NCERT/STATE BOARD

CRASH COURSE

NEET/CET 2020-21

UNIT VI

REPRODUCTION

Chapter 3 (Part I)

Human Reproduction

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BIOLOGY EXPERT

MALE REPRODUCTIVE SYSTEM CONSIST OF

PRIMARY SEX ORGAN

The organ where gametogenesis take place.

e.g. TESTIS

SECONDARY SEX ORGAN

It consists of duct or pipe which help in transport of gamete outside the body.

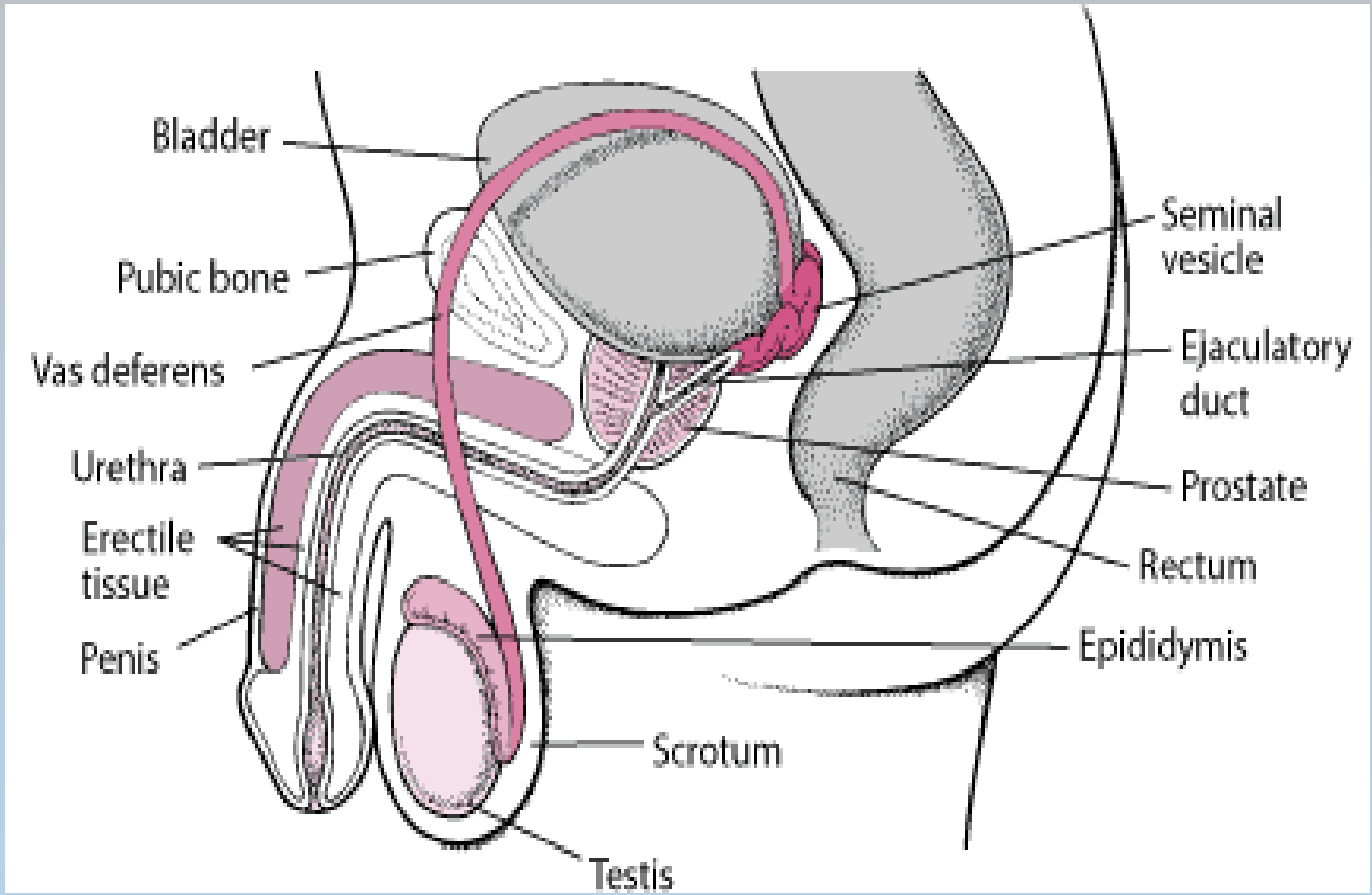
e.g. Vas Deference, Vas Efferentia, Penis etc.

ACCESSORY SEX ORGAN

It consists of GLAND which provide nutrition to the gametes.

e.g. Prostate gland, Seminal vesicle.

MALE REPRODUCTIVE STRUCTURE



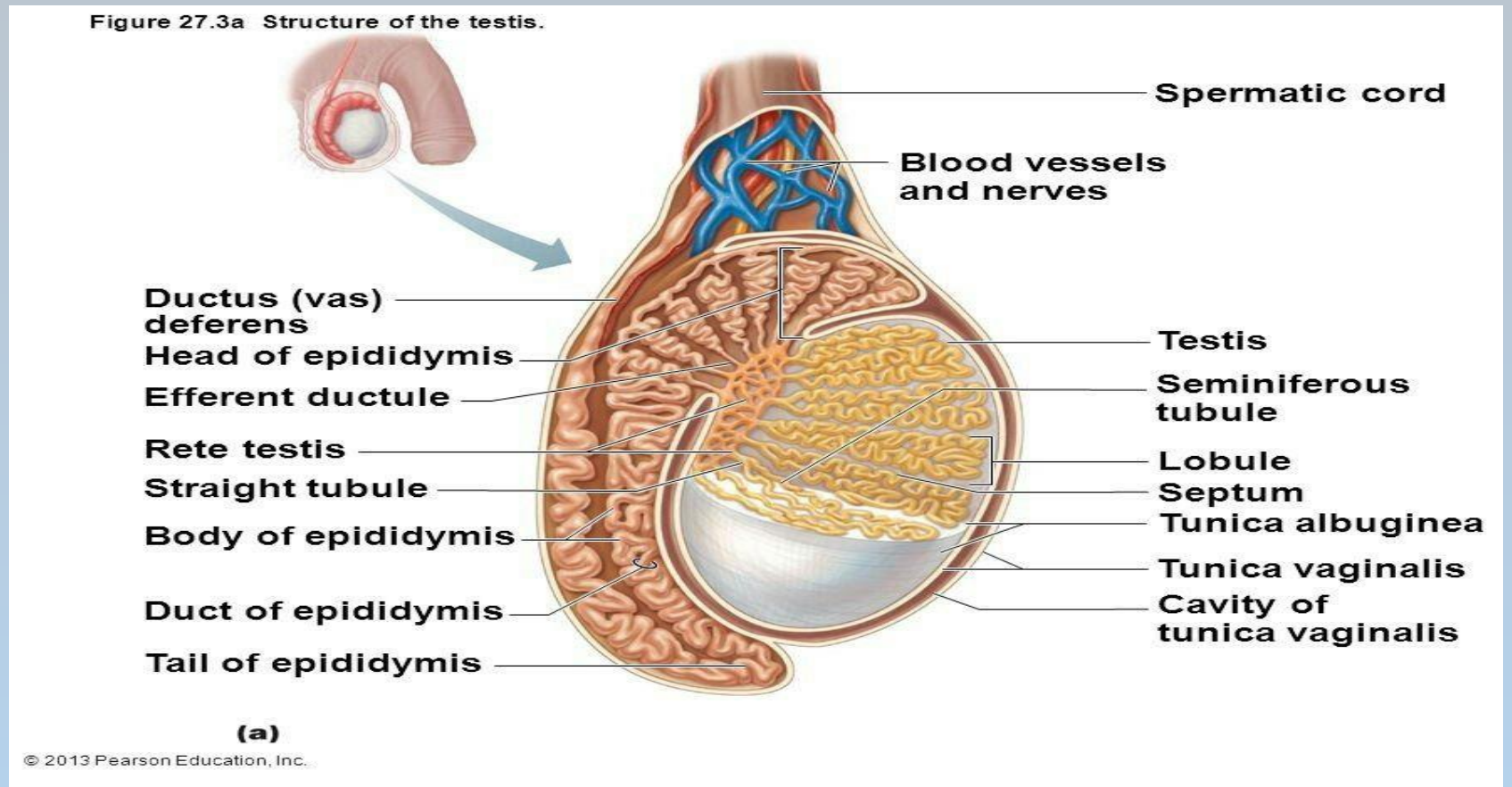
SCROTUM

IT IS A POUCH OF DEEPLY PIGMENTED SKIN DIVIDED INTO TWO SEPARATE SACS

- Each sac contains one testis.
- The normal temperature of the testis in scrotum is about 2^{o} - 2.5^{o}C lower than the internal body temperature.
- This temperature is ideal for development of sperm.
- Inner side of scrotum having “Dartos muscle” which help descending & ascending of testis in scrotum.

TESTIS

- Testis are primary sex organs in man.
- During early foetal life the testis develop in the abdominal cavity just below the kidney they descent into the scrotum.
- Cord like structure arises called Gubernaculum.



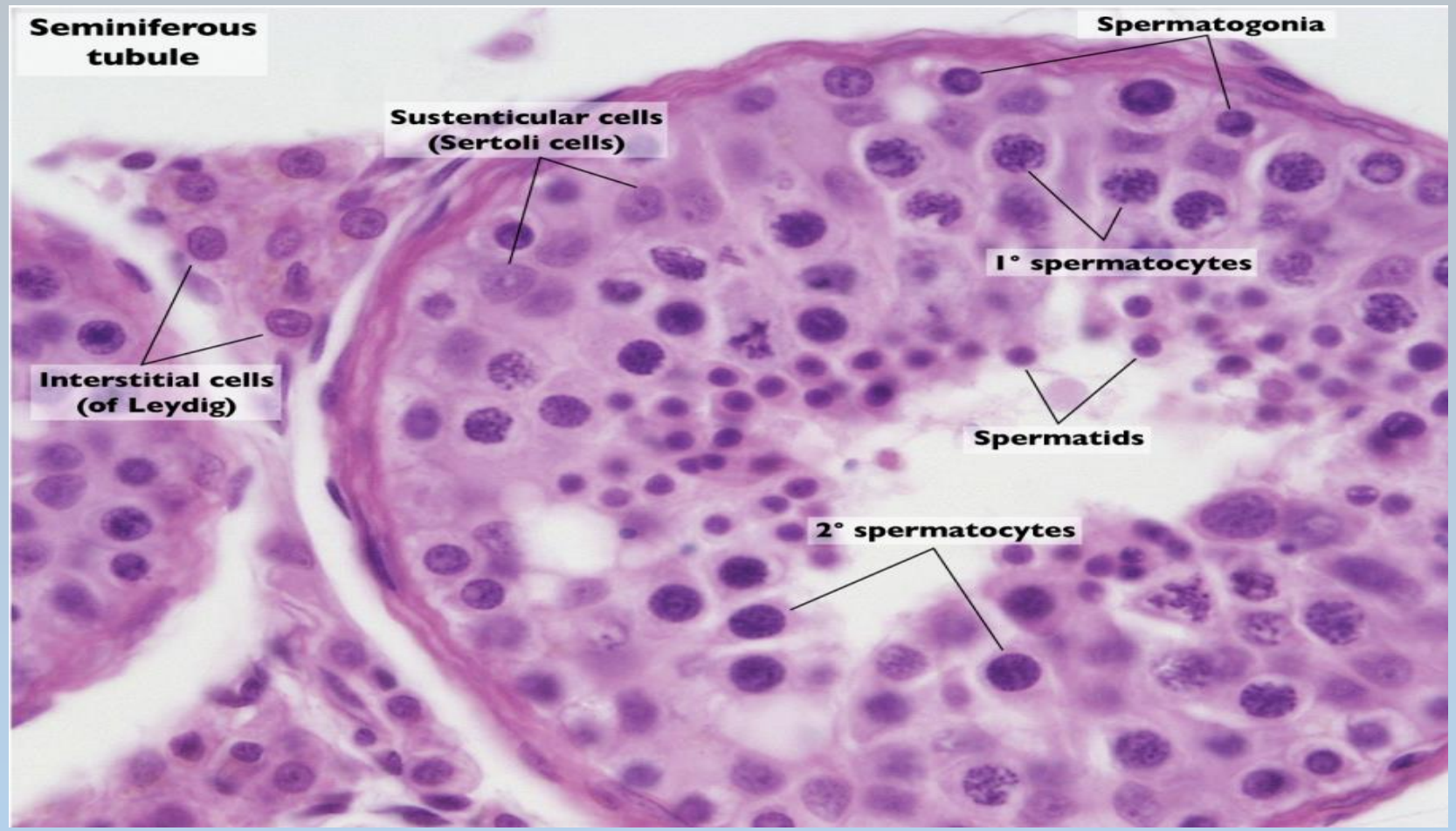
SEMINIFEROUS TUBULES

- 900 in each testes.
- Wall of each seminiferous tubules is formed of a single layer of "Germinal Epithelium".
- Majority of cell in this Epithelium are cuboidal called "male germ cell(Spermatogenesis).
- During puberty – FSH secret from pituitary gland – act on spermatogonia – spermatogenesis.

RETE TESTIS

- It is union of seminiferous tubules.
- Transport sperm from seminiferous tubules to the vas efferentia.

- **Sertoli cell(nurse cell) –** Provide nutrition to the sperm.
- **Interstitial cell(leydig cell)** – Secrete "testosterone" (Androgen).



LEYDIG CELL / INTERSTITIAL CELL

- This cell secrete androgen or testosterone (male sex hormone).
- Important for maintain secondary sexual characters & help in spermatogenesis.

SERTOLI CELLS

- They provide nutrition to the growing sperms.
- They produce “fluid” for easy transport of sperms.
- They secrete two hormones a) Inhibin b) MIH(Mulerian Inhibiting Hormone).
- Inhibin supress the FSH function.
- MIH this is present in male – inhibit the Mulerian duct – unable to formation of uterus in male.

1. Sertoli cells are found in.

    a. Ovaries & secrete progesterone

    b. Adrenal cortex & sec. Adrenaline

    c. Seminiferous tubules & provide nutrition to the germ cell

    d. Pancreas & secrete cholecystokinin.

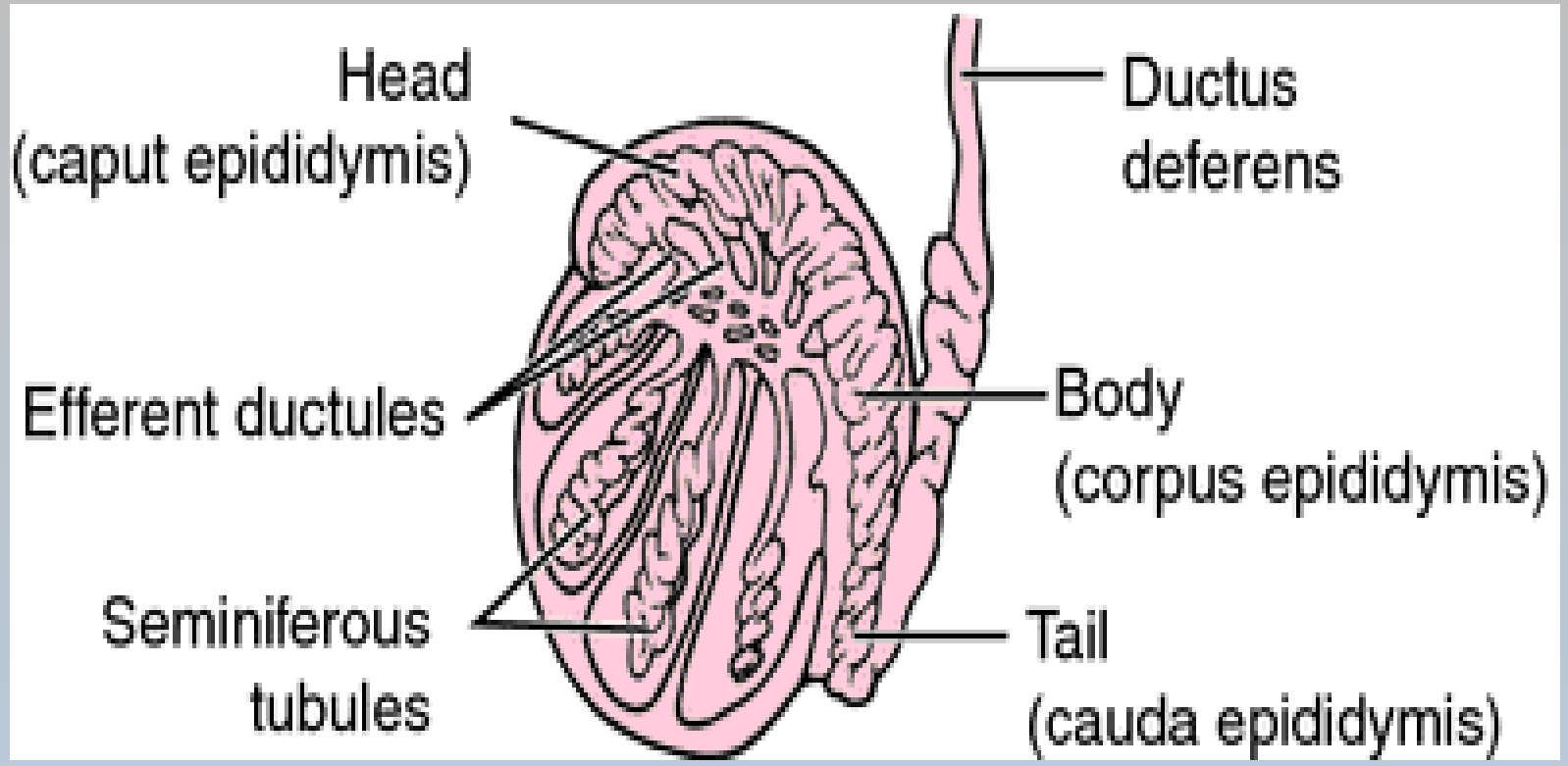
2. Vasa efferentia are duct leading from

    a. Testicular lobules to rete testis b. Rete testis to vas differentia

    c. Vas deference to Epididymis d. Epididymis to urethra

EPIDIDYMIS

- Highly coiled tubules.
- Approx. 6m in length.
- Divides in 3 parts.
- Sperm gain motility in epidermis.
- If the sperm are not ejaculated, then epidermis reabsorb back.



Caput Epidermis	Corpus Epidermis	Cauda Epidermis
Head Part	Middle Part	Posterior part

VAS EFFERENTIA:

- It carry spermatozoa from rete testis to the epididymis.
- They arises from rete testis.

VAS DEFERENCE:

- They arises from cauda part of epididymis.
- Vas deference enter into abdominal cavity through spermatic cord.

EJACULATORY DUCT / URINOGENITAL DUCT:

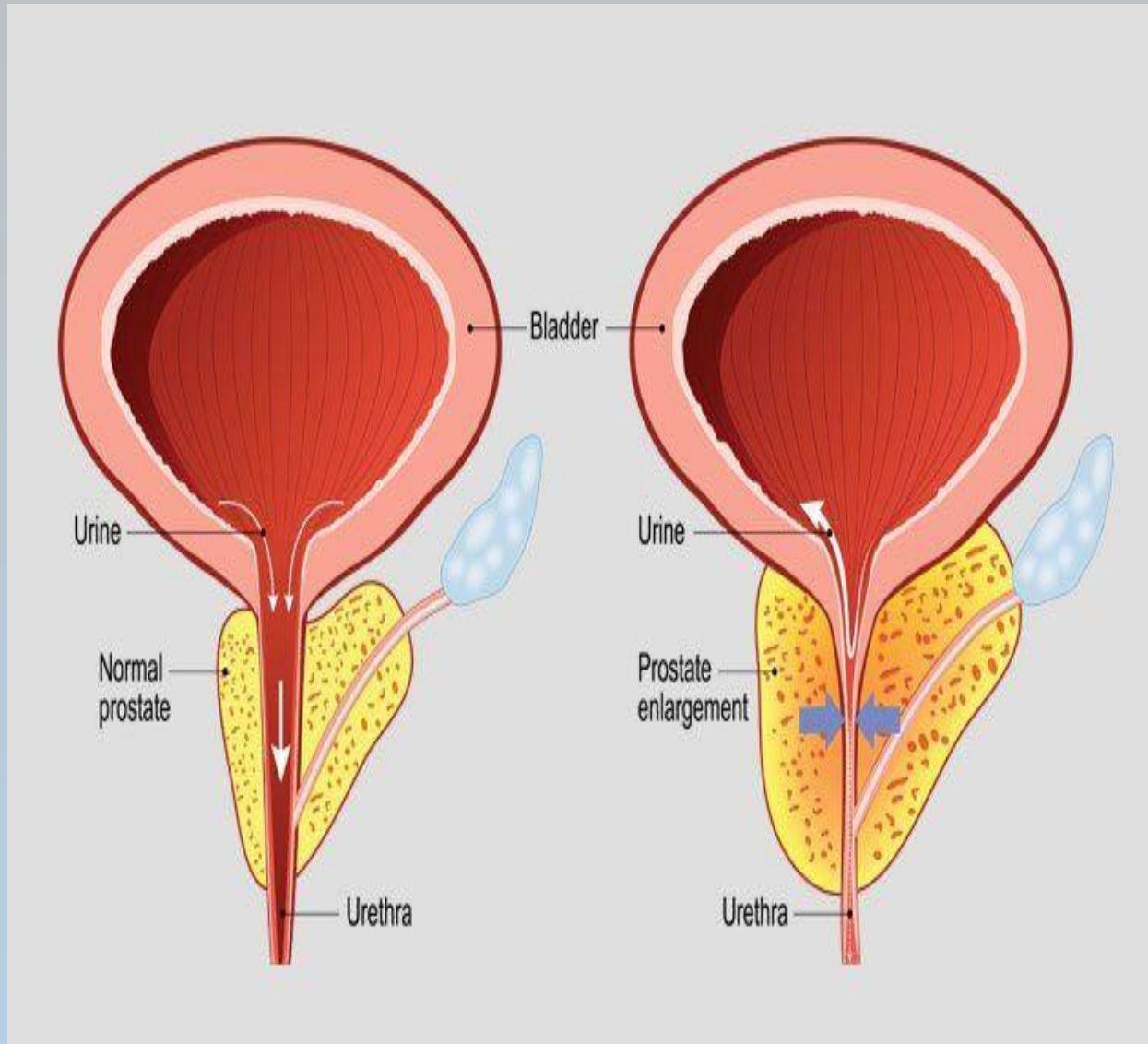
- Carry sperm
- Arises from ampulla to the glans penis.

SEMINAL VESICLE

- Utriculus vesiculus – one pair.
- It does not store sperm.
- It form 70% part of semen
- The secretions of these gland constitute the seminal plasma which is rich in fructose, calcium & certain enzymes.
- It secrete fructose – Energy source for the sperms.
- Fructose is species specific.
- Fructose found in only sperm & not present any where else in the body secretion.
- Fructose help in identified RAPE VICTIM.

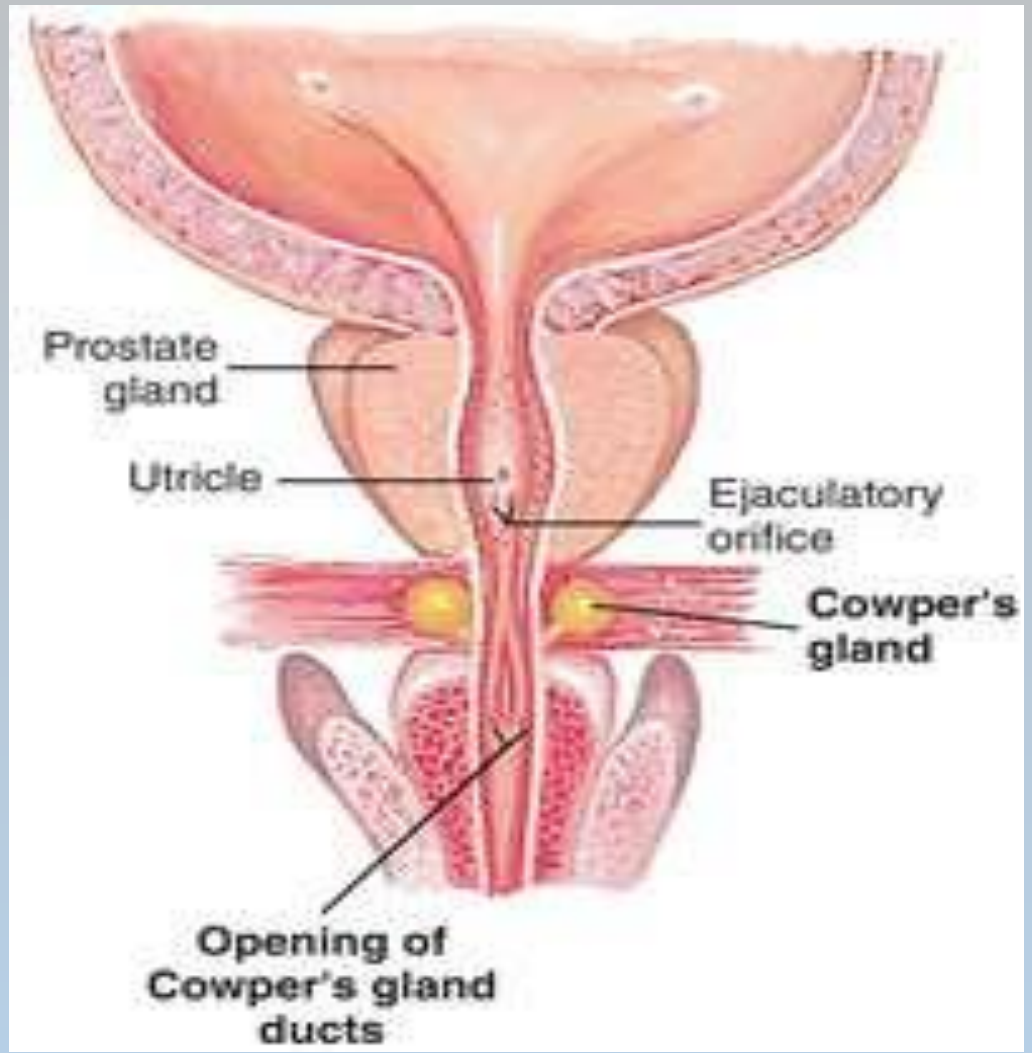
PROSTATE GLAND

- Single large accessory gland surrounded by urethra.
- It secrete milky fluid that contain citric acid, prostaglandin & acid phosphatase.
- It provide nutrition & activate the sperm to swim.
- With the increase age, the shape & size of prostate gland will be increases.
- BPH – Benign Prostate Hyperplasia.
- Cancerous condition in which size of prostate increases.



COWNPERS GLAND/BULBO URETHRAL GLAND

- Paired gland situated on the either side of urethra.
- They secrete “alkaline fluid” which neutralized the acid of urethra before ejaculation of semen, since sperm are active in alkaline median only.
- They also secrete “mucus” that help in lubrication of penis.



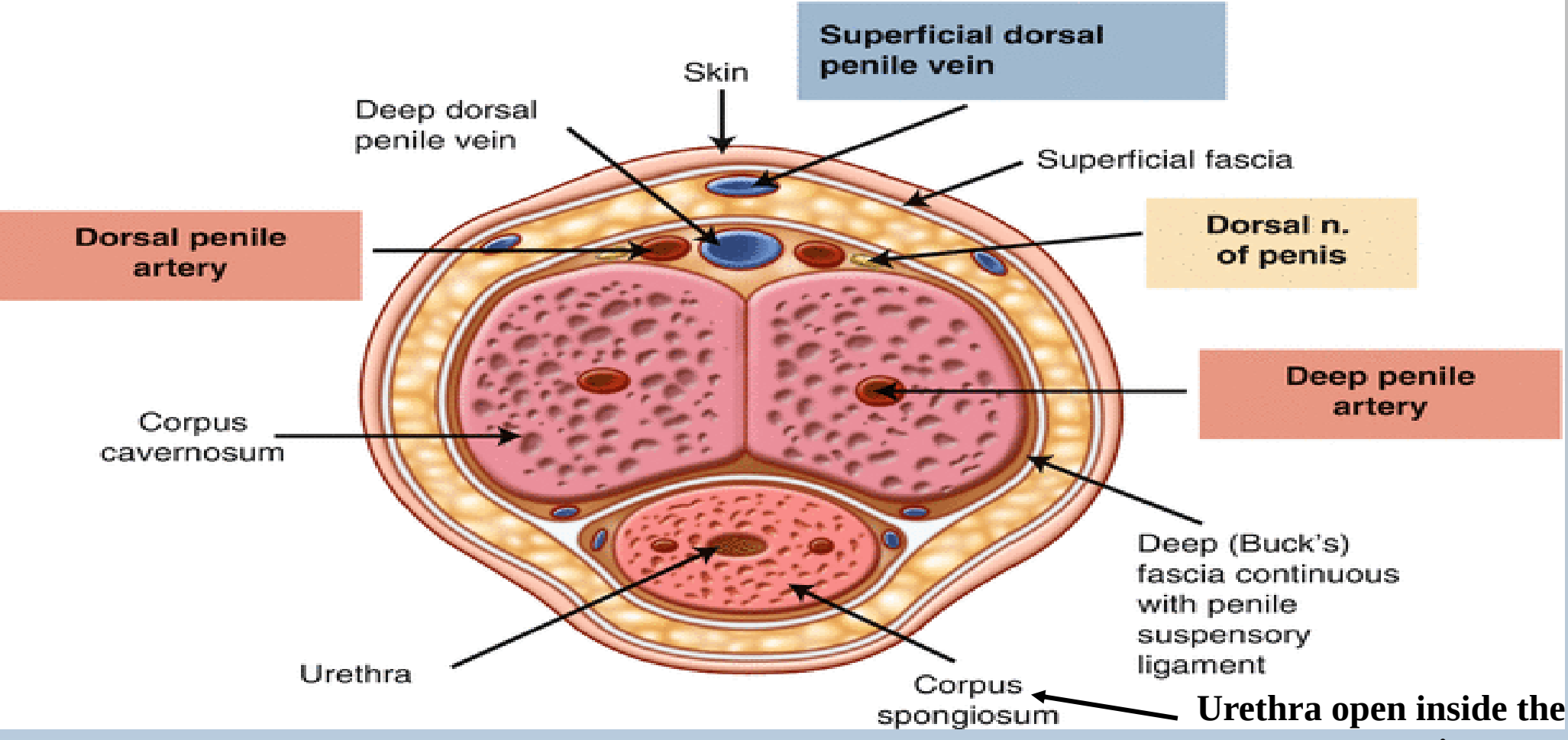
- **NOTE: Bulbo urethral gland secrete some amount of sperm before final ejaculation, that’s why High Failure Rate of withdrawal method of Birth Control.**

PENIS

- It is ejectile copulatory organ meant for deposition of sperms in VAGINA & discharge urine from the body.
- It consist of long shaft that ends in swollen tip known as “Glans Penis”.
- Glans penis covered with fold of skin called Prepuce or Foreskin.

- PARASYMPATHETIC NERVOUS SYSTEM CAUSES
  1. Increase supply of blood into the shaft of penis/muscle of penis.

ERRECTION OF PENIS TAKES PLACE



1. Secretion from which one of the following are rich in fructose, calcium & some enzymes.

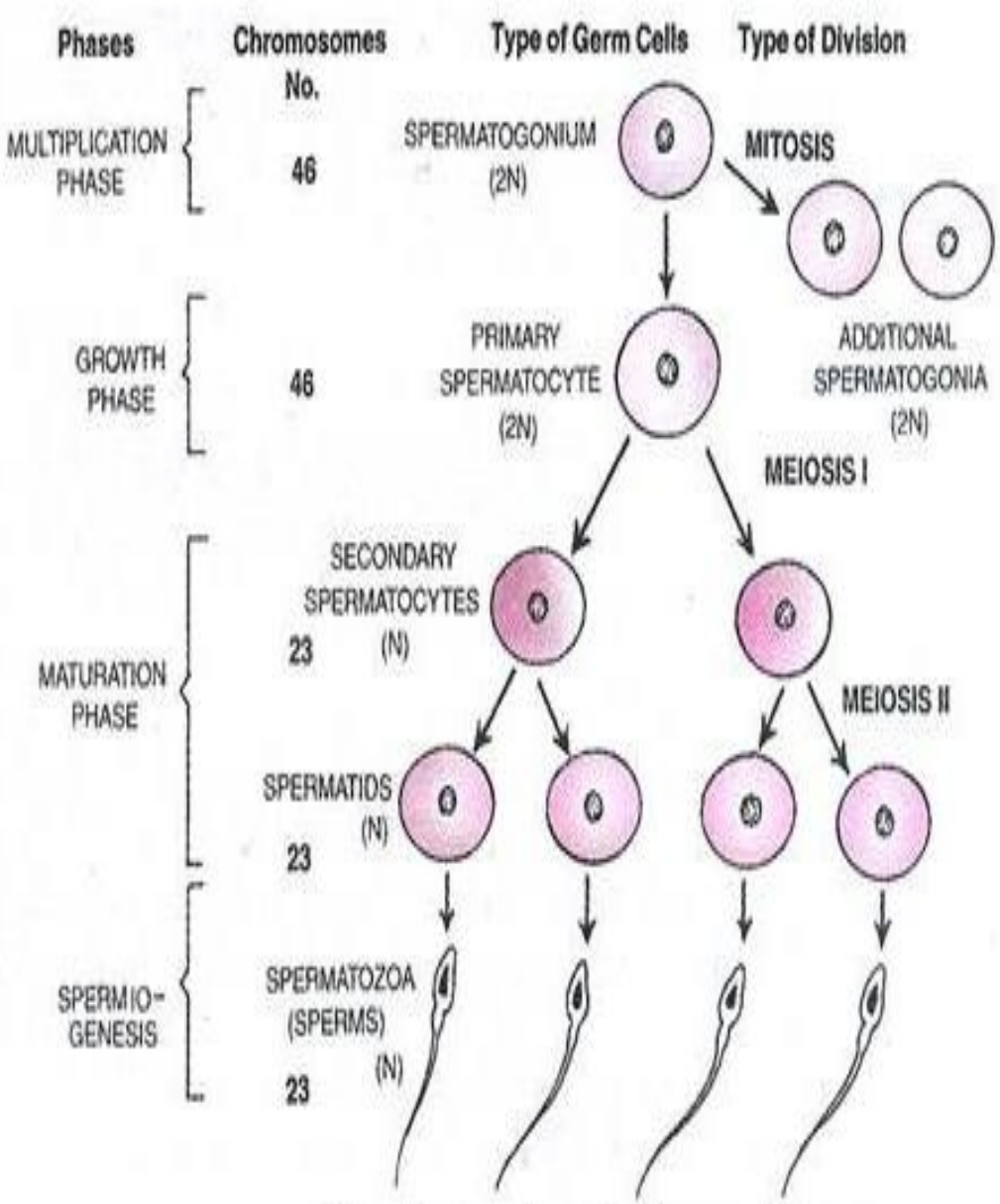
   a. Male accessory glands b. Liver c. Pancreas d. Salivary gland

GAMETOGENESIS

- It is the process of formation of male & female gamete.
- Male gamete consist of sperm & female gamete consist of “OVUM”.

SPERMATOGENESIS

- The process of formation of sperms is called spermatogenesis.
- It occur in seminiferous tubules of the TESTES.
- Vitamin ‘A’ & ‘E’ are necessary for normal spermatogenesis.
- It start at puberty.
- At puberty, spermatogonia or male germ cells induces form FSH.
- Spermatogonia converted into primary spermatocyte by the help of 1st meiotic division.
- Primary spermatocytes converted into secondary spermatocytes & finally form spermatid.
- Rounded spermatid differentiated into flagellated sperms.



Stages in spermatogenesis (diagrammatic).

SPERMATOGONIA

46 — Mitosis differentia

PRIMARY SPERMATOCYTES

23 — 1st meiotic division

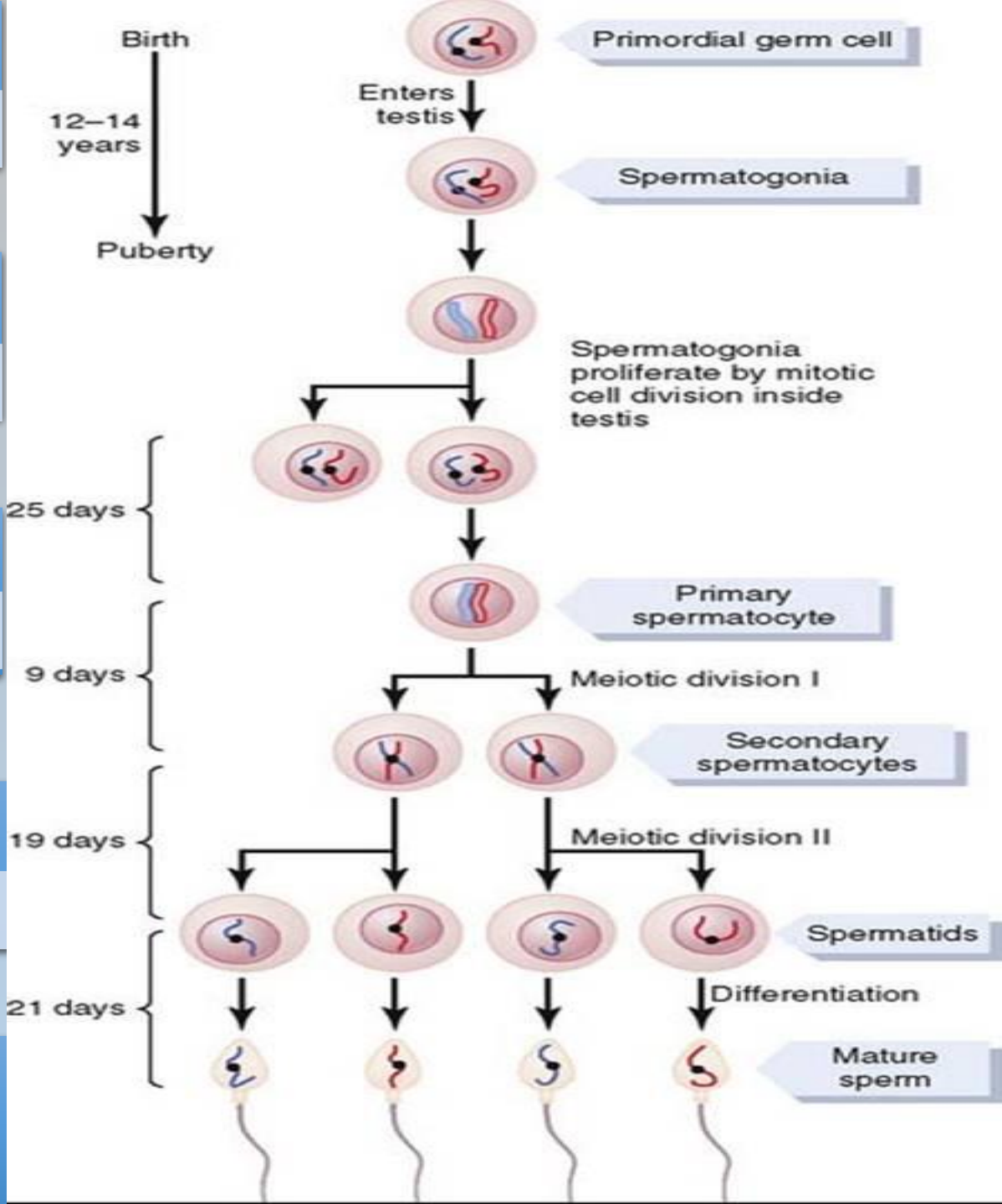
SECONDARY SPERMATOCYTES

23 — 2nd meiotic division

SPERMATID

Differentiation

SPERMATOZOA



1. **SPERMEOGENESIS:** The process of conversion of rounded spermatid into the flagellated spermatozoa is called spermeogenesis.

2. **SPERMIATION:** The process of release of sperm from seminiferous tubules is called spermiation.

3. **SPERMATOGENESIS:** The process of formation of spermatozoa is called spermatogesis.

STRUCTURE OF SPERM

- Sperm consist of – Head, Neck, Middle piece, Tail.

HEAD CONSIST OF:

A) Acrosome:

✓It is made up of Golgi body.

✓Contain many Hydrolytic Enzymes which help penetrate the egg at the time of fertilization.

✓Enzymes are – Acrosin, Zona lysine, Corna penetrating enzymes, Hyaluronidase.

B) Nucleus:

✓Light weight due to the loss of water & found in head region of sperm below the acrosome.

❖NECK:

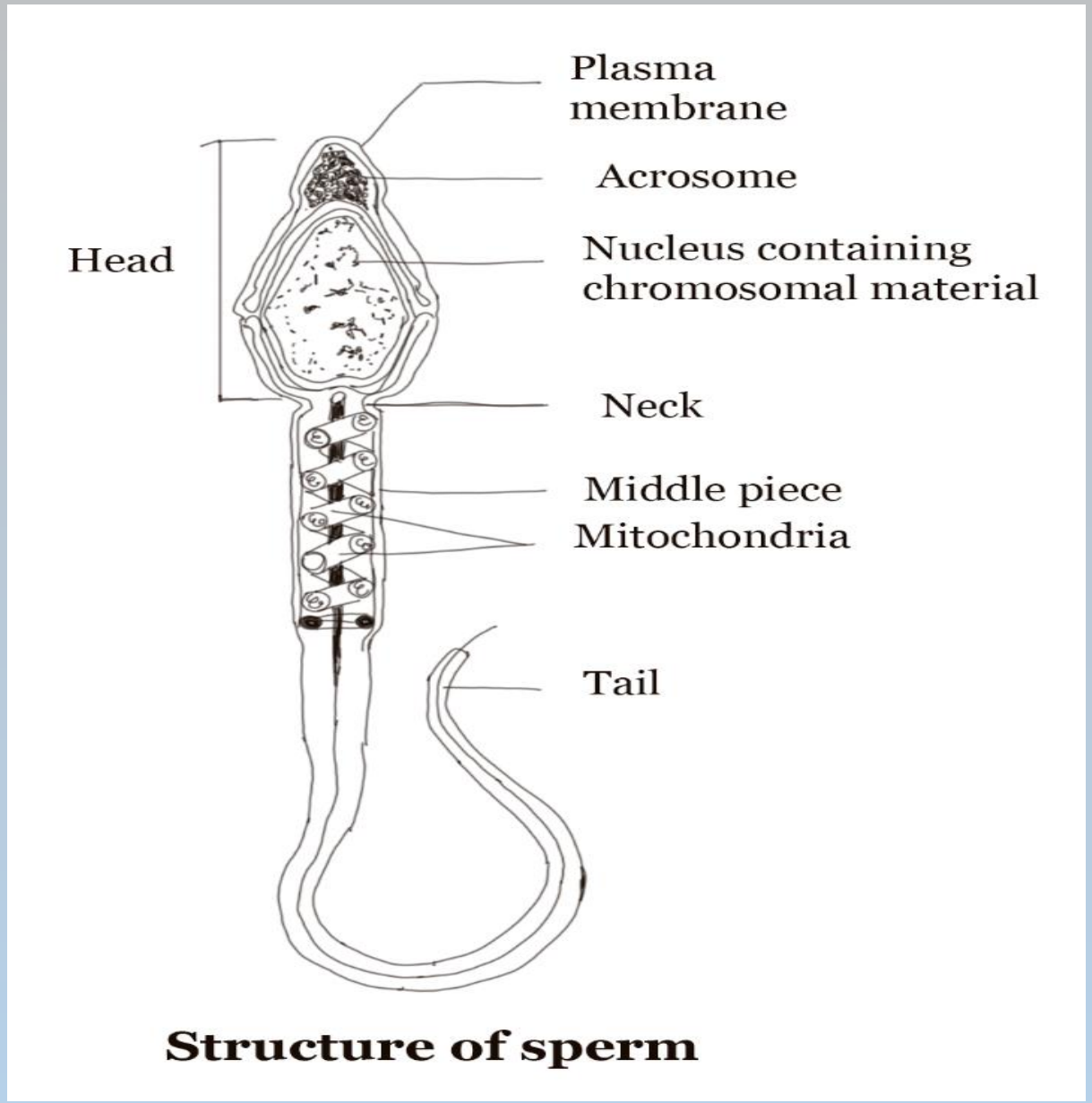
- ✓It is very short part which present between the head & middle piece.
- ✓It consist of proximal centroid distal centriole which help in cleavage of zygote.

❖MIDDLE PIECE:

- ✓It consist of mitochondria which help in energy to the sperm for the movement.

❖TAIL:

- ✓It is longer than head.
- ✓Help in swimming in fluid medium.



Structure of sperm

❖CAPACITATION:

✓When the sperm are deposited in female genital system.

✓The vaginal epithelium secrete fluid over the sperm & remove the fatty layer present over it – so that sperm gain power of fertilization.

1. Middle piece of mammalian sperm possesses.

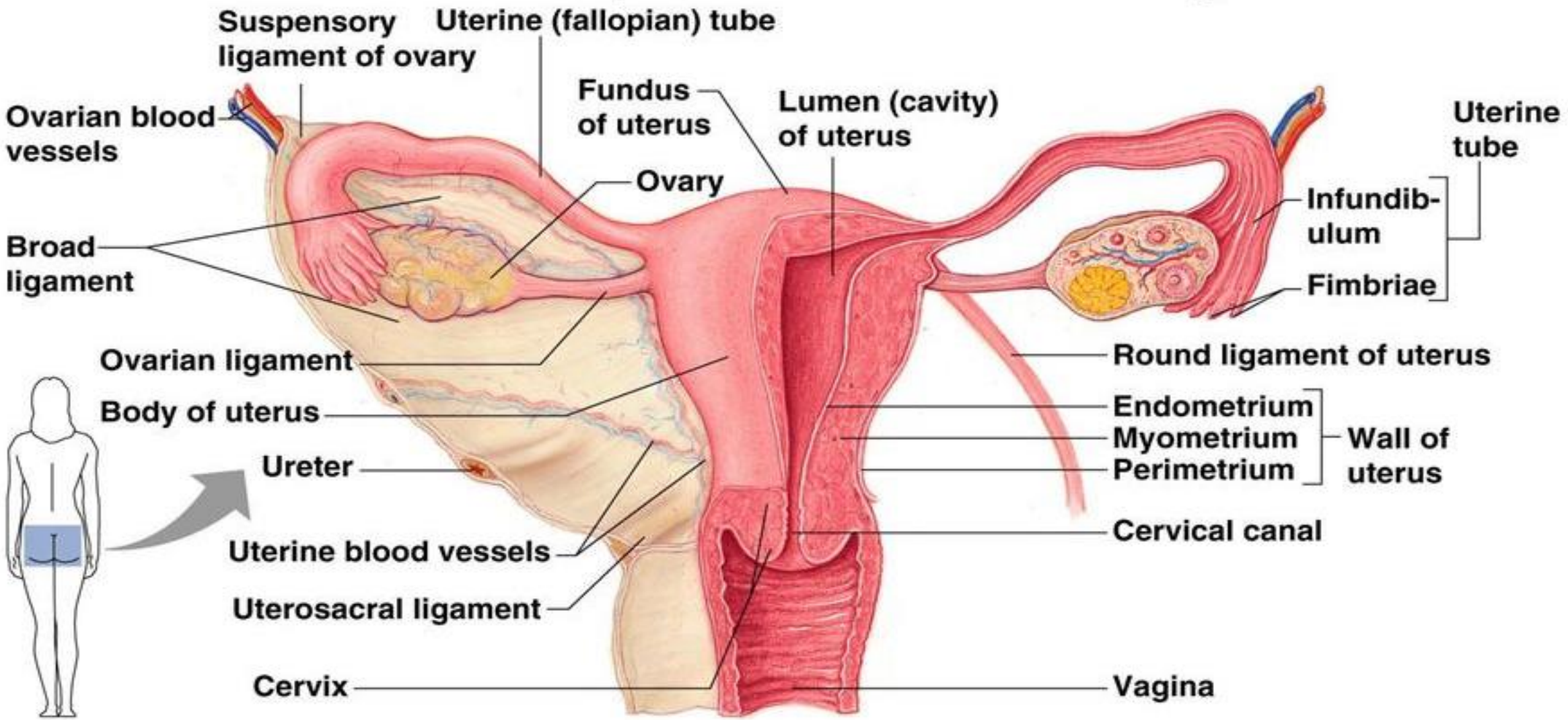
   a) Mitochondria & Centriole b) Mitochondria only

   c) Centriole only d) Nucleus & Mitochondria

2. In human, at the end of the 1st meiotic division, the male germ cells is differentiate into the.

a) Spermatids b) Spermatozoa c) Primary spermatocytes d) Secondary spermatocytes.

Female Reproductive System

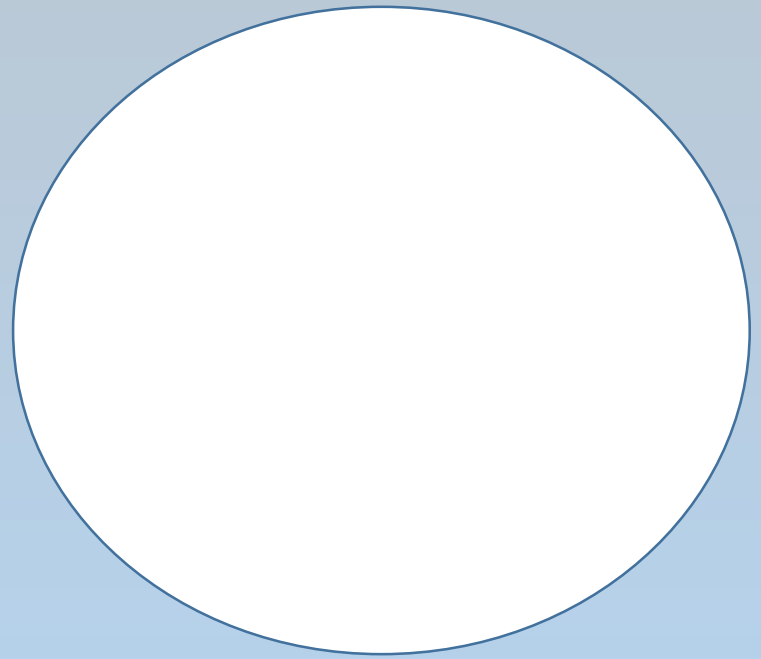


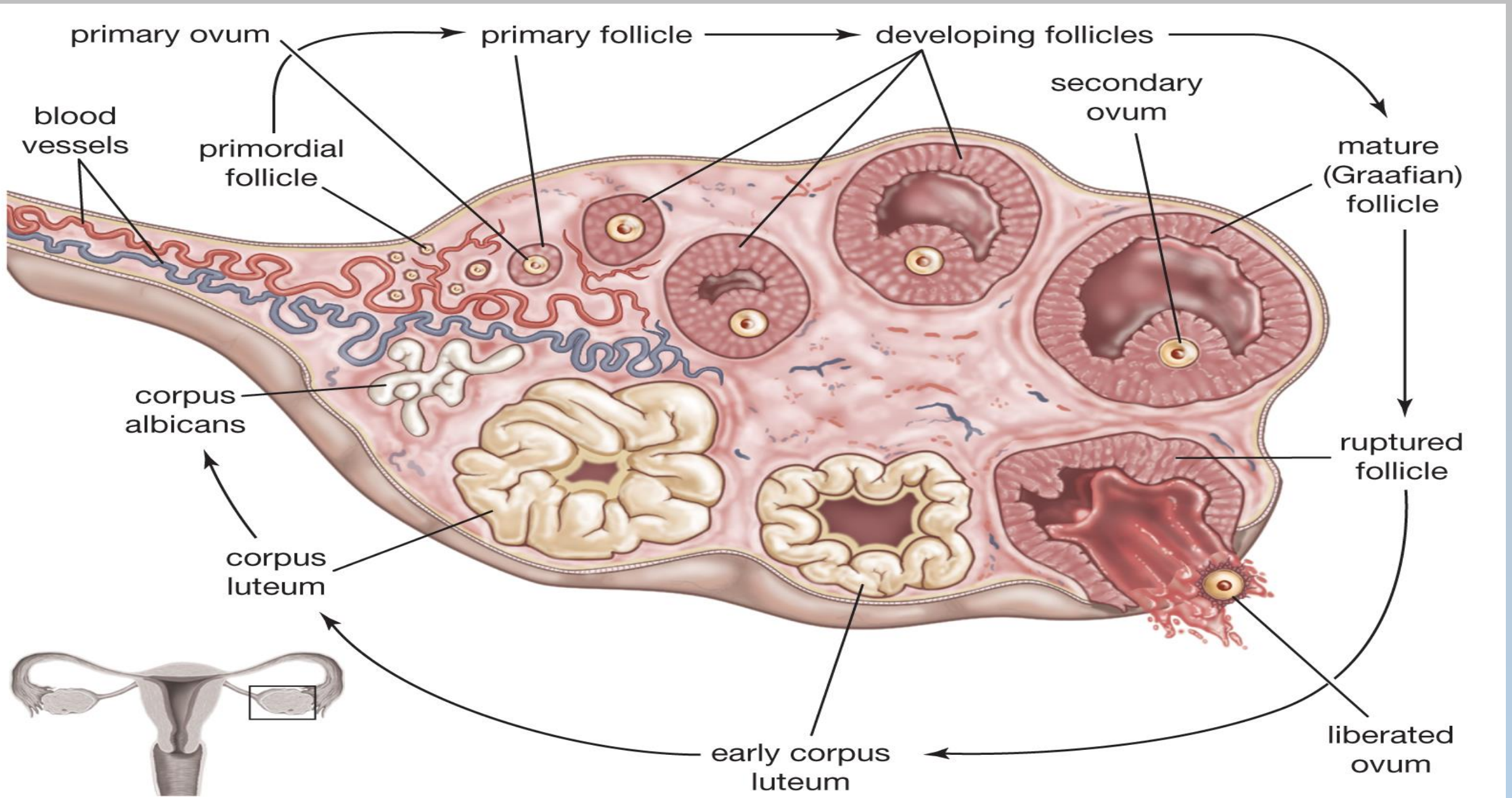
FEMALE REPRODUCTIVE SYSTEM

Primary Sex Organ	Secondary Sex Organ	Accessory Sex Organ
• Oogenesis takes place • e.g. Ovary	• It consist of pipe or duct which conduct the gametes. • e.g. Oviduct/Fallopian tube	• It consist of gland which provide the nourishment to offspring.

OVARY

- It is the primary sex organ in reproductive system.
- Pair structure one either inside of the uterus.
- Ovarian ligament attached ovary to the uterus.
- Fimbriae help in attached ovary to the fallopian tube.
- Each ovary about 2-4 cm in length.





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- During puberty FSH releases from pituitary gland which stimulate germinal epithelium of the ovary.
- The following event take place inside the ovary.

1. **PRIMARY FOLLICLE:** Primary follicle are formed by egg nest in the present of FSH.

2. **SECONDARY FOLLICLE:**

✓It surrounded two layered from primary follicle in the presence of FSH.

✓Fluid filled cavity present in secondary follicle.

3. **TERTIARY FOLLICLE:**

✓They are derived from secondary follicle in the presence of FSH.

✓The size of follicle increases due to increases in size of Antrum.

4. GRAFFIAN FOLLICLE:

- ✓Outer layer = Theca externa
- ✓Inner layer = Theca interna
- ✓Graffian follicle formed from Tertiary Follicle in the presence of FSH & LH.
- ✓Inside the Graffian follicle – Secondary Oocyte is present which released out on the 14th Day of MC in the presence of LH, Lead to OVULATION.

The following cells are left inside ovary after ovulation

a. Corpus Luteum:

- ✓It is formed by layers of Graffian follicle in the presence of LH.
- ✓If fertilization is take place, corpus Luteum secrete progesterone which maintain the condition for the pregnancy.
- ✓If fertilization not take place then Corpus Luteum converted into Corpus Albicans.

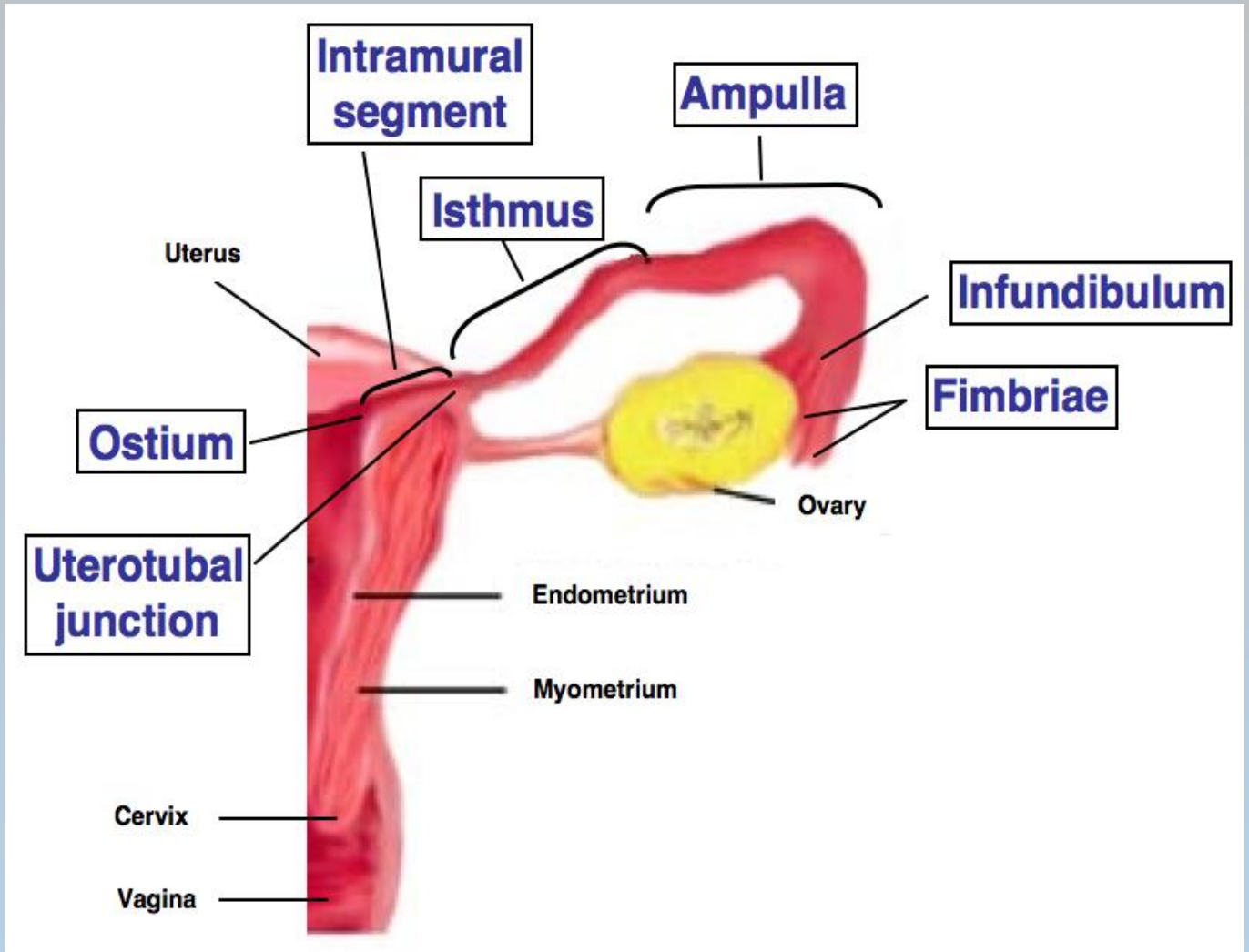
b. Corpus Albicans: Degenerate inside the ovary.

- **FIMBRICATED FUNNELS:** finger like projection which hold ovary in fixed position & also suck ovum from ovary inside the fallopian tube.
- **FALLOPIAN TUBE / OVIDUCT:**

✓Each fallopian tube is about 10-12 cm long & extends from the periphery of each ovary to the uterus.

PART OF FALLOPIAN TUBE:

1. **Infundibulum:** The part closer to the ovary is a funnel shape structure.
2. **Ampulla :** swollen structure, where fertilization take place.
3. **Isthmus:** fertilization is take place at the junction of isthmus & ampulla.



LAYERS OF UTERUS

A. **Perimetrium :** Outermost thin layer, which provide shape of uterus.

B. **Myometrium :** Thick layer of smooth muscle, which help in child birth & provide nutrition.

C. **Endometrium :**

✓The blood vessels of endometrium provide the nutrition to the ovum, lower portion of the endometrium get thick at every month & shed off called Menstrual Flow.

VAGINA

- It is tube like structure, approx. 10cm in length.
- The pH of vagina is ACIDIC, due to Bacteria present in it.
- It is also called Birth Canal, because child birth take place through it.
- During copulation, sperms discharge inside it.

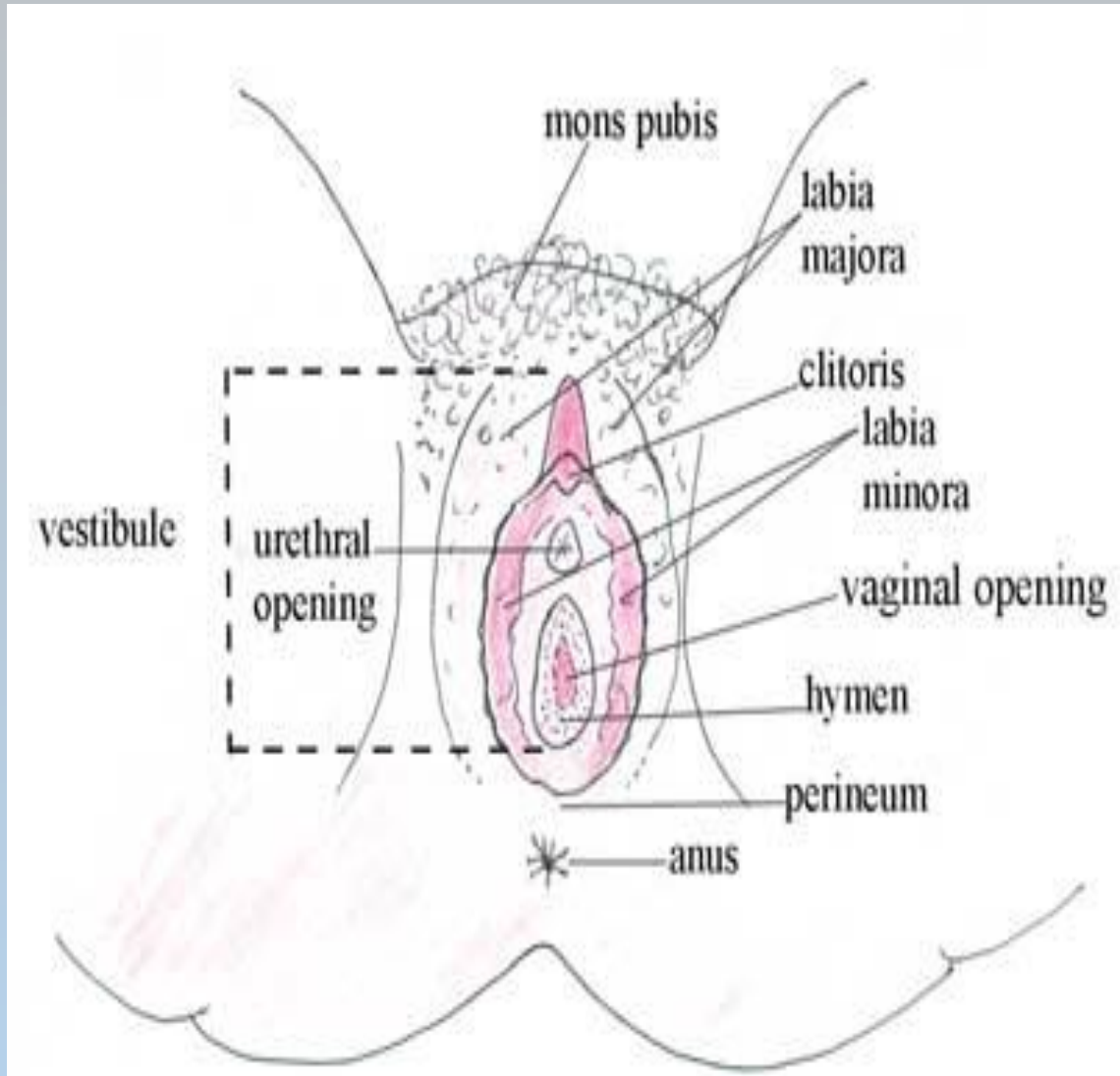
EXTERNAL GENITAL ORGAN OF FEMALE

- **Mons Pubis:**

✓Triangular area which is present on the lower abdomen which having deposition of adipose tissue.

✓On the mons pubis – pubic hair is present.

- **Labia – Majora:** Large skin fold, Analogous to scrotum.
- **Clitoris:** Analogous to penis, it become erect like penis during copulation.
- **Urethral orifice:** There is separate opening for urine discharge.



- **Hymen:**

✓Vaginal opening is partially covered by thin membrane is called Hymen.

✓If often broken during the first coitus (Sex).

✓It is NOT indicator of virginity of female because it often breakdown by simple jerk, cycling & horse riding.

✓The presence or absence of Hymen is NOT a reliable indication of virginity or sexual experience.

1. The main function of mammalian Corpus Luteum is to produce.

a. Estrogen only b. Progesterone only c. Human chronic gonadotrophin d. Relaxin only

2. The part of fallopian tube closest to the ovary is

a. Isthmus b. Infundibulum c. Cervix d. Ampula

3. After ovulation – Graffian Follicles regress into

a. Corpus Artesia b. Corpus Callosum c. Corpus Luteum d. Corpus Albicans

MAMMARY GLAND / STRUCTURE OF BREAST

- Mammary glands are modification of sweat gland & produce milk after child birth.
- Present in both the sexes, but functional in female only.
- 15 – 20 lobules present in each breast.
- Each breast having nipple, which have opening – where milk is emerges.

Shape & Size of Breast is based on GENETIC

Development

During Puberty – During Pregnancy

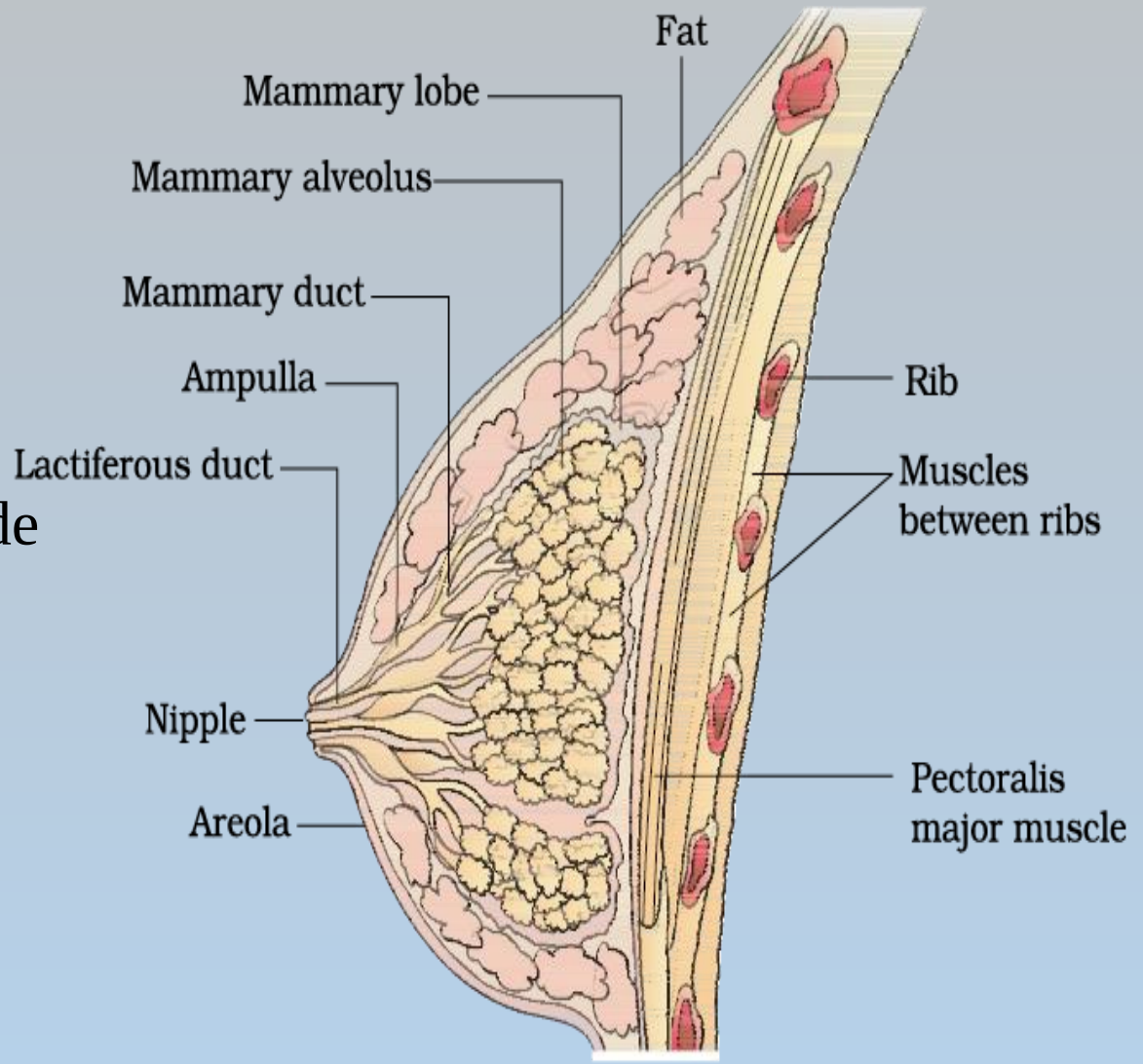
[Estrogen] [Prolactin]

After child birth

[Oxytocin]

- CONNECTIVE tissue & ADIPOSE tissue provide the shape of Breast.

- Breast – most common cancer in female..
  - Urban female
  - Nullapara
  - India
  - Asia



MENSTRUAL CYCLE

- It is characteristic of female belonging to primate mammals.
- Periodic changes occur in female reproductive tract (Uterus, Ovary, Vagina).
- Start during 12 to 15 years, till 55-60 years.
- Menstrual cycle stop during pregnancy & after menopause.
- Occur due to secretion of hormones from ovary & corpus luteum.
- Menarche – at puberty, the 1st menstrual flow called menarche.

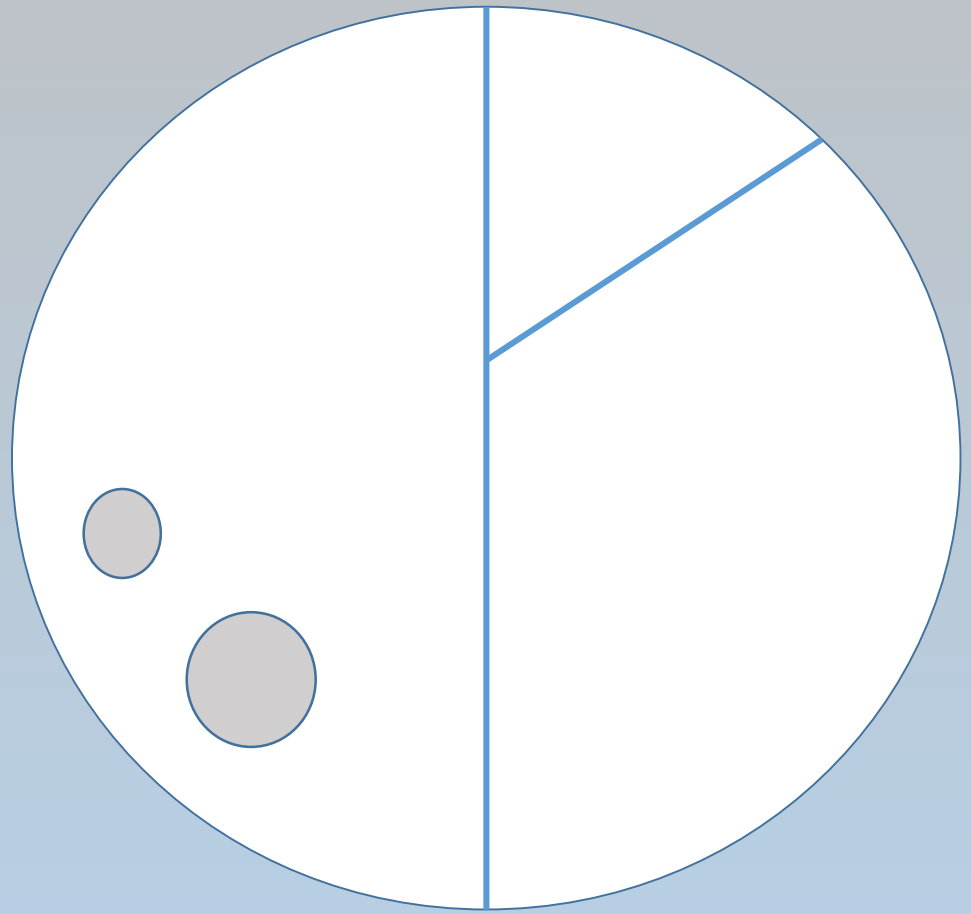
MENSTRUAL CYCLE CONSIST OF

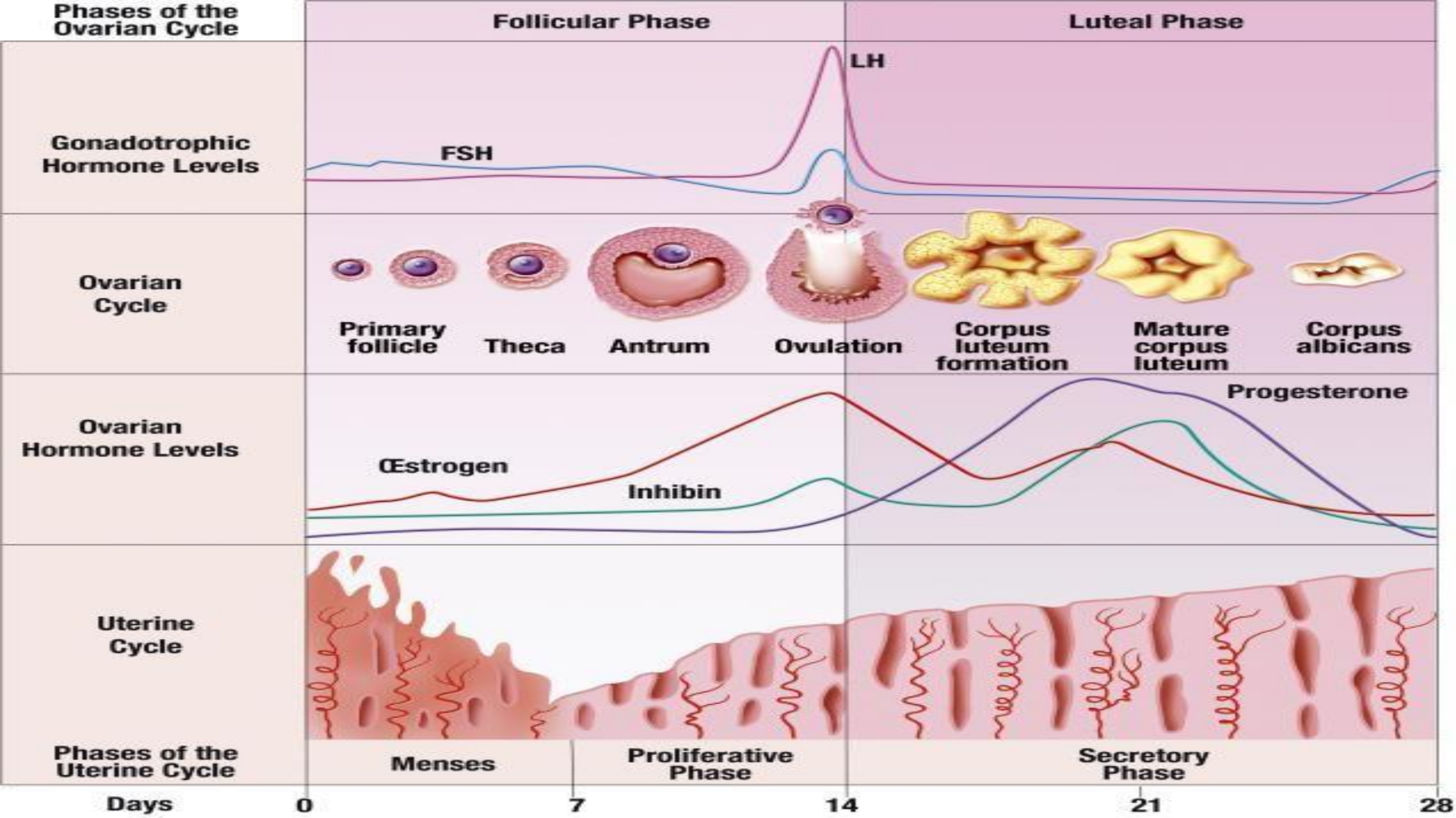
OVARIAN PHASE

New follicles are formed & released out & ovulation takes place.

UTERINE PHASE

Inner layer of endometrium grow & finally shaded out & release of blood.




Phases of the Ovarian Cycle
Follicular Phase
Luteal Phase
Gonadotrophic Hormone Levels
LH
FSH
Ovarian Cycle
Primary follicle
Theca
Antrum
Ovulation
Corpus luteum formation
Mature corpus luteum
Corpus albicans
Ovarian Hormone Levels
Progesterone
Œstrogen
Inhibin
Uterine Cycle
Phases of the Uterine Cycle
Menses
Proliferative Phase
Secretory Phase
Days
0
7
14
21
28

IT CONSIST OF:

1. MENSTRUAL PHASE / BLEEDING PHASE:

- This phase last for 5-7th days of total menstrual cycle.
- Due to low level of Oestrogen & Progesterone – the thickening of endometrium not maintain so it breakdown & causing Bleed.
- Every day approx. 20 – 25ml of blood lost.
- Uterus secrete – Anticoagulant (Fibrinogen) so that menstrual flow does not clot.

2. FOLLICULAR PHASE / PROLIFERATIVE PHASE:

- 5^{th} to 15^{th} days of total menstrual cycle.
- New follicles are formed in this phase under the action of FSH.
- At the 14^{th} days of menstrual cycle, the level of LH increases called LH surge, this is causes Rupture of Graffian Follicle called Ovulation.
- If the copulation occur on the 14^{th} days of menstrual cycle chances of pregnancy is more.

3. SECRETORY PHASE / LUTEAL PHASE:

- After ovulation, follicular cells form corpus luteum.
- LH stimulate corpus luteum to secrete progesterone.
- Progesterone hormone is called – “Hormone of Pregnancy” since it causes thickening of the Endometrium.

TERMS

1. **Menarche:** 1st menses during puberty.

2. **Amenorrhea:** Absence of MC – Before puberty, During pregnancy, After 55 years old.

3. **Menopause:** Absence of Menses.

4. **Dysmenorrhea:** Painful menstrual cycle.

1. In the fertile human female, approximately on which day of menstrual cycle does ovulation take place.

   a. Day 14^{th} b. Day 18^{th} c. Day 1^{st} d. Day 8^{th}

2. Menstrual flow occurs due to lack of ..

   a. Oxytocin b. Vasopressin c. Progesterone d. FSH

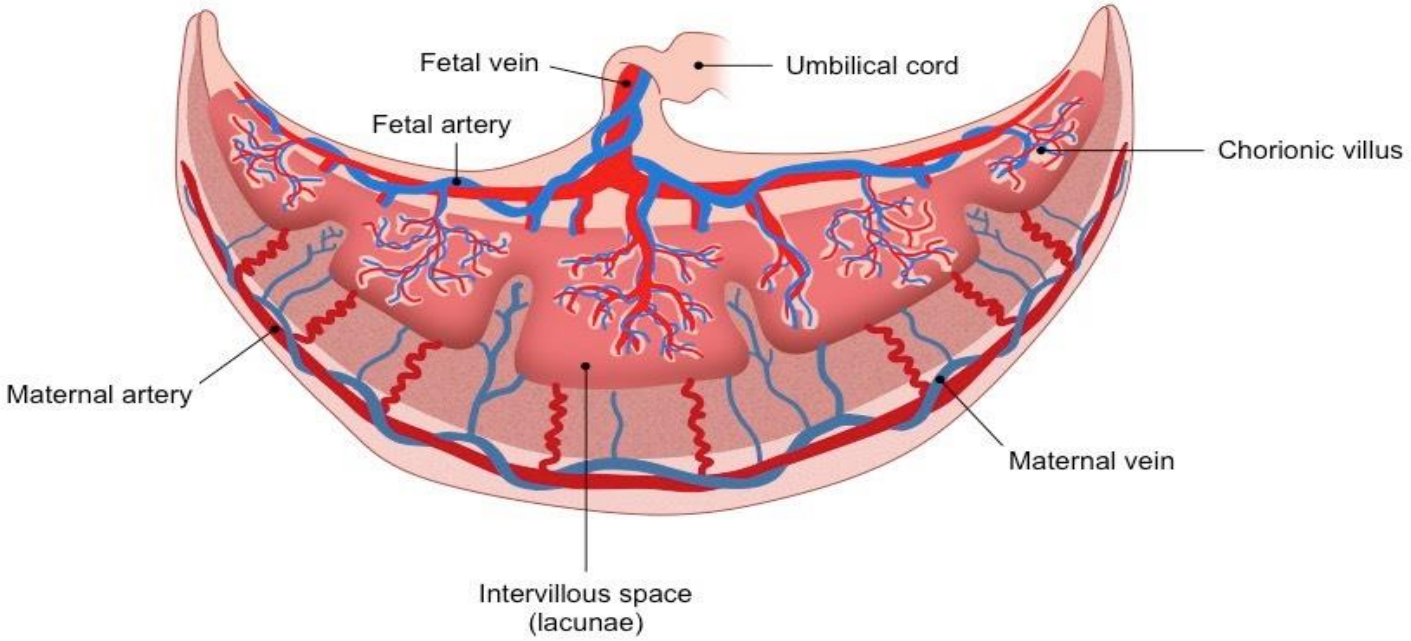
IMPLANTATION

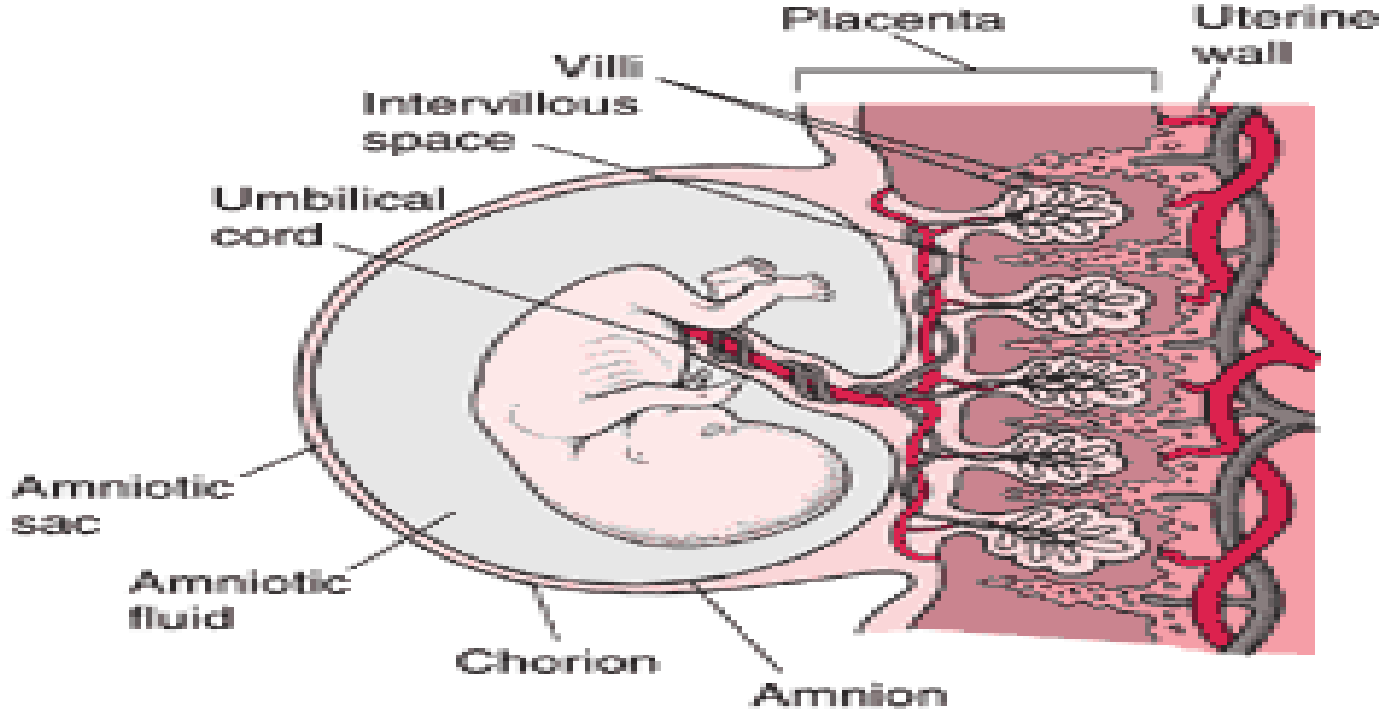
- The attachment of Blastocyst to the uterus (Endometrium) is called implantation.
- Occur after the 6^{th} Days of fertilization.
- At the point of implantation – placenta is formed.

PREGNANCY & EMBRYONIC DEVELOPMENT

PLACENTA:

- ✓Placenta is organic connection between the foetus & uterine wall for physio-chemical exchange between foetus & maternal blood.





FUNCTION OF PLACENTA

1. **Nutrition:** all the nutritive materials like – Glucose , Fatty acids, Amino acids, Vitamins & Minerals from maternal blood pass into the foetus.

2. **Respiration:** Oxygen pass from the maternal blood to foetus through placenta.

3. **Excretion:** Excretory products diffuses into maternal blood.

4. **Endocrine function:** it secretes hormone like – Human chorionic Gonadotrophic (HCG), Human Placental Lactogen (HPL), Estrogen & Progesterone.

ORGANOGENESIS

- The formation of organs inside the foetus is called ORGANOGENESIS.
- By the end of 1st month – Heart Beat can be heard.
- By the end of 2nd month – Limbs & Digits appeared.
- By the end of 3rd month (Trimester) – Mostly all the organs are formed .
- By the End of 4th & 5th months – 1st Movement of Foetus is takes place.
- By the End of 6th months (2nd Trimester) – Formation of fine hairs, eyelid separate, eye lashes formed.
- After 9th month – Child Birth takes place.

❖**Foetal Ejection Reflex:** Fully developed foetus & placenta send signal to the mothers pituitary gland to secrete hormone i.e. OXYTOCIN which causes strong uterine contraction.

❖**Parturition:** The vigorous contraction & relaxation of the uterus at the end of pregnancy causes delivery of foetus.

STAGES OF PARTURITION

- CHILD BIRTH – It is vigorous contraction & relaxation of uterus during 9 months.

•There are 3 Stages:

1. Stage of Dilation

2. Stage of Expulsion

3. Stage after Birth

1. Stage of Dilation:

- It extends up to 6-12 hrs.
- It is characterised by the Labour Pain by the OXYTOCIN.
- The whole uterus & cervix become dilated.
- During this stage, regular contraction of the uterus causes rupturing of Amniotic sac.

2. Stage of Expulsion:

- The dilation **stage**, where the cervix widens and opens to about 10 centimetres to allow passage of the fetus, or baby.
- Fetus comes out from the Birth canal.

3. Stage of Birth:

- Umbilical cord & part of the placenta that comes out from the maternal body.

LACTATION

- The mammary glands of the female start producing milk, this process is called Lactation.

- Initially few days of lactation – milk is called **COLOSTRUM**
- **It contain several antibiotic.**
- **IgA antibodies**
- **Minerals, vitamins but lade of IRON.**

1. Signals for parturition originate from

    a. Both placenta as well as fully developed fetus.

    b. Oxytocin released from maternal pituitary.

    c. Placenta only.

    d. Fully developed fetus only.

2. What is TRUE for cleavage?

    a. Size of embryo increases b. Size of cells decreases

    c. Size of cells increases d. Size of embryo decreases

3. The extra embryonic membranes of the mammalian embryo are derived from.

    a. Trophoblast b. Inner cell mass c. Formative cells d. Follicle cells

FETUS EJECTION REFLEX

IMPORTANT MCQs

1. Egg is liberated from ovary in

   a. Secondary oocyte stage b. Primary oocyte stage

   c. Oogonial stage d. Mature ovum stage

2. How many sperms are formed from a secondary spermatocyte?

   a. 4 b. 8 c. 2 d. 1

3. In telolecithal egg the yolk is found

   a. All over the egg b. On one side c. Both the side d. Centre

4. In the 28 days Human ovarian cycle, the ovulation takes place, typically on

   a. Day 14^{th} of the cycle b. Day 28^{th} of the cycle

   c. Day 1^{st} of the cycle d. Day 5^{th} of the cycle

5. Which one of the following Hormones is not a secretion product of Human placenta?

   a. Human chorionic gonadotropin b. Prolactin

   c. Progesterone d. Oestrogen

6. Menstrual flow occur due to lack of

   a. Oxytocin b. Vasopressin c. Progesterone d. FSH

7. Hysterectomy is surgical removal of..

   a. Vas deference b. Mammary glands c. Prostate gland d. Uterus

8. Which of the following layers in an central follicle is a cellular?

   a. Stroma b. Zona pellucida c. Granulosa d. Theca interna

9. The amnion of mammalian embryo is derived from

a. Ectoderm & Mesoderm b. Endoderm & Mesoderm

c. Mesoderm & Trophoblast c. Ectoderm & Endoderm

10.Fertilization is a chemical substance produced from

a. Polar bodies b. Middle piece of sperm c. Mature eggs d. Acrosome

11.Human eggs are

a. Alecithal b. Microlecithal c. Mesolecithal d. Macrolecithal

12.Gonads develop from embryonic

a. Ectoderm b. Endoderm c. Mesoderm d. Both Mesoderm & Endoderm

13.Location & Secretion of Leydig's cells are

a. Liver – Cholesterol b. Ovary – oestrogen

c. Testis – Testosterone d. Pancreas – Glucagon

14.Fertilizin are emitted by

a. Immature eggs b. Mature eggs c. Sperms d. Polar bodies

15.Eye lens are formed from

a. Ectoderm b. Mesoderm c. Endoderm d. Ectoderm & Mesoderm

16.Meroblastic cleavage is a division which is

a. Horizontal b. Partial/Parietal c. Total d. Spiral

17.Male hormone is produced in the testis by cells of

a. Sertoli b. Epithelial c. Spermatocytes d. Leydig

18. The mammalian corpus luteum produces

a. Luteotrophic hormone b. Luteinizing hormone

c. Oestrogen d. Progesterone

19. In human being, the eggs are

a. Mesolecithal b. Alecithal c. Microlecithal d. Macrolecithal

20. The middle piece of the sperm contains

a. Proteins b. Mitochondria c. Centriole d. Nucleus

21. Blastopore is the pore of

a. Archenteron b. Blastocoel c. Coelom d. Alimentary canal

22. What is true for cleavage?

a. Size of embryo increases b. Size of cells decreases

c. Size of cells increases d. Size of embryo decreases

23. The shared terminal duct of the reproductive & urinary system in the human male is..

a. Urethra b. Ureter c. Vas deference d. Vas efferentia

24. Which of the following cells during gametogenesis is normally diploid?

a. Spermatogonia b. Secondary polar body

c. Primary polar body d. Spermatid

25. In human females, meiosis – 2 is not completed until

a. Uterine implantation b. Birth c. Puberty d. Fertilization

26. Several hormones like HCG, HPL, Oestrogen, Progesterone are produced by

a. Ovary b. Placenta c. Fallopian tube d. Pituitary

27. Capacitation occurs in

a. Epididymis b. Vas deference

c. Female reproductive tract d. Rete testis

28. Middle piece of mammalian sperm possesses

a. Mitochondria & centriole b. Mitochondria only

c. Centriole only d. Nucleus & mitochondria

29. Freshy released Human egg has

a. One – Y chromosome b. One – X chromosome

c. Two – X chromosome d. One – X & One Y chromosome