Reproduction

المحاضرة الثانية

Female

بتاريخ ٢٧ ابريـــل ٢٠١٨

Female reproductive system

Functions of ovaries — 2 Functions:

1. Endocrinal — Estrogens & Progesterone.
2. Oogenesis — It occurs in intrauterine life.

- **Fetal life**

1. Primordial germ cells in hind gut migrate to gonadal ridge → 2. Primordial ova (oogonia) migrate to ovarian cortex & proliferate → 3. Primordial follicles (collect ovarian stroma / form granulosa cells) — 11-12th weeks

6-7th W	10.000	20 W	6-7 million
8th W	600.000	At birth	2-2.5 million

4. First meiotic division at 5th month of gestation — crossing over of genetic material

- **Childhood**

No pituitary gonadotropins. Ovaries inactive
++ size of follicles & granulosa cells → Stratum granulosum

- **Puberty & adult life** — 400.000 follicles

Prim oocyte (Diploid No) in primordial follicle → (2nd stage of 1st meiotic divis. / Before ovulation / FSH) → Second oocyte (Haploid N) + 1st polar body

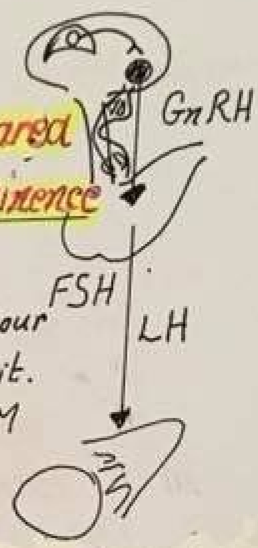
Second meiotic division: Secondary oocyte → (2-3 hours / After fertilization / LH) → Mature ovum + 2nd polar body (extra genetic material)

During reproductive period, only 450 follicles expel their ova

1st meiotic division is arrested in metaphase by ptn pp 39 mos in ova. Fertilization causes its destruction in 30 min

3 [illegible] Regulation of ovarian cycle

A) Gonadotropin releasing hormone GnRH



- Synthesis Hypoth. Arcuate n & Preoptic area
- Storage N. terminals project to Median Eminence
- Release Rhythmic pulses (oscillations)
  - Arcuate nucleus Hourly rhythm i.e/ Hour
    → upregulate GnRH recept on ant. pit.
  - Preoptic area Monthly rhythm i.e/M
    → GnRH surge → LH surge

Note ½life of GnRH in blood 2-4 min.

- Chemistry Decapeptide
- Mode of action nongenomic via G ptn $\xrightarrow{\text{activate}}$ phospholipase C
  - IP_3 ++ Ca^{++} (from E reticulum & influx of ECF)
    → exocytosis & release of gonadotropins
  - DAG stim ptn kinase C → ++ transcription & synthesis of gonadotropins
- Control (regulation) of GnRH 5

[1] -ve feed back of ovarian steroids on hypoth & ant. pit.
- Estrogen at both low & high conc.
- Progesterone only at high conc.

Indirect i.e via inhibitory interneurone in hypoth
In arcuate n. via opiates & in preoptic area via GABA

[2] -ve feed back by inhibin
- Ant. pituitary : -- FSH (α and β) by -- mRNA
- Ovary : -- androgen → -- estrogen

[3] +ve feed back by ovarian steroids

Rising level of estradiol for 2 days → midcycle LH surge & to a lesser extent FSH surge via:
- Hypoth induces monthly GnRH surge in preoptic area
- Ant. pit sensitizes gonadotrophs to GnRH pulses.

Less ++ in progesterone only augments LH surge.

[4] +ve feed back by activin
- Ant pituitary : ++ FSH (β subunit) by ++ mRNA
- Ovary : ++ estrogen

5 Psychic factors

Stress & Suckling (lactation) Suppress GnRH release

B) Anterior pituitary FSH & LH

- Chemistry Glycoptn
- Mode of action via cAMP on ovarian cells.
- Actions of FSH:
  - a Early maturation of ovarian Follicles
  - b Androgen —Aromatase→ Estrogens
    Theca cells Granulosa cells
  - c ++ estrogen formation by Granulosa cells
- Actions of LH:
  - a LH & FSH Graffian Follicle. (late maturation)
  - b Ovulation (LH surge) & C luteum formation.
  - c ++ Androgen from glandular theca interna cells
  - d ++ Estrogen & Progesterone (main) from C. luteum.
  - e LH & FSH → growth of new follicles → new cycle

Hypothalamic - pituitary - ovarian hormone relation

Phase	Ovaries	Ant. pit & hypoth.
1 Follicular growth	0 -- estrogen & progest. (due to Degeneration of C. luteum)	-ve → ++ FSH (2-3 folds) & ++ LH (2 folds)
	++ estrogen (granulosa cells)	-ve → -- FSH & LH (11th 12th day)
2 Preovulatory & ovulation	1 estrogen peak 13th day rising level 2 day before	+ve → preovulatory LH (main) & FSH surge
	ovulation & C. luteum formation.	
	note progesterone only augments LH surge	
3 Postovulatory & menstruation	C. luteum (stim. LH mainly)	
	2 ++ estrogen, progest & inhibin	-ve → -- FSH & -- LH
	Degeneration of C luteum → -- estrogen & progest. → menstruation.	lowest level 2 to 3 days before menstruation

Ovarian Cycle 4+4

• Ovary • Controlled by FSH & LH
• Aim Ovulation & Estrogens & Progest. • 4 Phases

1 Follicular Maturation FSH mainly

• Ovum
10-15 follicles
Ovum size ↑ 2-3
Granulosa cells proliferate

• Primary F
Zona Pellucida (glycoprn)

• Preantral F
Theca cells
interna Secretory
externa Fibrous

• Antral F
Cavity

• Vesicular Follicle
Very large cavity
Cholesterol
LH
Androgen
FSH
Estrogen

2 Graffian Follicle

After 1W 1F is Choosen by programmed cell death

• Dominant (Graffian) follicle
Androgen —(FSH aromatase, has ++ FSH recept)→ Estrogens
then estrogens —(-ve FB)→ ↓ FSH, LH

• Other follicles
Androgen —(5α reductase)→ DHT
DHT → ↓ LH receptors
Atrophy of other follicles being Gonadotropin dependent

3 Ovulation

• Cause LH surge (mainly) 6-10 folds
16 H before ovul. & FSH surge 2-3 folds
Mid cycle
LH → ↑ progesterone & ↓ estrogens

• Mechanism LH & Progesterone
- Stigma is weak by proteolytic enzyme
- Cavity P is increased by PGs E & F
Vessel bl. vs & VD
transudation → Rupture

4 Luteal phase

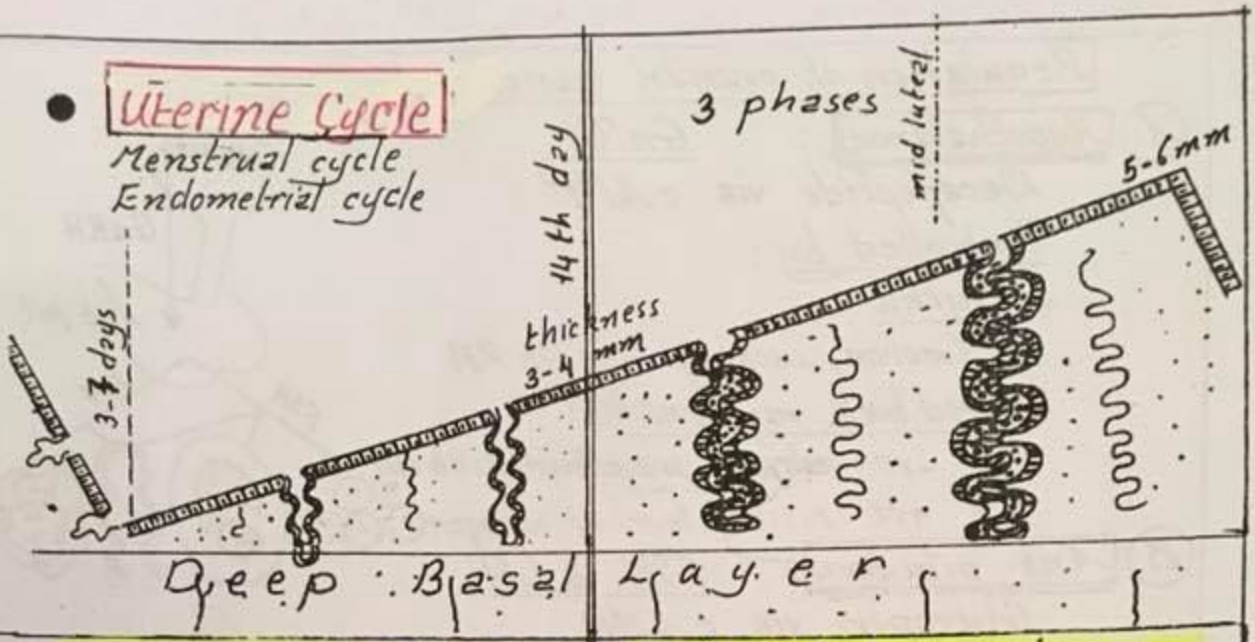
• Granulosa & Theca cells —(LH, mainly)→ Lutein cells
- Lipid ER blks

• CL secretes
↑ Progesterone (primarily) peak 7 days
From granulosa Lutein cells
Action Centrally -- FSH & LH
Locally -- Follic. growth
2 Estrogens from Theca lutein cells
Action + progesterone → endometr.
3 Inhibin -- FSH + -- LH

• Fate → Corpus albicans
10-14 days of ovulation
2-3 Months pregnancy

Uterine Cycle

Menstrual cycle
Endometrial cycle



Preovulatory phase		Postovulatory phase
Degenerative	Proliferative	Secretory (luteal)
Menstruation	Estrogen phase	Progestational phase

- **Duration:** 3-5 / 5 — 14th day — 28 days

- **Control:** 0 — 1 — 2

Sudden withdrawal of estrogen & progesterone ↓

1: Estrogen

2: Estrogen and Progesterone

- **Changes:**

■ **Vasospasm**
Due to ↑ PGs → ischemia necrosis

■ **Vasodil (PGs)** → Shedding
70 - 100 cc Disch.
- unclotted bl.
- 75% arterial bl.
- necrotic endom Functional layer
- cervical mucous
- vaginal epith.
- bacteria
- unfertilized ovum
- PGs & WBCs

■ **Vasospasm** stops bleeding

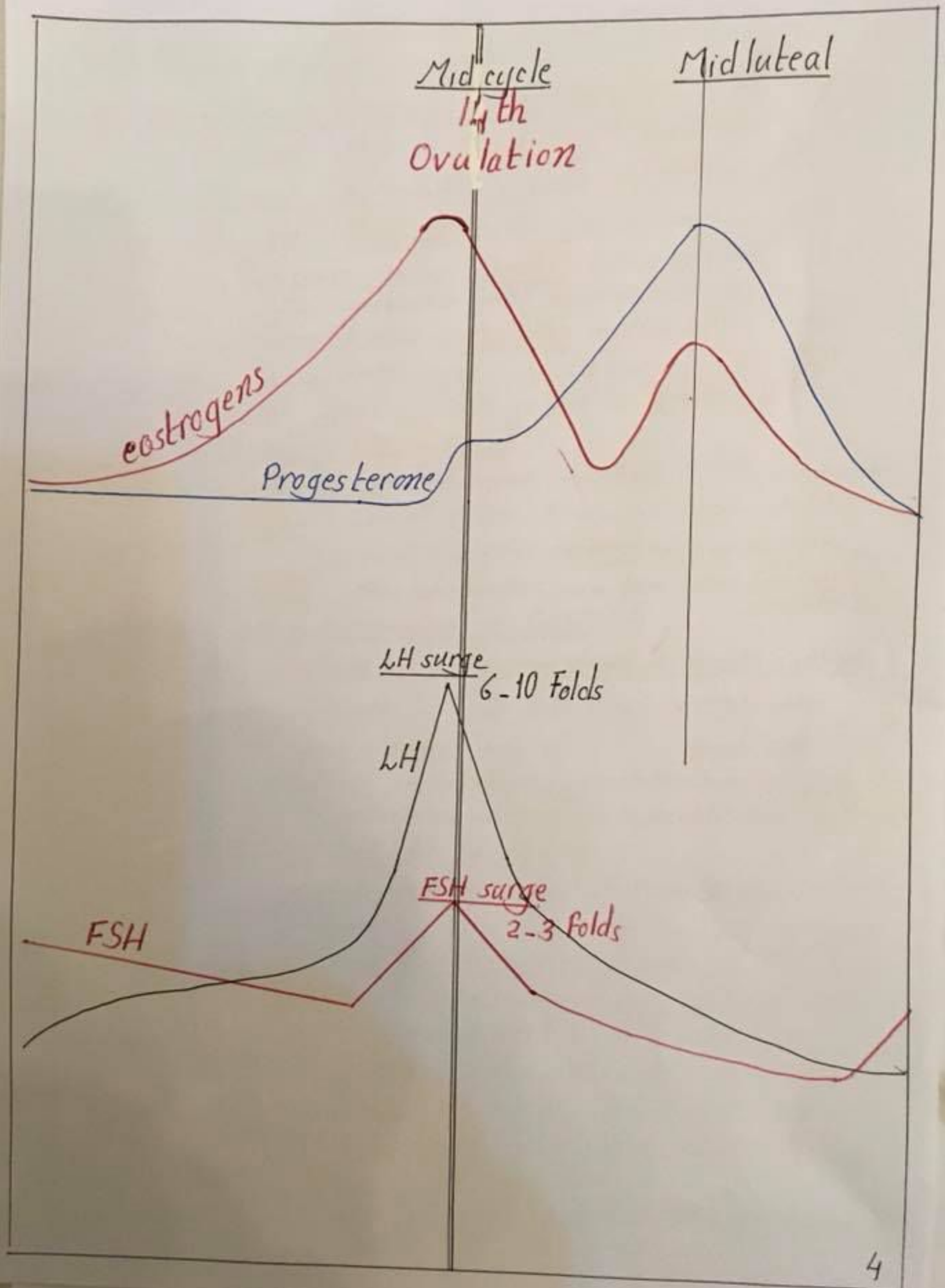
■ **Endometrial stroma & epith.**
Proliferation
3-4 mm thick at ovul
Lipid and glycogen deposit
5-6 mm thick at 28th D

■ **Endometrial gland**
Proliferation
Minimal secretion
++ tortuosity (coiling)
Filled with SECRETION

■ **Blood vessels** (spiral)
Proliferate
Rich in Igs & WBC
More tortuous i.e corkscrew

Note →

Superf. (functional) layer	Deep (basal) layer
Outer 2/3	Inner 1/3
Implant blastocyst	Regenerate endom.
Proliferates & shed off	Doesn't shed off
Supply	
Spiral tortuous arteries	Short straight arteries


Mid cycle
14th
Ovulation
Mid luteal
eostrogens
Progesterone
LH surge
6-10 Folds
LH
FSH surge
2-3 folds
FSH

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اضغط هنا