



# PHYSIOLOGY OF FEMALE REPRODUCTION

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# Introduction

## OBJECTIVES:

- LIST the general functions of the female reproductive system in the non-pregnant state.
- List the components of the female reproductive system & their specific functions.
- Describe the hormonal control of the development of ovarian follicles , mature ova and corpus luteum .

# Objectives

- EXPLAIN the synthesis, secretion, and the effects of ovarian steroid hormones.
- EXPLAIN the positive & negative feedback effects of steroid control gonadotrophin secretion.
- DESCRIBE the physiological basis of the menstrual cycle & the coordinate cyclic changes in the function of the hypothalamus, pituitary, ovaries, and reproductive tract.

# DEFINITIONS

- ❖ Menstruation ( Menses)
- ❖ Menstrual Cycle
- ❖ Menarche
- ❖ Menopause
- ❖ Ovarian Follicle
- ❖ Corpus Luteum
- ❖ SEX Steroid

# Reproductive Organs

- The Gonads are the primary reproductive organs .
- Testis in the male & the ovaries in the Female.
- ❖ **The Functions of the gonads**
  - Gametogenesis: Ova in the female, Sperm male.
  - Secretion of Sex Hormones.  
TESTOSTERONE in Male  
Oestrogen & Progesterone in Female

# REPRODUCTIVE HORMONES

- HYPOTHALAMIC HORMONE. (GnRH)
- PITUITARY HORMONES ( FSH ; LH)
- SEX STEROIDS : OESTOGENS & PROGESTERONE
- Secretion Of Sex Steroids
- Ovary : Granulosa Cells & Theca Interna  
Cells Source of Oestogens  
Corpus Luteum  $\rightleftarrows$  Progesterone
- MODE OF ACTION .

# EFFECTS OF FEMALE SEX STEROIDS

## ■ ESTROGENS

- ❑ Stimulates growth of ovary & follicles.
- ❑ Smooth muscle & epithelial proliferation.
- ❑ Increase myometrial & tubal contraction.
- ❑ Stimulates breast growth (Ducts & Fat ).
- ❑ Stimulates bone growth ultimate Cessation of bone growth.
- ❑ Vascular—Deficiency produces Hot Flushes.
- ❑ Stimulates fluid retention.
- ❑ Protects against atherosclerosis.

# EFFECTS OF FEMALE SEX STEROIDS

## PROGESTERONE

- Converts oestrogen-primed endometrium to secretory phase.
- Induces thick, sticky cervical mucous.
- Decreases contractions of smooth m.
- Stimulates breast growth-Glands.
- Has feedback effects on hypothalamus.
- *Increases basal body temperature.*



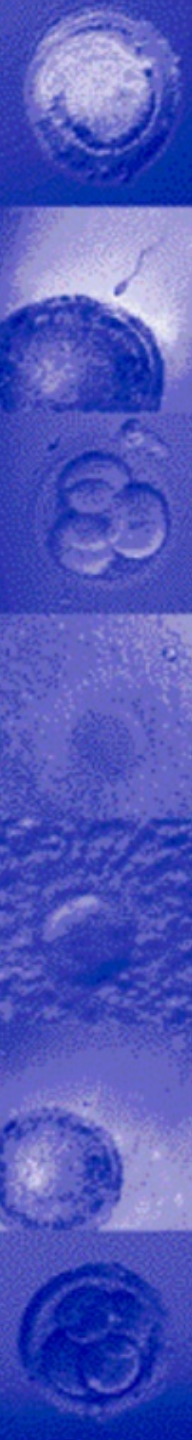
# The Ovary

- Within the ovary, the menstrual cycle can be divided into three phases:
  1. The Follicular Phase.
  2. Ovulation
  3. The luteal phase.

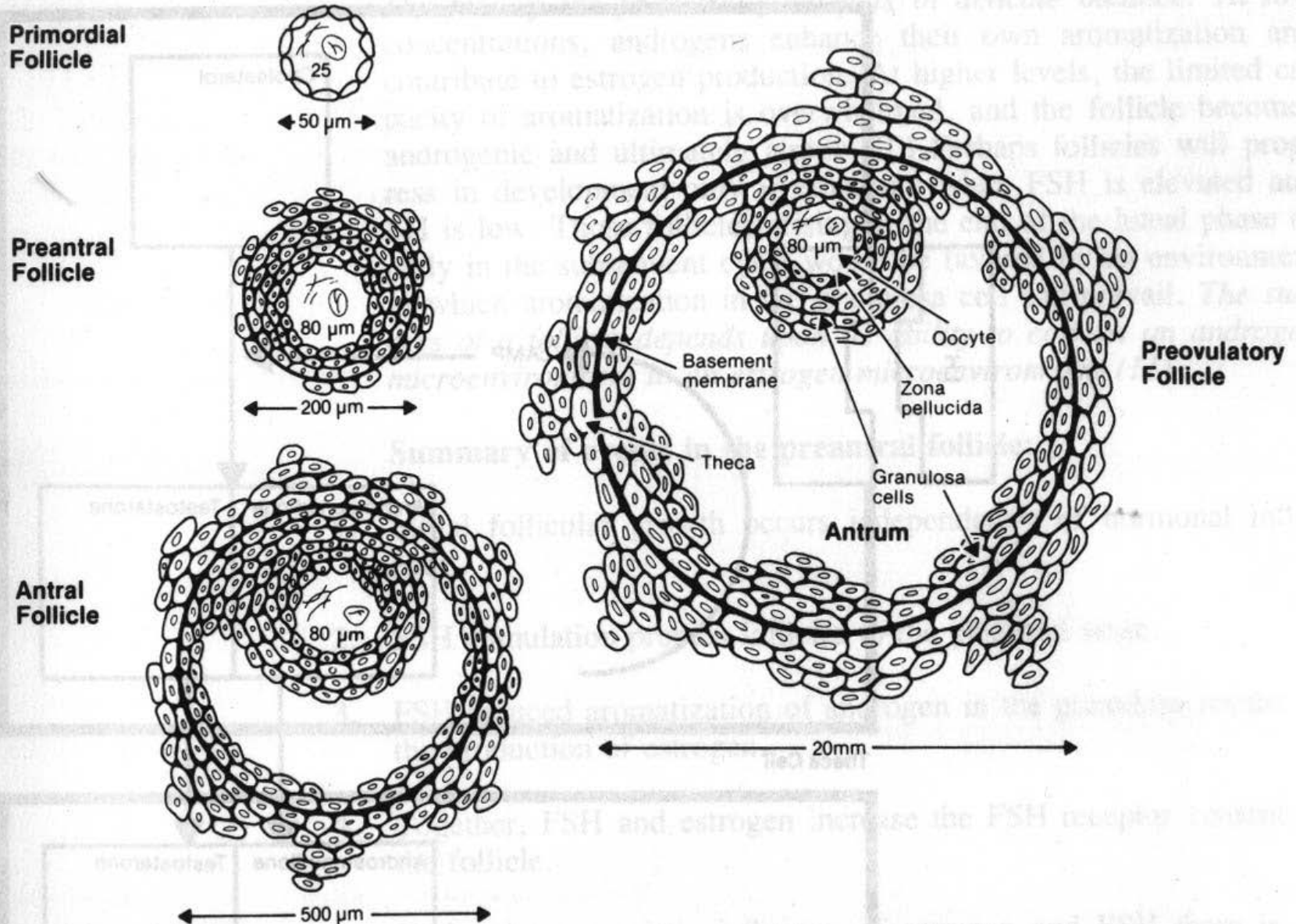


# Follicular Phase

- Development of oocyte is the key event in the follicular phase of the menstrual cycle.
- Thousands of “Primordial follicles” are in continuous state of development from birth.
- The initial stages of follicular development are independent of hormonal stimulation.
- In the absence of hormonal stimulation, the follicular development fails at the pre-antral stage.
- Development beyond the pre-antral stage depend on pituitary hormones.



# OVARIAN CYCLE



# Steroidogenesis

- Two cell types:
  1. Granulosa cells
  2. Theca cells.
- FSH is responsible for proliferation of granulosa cells.
- Within the theca cells, LH stimulate the production of androgens from cholesterol.
- FSH stimulate the production of thecally derived androgens to estrogens(aromatization)

# SYNTHESIS OF OESTROGEN

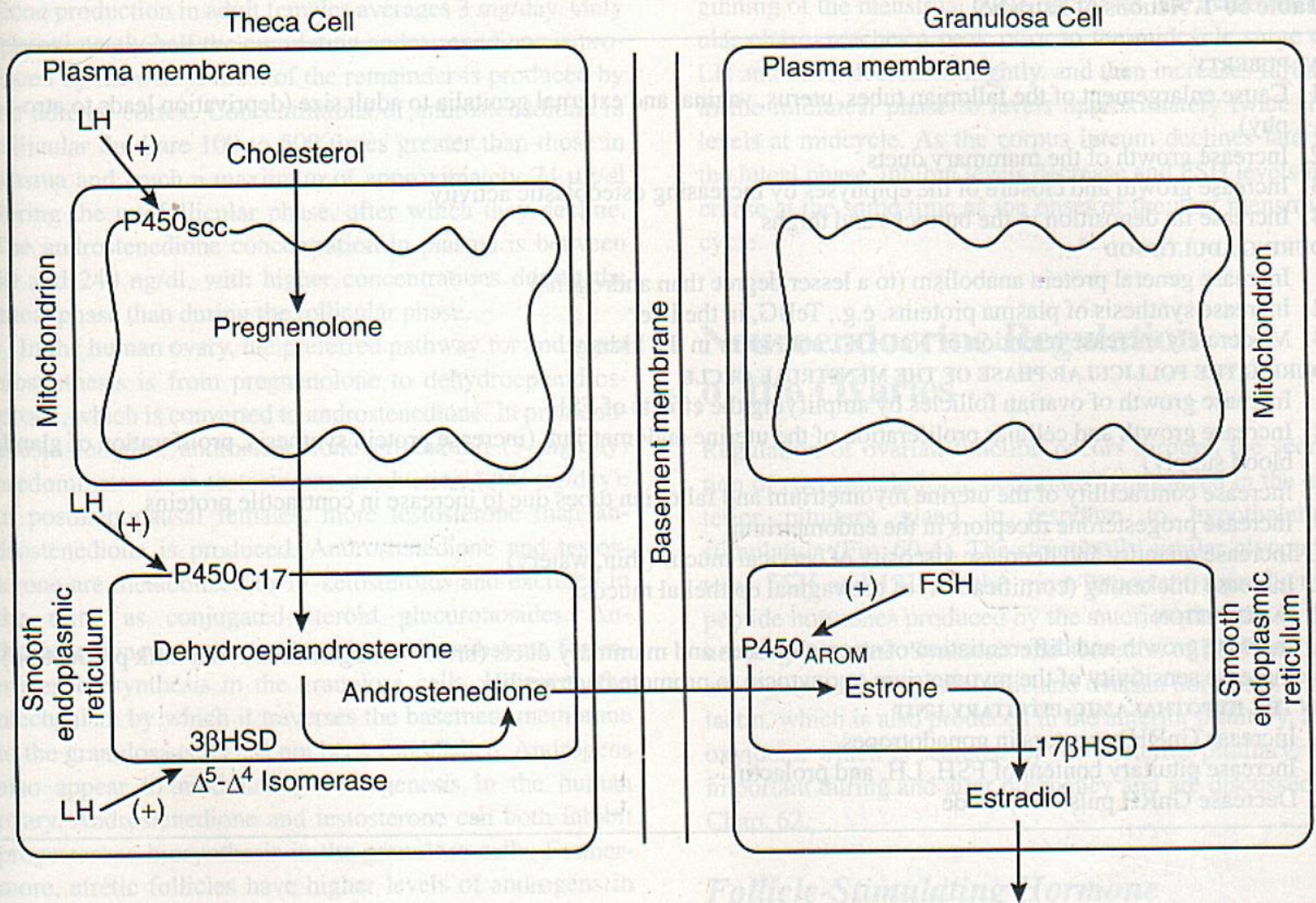


Fig. 60-3. Biosynthesis of androstenedione and estradiol in the follicle.

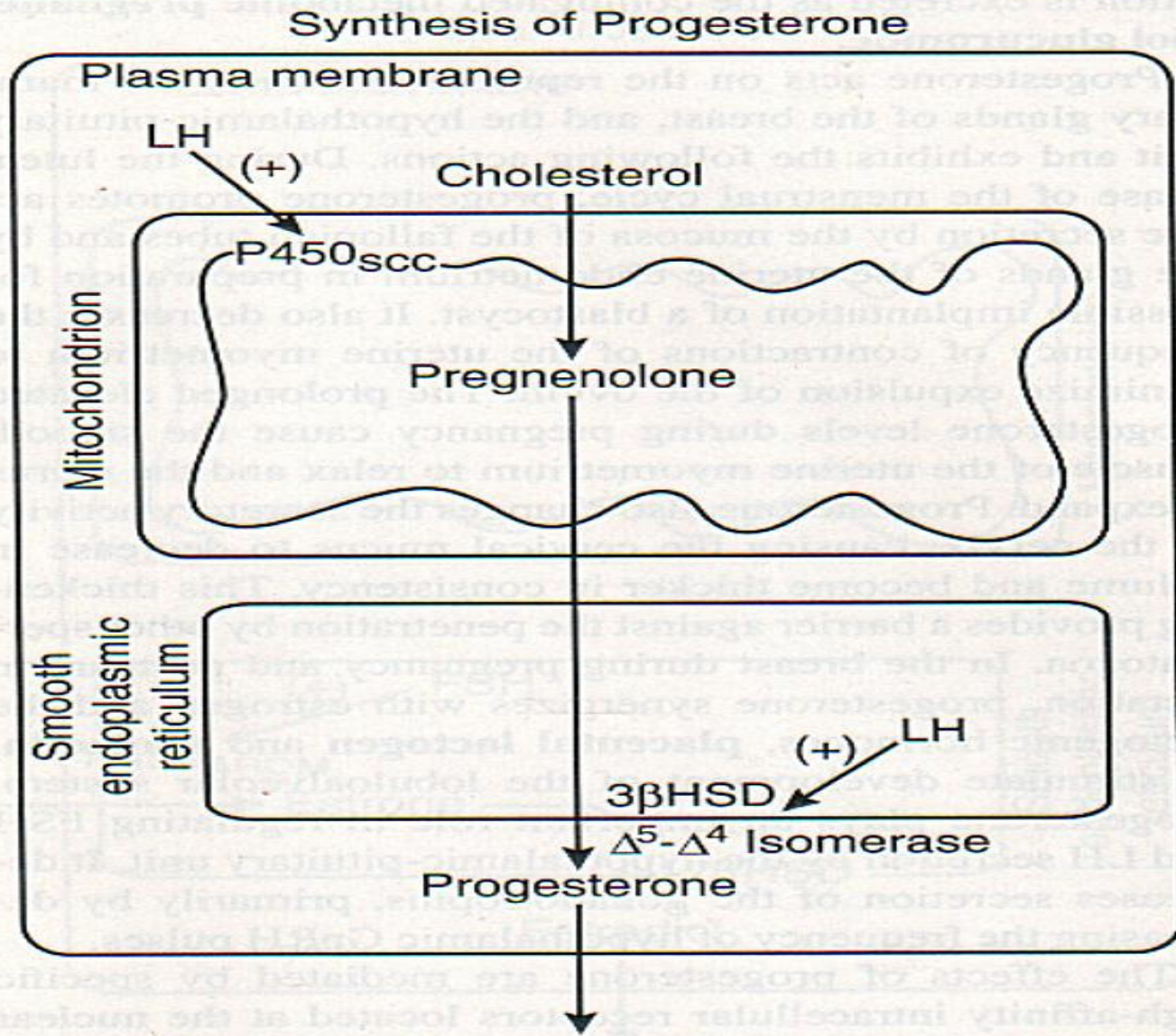
# OVULATION

- Late in Follicular phase, **FSH** induces **LH** receptors in the **granulosa** cells.
- Production of oestrogen increases to the threshold required to induce a positive – feedback effect on the anterior pituitary LH secretion.
- LH induces **luteinization** of granulosa cells in the dominant follicle.
- **Progesterone** is produced and amplifies the positive –feedback of oestrogen leading to LH surge.
- Ovulation occurs 36 hours after the onset of LH surge.

# Luteal Phase

- Luteal phase is characterized by the production of progesterone.
- The corpus luteum is derived from granulosa cells that remains after ovulation + some of the theca cells that differentiate into theca lutein cells.
- The production of progesterone depends on continuous LH secretion.
- Luteolysis: The duration of luteal phase is fairly constant being around 14 days.
- If no hCG from implanted embryo-the corpus luteum regresses –Luteolysis.

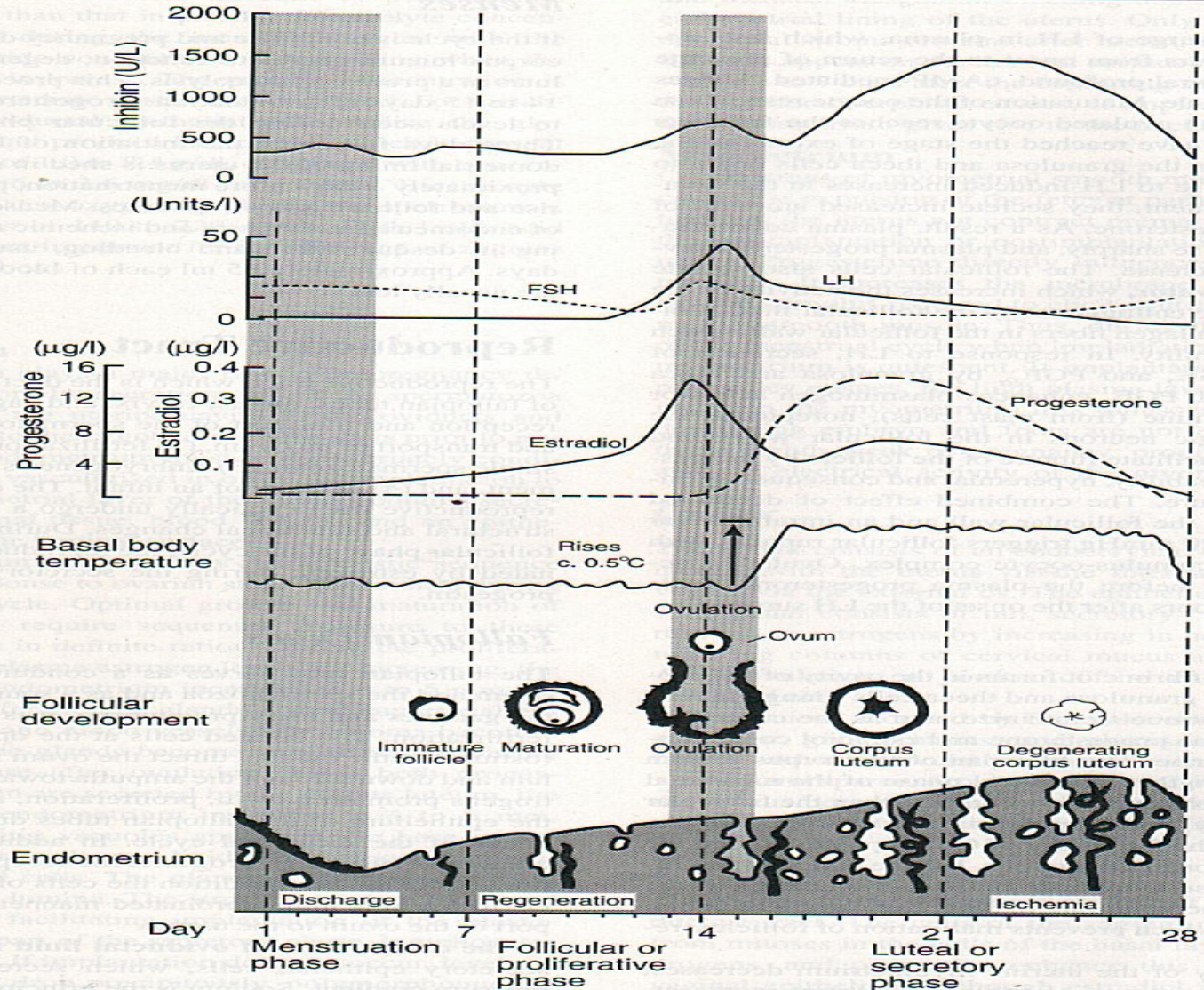
# SYNTHESIS OF PROGESTERONE



**Fig. 60-2.** Biosynthesis of progesterone.



# HORMONAL CHANGES DURING MENSTRUAL CYCLE

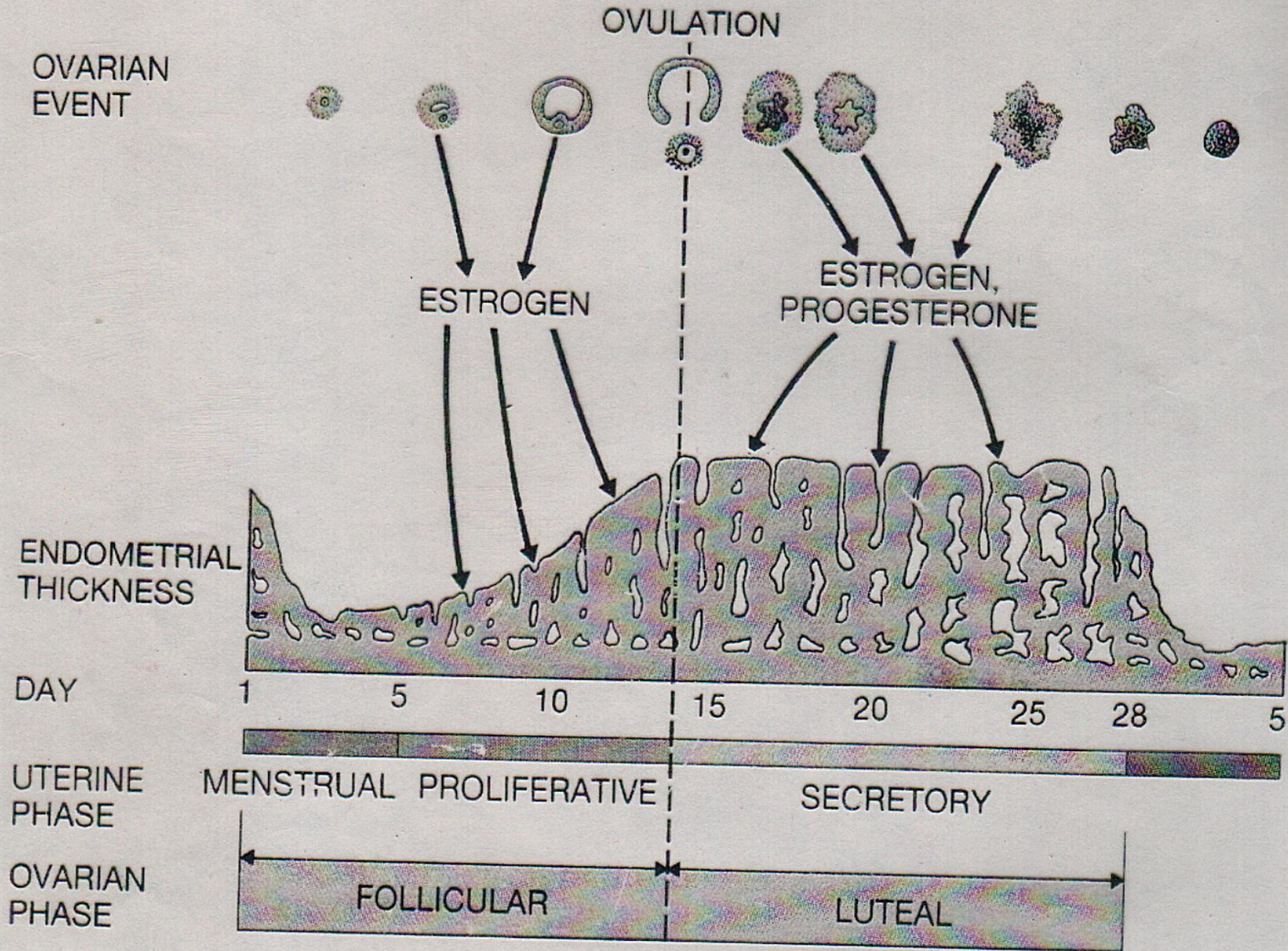


50-6. Temporal relationship among changes in pituitary, ovarian, and endometrial function throughout the menstrual cycle. The beginning of menses is considered day 0.

# Uterine Cycle

- **Proliferative /follicular phase.**
- Once the end, usually endometrium is repaired usually 5-6 days, menstruation ceased.
- Single layer low columnar changed to pseudostratified epithelium.
- **Secretory / Luteal phase.**
- Peak secretory activity is reached 7 days after ovulation.
- In the late **secretory** phase, progesterone induces irreversible decidualization of the stroma.

# UTERINE CYCLE



A vertical strip on the left side of the image contains seven rectangular panels, each showing a different stage of a cell's development. From top to bottom: 1. A single cell with a prominent nucleus. 2. A cell with a more defined nucleus and some cytoplasmic structures. 3. A cell with a nucleus and several smaller, rounded structures. 4. A cell with a nucleus and a large, granular cytoplasm. 5. A cell with a nucleus and a large, granular cytoplasm. 6. A cell with a nucleus and a large, granular cytoplasm. 7. A cell with a nucleus and a large, granular cytoplasm.

***THANK YOU***

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