GAMETOGENESIS

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INTRODUCTION

Definition: Gametogenesis is the process of producing gametes (sperms and eggs) from germ cells in an organism.

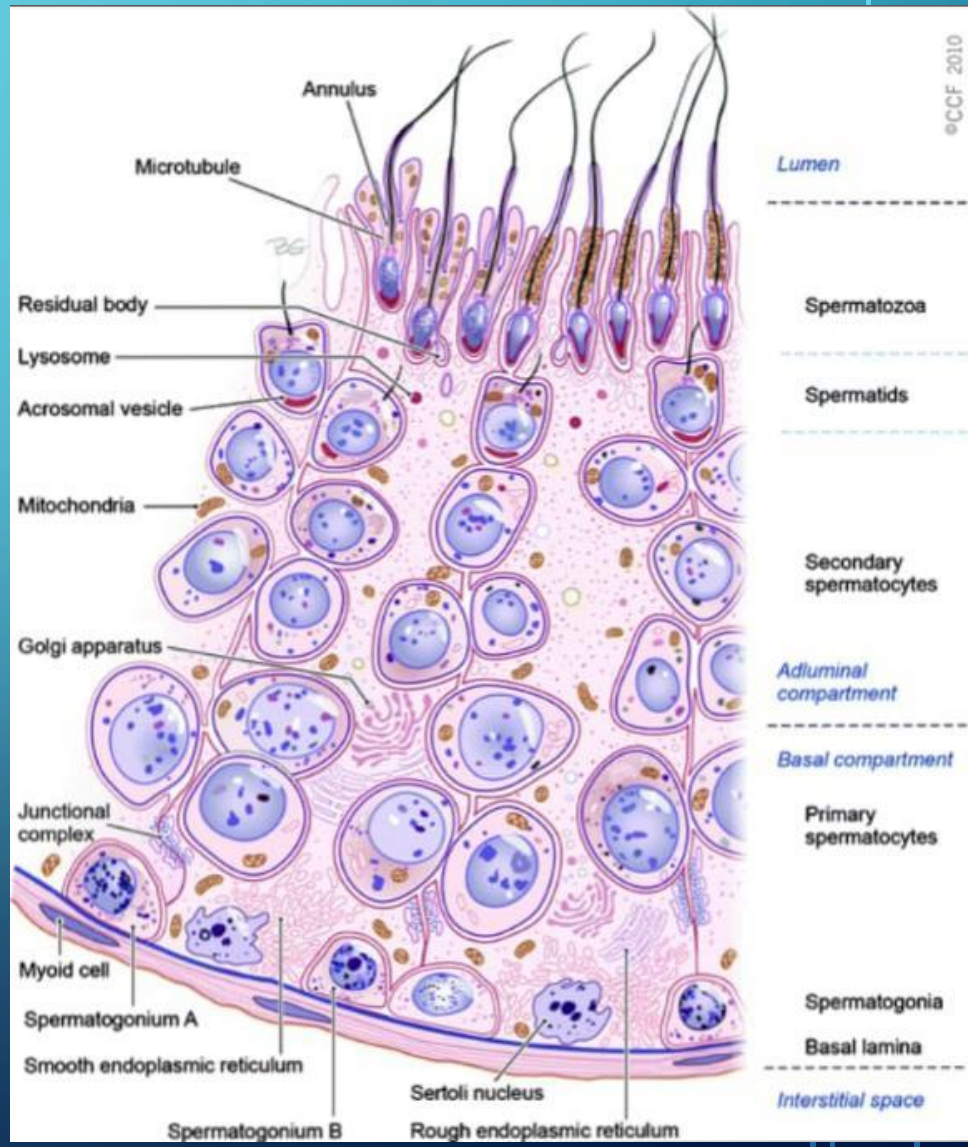
Importance : Essential for sexual reproduction and genetic diversity.

TYPES OF GAMETOGENESIS

- There are two main types of gametogenesis
- **01. Spermatogenesis** – formation of sperm cell (spermatozoa) in males.
- **02. Oogenesis** – formation of egg (ova) in female.

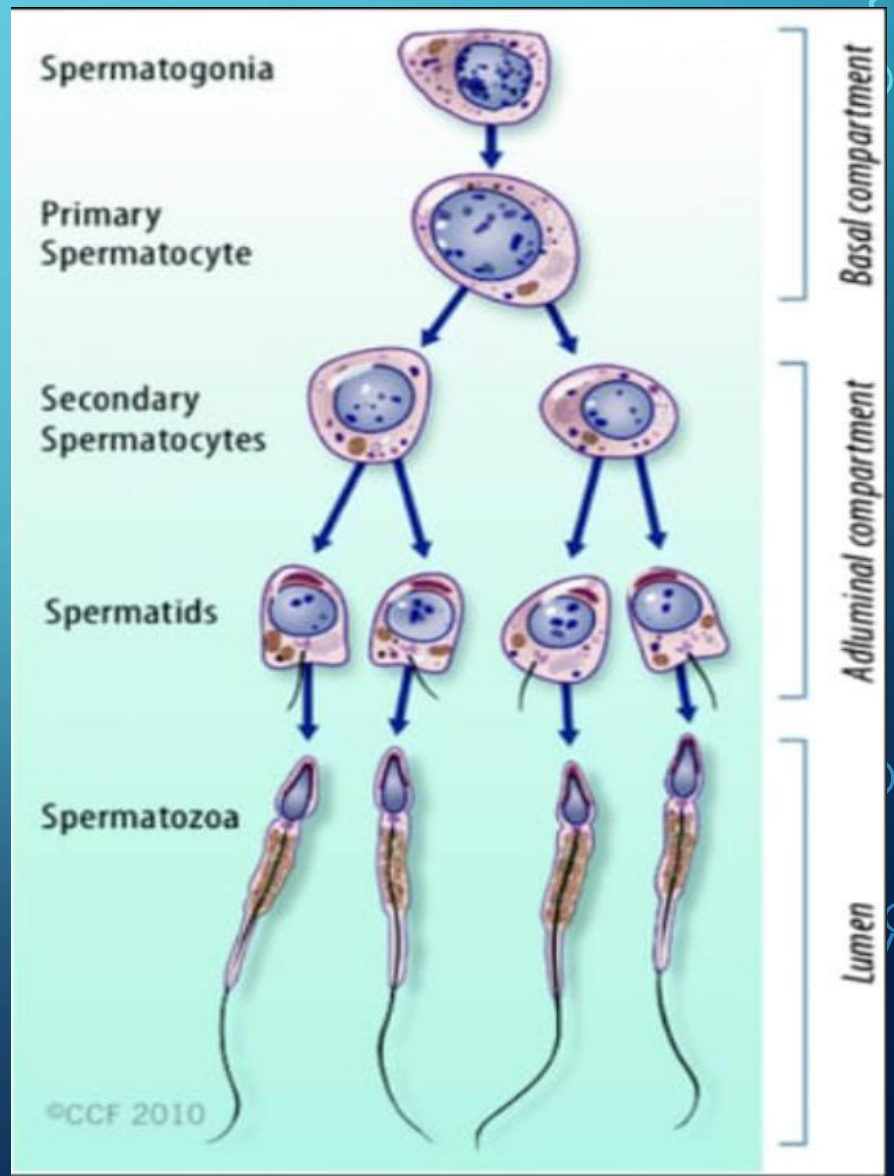
01. SPERMATOGENESIS

- Spermatogenesis is the process of the production of spem from immature germ cell in males.
- **Site :** In the seminiferous tubules in testis.
- **Duration :** Take about 74 days (two months).
- **Occurance :** Start at puberty and continues throughtout life.



STAGES OF SPERMATOGENESIS –

- **Proliferation:** Each spermatogonium devides by mitosis into two daughter spermatogonia (with diploid number of chromosomes 44+xy).
- **Growth :** Spermatogonium enlarge to form a primary spermatocytes (with deploid number).

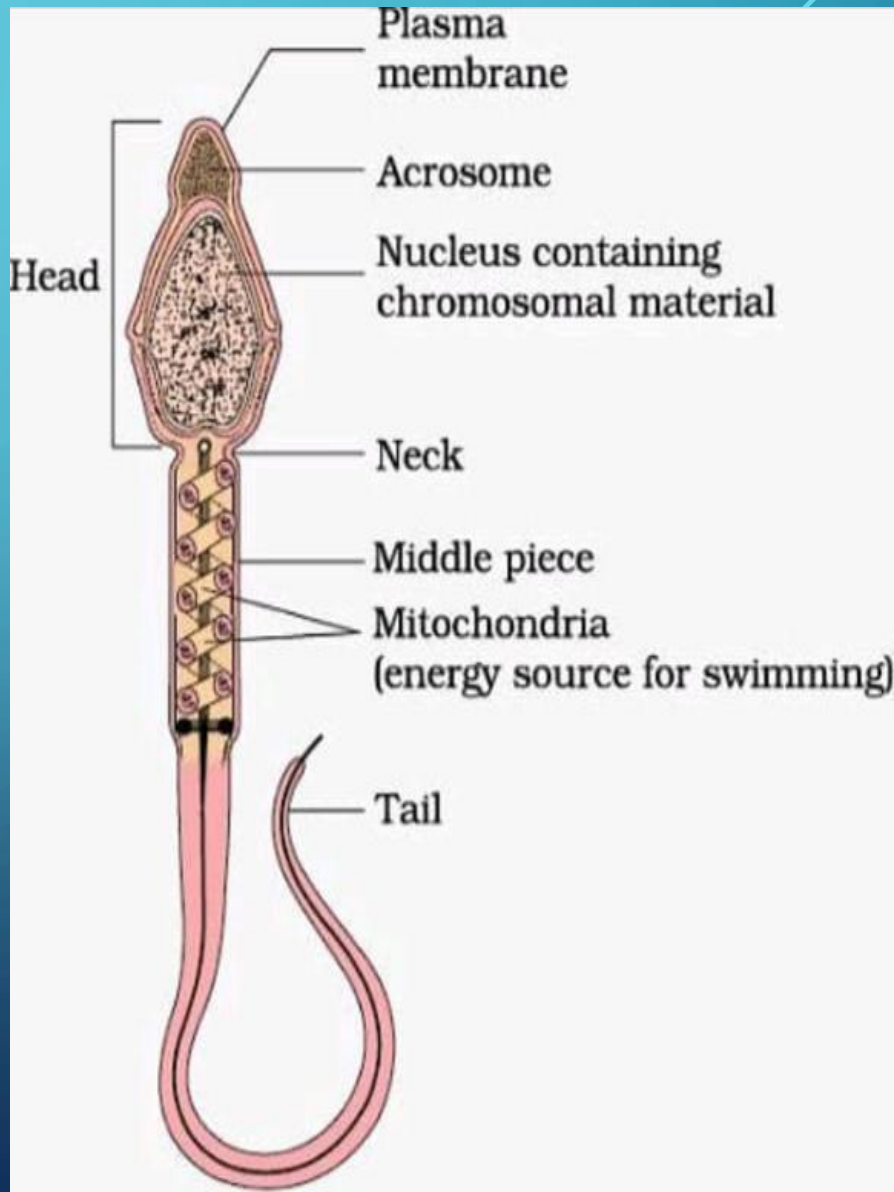


MATURATION (BY MEIOSIS) -

- **1st meiotic division :** A reduction division by which a primary spermatocytes divides into two secondary spermatocytes (haploid number of chromosome :22+x or 22 + y).
- **2nd meiotic division :** A process of mitosis without a normal interphase (without DNA replication) through which a secondary spermatocytes divided into two spermatids (with haploid number of chromosomes).
- **Spermatogenesis :** A process by which a sparmatid is transformed into a mature sperm (with deploid number)

STRUCTURE OF A SPERM

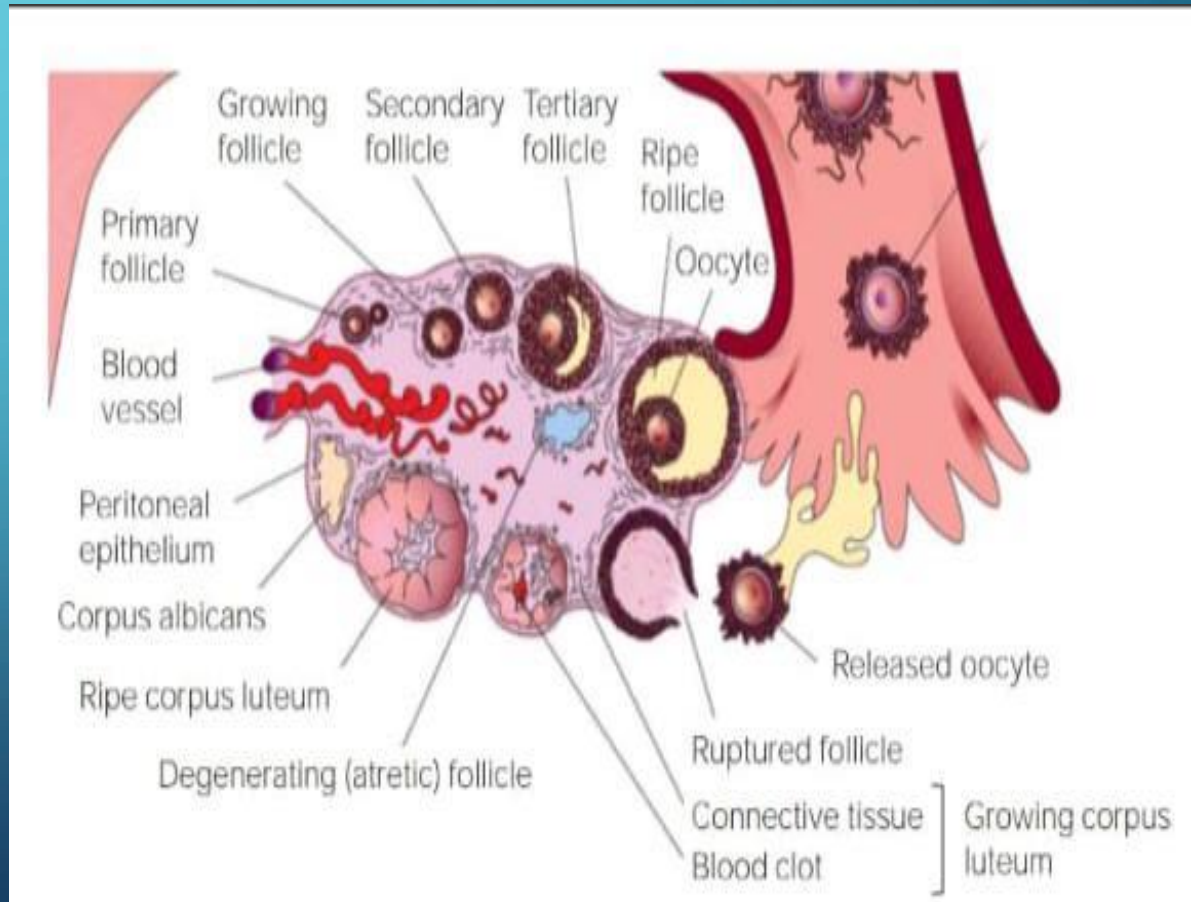
- It is a microscopic structure composed of a head ,neck ,q middle piece and tail.
- A plasma membrane envelopes the whole body of the sperm.
- The sperm head contains an elongated haploid nucleus ,the interior portion of which is covered by a cap-like structure acrosome.
- The acrosome is filled With enzymes that help fertilization of the ovum.



- The middle piece posses numerous mitochondria , which produce energy for the movement of the tail that facilliate sperm motality.
- The human male ejaculates about 200 to 300 million sperm during a coitus of which for normal fertility at least 60 percent sperm must have normal shape and size.

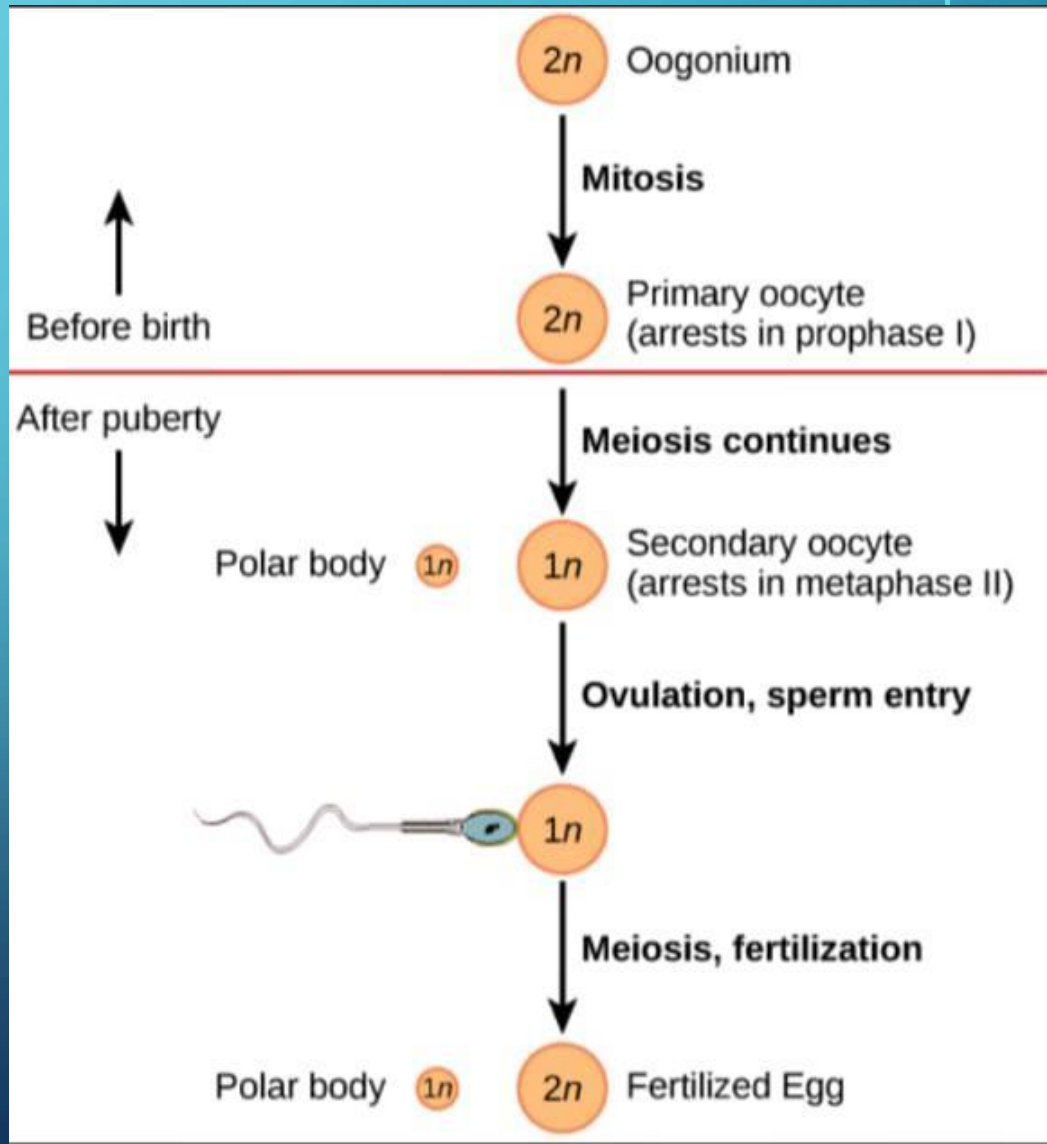
02. OOGENESIS

- Oogenesis is the process of the formation of mature ovum from the oogonia in female.
- **Site :** In the cortex of overy.
- **Occurance :** Starts during fetal life becomes completed after puberty and continues till menopause.



STAGES OF OOGENESIS

- Oogenesis is initiated during the embryonic development stage when a couple of million gametes mother cell (oogonia) are performed within each fetal overy ; no more oogonia are performed and add after birth .
- These cells start division and enter into a prophase-I of the mitotic division and get temperarly arrest at the stage called primary oocytes.



- Each primary oocytes then gets surrounded by a larger of granulosa cell and is called the primary follicle.
- A large number of these follicles degenerates during the phase from birth to puberty.
- Therefore at puberty only 60.000-80.000 primary follicles are left in each overy .The primary follicles get surrounded by more layer of granulosa cell and a new theca and are called secondary follicles.

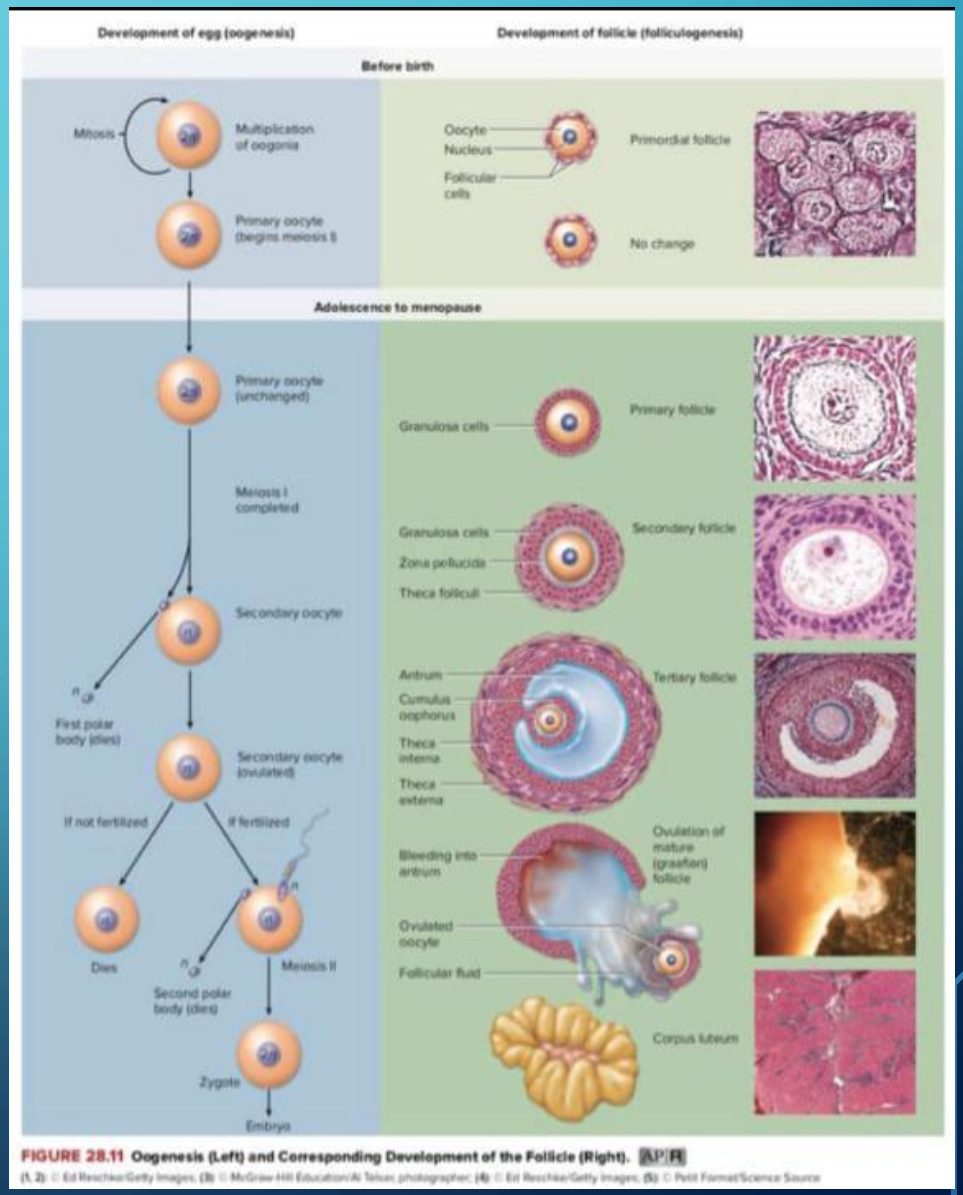


FIGURE 28.11 Oogenesis (Left) and Corresponding Development of the Follicle (Right). AP R

- The secondary follicles soon transforms into a tertiary follocle which is characterized by a fluid filled cavity called **Antrum** .The theca layer is organised into an inner theca interna and outer theca enterna.It is important to draw your attention that it is at this stage that the primary oocytes within the tertiary follicle grow in size and complete its first mitotic division.
- It is unequal division resulting in the formation of a large haploid secondary oocyte and tiny first polar body.
- The secondary oocyte return bulk of the nutrient rich cytoplasm of the primary oocytes.

- The tirtiary follicle further changes into the mature follicle or graffian follicle.
- The secondary oocyte forms a new membrane called zona pellucida surrounding it.
- The graffian follicle now rapture to release the secondary oocyte (ovum) from the overy by the process called ovulation.

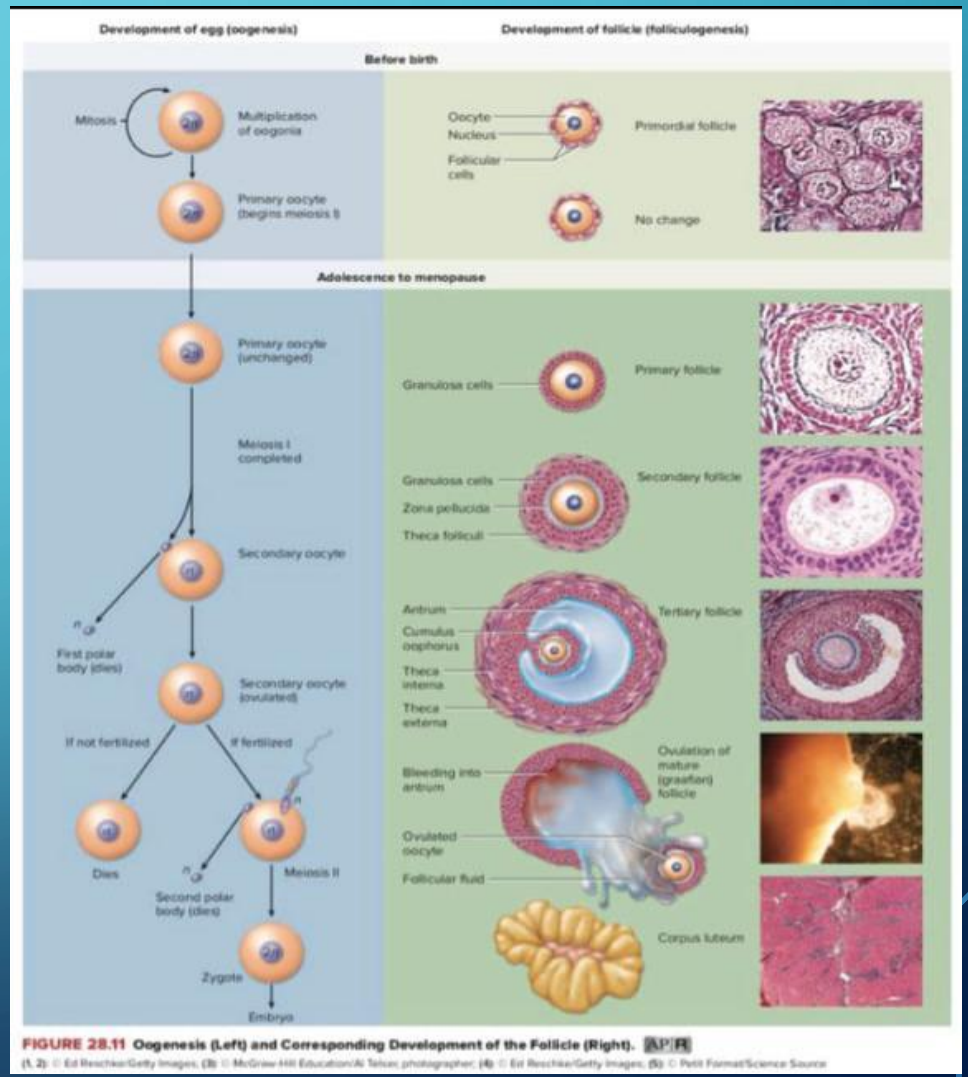
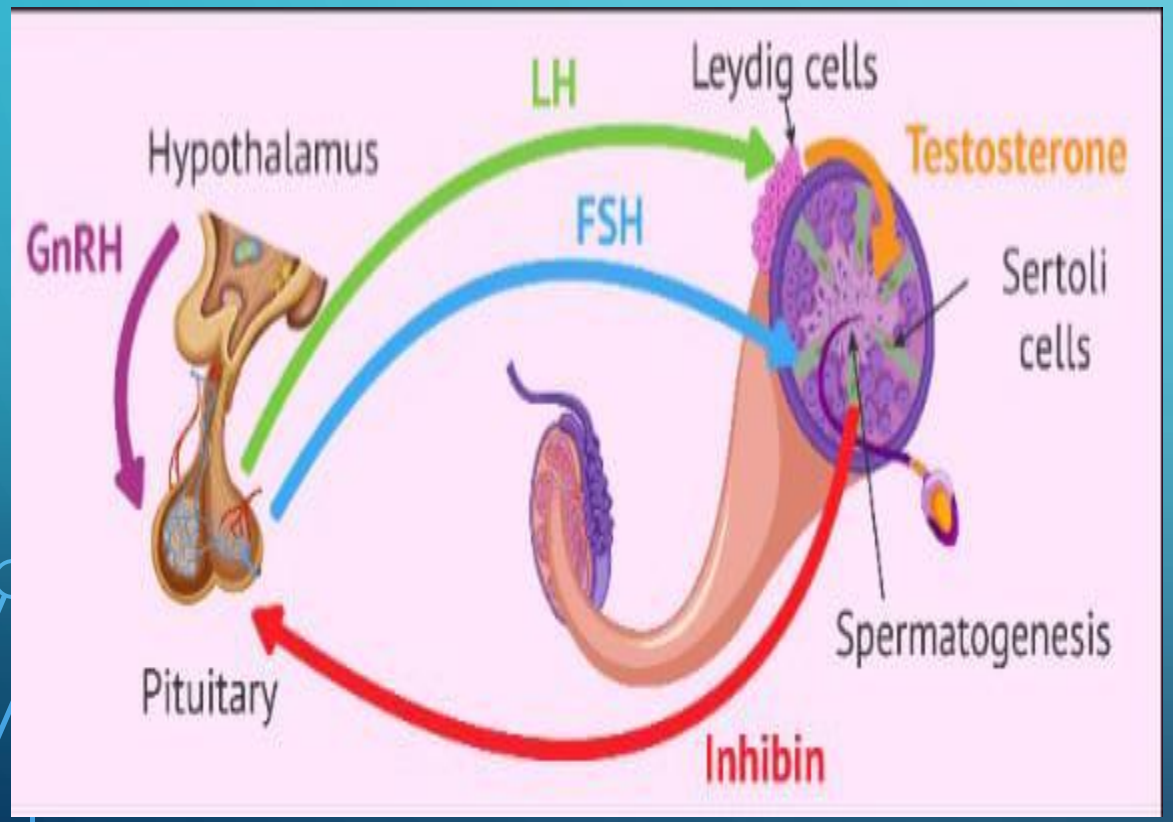


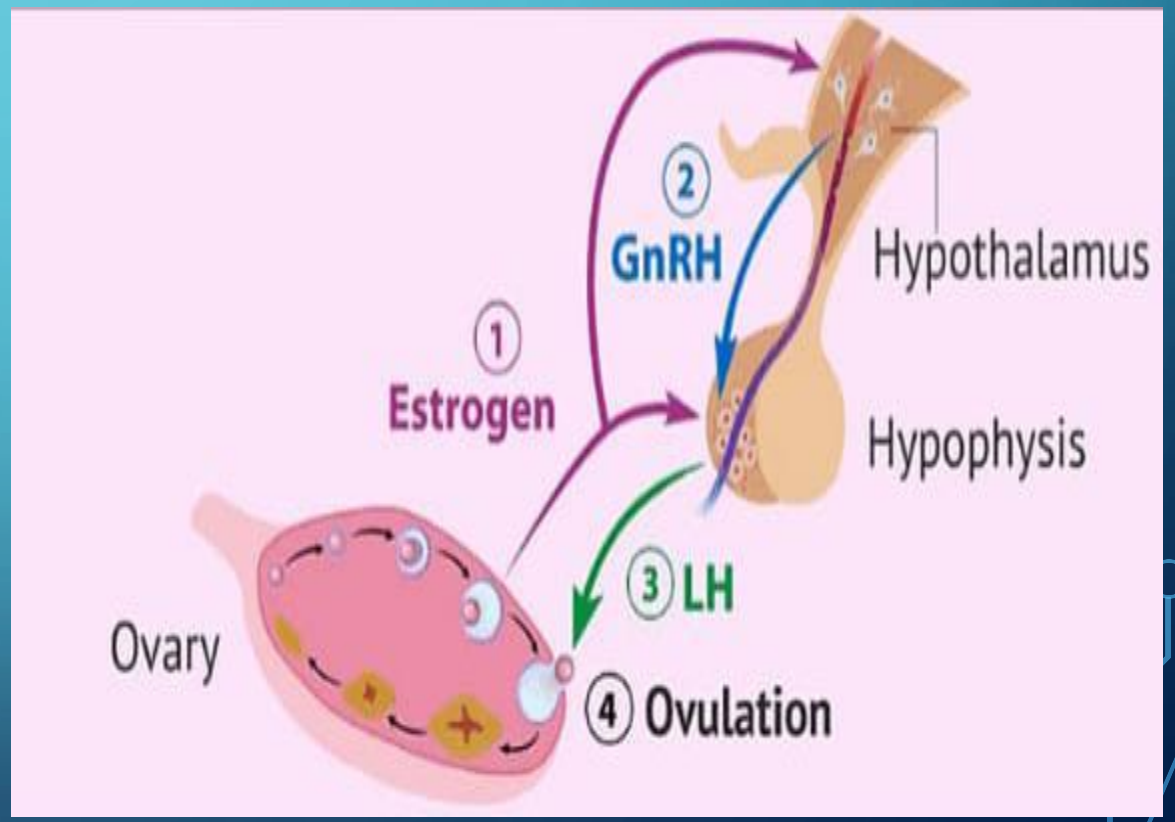
FIGURE 28.11 Oogenesis (Left) and Corresponding Development of the Follicle (Right). AP|R

COMPARISON BETWEEN SPERMATOGENESIS AND OOGENESIS :

	Spermatogenesis	Oogenesis
Process		
Location	Occurs *entirely* in testes	Occurs *mostly* in ovaries
Meiotic divisions	Equal division of cells	Unequal division of cytoplasm
Germ line epithelium	Is involved in gamete production	Is not involved in gamete production
Gametes		
Number produced	Four	One (plus 2 – 3 polar bodies)
Size of gametes	Sperm smaller than spermatocytes	Ova larger than oocytes
Timing		
Duration	Uninterrupted process	In arrested stages
Onset	Begins at puberty	Begins in foetus (pre-natal)
Release	Continuous	Monthly from puberty (menstrual cycle)
End	Lifelong (but reduces with age)	Terminates with menopause

HARMONAL FACTOR





DISORDER RELATED TO GAMETOGENESIS :

- **Spermatogenesis disorder :**
- **Aligospermia :** Low sperm count.
- **Asthenospermia :** low sperm motality.
- **Azoospermia :** absence of sperm in seman.
- **Spematogenic arrest :** failure of sperm cell to mature.

- **Oogenesis disorder :**
- **Amenorrhea :** absence of menstruation.
- **Ovarian Disgenesis :** abnormal development of overies.
- **Polystic overy sundrome (pcos) :** harmonal imbalance affecting ovulation.

- **Genetic disorder :**
- **Klinefelter syndrome** (extra x chromosome in male **xxy**)
- **Turner syndrome** (missing x chromosome in female).

- **Refferences :**

  - NCERT Biolgy book.
  - Paul M Wasserman.
  - Joseph G. Gall.

THANK YOU.