

CHAPTER IV. FOLLICULOGENESIS

I. Definition:

Set of processes by which a primordial follicle (small bag located in the ovary and containing the oocyte) will evolve to a mature follicle , it ends with ovulation (release, through the ovary, of the female reproductive cell: the egg ready to be fertilized by the sperm).

It is made from the stock of primordial follicles formed during intrauterine life and is associated with oogenesis.

Folliculogenesis begins from the 7th month of pregnancy by the establishment of primordial follicles. At birth the number of primordial follicles is 1 million per ovary on average. From birth to puberty, folliculogenesis is blocked, causing 60% of the initial stock of primordial follicles to degenerate. At puberty their number drops to 400,000 per ovary.

From puberty to menopause, once a month and just after menstruation, (4th day of the cycle) about twenty primordial follicles continue folliculogenesis by secretion, at the hypothalamus, of GnRH (gonadotropin-releasing hormone); the role of this peptide hormone is to stimulate the pituitary gland to increase its secretions of FSH (follicle-stimulating hormone) and LH (luteinizing hormone); these two peptide hormones trigger folliculogenesis and egg maturation in the ovaries. Usually, only one follicle reaches term the others degenerate.

It has several phases.

II. The phases of folliculogenesis:

- 1. Primordial follicle:** The primordial follicle is composed of an oocyte I, blocked in prophase I, surrounded by some flattened follicular cells.
- 2. Primary follicle:** It is characterized by an increase in the size of oocyte I, a single layer of cubic follicular cells; a pellucid zone (glycoprotein) between oocyte I and follicular cells; an undifferentiated library; and a Slavjansky membrane between the undifferentiated theca and follicular cells.
- 3. Secondary follicle:** The number of layers of follicular cells is greater or equal to two. All follicular cells are called granulosa. At this stage, the library

has been differentiated into two distinct layers: one internal cellular and the other external fibrous.

4. Tertiary or cavity follicle: There are several cavities within follicular cells. These cavities gather together into a single large cavity or antrum (crescent-shaped), which closes the follicular fluid.

5. Wall or follicle of De Graaf: The oocyte I, voluminous, reaches its mature size which is of the order of 0.125 cm. The follicular cells directly surrounding the oocyte form the corona radiata. A few hours before ovulation, oocyte I completes its reductional division and gives oocyte II (n chr.) blocked in metaphase 2 and the first polar globule (G.P.) that remains in the pellucid zone. The whole: corona radiata, the oocyte II connected to the rest of the granulosa, forms the cumulus oophorus.

In women, egg laying or ovulation is cyclical and spontaneous. It takes place on the 14th day of an ideal 28-day cycle: there is an increase in the blood level of LH, and 37 to 38 hours after, the follicle ruptures and the oocyte is released.

III. Mechanism of ovulation:

Under the action of LH, cumulus oophorus separates from granulosa. Oocyte I completes the first division of meiosis and turns into oocyte II. About 56 hours before its release. Ovarian contractions promote the rupture of the follicle. There remains in the ovary a follicle **emptied of its oocyte and follicular fluid: the** dehiscent follicle.

IV. The yellow body:

The dehiscent follicle heals forming a temporary endocrine gland called yellow body. The yellow body granulosa cells become luteal, capable of synthesizing progesterone. Cells in the internal layer always synthesize estrogen. The yellow body can evolve in two different ways:

- In the absence of fertilization: the yellow body is called progesterin, its lifespan is 14 days; and
- In case of fertilization: the yellow body is said to be gestative, its lifespan is 3 months. Then it degenerates and the relay of steroid synthesis is taken by the cells of the placenta.

V. White Body (corpus albicans):

In the ovary, the degeneration of the yellow body (gestative or progesterin) gives the white body, which will be phagocytized by the phagocytic cells of the ovary.

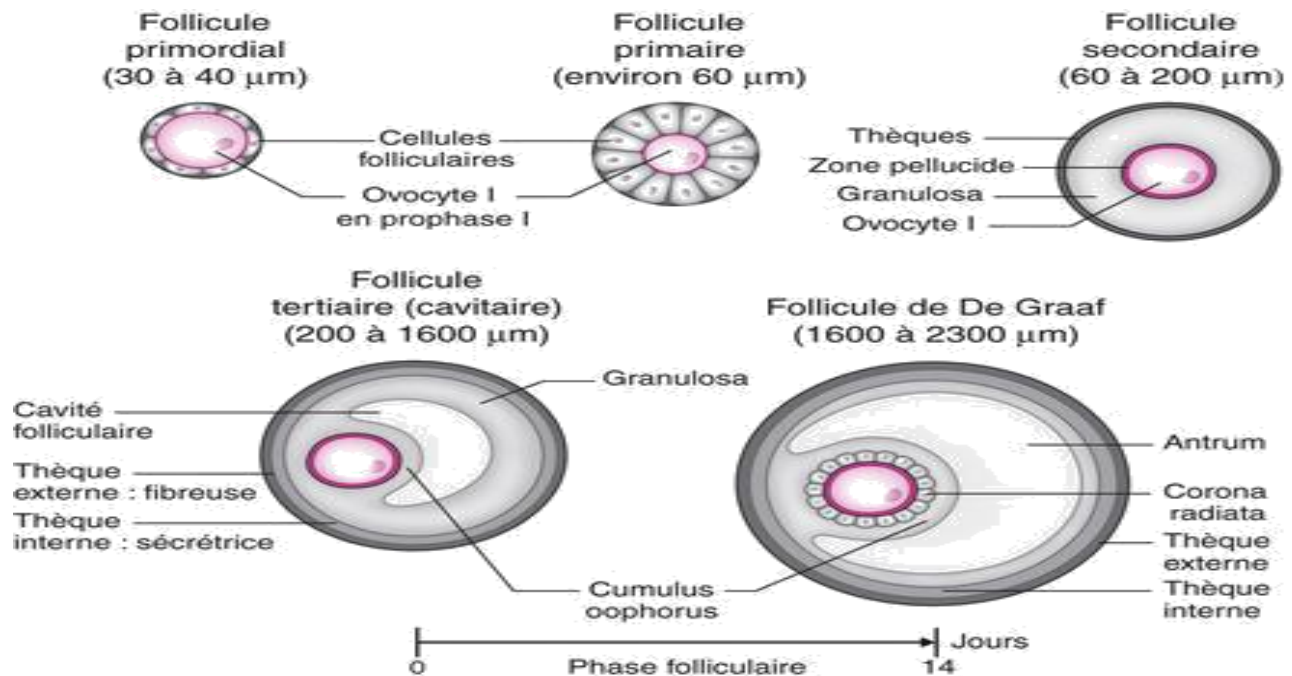


Figure 01: Explanatory diagram of the different phases of folliculogenesis

IV. The ovarian cycle (menstrual cycle):

A- General

- All the cyclic physiological changes that the female organism undergoes to prepare for a possible pregnancy.
- Appears at puberty and ends at menopause.
- Usual duration of 28j
- Begins on 1st day of menstruation
- Has two phases:
 1. Follicular phase.
 2. Luteal phase.
- Between the two ovulation 14J
- Under hormonal control.

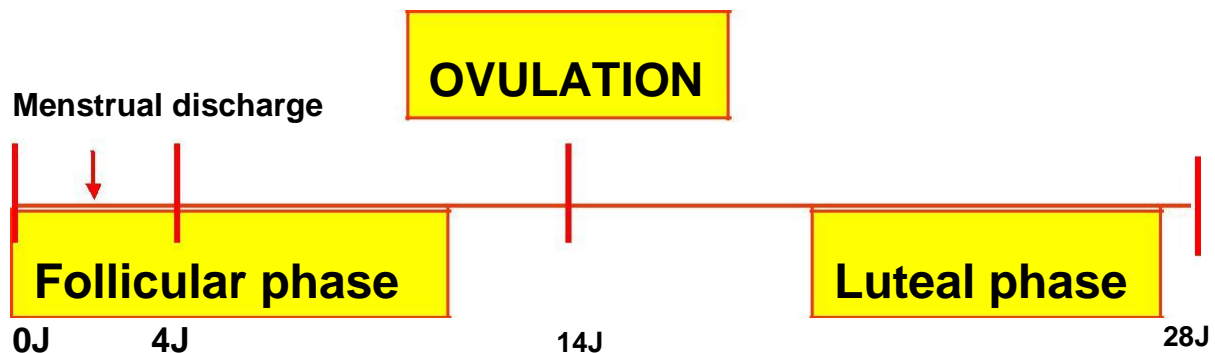


Figure 2: Menstrual cycle pattern

B. Different phases of the ovarian cycle

1. Follicular phase: Between J1 and

J14-Begins on the 1st day of menstruation -Ends with ovulation

- Usually 14 days in duration
- Follicular proliferation phase

2.Ovulatory phase:J14

-36h after LH peak (induced by estrogen increase = peak)

3.Luteal phase Be J14 and J28 (stable duration)

- Begins after ovulation
- Ends with menstruation without pregnancy

programmed degeneration of the yellow body
Fixed duration of 14J

C. Ovarian cycle and hormones

- Hypothalamus: pulsatile secretion of GnRH
- Pituitary: pulsatile/ cyclic secretion of: - FSH = follicle-stimulating hormone
- LH = luteinizing hormone
- Ovary:
 - Estrogen
 - Progesterone

