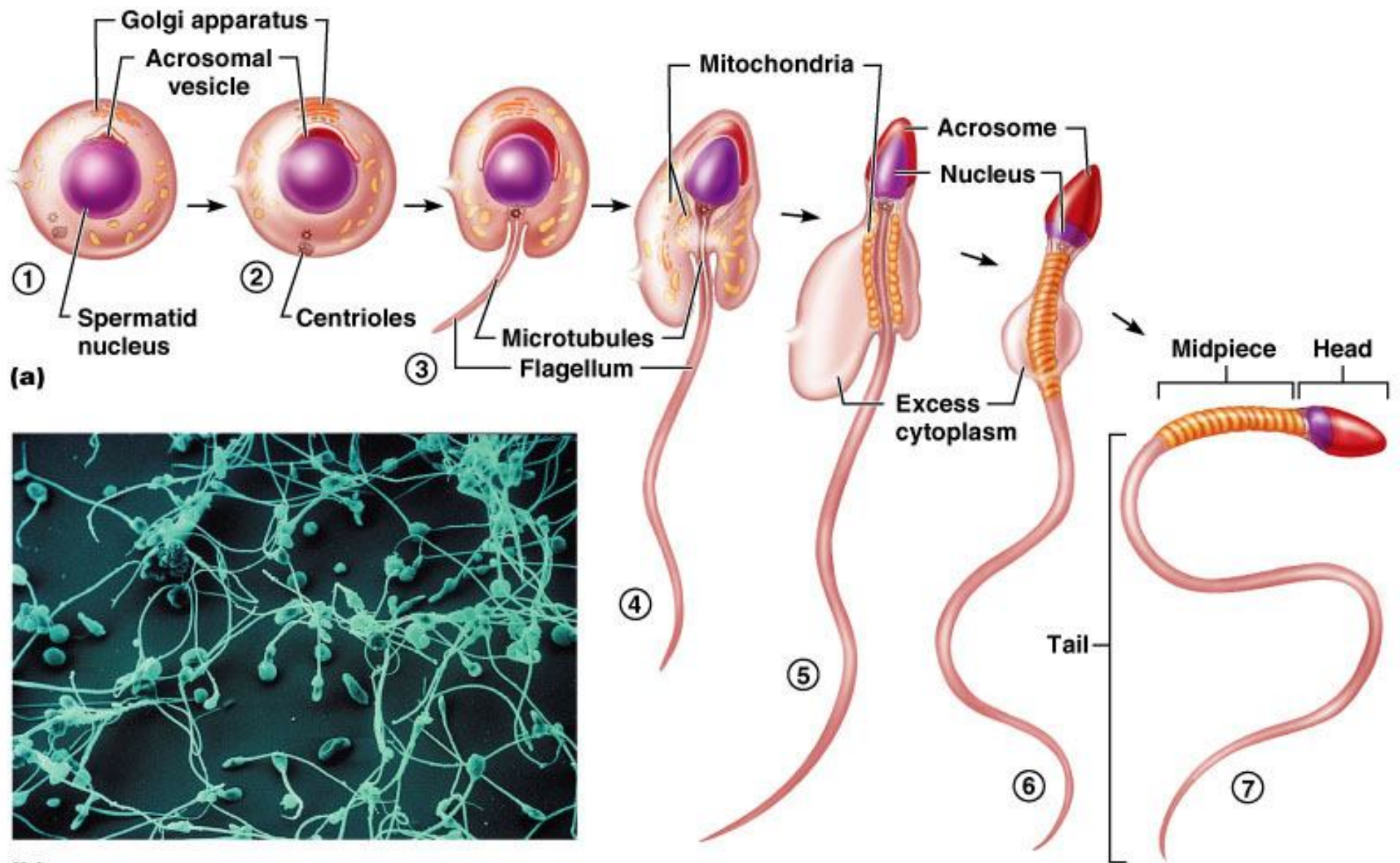
(3) Spermatid Phase (Spermiogenesis)

- *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)



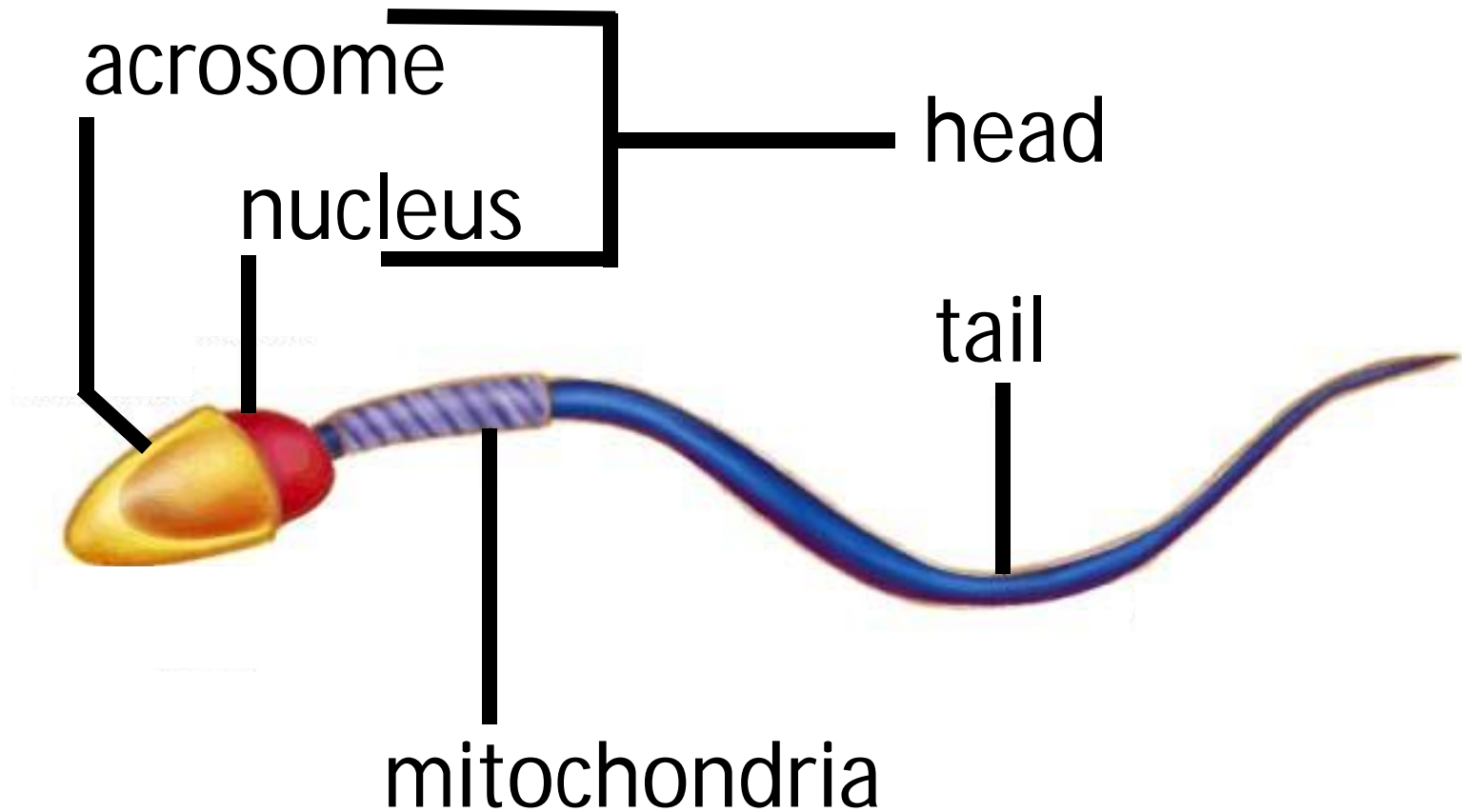
Spermatogenesis



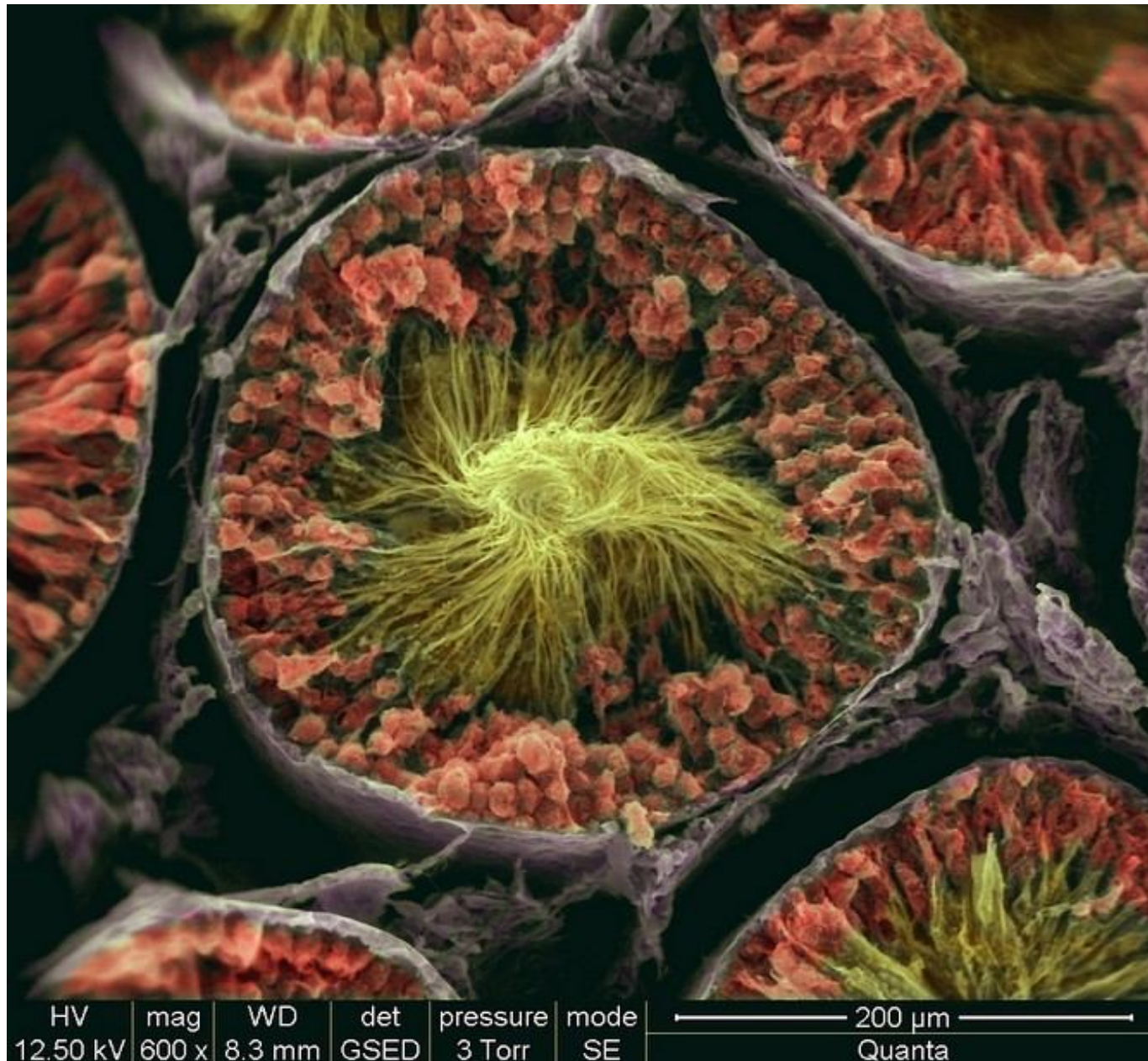


(b)

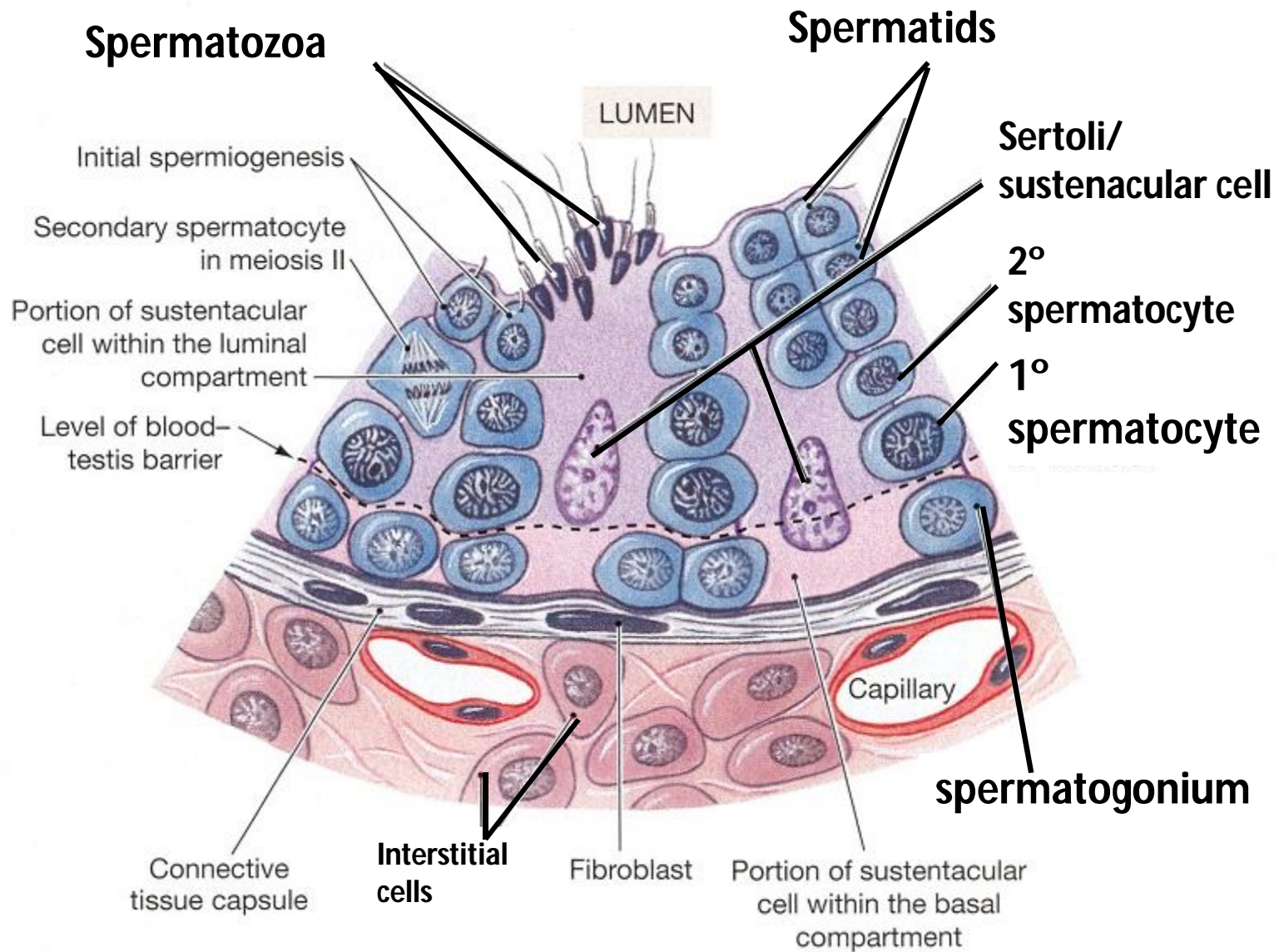
Mature Spermatozoa



Seminiferous Tubules



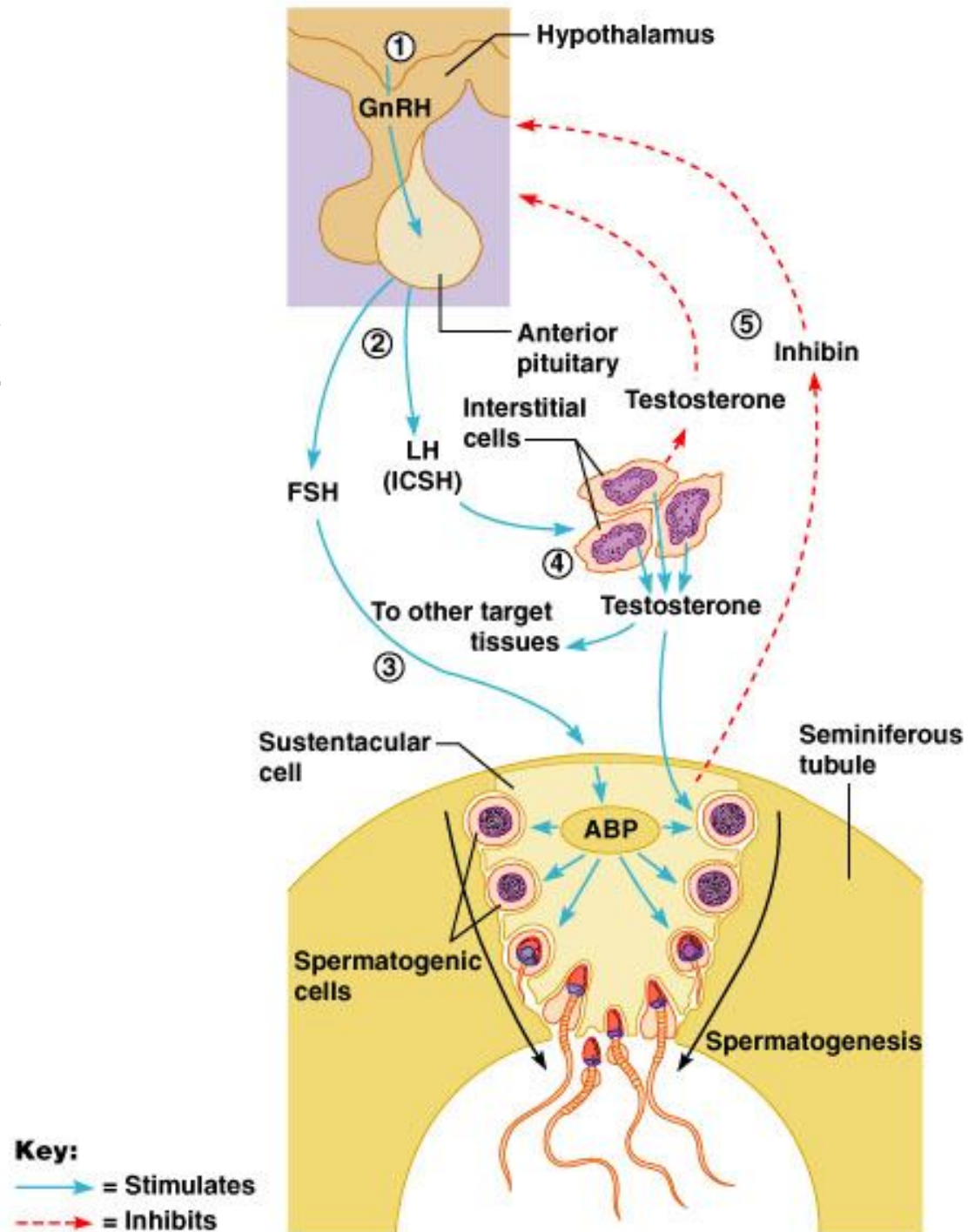
Seminiferous Tubules



Cell Types

- Interstitial Cells (Leydig Cells) produce testosterone
- Sertoli (Sustenacular) nurse cells help to promote spermatogenesis

Sperm Maturation & Development



Hormones Involved in Spermatogenesis

- Gonadotropin Releasing Hormone (GnRH)
- Follicle Stimulating Hormone (FSH)
- Interstitial Cell Stimulating Hormone (ICSH=LH)
- Testosterone
- Inhibin
- ABP

Hormones involved with spermatogenesis

GnRH Gonadotropin Releasing Hormone

- Secreted from the hypothalamus
- Stimulates the secretion of FSH & LH

Hormones involved with spermatogenesis

FSH Follicle Stimulating Hormone

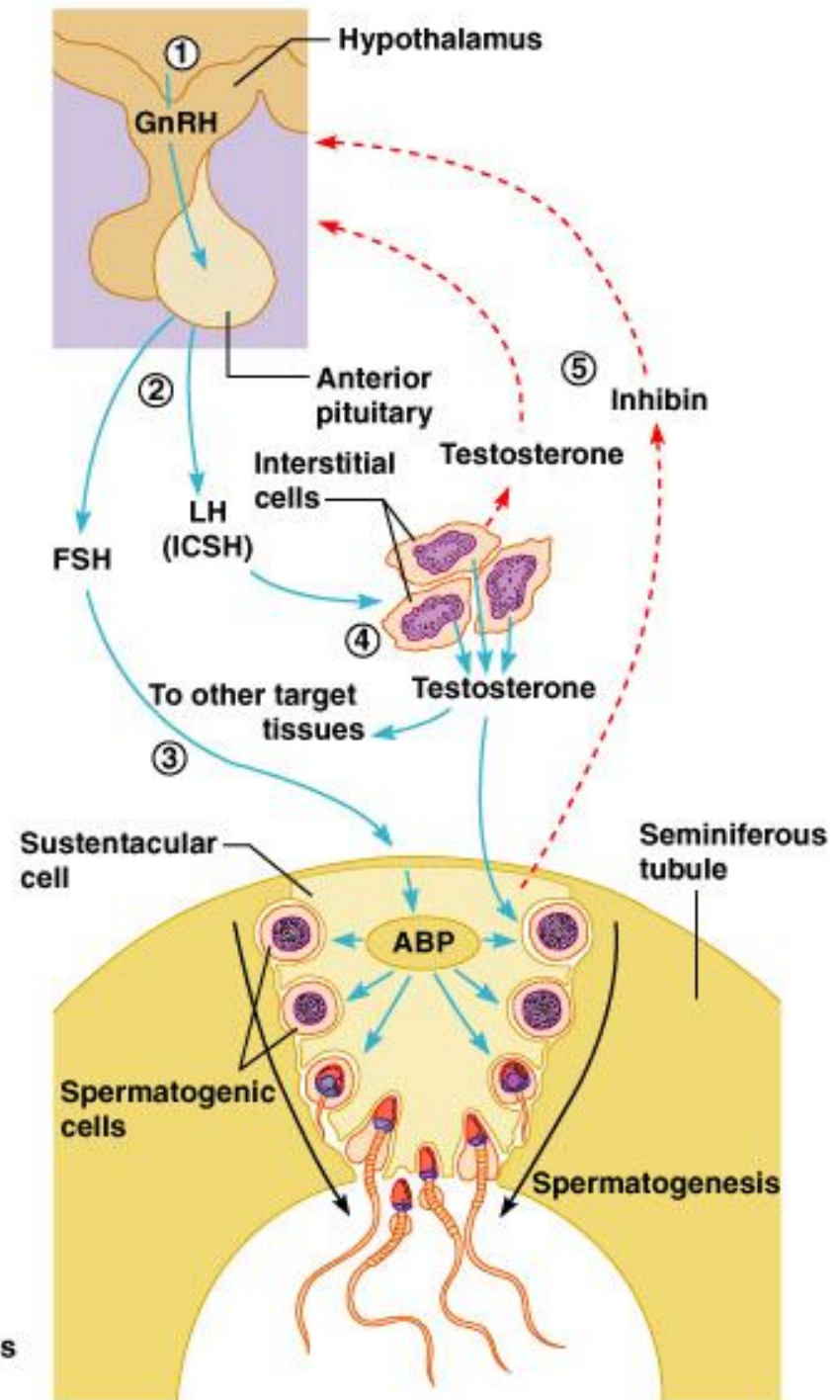
- Stimulates the secretion of ABP by the Sertoli cells (androgen binding protein)

ABP keeps testosterone levels high in the area of spermatogenesis

Sperm Maturation & Development

Key:

—→ = Stimulates
- - -→ = Inhibits



Hormones involved with spermatogenesis

LH (Luteinizing Hormone)

- Binds to the interstitial cells of the testes stimulating testosterone release.

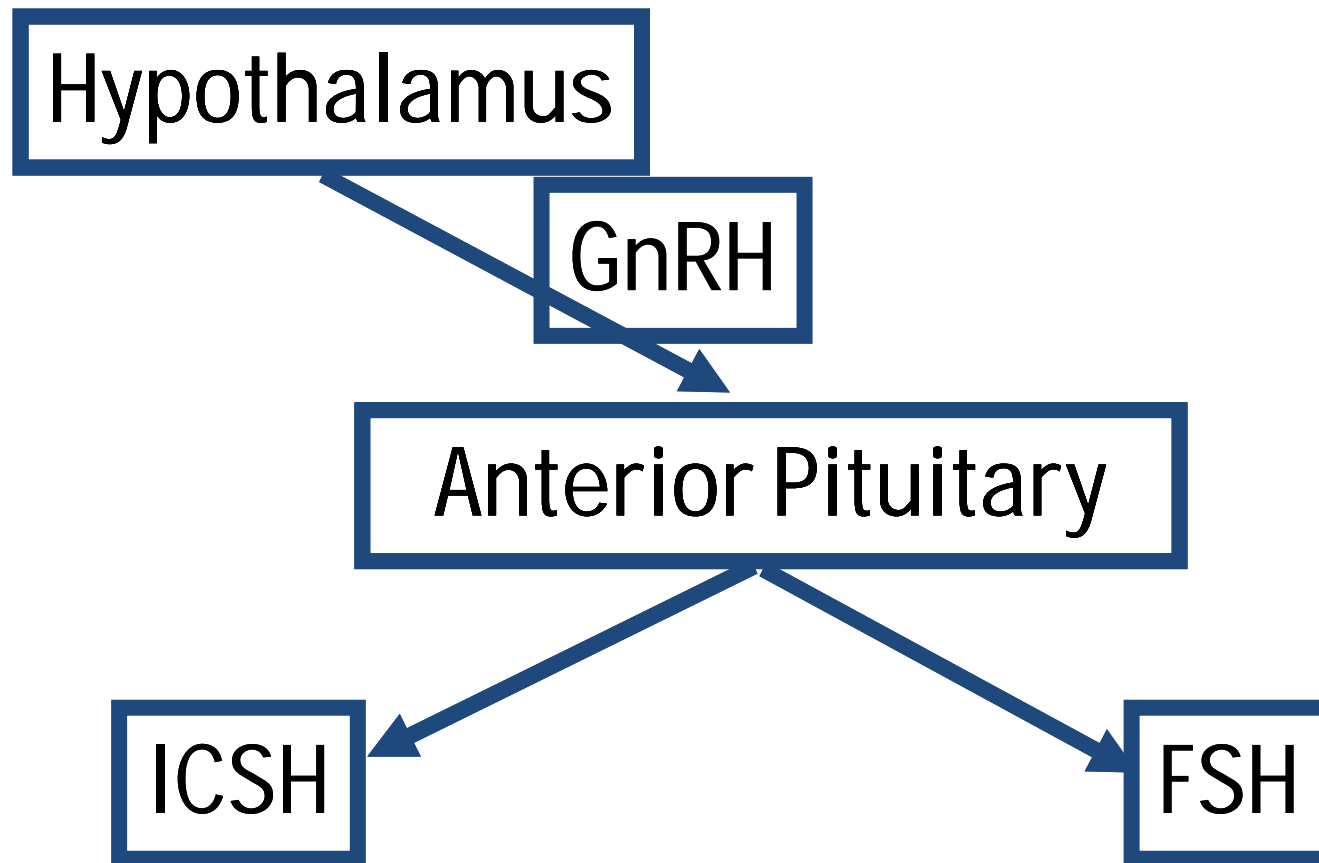
Hormones involved with spermatogenesis

Inhibin is a protein hormone that serves as a barometer of spermatogenesis.

If the rate is too high, it is secreted and inhibits FSH.

If the count is too low (20 million/ml), its secretion drops

Hormonal Control of Spermatogenesis



Hormonal Control of Spermatogenesis

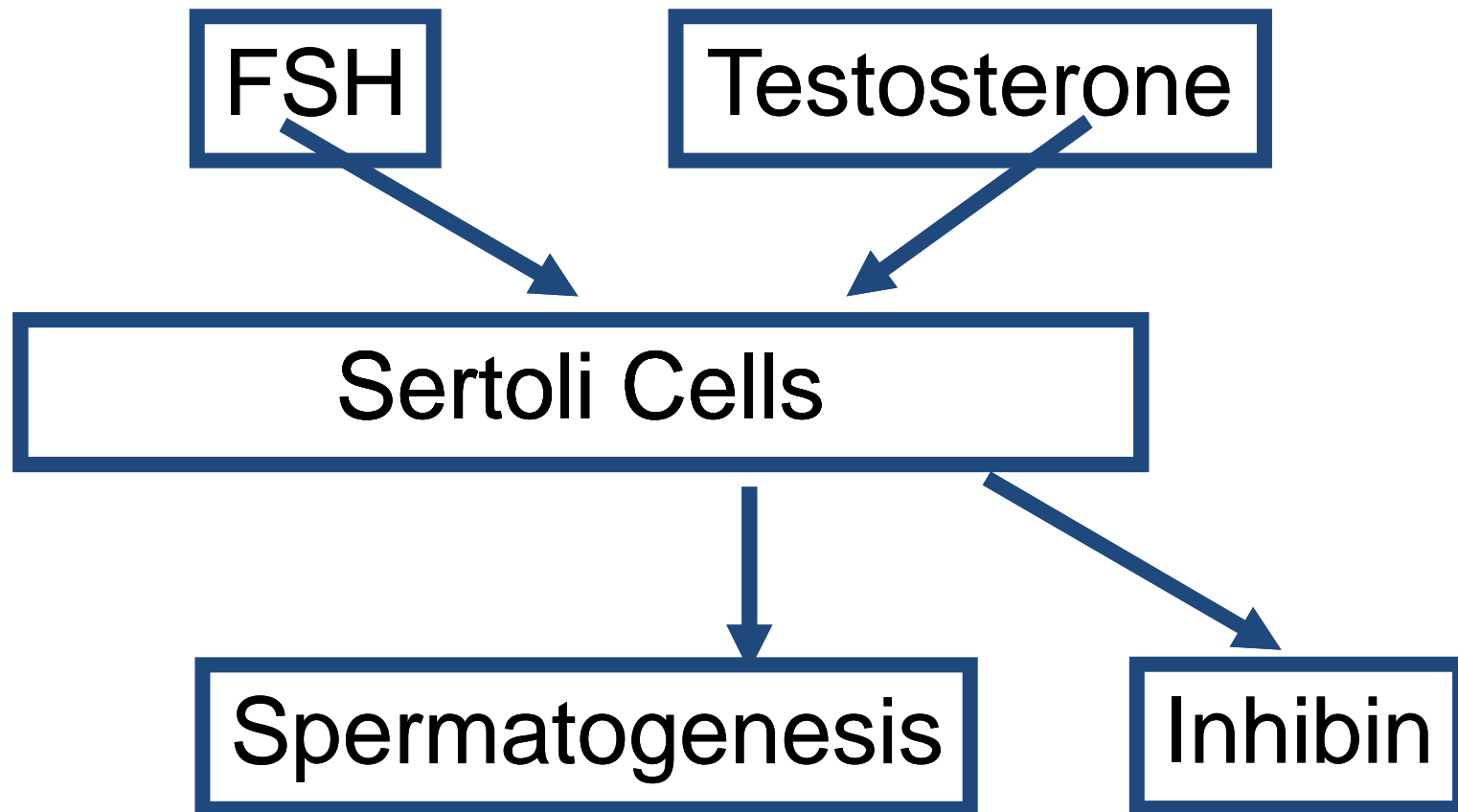
ICSH

```
graph TD; ICSH[ICSH] --> IC[Interstitial Cells]; IC --> T[Testosterone]
```

Interstitial Cells

Testosterone

Hormonal Control of Spermatogenesis



Hormonal Control of Spermatogenesis

Feedback Inhibition

Inhibin

Acts on anterior pituitary
Inhibits FSH production

Testosterone

Acts on hypothalamus
Inhibits GnRH production

Some Other Effects of Testosterone

- muscle and bone growth
- facial and pubic hair growth
- thickening of vocal cords
- growth of pharyngeal cartilage
- hair follicle effects
- stimulates sebaceous glands
- Increased BMR