



Dr. Sumeya

# Gametogenesis

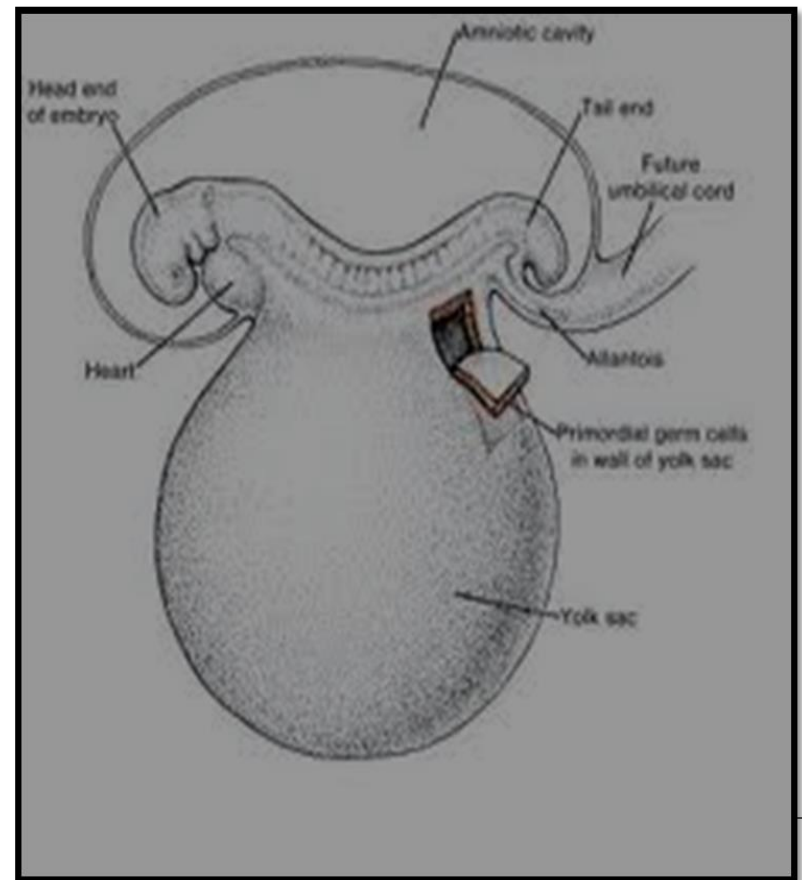
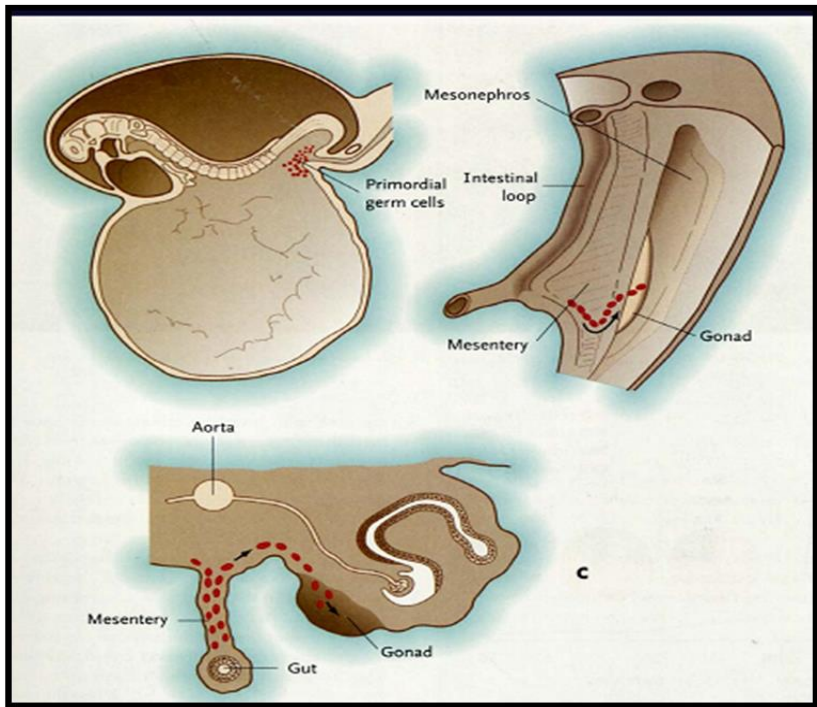
Gametogenesis – \*\*\*  
gamete formation by meiosis.

Spermatogenesis – \*\*\*  
Sperm formation (1N)

Oogenesis – \*\*\*  
Egg formation (1N)

- **Primordial germ cells (PGCs)**

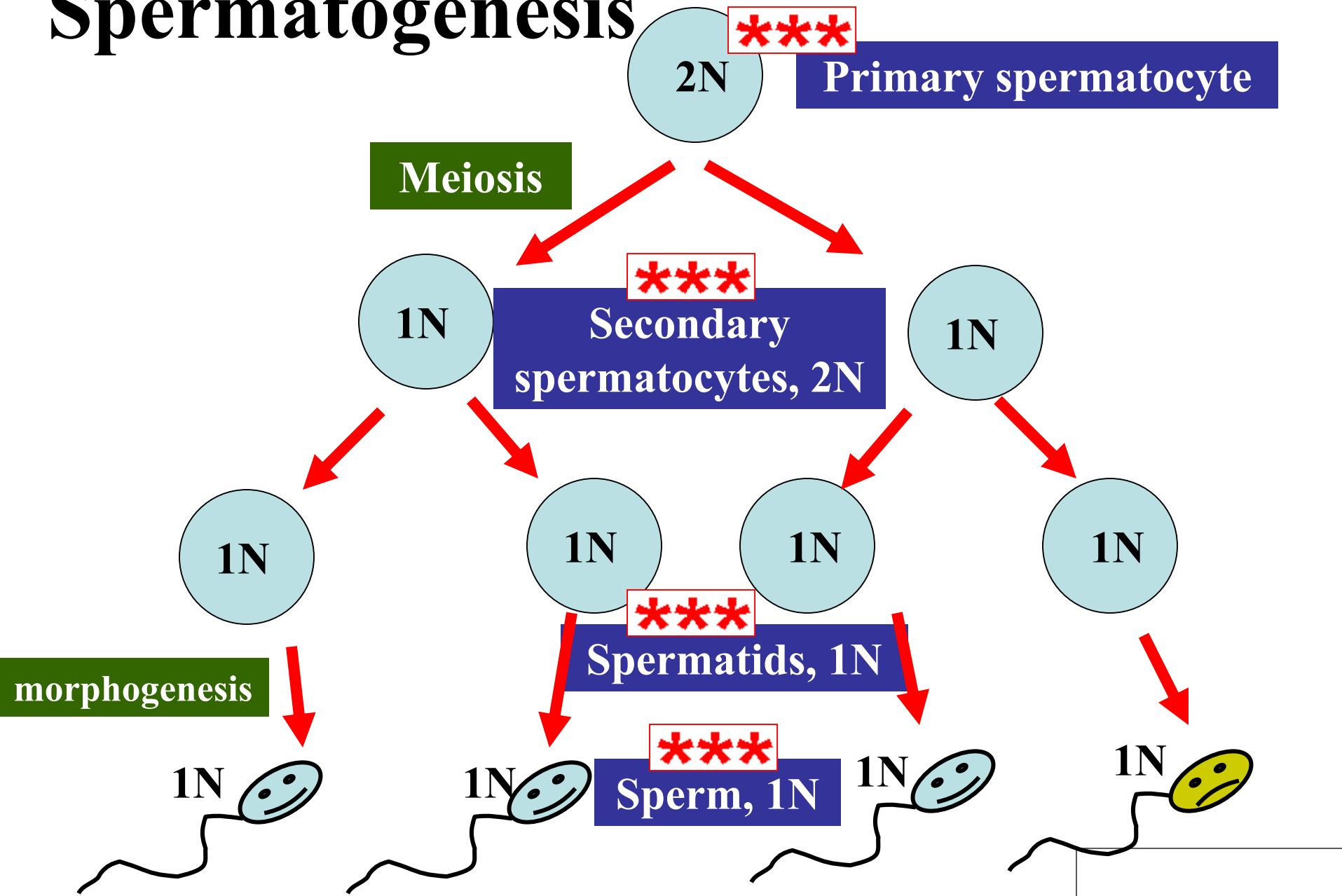
- Gametes are derived from (PGCs) that are formed in epiblast during **2<sup>nd</sup> week** & that move to wall of yolk sac.
- During **4th week**, these cells begin to migrate by amoeboid movement from yolk sac toward developing gonads, where they arrive by **end of 5th week**



# Obgective

- This lecture discuss the steps of sperm formation from primordial germ cells to mature spermatozoa, hormonal control and abnormality of spermatogenesis

# Spermatogenesis



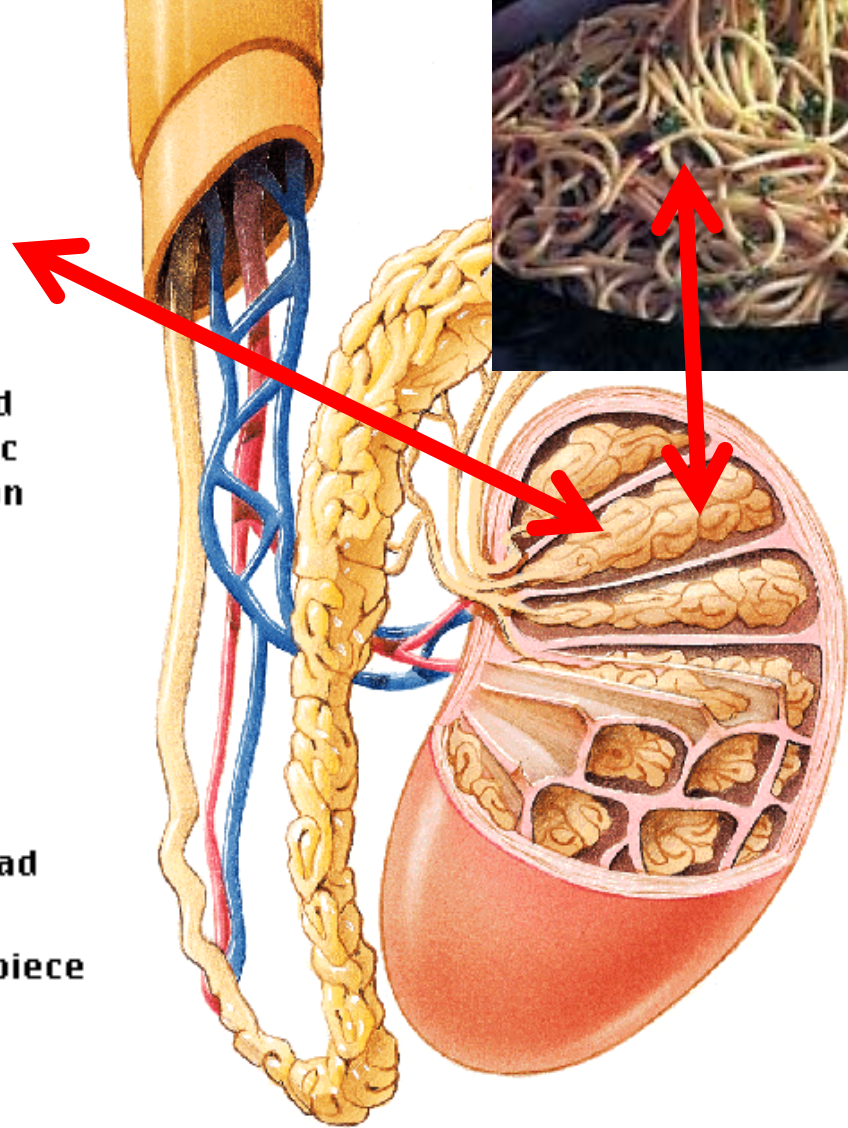
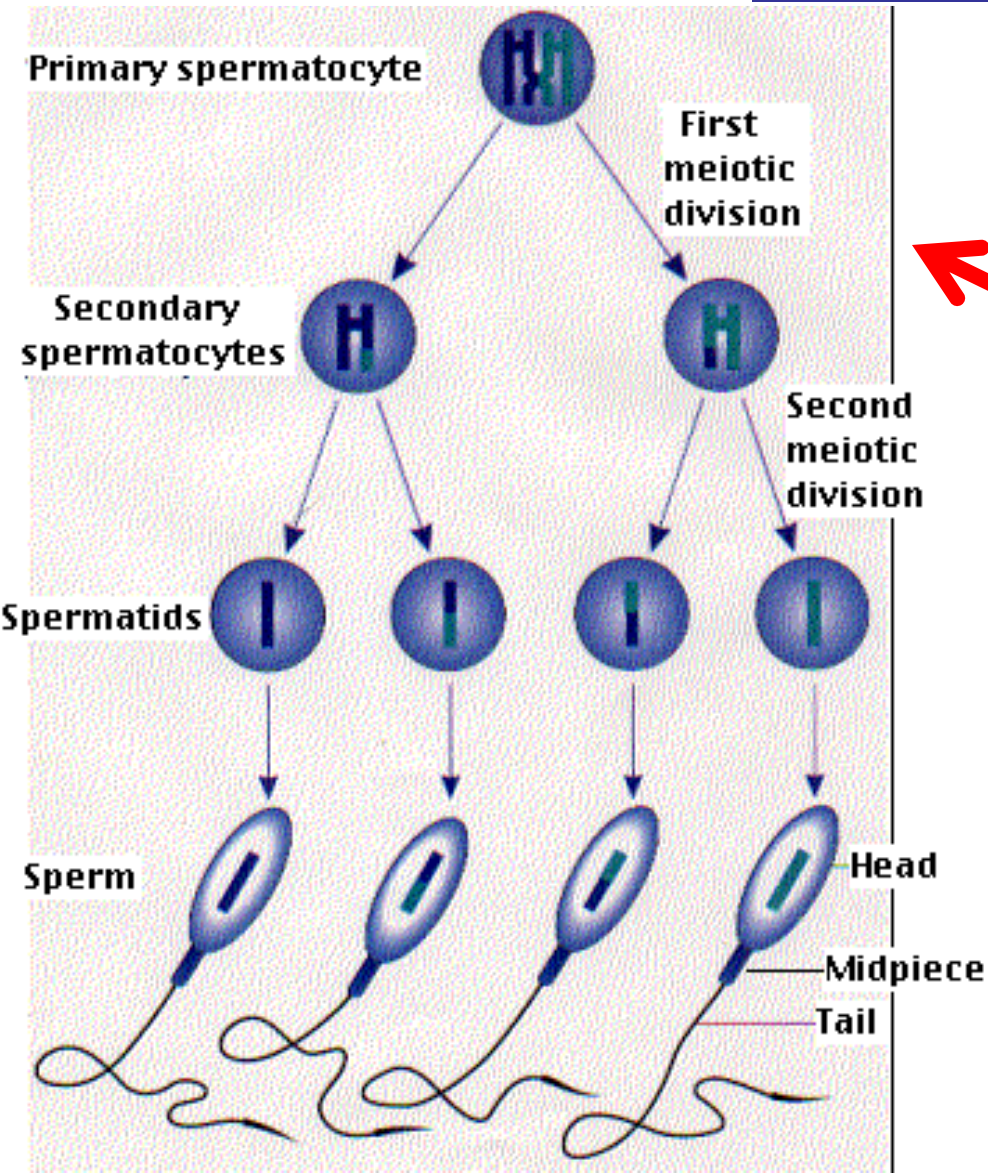
# Spermatogenesis

## *Maturation of Sperm Begins at Puberty*

- **Spermatogenesis**, which begins at puberty, includes all of the events by which **spermatogonia** are transformed into **spermatozoa**.
- It can be divided into 3 phases :
  - a. spermatocytosis
  - b. meiosis
  - C. spermiogenesis
- At birth, germ cells in the male infant can be recognized in the sex cords of the testis as large, pale cells surrounded by supporting cells . Supporting cells, which are derived from the surface epithelium of the testis become **sustentacular cells**, or **Sertoli cells**

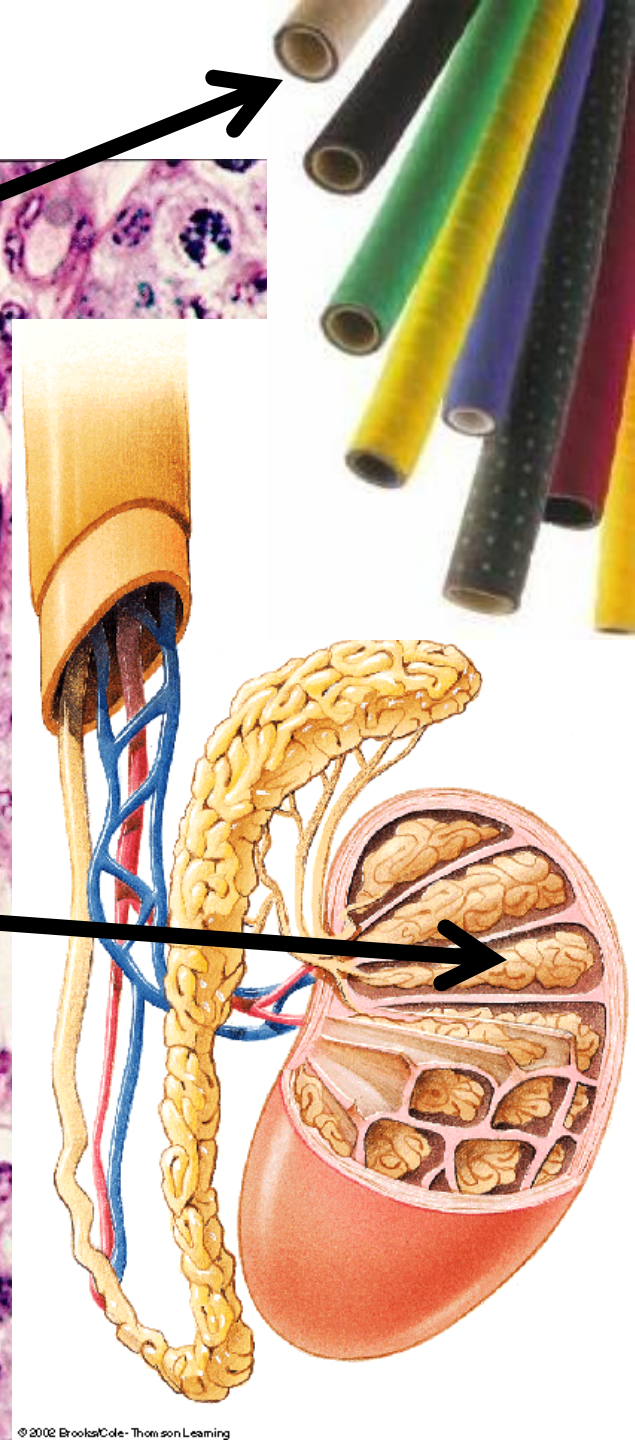


# Spermatogenesis occurs in testes

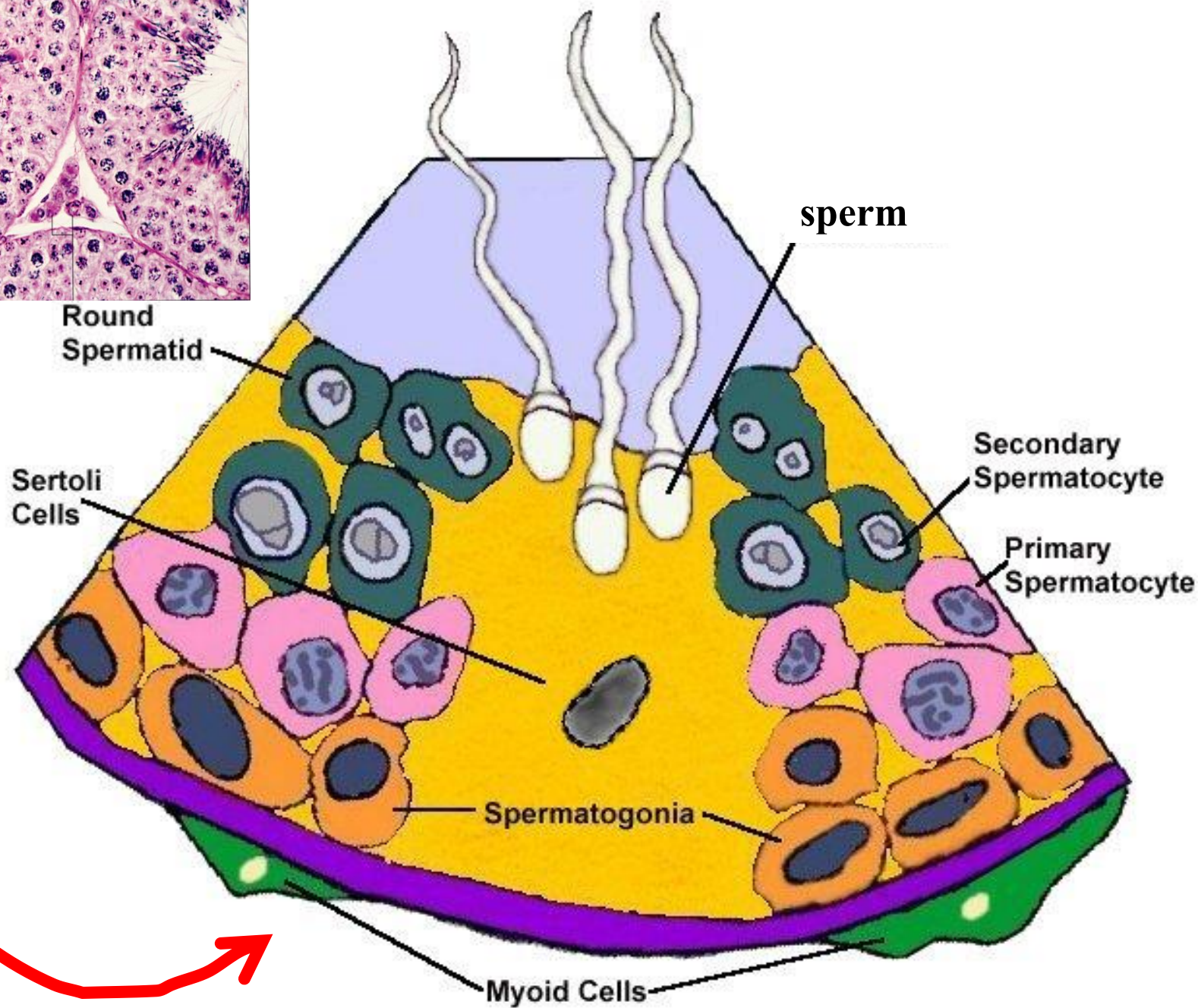
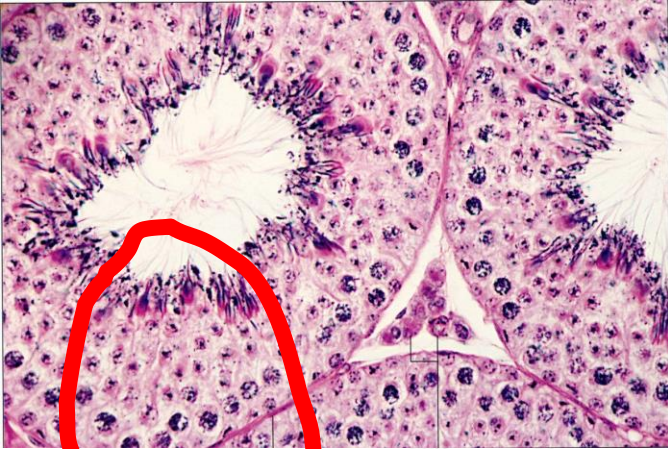




**Cross section  
through testes' tubes**

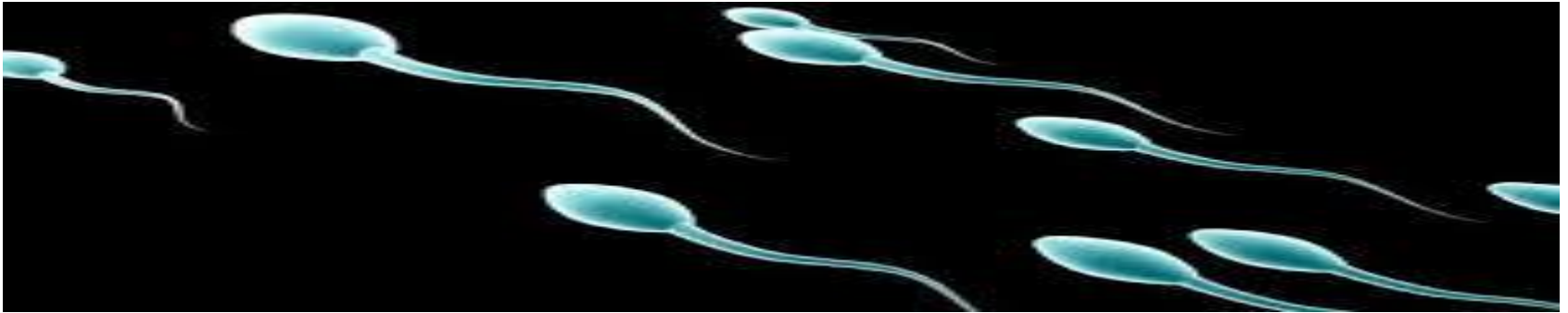






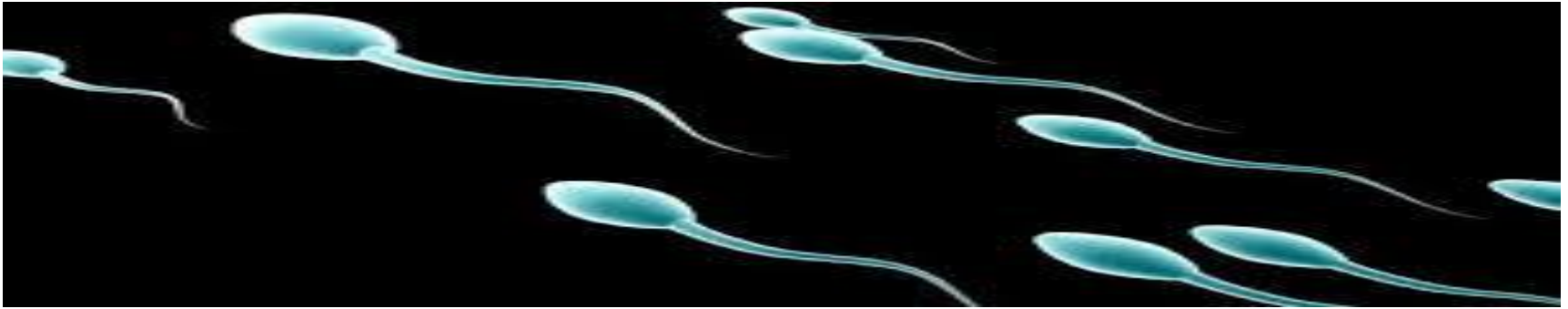


- Shortly before puberty, the sex cords acquire a lumen and become the **seminiferous tubules**. At about the same time, PGCs give rise to spermatogonial stem cells. At regular intervals, cells emerge from this stem cell population to form **type A spermatogonia**, and their production marks the initiation of spermatogenesis.
- Type A cells undergo a limited number of mitotic divisions to form clones of cells. The last cell division produces **type B spermatogonia**, which then divide to form **primary spermatocytes**



- spermatocytes then enter a prolonged prophase (22 days) followed by rapid completion of meiosis I and formation of **secondary spermatocytes**. During the second meiotic division, these cells immediately begin to form haploid **spermatids** .

Throughout this series of events, from the time type A cells leave the stem cell population to formation of spermatids, cytokinesis is incomplete, so that successive cell generations are joined by cytoplasmic bridges.



- Furthermore, spermatogonia and spermatids remain embedded in deep recesses of Sertoli cells throughout their development). In this manner, Sertoli cells support and protect the germ cells, participate in their nutrition, and assist in the release of mature spermatozoa.
- Spermatogenesis is regulated by LH production by the pituitary gland. LH binds to receptors on Leydig cells and stimulates testosterone production, which in turn binds to Sertoli cells to promote spermatogenesis. **Follicle-stimulating hormone (FSH)** is also essential because its binding to Sertoli cells stimulates testicular fluid production and synthesis of intracellular androgen receptor proteins.



**Primary  
Spermatocyte**

2N

**Secondary  
Spermatocyte**

1N

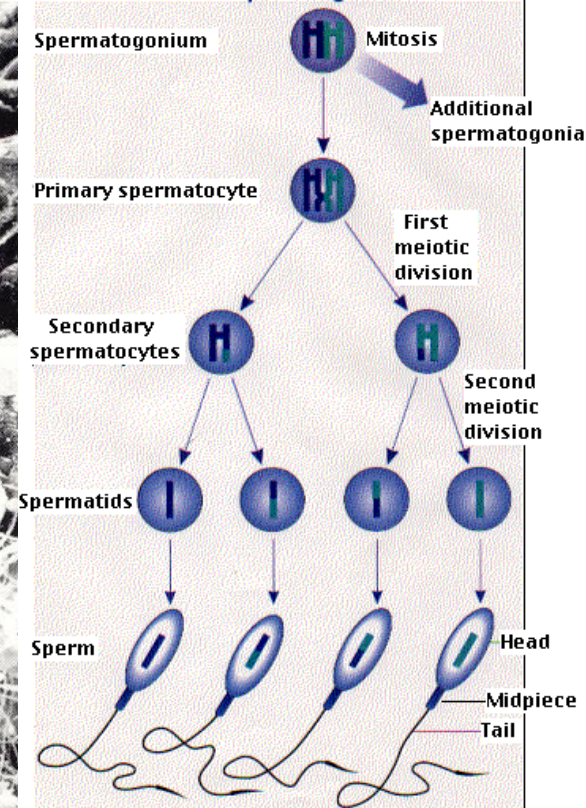
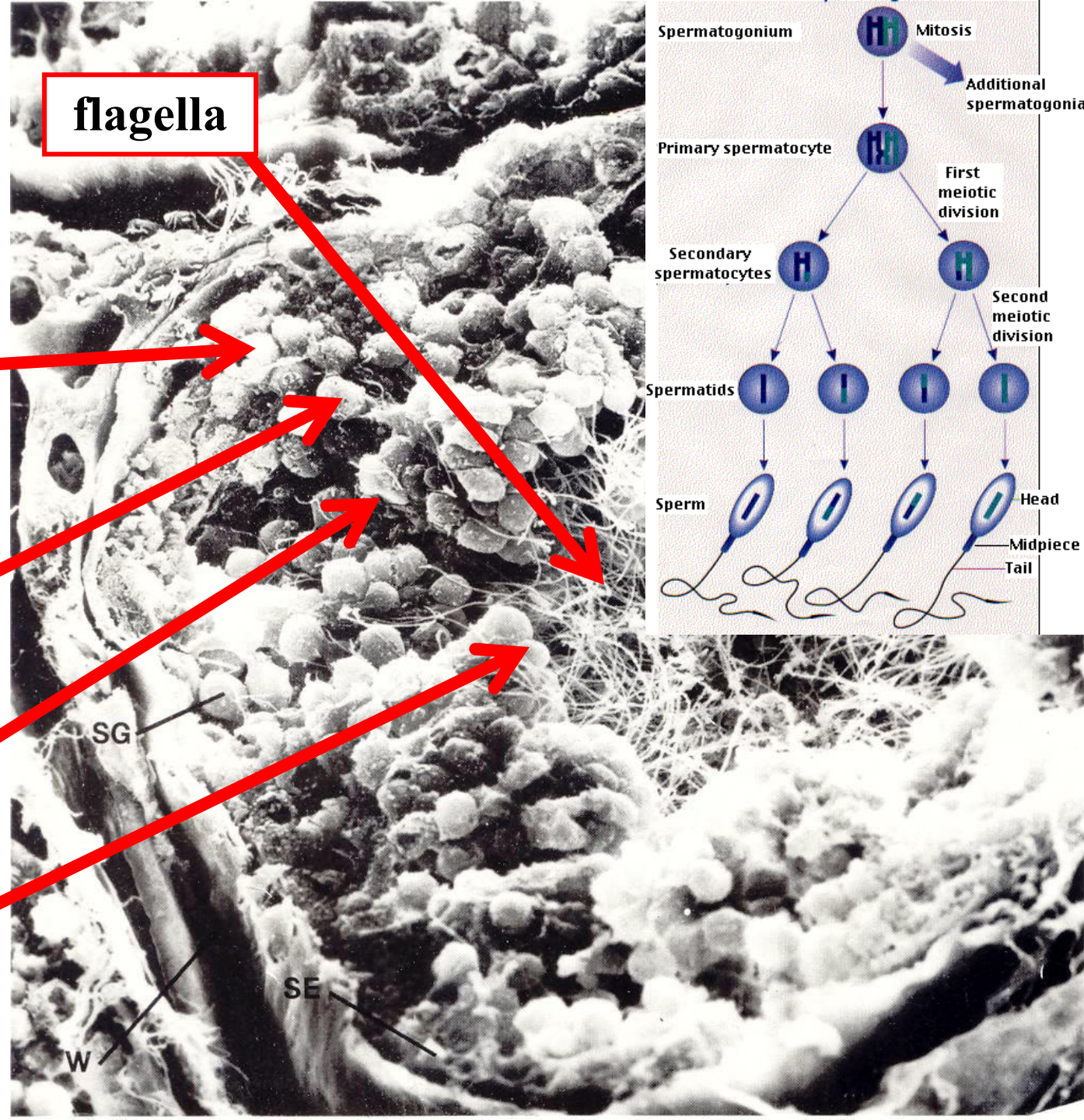
**Spermatid**

1N

**Sperm**

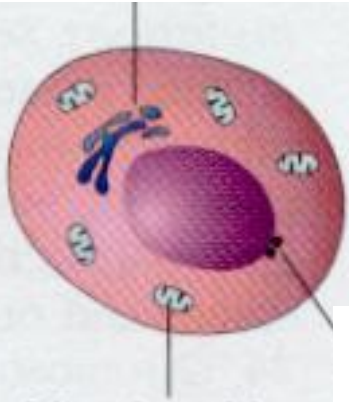
1N

**flagella**



# Sperm morphogenesis (change of shape)

Golgi complex



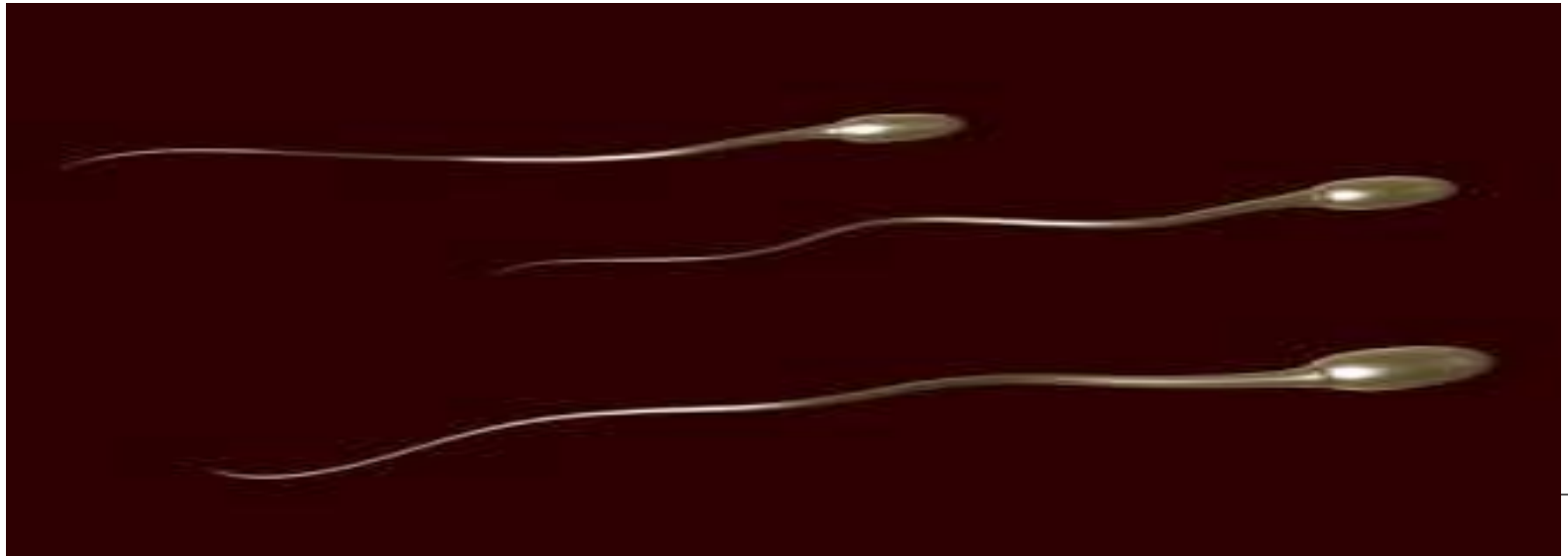
nucleus

mitochondrion

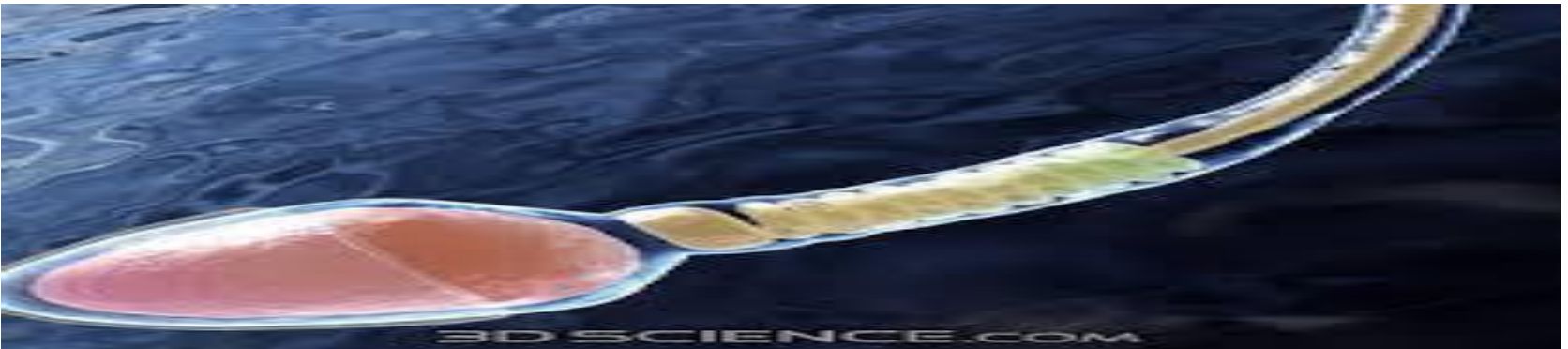
# *Spermiogenesis*

- The series of changes resulting in the transformation of spermatids into spermatozoa is **spermiogenesis**. These changes include
  - (1) formation of the **acrosome**, which covers half of the nuclear surface and contains enzymes to assist in penetration of the egg and its surrounding layers during fertilization
  - (2) condensation of the nucleus;
  - (3) formation of neck, middle piece, and tail
  - (4) shedding of most of the cytoplasm as residual bodies that are phagocytized by Sertoli cells.
- In humans, the time required for a spermatogonium to develop into a mature spermatozoon is approximately 74 days, and approximately 300 million sperm cells are produced daily.

- When fully formed, spermatozoa enter the lumen of seminiferous tubules. From there, they are pushed toward the epididymis by contractile elements in the wall of the seminiferous tubules. Although initially only slightly motile, spermatozoa obtain full motility in the epididymis.







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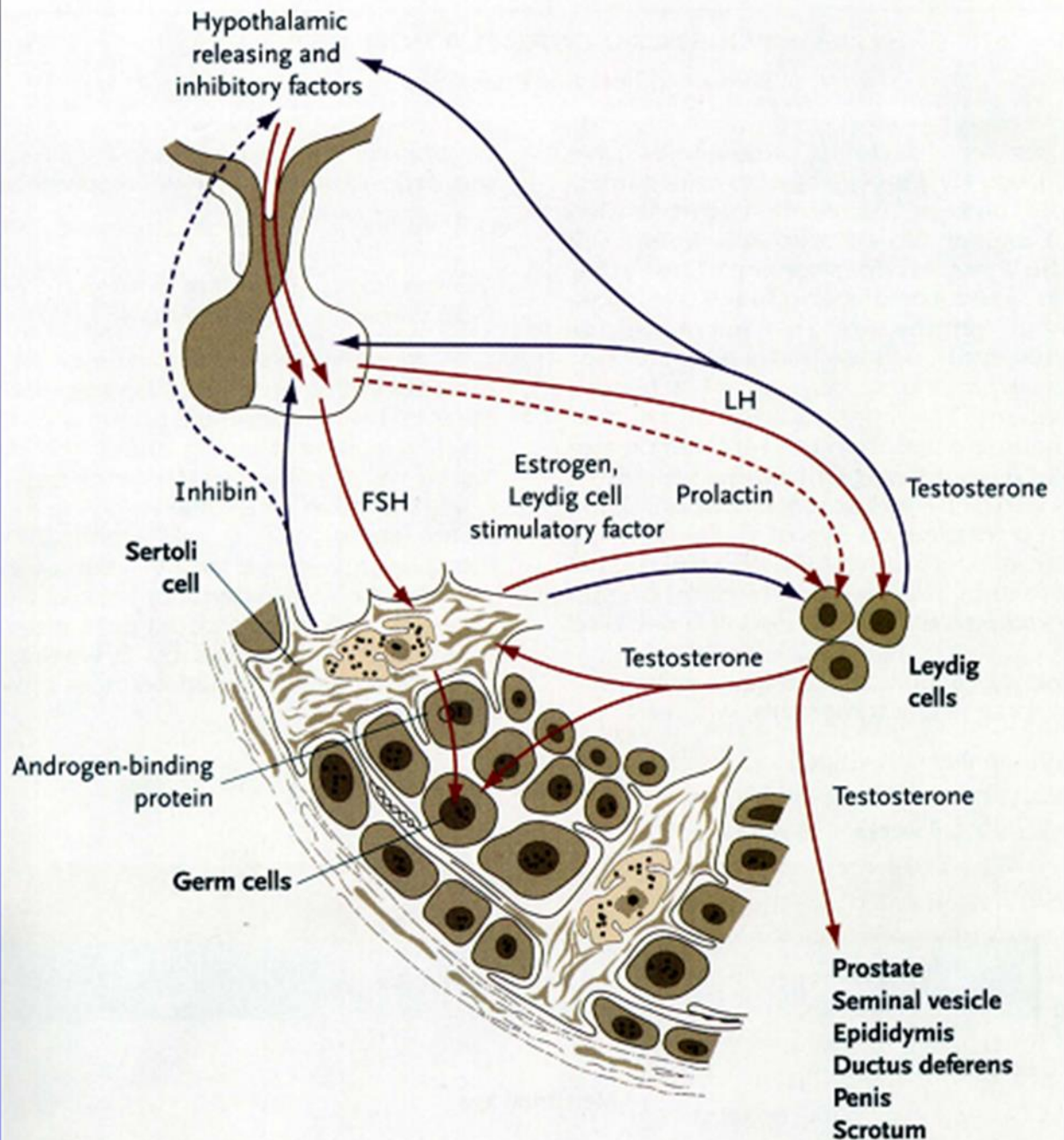
**Follicle-stimulating hormone (FSH)** is also essential because its binding to Sertoli cells stimulates testicular fluid production and synthesis of intracellular androgen receptor proteins.

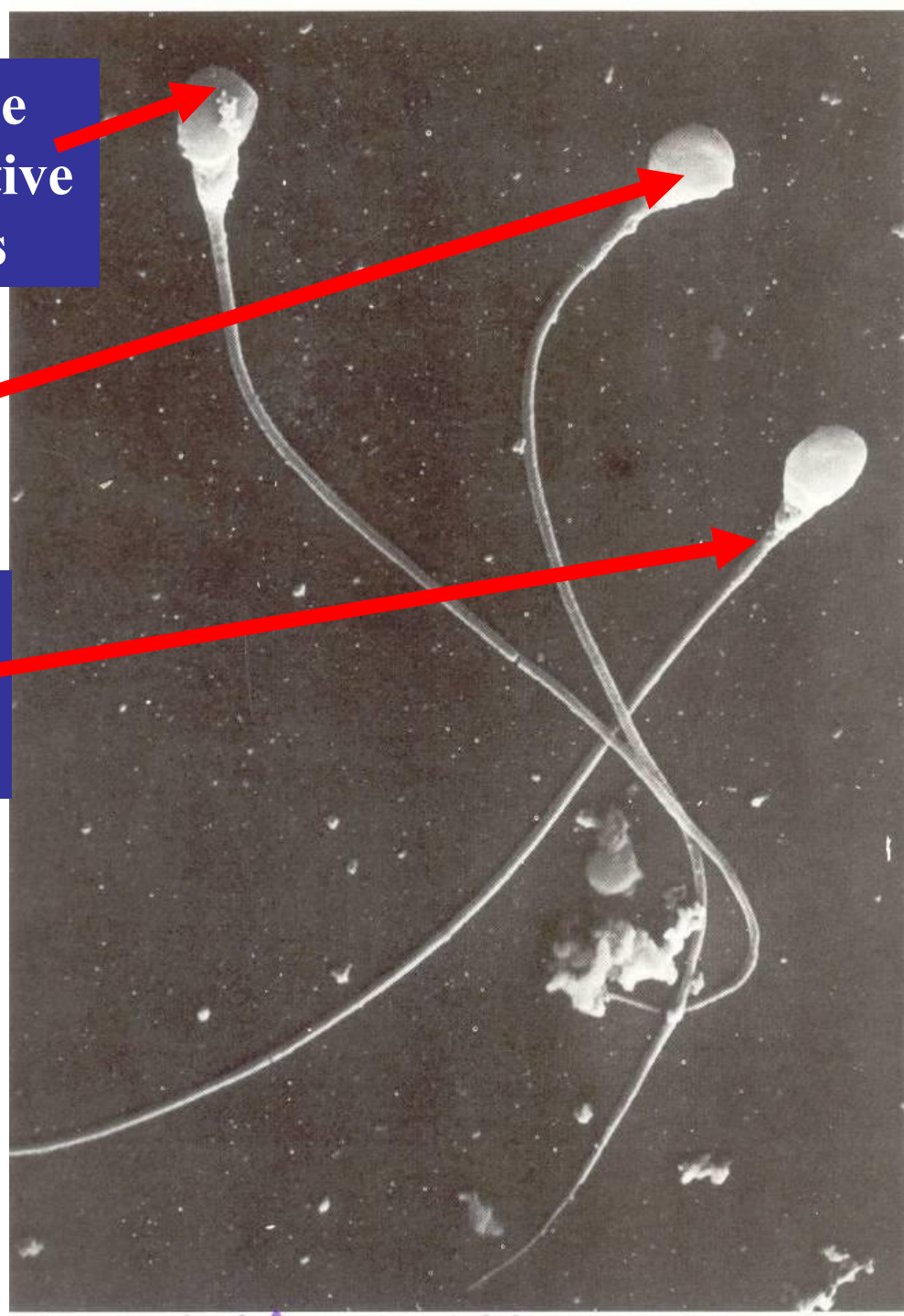
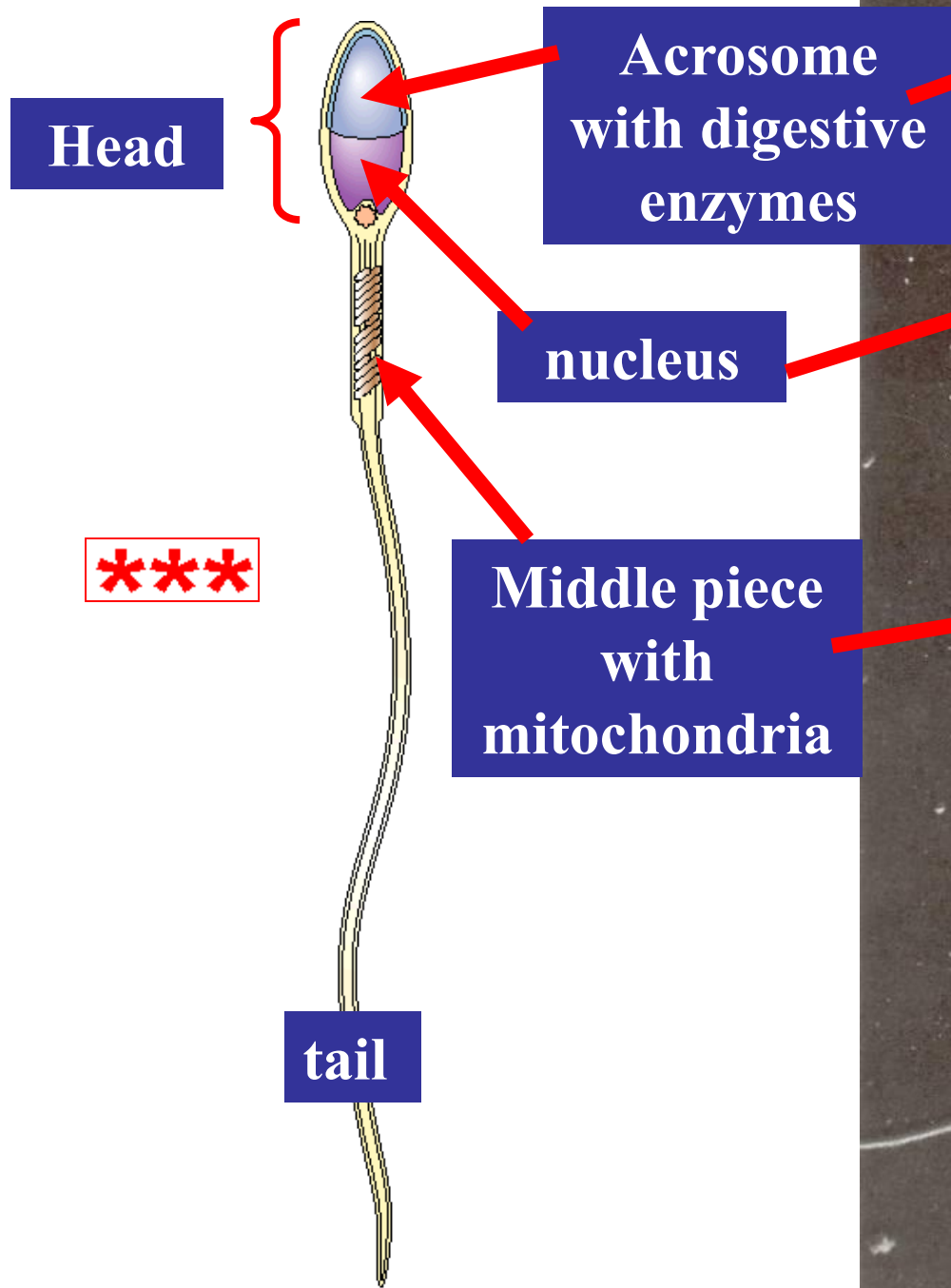


# Hormones Influence Spermatogenesis

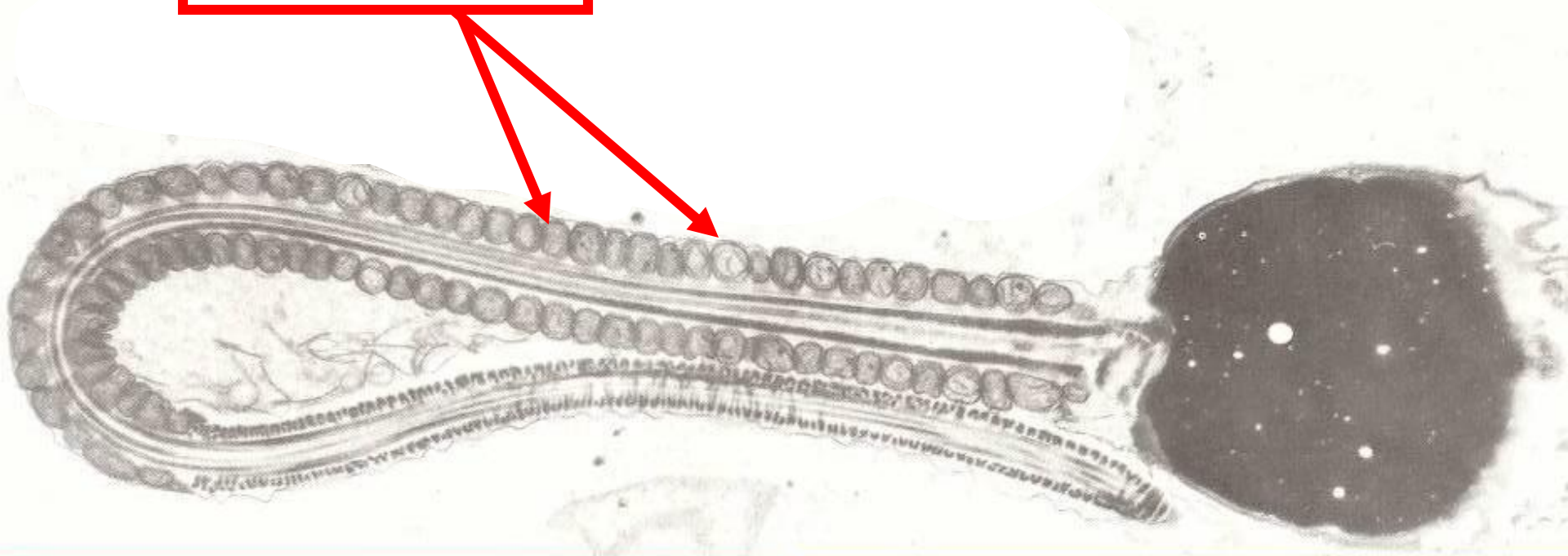


From BM Carlson, 1999





# Mitochondria







THANK YOU