Female reproductive system

Component of female reproductive system

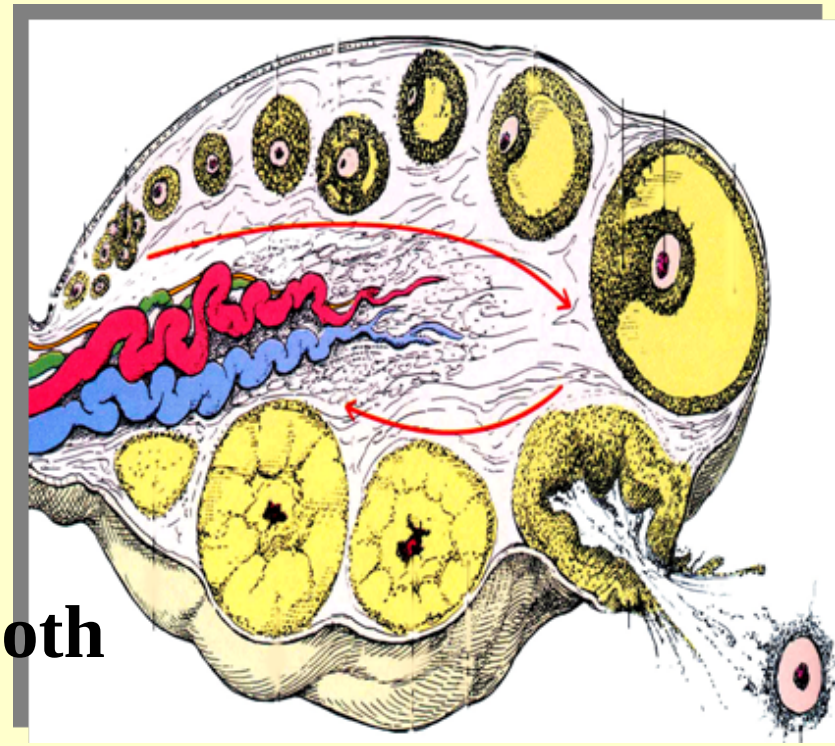
- Genital glands-------Ovary
- Genital ducts
  - Uterine tube
  - Uterus
  - Vagina
- External genitalia
- Breast

General structure of Ovary

Capsule

Superfical epith.

Tunica albuginea



Cortex

*** different stages follicles**

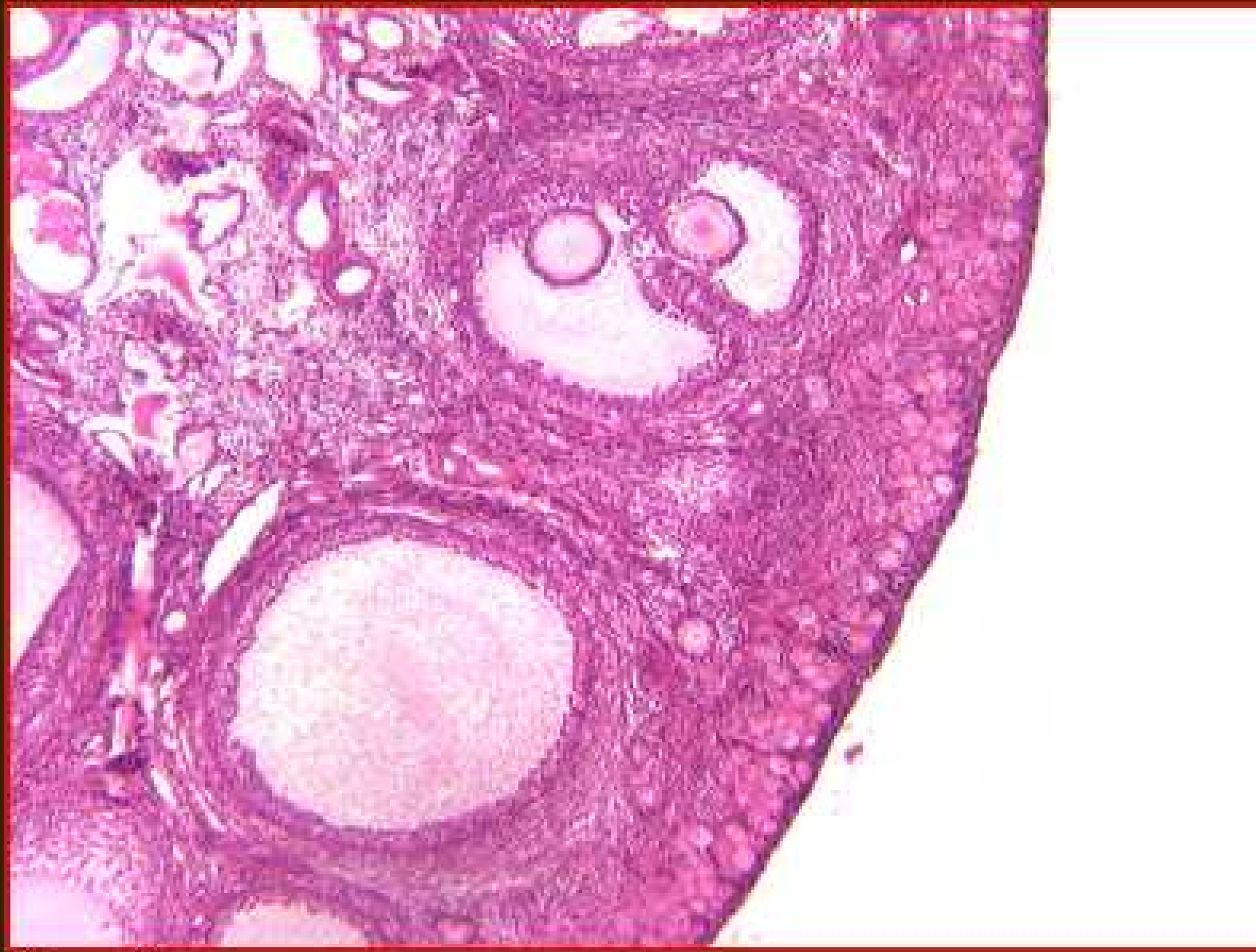
*** Corpus luteum and corpus albicans**

*** Connective Tissue with more spindle-shaped stroma cells, smooth muscles and reticular fibers**

Medulla

loose connective tissue containing more elastic fiber & blood vessels

Slide 151
Image 1/7



* ***Ovary*** (Cat)- Low Mag.

Follicles of varying stages of development are located in the **cortex**. The **medulla** contains blood vessels, lymphatics & loose ct. At this low mag, **large follicles**, some with **oocytes**, can be seen easily. Smaller follicles are located near the periphery.

follicles

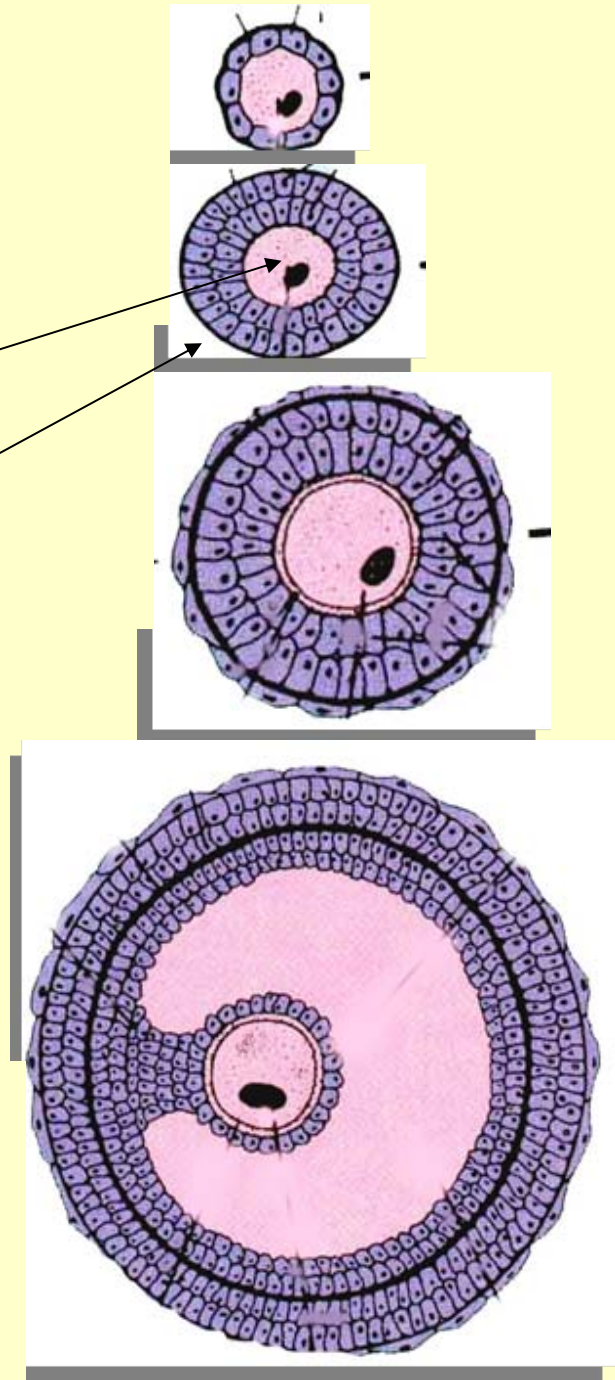
- Primordial follicle
- primary follicle
- secondary follicle
- Mature follicle

Follicles & their development

*component of a follicle

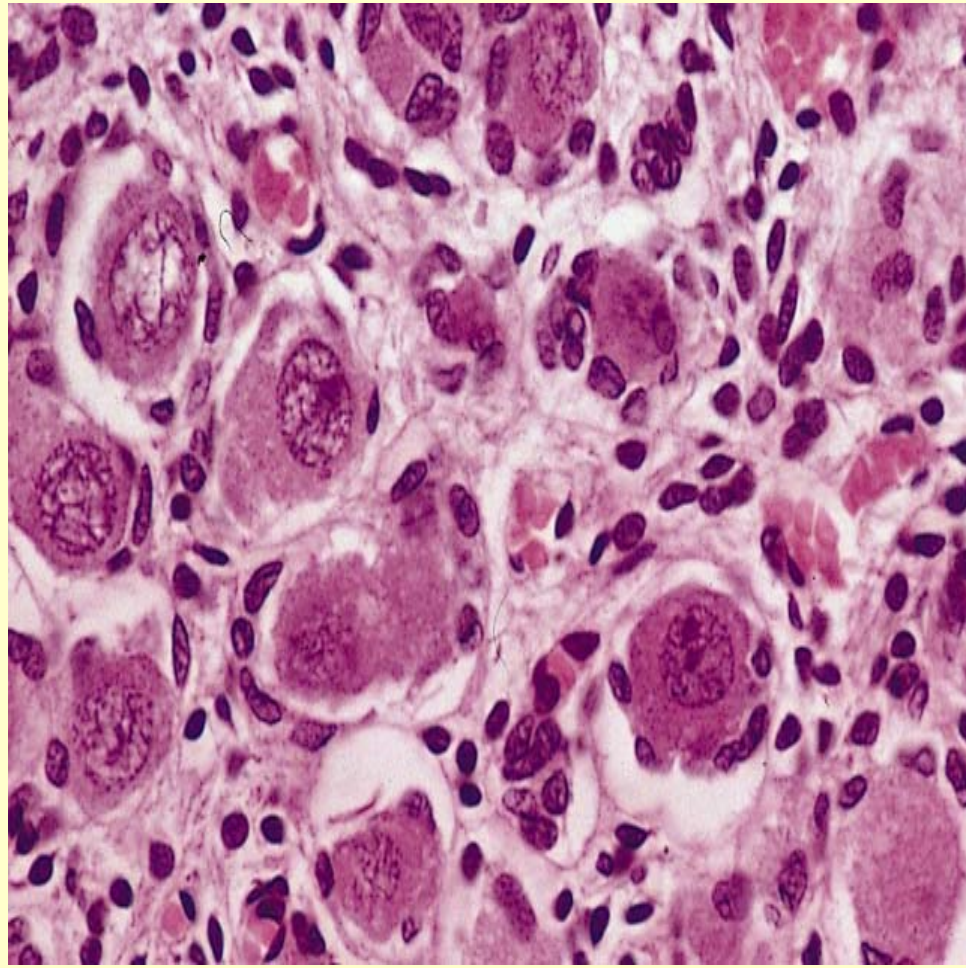
oocyte

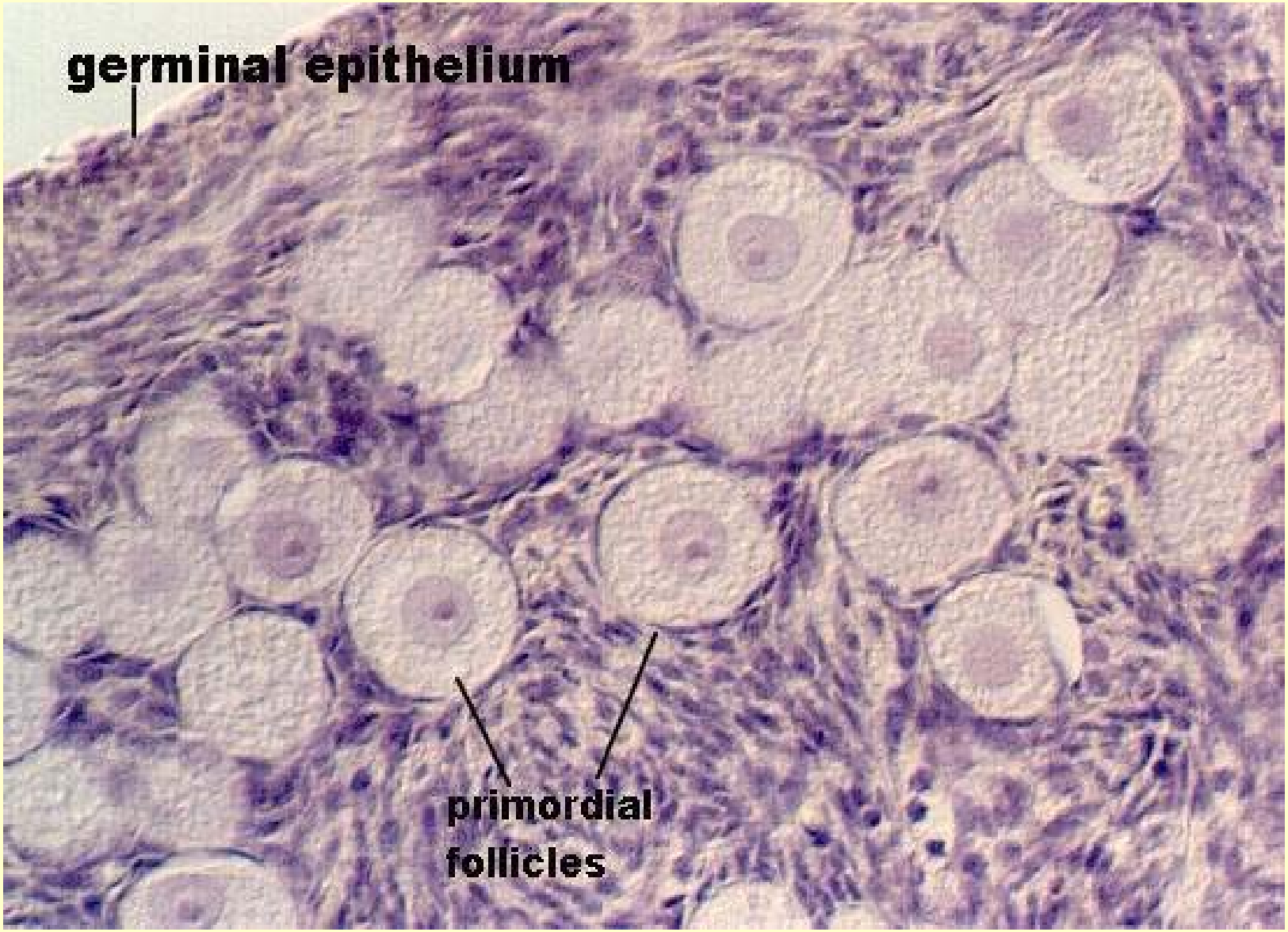
follicular cells



Primordial follicle

* the earliest stage of follicle
* located in the cortex
* primary oocyte (in prophase of 1st meiotic division) has a large nucleus with prominent nucleolus.
* a single layer of flatten follicular cells surrounding the primary oocyte.




germinal epithelium
primordial
follicles

Primary follicle

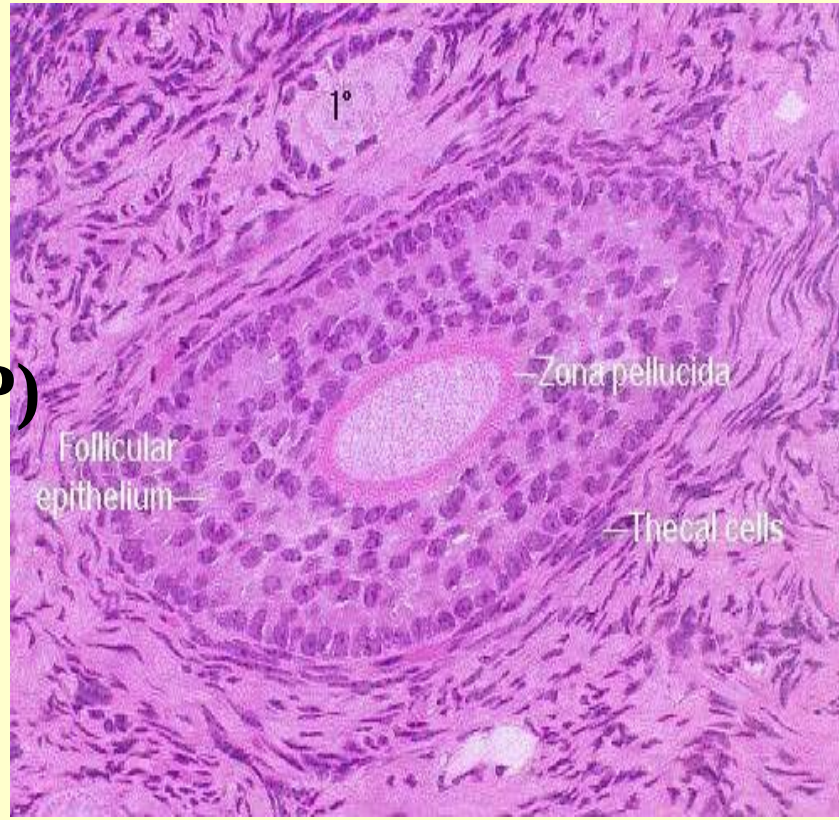
*** greatly enlarged primary oocyte.**

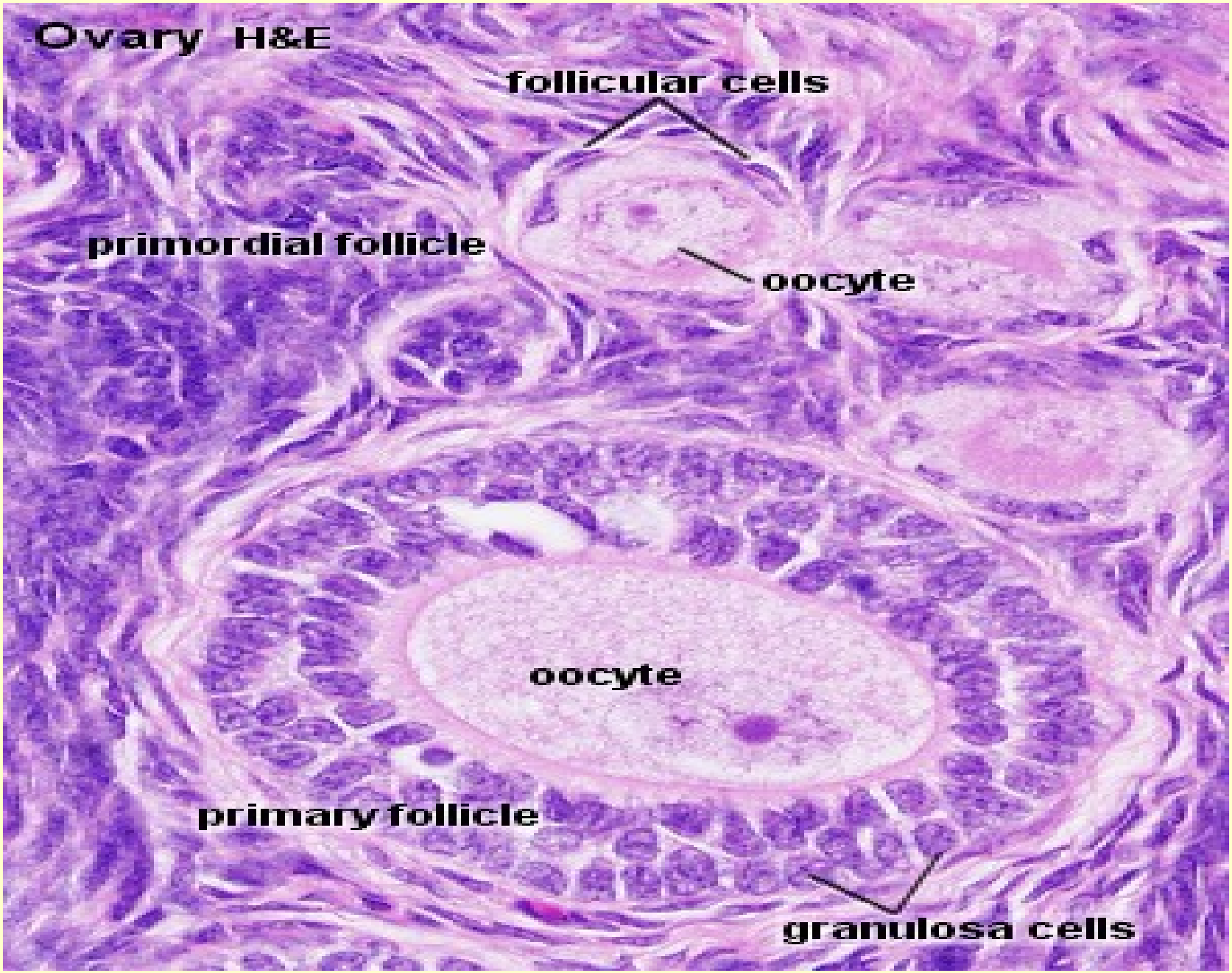
*** multiplied follicular cells become cuboidal in shape.**

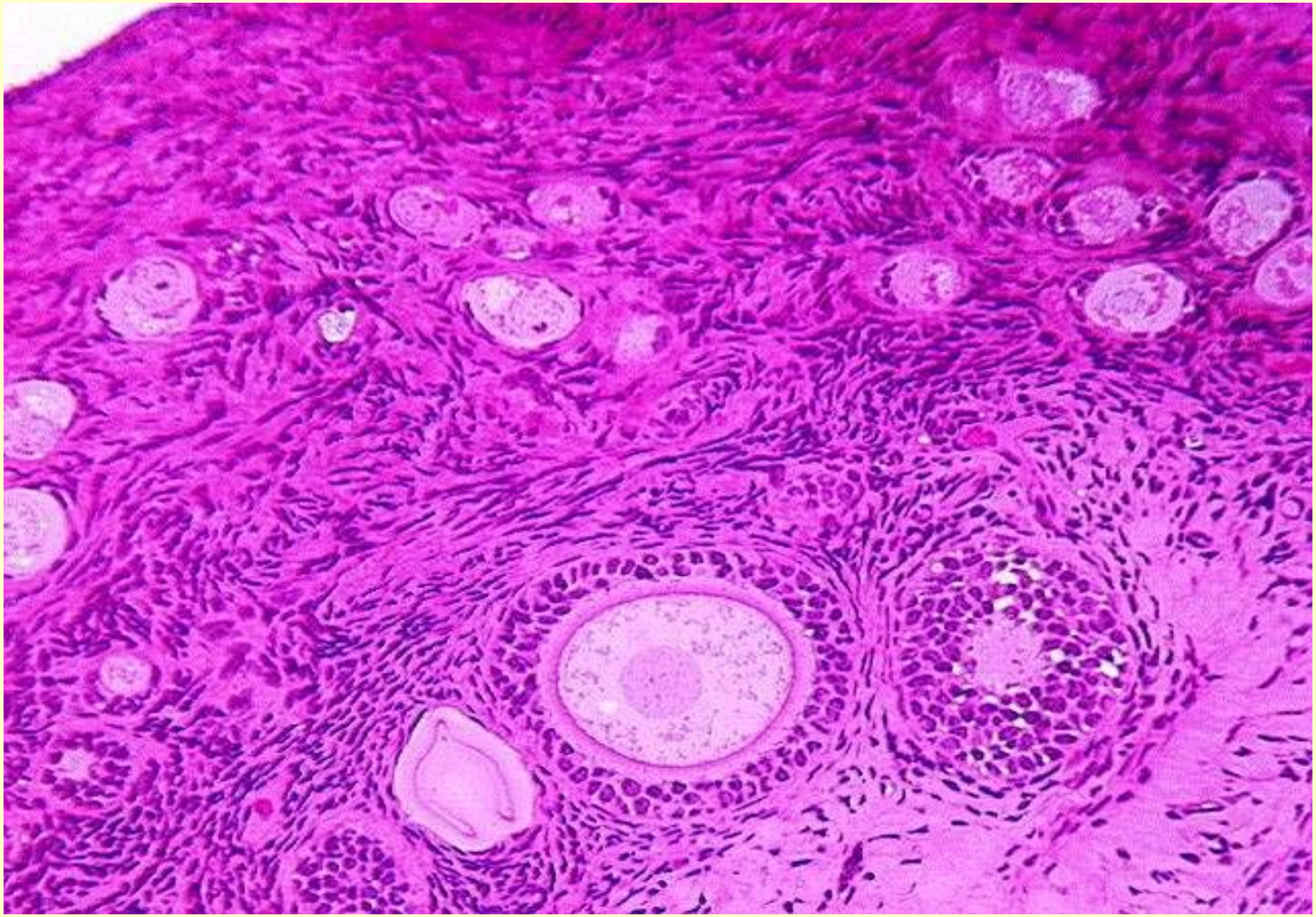
*** *Corona radiate: columnar cell***

*** *zona pellucida:* Zona protein(ZP)**

*** *theca folliculi***

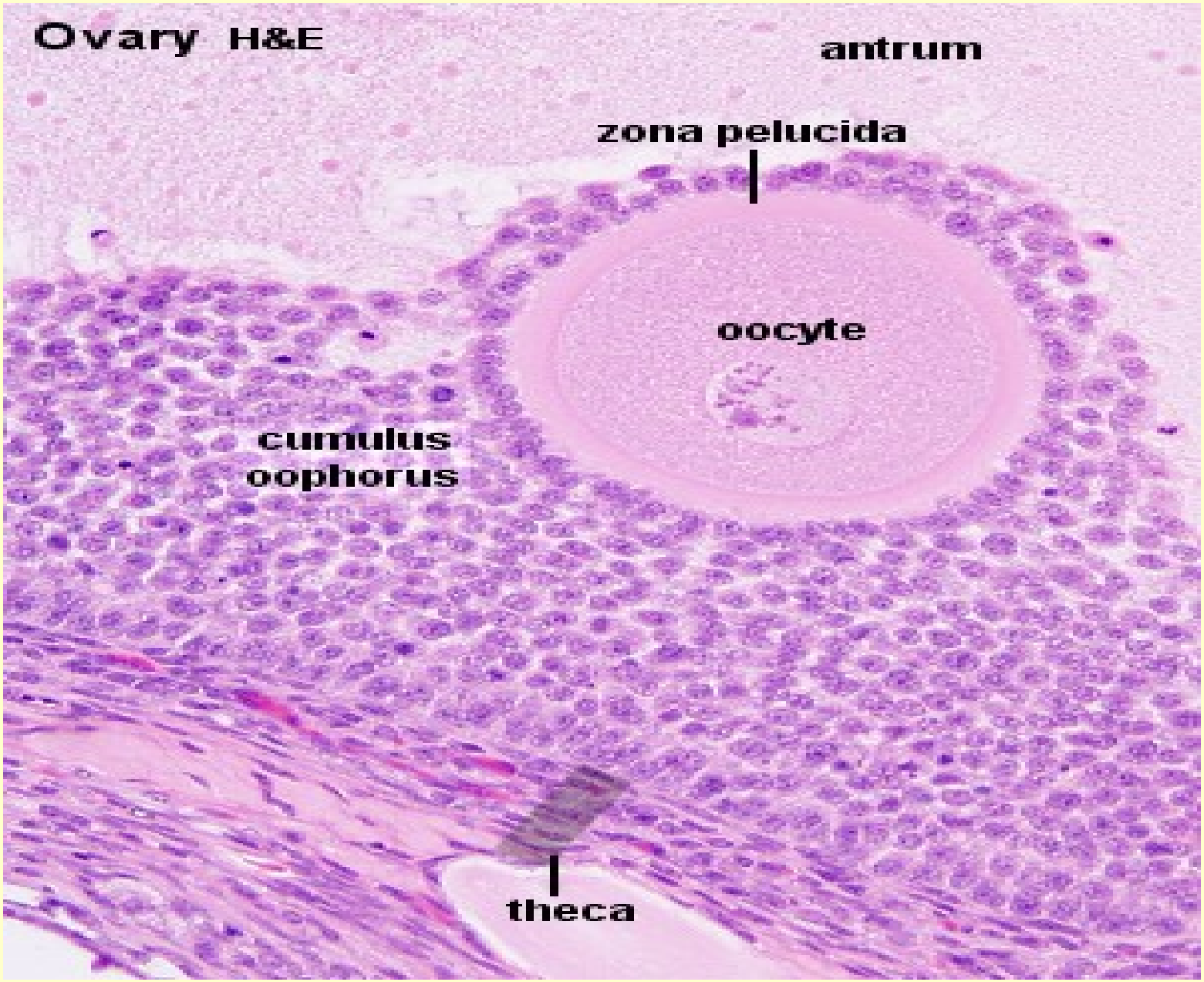



Ovary H&E
follicular cells
primordial follicle
oocyte
oocyte
primary follicle
granulosa cells

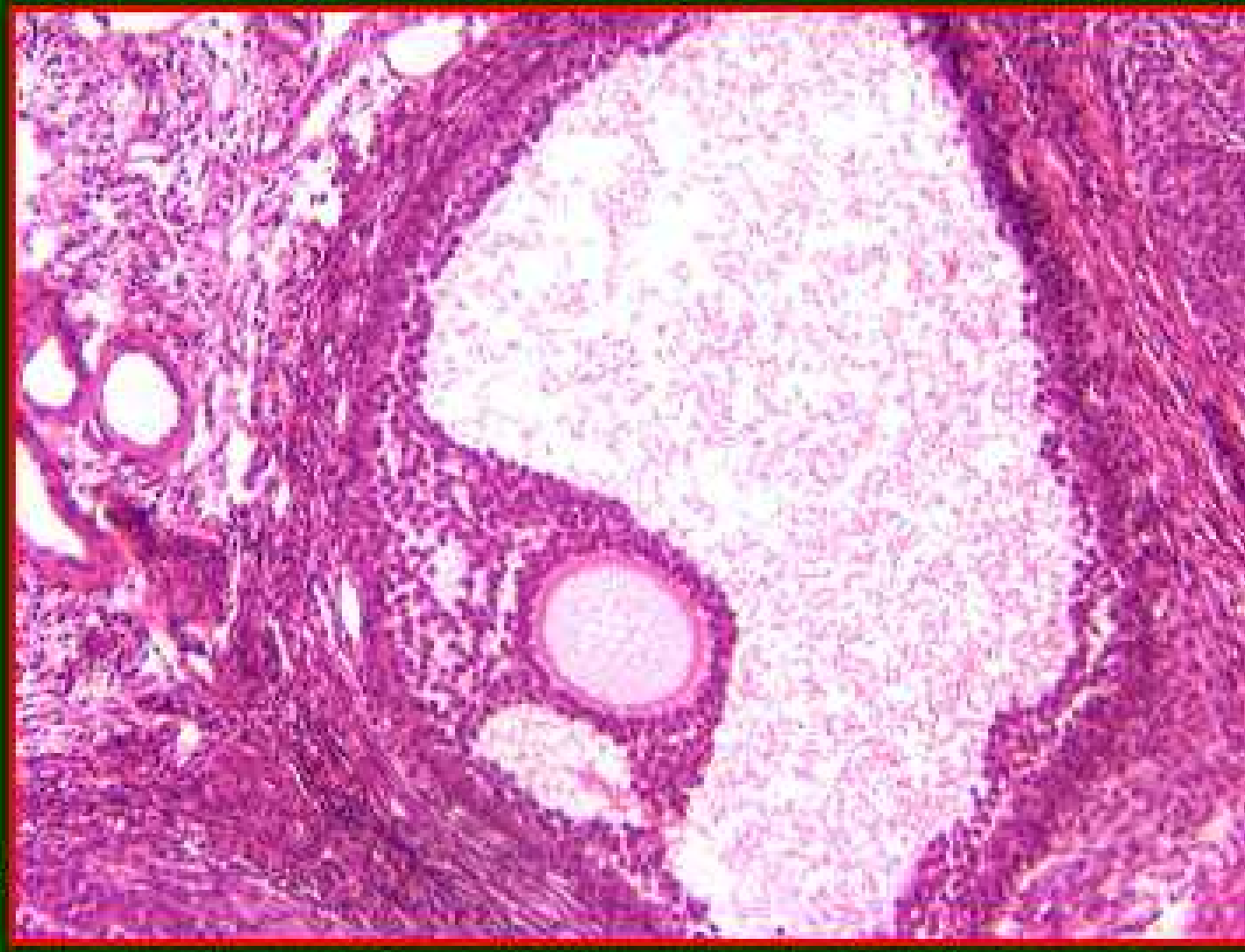


Secondary follicle

* small fluid-filled spaces visible
* cumulus oophorus
  - corona radiate
  - primary oocyte
  - zona pellucida
* stratum granulosum
* follicular theca
  - theca interna: theca cell
  - theca externa: connective tissue


Ovary H&E
antrum
zona pelucida
oocyte
cumulus
oophorus
theca

Slide 151
Image 5/7



Secondary Follicle
Med Mag.

The follicular cells produce a fluid that coalesces to form an **antrum**, the presence of which defines a secondary follicle. The follicle cells lining the antrum and surrounding the **oocyte** are now called **granulosa cells**. The **zona pellucida**, composed of glycoproteins around the enlarged oocyte, is surrounded by granulosa cells called the **corona radiata**. The entire mass of granulosa cells and the oocyte are referred to as the **cumulus oophorus**.

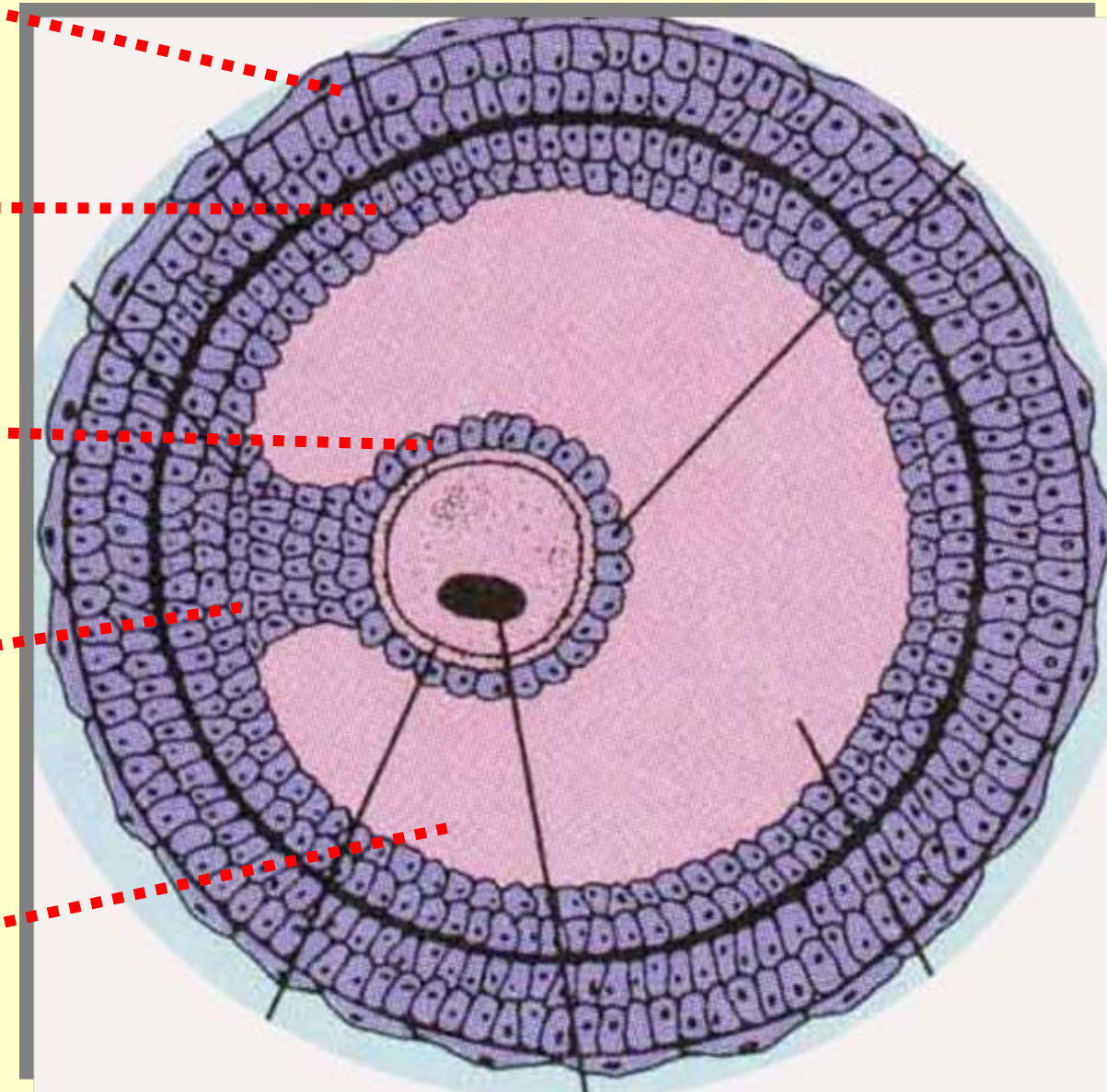
follicular theca

stratum granulosum

corona radiata

cumulus oophorus

follicular cavity



Mature follicle

***more than 2 cm in diameter**

***bulges under the ovarian surface**

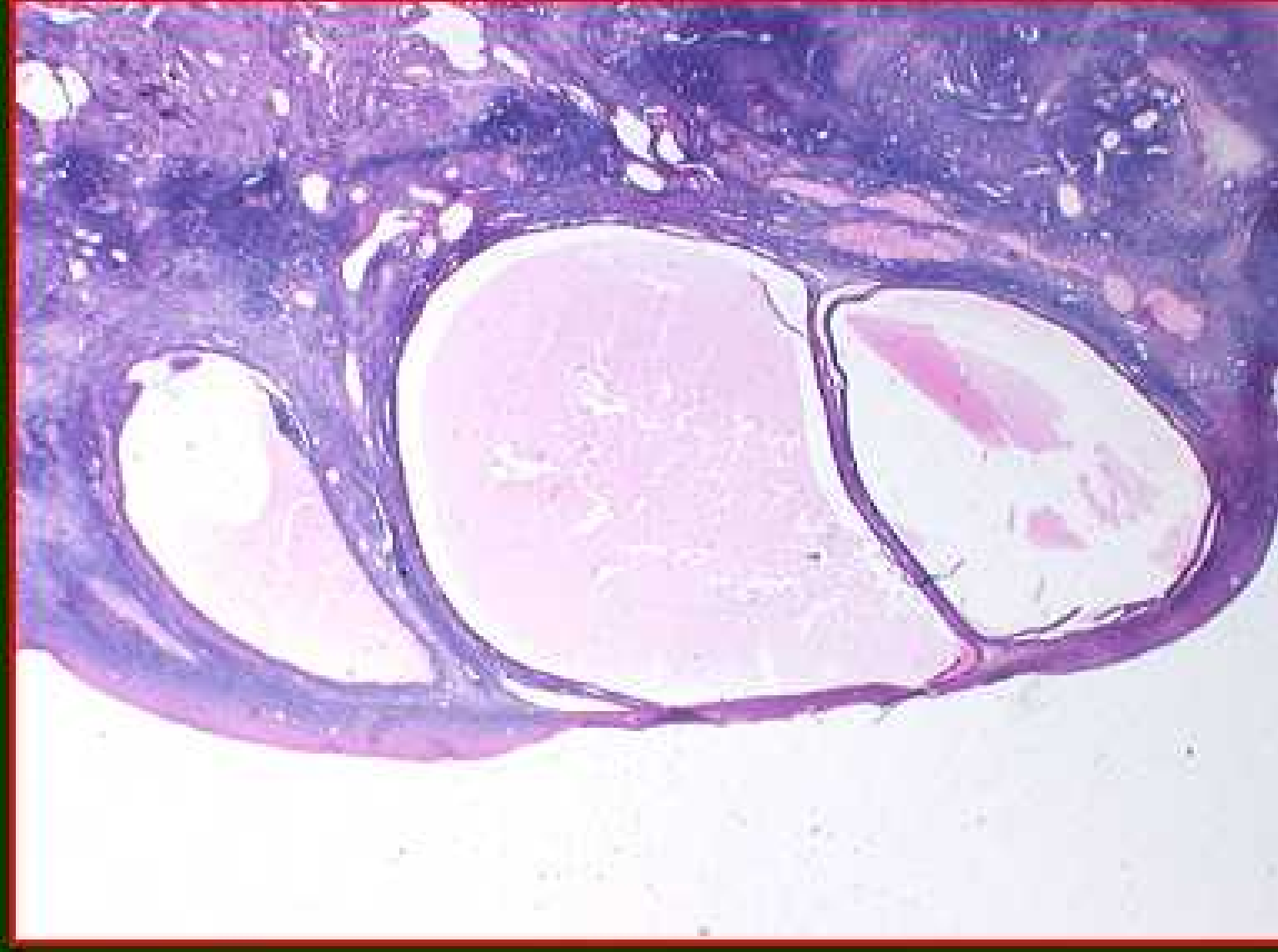
***stratum granulosum becomes very thin**

***follicular cavity enlarges markedly**

***the 1st meiotic division completed just before the ovulation of 36-48 hours**

***forming secondary oocyte which arrested in the metaphase of 2th meiotic division**

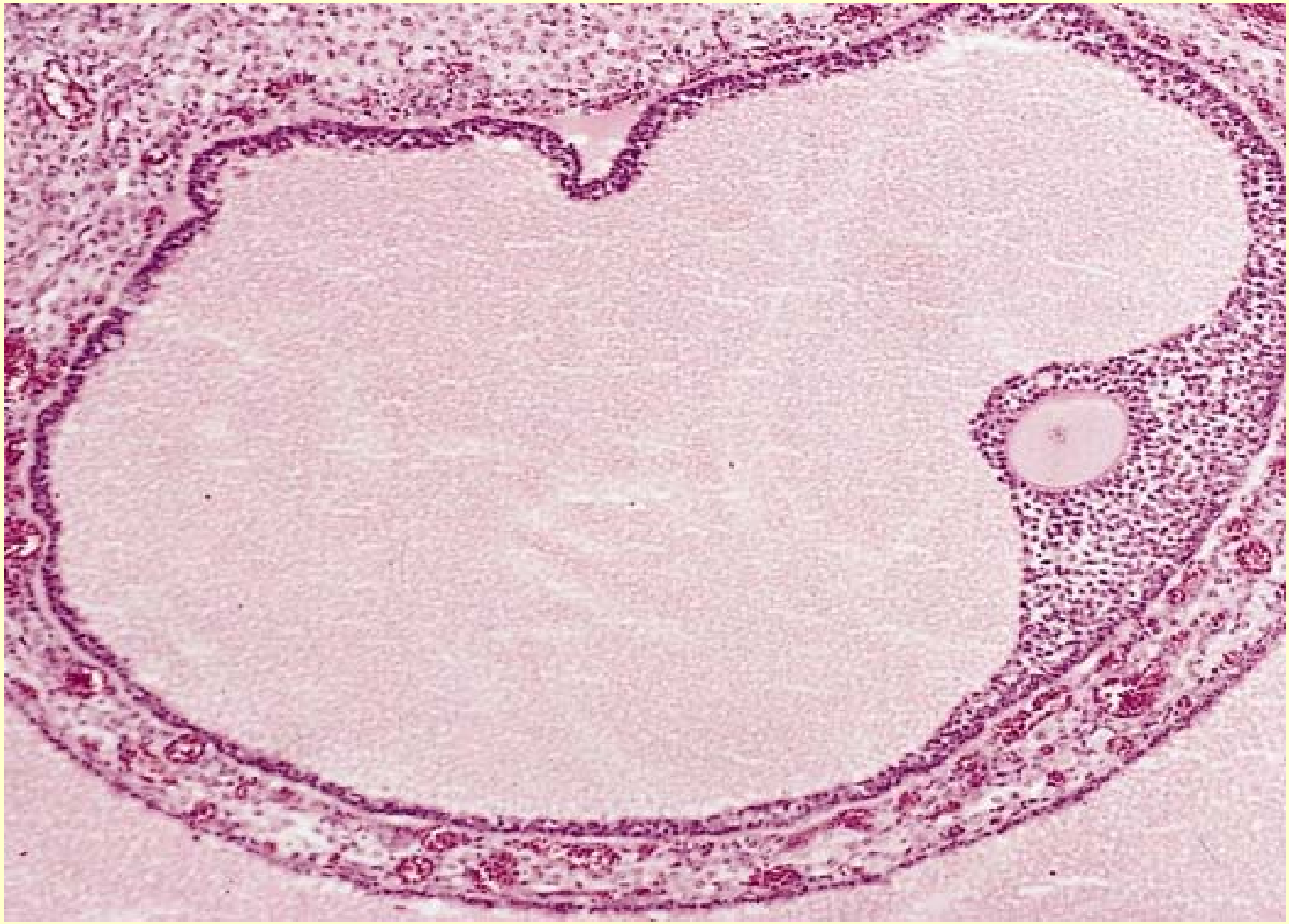
Demo Slide Image 1/1



- ***Mature Follicle*** - Low Mag.

All of the features of a secondary follicle previously studied apply to the **mature (Graafian) follicle**, which is noticeably larger and closer to the ovarian surface than other secondary follicles.

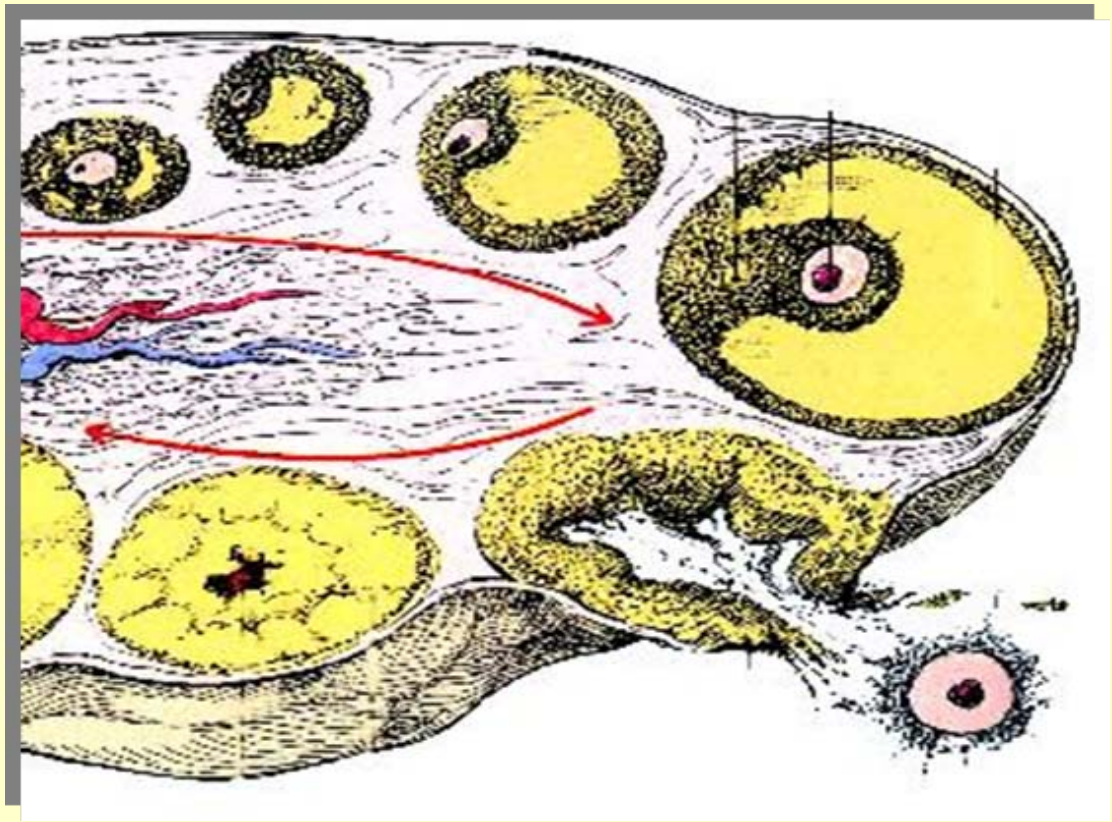
Mature follicle



Ovulation

Definition:

The process of in which mature follicle ruptures and the secondary oocyte with zona pellucida & corona radiata is expelled from ovary.



Corpus luteum

*** ruptured follicle becomes a temporary endocrine organ.**

***cell type of corpus luteum**

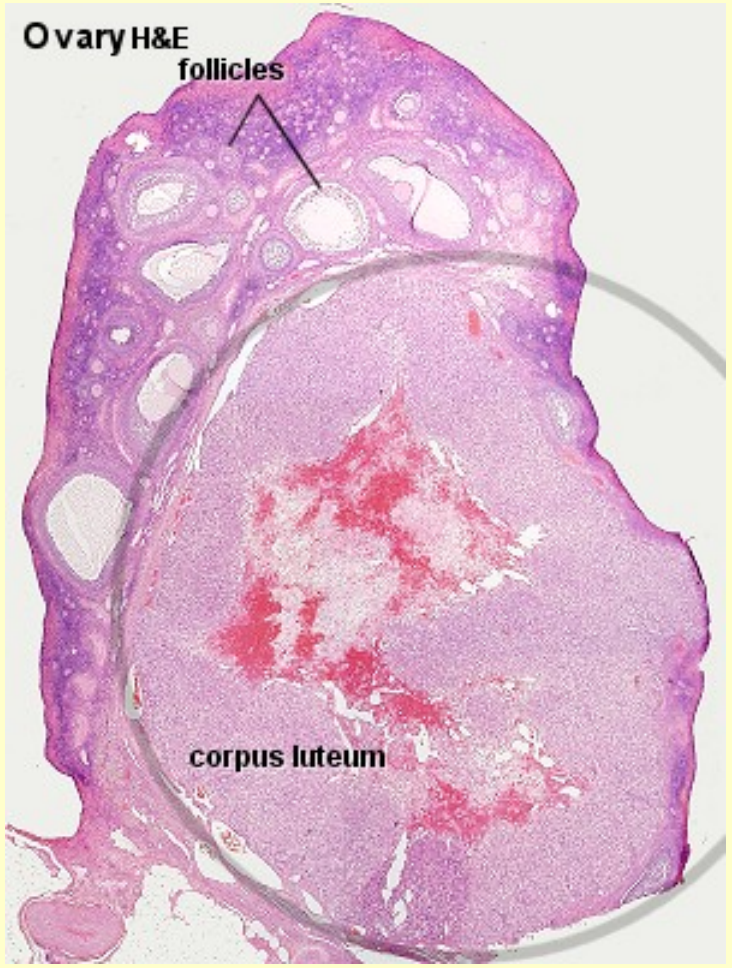
granulosa lutein c. (*progesterone*, *relaxin*)

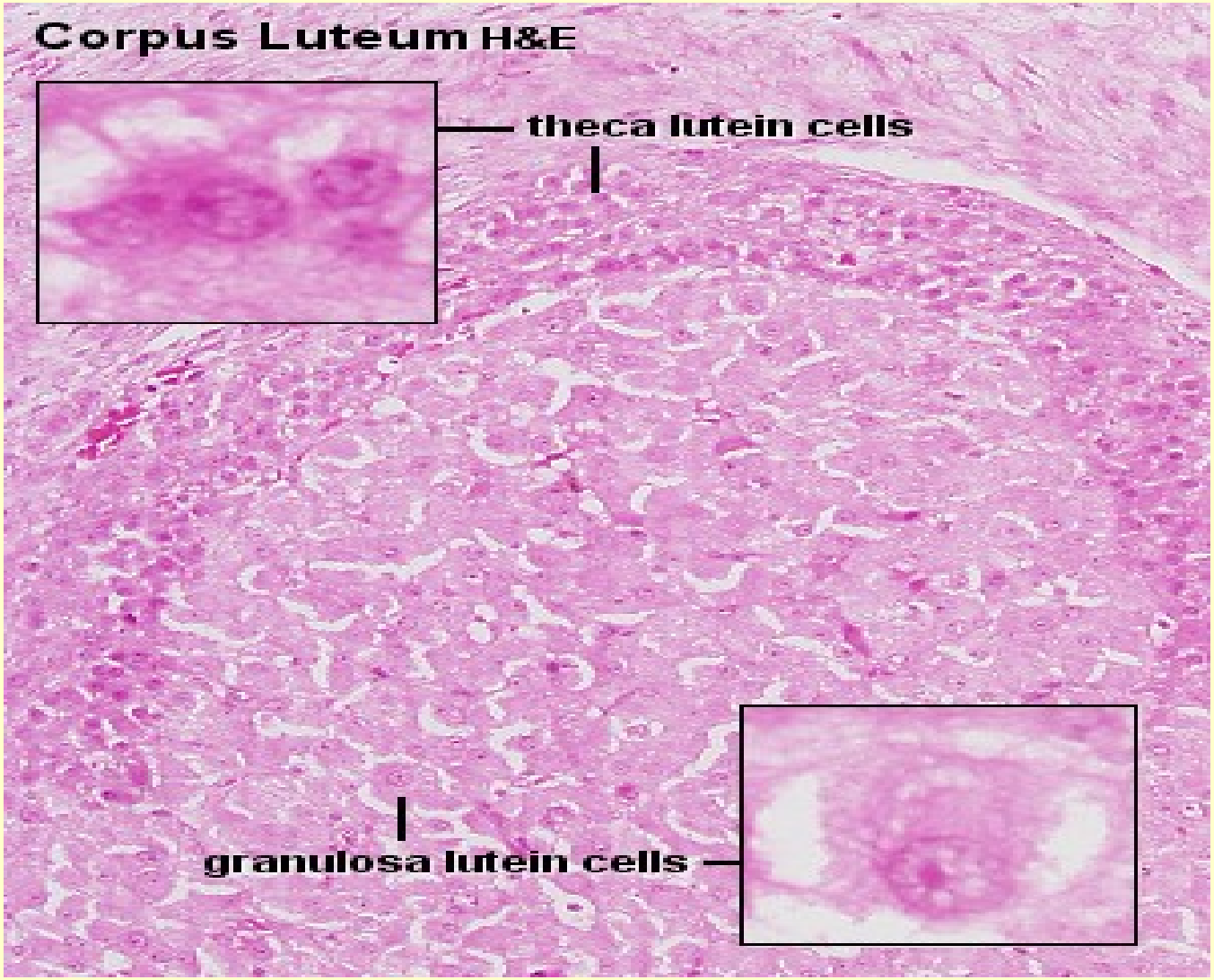
theca lutein c. (*estrogen*)

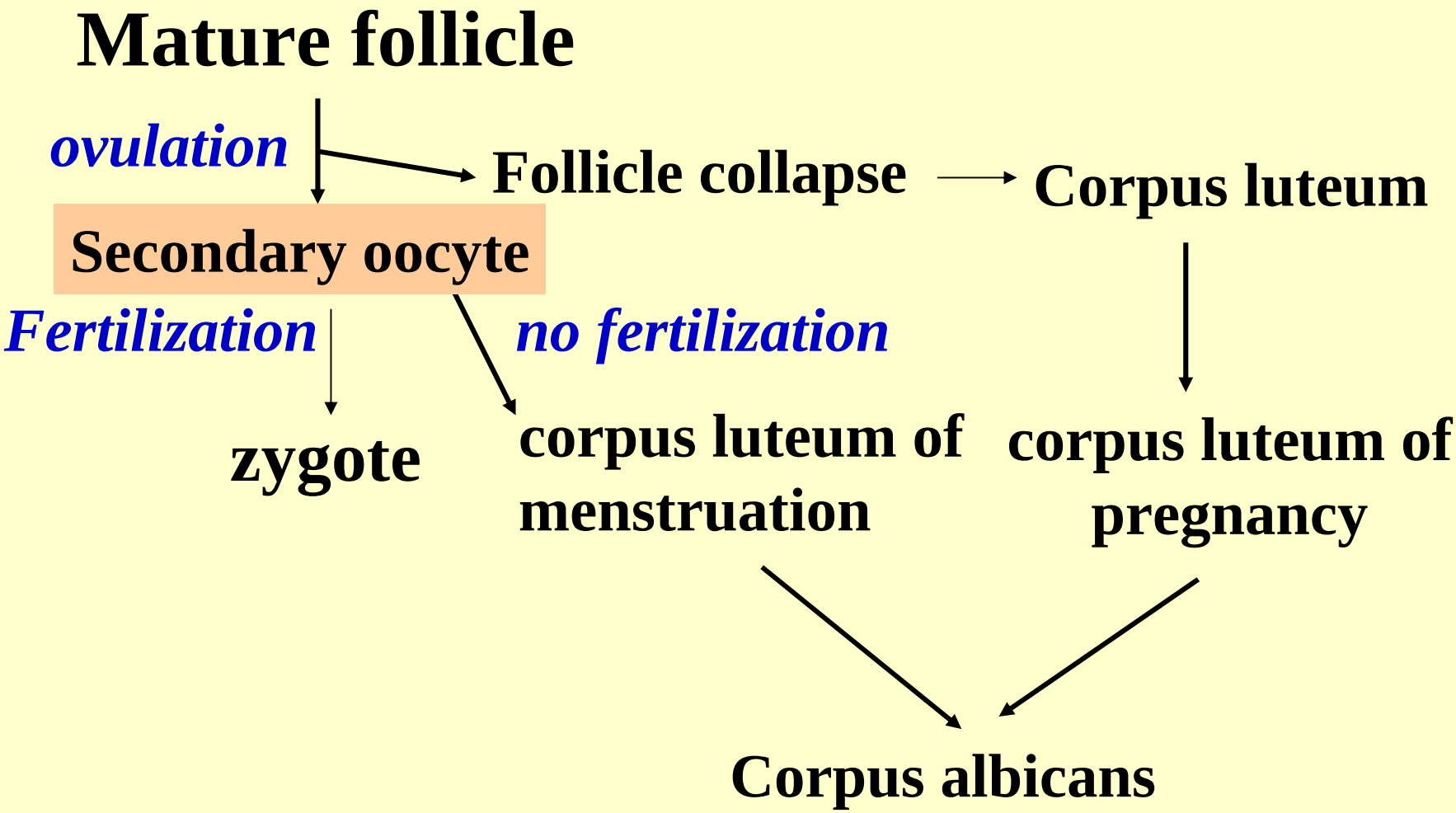
***two type of corpus luteum:**

corpus luteum of menstruation

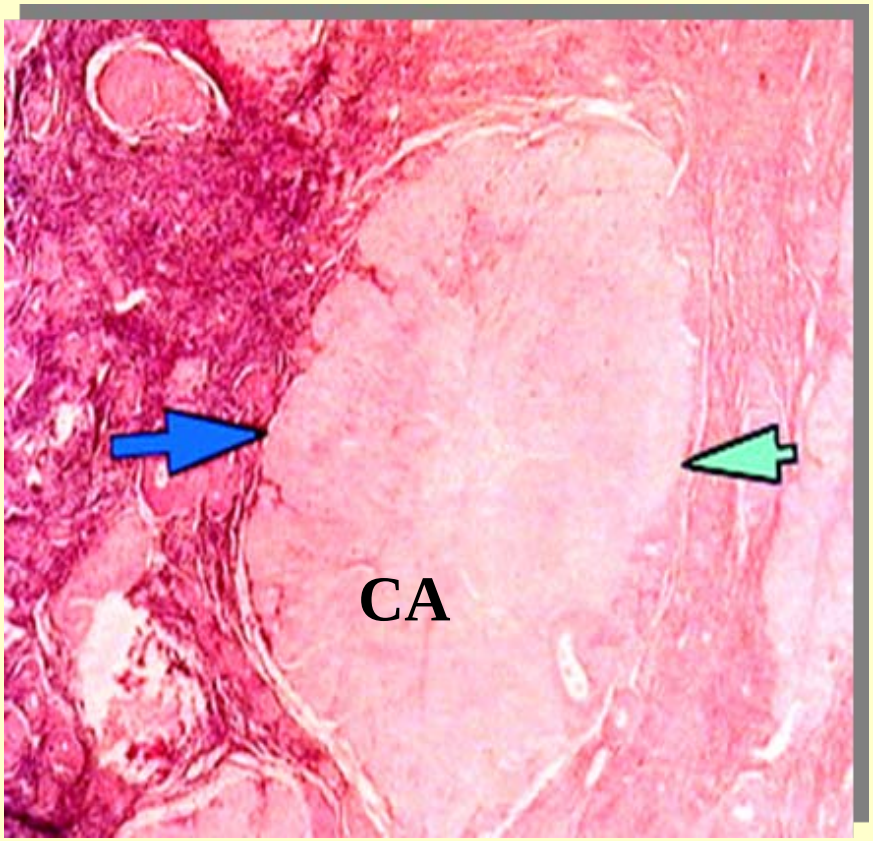
corpus luteum of pregnancy

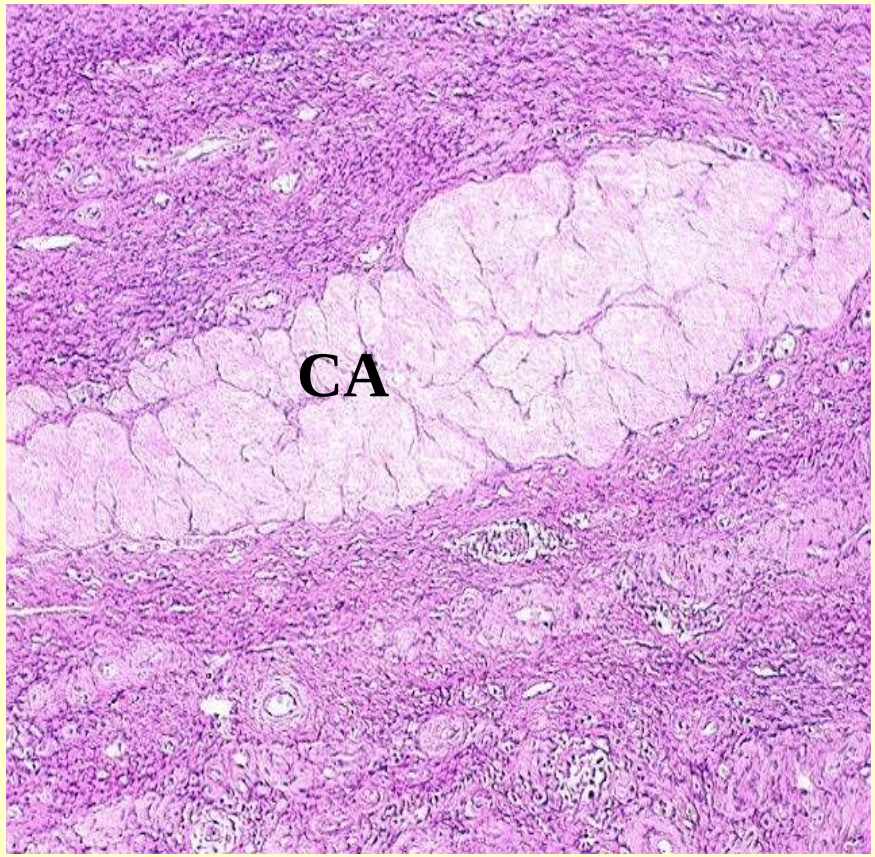



Corpus Luteum H&E
theca lutein cells
granulosa lutein cells


Mature follicle
ovulation
Follicle collapse
Corpus luteum
Secondary oocyte
Fertilization
no fertilization
zygote
corpus luteum of menstruation
corpus luteum of pregnancy
Corpus albicans

Fate of corpus luteum



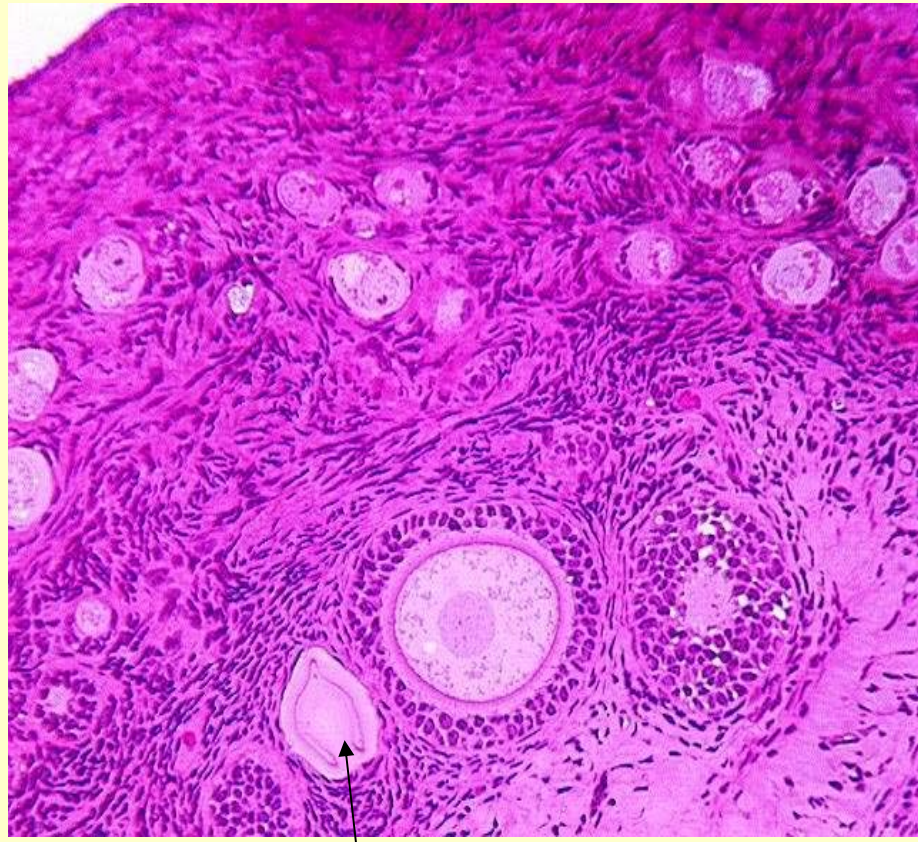


corpus albicans

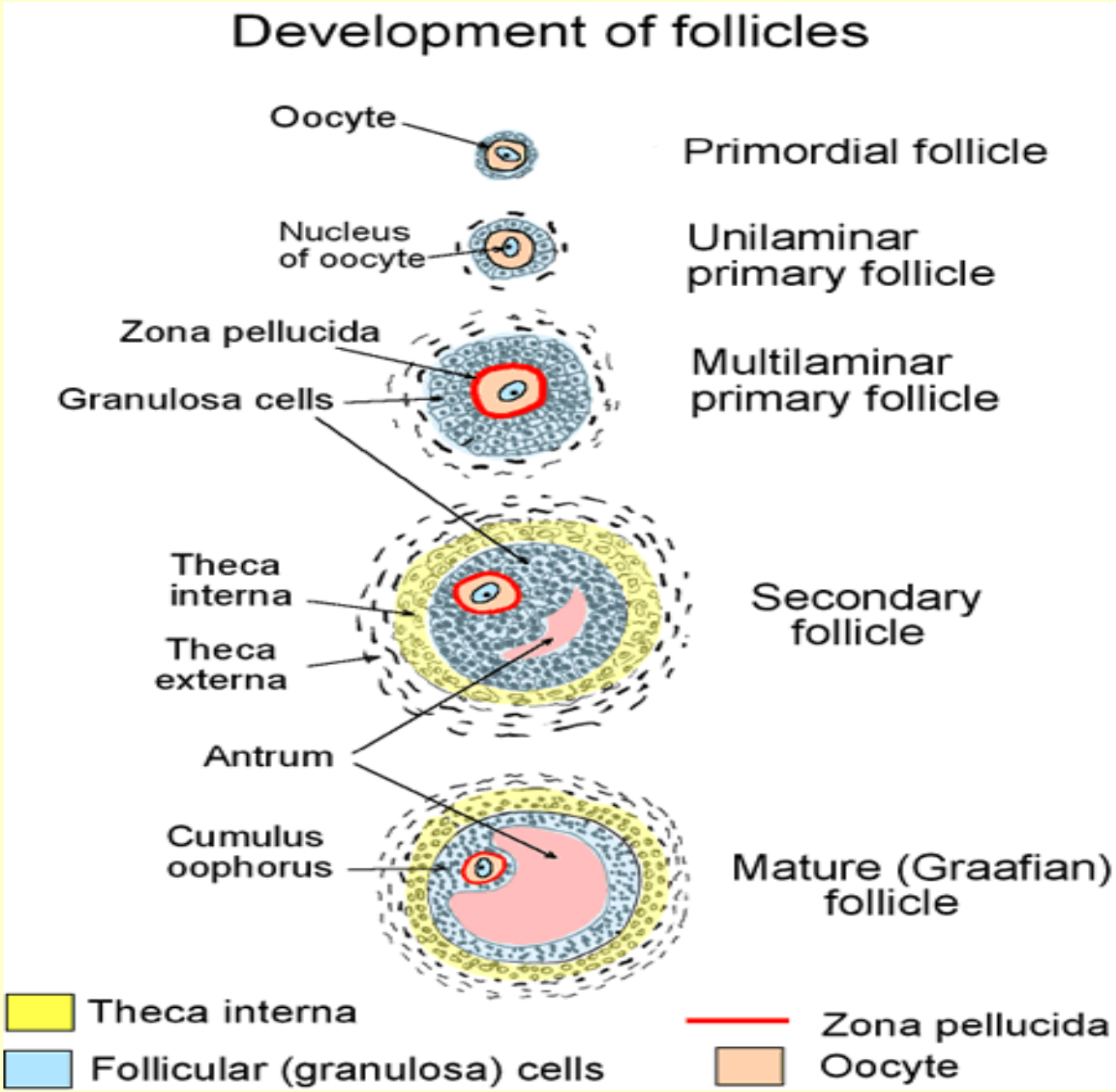
Atretic follicle

*The process of follicular atresia may occur at any stage in the development of the ovum.

*The histological appearance of atretic follicles varies enormously, depending on the stage of development reached .



atretic follicle


Development of follicles
Oocyte
Primordial follicle
Nucleus of oocyte
Unilaminar primary follicle
Zona pellucida
Granulosa cells
Multilaminar primary follicle
Theca interna
Theca externa
Secondary follicle
Antrum
Cumulus oophorus
Mature (Graafian) follicle
Theca interna
Follicular (granulosa) cells
Zona pellucida
Oocyte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Hilus cell

- **located at the hilum of ovary.**
- **morphologically very similar to sustentacular cells of the testis.**
- **Those cells can produce androgen.**

Uterine tube

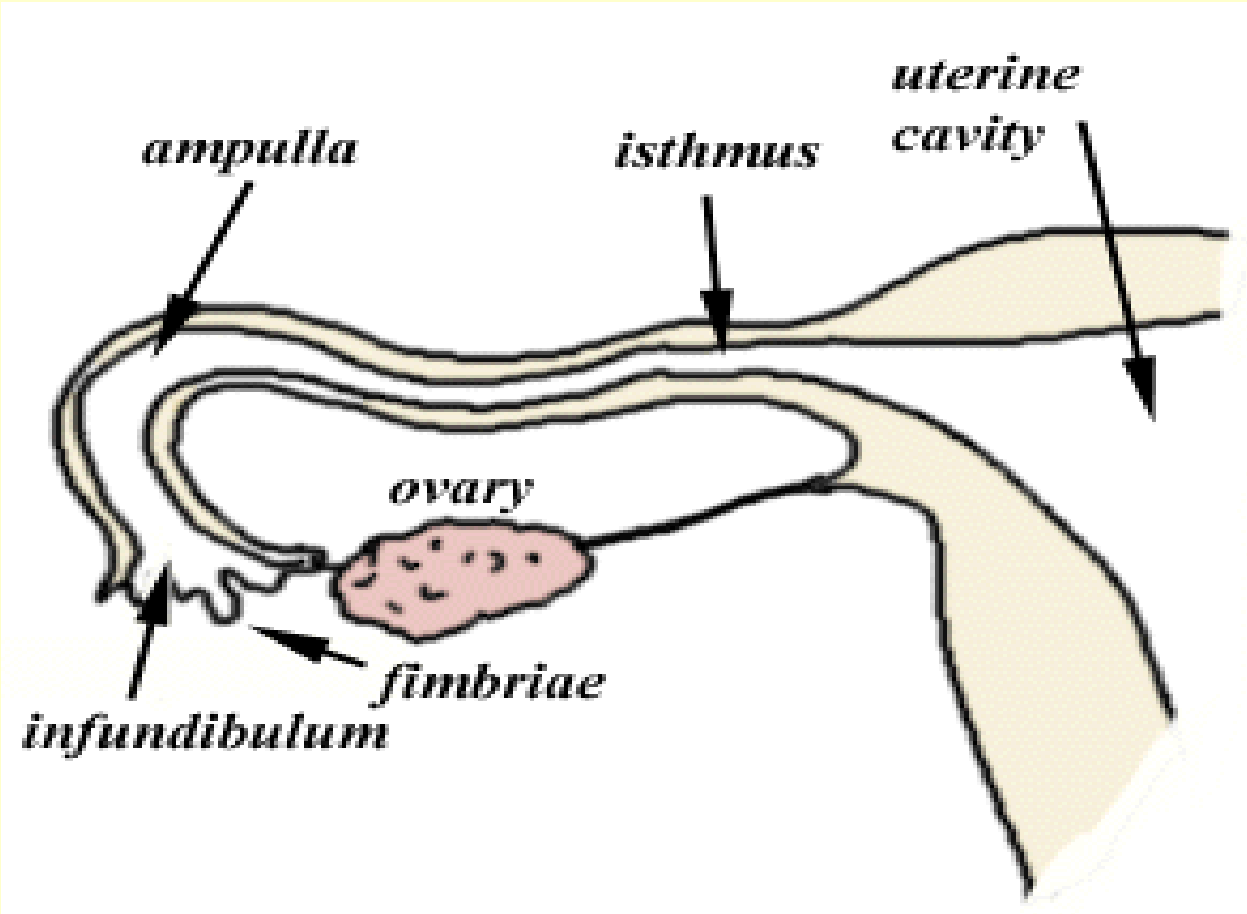
- **conducts ovum from the surface of the ovary to the uterine cavity**
- **is the site of fertilization by spermatozoon**
- **4 parts:**

  infundibulum

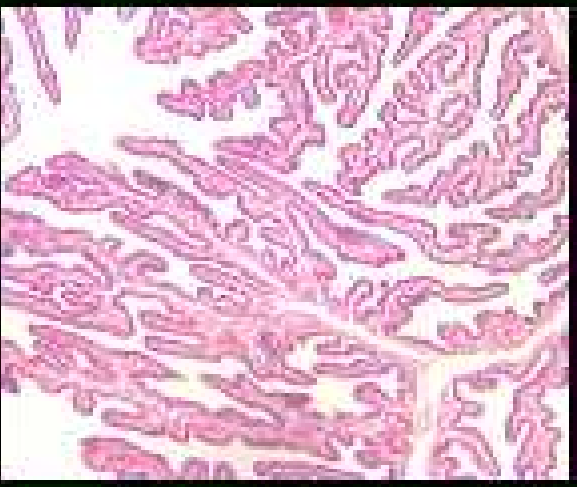
  ampulla

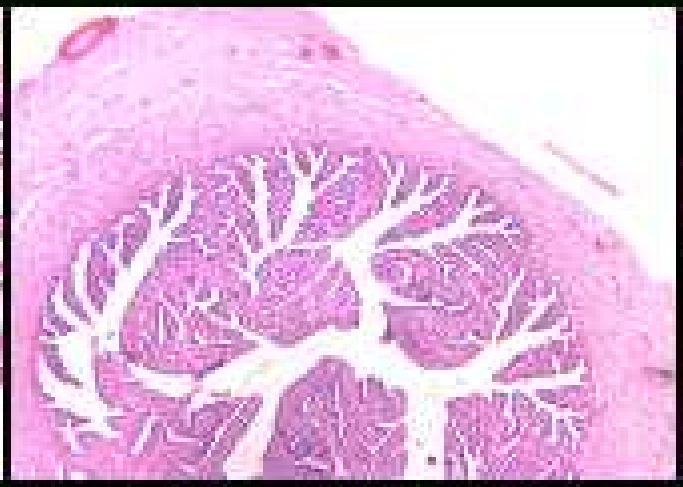
  isthmus

  uterine part



Slides 198,149,156 Image 1/2





Infundibulum **Ampulla** **Isthmus**

★ ***Uterine Tube*** - Low Mag.

General Features

The smooth muscle wall of the uterine tube becomes gradually thicker from the infundibulum (ovarian end) to the isthmus (uterine end). Also the mucosal lining becomes less folded and the lumen smaller.

Histological structure of uterine tube

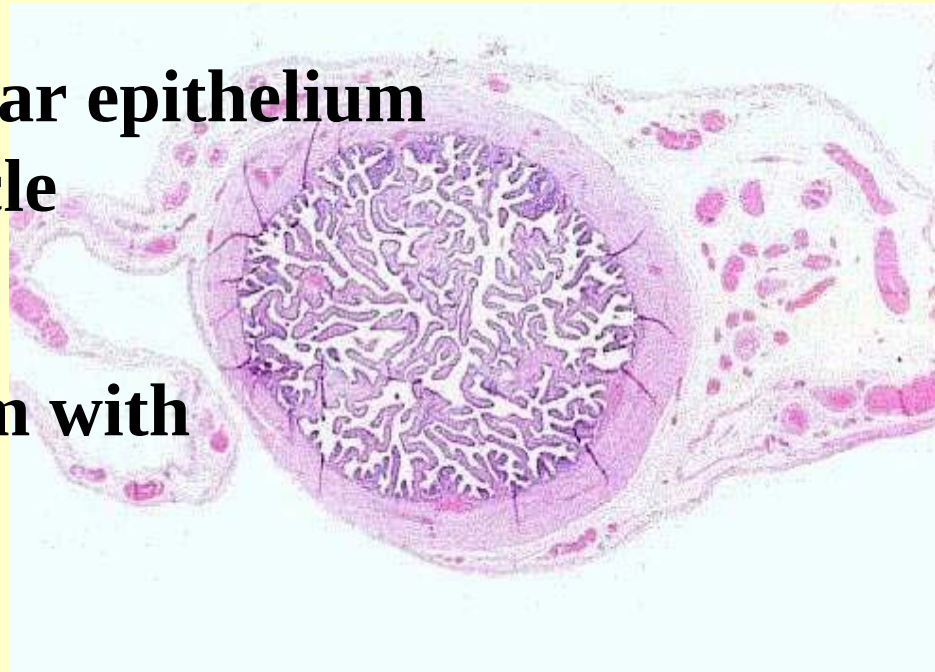
- **longitudinal folds with branch in mucosa**

***three layers:**

mucosa: a simple columnar epithelium

muscularis: smooth muscle

serosa



***simple columnar epithelium with two types of cells:**

- **ciliated cells**
- **secretory cells**

Uterus

***perimetrium : serosa**

***myometrium: smooth muscle**

***endometrium:**

-*epithelium:* simple columnar epithelium

-*laminar propria:* thick, numerous tubular glands

glands and stroma undergo extensive changes during the menstrual cycle.

Endometrium

***Epithelium*:**

simple columnar epithelium with two types of cells.

***Laminar propria*:**

Connective tissue

uterine glands

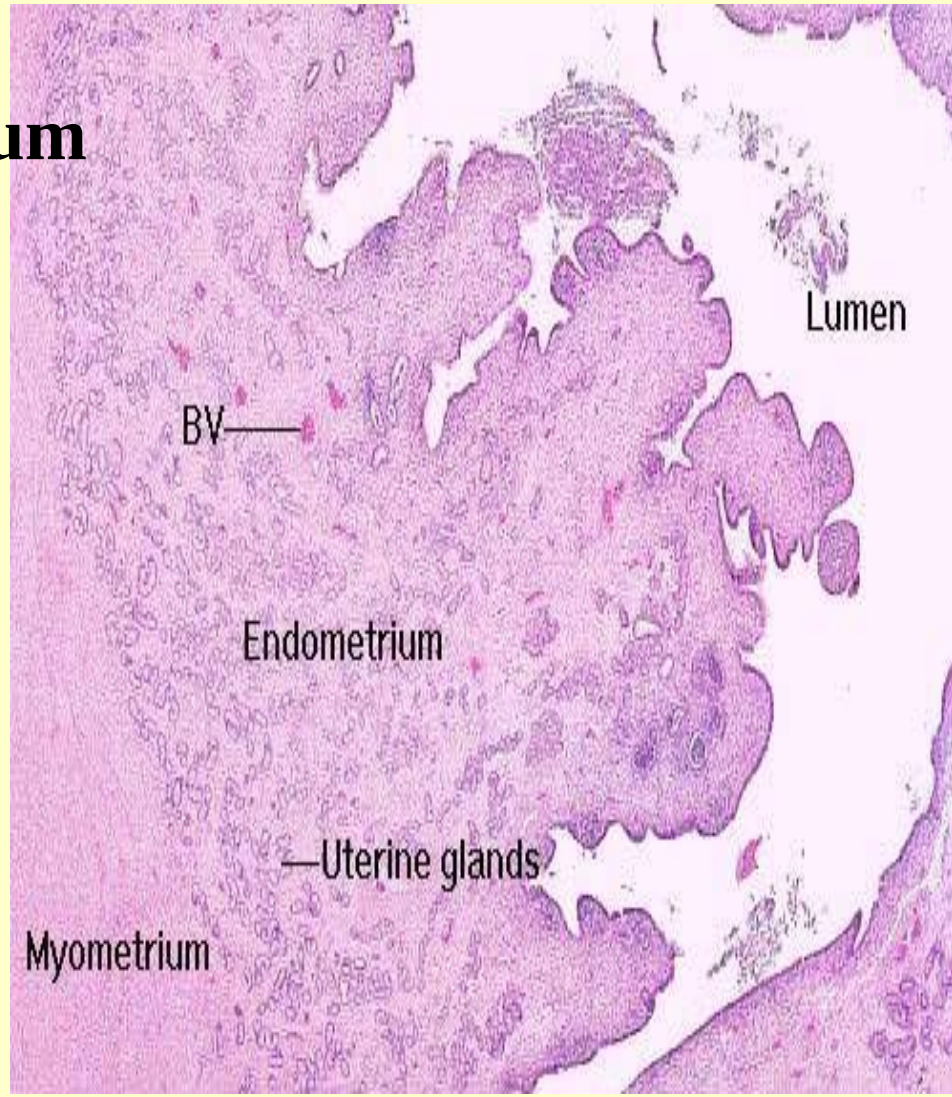
stroma cell

spiral artery

Layer:

functional layer

basal layer



Functional layer:

*exhibits dramatic changes throughout the cycle.

*is shed during menstruation

*is supplied by spiral arteries which are responsive to the hormonal changes.

Basal layer:

*adjacent to the myometrium

*undergoes little change

*is supplied by the straight artery

*is capacity of proliferation.

Cyclic changes in the endometrium

Beginning with puberty and ending at the menopause, the functional layer of endometrium undergoes periodic changes, which is called menstrual cycle.

proliferative phase: first - 4^{th} day

secretory phase: 5^{th} –14^{th} day

menstrual phase: 15^{th} – 28^{th} day

menstrual phase

Degeneration of the corpus luteum

↓

The level of Estrogen & progesterone decreased

↓

Spiral artery constriction

↓ *resulting in ischemia*

Spiral artery relax

↓ *endometrium discharges, necrosis*

Bleeding

Proliferative phase

The growth of follicles

↓

Estrogen increasing

↓

***regeneration of endometrium**

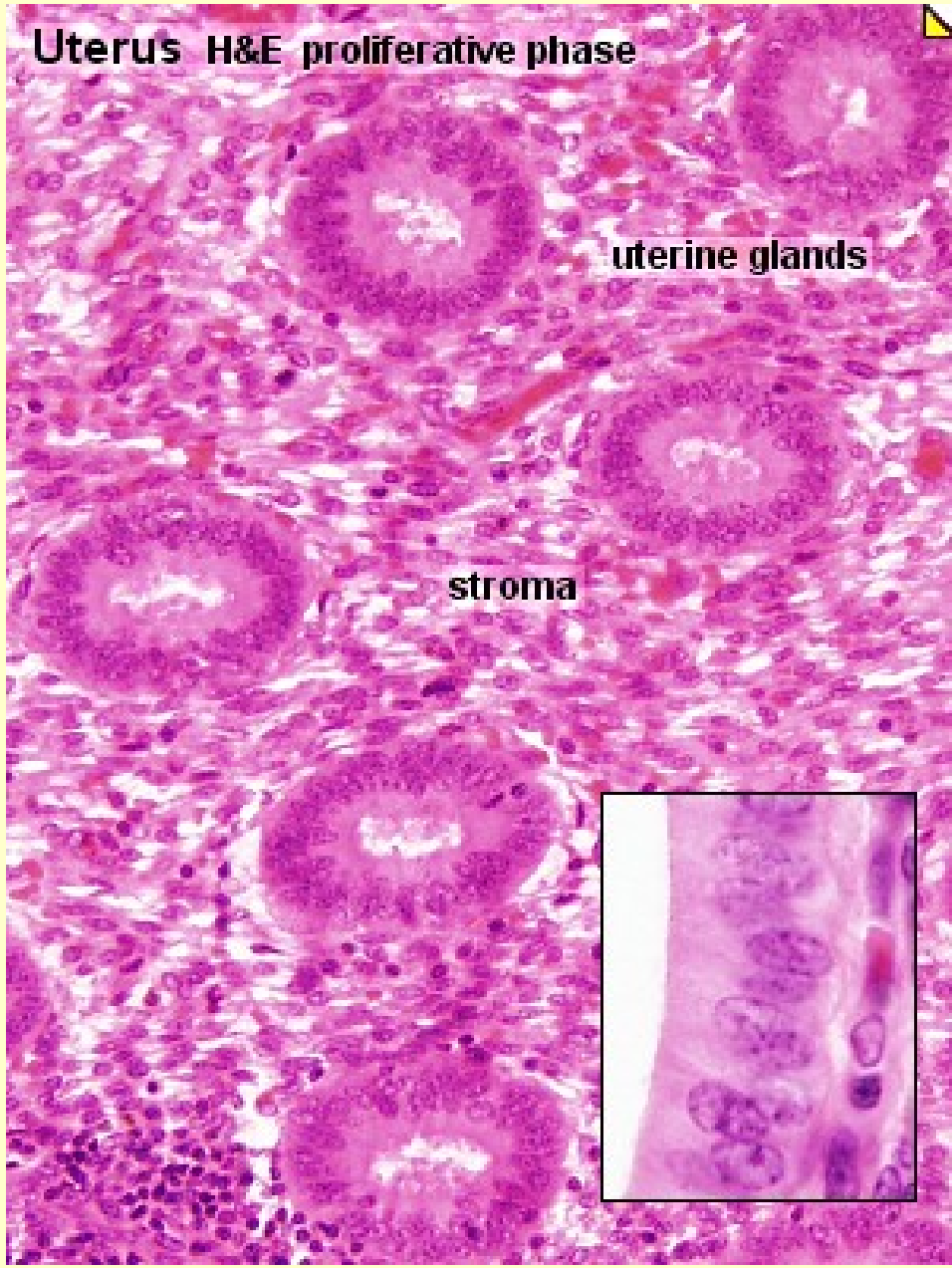
***proliferation of stroma cell**

***uterine glands grow, lengthen and become closely packed.**

***glycogen accumulates in the basal region of the glandular cell toward of the end of this phase.**

*** Spiral arteries elongate**


Uterus H&E proliferative phase
uterine glands
endometrium
myometrium


Uterus H&E proliferative phase
uterine glands
stroma

Secretory phase

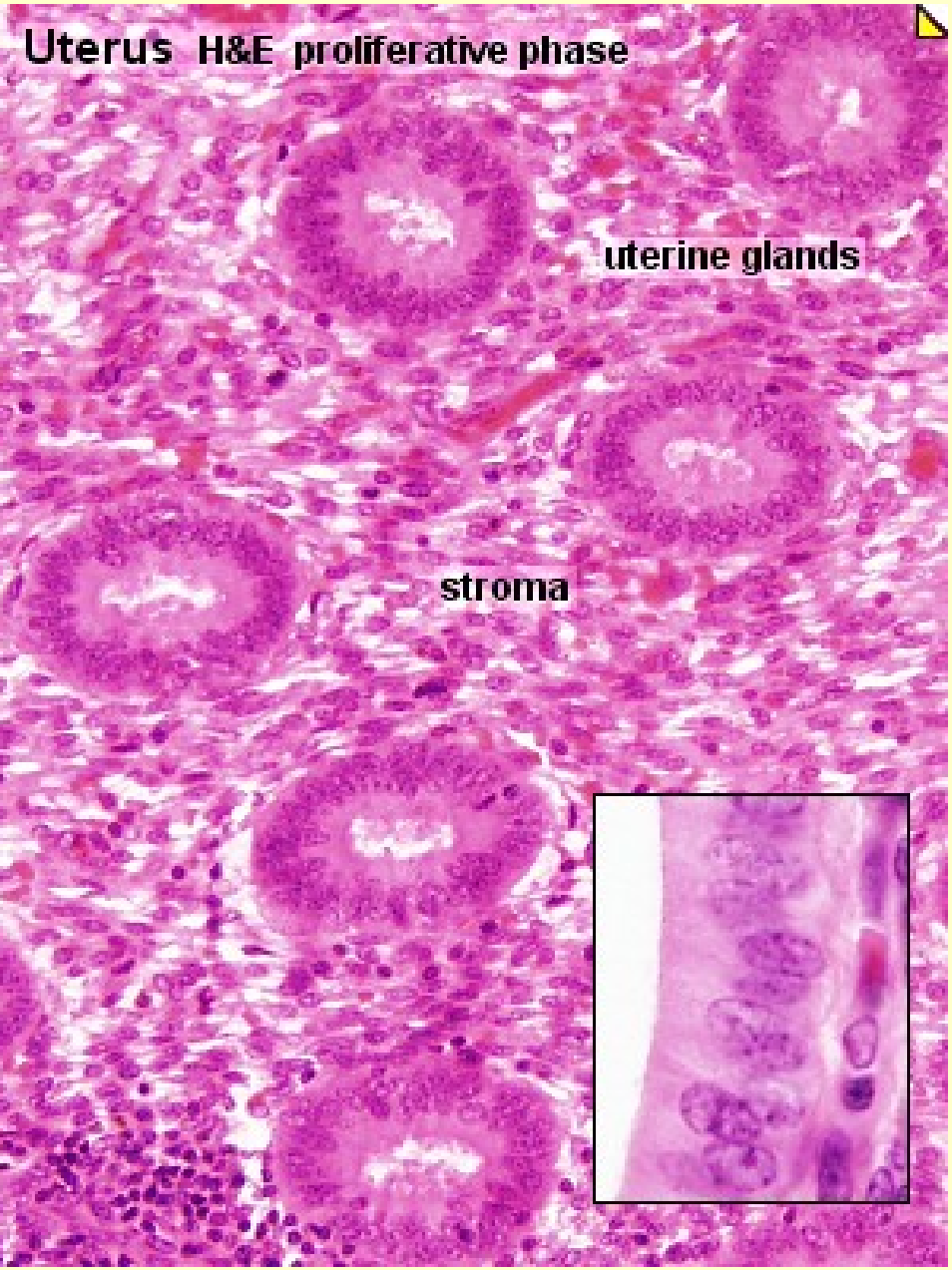
Formation of the corpus luteum

* endometrium thickness.

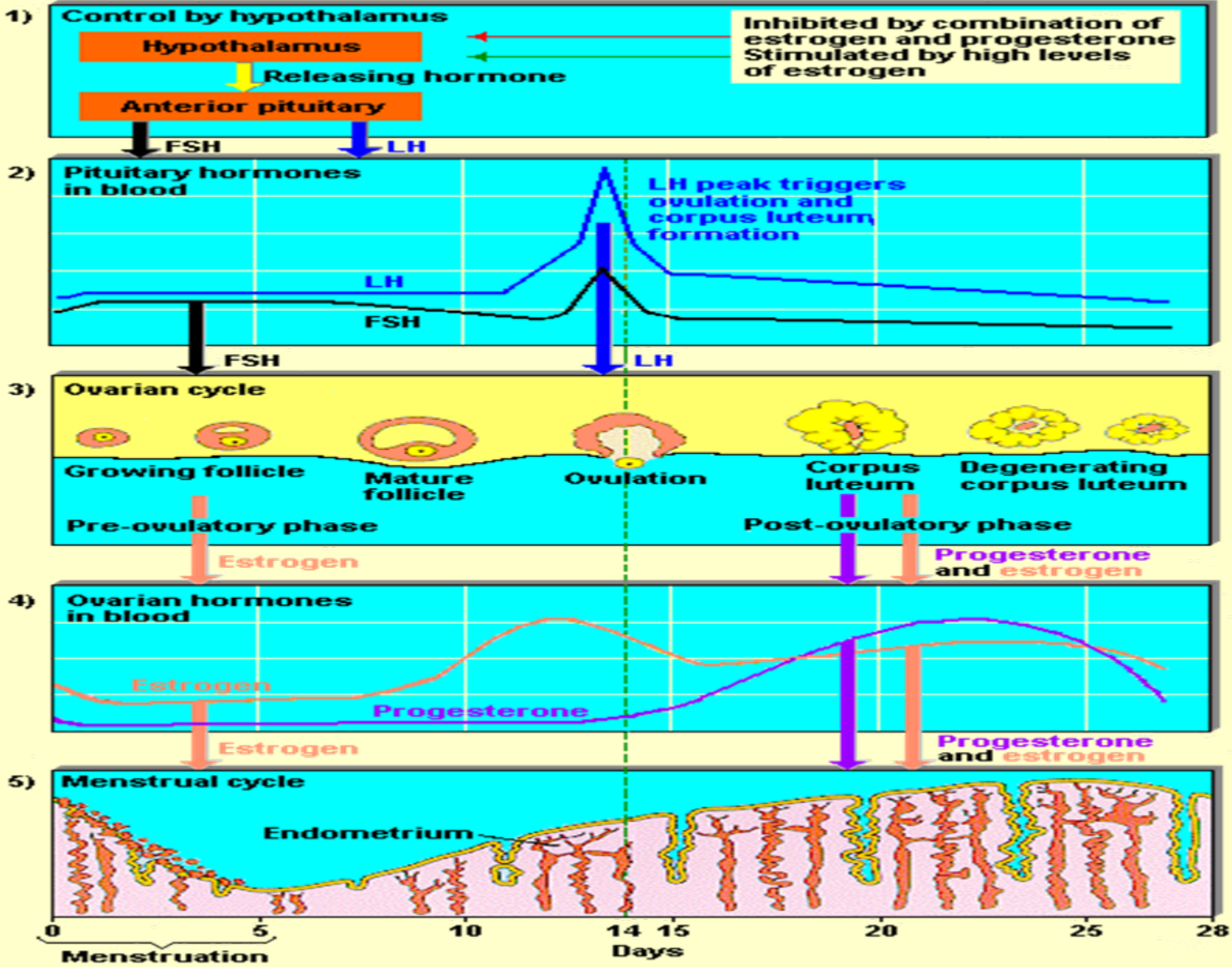
*glands lengthen, swell and coil.

*glycogen moves to the apical zone of the glandular cells.

*coiled arteries grow nearly to the surface of endometrium


Uterus H&E proliferative phase
uterine glands
stroma


Uterus H&E secretory phase
uterine gland
stroma


1)
Control by hypothalamus
Hypothalamus
Releasing hormone
Anterior pituitary
FSH
LH
Inhibited by combination of estrogen and progesterone
Stimulated by high levels of estrogen
2)
Pituitary hormones in blood
LH peak triggers ovulation and corpus luteum formation
LH
FSH
FSH
LH
3)
Ovarian cycle
Growing follicle
Mature follicle
Ovulation
Corpus luteum
Degenerating corpus luteum
Pre-ovulatory phase
Post-ovulatory phase
Estrogen
Progesterone and estrogen
4)
Ovarian hormones in blood
Estrogen
Progesterone
Estrogen
Progesterone and estrogen
5)
Menstrual cycle
Endometrium
0
5
10
14
15
20
25
28
Menstruation
Days

Mammary gland

- **Lobes of the compound tubuloalveolar type**
- **Acinus consist of simple columnar or cuboidal epithelium**
- **Duct consist of simple columnar, stratified columnar or stratified squamous epithelium**