

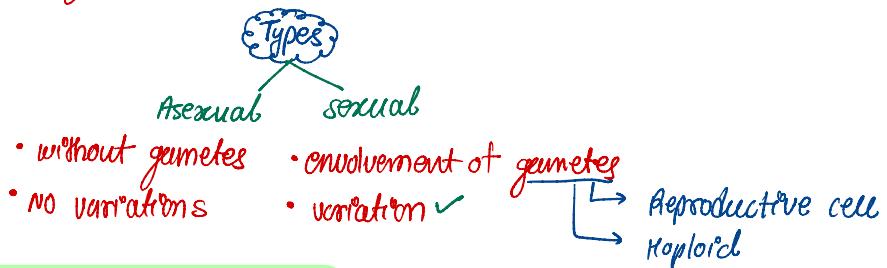
2. Reproduction In Lower and Higher animal

Asexually reproducing animal
e.g. → Hydra

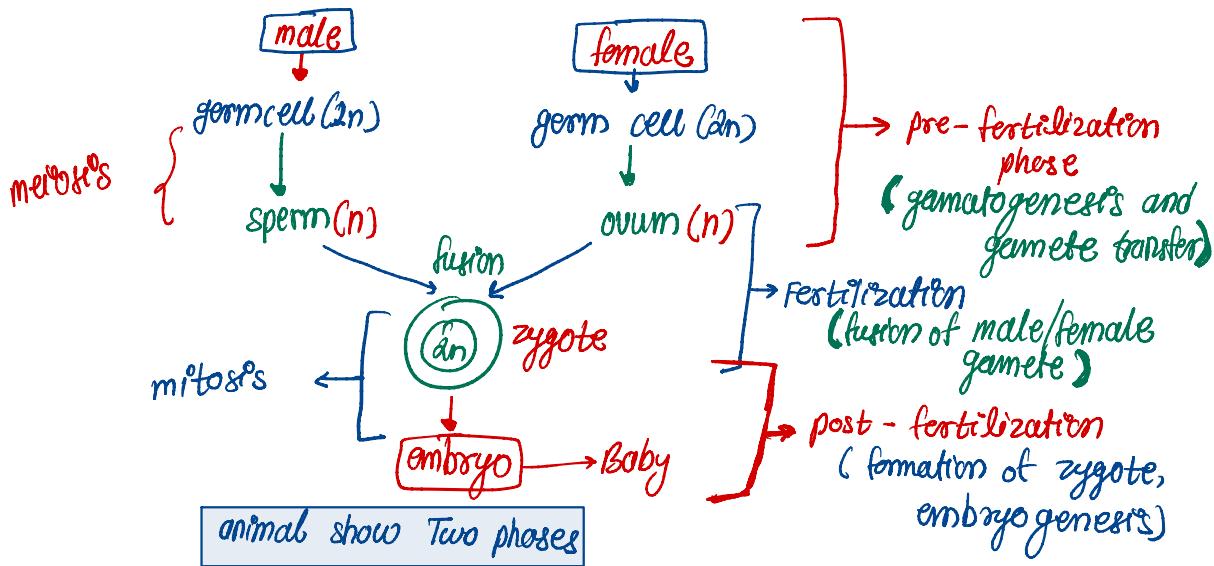
sexually reproducing animal
e.g. → Human, mammals.

Reproduction

- "formation of new life from pre-existing similar life."
- Helps in continuing new life.



Sexual Reproduction In animals :-



Juvenile phase Reproductive maturity phase

- physical growth
- starting from birth
- cannot do reproduction
- occurs after physical growth
- growth of sex organ occurs
- can produce sexually

Breeders

continuous

- | | |
|----------|------------|
| seasonal | continuous |
| - goat | - Humans |
| - sheep | - apes |
| - Donkey | |

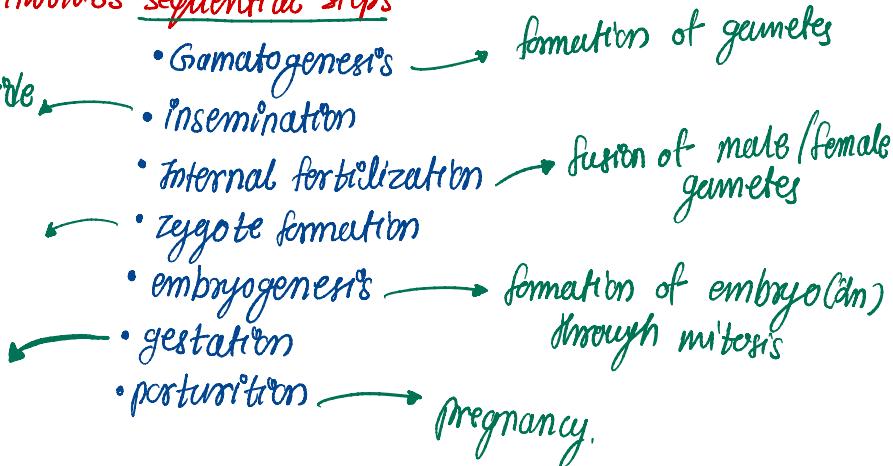
Human Reproduction :-

- This process involves sequential steps

sperm is going inside
vagina

Formation of zygote

Development of embryo → to Baby



Secondary sexual characters (sexual Dimorphic characters)

male female

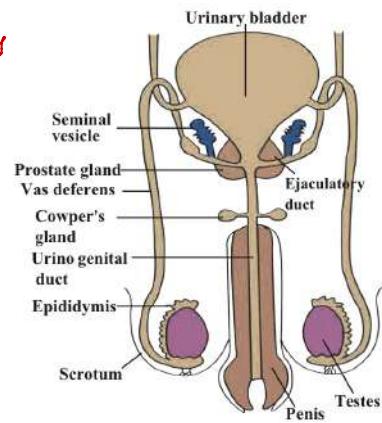
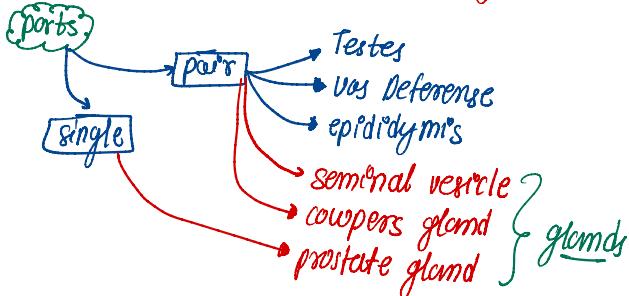
- presence of beard
 - moustache
 - hair in chest
 - muscular body
 - adams apple
 - development of breast
 - Broader pelvis
 - High pitched voice

Primary sex organ:-

- Testis
- ovary

A. male reproductive systems

- consists of primary male organ (gonad) called testes
 - forms external and internal genitalia.



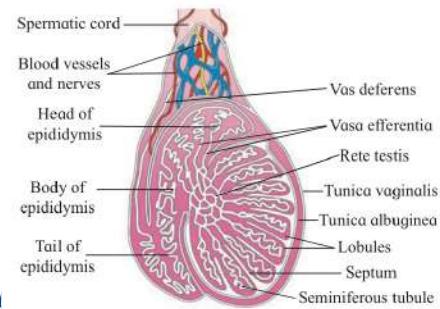
① Testes :-

- mesodermal in origin.
- formed in lower abdominal cavity
- located in pouch called scrotum

• Developed in abdominal cavity
and later they descend into scrotum through Inguinal canal

Dimension

- 4cm to 5cm long
- 2cm to 3cm wide
- 3cm thick



Histology of testis :-

(external collagenous connective tissue)
Tunica albuginea

3-layer of testis
→ Tunica vaginalis
- outer to albuginea and it is incomplete peritoneal covering
→ Tunica vasculosa
- inner layer
- vascular layer

- Fibers from this layer divided to form 200-300 lobule
- each lobule having 1-4 highly coiled seminiferous tubule

↳ internally lined by cuboidal germinal epithelial cells ($2n$)
few large pyramidal cell called Sertoli cell.
↳ provide nutrition to sperm.
that germinal epithelial cell undergoes gametogenesis (formation of gamete)

* Various stages of spermatogenesis

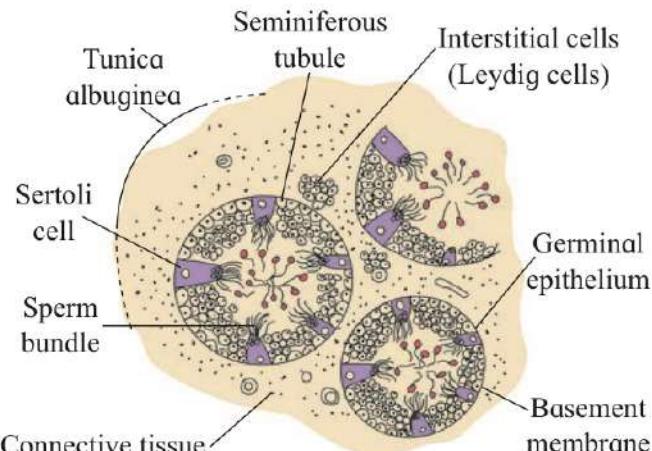


Fig. 2.4 : T. S. of Testis

- spermatogonial cell ($2n$)
- primary spermatocyte ($2n$)
- secondary spermatocyte (n)
- spermatids (n)
- sperm (n)

⑥ Accessory ducts

- Includes :-

① Aete testis :-

- seminiferous tubules forms network at posterior of testis, that network is called as Aete testis.

② Vasa efferentia :-

- 12-20 fine tubules arising from aete testis
- they carry sperm and pass it to epididymis

③ Vas Deferens

- now sperm reaches to vas deferens
- travel through abdominal cavity
- loops over ureter and opens into urethra

④ Ejaculatory duct

- passes through prostate gland and consists of seminal vesicle and opens into urethra.
 ↳ provide common passages for sperm/urine.

- * opening of penis is called
urethral orifice
 ↳ hole

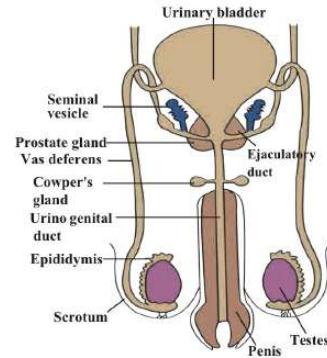
• glands

⑤ Seminal vesicles :-

- located at posterior side of urinary bladder
- secretes seminal fluid
 containing
 - fructose → provides energy to sperm
 - fibrinogen → coagulates semen
 - prostaglandins → faster movement of sperm
- contributes about 60% of total semen.

⑥ Prostate gland :-

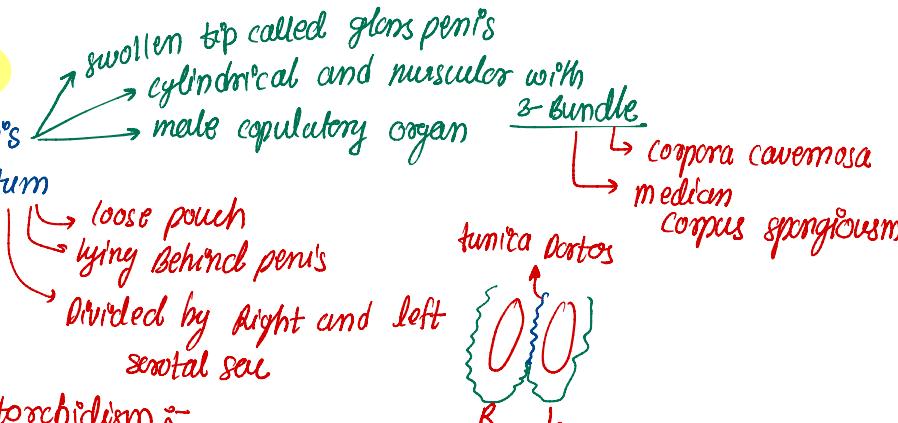
- large and single gland made up of 20-30 lobes and is located underneath the urinary bladder.
- provides milky white and power to sperm to be protected from acidic environment.
- 30% of semen.



semen

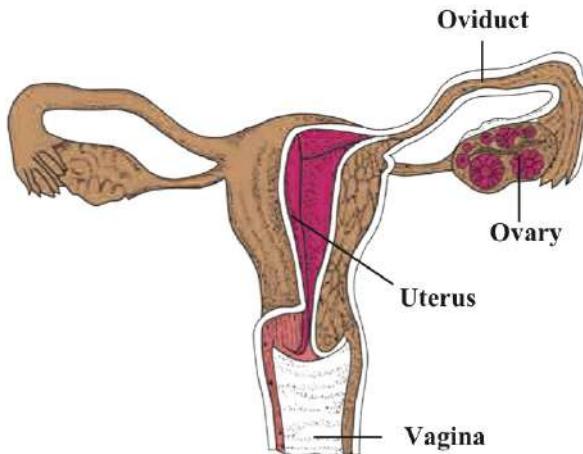
- viscous, alkaline and milky fluid
- pH 7.2 - 7.7
- single ejaculation → 400 million sperm
- contains fructose.

External genitalia

- includes - penis
- scrotum
- swollen tip called glans penis
cylindrical and muscular with s- bundle
loose pouch lying behind penis
Divided by right and left scrotal sac
- * cryptorchidism :-
- failure of testis to descend into scrotum.
- 

Female Reproductive System :-

- * includes
- pair of ovaries
 - pair of oviducts
 - uterus
 - vagina
 - External genitalia (vulva)
 - pair of vestibular glands
 - mammary glands



Ovary

- primary female sex organ.
- function :- produce egg/oovum.
 - Reproductive hormones
- solid, oval or almond shaped organ.

Dimension :-

3cm → length

1.5cm → breadth

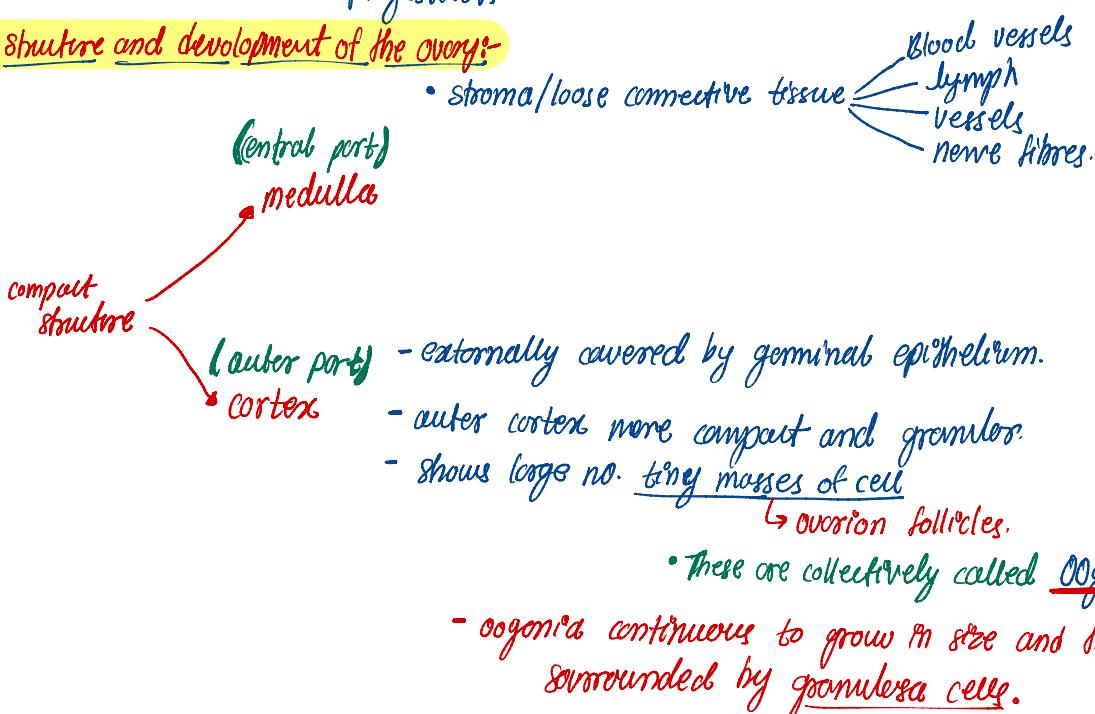
1.0cm → thick

- located near the kidney at pelvis region.
- ovarian ligament attach ovary and uterus.

ovary produces :-

- estrogen	- relaxin	- inhibin
- progesterone	- oestriol	

structure and development of the ovary



• These are collectively called oogonia

• oogonia continues to grow in size and they are surrounded by granulosa cells.

• oogenesis starts much before Birth. (end of 12-w)

• Has 2-million primordial cells.

After menses → 1-million Remain at Birth

→ 40,000 Remain at time of puberty.

Atresia:-

"A large scale destruction of primordial follicles during growth"

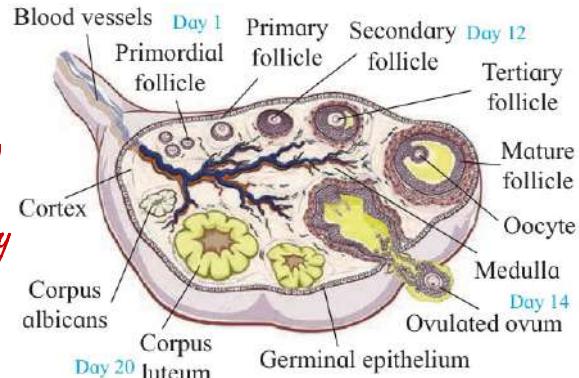
- primordial follicle into mature/granulosa follicle.

↳ It starts with onset of puberty

In each menstrual cycle

Only one primordial cell

starts growing to form the granulosa follicle.



Note:-

- 1st menstrual cycle i.e. menarche

Begins at about 13-yr.

- stoppage/menopause at 48 age.- 55 age

* Reproductive age

(period between menarche/menopause) i.e. 32 yr

* female produces maximum 416 egg ($32 \times 13 = 416$ egg)

Ovary Histology of mature female:-

• Development of oocytes can be seen in different stages

• maturation of primordial cell into

↓
- primary

- secondary

- granulosa follicles

grows into

Now begins to move towards surface of ovary.

egg is released during ovulation.

Remaining part of follicles changes into corpus luteum

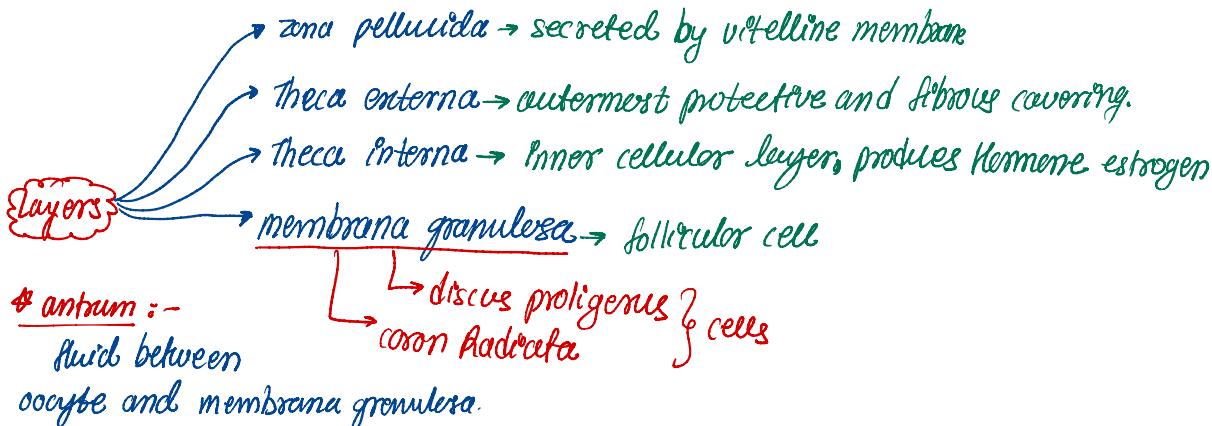
corpus albicans

↳ temporary
endocrine gland.

Structure of Graafian follicle :-

- It is mature ovarian follicle.

also called as secondary oocyte.



Oviduct/Fallopian tube :-

- pair of muscular ducts. lies at peritoneal cavity.
- proximal part close to ovary and distally close to uterus.
- tube 10-12 cm in length.
- lined by ciliated epithelium

Divided into 3-Region

① Infundibulum - funnel like opening surrounded many fingers called fimbriae

② Ampulla - middle, long and straight part

③ Isthmus/cornua - fertilization occurs

→ Distal narrow part of the duct

Uterus

- also called womb
- hollow, muscular, pear shaped organ
- located above and behind the urinary bladder

Dimension :- 7.5 cm - long

5 cm - broad

2.5 cm - thick

Fundus :-

- upper dome shaped
- Implantation occurs

Body

• broad part

Cervix

- narrow nec about 2.5 cm in length
- extended to vagina
- Has two opening :-

Internally uterus

- **perimetrium** → outer layer
- **myometrium** → middle thick muscular, causes labour during parturition
- **endometrium** → innermost, mucosal membrane and richly supplied with blood vessels and uterine gland.

⑤ Internal OS → towards body
⑥ External OS → towards vagina.

Vagina

- Tubular, female copulatory organ.

- 7-9cm in length.

- lies between cervix and vestibule.

3-layer

- Inner mucosal lining
- middle muscular layer
- outer adventitia layer

• Vagina opens into vestibule called as vaginal orifice

↳ this orifice covered by
Hymen → layer
membrane

• menstrual flow as well as parturition (Baby Birth)

External genitalia :-

* Vulva → collectively whole part of PRS

* Vestibule → (Covering/wrapping)
medium vestibule Depression

- pair / fleshy
folded skin
boundary of vulva.

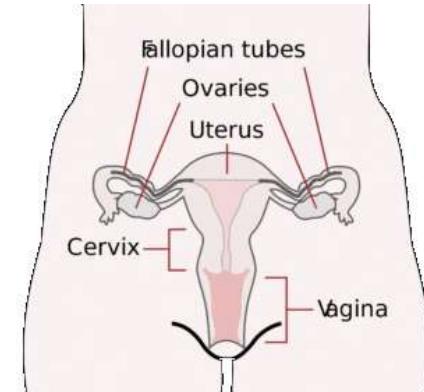
labia majora

- inner to majora
- contains hood-like clitoris

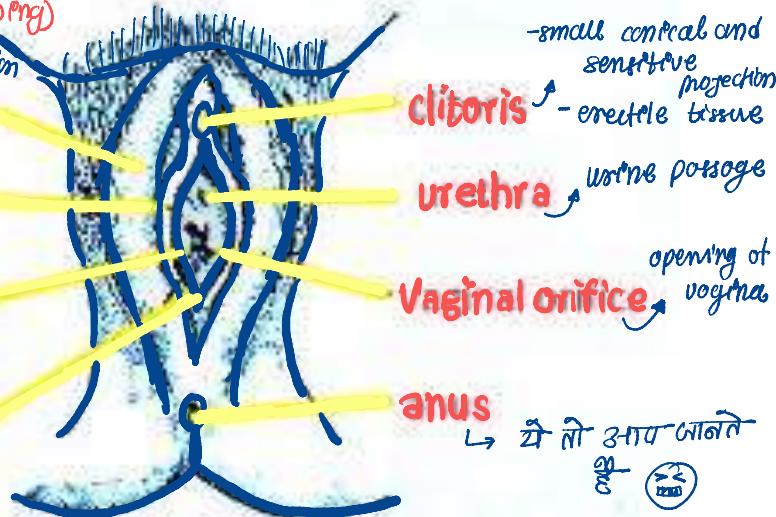
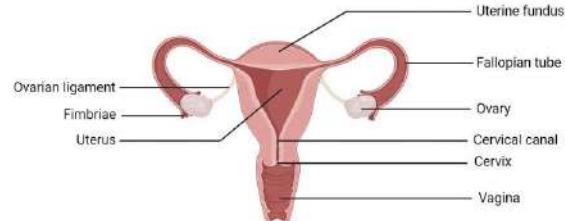
- covering to
vaginal orifice

hymen

opening of
Bartholin gland



Female Reproductive System

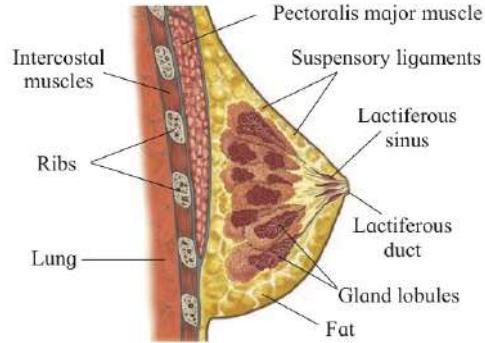


Accessory gland

- pair homologous to bulbourethral/campers glands.

mammary gland

- Helps in release of milk after parturition.
- Development occurs at puberty under influence of
 - estrogen
 - progesterone
- Hormone LTH (lactotrophic Hormone)/prolactin
Helps in development of lactiferous tubules.
- pair of rounded structures presents in subcutaneous tissue of anterior thorax (pectoral region) (2nd - 6th rib)
- These are modified sweat gland.
- each mammary gland contains fatty connective tissue.
- Ampulla :- many mammary ducts combined.
↳ converge toward nipple located near the tip of the breasts
- areola :-
↳ Dark Brown coloured / circular area of skin.



puberty / sexual maturity

male

female

- age where reproductive system becomes functional.
 - sex organs begins to produce gametes
 - age 12-15
 - under influence of Testosterone.
- Reproductive system become functional.
 - characterised by onset of menstrual cycle / menarche
 - This continue only upto menopause (45-50)
 - controlled by gonadotrophic Hormones

Menstrual cycle :-

- characteristics features of Humans.
- involves series of cyclic changes in the ovary and the female reproductive tract, mainly in the uterus.
- Changes takes place gonadotropins and ovarian Hormones.

↳ LH
FSH

↳ progesterone
estrogen

④ menstrual phase :- (1st- 5th)

- Beginning of each cycle is taken as 1st day of menses (loss of blood)
- last for 5 days (3-7 days)
- endometrium of uterus breaks down due to effects of prostaglandins released due to decreased level of progesterone, estrogen.
- Discharged material
 - Blood → Blood does not clot due to fibrinolysis
 - tissue fluid
 - mucus
 - endometrial lining

⑤ proliferative phase/follicular phase

- Duration Between → end of menstruation and release of ovum (ovulation)
- Duration is variable than other phase
 - extended from 5th- 13th day of menstrual cycle.
 - [6-12] secondary follicles proceed to develop but usually one of them develops into graafian follicles (mature follicle)
 - secondary follicles secrete the Hormone estrogen.
 - new follicles formed due to GnRH and FSH.
 - endometrium begins to regenerate

⑥ ovulatory phase :-

- shortest phase of cycle.
- involves rupturing of mature graafian follicle and release of ovum.
- Day → 14th Day.
- Rapid secretion of LH by positive feedback mechanism causes mature follicle to rupture.
- severe pain in lower abdomen.

⑦ secretory phase/luteal phase

- Duration :- between ovulation and beginning of next menses.
- longest phase
- lasts for 14 Days
- 15th-28th Days of the cycle
- After Release of secondary oocyte Remaining tissue of graafian follicle → corpus luteum.

- corpus luteum begins to secrete progesterone and estrogen.
 - ↳ can survive for two weeks
 - if ovum is not fertilized it is converted into corpus albicans.
- * If ovulated egg fertilized and embryo is implanted,
 - there is secretion of Human chorionic gonadotropin (hCG)
 - ↳ extend life of corpus luteum
 - Indicator of pregnancy.



Always Remember

Hygiene practices during menstruation :

- Keep the pubic area clean.
- Change the sanitary napkin every 4-5 hours.
- Maintaining personal hygiene during menstruation is important to reduce the risk of infection.
- Dispose used sanitary napkin properly.
- Using damp and dirty clothes or using a sanitary napkin for a longer time can act as a perfect environment for growth and multiplication of harmful bacteria and lead to infections.

Gametogenesis

- process of formation gametes in sexual reproducing animal
- male gamete → } - gametes from primordial germ cells of gonads.
- female gamete →

Spermatogenesis

- formation of sperm (male gamete)
- at beginning ⇒
- After, puberty (12yr age)
 - Hypothalamus begins to secrete gonadotropin Releasing Hormone (GnRH).
 - ↳ initiates significant increase in the secretion of follicle stimulating hormone (FSH)
 - * seminiferous tubule triggered
 - epithelial tissue begin to produce sperm.
- * Germinal epithelium undergo spermatogenesis.

3-phases:-

@ multiplication phase:-

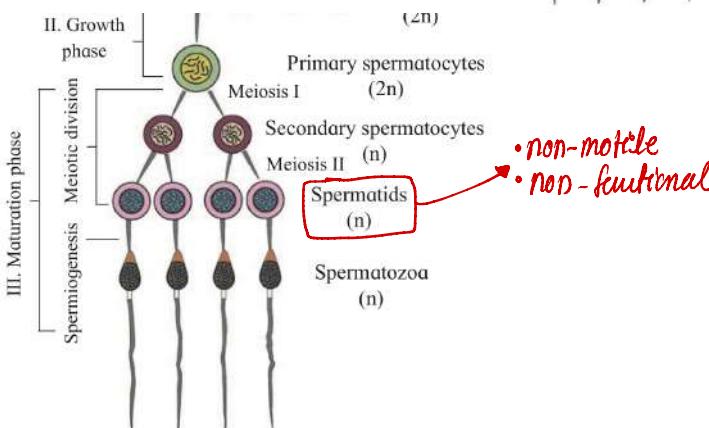
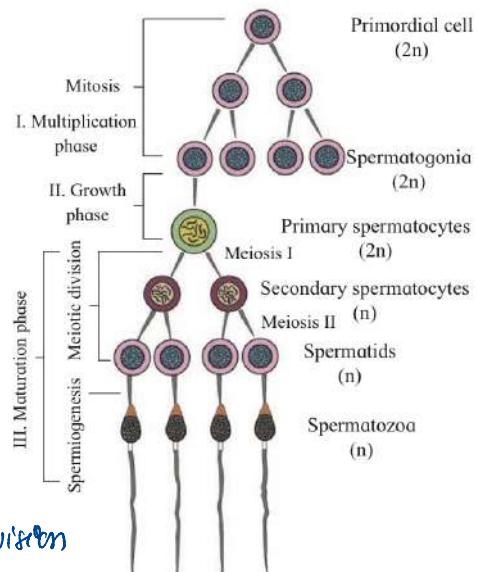
- primordial germ cell ($2n$) of seminiferous tubules undergoes repeated mitotic division \Downarrow
 - Produces spermatogonia ($2n$)

② Growth phase:-

- some spermatogonia stop dividing and grow in size to develop into primary spermatocyte ($2n$)

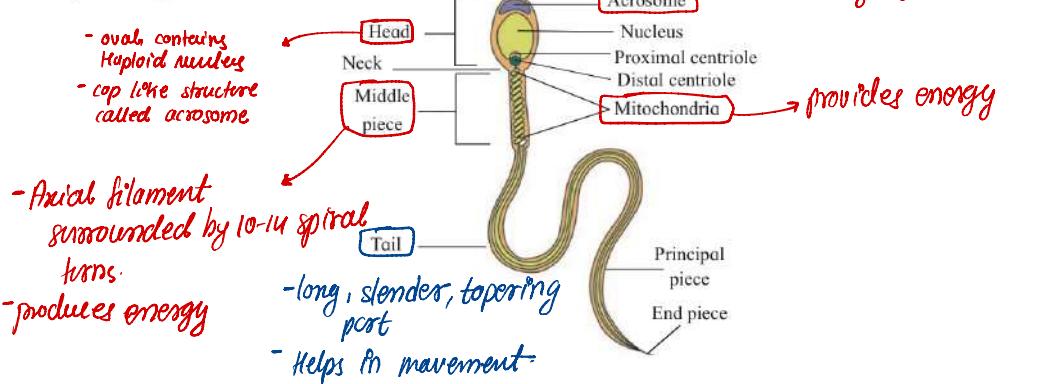
③ maturation phase:-

- involves meiotic (meiosis) or Reductive division



Structure of sperm:

Sperm is the male gamete. It is a motile, microscopic elongated cell. It is divisible into three parts- head, middle piece and tail.

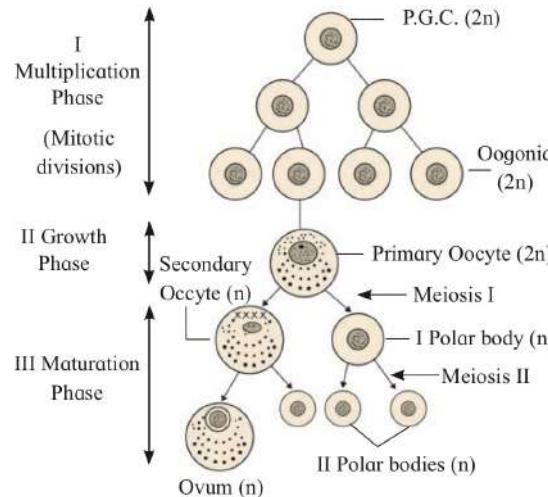


Oogenesis:

It is process of formation of the haploid female gamete i.e. egg or ovum from the diploid germinal epithelium. It involves the process of meiosis (and mitosis). Like spermatogenesis, oogenesis process can be divided into three stages :

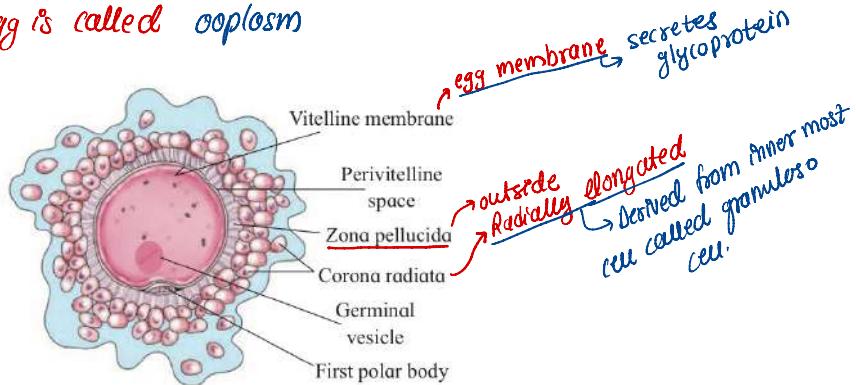
- I. Multiplication phase
- II. Growth phase
- III. Maturation phase

- primary germinal cells ($2n$) undergoes repeated mitotic division to form gamete cell or oogonial cell ($2n$)
- some of oogonia stops further development
- form the primary oocytes ($2n$)



Structure of secondary oocyte

- unfertilized egg when ovulated & released from the ovary is actually the secondary oocyte
- size :- 0.1 mm (100 microns)
- rounded, nonmotile and haploid female gamete
- nucleus of egg appears large and is called germinal vesicle.
- cytoplasm of egg is called ooplasm



Fertilization /syngamy

• take place in female's ampulla of female's fallopian/uterine tube.

* Semen released from penis during copulation, (contains sperm) undergoes liquification and sperms become active.

a. Movement of sperm towards egg:

It involves capacitation of sperms reaching the vagina. Here as many as 50% are demobilised / broken / destroyed. Remaining sperms undergo capacitation. This process requires 5-6 hours. Acrosome membrane

becomes thin, Ca^{++} enters the sperm and their tails begin to show rapid whiplash movements.

As a result of capacitation, sperms become extra active and begin to start moving upwards from vagina to uterus and to the oviducts. The prostaglandins activate the sperms. The vestibular secretions of the female also enhance sperms motility. The sperms swim at an average speed of 1.5 to 3.0 mm/min.

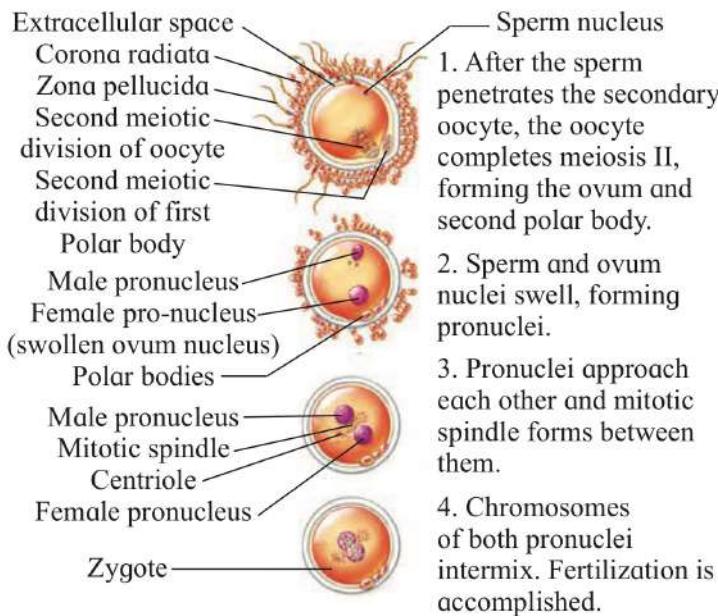
Sperms reach upto the ampulla as a result of their own swimming and partly by contraction of uterus and fallopian tubes stimulated by oxytocin of female. After capacitation the sperms may reach ampulla within 5 minutes. Sperms can remain viable for 24-48 hours (Ovum for about 24 hours).

b. Entry of sperm into the egg : Out of 200 to 400 million sperms, only few hundred manage to reach the ampulla. Though many sperms reach the ampulla but only a single sperm fertilizes the ovum. A sperm after reaching the egg / ovum comes to lie against it. Its acrosome releases lysins : hyaluronidase and corona penetrating enzymes. They separate and dissolve the cells of corona radiata, so the sperm head passes through the zona pellucida

Acrosome reaction : As the sperm head touches the zona pellucida in the animal pole region, its acrosome covering ruptures to release lytic enzymes, acrosin or zona lysin. They act on the zona pellucida at the point of contact. This causes egg reaction - A small fertilization cone / cone of reception is formed on the egg membrane. The sperm head comes in contact with this cone. It results in production of a weak wave of depolarisation. Plasma membrane of the both cells dissolve at the point of contact. The sperm nucleus and the centrioles enter the egg, while other parts remain outside.

c. Activation of ovum : The ovum before fertilization was at metaphase II stage. With a contact of sperm head to the vitelline membrane of egg, it gets activated to resume and complete its meiosis II. With this it gives out the second polar body. The germinal vesicle organises into female pronucleus. At this stage, it is the true ovum or egg.





Significance of fertilization :

- Secondary oocyte completes the process of oogenesis and is transformed into a mature ovum (n).
- The diploid chromosome number is restored in the zygote by the process of syngamy.
- The ovum lacks the centrioles necessary for further divisions, are received from the sperm during fertilization.
- Fertilization involves fusion of male and female gametes from the two parents. It results in variations which are significant to evolution.
- Sex of the offspring is determined.

Embryonic development

① cleavage



→ cell formed cleavage called as Blastomere.

- In cleavage growth

- size is reduced

↳ metabolic rate increased

↳ rapid replication of DNA

↳ High consumption of O_2

Process of cleavage :-

- cleavage is holoblastic

↳ whole zygote gets divided.

↳ It may be

- longitudinal / meridional
- equatorial / horizontal

1st cleavage :- • It is longitudinal and occurs 30 hr after fertilization.

→ give 2-Blastomere

and cleavage

- it is also longitudinal but at right angle to 1st one.
- occurs 30hr of 1st cleavage

3rd cleavage :-

- it is horizontal
 - embryo is 8-cell stage
- gradually pushing towards uterus

4th Day of fertilization :-

- embryo is solid ball of 16-32 cells and externally looks like mulberry. This stage is called **Morulla**.

smaller, darker
cells towards
the outer side

Inner cell mass
of larger cells.

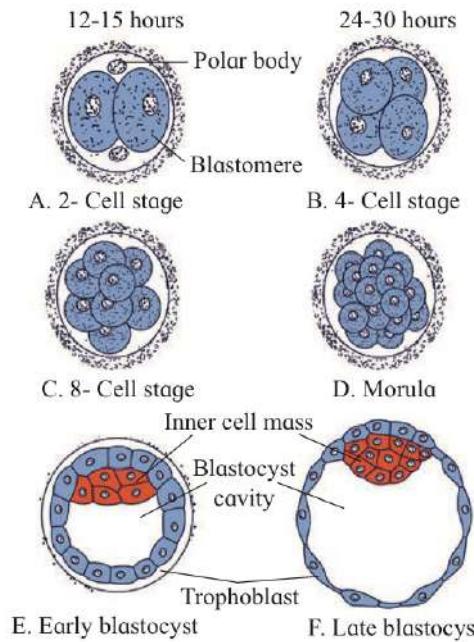


Fig. 2.14 : Process of cleavage and formation of Blastula

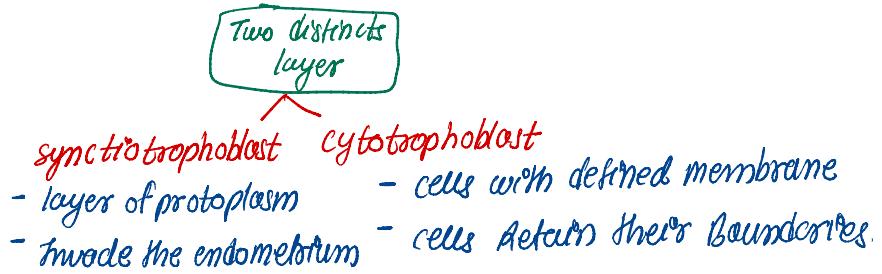
Blastulation :-

- "process of formation of the hollow and multicellular Blastocyst."
- That embryo floats in uterus remains floating for 2-4 days. (embryo)
 - i.e till end of 7th day of fertilization.
- outer layer of cells of morula called Trophoblast
 - ↳ cells from trophoblast begin to absorb the glycogen rich uterine milk.
- Blastocyst Doubled, 0.15 mm → 0.30 mm,
- at the end of 7th Day
 - ① Blastocyst is formed

Note:- • zona pellucida get degenerated
 ↳ function → to prevent implantation of embryo in abnormal place.

Implantation

- Blastocyst after its formation, gets implanted or embedded into the endometrium of uterus.
- process begins on day 7th after fertilization.
- By end of 10th day →
 - embryo is buried inside the endometrium.
 - implantation occurs at fundus of uterus.



Gastrulation

"process of formation of 'gastrula' from the blastocyst."

* Two important events

① Differentiation of Blasto meres

- process of formation of 3- germinal layer

||| ↳ ecotoderm ?

(b) morphogenetic movements

- these are different types of movement to reach their definite place in the embryo.

- Gastrulation begins in the 8th day of fertilization

- Inner mass cell starts dividing and becomes flat and move towards the Blastocoel.

↳ that cell grows within the Blastocoel and form Yolk sac.

mesoderm
endoderm

from the cells of embryo blast.

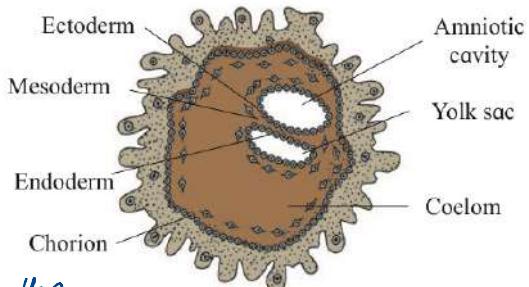


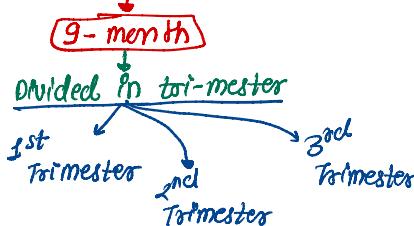
Table 2.16 : Fate of germinal layers:

Ectoderm	Mesoderm	Endoderm
Ectoderm gives rise to epidermis of skin, hair, nails, sweat glands, salivary glands, mammary glands, lacrimal glands, sebaceous glands, cornea, lens, retina, conjunctiva, nasal epithelium, enamel of teeth, internal and external ear, foregut, hindgut, adrenal medulla, anterior and posterior pituitary, pineal gland, entire nervous system.	Mesoderm forms all types of muscles (except iris muscles and ciliary muscles of eye which originate from ectoderm), connective tissues, dermis of skin, adrenal cortex, heart, blood, blood vessels, lymphatic vessels, middle ear, dentine of teeth, urinary and reproductive ducts, gonads, kidneys, sclera and choroid of eye.	Endoderm develops into epithelium of mid-gut, glands of stomach and intestine, tongue, tonsils, lungs, trachea, bronchi, larynx, urinary bladder, vagina, liver, pancreas, thyroid gland, parathyroid gland, thymus gland, Eustachian tube, epithelium of urethra, lining of middle ear.

- Anterior end of primitive groove communicate with yolk sac and forms Blastopore (future anus)
- gastrulation last for 1s - days of fertilization
 - After this organogenesis begins
 - formation of organs.

Pregnancy

- condition of carrying one or more embryos in the uterus.
also called **gestation**.
- period between fertilization → **gestation**
- average period 266 days from fertilization



First tri-mester :-

(Fertilization - 12th week)

- 2-4 weeks embryo gets nutrition directly from endometrium.
- main period organogenesis.
- end 8th week all major structures are formed
- embryo → Become foetus
 - ↳ 3cm long
 - arm, hand, fingers, feet, toes formed
 - CNS fully formed
 - working of excretory / circulatory system begins
 - movement of foetus begins but mother cannot feel
 - at the end foetus is around 7-10 cm long.
 - mother experiences 'morning sickness' (vomiting, mood swings etc)

2nd Tri-mester

(13th - 26th week)

- rapid growth of foetus
- uterus grows enough for the pregnancy to become obvious.
- foetus grows to 20cm.
- Development of brain begins.
- now, hCG/corpus luteum → regresses
 - placenta takes charge of Progesterone ↳ maintain pregnancy

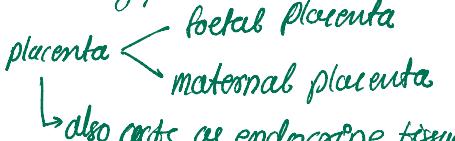
• Baby's movement easily can be felt by mother.

3rd - Trimester :-

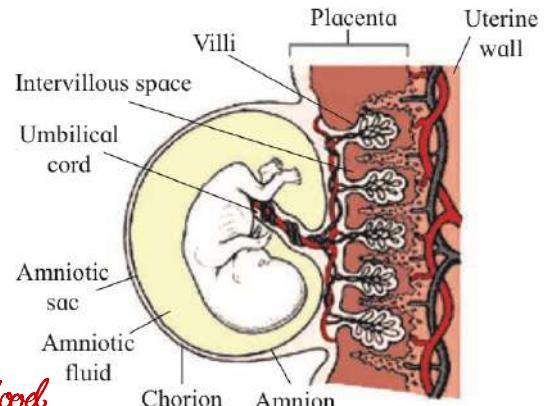
(27th week till parturition)

- foetus grows to about 3-4kg in weight
soem in length.
- gain in body weight
- uterus expands
- abdominal organ of mother gets compressed and displaced.
- now foetus is ready for parturition.

* placenta

- It is flattened, discoidal organ in the uterus of a pregnant woman.
- temporary structural and functional connection between foetal and maternal circulation.
- facilitate supply of O₂
- attached to wall of uterus and to the baby's umbilical cord.
- only organ formed from two tissue i.e.
Baby / mom.
- 
placenta 

also acts as endocrine tissue



* umbilical cord

- ↳ formed from 3-Blood vessels
 - 2-are small arteries
 - 1-vein
- ↳ Returns Blood to the foetus.
- ↳ carry Blood towards placenta

Parturition

- Humans are viviporous
 - ↳ who give birth to young one
- physical activities involved in parturition like
 - uterine
 - abdominal contraction
 - dilation of cervix
 - passage of baby

} → labour

↳ localised by sensation of discomfort or agony called labour pain.
- parturition controlled
 - ↳ neuroendocrine mechanism

Begin →

- signals arise from fully formed fetus and placenta cause contraction
- accompanied by estrogen-progesterone fluctuation.
- increase in oxytocin.

* causes vigorous contraction of myometrium

- fully developed Baby gives signal by releasing Adrenocorticotrophic Hormone (ACTH) from pituitary and adrenal gland.

- finally oxytocin is released.

② Dilation stage :-

- uterine contraction begins from top, forcing Baby towards the cervix.
- Head comes toward cervix
- cervix gets dilated
- vagina also shows dilation
- ends after rupture of amniotic membrane of foetus.

2. Expulsion stage : The uterine and abdominal contractions become stronger. In normal delivery, the foetus passes out through cervix and vagina with head in forward direction. It takes 20 to 60 min. The umbilical cord is tied and cut off close to the baby's navel.

3. After birth : After the delivery of the baby the placenta separates from the uterus and is expelled out as "after birth", due to severe contractions of the uterus. This process happens within 10 to 45 minutes of delivery.

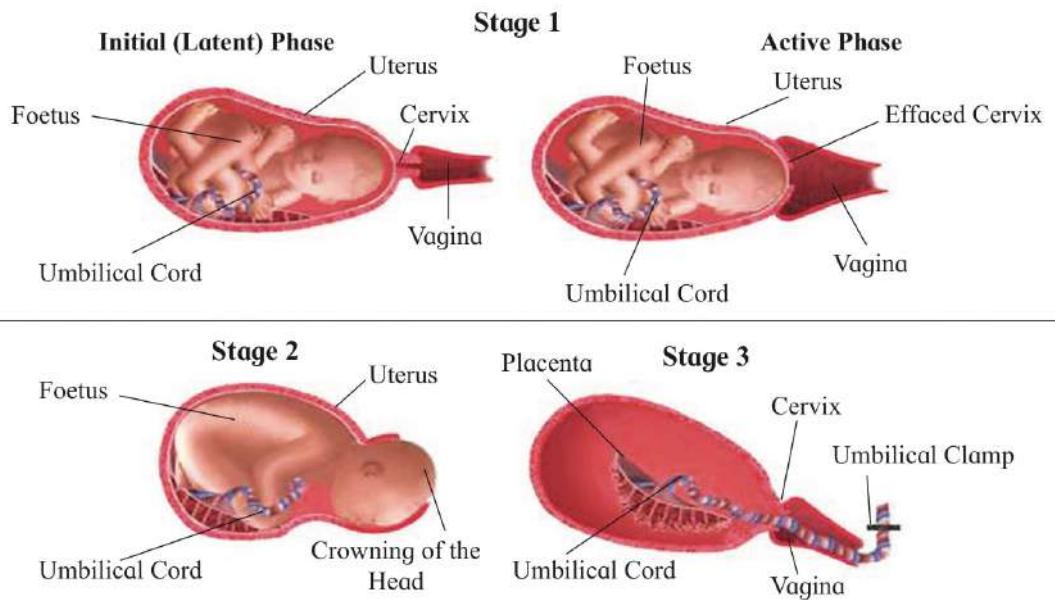


Fig. 2.18 : Parturition

Lactation

- mammary gland of female starts producing milk at the end of pregnancy.
- prolactin
 - ↳ hormone which is responsible for production of milk
- Helps mother to feed new born Baby.
- * fluid secreted by mothers mammary gland soon after child Birth called

Colostrum

- ↳ sticky, yellow fluid
- contains protein, lactose and mothers antibodies e.g IgA
- fat content is low.
- make immune system strong.

2.11 Reproductive Health:

According to World Health Organisation (WHO), reproductive health means total wellbeing in all aspects of reproduction- its emotional, behavioural and social aspects along with the physical ones. Therefore, a society with people having physically and functionally normal reproductive organs and normal emotional and behavioural interactions amongst them in all sex-related aspects might be called reproductively healthy society.

Of all the social goals of India, an important one is to attain total reproductive health. India was amongst the first few countries in the world to initiate action plans and programmes at a national level to improve reproductive health. All these improved programmes cover wider areas related to reproduction. These programs are currently in operation under the Reproductive and Child Health Care (RCH) programmes.

Goals of RCH Programmes:

1. To create awareness among people about various aspects related to reproduction.
2. To provide the facilities to people to understand and build up reproductive health.
3. To provide support for building up a reproductively healthy society.
4. To bring about a change mainly in three critical health indicators i.e. reducing total infertility rate, infant mortality rate and maternal mortality rate.

The goals of RCH can be achieved by the following ways:

1. By introduction of sex education in schools. Schools should be encouraged to provide correct information to the young so as to discourage children from believing in myths and clear the misconceptions about sex related aspects. Proper information about safe and hygienic sexual practices, sexually transmitted diseases (STD, AIDS), problems related to adolescence and proper information about reproductive organs.
2. With the help of audio-visual and the print media, government and non-government organisations should take various steps to create awareness about various aspects related to reproduction.
3. By educating the younger generation about birth control measures, pre-natal care of pregnant woman and post-natal care of the mother and child, importance of breast feeding.
4. By developing awareness about problems arising due to uncontrolled population growth, social evils like sex abuse and sex related crimes and take up necessary steps to prevent them.
5. By creating awareness about statutory ban on amniocentesis for sex determination.
6. By creating awareness about child immunization programmes.

Birth control

Temporary method

permanent method

- ④ natural method / safe period
- ⑤ coitus interruptus / withdrawal
- ⑥ lactational amenorrhoea
- ⑦ chemical means (spermicides)
- ⑧ mechanical means
 - condom
 - Diaphragm
 - intra-uterine device
- ⑨ physiological (oral devices)
- ⑩ other contraceptives

2.12 Birth control :

The birth control measures which deliberately prevent fertilization are referred to as contraceptives. The contraceptive methods help to prevent unwanted pregnancies. An ideal contraceptive should be easily available, user friendly, effective and with no or least side effects.

Contraceptive methods are of two main types i.e. temporary and permanent.

- ① Tubectomy → female
- ② vasectomy → male

a. Temporary methods:

These are of following types :

1. Natural method/ Safe period / Rhythm method : In the natural method, the principle of avoiding chances of fertilization is used. A week before and a week after menstrual bleeding is considered the safe period for sexual intercourse. This idea is based on the fact that ovulation occurs on the 14th day of menstrual cycle. Its drawback lies in having a high rate of failure.

2. Coitus Interruptus or withdrawal : In this method, the male partner withdraws his penis from the vagina just before ejaculation, so as to avoid insemination. This method also has some drawbacks, as the pre-ejaculation fluid may contain sperms and this can cause fertilization.

3. Lactational amenorrhea (absence of menstruation): This method is based on the fact that ovulation does not occur during the period of intense lactation following parturition. Therefore, as long as the mother breastfeeds the child fully, chances of conception are almost negligible. However, this method also has high chances of failure.

5. Mechanical means / Barrier methods:

In this method, with the help of barriers the ovum and sperm are prevented from physically meeting. These mechanical barriers are of three types.

i) **Condom:** It is a thin rubber sheath that is used to cover the penis of the male during copulation. It prevents the entry of ejaculated semen into the female reproductive tract. This can prevent conception. It is a simple and effective method and has no side effects. “Nirodh” is the most widely used contraceptive by males. It is easily available and is given free by the government. It should be properly discarded after every use. **Condom is also a safeguard against STDs and AIDS.**

ii) Diaphragm, cervical caps and vaults:

These devices used by the female are made up of rubber. They prevent conception by blocking the entry of sperms through the cervix. The device is inserted into the female reproductive tract to cover the cervix during copulation.

iii) **Intra-uterine devices (IUDs)** : These clinical devices are plastic or metal objects. A doctor or trained nurse places the IUDs into the uterus. These devices include **Lippes loop, copper releasing IUDs (Cu-T, Cu7, multiload 375) and hormone releasing IUDs (LNG-20, progestasert).**

4. Chemical means (spermicides): In this method, chemicals like foam, tablets, jellies, and creams are used by the female partner. Before sexual intercourse, if these chemicals are introduced into the vagina, they adhere to the mucous membrane, immobilize and kill the sperms. It may cause allergic reaction. This method also has chances of failure.



Diaphragm



Lippes loop

Fig. 2.19 : Mechanical means

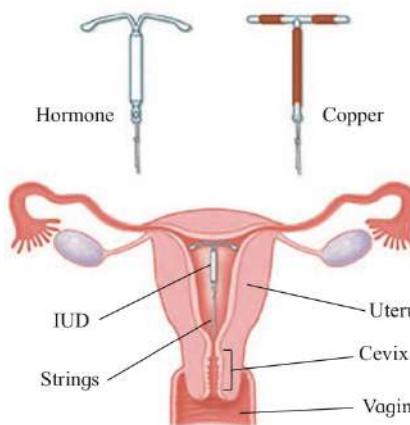


Fig. 2.20 : Copper - T

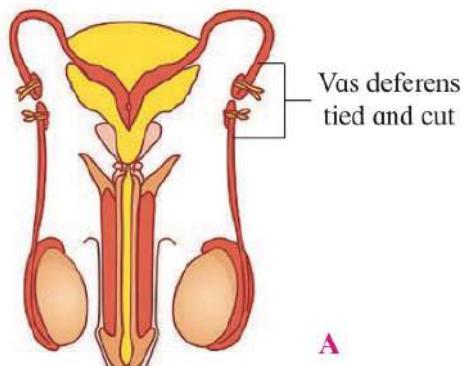
6. Physiological (Oral) Devices : Physiological devices are used in the form of tablets and hence are popularly called **pills**. It is an oral contraceptive, used by the female. The pill contains progesterone and estrogen. They inhibit ovulation, hence no eggs are released from the ovary of the female using this pill and thus conception cannot occur. They also alter the quality of cervical mucus to prevent the entry of sperms.

The pills have side effects such as nausea, weight gain, tenderness of breast and slight blood loss between menstrual periods. The pill "**Saheli**" is an oral contraceptive for females which is nonsteroidal. Saheli is to be taken once in a week. These pills are sponsored by the Government.

b. Permanent Method:

The permanent birth control method in men is called vasectomy and in women it is called tubectomy.

These are surgical methods, also called **sterilization**. In vasectomy a small part of the vas deferens is tied and cut where as in tubectomy, a small part of the fallopian tube is tied and cut. This blocks, gamete transport and prevent pregnancy.



7. Other contraceptives : The birth control **implant** is a contraceptive used by the female. It is a tiny, thin rod about the size of a matchstick. It is implanted under the skin of the upper arm.

They contain progesterone and estrogen. Their mode of action is similar to that of pills. They prevent pregnancy for 3-4 years.



Fig. 2.21 : Implanon/ Nexplanon

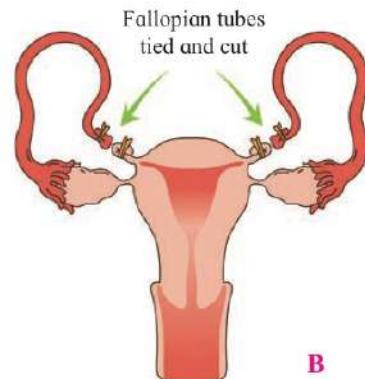


Fig. 2.22 : Permanent method

Medical Termination of Pregnancy (MTP) :

An intentional or voluntary termination of pregnancy before full term is called Medical termination of Pregnancy (MTP) or induced abortion. MTP is essential in cases of unwanted pregnancies or in defective development of foetus. It is safe during the first trimester of pregnancy. The defective development of foetus is examined by amniocentesis.

Amniocentesis is a process in which amniotic fluid containing foetal cells is collected using a hollow needle inserted into the uterus under ultrasound guidance. The chromosomes are studied to see the abnormalities in the developing foetus. But the dangerous trend is the misuse of amniocentesis to determine the sex of the unborn child. Frequently, if the foetus is found to be female, it is aborted which is totally illegal. So the Government of India has legalised MTP Act in 1971, with strict conditions to avoid its misuse.

Amniocentesis : Used to extract foetal cells for genetic analysis.

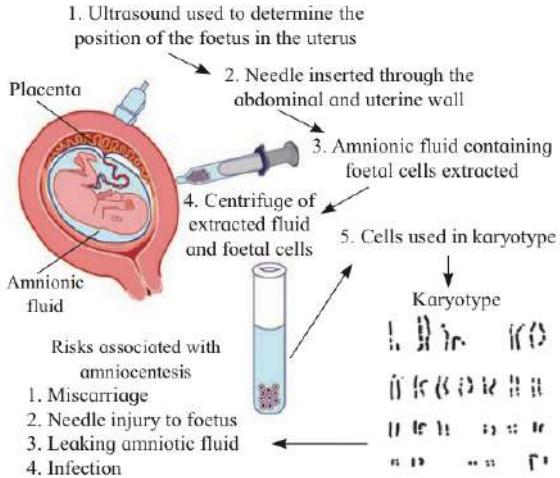


Fig. 2.23 : Amniocentesis process

2.13 Sexually Transmitted Diseases (STDs) :

Diseases or infections which are transmitted through sexual intercourse are collectively called Sexually Transmitted Diseases (STDs) or Venereal Diseases (VDs) or Reproductive Tract Infections (RTI). The major venereal diseases are syphilis and gonorrhoea.

Name of Disease	Syphilis	Gonorrhoea
Causative agent	<i>Treponema pallidum</i> (Bacteria)	<i>Neisseria gonorrhoeae</i> (Bacteria)
Incubation period	3-4 weeks	Male – 2 to 14 days Female – 7 to 21 days
Infection site	Mucous membrane in genital, rectal and oral region.	Mucous membrane of urino-genital tract, rectum, throat and eye.
Symptoms	Primary lesion called chancre at the site of infection. Chancre is formed on external genitalia, skin rashes and mild fever, inflamed joints, loss of hair. Paralysis, Degenerative changes occur in the heart and brain.	In male, partial blockage of urethra and reproductive ducts, pus from penis, pain and burning sensation during urination, arthritis, etc. In female, pelvic inflammation of urinary tract, sterility, arthritis, the children born to affected mother suffer from gonococcal ophthalmia and gonococcal vulvovaginitis of girls before puberty.
Preventive measures	Education about sex practices, sex hygiene, avoiding sex with unknown partner or multipartners, using condom during coitus.	Sex hygiene, using condom during coitus, avoiding sex with unknown partner or multipartners.
Treatment	Antibiotic-Penicillin	Antibiotic-Cefixime

2.14 Infertility :

Infertility is defined as the inability to conceive naturally after (one year of) regular unprotected intercourse. The causes of infertility could be physical, congenital, diseases, immunological or even psychological. The common physical causes in females are polycystic ovary syndrome (PCOS), hormonal imbalance, endometriosis while in male, it is less sperm count and small size of penis.

Prior to 1978, infertile couple had two options, adopt or be childless. Today infertile couples have many options to have a child such as fertility drugs, test tube babies, artificial insemination, IUI, surrogate motherhood, etc. The couple could be assisted to have child / children through certain special techniques commonly known as Assisted Reproductive Technologies (ART).

IVF (In Vitro Fertilization) :

It is a process of fertilization where an egg is combined with sperm outside the body in a test tube or glass plate to form a zygote under simulated conditions in the laboratory. The zygote or early embryos (with up to 8 blastomeres) could be then transferred into the fallopian tube for further development.

ZIFT (Zygote Intrafallopian Transfer) :

ZIFT is an infertility treatment used when there is a blockage in the fallopian tubes which prevents the fertilization of egg by the sperm.

In this method, egg is removed from woman's ovary. Fertilization of the egg with sperms is brought about outside the body under sterile conditions to form zygote by the process called *in vitro* fertilization (IVF). The zygote is then transferred to fallopian tube for further development.

GIFT (Gamete Intrafallopian Transfer) :

Transfer of an ovum collected from a donor into the fallopian tube of another female who can provide suitable environment for its fertilization and development.

This technique called gamete intrafallopian transfer (GIFT) has been developed for the cases in which only the entrance to the oviducts or the upper segment of the oviducts is blocked. In this procedure ova and sperms are directly injected into regions of the oviduct, where fertilization produces a blastocyst, which enters the uterus via the normal route. GIFT has a success rate of about 30 percent.

ICSI (Intra Cytoplasmic Sperm Injection) :

ICSI is an *in vitro* fertilization procedure in which a single sperm cell is injected directly into cytoplasm of an ovum in the laboratory. Here the sperm has to naturally penetrate the egg.

Artificial Insemination (AI) :

In some infertility cases, the male partner is unable to inseminate the female due to a very low sperm count. This problem can be solved by artificial insemination. In this technique, the sperms are collected from the male and artificially introduced into the cervix of female, for the purpose of achieving a pregnancy through *in vivo* fertilization (inside the body).

IUI (Intra Uterine Insemination) :

In this technique the process is somewhat like that of artificial insemination, the only difference is that the sperms are introduced into the uterine cavity instead of cervix.

Sperm bank / Semen bank:

A sperm bank or semen bank is a place which collects, stores and provides human sperms / semen. The semen is provided by healthy males called **sperm donors**. The sperms are stored in sperm bank by cryopreservation method (at low temperature).



Can you recall?

Surrogate mother :

Some women have problem in implantation of embryo in uterus. Such woman can take help of the modern remedial technique called surrogacy. In this, embryo is implanted in surrogate mother, who is not the biological mother.

Adoption :

Adoption is a legal process by which a couple or a single parent gets legal rights, privileges and responsibilities that are associated to a biological child for the upbringing of the adopted child.

An adoptive parent should be medically fit and financially able to take care of the adopted child. A person wishing to adopt a child must be at least 21 years old but there is no legal upper age limit for adoption.