

# ANDROLOGY

## LECTURE-2



A group of people, including a child and an adult, are gathered around a table, looking at a document together. The image is overlaid with a semi-transparent teal filter. The text 'PUBERTY AND SEXUAL MATURITY' is centered in white, serif font.

# PUBERTY AND SEXUAL MATURITY

# PUBERTY

Puberty:

The age/time when genital organs become functional, and reproduction becomes possible.

Characteristics of puberty in males:

- Secondary sexual characters
- Sexual desire
- Presence of viable spermatozoa in semen

# PUBERTY

## Puberty in males

- 4-6 months : Primary spermatocytes in seminiferous tubules
- 5-7 months : Seminal secretions released by accessory glands
- 6-7 months : Spermatids appear
- 7-9 months : Spermatozoa in semen
- Growth acceleration (6-10 months)
  - GnRH
  - LH
  - Onset of spermatogenesis
  - Early signs of puberty

# SEXUAL MATURITY

Sexual maturity –

Attainment of full reproductive capacity

- Increased ejaculate volume.
- Higher motility and concentration of spermatozoa.
- This happens 6-9 months after puberty in bulls.

**Gap between puberty and sexual maturity:**

Immature males should not be used for breeding until after 6-12 months of reaching puberty

# FACTORS AFFECTING PUBERTY/SEXUAL MATURITY

1. Poor nutrition
2. Insufficient weight gain
3. Gonadal growth
  - Scrotal circumference
  - Sex desire & sperm production
  - Diameter of seminiferous tubules
4. Genetic factors
  - Larger breeds – early onset
  - Buffalo male calves mature earlier than cattle bulls
  - Cross breeding – acceleration of puberty onset

# FACTORS AFFECTING PUBERTY/SEXUAL MATURITY

5. Tropical regions – delayed puberty

6. Seasonal influence:

- Winter – favours sexual maturity in young bulls used for AI
- Hot seasons – delay puberty – esp in sheep and buffaloes

7. Presence of opposite sex

# AGE AT PUBERTY FOR DIFFERENT SPECIES

Species	Age at Puberty	Range
<b>Bull</b>	9-12 months	6-18 months
<b>Stallion</b>	18 months	12-24 months
<b>Boar</b>	5-7 months	4-8 months
<b>Ram/Buck</b>	7-8 months	4-12 months
<b>Dog</b>	7-10 months	5-12 months
<b>Cat</b>	8-10 months	6-15 months





# ENDOCRINOLOGY OF MALE REPRODUCTION

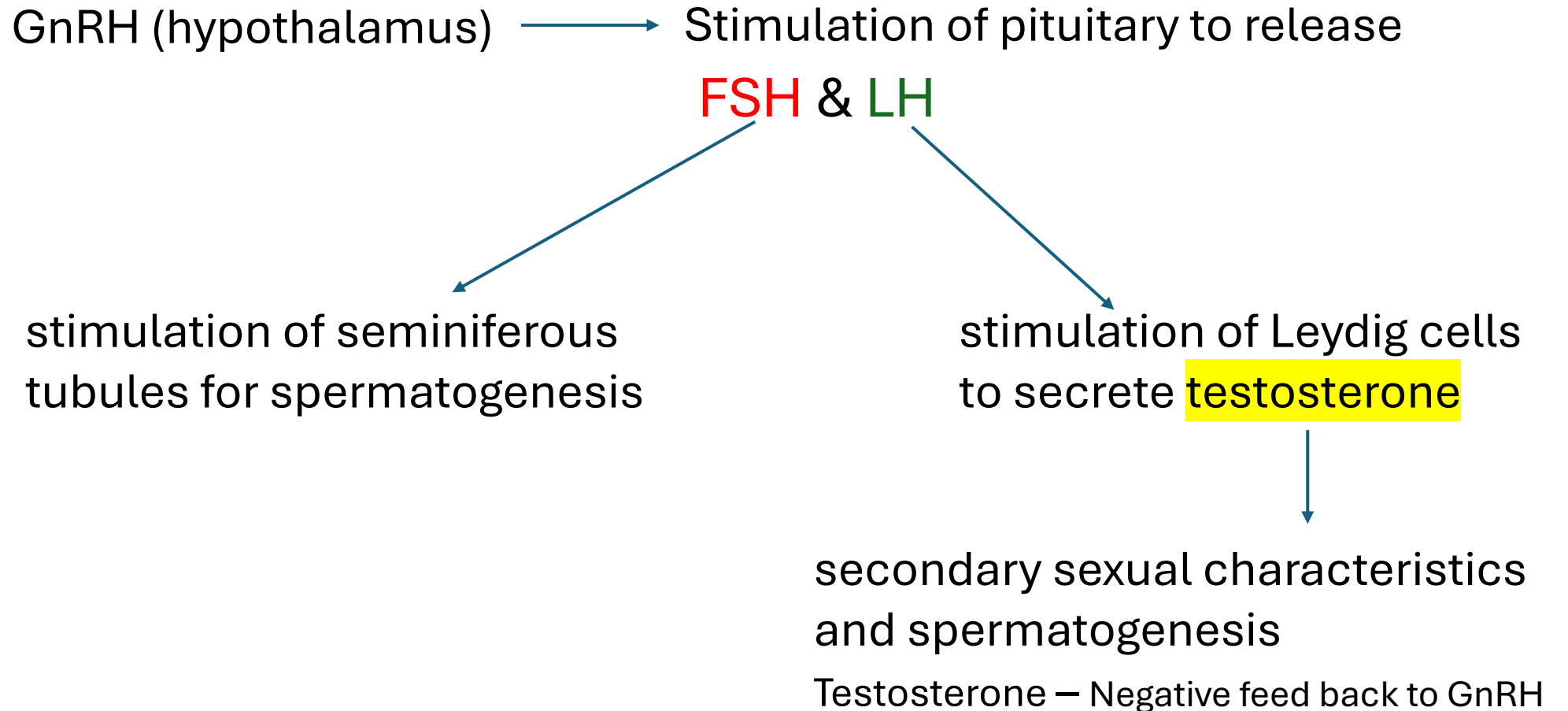
# GERM CELL DEVELOPMENT

Primordial germ cells – spermatogonia in primitive testes

## Testicular development –

- Development of medullary cords
- Androgen secretion by primitive testes
- Development of mesonephric ducts, male external genitalia
- Degeneration of paramesonephric ducts
- Masculinisation of the foetus

# HORMONE REGULATION BEFORE PUBERTY



# HORMONE REGULATION BEFORE PUBERTY

## **Sertoli cells:**

FSH -> stimulates Sertoli cells to produce Androgen binding protein (ABP)

- *ABP carries testosterone to epididymis*
- *Essential for sperm maturation and storage*

## **Biosynthesis of testosterone:**

Acetate → Cholesterol → Pregnenolone → Progesterone → Androstenedione → Testosterone.

- Testosterone is bound to steroid-binding globulin in the bloodstream.
- 1% free testosterone enters prostate gland, testosterone is converted to dihydrotestosterone (DHT) by the enzyme 5-alpha reductase, which then binds to androgen receptors, influencing growth and function of the prostate.

# HORMONE REGULATION BEFORE PUBERTY

## ***Effect of Excess Androgens:***

- Sertoli cell tumours in dogs – high levels of estrogens – feminization and testicular atrophy.
- Masculinization in females.

# SPERMATOGENESIS

## ***Formation of spermatozoa from spermatogonia in seminiferous tubules of testes***

### **Phases:**

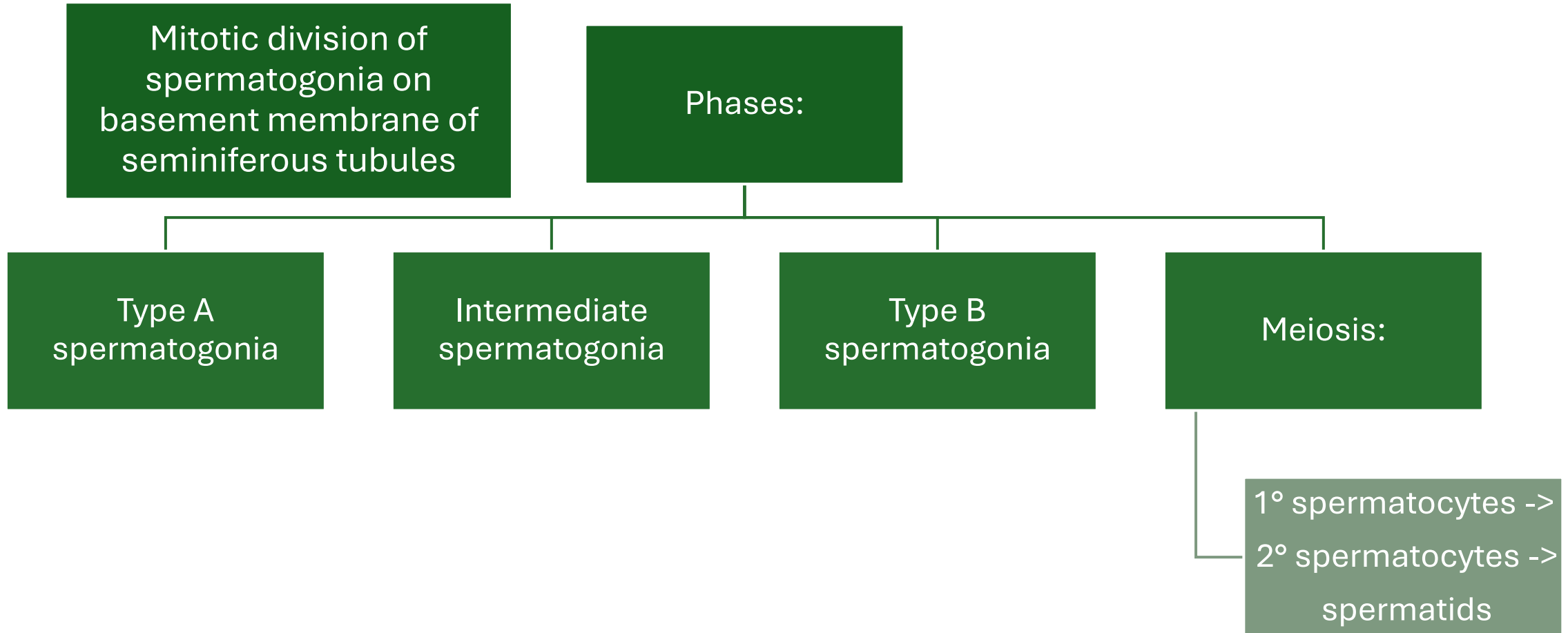
1. Spermatocytogenesis: Proliferation of spermatogonia via mitosis and meiosis to form spermatids.
2. Spermiogenesis: Differentiation of spermatids into spermatozoa (morphological changes).

# TYPES OF SPERMATOGONIA:

**1.Type A Spermatogonia:** These cells maintain the stem cell population through mitotic division. They can either replicate themselves or differentiate into Type B spermatogonia.

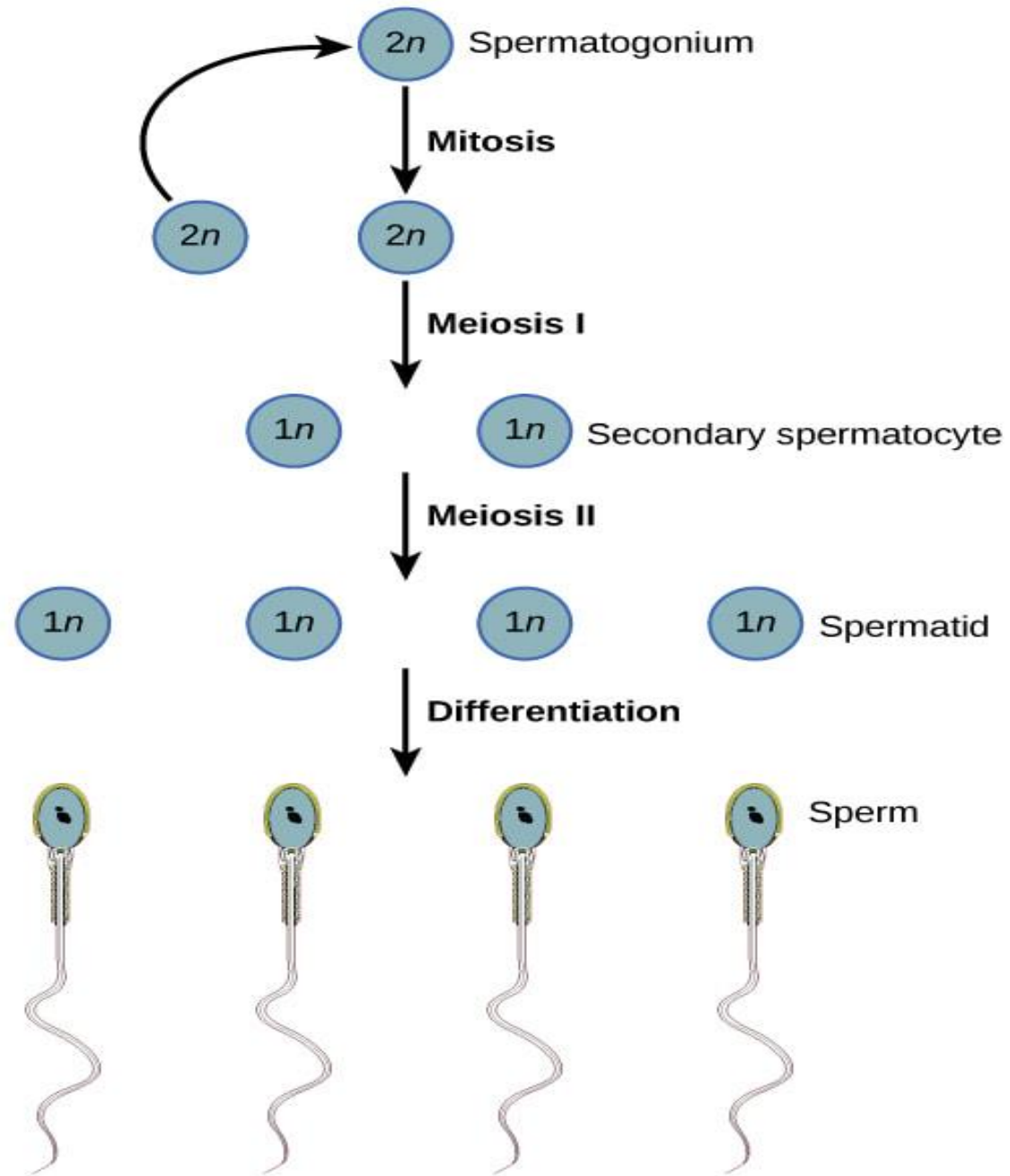
**2.Type B Spermatogonia:** These cells are derived from Type A and will undergo further mitotic divisions to become primary spermatocytes.

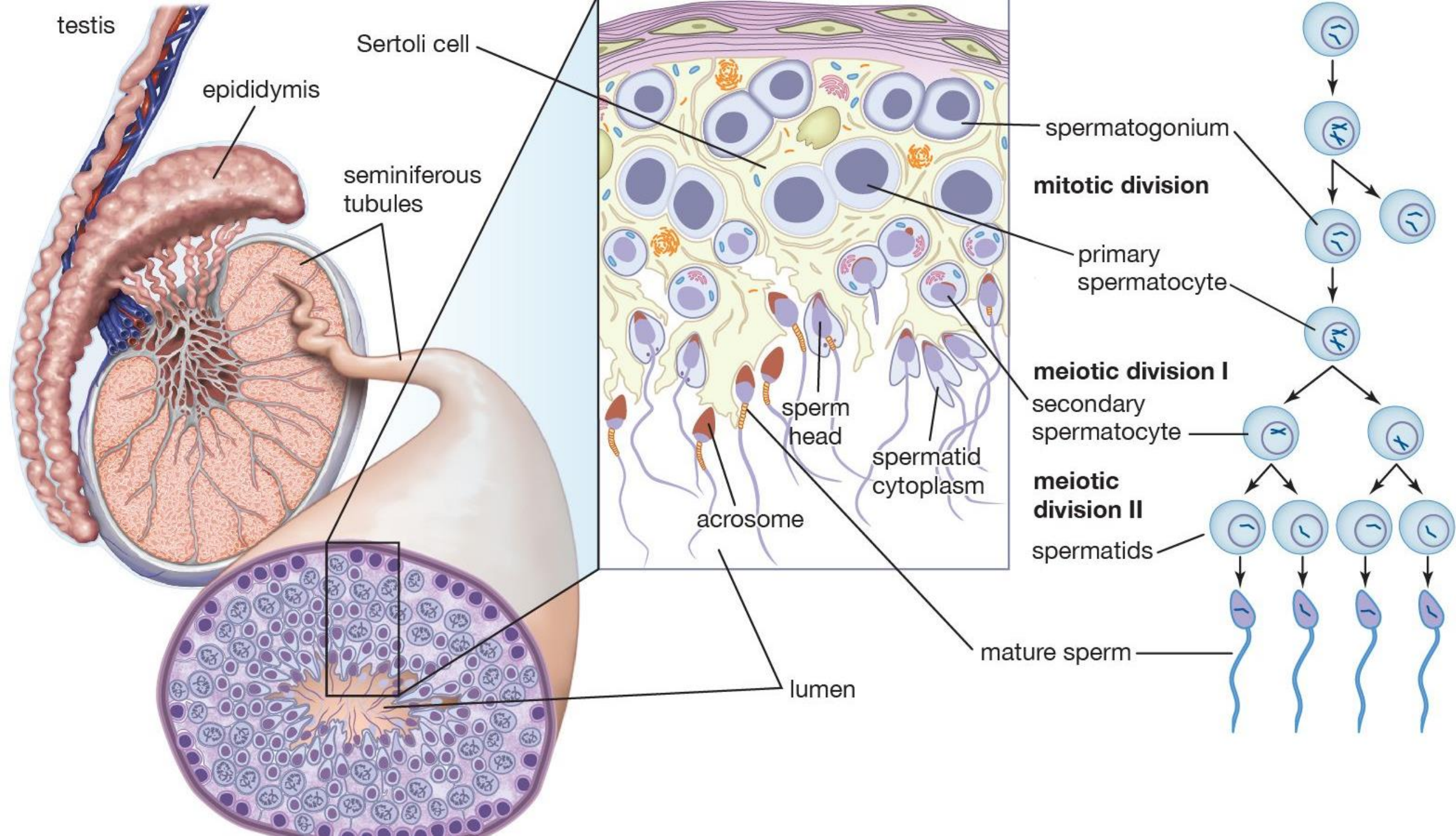
# SPERMATOGENESIS - Spermatocytogenesis



Duration: 45 days in bulls







# SPERMATOGENESIS - Spermiogenesis

## ***Key changes:***

1. Condensation of nuclear chromatin.
2. Formation of tail/flagellum.
3. Formation of acrosomal cap.

## ***Phases:***

1. Golgi phase
2. Cap phase
3. Acrosomal phase
4. Maturation phase

# SPERMATOGENESIS - Spermiogenesis

## ***Duration of spermatogenesis:***

- Time:
  - Boar: 50-60 days.
  - Bull: 60-70 days.
  - Ram: 60-70 days.
- Cycle of seminiferous epithelium: 4-5 cycles in spermatogenesis.
- Cycle Duration (Species):

Species	Cycle Duration (Days)
Boar	9
Ram	10
Horse	12
Bull	14

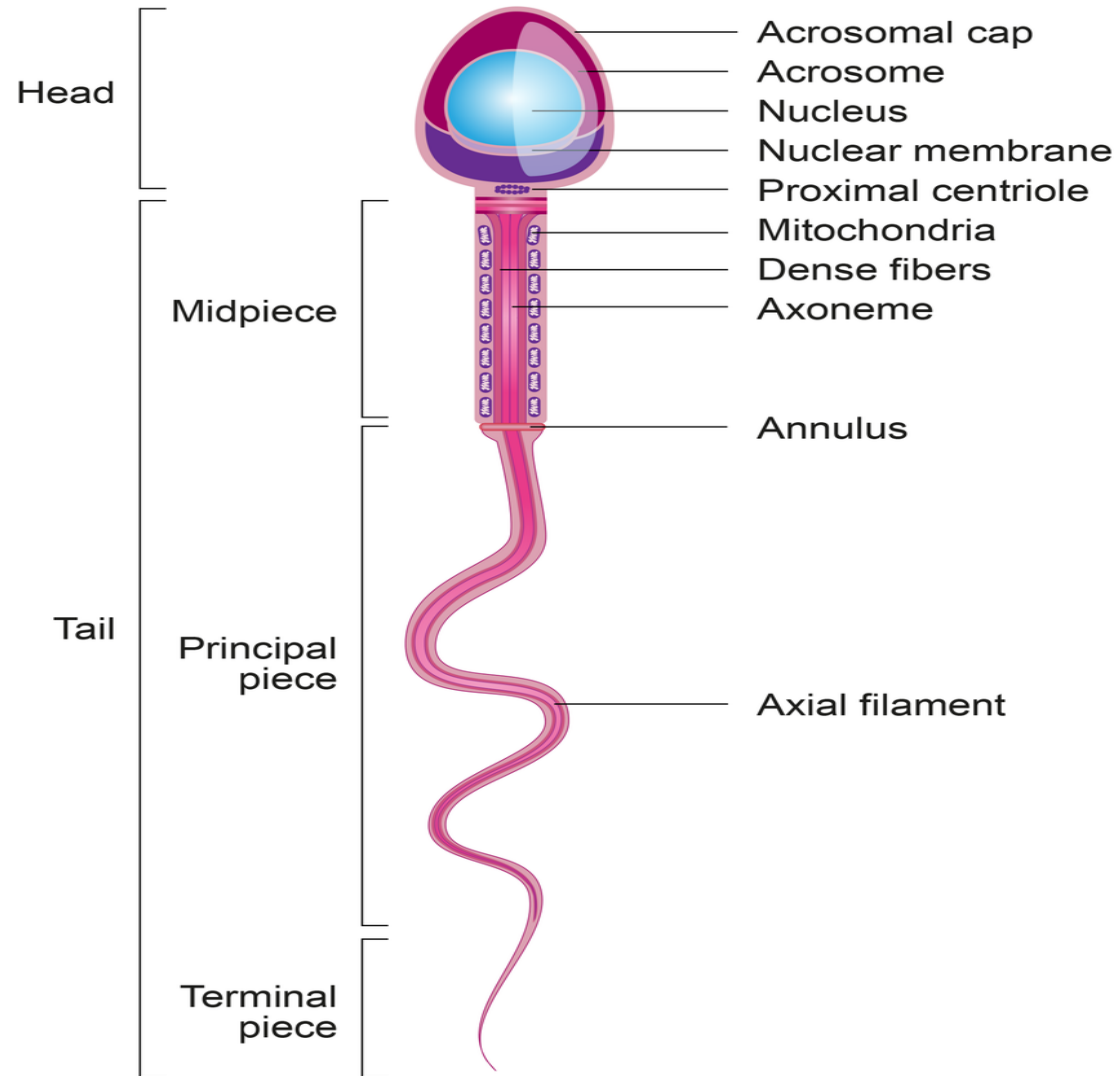
# SPERMATOGENESIS - Spermiation

Definition: Release of mature spermatozoa into seminiferous tubule lumen.

Process:

- Elongated spermatids extruded into lumen.
- Cytoplasmic stalk forms, leading to proximal droplet.
- Residual bodies removed by Sertoli cells.

# STRUCTURE OF SPERMATOZOOA



# FACTORS AFFECTING SPERMATOGENESIS

## PHYSICAL FACTORS

- Irradiation
- Hyperthermia
- Hypothermia
- Light
- Low oxygen tension

## CHEMICAL FACTORS

- Anti-spermatogenic drugs
- Alkylating agents
- Organochlorides
- Organophosphates

## NUTRITIONAL FACTORS

- Low/High plane of nutrition
- Hypovitaminosis A, E
- Exogenous steroids

# FACTORS AFFECTING SPERMATOGENESIS

## GENETIC FACTORS

- Hereditary defects
- Inbreeding
- Cytogenetic disturbances
- Hybridisation
- Freemartinism

## PATHOLOGICAL EFFECTS

- Testicular hypoplasia
- Cryptorchidism
- Imperfect testicular descent
- Hernia

## ACQUIRED FACTORS

- Testicular degeneration
- Aging



# PYQS

1. Puberty in bull is reached when the first ejaculate contain at least PPSC 2023
  1. 50 million sperm with 50% motility
  2. 500 million sperm with 50% motility
  3. 50 million sperm with 10% motility
  4. 500 million sperm with 10% motility
  
2. Which following animal species possess highest sperm concentration in semen (PPSC 2023)
  1. Ram
  2. Bull
  3. Stallion
  4. Boar

# PYQS

3. Which of the following species is short day breeder? PPSC 2023
1. Mare
  2. Cattle
  3. Dog
  4. Sheep
4. Transformation of secondary spermatocytes to spermatids is known as: OPSC 2019
1. Spermatocytogenesis
  2. Spermiogenesis
  3. Spermateliosis
  4. Spermiation

# PYQS

5. Which of the following testicular pathology is not due to congenital or hereditary causes ?
  1. Testicular hypoplasia
  2. Testicular degeneration
  3. Cryptorchidism
  4. None of above

MPSC 2017
  
6. Sigmoid flexure is located pre scrotal in:
  1. Bull
  2. Boar
  3. Ram
  4. Stallion

UK VO 2024

# PYQS

7. Castration of the male calf causes total loss of:

1. Erection
2. Ejaculation
3. Sexual desire
4. All of the above

OPSC 2017

8. Seminal plasma is slightly alkaline in:

1. Boar
2. Bull
3. Ram
4. Buck

OPSC 2017

# PYQS

9. Cowper's glands are well developed in:

1. Bulls
2. Dogs
3. Bears
4. Stallion

OPSC 2017

10. Bulbo-urethral gland is developed from:

1. Genital tubercle
2. Urogenital sinus
3. Genital fold
4. Genital swelling

OPSC 2017

*Thank-you*