



CSIR-NET

Council of Scientific & Industrial Research

LIFE SCIENCE

VOLUME – 5

**DEVELOPMENT BIOLOGY, PLANT
& ANIMAL PHYSIOLOGY**



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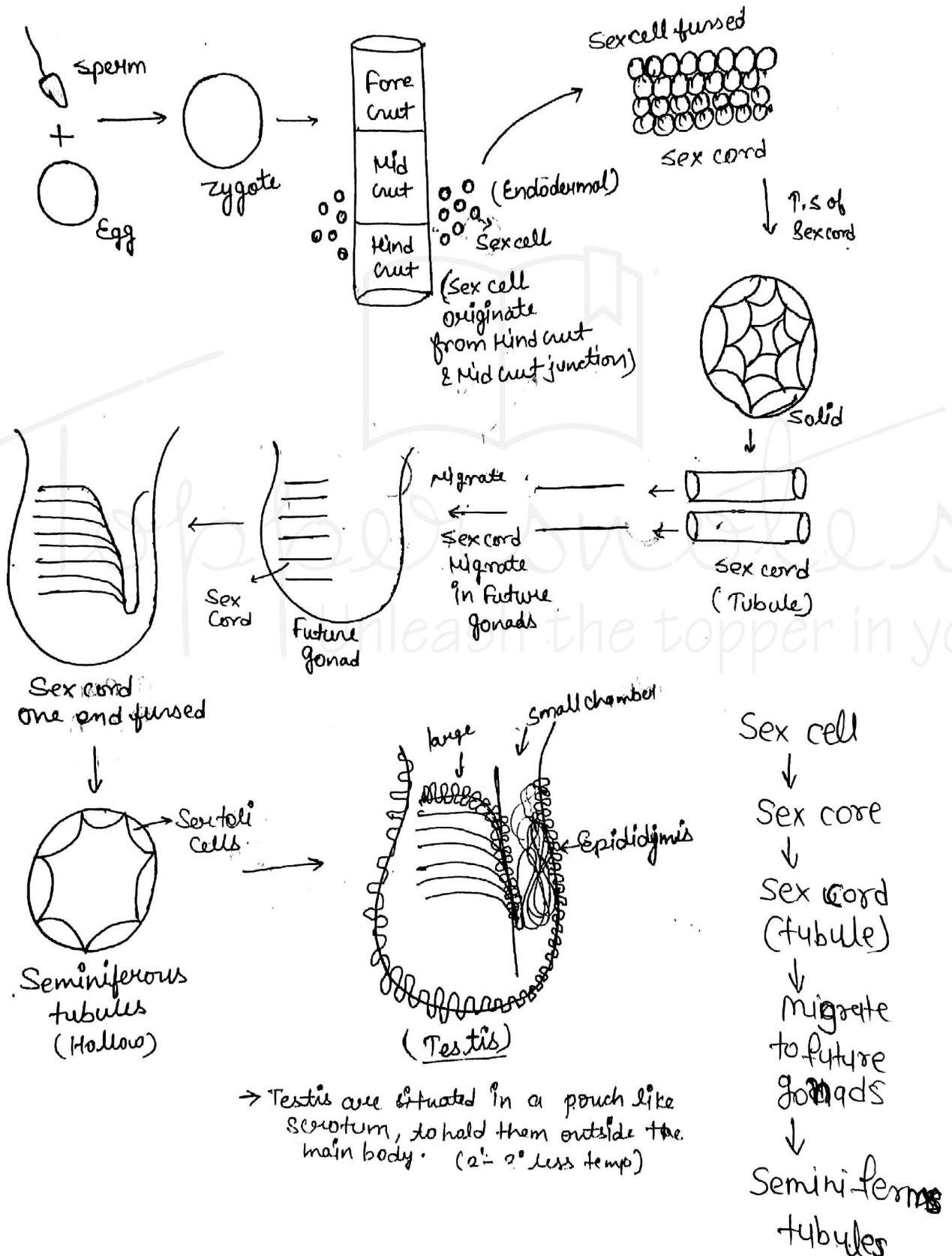
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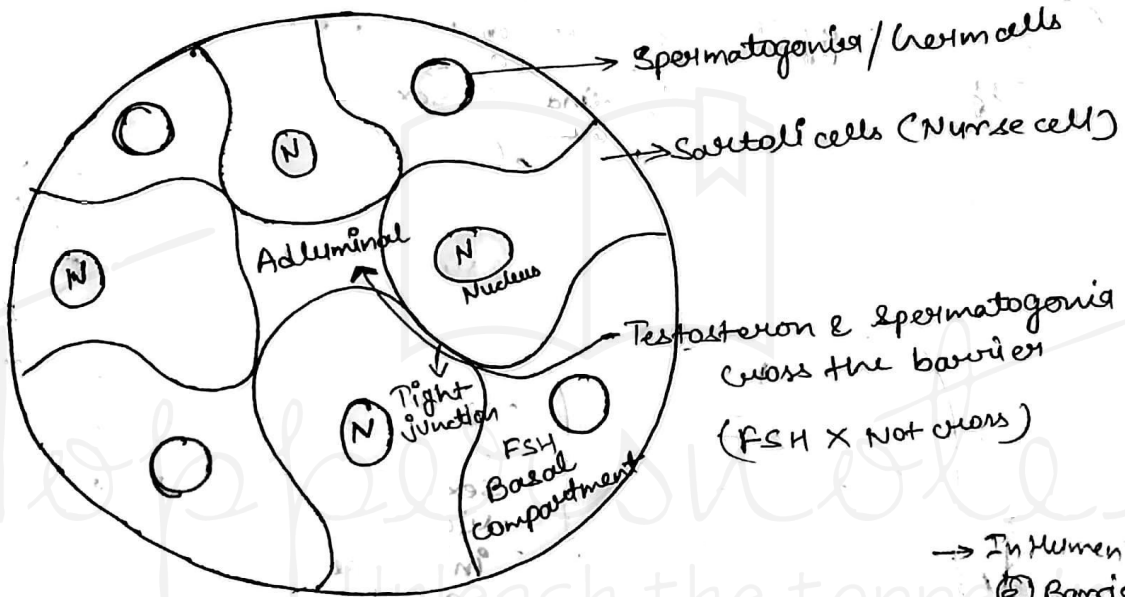
DEVELOPMENT BIOLOGY

Spermatogenesis



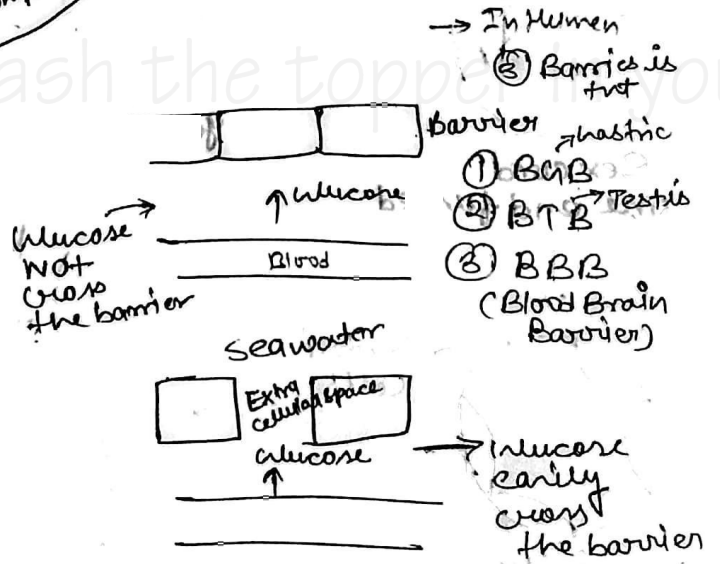
- Sex cell are endodermal in origin.
- Sex cells are originated from mid gut & hind gut junction.
- Sex cells fused to form sex cord.
- These sex cord migrate to future gonads & settled in future gonad after settlement sex cord hollow out to form seminiferous tubules.

★ Structure of seminiferous tubules :- Seminiferous tubules 2 type
 ① Sertoli cells
 ② Spermatogonia (germinal cell)

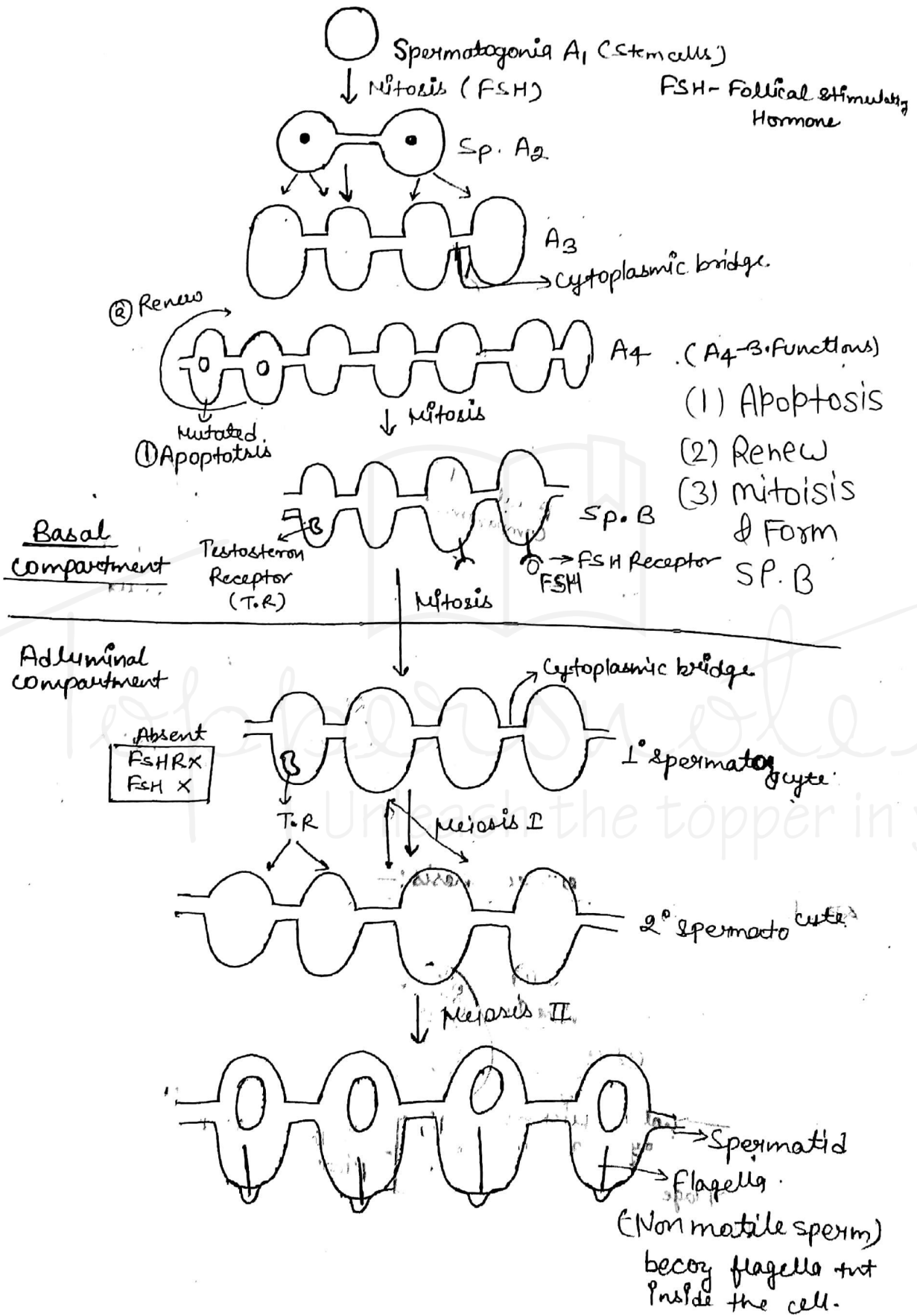


Adluminal = Meiosis
 Basal compartment = Mitosis

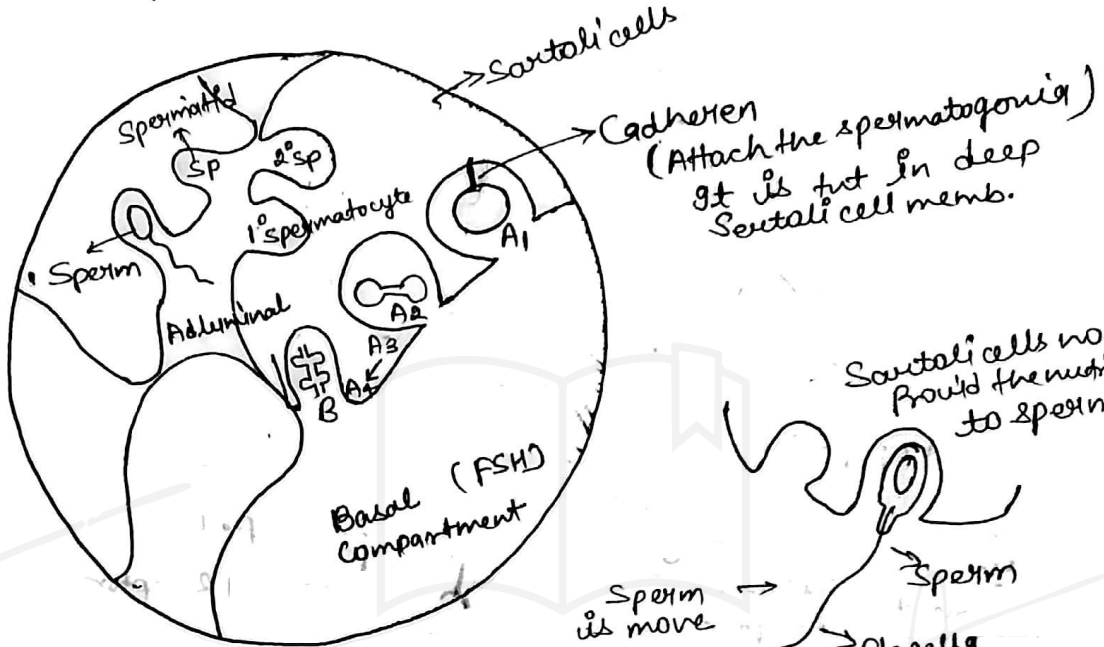
→ Sperm form both chamber
 ही बात है।



Nuclear Condensation :- The protamine protein is expressed in high amount in a spermatozoid. Protamine are rich arginine & has over 60% arginine residue. During nuclear condensation the histone are replaced by protamine. Protamine binds more tightly with DNA & make DNA more condense. Transcription off 15% gene is on

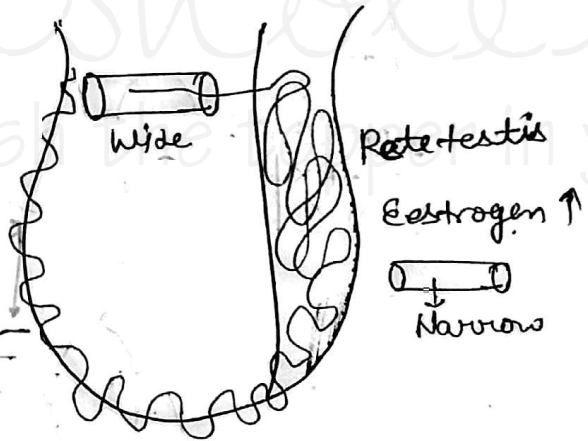


- The testosterone receptor start appearing in spermatogonia B.
- The spermatogonia A4 differentiated into spermatogonia B so during differentiation they on new set of genes.

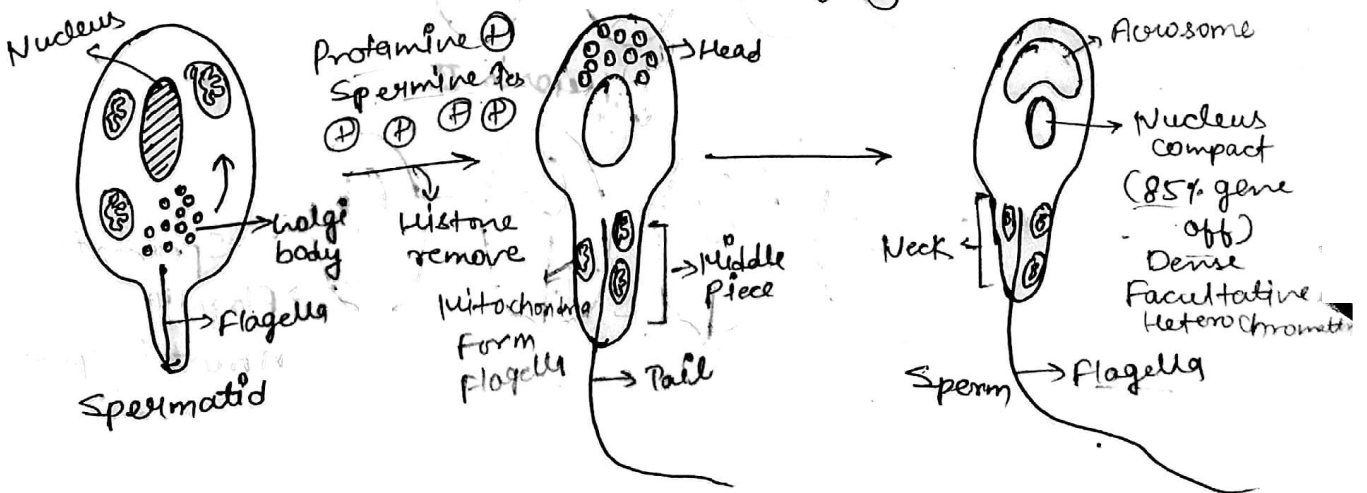


Sertoli cells not provide the nutrition to sperm

Sperm is move

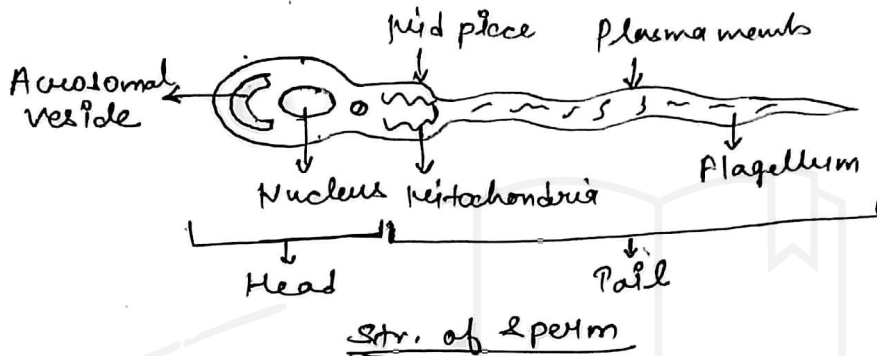


Spermatolysis / spermeogenesis!
Spermatid → Sperm



Formation of Tail :-

- One of the centrioles of the cell elongates to become the tail of the sperm. A temporary str. called the "Manchette" assists in this elongation. During this phase, the developing spermatozoa orient themselves so that their tails point towards the center of the lumen, away from the epithelium.
- Spermiogenesis is breaking the str. and bonds anchoring a mature spermatid to a Sertoli cell so the spermatozoon is released into the tubule lumen & can be washed out of the seminiferous tubule.

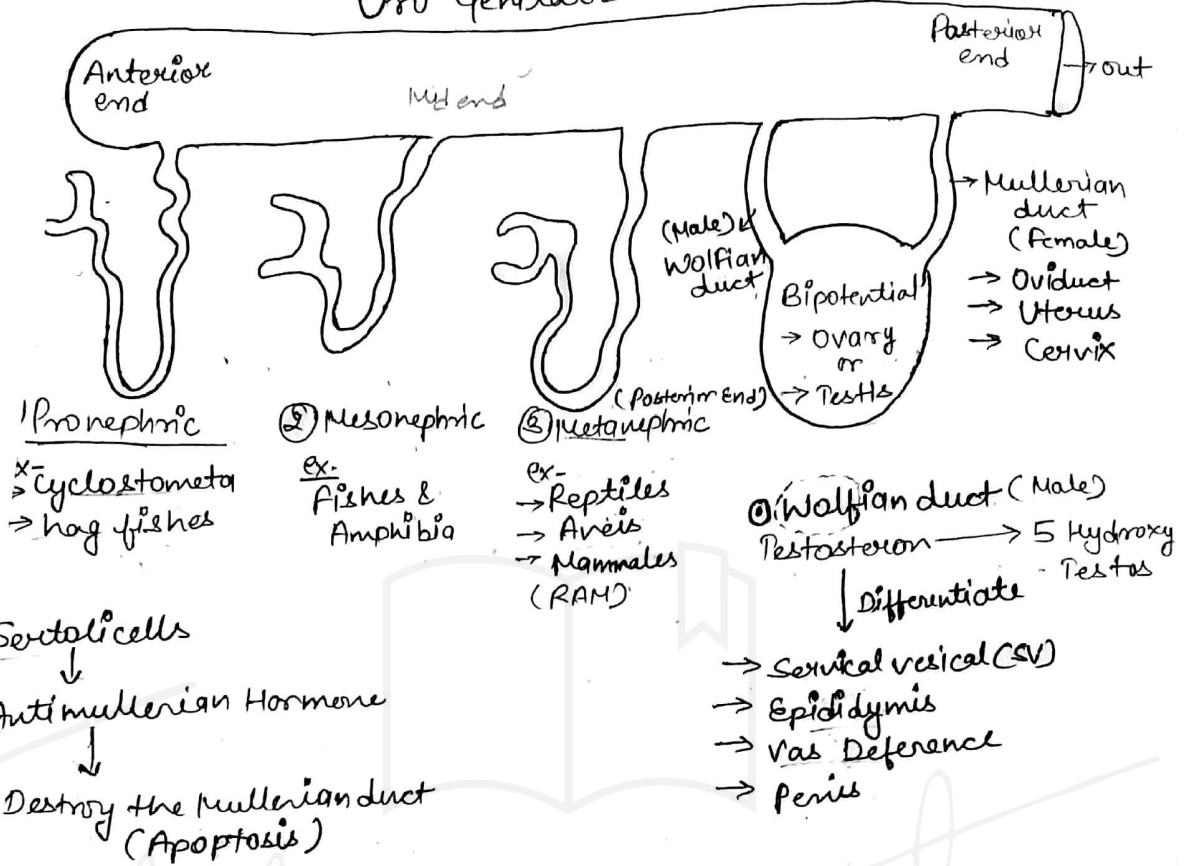


- Sertoli cells are required for male sexual development. During male development, the gene 'SRY' present on Y chromosome activates 'SOX9'; SOX9 activates fibroblast growth factor 9 (FGF9). The proliferation & differentiation of Sertoli cell is mainly activated by FGF9. The absence of FGF9 tends to cause a female to develop. Once fully differentiated, the Sertoli cell is unable to proliferate. Therefore once spermatogenesis has initiated, no more Sertoli cells created.

★ Leydig's interstitial cells :-

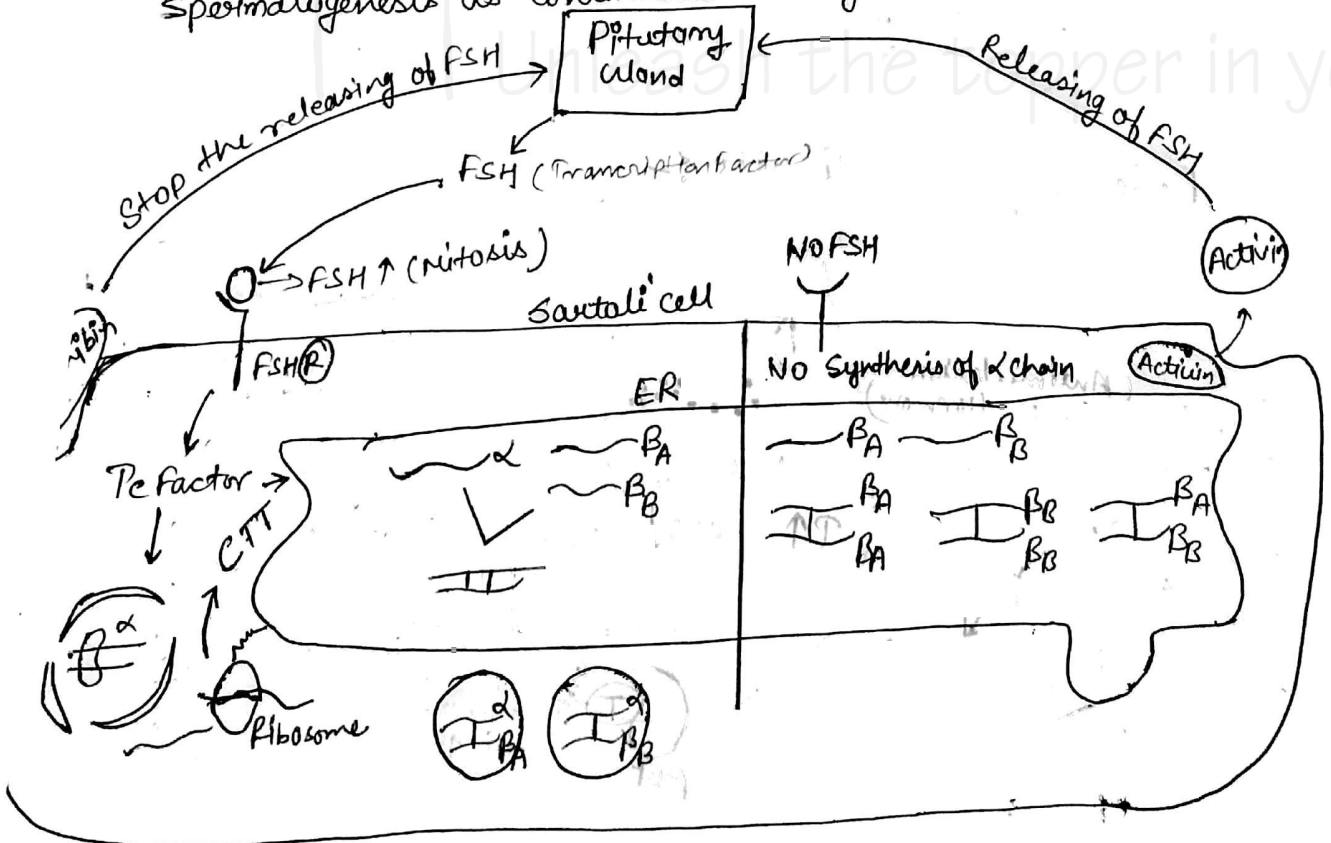
- Located b/w seminiferous tubules & act as endocrine cells which produce testosterone in the tute of luteinizing hormone (LH). Testosterone release into the blood.
- Leydig cells release a class of hormone called androgens (19-carbon steroids). They secrete testosterone, androstenedione and dehydroepiandrosterone (DHEA), when stimulated by the pituitary hormone luteinizing hormone (LH). LH has cholesterol desmolase activity (an enzyme associated with the conversion of cholesterol to pregnenolone), leading to testosterone synthesis & secretion by Leydig cells. Testosterone & LH initially act during embryonic development & later at puberty age after LH secretion from anterior hypophysis (pituitary). The testosterone secreted by these cells along with adrenal cortex initiates the maturation of sperm at puberty.

Uro Genital Duct



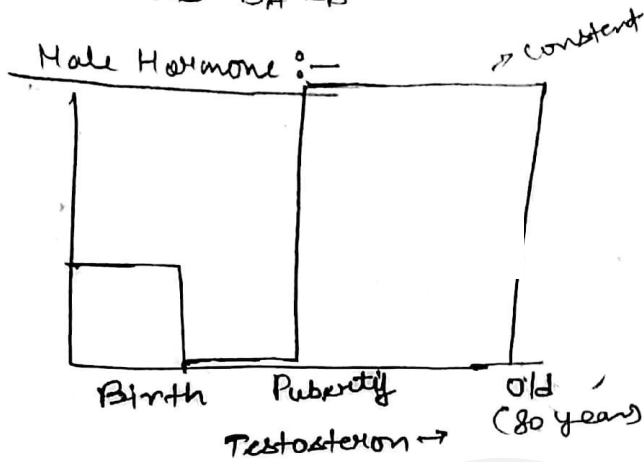
Regulation of spermatogenesis :-

Spermatogenesis is continuous but regulated process.

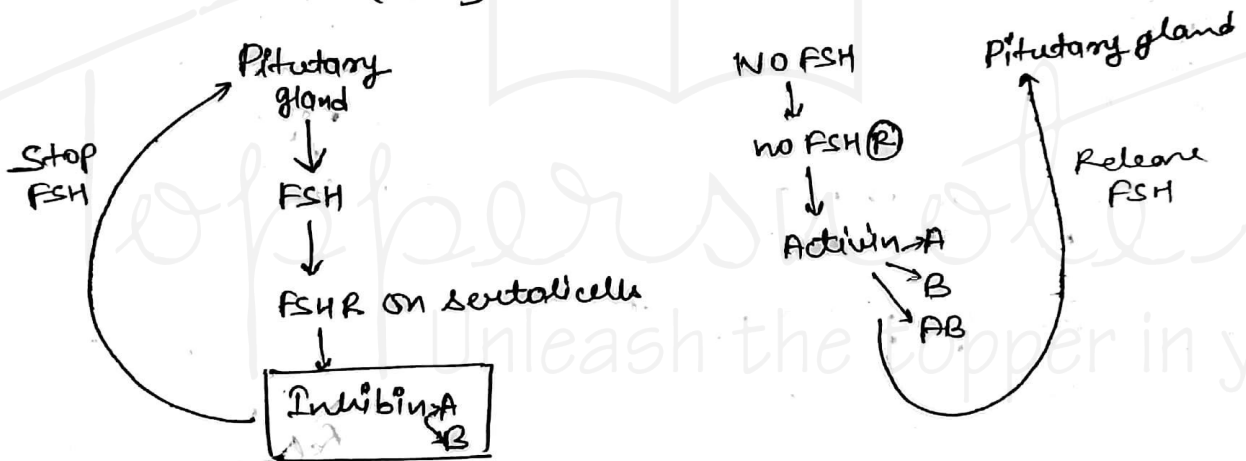


Activin - A - $\alpha_1\beta_1\beta_2$
 B - $\beta_1\beta_2$
 AB - $\alpha_1\beta_2$

Inhibin A - $\alpha\beta_1$
 B - $\alpha\beta_2$

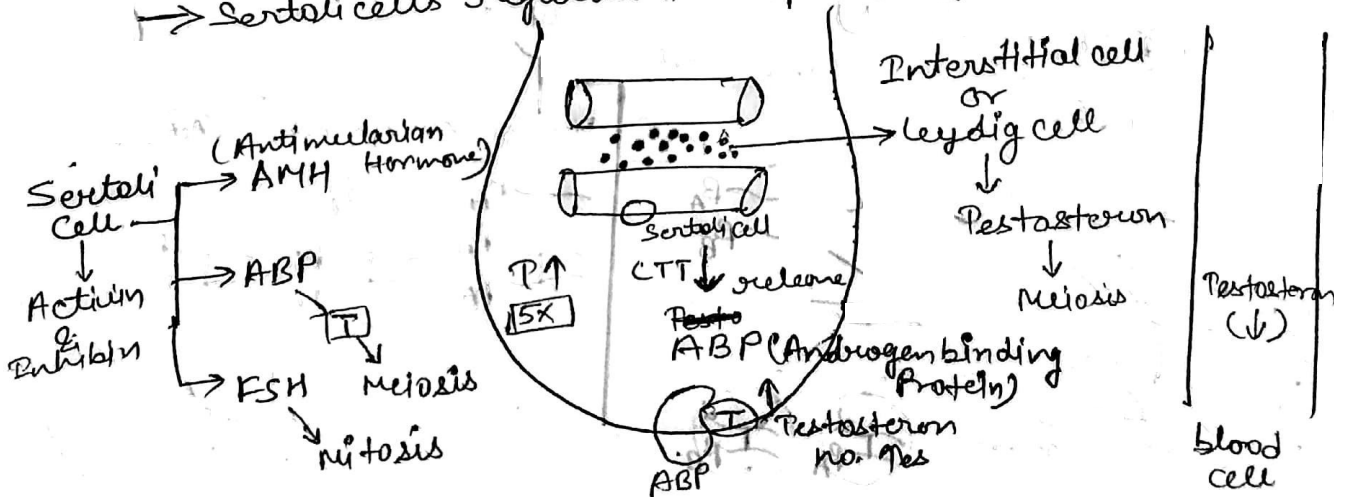


→ FSH is GPCR Receptor
 FSH(R) → ERK (MAPK) → Cell division

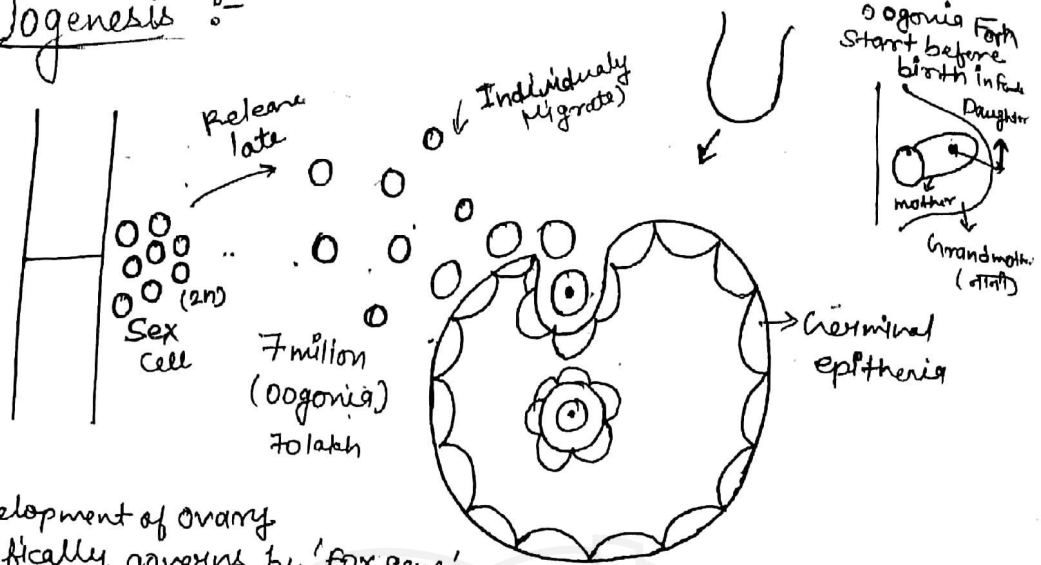


★ Role of Sertoli cells :-

→ Sertoli cells regulate the spermatogenesis



Oogenesis :-



- Development of ovary & specifically governs by 'fox gene'.
- Perinatal germ cells give rise to egg or ova.

Cell

Leydig cell

Sertoli cell

Graafian follicle

Corpus luteum

Hormone

Testosterone

Antimüllerian Hormone

FSH

LH

Progesterone Hormone

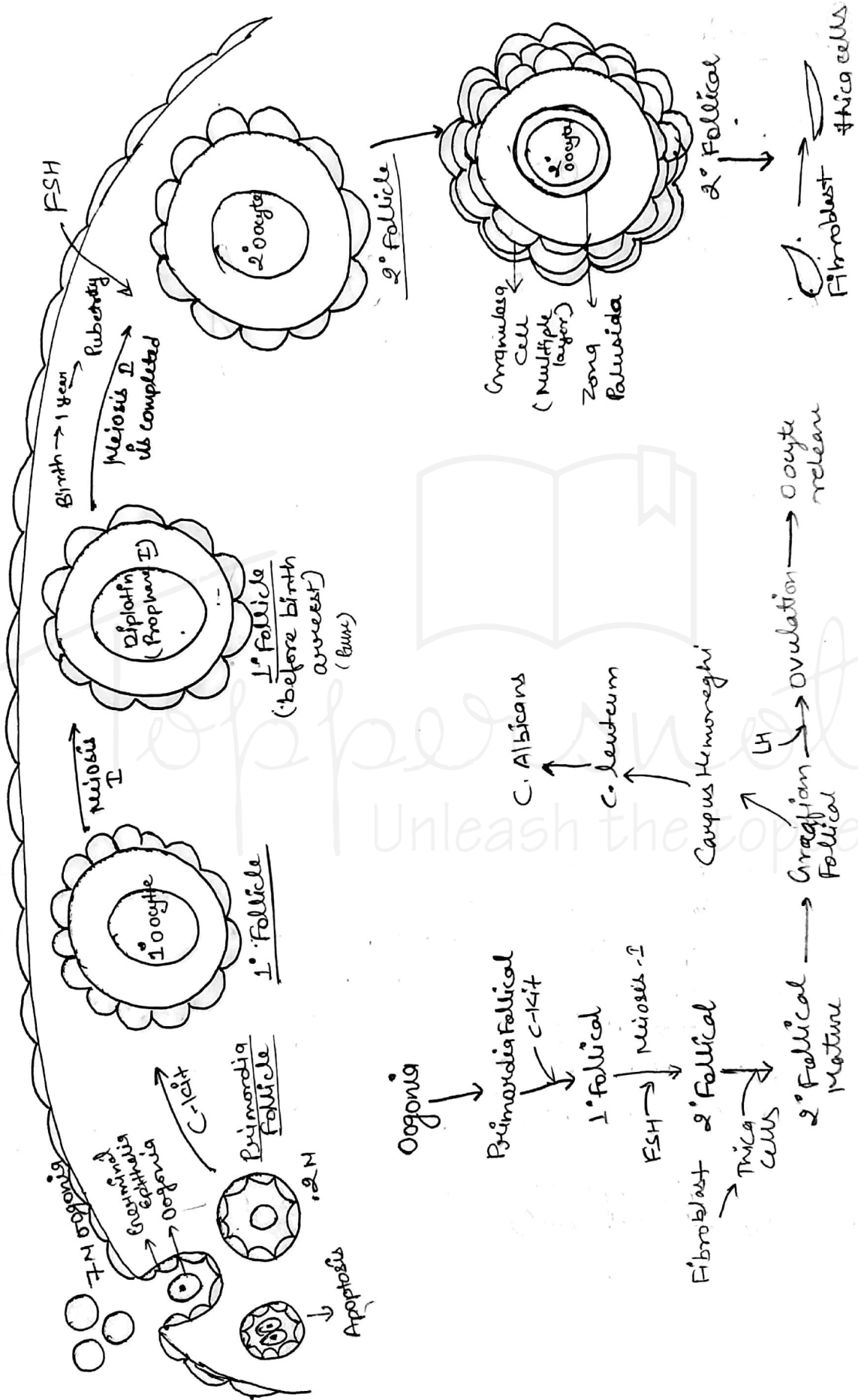
★ Acrosome Formation :-

→ The vesicle of golgi apparatus are merge & invert to form a cap in the most part of condensed nucleus that is known as acrosome.

→ It function as lysosome (containing enzyme like hyaluronidase & proteases)

tail = 9+2 axoneme.

→ Androgen binding protein (Testosterone binding globulin)
(1x testosterone concⁿ)

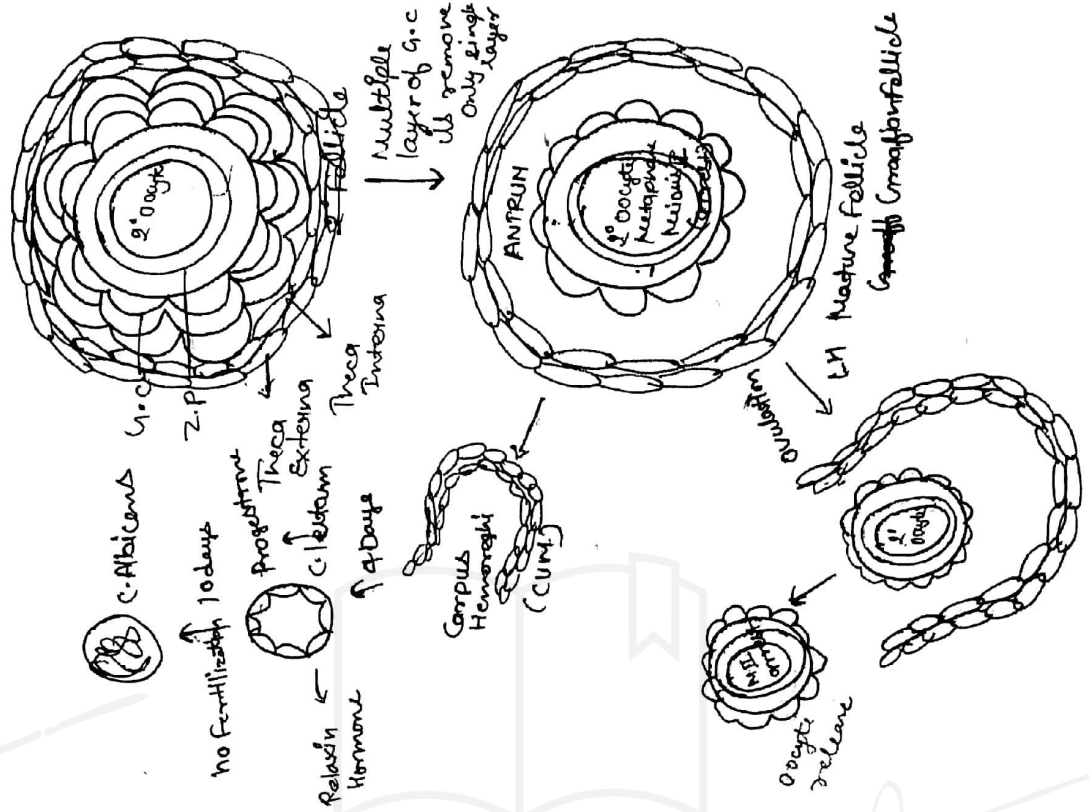


Cetexesia :- Death of ovarian follicles.

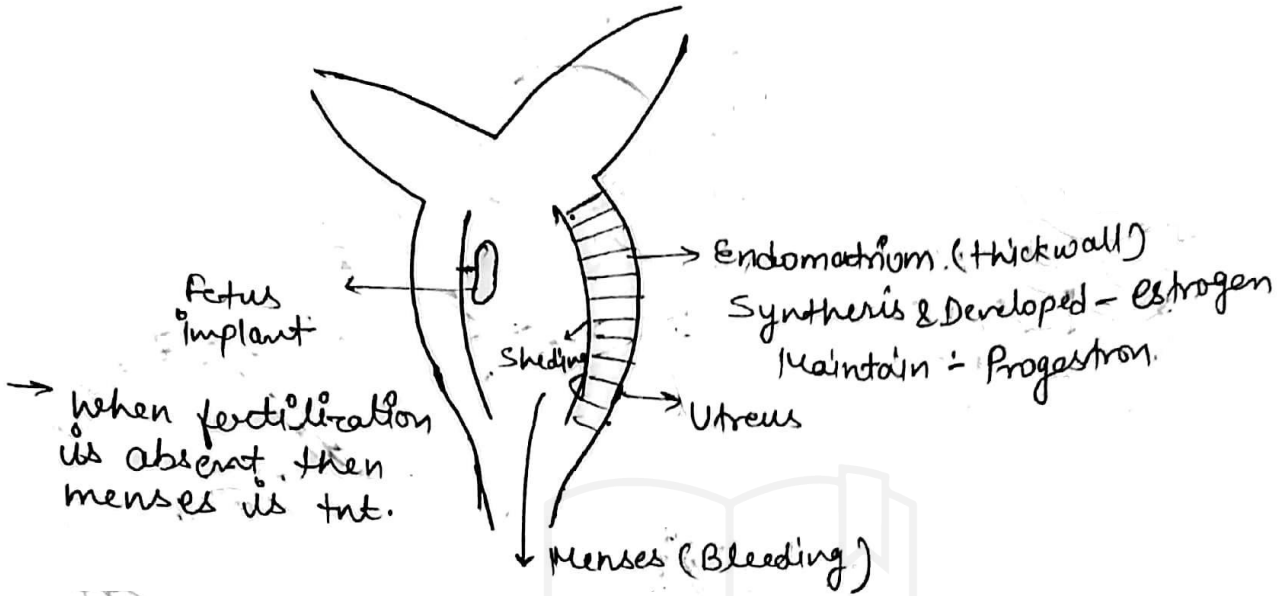
1° Follicular - arrest in Prophase - I Deplatin Stage

2° Follicular - arrest in meiosis - I Metaphase

- Ovary also acts as endocrine gland to release steroids, which is responsible for female secondary sexual characteristics & support pregnancy.
- Germinal epithelium aka Tunica albuginea which is made up of connective tissue elastic fiber & collagen.
- The theca interna are the major source of androgens hormone.



★ Menstrual cycle :- (28 Days)

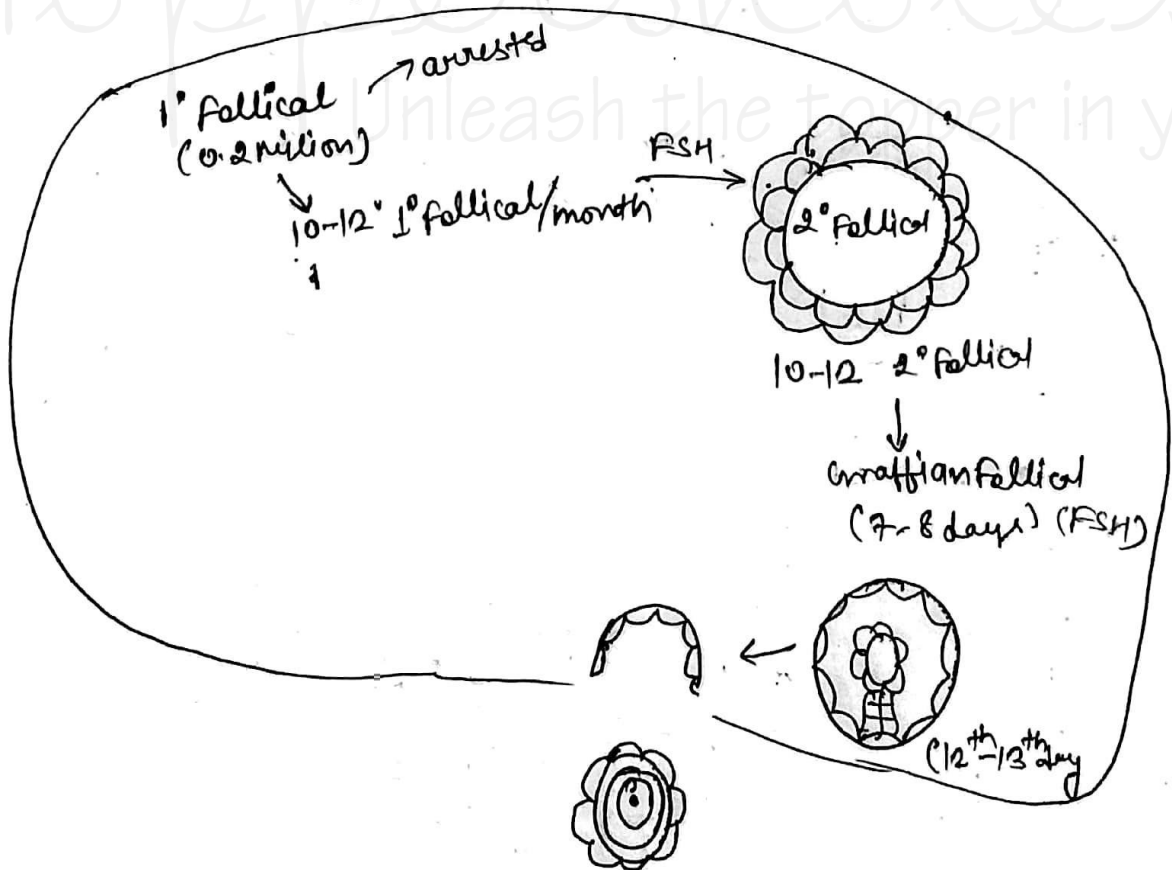


→ when fertilization is absent, then menses is int.

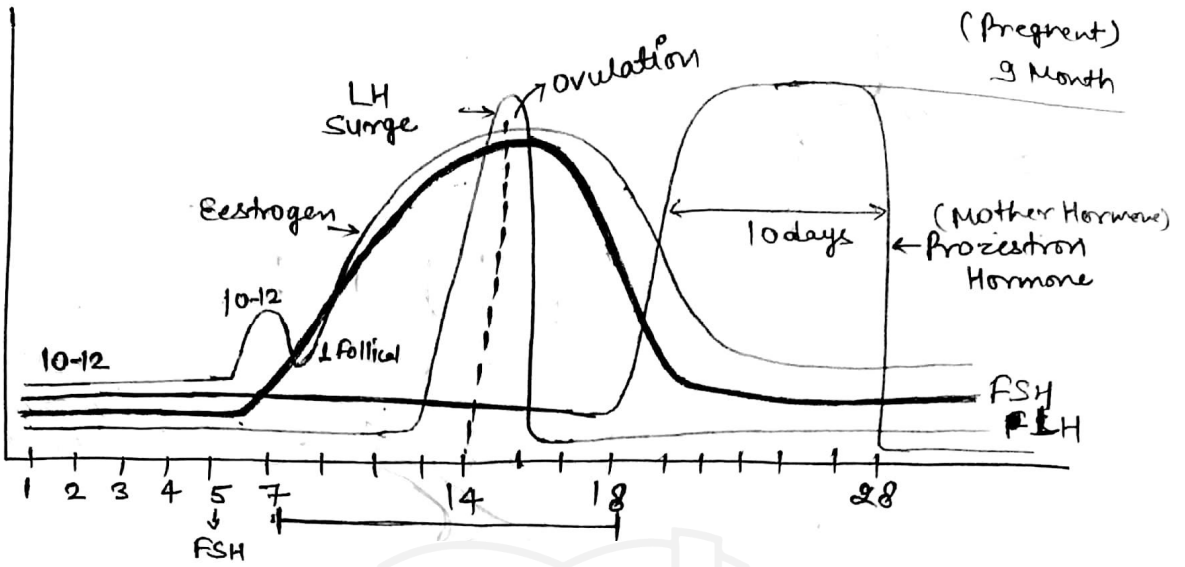
egg size = 100µm

28 Days 1 egg is form

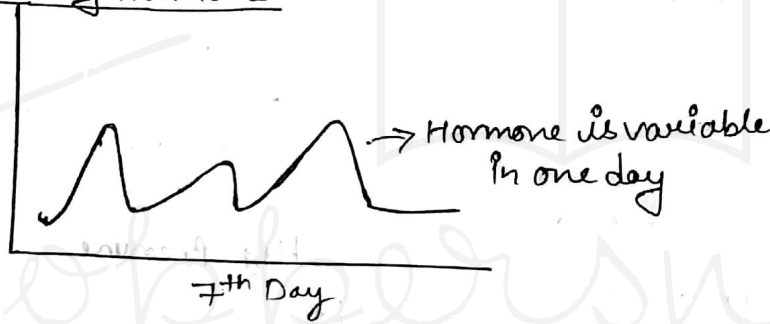
Life- egg = 1 day
Sperm = 1-3 days



Hormones in menstrual cycle :-

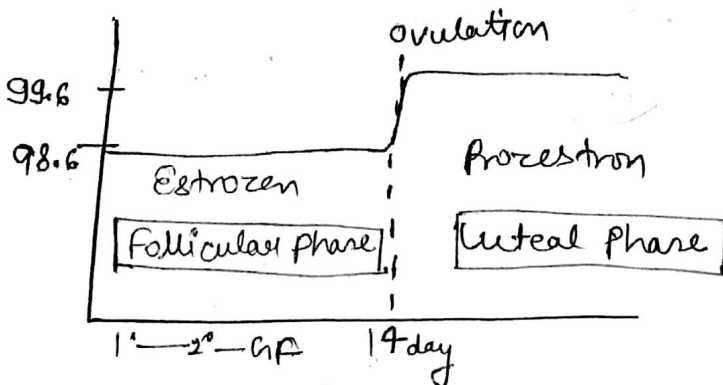


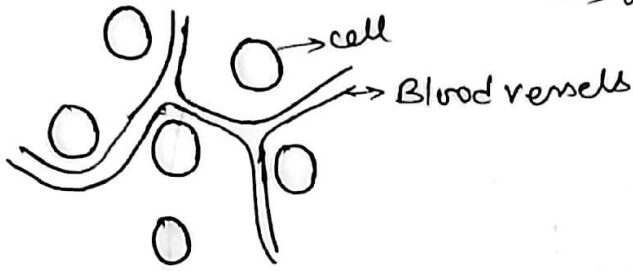
One Day Hormone



6
menses 1 day
start hot 14
day 14th day
or ovulation
hot 14

- Every month 10-12 1° follicles are selected remaining. Undergo apoptosis. Apoptosis process is known as Atresia.
- selection is based upon location. These 1° follicles which are not at the periphery of ovary are selected.
- Normally Body temp 98.6 होता है but after ovulation it up होता है तो women body temp 99 हो जाता है

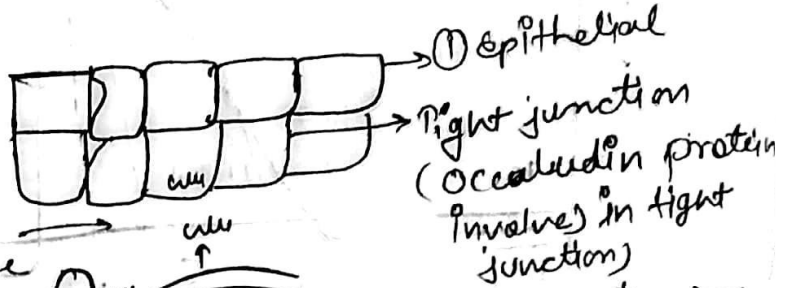




→ all cells के बीच gap होता है
जिसमें Blood vessels फिट
होती है जो cell को Nutrition
Provide करती है।

→ Sertoli cells
Form the tight
junction with
each other to
form blood-
testis barrier
This protect
spermatoid from
the immune system
of male.

Very low
concn glucose
is but

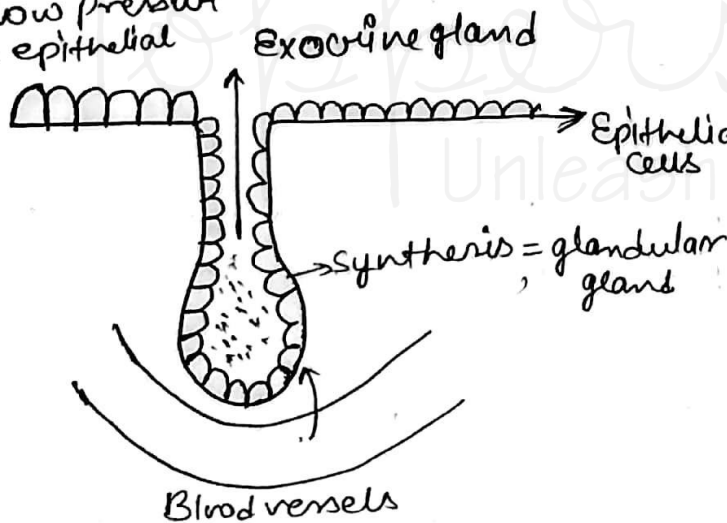


→ जब cells के बीच
में gap absent होता
है तब इसमें Blood
vessels नहीं होती है
और वो Dead हो जाती है

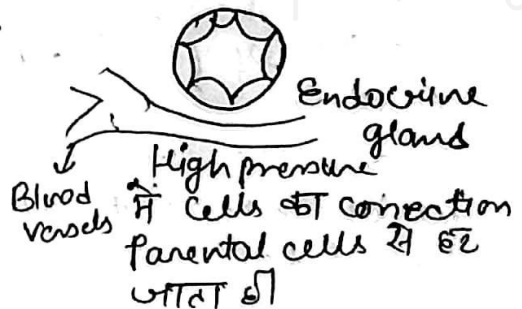
② Connective
Tissue

→ इसलिए all epithelial
के नीचे Connective tissue
हूँ होता है।

low pressure
on epithelial



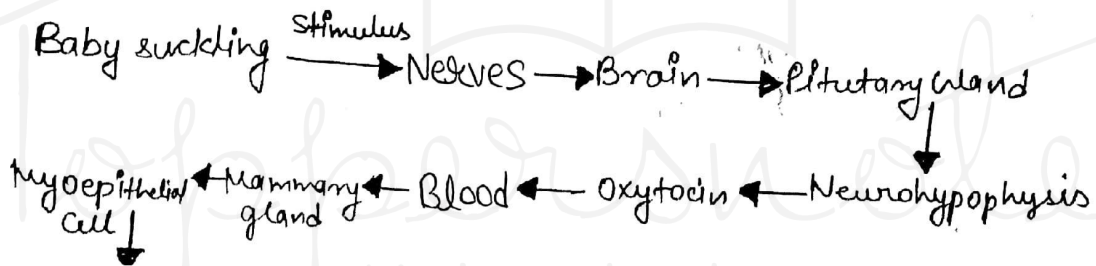
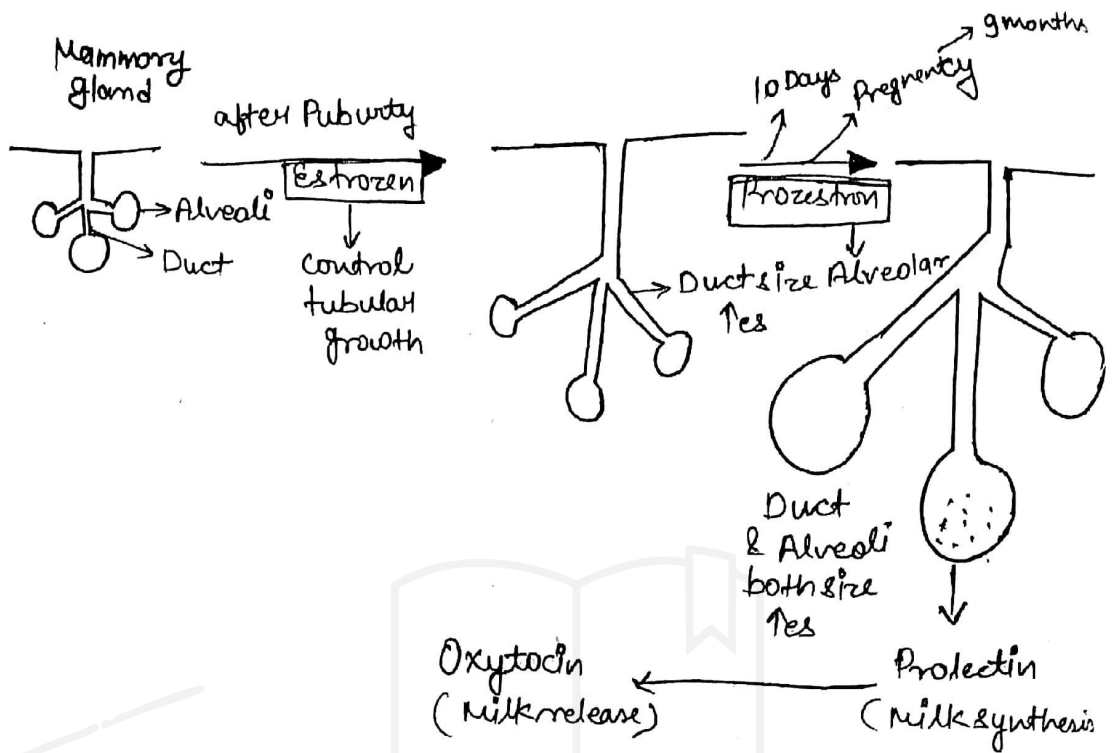
High pressure



4 type Tissue

- ① Epithelial
- ② Connective tissue
- ③ Muscular
- ④ Nervous

→ all glands are formed by
epithelial cells / tissue.



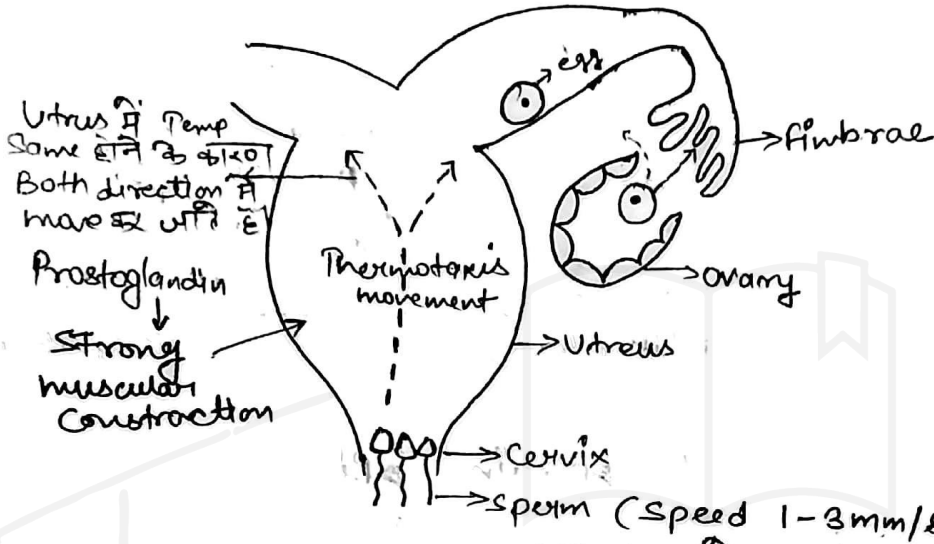
Occludin Protein → Tight Junction

Fertilization

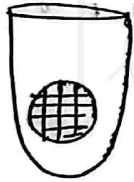
2 type -

- ① External
- ② Internal

Internal Fertilization -



→ Sperm की mostly 7 days egg तक पहुँचने में लगते हैं But sperm life 3 days होती है इसलिए Thermotaxis movement के द्वारा ½-1 hour में egg तक पहुँच जाते हैं।



Prophoblast (IVF)
In-vitro fertilization

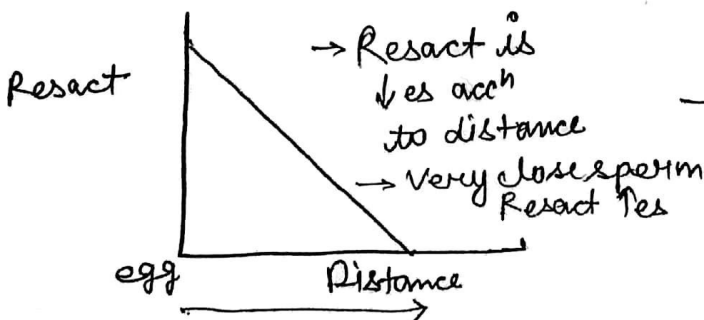
External fertilization :-

→ Sperm & egg both in external environment like-water.



→ Species specificity is not

In sea urchin :-



→ Resact is chemical so it is chemotactic movement
→ In thermotaxis movement temp is require