

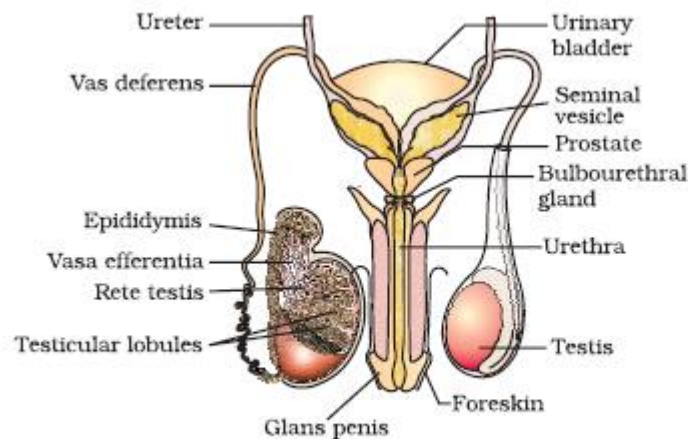
## CHAPTER – 3: HUMAN REPRODUCTION

- In humans reproduction is sexual method and they are viviparous.
- The reproductive events include gametogenesis, transfer of sperms into the female genital tract (insemination) and fertilization leading to the formation of zygote.
- This is followed by the formation of blastocyst and its attachment to the endometrial uterine wall called implantation.
- Embryonic development called gestation or pregnancy.
- Finally parturition (delivery of the baby).
- These reproductive events occur after puberty.
- There are remarkable differences between the reproductive events in male and female. For example, male can produce sperms even at the old age, but formation of ovum in female ceases around the age of 50 years. The male produces millions of sperms at a time whereas in female only one ovum is produced at a time.

### The Male Reproductive System

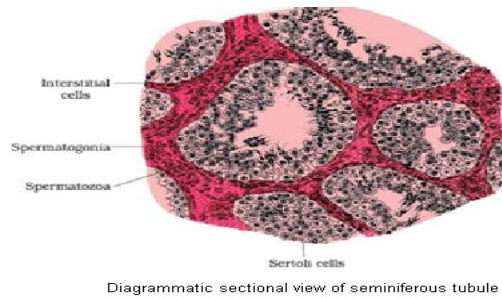
- The male reproductive system is located in the region of pelvis.
- It includes a pair of testes, accessory ducts, glands and external genitalia (Penis).

#### a) Structure of Testes



#### Diagrammatic view of male reproductive system

1. Testes are extra abdominal present within a pouch called **scrotum**. The scrotum helps in maintaining the low temperature (2-2.5°C lower than internal body temperature) which is necessary for spermatogenesis.
2. In adults, each testis is oval in shape, with a length of about 4 to 5 cm and a width of about 2-3 cm.
3. Each testis has about 250 compartments called testicular lobules.
4. Each lobule contains one to three highly coiled **seminiferous tubules** in which sperms are produced.
5. The wall of seminiferous tubule is lined by two types of cells called **male germ cells** (spermatogonia) and **Sertoli cells**.
6. Male germ cells undergo meiosis to produce sperms, whereas sertoli cells are the nursing cells which provide nutrition to the germ cells.
7. The regions between adjacent seminiferous tubules is called interstitial spaces contain small blood vessels and **interstitial cells** or **Leydig cells** which synthesise and secrete testicular hormones called **androgens**.



### b) Accessory ducts

- The male sex accessory ducts include **rete testis**, **vasa efferentia**, **epididymis** and **vas deferens**.
- The seminiferous tubules of the testis open into the vasa efferentia through rete testis.
- The vasa efferentia leave the testis and open into epididymis located along the posterior surface of each testis.
- The epididymis leads to vas deferens that ascends to the abdomen and loops over the urinary bladder.
- It receives a duct from seminal vesicle and opens into urethra as the ejaculatory duct.
- The urethra originates from the urinary bladder and extends through the penis to its external opening called **urethral meatus**.

### c) Accessory glands

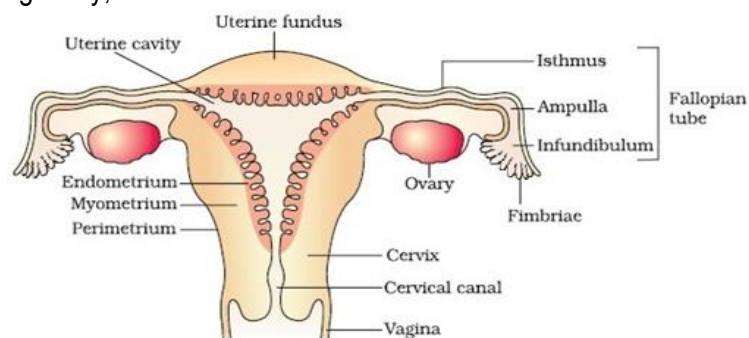
- \* It includes paired **seminal vesicles**, a **prostate gland** and paired **bulbourethral glands** (Cowper's glands).
- \* Secretions of these glands constitute the seminal plasma which is rich in fructose, calcium and certain enzymes.
- \* The secretions of bulbourethral glands also help in the lubrication of the penis.

### d) Penis

- The penis is the male external genitalia.
- It is made up of special tissue that helps in erection of the penis to facilitate insemination.
- The enlarged end of penis is covered by a loose fold of skin called foreskin.

## The Female Reproductive System

- The female reproductive system located in the pelvic region.
- It consists of a pair of ovaries, a pair of oviducts (fallopian tubes), uterus, cervix, vagina and the external genitalia
- A pair of mammary glands is also integrated structurally and functionally to support the processes of ovulation, fertilization, pregnancy, birth and child care.



### a) Ovaries

- Ovaries are the female primary sex organs that produce the female gamete (ovum) and several steroid hormones (ovarian hormones).
- The ovaries are located one on each side of the lower abdomen.
- Each ovary is about 2 to 4 cm in length and is connected to the pelvic wall and uterus by ligaments.

- Each ovary is covered by a thin epithelium which encloses the ovarian stroma. The stroma is divided into two zones – a peripheral cortex and an inner medulla.

#### b) Oviduct (Fallopian tube)

- Each fallopian tube is about 10-12 cm long and extends from the periphery of each ovary to the uterus and the part closer to the ovary is the funnel shaped **infundibulum**.
- The edges of the infundibulum possess finger like projections called **fimbriae** which help in collection of the ovum after ovulation.
- The infundibulum leads to a wider part of the oviduct called **ampula**.
- The last part of the oviduct **Isthmus** has a narrow lumen and it joins the uterus.

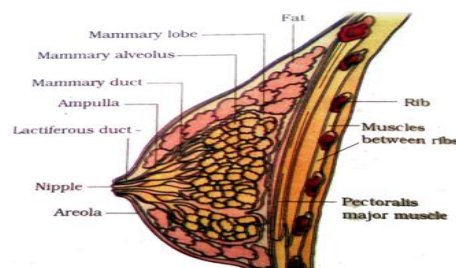
#### c) Uterus

- The uterus is single and it is also known as **womb**.
- The shape of the uterus is like an inverted pear and is supported by ligaments attached to the pelvic wall.
- The uterus opens into vagina through a narrow cervix. The cavity of the cervix is called **cervical canal** which along with vagina forms the birth canal.
- The uterus wall has three layers of tissue. The external thin membranous **perimetrium**, middle thick layer of smooth muscle **myometrium** and inner glandular layer called **endometrium** that lines the uterine cavity.
- The endometrium undergoes cyclical changes during menstrual cycle while the myometrium exhibits strong contraction during delivery of the baby.

#### d) Vagina

- The female external genitalia include mons pubis, labia majora, labia minora, hymen and clitoris.
- **Mons pubis** is a cushion of fatty tissue covered by skin and pubic hairs.
- The **labia majora** are fleshy folds or tissue which extend down from the mons pubis and surround the vaginal opening.
- The **labia minora** are paired folds of tissue under the labia majora.
- The opening of the vagina is often covered partially by a membrane called **hymen**.
- The **clitoris** is a tiny finger like structure which lies at the upper junction of the two labia minora above the urethral opening.
- The hymen is often torn during the first coitus (intercourse).
- *However, it can also be broken by a sudden fall or jolt, insertion of a vaginal tampon, active participation in some sports like horse riding, cycling etc. In fact the presence or absence of hymen is not a criteria of virginity or sexual experience.*

#### e) Mammary Glands



A diagrammatic sectional view of mammary gland

- A functional mammary gland is characteristic of all female mammals.
- The mammary glands are paired structures (breasts) that contain glandular tissue and variable amount of fat.

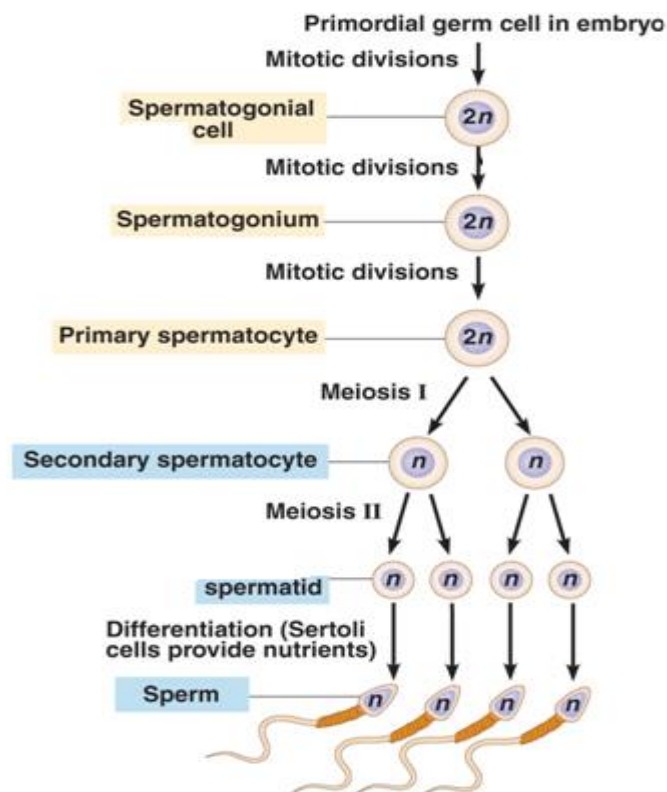
- The glandular tissue of each breast is divided into 15-20 **mammary lobes** containing clusters of cells called alveoli.
- The cells of alveoli secrete milk which is stored in the cavities (lumens) of alveoli.
- The alveoli open into **mammary tubules**.
- The tubules of each lobe join to form a **mammary duct**.
- Several mammary ducts join to form a wider mammary ampulla which is connected to **lactiferous duct** through which milk is sucked out.

## GAMETOGENESIS

“Formation of haploid male or female gamete by gonads is called gametogenesis”. It includes two processes namely, spermatogenesis and oogenesis.

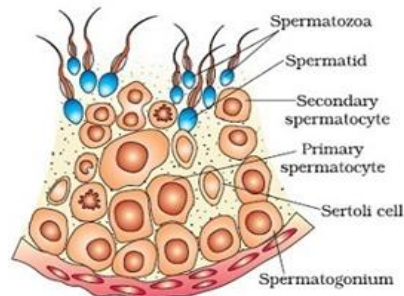
### Spermatogenesis

1. “Production of haploid sperms by the seminiferous tubules of the testis is called Spermatogenesis”.



2. The wall of each seminiferous tubule consists of two types of cells namely **gonial cells** (sperm mother cells) and **sertoli cells**. The gonial cells develop into sperms whereas the sertoli cells are the nursing cells which nourish the gonial cells during spermatogenesis.
3. A diploid gonial cell divides repeatedly by mitosis to produce more number of **spermatogonia**.
4. Spermatogonia increase their size due to accumulation of nutritive materials in the cytoplasm and the cell is ready to undergo meiosis is called **primary spermatocyte** having 46 chromosomes.
5. A diploid primary spermatocyte undergoes meiosis to produce two haploid **secondary spermatocytes** which have only 23 chromosomes.
6. Secondary spermatocyte undergoes meiosis 2<sup>nd</sup> to produce 4 haploid daughter cells called **spermatids** (carrying 23 chromosomes).

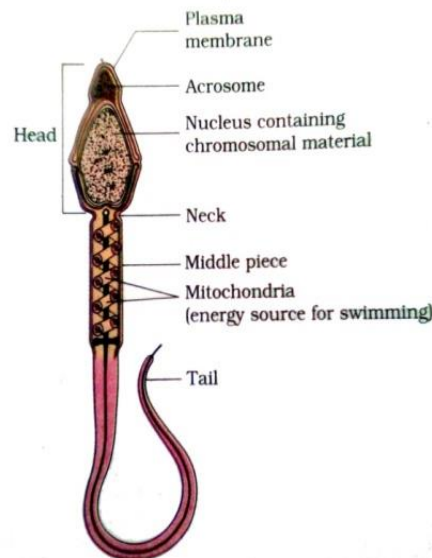
- The spermatids have to undergo further metamorphosis to convert into **sperms**. This process is called **spermiogenesis** or **spermateliosis**. After spermiogenesis, sperm head become embedded in the sertoli cells and are finally released from the seminiferous tubules by the process called **spermiation**.



Diagrammatic sectional view of a seminiferous tubule (enlarged)

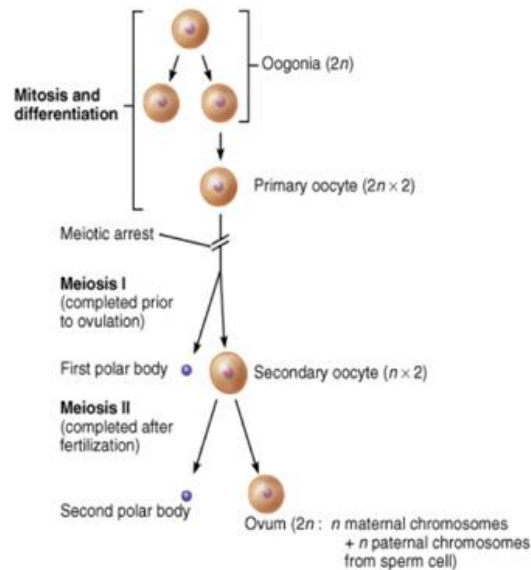
### Structure of Sperm

- The sperm is a motile, haploid, male gamete produced in the seminiferous tubules of the testis.
- The sperm is about 50-60 micro meters in length. The sperm consists of three distinct parts such as head, middle piece and tail.



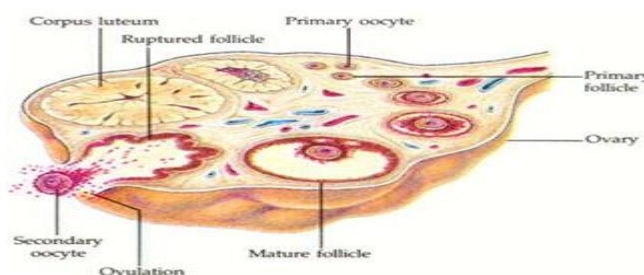
- Human sperm is microscopic structure and composed of head, neck, middle piece and tail.
- A plasma membrane envelopes whole body of sperm.
- The sperm head contains an elongated haploid nucleus, the anterior part is covered by a cap like structure called **acrosome**.
- Acrosome is filled with enzymes that help in fertilisation of ovum.
- The middle piece contains numerous mitochondria which supply energy for the motility of the sperms essential for fertilisation.
- The human male ejaculates about 200 to 300 million sperms during coitus of which, for normal fertility atleast 60% sperms must have normal size and shape and atleast 40% of them must show vigorous motility.
- Sperms released from the seminiferous tubules, are transported by the accessory ducts.
- Secretions of epididymis, vas deferens, seminal vesicle and prostate are essential for maturation and motility of sperms.
- The seminal plasma along with the sperms constitutes the **semen**.
- The functions of male sex accessory ducts and glands are maintained by the testicular hormones (androgens).

## Oogenesis



Schematic representation of Oogenesis

1. Formation of ovum or egg in the follicles of ovary is called **Oogenesis**.
2. Oogenesis is initiated during the embryonic development stage when a couple of million gamete mother cells (oogonia) are formed within each fetal ovary. No more oogonia are formed and added after birth.
3. These cells start dividing and enter into prophase-I of meiosis and get temporarily arrested, at that stage is called **primary oocytes**.
4. Each primary Oocyte gets surrounded by a layer of **granulosa cells** and then called the **primary follicles**. A large number of follicles degenerate during the phase from birth to puberty. Therefore, at puberty only 60,000-80,000 primary follicles are left in each ovary.
5. The primary follicles get surrounded by more layers of granulosa cells and a new theca and are called **secondary follicles**.
6. The secondary follicle soon transforms into a **tertiary follicle** which is characterized by a fluid filled cavity called **antrum**. The theca layer is organized into an inner **theca interna** and an outer **theca externa**.
7. At this stage, the primary oocyte within the tertiary follicle grows in size and completes its first meiotic division. It is an unequal division resulting in the formation of a large haploid **secondary oocyte** and a tiny first **polar body**.
8. The secondary oocyte retains bulk of the nutrient rich cytoplasm of the primary oocyte.
9. The tertiary follicle further changes into the mature follicle or **Graafian follicle**.
10. The secondary oocyte forms a new membrane called **zona pellucida** surrounding it.
11. The Graafian follicle now ruptures to release the **secondary oocyte** (ovum) from the ovary by the process called **ovulation**.



Diagrammatic section view of ovary

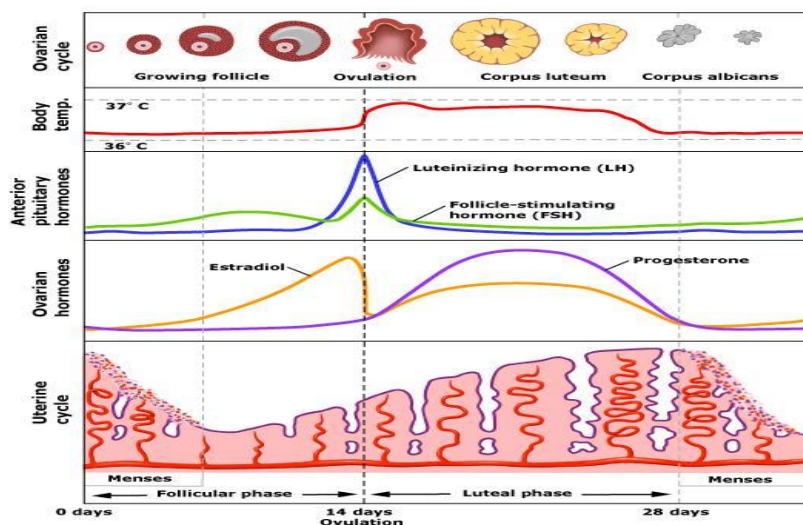
## Differences between Spermatogenesis and Oogenesis

Spermatogenesis	Oogenesis
1. Occur in the seminiferous tubule of the testis	1. Occur in the follicle of ovaries.
2. Sertoli cells are associated	2. Sertoli cells are not associated
3. Polar bodies are not produced	3. Polar bodies are produced
4. Spermatids undergo metamorphosis to convert into sperms	4. After second meiosis secondary oocyte produces a functional ovum
5. A single primary spermatocyte produce four functional sperms	5. A single primary oocyte produce only one functional ovum
6. The process of spermiogenesis is present	6. It is absent

## Menstrual Cycle

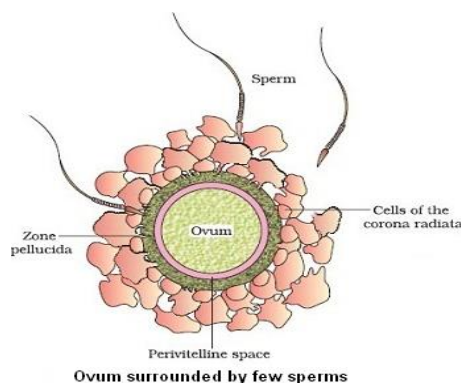
- ✧ The reproductive cycle in the female primates (e.g. monkeys, apes and human beings) is called **menstrual cycle**.
- ✧ The first menstruation begins at puberty is called **menarche**.
- ✧ In human females, menstruation is repeated at an average interval of about 28/29 days, and the cycle of events starting from the one menstruation till the next one is called the menstrual cycle.
- ✧ Only one ovum is released (ovulation) during the middle of each menstrual cycle.
- ✧ The major events of menstrual cycle are **menstrual phase, Follicular phase, Luteal Phase**.
- ✧ The cycle starts with the menstrual phase when menstrual flow occurs and it lasts for 3-5 days.
- ✧ The menstrual flow results due to breakdown of endometrial lining of the uterus and its blood vessels which forms a red fluid that comes out through vagina.
- ✧ Menstruation occurs only if the released ovum is not fertilized. Hence lack of menstruation is the **indicative of pregnancy**.
- ✧ The menstrual phase is followed by the follicular phase. During this phase, the primary follicles in the ovary grow to become a fully matured **Graafian follicle** and simultaneously the endometrium of uterus regenerates through proliferation.
- ✧ These changes in the ovary and the uterus are induced by changes in the levels of pituitary and ovarian hormones.
- ✧ The secretion of gonadotropins (FSH and LH) increases during the follicular phase and stimulates follicular development as well as secretion of estrogens by the growing follicles.
- ✧ Both FSH and LH attain a peak level in the middle of cycle (about 14<sup>th</sup> day). Rapid secretion of LH leading to its maximum level during the mid-cycle called **LH surge** that induces rupture of Graafian follicle and thereby the release of ovum into the uterine tube is called **ovulation**.
- ✧ The ovulation is followed by the luteal phase during which the remaining parts of the Graafian follicle transforms as the **corpus luteum**.
- ✧ The corpus luteum secretes large amounts of **progesterone** which is essential for maintenance of the endometrium. Such an endometrium is necessary for implantation of the fertilized ovum and other events of pregnancy.

- ⊗ During pregnancy all events of the menstrual cycle stop and there is no menstruation. In the absence of fertilization, the corpus luteum degenerates. This causes disintegration of the endometrium leading to menstruation that marks a new menstrual cycle.
- ⊗ In human beings, menstrual cycle ceases around 50 years of age called **menopause**. Cyclic menstruation is an indicator of normal reproductive phase in female that extends between **menarche** to **menopause**.



## Fertilisation and Implantation

**Fertilisation:** It is the fusion of haploid sperm and ovum to form a diploid zygote.



- During copulation (coitus), semen is released by the penis into the vagina is called insemination.
- The motile sperms swim rapidly, pass through the cervix to enter into the uterus and finally reach the junction of the isthmus and ampulla (ampullary – isthmic junction) of the fallopian tube.
- The ovum released by the ovary is also transported to the ampullary-isthmic junction where fertilisation takes place.
- Fertilisation can only occur if the ovum and sperms are transported simultaneously to the ampullary-isthmic junction. This is the reason why all copulations do not lead to fertilisation and pregnancy.
- The process of fusion of a sperm with an ovum is called fertilisation. During fertilisation, a sperm comes in contact with the **zona pellucida** layer of the ovum and induces changes in the membrane that block the entry of additional sperms. Thus, it ensures that only one sperm can fertilise an ovum.
- The secretions of acrosome help the sperm to enter into the ovum through zona pellucida and the plasma membrane. This induces the completion of the meiotic division of the secondary oocyte. The second meiotic division is also unequal and results in the formation of a second polar body and a haploid ovum (ootid).
- Later, the haploid nucleus of the sperm and that of the ovum is fuse together to form a **zygote**.



## Sex Determination of a child

How sex of a child is decided before birth?

- The sex of the child is determined at the stage of fertilisation.
- The sex chromosomes of the male parent are X and Y. Hence, the male individual produces two types of sperms carrying X and Y chromosomes. Hence, he is called heterogametic.
- Whereas the female parent has XX chromosomes and she produce only one ovum carrying X chromosome. Hence, she is called homogametic.
- After the fusion of sperm and ovum the zygote would carry either XX or XY chromosomes. The zygote carrying XX chromosomes would develop into female child and the zygote carrying XY chromosomes would develop into male child.

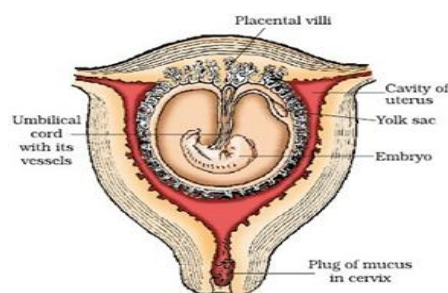
## Implantation

- Attachment of blastocyst to the endometrium wall of the uterus is called implantation.
- The zygote starts moving through the isthmus of the oviduct towards the uterus, during which the zygote undergo mitotic division called **cleavage** to form 2, 4, 8, 16 daughter cells called **blastomeres**.
- The embryo with 8 to 16 blastomeres is called a **morula**.
- The morula continues to divide and transforms into **blastocyst** as it moves further into the uterus.
- The blastomeres in the blastocyst are arranged into an outer layer called **trophoblast** and inner group of cells attached to trophoblast is called **inner cell mass**.
- The trophoblast layer then gets attached to the endometrium of the uterus and the inner cells divide rapidly and cover the blastocyst. As a result, the blastocyst becomes embedded in the endometrium of the uterus called **implantation** and it leads to pregnancy.

## Pregnancy

- After implantation, finger like projections appear on the trophoblast called **chorionic villi** which are surrounded by the uterine tissue and maternal blood.
- The chorionic villi and uterine tissue become interdigitated with each other and jointly form a structural and functional unit between developing embryo (foetus) and maternal body called **placenta**.
- The placenta facilitates the supply of oxygen and nutrients to the embryo and also removal of carbon dioxide and excretory materials produced by the embryo.
- The placenta is connected to the embryo through an umbilical cord which helps in the transport of substances to and from the embryo.
- Placenta also acts as an endocrine tissue and produces several hormones like human chorionic gonadotropin (hCG), human placental lactogen (hPL), estrogens, progesterones.
- In the later stage of pregnancy, a hormone called **relaxin** is also secreted by the ovary. Increased production of these hormones will support the fetal growth, metabolic changes in the mother and maintenance of pregnancy.

## Embryonic Development



The human foetus within the uterus

- Immediately after implantation, the inner cell mass (embryo) differentiates into an outer layer called **ectoderm** and an inner layer called **endoderm** with **mesoderm** in between.
- These three layers give rise to all tissues and organs in adults.
- Certain cells present in the inner cell mass are called **stem cells** which have the potency to give rise to all types of tissues and organs.
- The human pregnancy lasts for 9 months.
- After one of pregnancy, the embryo's heart is formed. The first sign of growing foetus may be noticed by listening to the heart sound carefully through the stethoscope.
- By the end of the second month of pregnancy, the foetus develops limbs and digits.
- By the end of 3 months (12 weeks – first trimester), most of the major organ systems are formed.
- The first movement of the foetus and appearance of hair on the head are usually observed during the fifth month.
- By the end of 24 weeks (second trimester), the body is covered with fine hair, eye-lids separate and eyelashes are formed.
- By the end of nine months of pregnancy, the foetus is fully developed and is ready for delivery.

### **Parturition**

- The average duration of human pregnancy is about 9 months which is called the **gestation period**.
- Vigorous contraction of the uterus at the end of pregnancy causes expulsion or delivery of the foetus (child birth) is called **parturition**.
- Parturition is induced by a complex neuroendocrine mechanism.
- The signals for parturition originate from the fully developed foetus and the placenta which induces mild uterine contractions called **foetal ejection reflex**. This triggers release of **oxytocin** from the maternal pituitary.
- Oxytocin acts on the uterine muscle and causes stronger uterine contractions, which in turn stimulates further secretion of oxytocin.
- This stimulatory reflex continues resulting in stronger and stronger contractions. This leads to expulsion of the baby out of the uterus through the birth canal (vagina) results in parturition.
- Soon after the delivery the placenta is also expelled out of the uterus.

### **Lactation**

- The mammary glands undergo differentiation during pregnancy and starts producing milk towards the end of pregnancy by the process called **lactation**.
- This helps the mother in feeding the new born child.
- The milk produced during the initial few days of lactation is called **colostrum** which contains several antibodies absolutely essential to develop resistance against diseases for the new born baby.

## CHAPTER – 4: REPRODUCTIVE HEALTH

According to the World Health Organisation (WHO) reproductive health means a total well being in all aspects of reproduction, i.e., physical, emotional, behavioural and social.

### Reproductive Health – Problems and Strategies

India was amongst the first countries in the world to initiate action plans and programmes at a national level to attain total reproductive health as a social goal. These programmes called 'family planning' were initiated in 1951 and were periodically assessed over the past decades. Improved programmes covering wider reproduction related areas are currently in operation under the popular name 'Reproductive and Child Health Care (RCH) programmes'. Creating awareness among people about various reproductions related aspects and providing facilities and support for building up a reproductively healthy society are the major tasks under these programmes.

1. Governmental and non-governmental agencies have taken various steps through audio-visual and print media to create awareness among people about reproduction related aspect.
2. Parents, teachers, relatives and friends also have a major role in spreading of the above information.
3. Introduction of sex education in schools and colleges should also be encouraged to provide right information to the young so as to discourage children from believing in myths and misconceptions about sex related aspects.
4. Proper information about reproductive organs, adolescence (grown boy or girl) and related changes, safe and hygienic sexual practices, sexually transmitted diseases (STD), AIDS, etc., would help people especially those in the adolescent age group to lead a reproductively healthy life.
5. Educating people, especially fertile couples and those in marriageable age group, about available birth control options, care of pregnant mothers, post-natal care of the mother and child, importance of breast feeding, equal opportunities for the male and female child etc., would address the importance of bringing up socially conscious healthy families of desired size.
6. Awareness of problems due to uncontrolled population growth, social evils like sex abuse and sex related crimes etc., need to be created to enable people to think and take up necessary steps to prevent them and thereby build up a socially responsible and healthy society.

### How to implement Reproductive Health

- Successful implementation of various action plans to attain reproductive health requires strong infrastructural facilities, professional expertise and material support.
- These are essential to provide medical assistance and care to people in reproduction-related problems like pregnancy, delivery, STD's, abortions, contraception, menstrual problems, infertility etc.
- Implementation of better techniques and new strategies from time to time is also required to provide more efficient care and assistance to people.
- Statutory ban on **amniocentesis** (a foetal sex determination based on the chromosomal pattern in the amniotic fluid surrounding the developing embryo) for sex determination to legally check increasing female **foeticides** (destruction of foetus), massive child immunization etc., are some programmes that merit mention in this connection.
- Research on various reproduction related areas are encouraged and supported by the government and non-government agencies to find out new methods to improve the existing ones. (A drug 'Saheli' a new oral contraceptive for the females developed by the Central Drug Research Institute (**CDRI**) in Lucknow.
- Better awareness about sex related matters, increased medically assisted deliveries and better post natal care leading to decreased maternal and infant mortality rates, increased number of couples with small families, better detection and cure of STDs and overall increased medical facilities for all sex related problems. All indicate improved reproductive health of the society.

## Population Explosion and Birth Control

1. In the last century all round development in various fields significantly improved the quality of life of the people. However increased health facilities along with better living conditions and an explosive impact on the growth of population.
2. The world population which was around 2 billion (2000 million) in 1900 rocketed to about 6 billion by 2000.
3. A similar trend was observed in India also. Indian population was approximately 350 million at the time of independence reached close to the billion mark by 2000 and crossed 1 billion in May 2000. This means, every sixth person in the world is an Indian.
4. A rapid decline in death rate, **Maternity Mortality Rate (MMR)** and **Infant Mortality Rate (IMR)** as well as an increase in number of people in reproductive age are probable reasons for this.
5. Such an alarming growth rate could lead to an absolute scarcity of even the basic requirements, ie., food, shelter and clothing, in spite of significant progress made in those areas. Therefore, Government is forced to take up serious measures to check this population growth rate.
6. The most important step to overcome this problem is to motivate smaller families by using various contraceptive methods.
7. You might have seen advertisements in the media as well as posters etc., showing a happy couple with two children with a slogan "**Hum Do, Hamare Do**" (we two, our two). Many couples, mostly the young, urban, working ones have even adopted 'one child norm'.
8. Statutory rising of marriageable age of the female to 18 years and that of males to 21 years, and incentives given to couples with small families are two of the other measures taken to tackle this problem.

## Contraceptive methods

- An ideal contraceptive should be user friendly, easily available, effective and reversible with no or less side effects.
- It also should in no way interfere with the sexual activities, desire and sexual act of the user.
- A wide range of contraceptive methods are presently available which could be broadly grouped into the following categories, namely Natural, Traditional, Barrier, IUDs. Oral contraceptives, Injectables, Implants and Surgical methods.

### 1. Natural methods

- Natural methods avoid the chances of sperm and ovum meeting.
- Periodic abstinence is one such method in which the couples avoid or abstain (keep away) from coitus from day 10 to 17 of the menstrual cycle when ovulation could be expected. As chances of fertilisation are very high during this period and called **fertile period**.
- Therefore, conception could be prevented by **withdrawal method** or **coitus interruptus** is another method in which the male partner withdraws his penis from the vagina just before ejaculation so as to avoid insemination.
- **Lactational amenorrhea** (absence of menstruation) method is based on the fact that the cycle does not occur during the period of intense lactation following parturition.
- Therefore, as long as the mother breast feeds the child fully, chances of conception are almost nil. However, this method has been reported to be effective only upto a maximum period of six months following parturition. As no medicines or devices are used in these methods, side effects are almost nil. Even though chances of failure high among those who are following this method.

### 2. Barrier Method

- In barrier methods, sperms and ovum are prevented from physically meeting with the help of barrier. Such methods are available for both males and females.

- Condoms are barriers made of thin rubber/latex sheath that are used to cover the penis in the male or vagina and cervix in female, just before coitus so that the ejaculated semen would not enter into female reproductive tract. This can prevent conception.
- '**Nirodh**' is a popular brand of condom for male. Use of condom also protecting the users from contracting STDs and AIDS.
- Both the male and female condoms are disposable, and can be self inserted and thereby gives privacy to the user.
- **Diaphragms, cervical caps** and **vaults** are also used as barriers made of rubber that is inserted into the female reproductive tract to cover the cervix during coitus. They prevent conception by blocking the entry of sperms through the cervix. Spermicidal creams, jellies and foams are used along with these barriers to increase their contraceptive efficiency.

### 3. Intra Uterine Devices (IUDs)

- These devices are inserted by doctors or expert nurses in the uterus through vagina.
- These Intra Uterine Devices are presently available as the non medicated IUDs (e.g. Lippes loop), copper releasing IUDs (CuT, Cu7, multiload 375) and the hormone releasing IUDs (Progestasert, LNG-20).
- IUDs increase phagocytosis of sperms within the uterus and the Cu ions released suppress sperm motility and the fertilizing capacity of sperms.
- The hormone releasing IUDs, in addition make the uterus unsuitable for implantation and the cervix hostile to the sperms.
- IUDs are ideal contraceptives for the females who want to delay pregnancy and space children.

### 4. Oral Contraception

- Oral administration of small doses of either progestogens or progestogen-estrogen combinations is another contraceptive method used by females. They are used in the form of tablets popularly called pills.
- Pills have to be taken daily for a period of 21 days starting preferably within the first five days of menstrual cycle. After a gap of 7 days it has to be repeated in the same pattern till the female desires to prevent conception.
- They inhibit ovulation and implantation as well as alter the quality of cervical mucus to prevent entry of sperms.
- Pills are very effective with lesser side effects and are well accepted by the females. '**Saheli**' the new oral contraceptive for the females contains a non steroidal preparation. It is a 'once a week' pill with very few side effects and high contraceptive value.

### 5. Surgical methods

Surgical methods also called sterilisation are generally advised for the male/female partner as a terminal methods to prevent any more pregnancies. Surgical intervention blocks gamete transport and there by prevent conception.

- a) **Vasectomy**: Male sterilisation method is called vasectomy. In this method a small part of the vas deferens is removed or tied up through a small incision on the scrotum.
- b) **Tubectomy**: Female sterilisation method is called tubectomy. In this method small part of the fallopian tube is removed or tied up through small incision in the abdomen or through vagina.

### Medical Termination of Pregnancy (MTP)

- Intentional or voluntary termination of pregnancy before full term of pregnancy is called MTP or induced abortion.
- Nearly 45 to 50 million MTPs are performed in a year all over the world which accounts for 1/5 of the total number of conceived pregnancies in a year.

- Of course, MTP has a significant role in decreasing the population even though it is not meant for that purpose.
- Whether to accept / legalise MTP or not is being debated upon in many countries due to emotional, ethical, religious, and social issues involved in it.
- Government of India legalised MTP in 1971 with strict conditions to avoid misuse.

### **Why MTP?**

1. To get rid of unwanted pregnancies either due to casual unprotected intercourse or failure of the contraceptive used during coitus or rapes.
2. Useful in the continued pregnancies which could be harmful or even fatal either to the mother or to the foetus or both.

### **When the MTPs are safe?**

MTPs are considerably safe during the first trimester (upto 12 weeks of pregnancy). Second trimester abortions are much riskier.

### **Sexually Transmitted Diseases**

- Diseases or infections which are transmitted through sexual intercourse are called sexually transmitted diseases (STD) or venereal diseases (VD) or reproductive tract infections (RTI).
- Gonorrhoea, syphilis, genital herpes, chlamydia, genital warts, trichomoniasis, hepatitis-B, AIDS etc.
- Among these, HIV infection is more dangerous.
- Some of these infections like hepatitis-B and HIV can also be transmitted by sharing injection needles, surgical instruments etc., with infected persons, transfusion of blood or from an infected mother to the foetus.
- Except for hepatitis-b, genital herpes and HIV infections, other diseases are completely curable if detected early and treated properly.
- Early symptoms of most of these are minor and include itching, fluid discharge, slight pain, swellings etc., in the genital region.
- Infected females may often be asymptomatic and hence may remain undetected for long time.
- Later complications are pelvic inflammatory diseases (PID), abortions, still births, ectopic pregnancies, infertility or even cancer of the reproductive tract.
- STDs are major threat to the society. Therefore, prevention or early detection and cure of these diseases are given prime consideration under the reproductive health-care programmes.
- Even though all persons are vulnerable to these infections, their incidences are reported to be very high among persons in the age group of 15-24 years. Avoid sex with unknown partners/multiple partners. Always use condoms during coitus.
- In case of doubt, contact immediately the qualified medical practitioner for early detection and cure.

**Infertility:** 'Inability to produce a child or inability to conceive pregnancy is called infertility'.

The reasons for this could be many like, physical, congenital, diseases, drugs, immunological or even psychological. Hence the couples could be assisted to have their own child through certain special techniques called **Assisted Reproductive Technologies (ART)**.

- **IVF–ET (Test Tube Baby):** In Vitro Fertilization and Embryo Transfer is popularly known as **test tube baby**. Ova and sperm collected from the affected individuals or from the healthy donors are allowed to fertilize and to form zygote under simulated conditions in the laboratory.
- The zygote or early embryos (Up to 8 blastomeres) could then be transferred into the fallopian tube **Zygote Intra Fallopian transfer (ZIFT)**.
- The embryos with more than 8 blastomeres are introduced into the uterus called **Intra Uterine Transfer (IUT)** to complete its further development.
- Embryos formed in vivo fertilization also could be used for such transfer to assist those females who cannot conceive.
- Transfer of an ovum from a donor into the fallopian tube of another female who cannot produce ovum called **Gamete Intra Fallopian Transfer (GIFT)**, but can provide suitable environment for fertilization and further development is another method attempted.

**Intra cytoplasmic sperm injection (ICSI)** is another specialized procedure to form an embryo in the laboratory in which a sperm is directly injected to inseminate the female or due to very low sperm counts in the ejaculates, could be corrected by **artificial insemination (AI)**. In this technique, the semen collected either from the husband or from the healthy donor is artificially introduced either into the vagina or into the uterus called **intra uterine insemination (IUI)**. Though options are many, the decision by the peoples in India is limited because of emotional, ethical, religious, and social beliefs.