

وسهلا

أهلا



الأستاذ الدكتور يوسف حسين

أستاذ التشريح وعلم الأجنة - كلية الطب - جامعة الزقازيق - مصر

رئيس قسم التشريح و الأنسجة و الأجنة - كلية الطب - جامعة مؤتة - الأردن

دكتورة من جامعة كولونيا المانيا

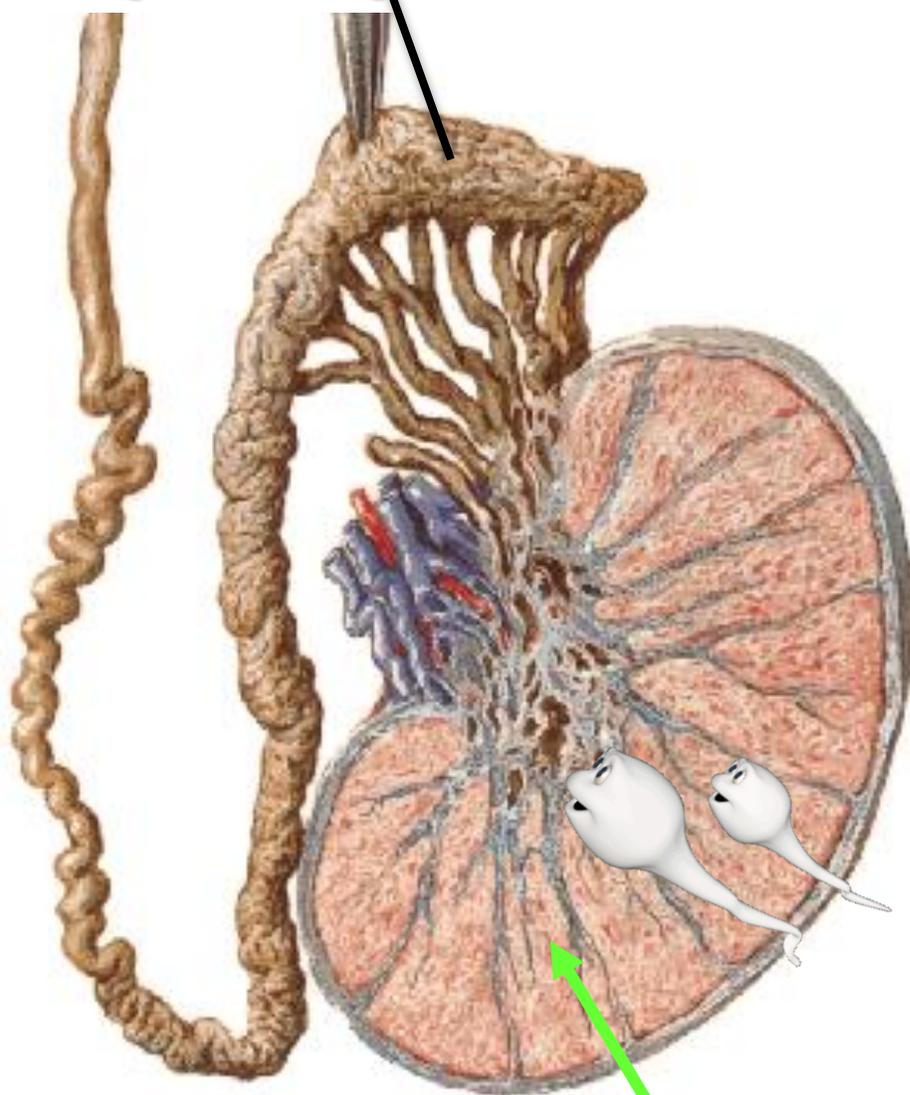
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SPERMATOGENESIS

- ** Definition:** It is the process of formation of the sperms (mature male gametes) from the primordial germ cells (spermatogonia)
- **Time: starting at puberty (15-17 years) and continues till old age.**

epididymis



seminiferous tubules

- Site of spermatogenesis
- in seminiferous tubules in testis and sperms stored in epididymis.
- **Testis** primary Male sex gland, Located in the Scrotum.
 - Produce Sperms and androgen hormone.
 - Testis have interstitial cells (**Leydig cells**) that produce male sex hormone (**testosterone**).
 - Seminiferous tubules is structural unit of testes, site of developmental phases of sperms, containing **Sertoli cells**.

❖ **Functions of Sertoli cells**

1. Secret protein for **nutrition** of developing sperms So called **mother cells or Nurse cells**
2. **Phagocytosis** for residual cytoplasm from spermatogenesis.
3. Epithelial **supporting** cells
4. Maintain the environment necessary for development and maturation of sperms via **formation of blood testis barrier**.
5. **Secret anti-Mullarian hormones** during early stage of fetal life
6. **Secret inhibin B and activin** after puberty to regulate FSH
7. **Secret androgen binding protein** leading to increase testosterone hormone to stimulate spermatogenesis

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Stage of proliferation

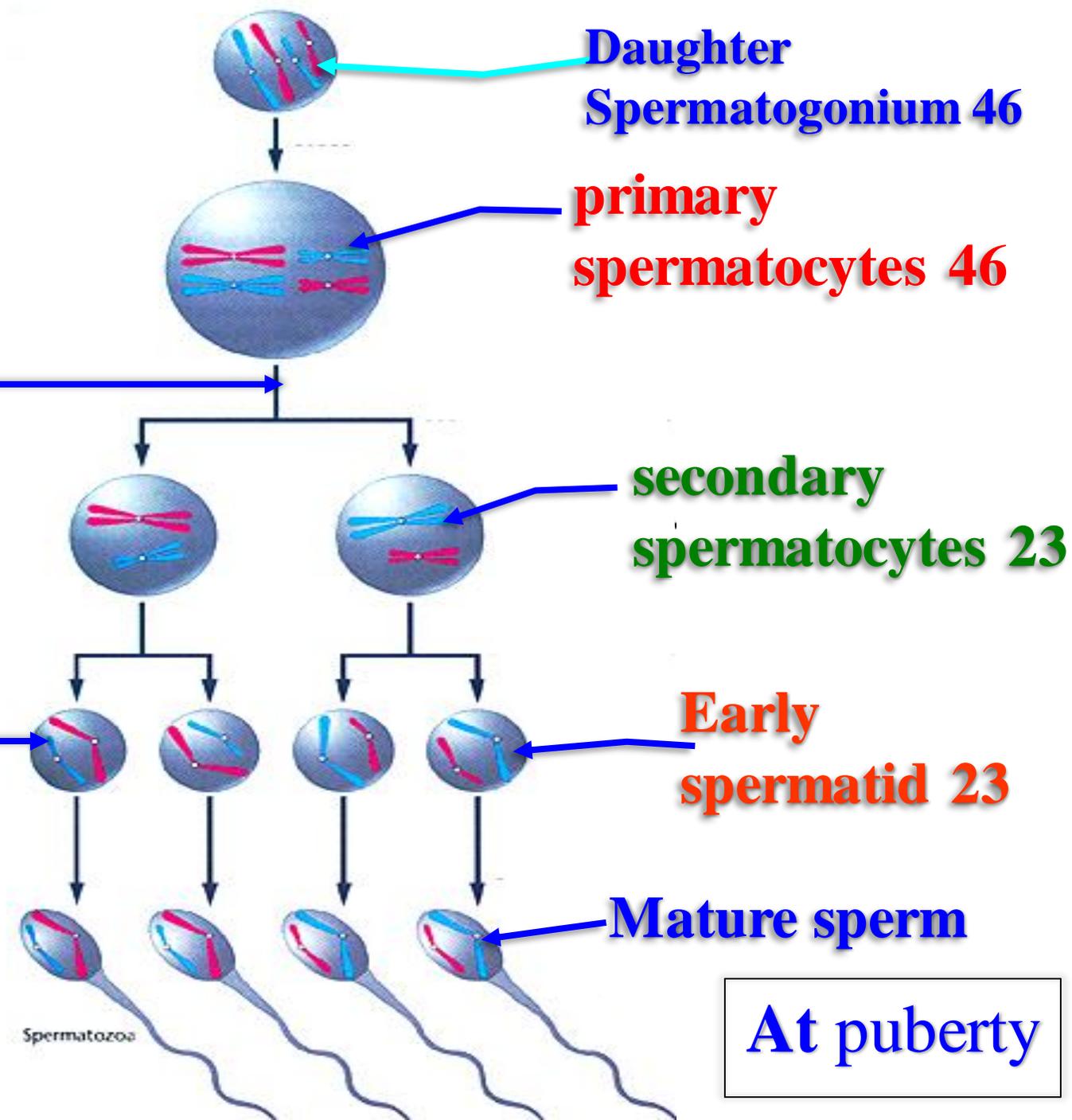
Stage of growth

1st meiotic division

Stage of maturation

2nd meiotic division

Stage of transformation



**Daughter
Spermatogonium 46**

**primary
spermatocytes 46**

**secondary
spermatocytes 23**

**Early
spermatid 23**

Mature sperm

At puberty

Spermatozoa

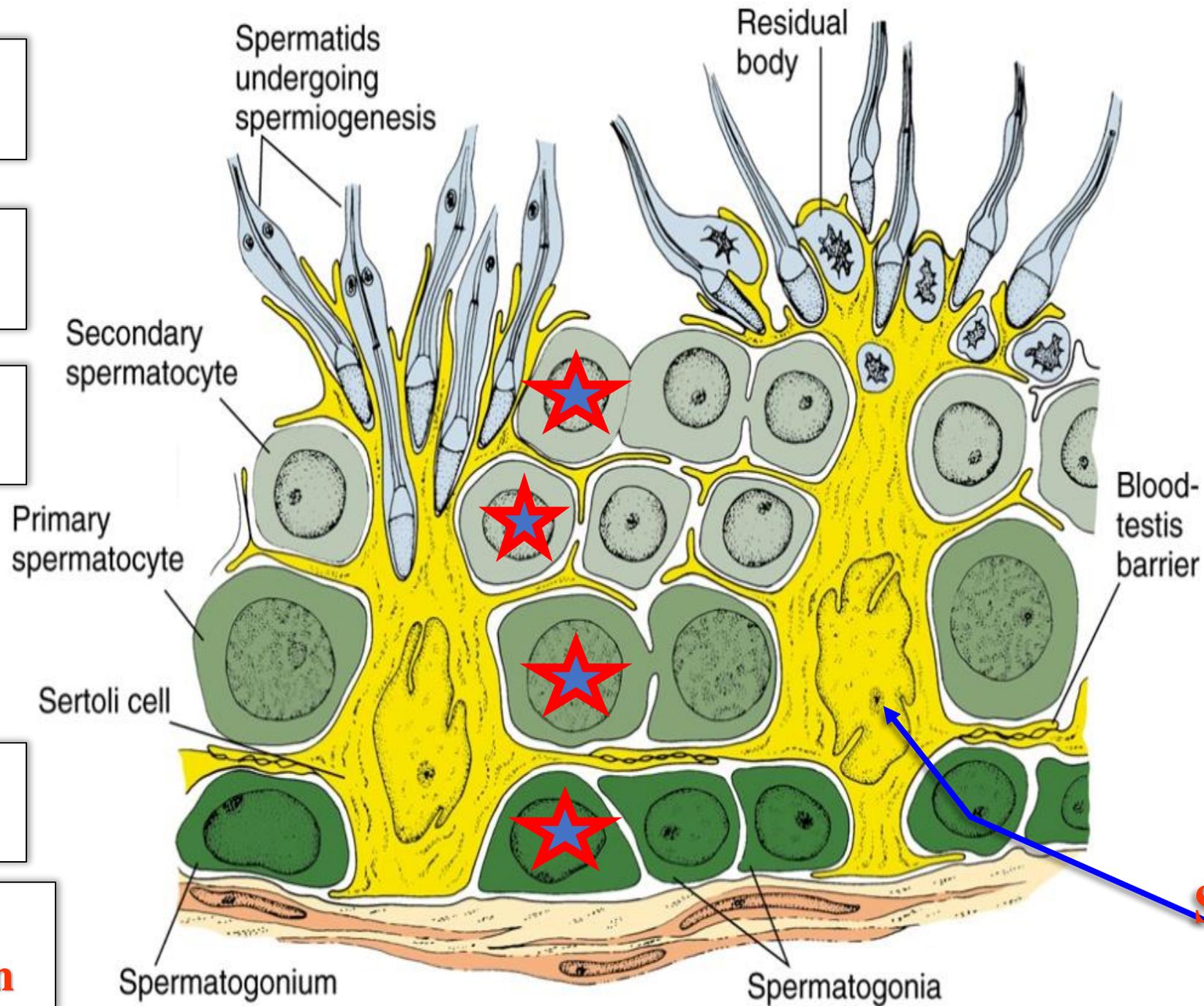
2nd meiotic division

Stage of Maturation

1st meiotic division

Stage of Growth

Stage of proliferation



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Sertoli cells

**** Stages of spermatogenesis**

**** It includes 4 stages:**

(1) Stage of proliferation

- Each primordial germ cell (**spermatogonium**, 46 chromosome) is divided by **mitotic division** into 2 **daughter spermatogonium** (each contains 46 chromosomes).

(2) Stage of growth

- Each of the daughter spermatogonia acquired more cytoplasm and increased in size forming **primary spermatocyte** (46 chromosomes).

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(3) Stage of maturation

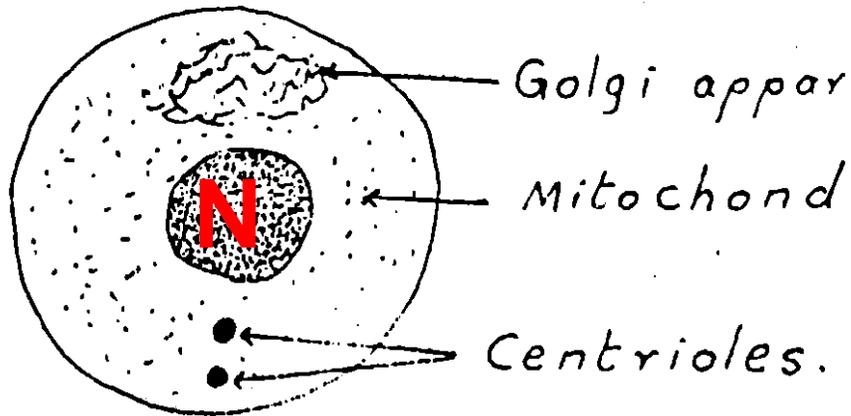
- In this stage the primary spermatocytes divide by **meiotic division** as follows:

I) 1st meiotic division (reduction division): each primary spermatocyte divide by meiotic division into two **secondary spermatocytes** {23 chromosome (one contains 22+X and one 22+Y)}.

II) 2nd meiotic division (equational division): each of the developed secondary spermatocytes divide into two cells called **spermatids** (each contains 23 chromosomes 22+X or 22+Y).

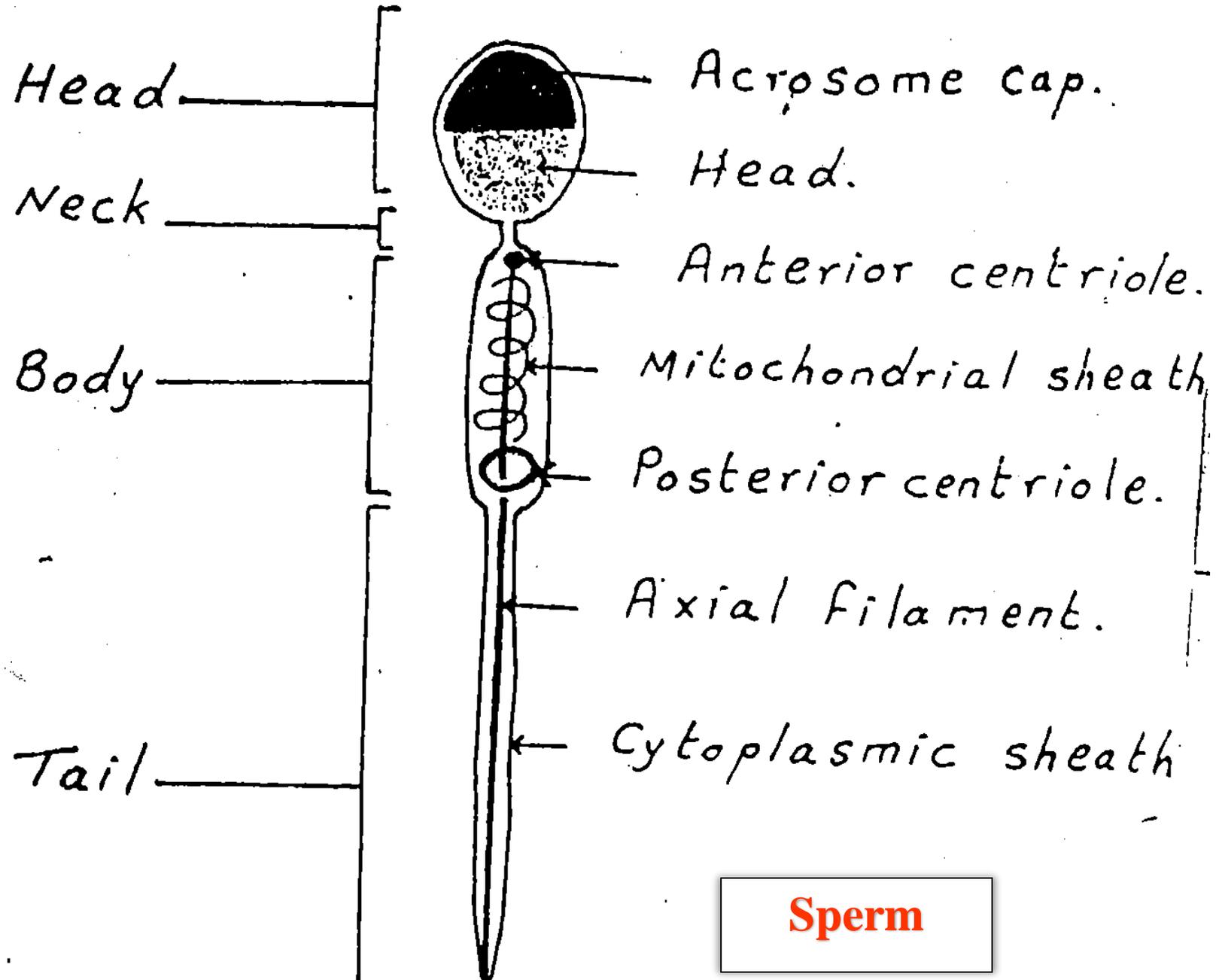
N.B; each primordial germ cell gives 8 spermatids (4= 22+X and 4= 22+Y).

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Spermatid

Stage of transformation



Sperm

(4) Stage of transformation (Spermiogenesis):

- It occurs in male only.
- Transformation of the spermatid into a mature sperm.
- The **length** of the sperm is about **50- 60 micrometer**
 1. The **nucleus** forms the **head** of sperm.
 2. The **Golgi** apparatus forms **acrosomal cap** contains **hydrolytic enzymes** which covers the anterior 1/2 of the head.
 3. **Centrioles**,
 - a- **Anterior** centriole: immediately behind the head.
 - b- **Posterior** centriole: forms a **ring** shaped structure at end of the body.
 - **Axial filament** arises from anterior centriole and passes through the ring shaped posterior centriole to the tail.
 4. **Mitochondria** forms a mitochondrial sheath around axial filaments between centrioles.
 5. **Cytoplasmic membrane** forms a cytoplasmic sheath around the body and tail.

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- **Characters of normal sperm**

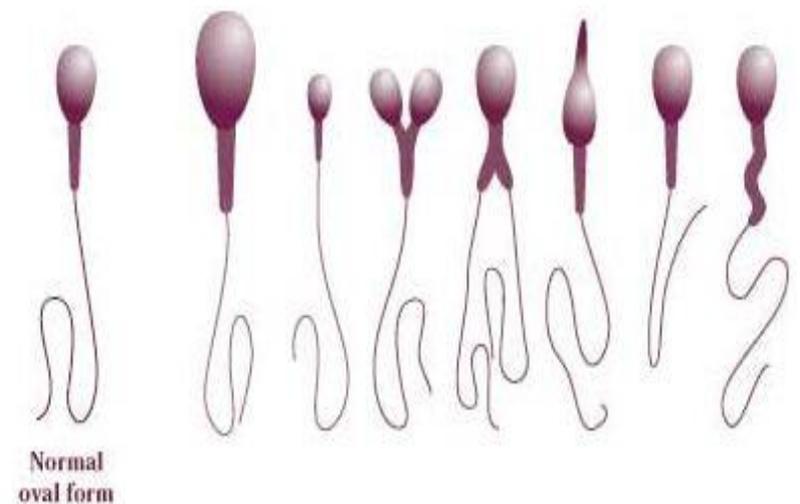
- 1. Number of sperm** about 20-200 million per ml and survive on fructose.
- 2. Parts of mature sperm:** head, neck, body and tail.
- 3. Motile of sperm at ejaculation:** more than 80%.
- 4. Rate of movement of sperms** in the female genital tract about 1- 3 mm per minute.
- 5. Survival of sperm** in the female genital tract about 3-4 days.
- 6. The average volume of semen** at ejaculation is 3-5 ml
- 7. Appearance** is whitish to gray
- 8. PH** is 7.2 - 7.8 (low is acidic while high is alkaline)
- 9. The seminal fluid is secreted by** testis, seminal vesicle, prostate, and bulbourethral glands

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- **Abnormal spermatogenesis**

- i) **Azoospermia:** absence of sperms in the seminal fluid
- ii) **Oligospermia:** decreased number of sperms in the seminal fluid
- iii) **Asthenospermia reduced sperm motility**
- iv) **Necrospermia: sperms found dead.**
- v) **Aspermia:** incomplete lack of semen with ejaculation
- vi) **Genetic abnormalities:** Sperm having abnormal chromosomal content
- vii) **Morphological Abnormalities:** If more than 20% affect fertility
 - Giant. - Dwarf. - Joined in head or in tail.

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Oogenesis

**** Definition:** It is a process by which mature ovum is formed from primitive germ cell (oogonium)

• OOOGENESIS

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**** Site:** in the cortex of ovary in female.

**** Time:**

- It **started** during foetal (intrauterine) life
 - **Continues** after puberty
 - **Completed** after fertilization
 - **Arrested** at the age of menopause.
- **At birth, the ovary contains about two million primary oocyte.** Thereafter most of them degenerate and, by puberty, when ovulation begins only about 300,000- **400,000 primary oocytes** are left in the ovary.

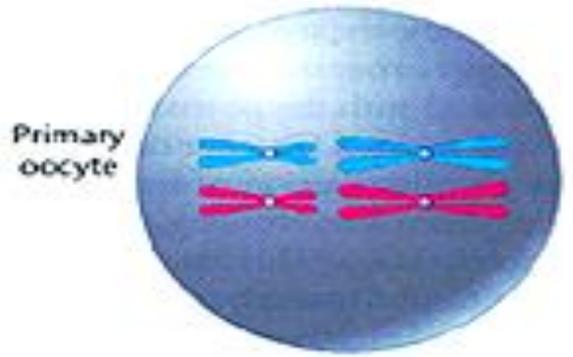
Period of Proliferation



Daughter oogonium

Before birth

Period of growth

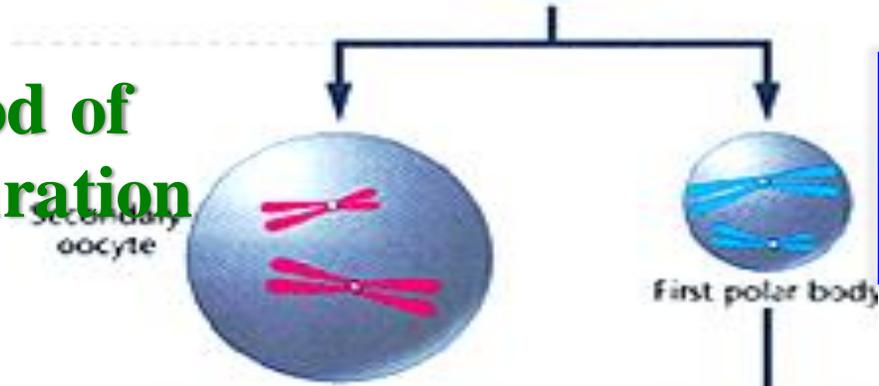


primary oocyte

1st meiotic division

At puberty (ovulation)

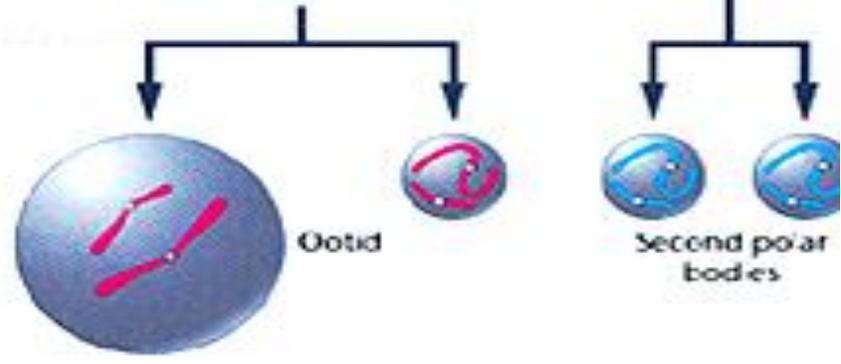
Period of maturation



2ry oocyte and 1st polar body

2nd meiotic division

At fertilization



Ovum and 2nd polar body

**** Stages of Oogenesis**

A- During foetal life

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(1) Stage of proliferation:

- Each primordial germ cell; {**oogonium**} (46 chromosome) is divided by mitosis into 2 **daughter** oogonia (each contains 46 chromosomes).

(2) Stage of growth:

- Each of the daughter oogonia increases in size forming the **primary oocyte** containing 46 chromosomes (at birth).

B- After puberty

(3) Stage of maturation:

- I) **1st meiotic division (reduction division):** each primary oocyte divide by meiotic division into one **secondary oocytes** (contains 22 +X chromosomes and **1st polar body** (contains 22 +X chromosomes and minimal amount of the cytoplasm)).

C- After fertilization

II) 2nd meiotic division (equational division):

- The secondary oocyte divides into **mature ovum** (contains 23 chromosome, 22 + X and most of the cytoplasm) and **2nd polar body** (contains 22 +X chromosomes and minimal amount of the cytoplasm).
- The 1st polar body divided by **secondary meiotic division** into two **2nd polar bodies**.

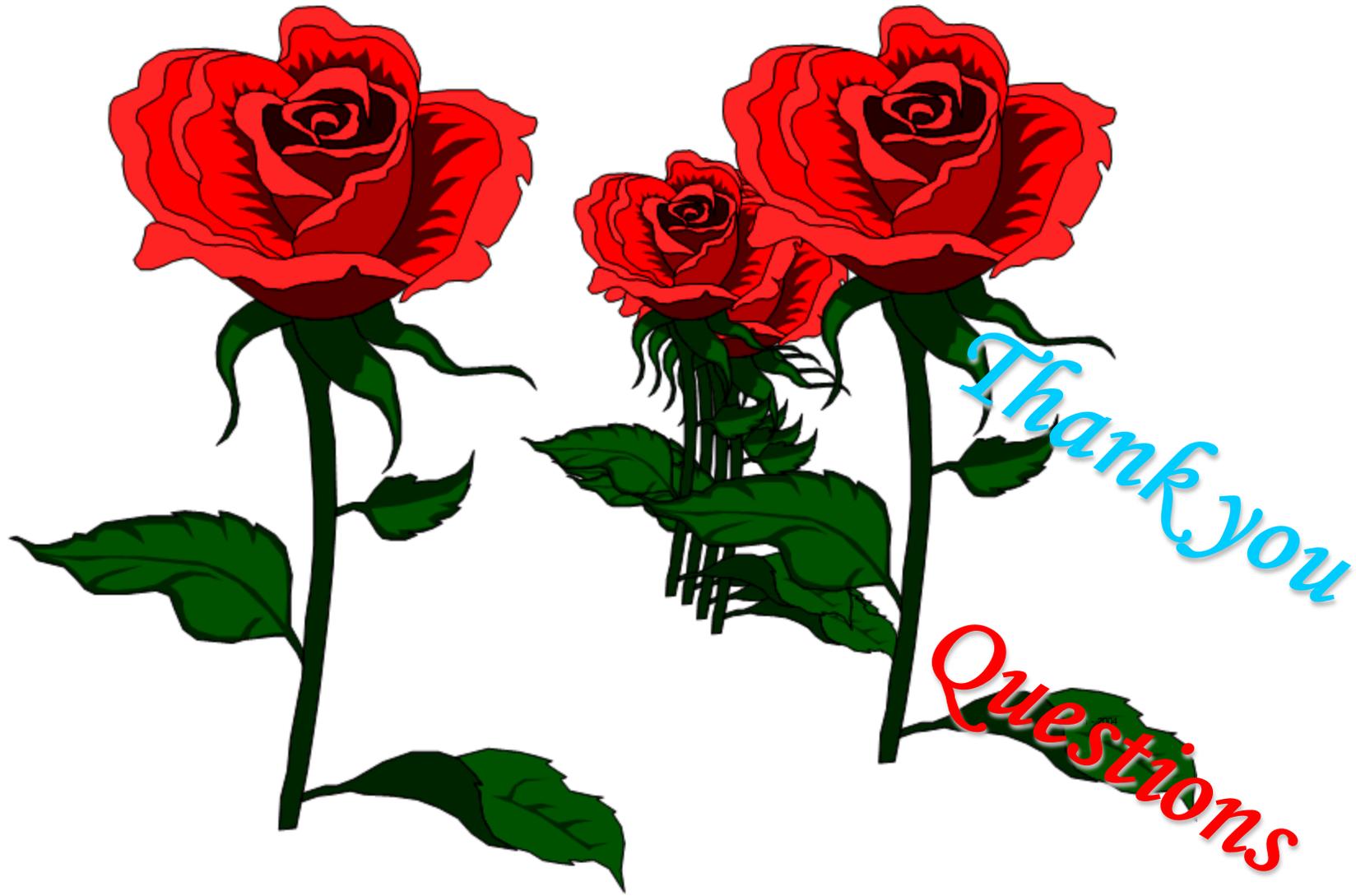
N.B;

- The role of the polar body is to reduce the number of chromosomes.

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• **Differences between spermatogenesis and oogenesis**

	Spermatogenesis	Oogenesis
Definition	Formation of the sperms from the primordial germ cells.	Formation of the ova from the primordial germ cell.
Site	In the testis	In the cortex of the ovary
Time	- It started at puberty and continues till very old age (all over life).	- It started during intrauterine life, and continues after puberty to be completed after fertilization. - It arrested at the age of menopause.
Hormones	- FSH, testosterone and interstitial cell stimulating hormone (ICSH)	- FSH and LH
Stages	Proliferation, growth, maturation and transformation.	Proliferation, growth, maturation (No transformation stage)
Results	Each primordial germ cell gives 8 sperms.	Each primordial germ cell gives 2 ova and 6 polar bodies.



Thank You

Questions