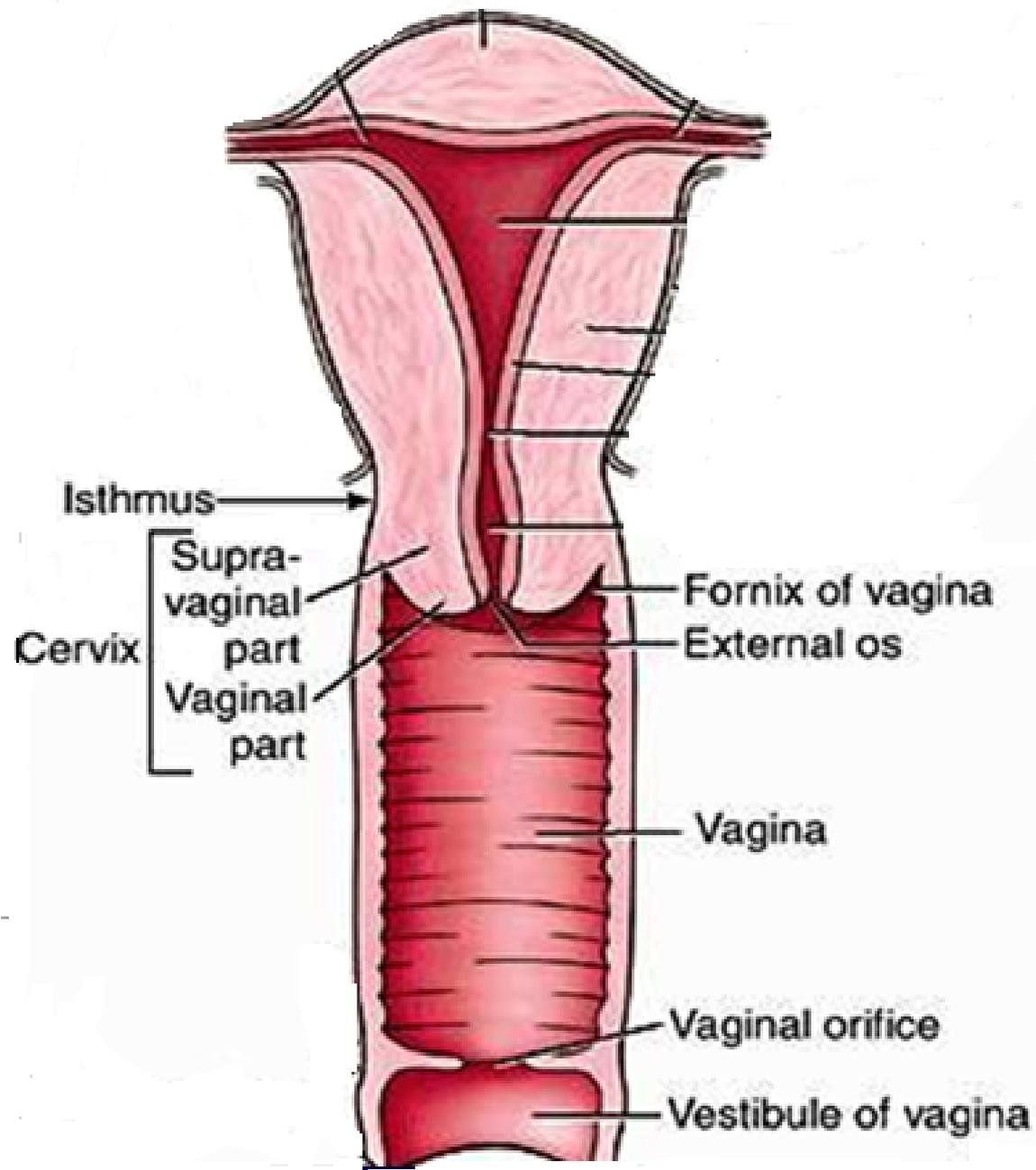


UGS Lecture – 9
)2021(

C. Vagina

- About 8 cm long, situated between bladder and urethra anteriorly, and rectum, posteriorly.**
- It extends downward and forward from cervix to vulva, where it opens into a space between labia minora, the vestibule.**
- Its upper half lies above pelvic diaphragm, while its lower half lies within perineum.**
- Its anterior wall is short, pierced superiorly by cervix, which projects downwards and backwards into vagina.**

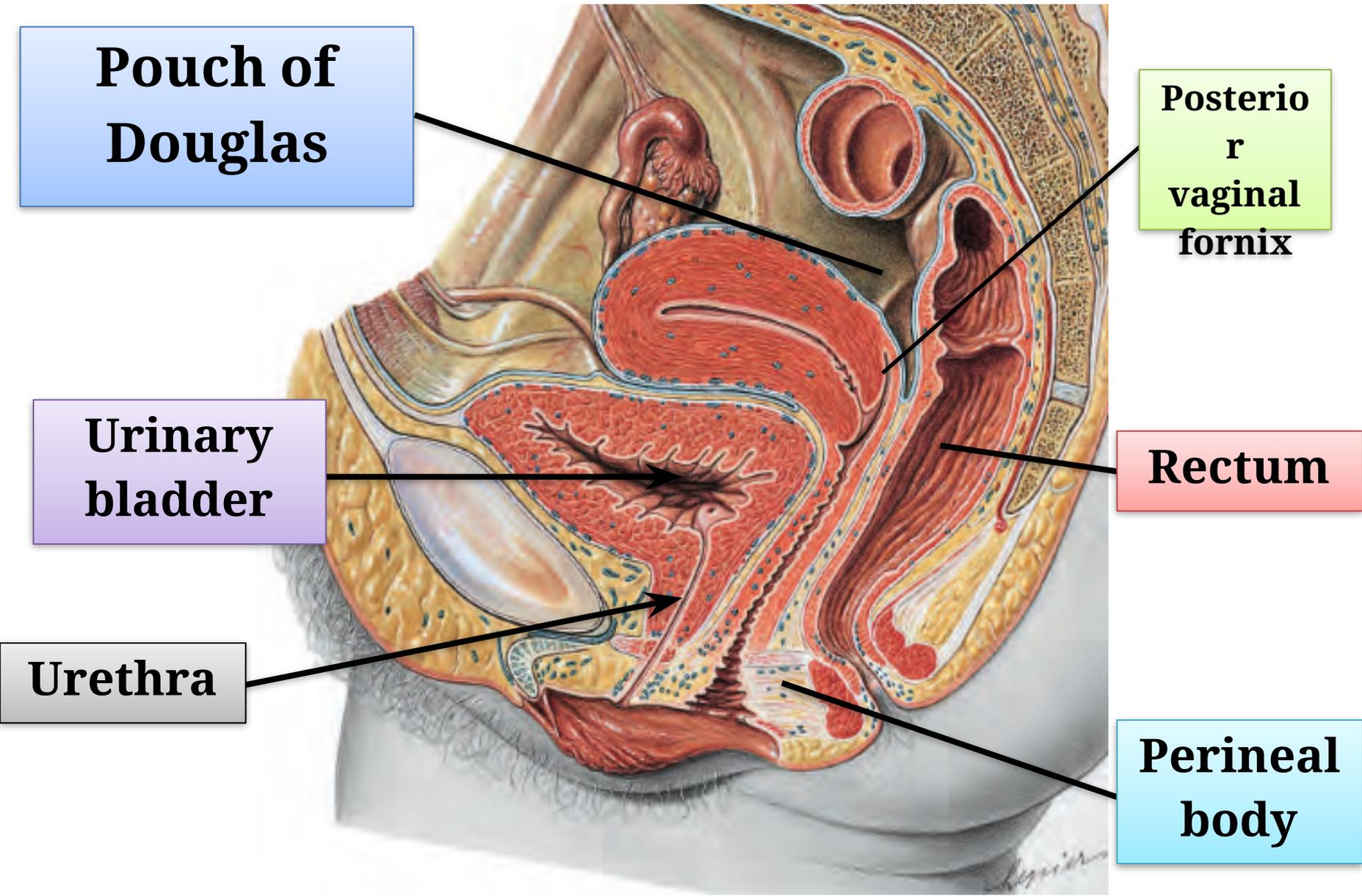
- **The area of vaginal lumen that surrounds cervix is divided into four recesses called vaginal fornices (anterior, posterior, and right & left lateral vaginal fornices).**
- **The posterior fornix is deeper than other.**
- **In virgins, the vaginal orifice contains a thin mucosal fold called hymen that is perforated at its center.**
- **The mucosal lining of vagina presents a series of transverse ridges in its lower third called rugae.**



The Vagina

Relations of the Vagina

- Anteriorly, above to bladder and below to urethra.**
- Posteriorly, in its upper part to pouch of Douglas, in its middle part to ampulla of rectum, and in its lower part to perineal body.**
- Laterally, upper part to ureter, middle part to levator ani muscle, and lower part to urogenital diaphragm and bulb of vestibule.**



Relations of the Vagina

Supports of Vagina

- (1) Upper part is supported by tone of levator ani muscles.**
- (2) Middle part is supported by urogenital diaphragm.**
- (3) Lower part is supported by perineal body.**

Blood Supply of Vagina

(1) Vaginal artery (branch of internal iliac artery).

(2) Vaginal branch of uterine artery.

Vaginal vein forms a plexus around vagina that drains into internal iliac vein.

Lymph Drainage of Vagina

(1) Upper part of drain into internal and external iliac lymph nodes.

(2) Middle part drain into internal iliac lymph nodes.

(3) Lower part drain into superficial inguinal lymph nodes.

Histology of Female Reproductive Organ

Ovary

Composed of four layers; from out and in:

(1) Germinal epithelium:

Covers surface and consists of a simple squamous or cuboidal or columnar epithelium.

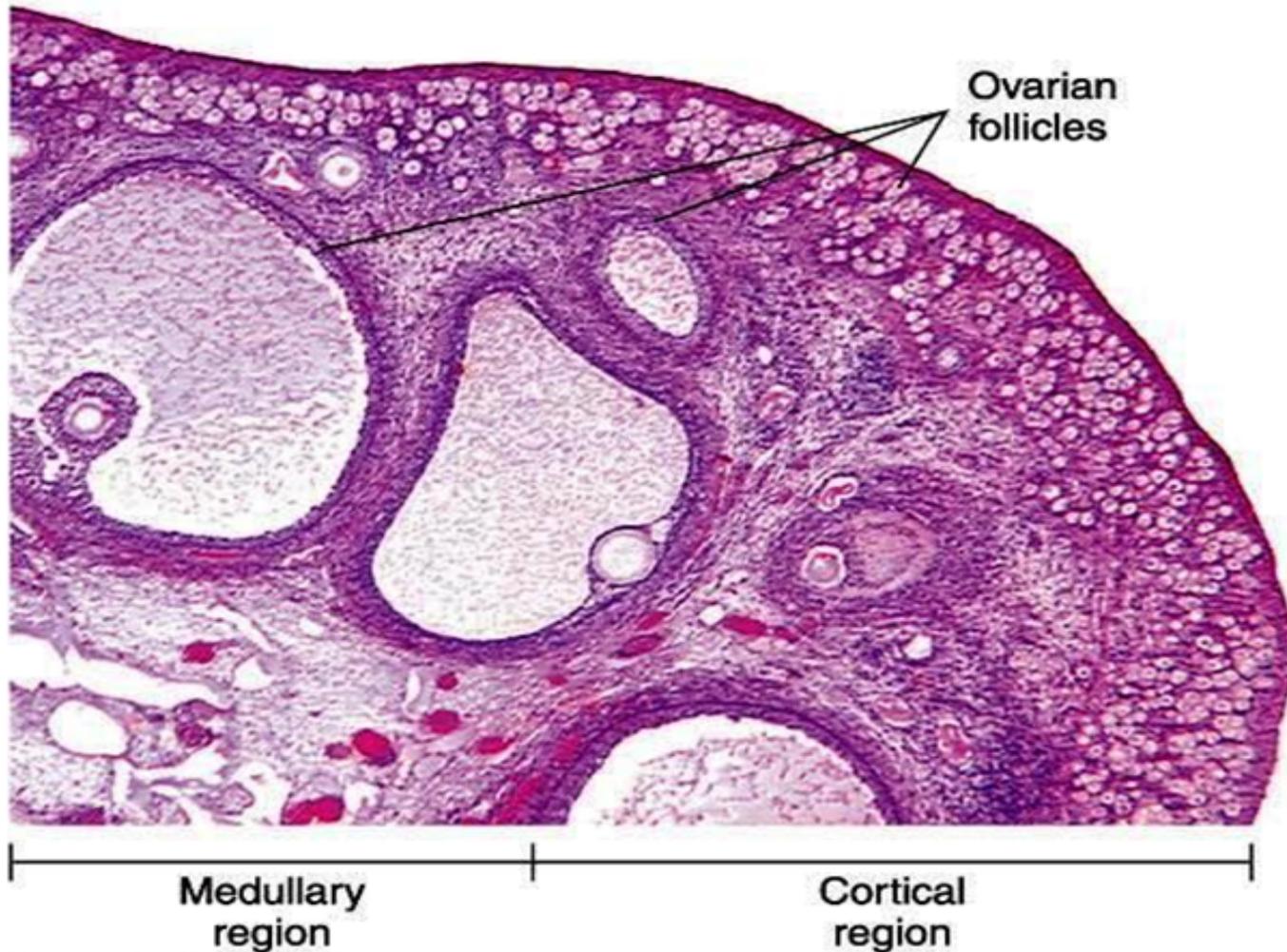
It is continuous with mesothelial lining of peritoneal cavity.

**(2) Tunica albuginea: Consists of dense
connective tissue. 9**

(3) Cortical region:

- Consists of ovarian follicle embedded in a connective tissue (stroma).**
- Each follicle contains an oocyte surrounded by one or more layers of follicular cells.**
- The connective tissue is composed of spindle-shaped fibroblasts-like cells that respond in different way to hormonal stimuli.**
- Bundles of smooth muscle cells are also scattered throughout stroma.**

**(4) Medullary region: Consists of a loose connective tissue rich in vascular bed.
No sharp limit between cortical and medullary regions.**



Reproductive cycle

During this cycle there are several changes occur in ovary (ovarian cycle) and uterus (uterine or menstrual cycle)

(1)Ovarian cycle consists of two phases, usually of about equal duration – follicular phase and luteal phase.

a. The follicular phase: Is characterized by growth, maturation and rupture (ovulation) of an ovarian follicle.

b. The luteal phase: Is characterized by development of a corpus luteum derived from ruptured follicle.

Follicular Phase

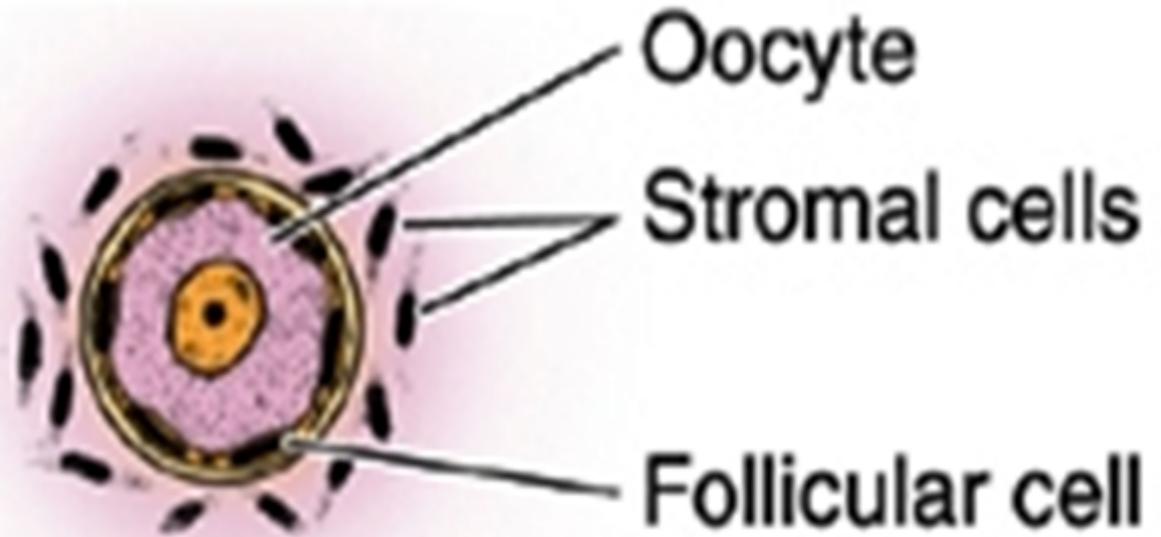
**Follicular growth is stimulated by FSH
(lasts about 90 days)**

(1) Primordial follicles:

- At birth in human ovary, there are about 500000 primordial follicles.**
- They occupy superficial part of cortical region.**
- They are formed during fetal life.**

- Each follicle consists of a primary oocyte surrounded by a single layer of flattened follicular cells.

Primordial
follicle



- **The oocyte is spherical-shaped cell with large nucleus, and is in prophase of 1st meiosis.**
- **There are numerous mitochondria.**
- **A basal lamina surrounds the follicular cells and marks boundary between follicle and surrounding stroma.**
- **Beginning from puberty, during each ovarian cycle, a group of up to 20 primordial follicles is activated to begin maturation process.**

- **However, usually only one follicle reaches full maturity and undergoes ovulation while remaining follicles undergo atresia.**

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(2) Unilaminar primary follicles:

- Oocyte has greatly enlarged with an increasement in number of mitochondria.**
- Golgi complex occupies apical cytoplasm.**
- Follicular cells divide by mitosis and form a single layer of cuboidal cells; they are now known as granulose cells.**
- Thick homogenous layer of glycoprotein and acid proteoglycans, zona pellucida develops between oocyte and follicular cells; both cell types probably contribute to its formation.**

Unilaminar
primary
follicle



Basal lamina

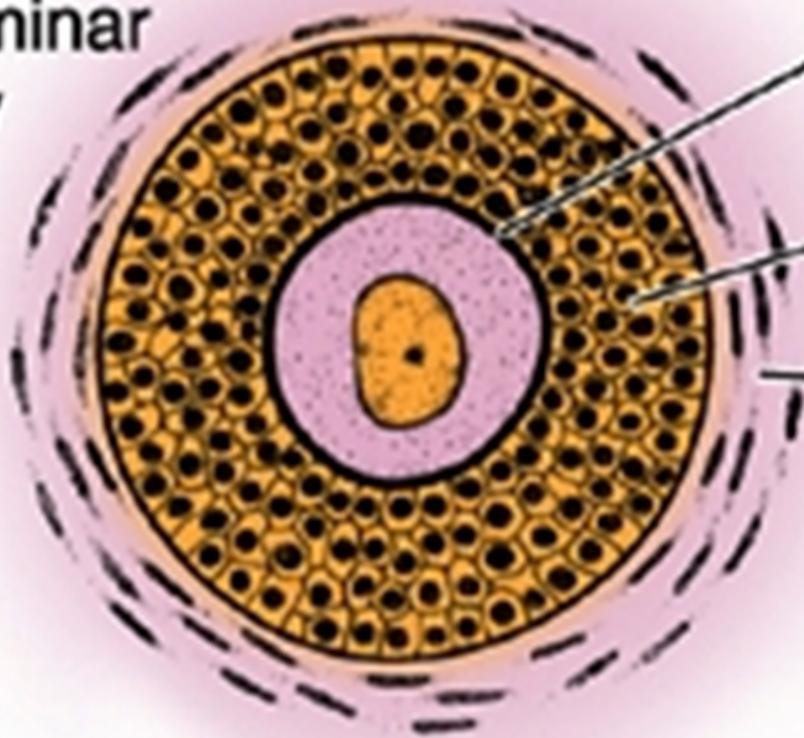
Zona pellucida forming

Follicular cell

(3) Multilaminar primary follicles:

- With further follicular growth, fibroblast-like cells of ovarian stroma surrounding follicle begin to form an organized layer around follicle called theca folliculi separated from granulosa cells by a basement membrane.**
- The granulosa cells continue to proliferate, forming a stratified epithelium called zona granulosa.**

Multilaminar
primary
follicle



Zona pellucida

Granulosa cells

Theca interna

(4) Secondary (antral) follicle

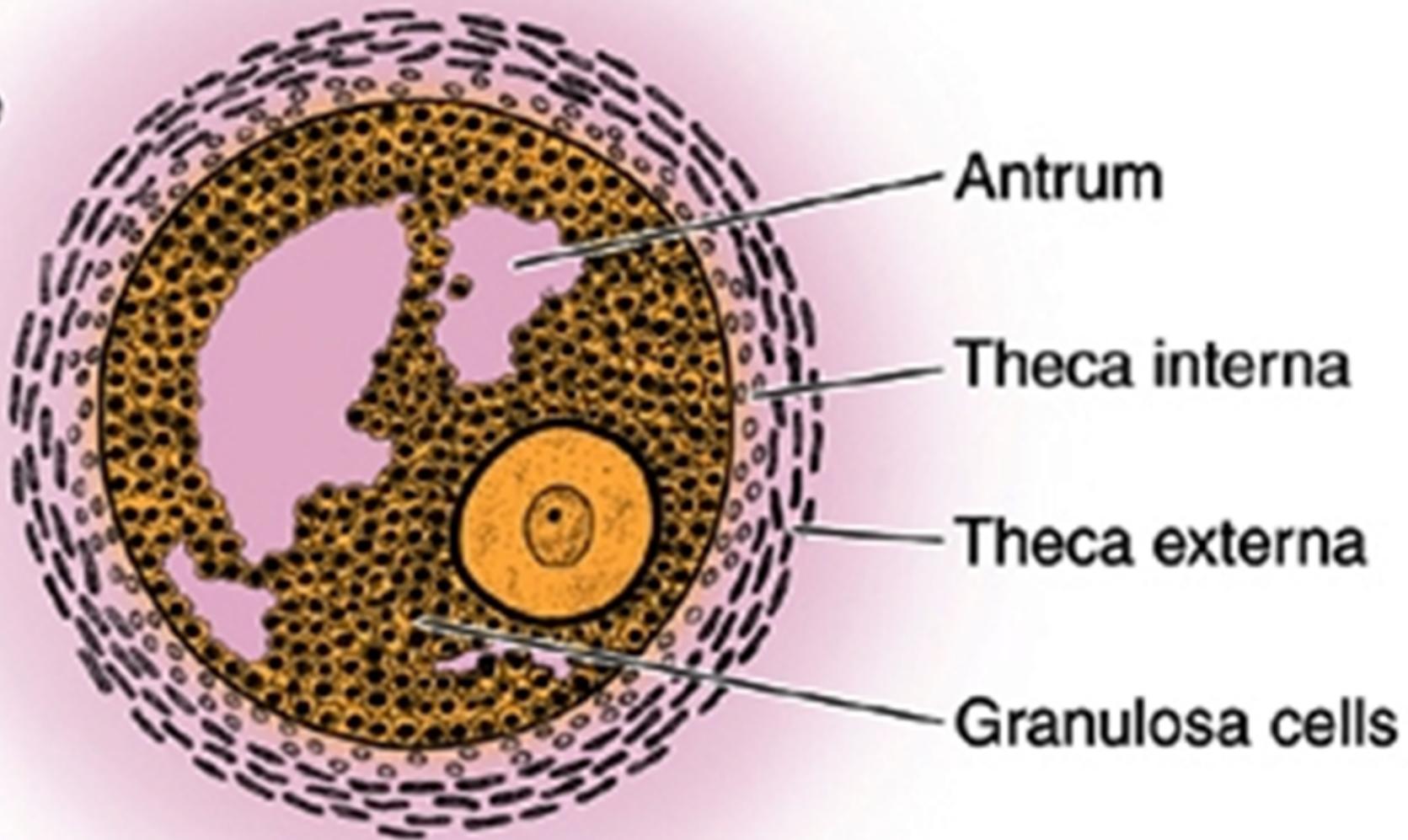
- Zona granulosa continues to proliferate and within it small fluid-filled spaces appear; these fuse to form follicular antrum, in which follicular fluid accumulates.**
- At this stage, oocyte has almost reached its full size and becomes situated eccentrically in thickened area of granulosa called cumulus oophorus.**
- Theca folliculi has developed two layers, theca interna, comprising several layers of rounded cells, and less well-defined theca externa consisting of spindle-shaped cells that merge with surrounding stroma.**

- **Cells of theca interna have features of typical steroid-secreting cells and synthesize androstenedione hormone that transported to granulosa layer.**
- **Cells of granulosa, under influence of FSH synthesize an enzyme, aromatase that transforms androstenedione into estrogen, which returns to stroma, enters blood vessels, and is distributed throughout body.**
- **Small blood vessels enter theca interna.**

- **They provide a rich capillary plexus around secretory cells of this region, which like all organs of endocrine function, is richly vascularized.**

- **There are no blood vessels in granulosa cell layer during stage of follicular growth.**

Antral follicle

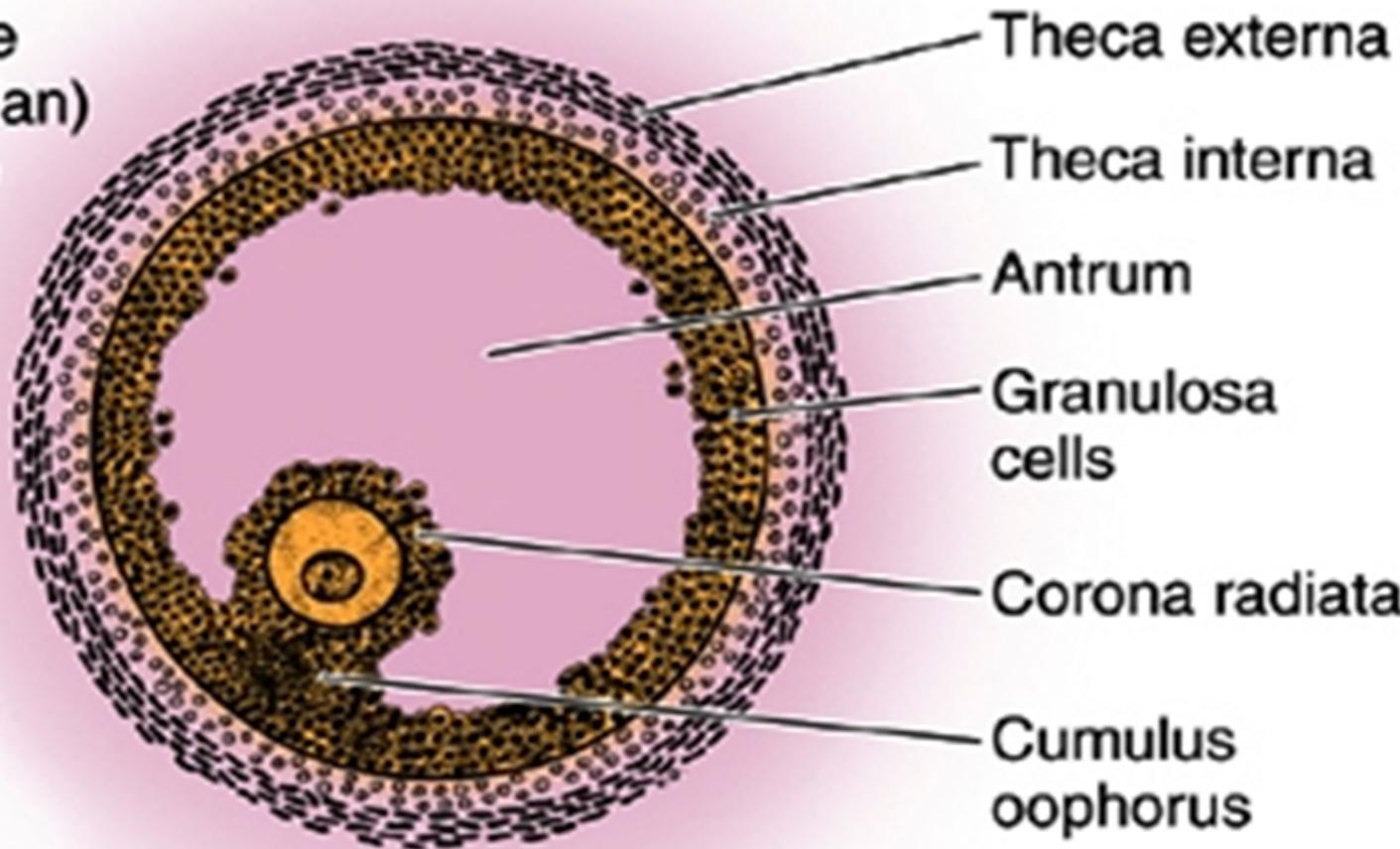


(5) Mature (graafian) follicle

- By this stage follicle becomes so large (between 1.5 and 2.5 cm in diameter) that it protrudes from surface of ovary and can be detected with ultrasound.**
- As a result of accumulation of liquid, follicular cavity increases in size.**
- The cumulus oophorus diminishes leaving the oocyte surrounded by a group of granulose cells termed corona radiate, which remains attached to zona granulose by thin bridges of cells.**
- Until this moment oocyte was in prophase of 1st meiosis, initiated during fetal life.**

- **Approaching maturity, further growth of oocyte ceases and first meiotic division is completed just before ovulation.**
- **The chromosomes are equally divided between the daughter cells, but one of secondary oocytes retains almost all of cytoplasm.**
- **The other becomes 1st polar body (very small cell containing a small nucleus and a minimal amount of cytoplasm).**
- **Secondary oocyte begins second meiotic division, which stops in metaphase, and is not completed until after penetration of ovum by spermatozoa.**

Mature
(graafian)
follicle



- **At time of ovulation, which is controlled by LH (lutenizing hormone) secreted by anterior pituitary gland in response to high levels of circulating estrogen produced by growing follicles, the mature follicle rupture and ovum, made up of secondary oocyte and first polar body, enclosed by zona pellucida, corona radiata, and some follicular fluid, is expelled to enter uterine tube where oocyte may be fertilized.**
- **If this does not happen within 1st 24 hours after ovulation, it degenerates and phagocytosed.**

- **Ovulation takes place in approximately middle of menstrual cycle.**
- **Although granulosa cells and oocytes undergo degeneration during follicular atresia, the theca interna cells frequently persist in small groups throughout cortical stroma and are called interstitial cells. These cells are active steroid secretors, stimulated by LH.**

Luteal Phase

- After ovulation, ruptured follicle collapses and fills with blood clot.
- Granulose cells and cells of theca interna reorganize to form a temporary endocrine gland called corpus luteum of menstruation, which becomes embedded in cortical region.
- Under influence of LH, granulose cells increase greatly in size, but not in number.
- They make up about 80% of parenchyma of corpus luteum and are then called granulose lutein cells.

- **These cells acquire characteristics of steroid-secreting cells.**
- **This is in contrast to their structure in preovulatory follicle, where they appear to be protein-secreting cells.**
- **Progesterone promotes changes in endometrium that make it ready for implantation of fertilized ovum.**
- **The cells of theca interna also increase somewhat in size and acquire similar cytoplasmic features to lutenised granulosa cell; these cells continue to secrete estrogens, which are necessary to maintain thickened uterine mucosa.**

- **The cells become known as theca lutein cells.**
- **Blood capillaries from theca interna and large vessels from theca externa grow into interior of corpus luteum and form a rich vascular network characteristic of endocrine glands.**
- **Corpus luteum produces progesterone, estrogens, relaxin, and inhibin.**
- **Progesterone production by corpus luteum is dependent on LH from anterior pituitary, but rising progesterone levels inhibit LH production.**

- **If no further LH stimulation takes place and pregnancy does not occur, cells of corpus luteum cannot be maintained, and in 12 – 14 days after ovulation, they degenerate by apoptosis.**
- **Cellular remnants are phagocytosed by macrophages.**
- **Neighboring fibroblasts invade area and produce a scar called corpus albicans.**
- **Once corpus luteum regresses, secretion of both estrogene and progesterone ceases.**

- **Without these two hormones endometrial lining of uterus collapses, resulting in onset of menstruation.**
- **If pregnancy occurs, corpus luteum persists for 4 – 5 months and then degenerates, and it is called corpus luteum of pregnancy.**