

Human Reproduction

Male and Female Reproductive Systems

- Reproductive events in humans –

Gametogenesis → Insemination → Fertilisation → Implantation → Gestation → Parturition

- **Male reproductive system:** It includes

1. A pair of testes
2. Accessory glands and ducts
3. External genitalia

- Testes are located outside the abdominal cavity, within the scrotum.
- Scrotum acts as temperature regulator.
- Testes contain seminiferous tubules that contain two types of cells.

1. Spermatogonia (male sperm cell)
2. Sertoli cells, which provide nutrition to spermatids (sperm)

- Outside seminiferous tubules, there are Leydig cells. Leydig cells are also known as interstitial cells. They secrete the male hormone, testosterone.

- **Male sex accessory ducts are**

1. Rete testis
2. Vasa efferentia
3. Epididymis
4. Vas deferens

- Male external genitalia include the penis. It facilitates insemination.

- **Male accessory glands are**

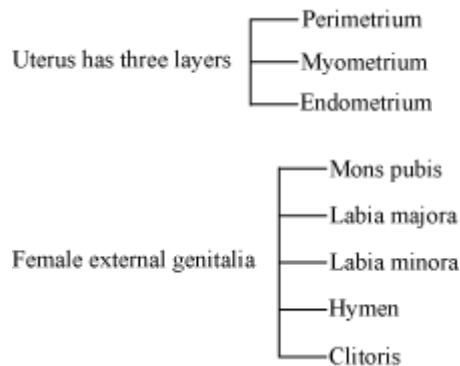
1. Seminal vesicles
2. Prostate gland
3. Bulbourethral gland

- **Female reproductive system:** It consists of

1. A pair of ovaries
2. A pair of oviducts (fallopian tube)
3. Uterus

4. Vagina
5. External genitalia
6. A pair of mammary glands

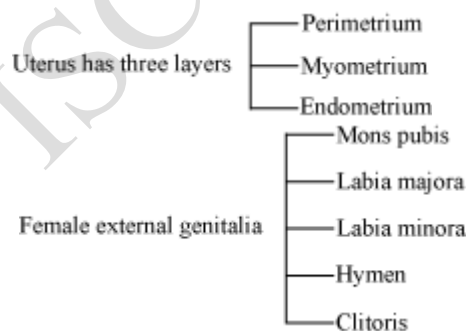
- Female accessory ducts are oviduct, uterus and vagina.
- The fallopian tube is divided into isthmus, ampulla and infundibulum.



Structure and Function of Female Reproductive System Female reproductive system:
Consists of

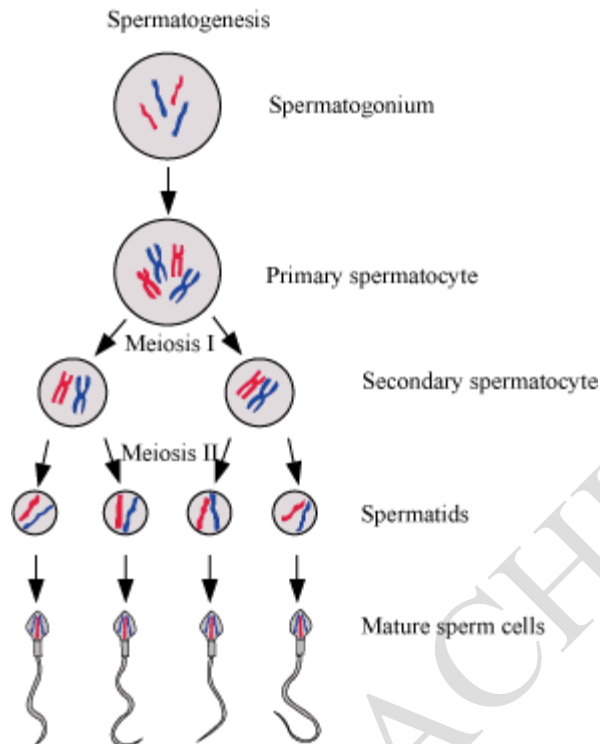
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- Female accessory ducts are oviduct, uterus and vagina.
- The fallopian tube is divided into isthmus, ampulla and infundibulum.
- Ovaries are the primary female sex organ. The ovarian stroma is made up of peripheral cortex and inner medulla.

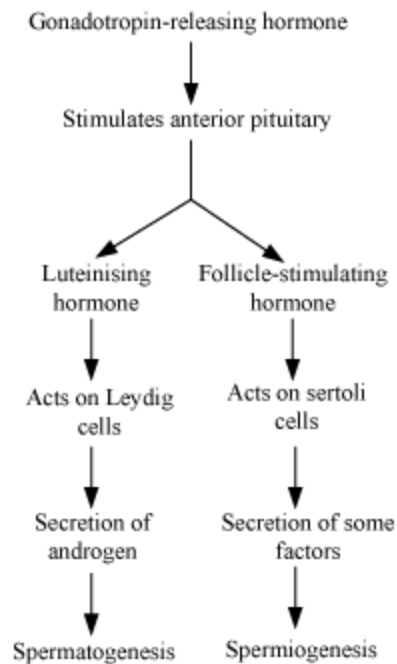


Gametogenesis

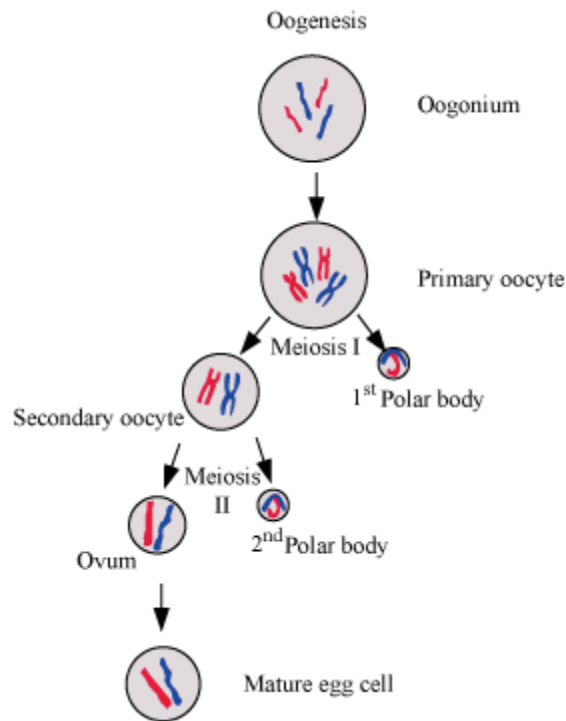
- It involves the formation of the male and female gametes in the male and female genital organs respectively. It involves two processes: spermatogenesis and oogenesis.
- **Spermatogenesis**
 - It is the process of formation of the haploid sperm from the diploid spermatogonia.



- **Spermiogenesis:** It is the process of transformation of the spermatids into the matured spermatozoa or sperm cell.
- **Spermiation:** It is the process of release of the matured spermatozoa into the lumen of the seminiferous tubules.
- **Hormones involved in spermatogenesis are : –**



- Sperm is made up of three parts –
 - **Head:** Anterior portion is covered by the acrosome (cap-like structure), which helps in the fertilisation of the ovum.
 - **Middle piece:** Contains the mitochondria and provides energy
 - **Tail:** Helps in the movement of the sperm
- **Oogenesis**
 - It is the process of formation of the haploid ovum from the diploid oogonium.



- **Various stages of primary oocyte –**

Primary follicle → Secondary follicle → Tertiary follicle → Matured Graafian follicle

- **Ovulation:** Process of release of the ovum from the ovary

Menstrual cycle

- **Menarche:** First occurrence of menstruation at puberty
- **Menopause:** End of the menstrual cycle, at around 50 years of age
- Events during the menstrual cycle –
 - **Menstruation phase:** It involves the process of menstruation. If the egg does not get fertilised, the endometrium breaks down and is released out from the vagina in the form of blood.
 - **Follicular/proliferative phase:** It involves increase in levels of FSH and LH hormones.
 - Release of the FSH hormone stimulates the primary follicle to change into the matured Graafian follicle.
 - Release of the LH hormone induces release of the ovum.

- **Ovulatory phase:** It is characterised by ovulation or release of the ovum from the Graafian follicle due to high level of LH hormone.
- Luteal phase: It is characterised by the rupture of the Graafian follicle in the corpus luteum.
- In the absence of fertilisation, the corpus luteum degenerates.
- The corpus luteum secretes progesterone.
- Progesterone is important during pregnancy as it prepares the endometrial wall of the uterus for implantation.

Fertilisation and implantation

- Fertilisation takes place in the ampullary-isthmic junction.
- Binding of the sperm with the zona pellucida layer of the ovum changes the membrane permeability and blocks the entry of any other sperm.
- Sex of the baby is determined by the type of the male gamete (X or Y) that fuses with the female gamete (X).
- A diploid zygote undergoes several mitotic divisions to form the blastocyst.

Zygote → Blastula → Morula (8 to 16 cell stages) → Blastocyst

- The blastocyst is implanted in the endometrium of the uterus.
- **Pregnancy**
- After implantation, the trophoblast forms finger-like projections called chorionic villi, surrounded by the uterine tissue and maternal blood.
- The chorionic villi and the uterine tissue get integrated to form the placenta.
- **Placenta:** It is the structural and functional unit between the embryo and the maternal body. It is connected to the embryo through the umbilical cord. **Placenta** acts as a permeable membrane and allows diffusion of substances through it. Moreover it does not allow the germs to pass through.
- Substances that pass through placenta:
 - From Mother to Foetus
 - Oxygen
 - Nutrients (glucose, amino acids, vitamins, mineral ions)

- From Foetus to Mother

- CO₂
- Urea and other wastes

- **Functions of the placenta:**

- Umbilical cord helps in transportation of substances between the mother and the foetus.
- Provides nutrients to the embryo
- Removes waste products produced by the foetus
- It releases several hormones that are essential for pregnancy –
 - Human chorionic gonadotropin (hCG).
 - Human placental lactogen (hPL)
 - Oestrogens
 - Progestogens
- Relaxin is secreted by the ovary.
- Relaxin, hCG and hPL are released only during pregnancy.
- After nine months of pregnancy, the foetus is ready for delivery.
- **Parturition:** It is the process of expulsion of the full term foetus out of the uterus. It is induced by the hormone oxytocin.
- **Lactation:** It the process of producing milk after the birth of the baby. The hormone involved in lactation is prolactin.