FREE NOTES · NCERT + NEET LEVEL

Human Reproduction

Male aur female reproductive systems, gametogenesis (spermatogenesis, oogenesis), menstrual cycle, fertilisation aur implantation, pregnancy aur embryo ka vikas, parturition aur lactation.

01 Male reproductive system
02 Female reproductive system
03 Gametogenesis
04 Menstrual cycle
05 Fertilisation aur implantation
06 Pregnancy, parturition, lactation
07 Extra + tricks
08 Important Q&A
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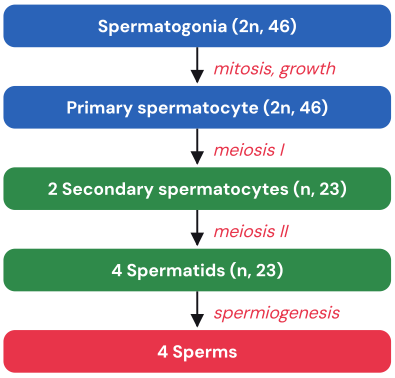
01 Male reproductive system

- **Testes** scrotum me (body se 2–2.5 °C thanda, spermatogenesis ke liye zaroori). Har testis ~4–5 cm; ~250 **testicular lobules**, har ek me 1–3 **seminiferous tubules**.
- Tubules me spermatogonia (male germ cells) aur **Sertoli cells** (poshan). Tubules ke bahar **Leydig/interstitial cells** androgens; immunocompetent cells bhi.
- Ducts: rete testis → vasa efferentia → epididymis → vas deferens → ejaculatory duct → urethra → urethral meatus.
- Accessory glands: seminal vesicles, bulbourethral glands, prostate: seminal plasma (fructose, Ca^{2+}, enzymes); bulbourethral secretion lubrication.

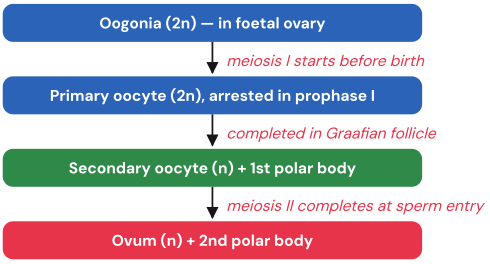
02 Female reproductive system

- **Ovaries** (2–4 cm), stroma me bahar cortex aur andar medulla; ovarian follicles.
- **Oviduct** (fallopian tube, 10–12 cm): infundibulum **fimbriae** ke saath (ovum pakadna) → ampulla (chauda; fertilisation yahin) → isthmus → uterus.
- **Uterus** (ulta nashpati): perimetrium, **myometrium** (mota smooth muscle; delivery me tez sikudna), **endometrium** (glandular; cyclic badlav). Cervix + vagina = birth canal.
- Bahari genitalia: mons pubis, labia majora, labia minora, hymen, clitoris. Mammary glands: 15–20 lobes, alveoli (doodh) → mammary tubules → ducts → ampulla → lactiferous duct.

03 Gametogenesis



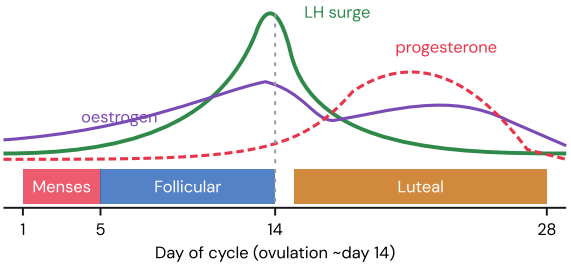
Spermatogenesis (puberty se)



Oogenesis

- Hormones: GnRH (hypothalamus) ⇒ LH (Leydig cells → androgens) aur FSH (Sertoli cells → spermiogenesis ke factors).
- Sperm: head (acrosome enzymes + nucleus), neck, middle piece (energy ke liye mitochondria), tail. Ek ejaculate me 20–30 crore sperms; fertility ke liye ≥60% sahi shape aur ≥40% tez motility.
- Follicles: primordial → primary → secondary → tertiary (antrum) → **Graafian follicle**. Puberty pe ~60,000–80,000 primary follicles bachte.

04 Menstrual cycle



28 din ke cycle me phases aur hormones

- Puberty pe pehli menstruation = **menarche**; ~50 saal pe band = **menopause**. Sirf primates me.
- **Menstrual phase** (din 1–5): ovum fertilise na ho to endometrium tootta.
- **Follicular/proliferative phase**: follicles badhte, endometrium phir banta; FSH, LH dheere badhte; oestrogen.
- **Ovulation** (~din 14): **LH surge** se Graafian follicle phatta, secondary oocyte nikalta.
- **Luteal/secretory phase**: corpus luteum **progesterone** (endometrium sambhalta). Fertilisation nahi ⇒ corpus luteum khatam ⇒ menstruation.

05 Fertilisation aur implantation

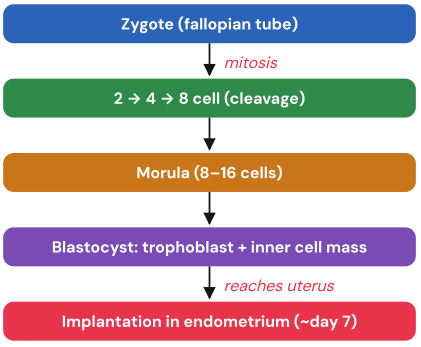
- Fertilisation oviduct ke **ampullary** hisse me. Sperm zona pellucida chhoota; badlav aur sperms ko rokte (polyspermy nahi). Acrosome enzymes andar jaane me madad; secondary oocyte meiosis II poora ⇒ ovum + second polar body ⇒ zygote.
- Ling sperm tay karta: X sperm ⇒ XX (ladki); Y sperm ⇒ XY (ladka).
- Cleavage ⇒ blastomeres ⇒ **morula** (8–16 cells) ⇒ **blastocyst**: trophoblast (bahar, endometrium se chipakta) + inner cell mass (embryo banta). Endometrium me dhansna = **implantation** ⇒ pregnancy.
- Inner cell mass me **stem cells** (saare tissues aur organs bana sakte).

06 Pregnancy, parturition, lactation

- **Placenta**: chorionic villi + uterine tissue; O_2, poshan deta; CO_2, kachra hataata; umbilical cord se juda. Hormones: hCG, hPL, oestrogens, progestogens; relaxin (baad me). hCG, hPL, relaxin sirf pregnancy me.
- Germ layers: ectoderm, mesoderm, endoderm inner cell mass se.
- Vikas: 1 mahine ant tak heart; 2 mahine ant tak haath-pair, ungliyan; 12 hafte ant tak mukhya organs, bahari genitalia (1st trimester); 5th mahine pehli harkat aur sir pe baal; 24 hafte ant tak body hair, palkein alag, eyelashes. Gestation ~9 mahine.
- **Parturition**: **foetal ejection reflex** (foetus aur placenta ke signal) ⇒ pituitary se oxytocin ⇒ uterus sikudta (positive feedback). Relaxin pelvic ligaments naram.
- **Lactation**: **colostrum** (pehla doodh, IgA antibodies) bachche ko suraksha.

07 Extra + tricks

- Sperm: head (acrosome = badla hua Golgi), middle piece (mitochondria, spiral), tail (axoneme). Ovum ke chaaron taraf zona pellucida aur corona radiata.
- Testis: tunica albuginea, ~250 lobules, Sertoli cells (nurse cells), tubules ke beech Leydig cells.
- Trophoblast se chorion (placenta); inner cell mass se embryo. Inner cell mass ke stem cells pluripotent.
- 1st trimester trick: **"1 heart, 2 limbs, 3 organs"** = 1 mahine heart, 2 me haath-pair, 3 me mukhya organs.
- Hormones: GnRH → LH, FSH; menstrual cycle: menstrual → follicular → ovulatory → luteal.



Implantation tak embryo ka vikas

08 Important Q&A

Q1. Testes scrotum me kyun?

Scrotum testes ko body se 2–2.5 °C thanda rakhta, spermatogenesis ke liye zaroori.

Q2. 100 primary spermatocytes aur 100 primary oocytes se kitne sperms aur ova?

400 sperms aur 100 ova.

Q3. Ovulation kis hormone ke surge se?

LH surge (cycle ke beech, ~din 14).

09 Common mistakes

- Kehna ki fertilisation uterus me (oviduct ka ampulla).
- Kehna ki ovulation pe ovum nikalta (secondary oocyte nikalta).
- Sertoli (poshan) aur Leydig (androgens) mix karna.
- Sochna ki maa bachche ka ling tay karti.

10 Practice (NEET style)

1. Fertilisation ki jagah?
2. Corpus luteum ka hormone?
3. Pehla doodh?
4. Sirf pregnancy ke hormones?
5. Kaun sa stage implant hota?

ANSWERS

1) Ampulla of oviduct · 2) Progesterone · 3) Colostrum · 4) hCG, hPL, relaxin · 5) Blastocyst

11 Quick revision: exam se 5 minute pehle

MALE

- Seminiferous tubules
- Sertoli poshan, Leydig androgen
- 1 spermatocyte → 4 sperms

FEMALE

- Fimbriae, ampulla
- 1 oocyte → 1 ovum + polar bodies
- Graafian follicle

CYCLE

- Menses 1–5
- LH surge din 14
- Progesterone luteal

PREGNANCY

- Morula → blastocyst → implant
- Placenta hCG, hPL
- Oxytocin, colostrum

Koi doubt? padhaiadda.netlify.app pe AI Doubt Solver se poocho, ya is chapter ka mock test do.