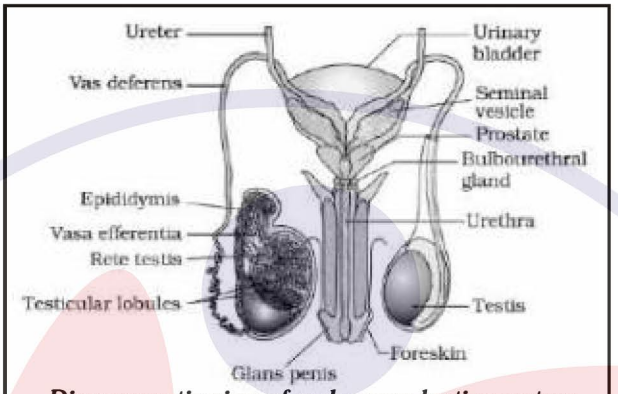
HUMAN REPRODUCTION

INTRODUCTION

Reproductive events in human :

(i) Gametogenesis (ii) Insemination (iii) Fertilisation
(iv) Blastocyst formation and implantation (v) Gestation/Pregnancy (vi) Parturition / Delivery

MALE REPRODUCTIVE SYSTEM (Situated in the Pelvis)



Diagrammatic view of male reproductive system (part of testis is open to show inner details)

Primary Sex Organs (Gametes formation)

Testes

(A) Paired, extra-abdominal, in scrotum (necessary temperature for spermatogenesis. Which is 2-3°C lesser than body)

(B) 4–5 cm × 2–3 cm

(C) Each with 250 lobules

Each lobule with 1–3 seminiferous tubules

Each tubule with

- Spermatogonia - male germ cells
- Sertoli cells - nutrition to sperms

(D) Between seminiferous tubules are interstitial cells (leydig cells) for androgens.

Ovaries

(A) Paired, endocrine gland, 2-4 cm long

(B) Connected to surroundings by ligaments

- Epithelium
- Stroma
  - Cortex
  - Medulla

Secondary Sex Organs

Accessory duct

(A) Seminiferous tubules → Rete testes → Vasa efferentia (leave testes) → Epididymis → Vas deferens (Enters abdomen)

Uretheral meatus ← Urethra ← Ejaculatory duct ← Seminal vesicle duct (with vas deferens)

(B) Important → Storage and transport of sperms.

Penis

(A) Erectile tissue with enlarged glans penis and movable foreskin.

Accessory glands

(A) Seminal vesicles → 2

(B) Prostate → 1

(C) Bulbo urethral/cowper's → 2

Secretion → Fructose, Calcium, Enzymes

FEMALE REPRODUCTIVE SYSTEM

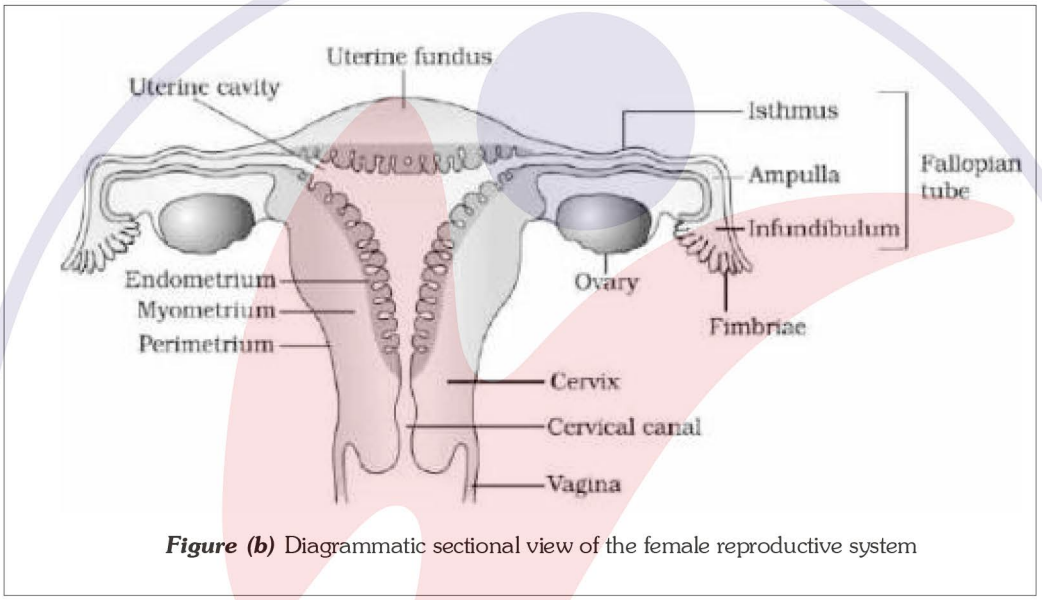


Figure (b) Diagrammatic sectional view of the female reproductive system

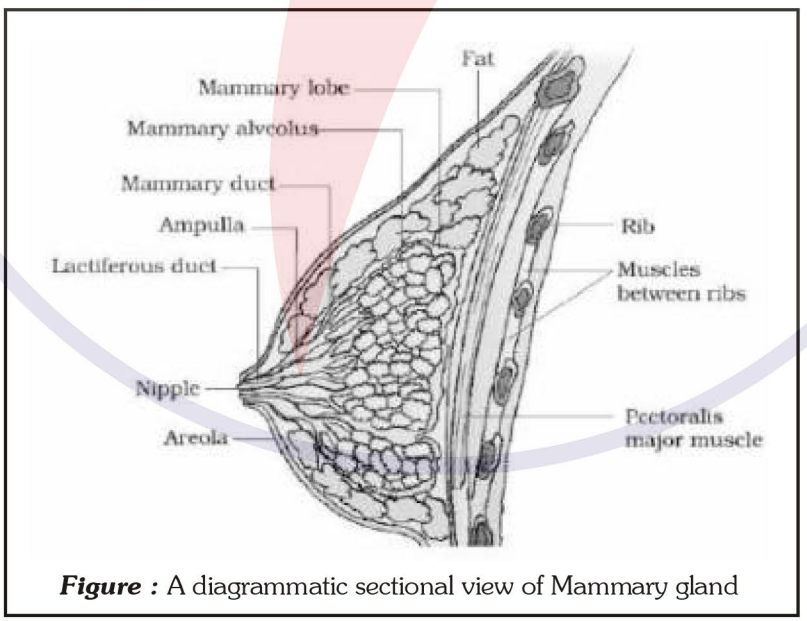


Figure : A diagrammatic sectional view of Mammary gland

Fallopian tubes (Oviducts 10-12 cms)

(A) Infundibulum with fimbriae

(B) Ampulla - wider

(C) Isthmus - narrow joins uterus

Uterus / Womb

(A) Inverted pear with narrow cervix
(B) Attached by ligament
(C) Wall
- Perimetrium – Thin
- Myometrium – Thick muscular
- Endometrium
  - Glandular
  - Cyclic changes in menstrual cycle

External Genitalia

(A) Mons pubis – fat cushion with hairs
(B) Labia minora – surround vaginal orifice
(C) Labia majora – surround labia minora
(D) Clitoris – Erectile at upper junction of labia minora
(E) Hymen
- Partially covers vaginal orifice.
- Presence/absence not a reliable indicator of virginity/sexual experience

(F) Birth canal → Vagina and Cervix

Paired functional mammary gland

(A) Variable fat
(B) Glandular tissue
15 – 20 lobes with alveoli → Mammary tubules → Ducts → Ampulla → Lactiferous duct → Outside

GAMETOGENESIS

Comparative study

(A) Beginning
Spermatogenesis – Puberty (↑ GnRH)
Oogenesis – I.U. life

(B) ***Steps***

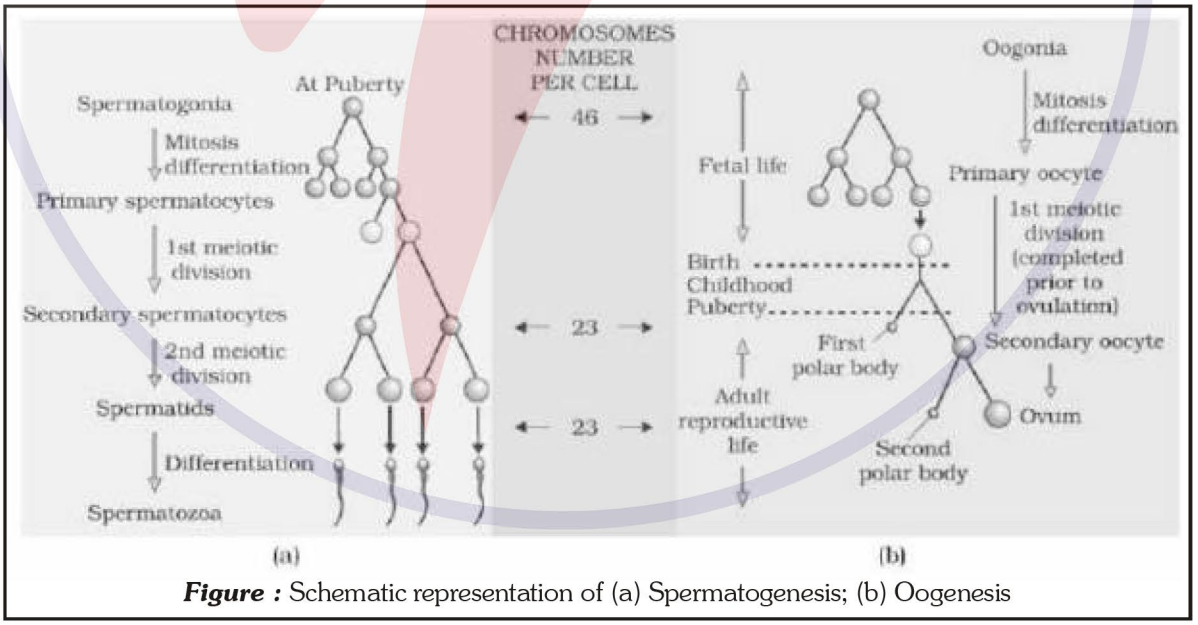


Figure : Schematic representation of (a) Spermatogenesis; (b) Oogenesis

(C) Number of gametes formed at the end
Spermatogenesis – 4
Oogenesis – 1

(D) Number of gamete mother cells
Spermatogenesis – new spermatogonia after birth
Oogenesis – no new oogonia formed after birth

General Concept / Facts

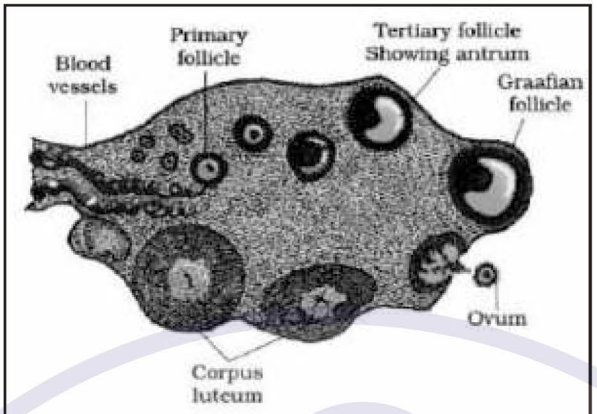


Figure : Diagrammatic Section view of ovary

(A) Spermatids to sperms, this process is – Spermiogenesis

(B) Sperms released from seminiferous tubules – Spermiation

(C) LH stimulates leydig cells for – Androgens

(D) FSH stimulates sertoli cell

(E) At puberty each ovary has – 60,000 -80,000 primary follicles

(F) Primary follicle → Sec. follicle → Tertiary follicle (antrum)

↓

Corpus albicans ← Corpus luteum ← Graafian follicle (matured)
(if no fertilisation)

(G) Developing follicle secretes – Estrogen

(H) Corpus luteum secretes – Progesterone (mainly) and some estrogen.

(I) Inhibin–Hormone secreted by sertoli cells of testis and by granulosa cells of ovary. Which give (–)ve feedback on anterior pitatary for FSH mainly.

Structure of Human Sperm

(A)

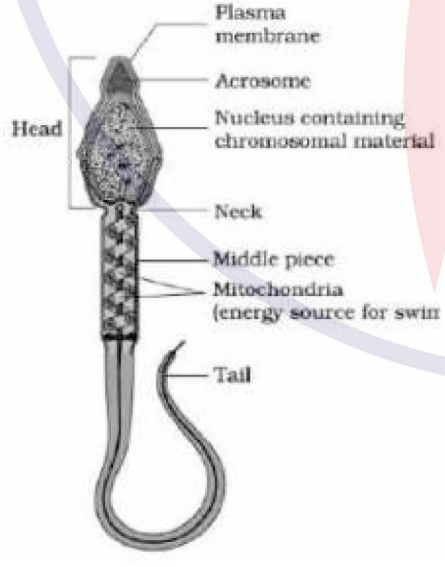


Figure : Structure of a sperm

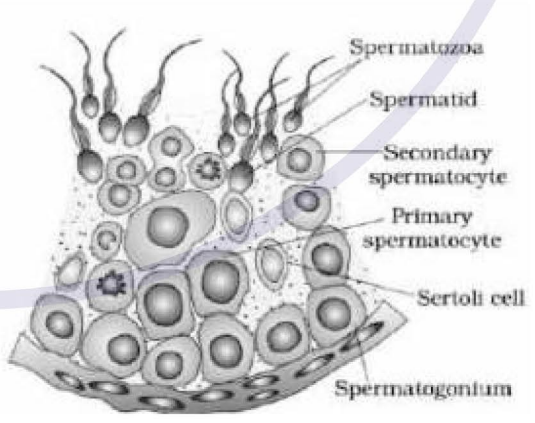


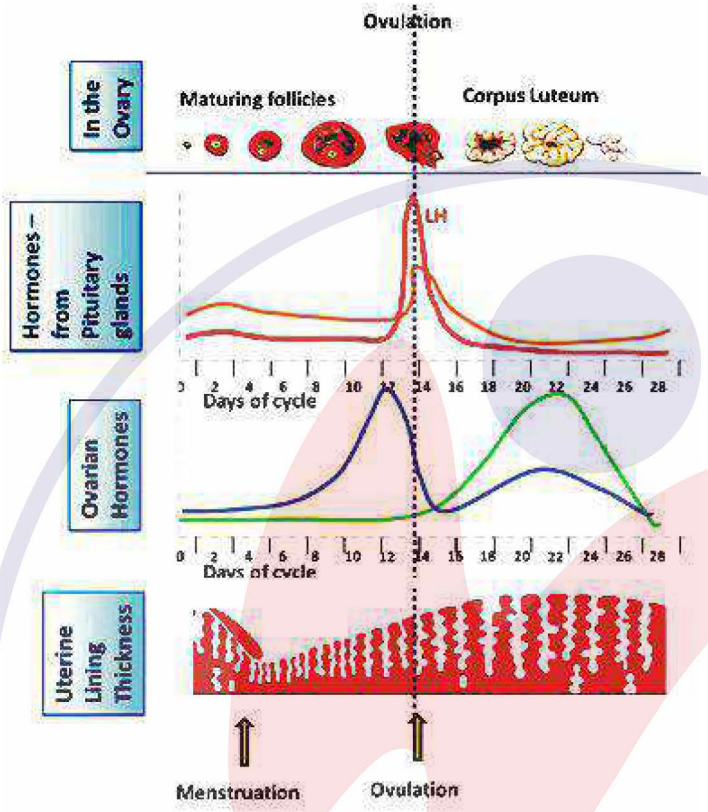
Figure : Diagrammatic sectional view of a seminiferous tubule (enlarged)

(B) For normal fertility – 60% (out of 200 – 300 millions) sperms should have normal shape and size and at least 40% of them should show vigorous motility.

(C) Acrosome (modification of golgi body) releases some enzyme which help in panetration of egg membranes for fertilization.

MENSTRUAL CYCLE

Events of Cycle (Average duration 28/29 days)



General Points Regarding Cycle

(A) Ist menstruation at puberty – Menarche

(B) Menstruation absence in

- Pregnancy
- Stress, Poor health

(C) For ovulation – LH surge (about 14th day) is mandatory

(D) Endometrial thickening by – Estrogen

(E) Endometrial maintained – Progesterone

(F) Cessation of cycle at around age of 50 years – menopause.

(G) Average Blood loss during each M.C. is 40–80 ml.

(H) After attaining menopanse there is constant high level of Gonadorophins. (FSH and LH)

(I) Menstation (shedding of uterine lining) occurs due to progesterone withdrawl.

(J) M.C. = Ovarian cycle + Uterine cycle Ovarian cycle – By FSH and LH Uterine cycle – By estrogen and progesteron.

FERTILISATION AND IMPLANTATION

General points

(A) At ovulation, secondary oocyte covered by → Zona pellucida and corona radiata.

(B) Fertilization at → Ampulla, only if gametes reach there at same time.

(C) XX is female and XY is male child.

(D) Implantation of embryo other than usual site (uterus) is known as ectopic pregnancy.

(E) Sperms are kept inactive in male body. But these become fully active in vagina (capicitation)

Events

Sperms attached to corona radiata → Enzymes released from acrosome → Sperm penetration
→ 2nd meiosis completed and ovum formed ← Changes in zona pellucida, so no extra sperms entry
→ Nucleus of sperm and ovum fuse → Zygote (Single cell and diploid) → Cleavage division
→ Blastocyst stage ← Morula stage (8 –16) ← Blastomeres (2, 4, 8, 16)
→ Implantation in uterus → Pregnancy → Placenta formation

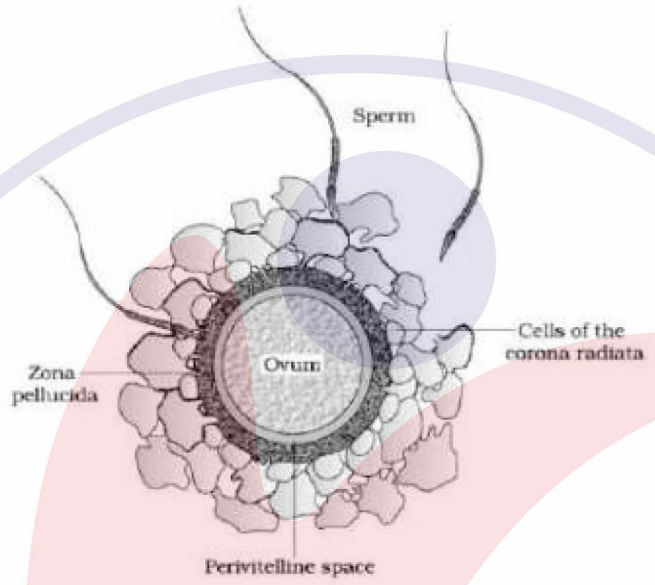


Figure : Ovum surrounded by few sperms

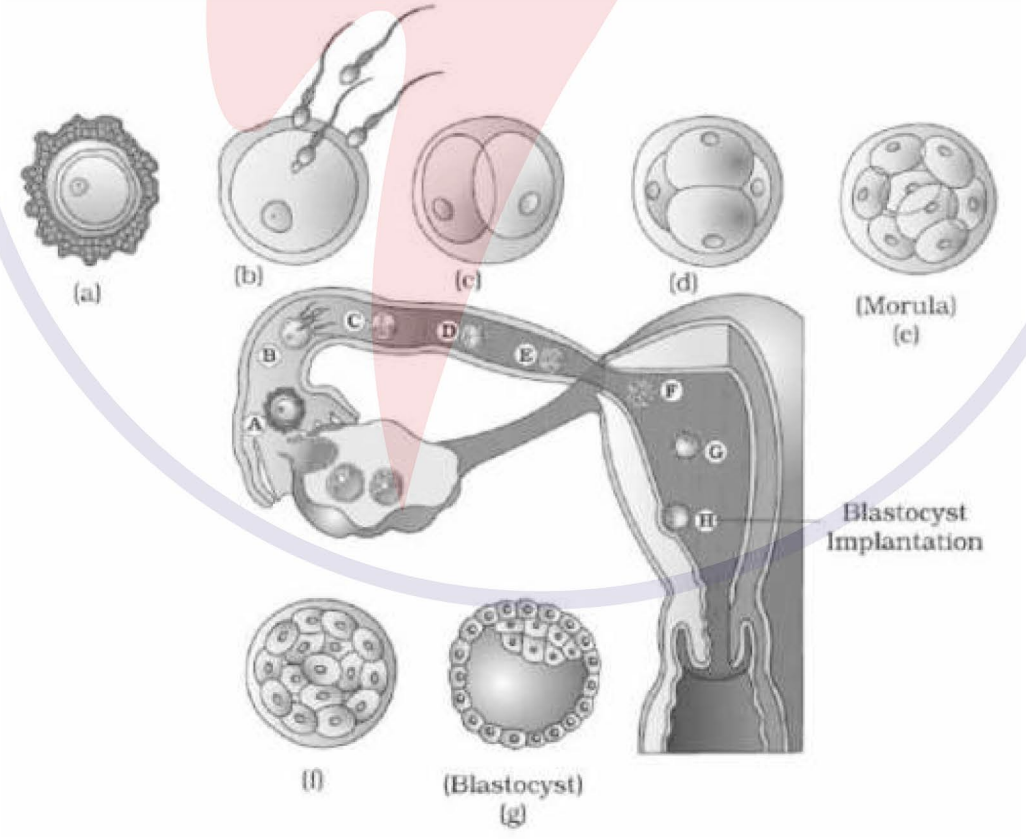


Figure : Transport of ovum, fertilisation and passage of growing embryo through fallopian tube

PREGNANCY AND EMBRYONIC DEVELOPMENT

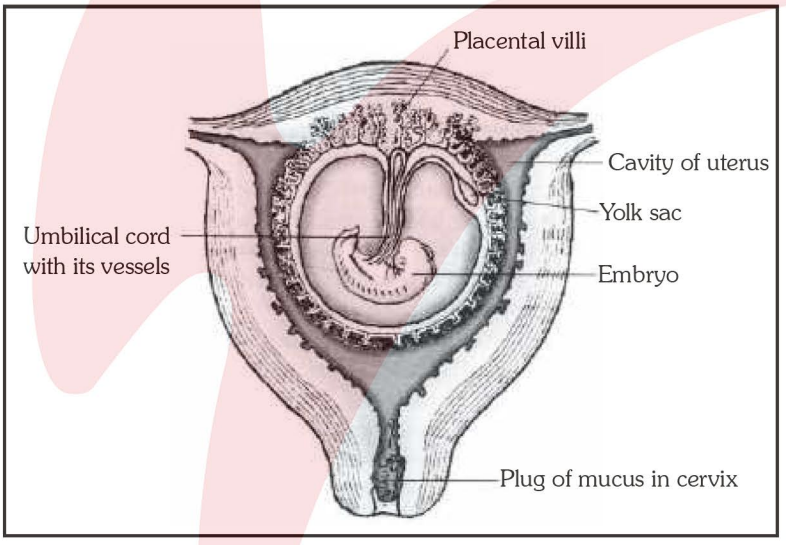
General Points

(A) Placenta
  (i) Chorionic villi + maternal tissue
  (ii) Gaseous exchange and excretion
  (iii) Connects to embryo by umbilical cord
  (iv) Endocrine gland – hCG, hPL, Estrogen, Progesterone
  (v) During pregancy corpus luteam is maintained by HCG.

(B) Hormones exclusive in pregnancy – hCG, hPL, Relaxin

(C) Events of embryonic development
  (i) Heart formation – 1 month
  (ii) Limbs and digits – 2 month
  (iii) Major organ systems – 3 month
  (iv) First foetal movements and hairs on head – 5 month
  (v) Fine hairs, eye - lid separation - 6 month

PARTURITION AND LACTATION



General Points

(A) Period of pregnancy – Gestation period

(B) Parturition is a – neuroendocrine mechanism

(C) Milk production – by the help of prolactin after child birth.

(D) First milk – Colostrum

Events

(A) Period of pregnancy – Gestation period

(B) Under the influence of cortisol of foetus, estrogen–Progesterone ratio is increased from placenta.

(C) Foetal ejection reflex (by foetus & placenta) → Mild uterine contractions → Oxytocin released from maternal pituitary → Powerful uterine contractions → Finally parturition

(D) Prostaglandin are also formed in uterine wall during pregnancy.