

# Female Reproductive System

## Objectives:

By the end of the lecture you should be able to:

- Describe the histological structure and fate of ovarian follicles.
- Describe the histological structure of:
  - Ovary.
  - Oviducts (Fallopian tubes).
  - Uterus.
  - Vagina.
  - Placenta.
  - Resting and lactating mammary gland.

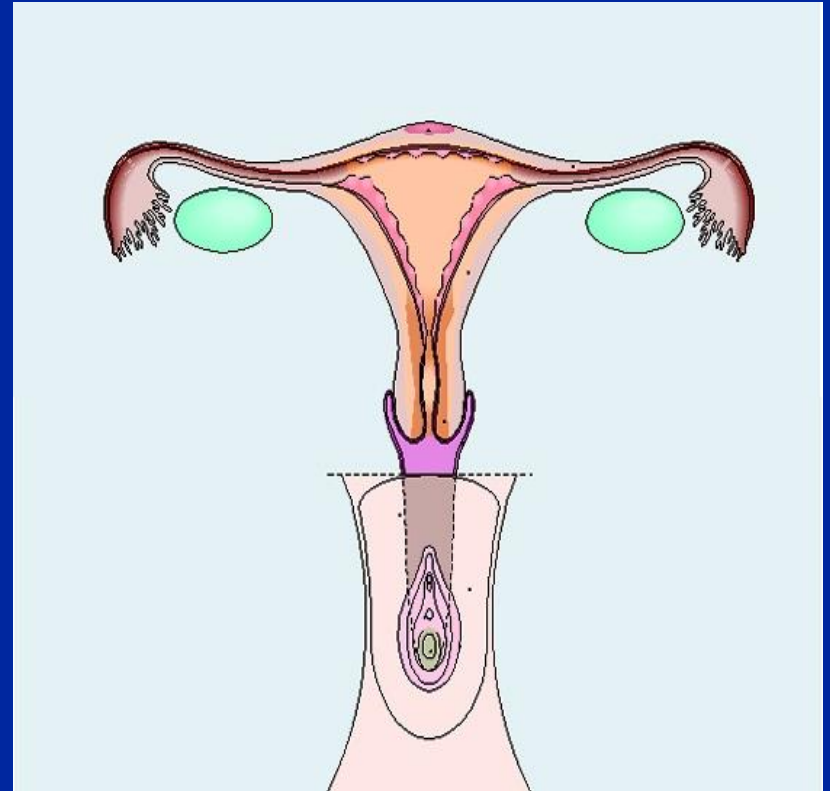
# Female Reproductive System

## ■ Primary sex organs:

- 2 ovaries.

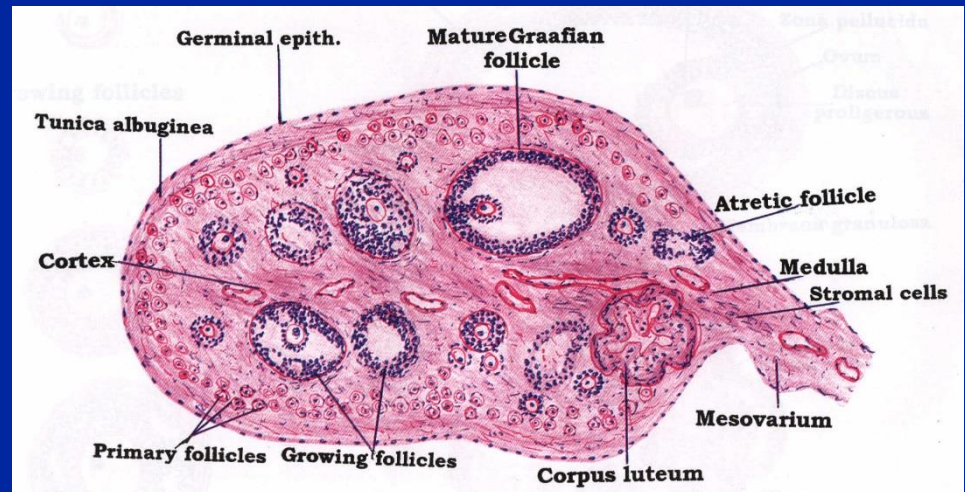
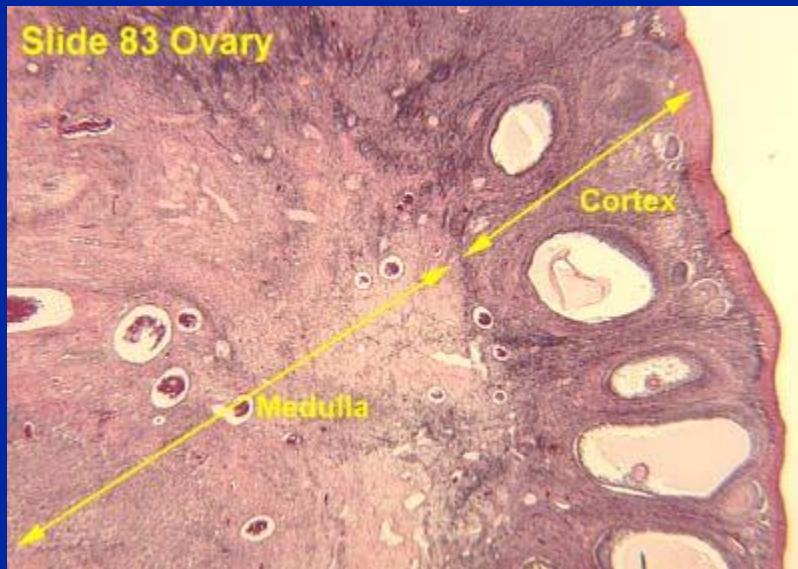
## ■ Secondary sex organs:

- 2 Fallopian tubes.
- Uterus.
- Vagina.
- External genitalia.
- 2 mammary glands.

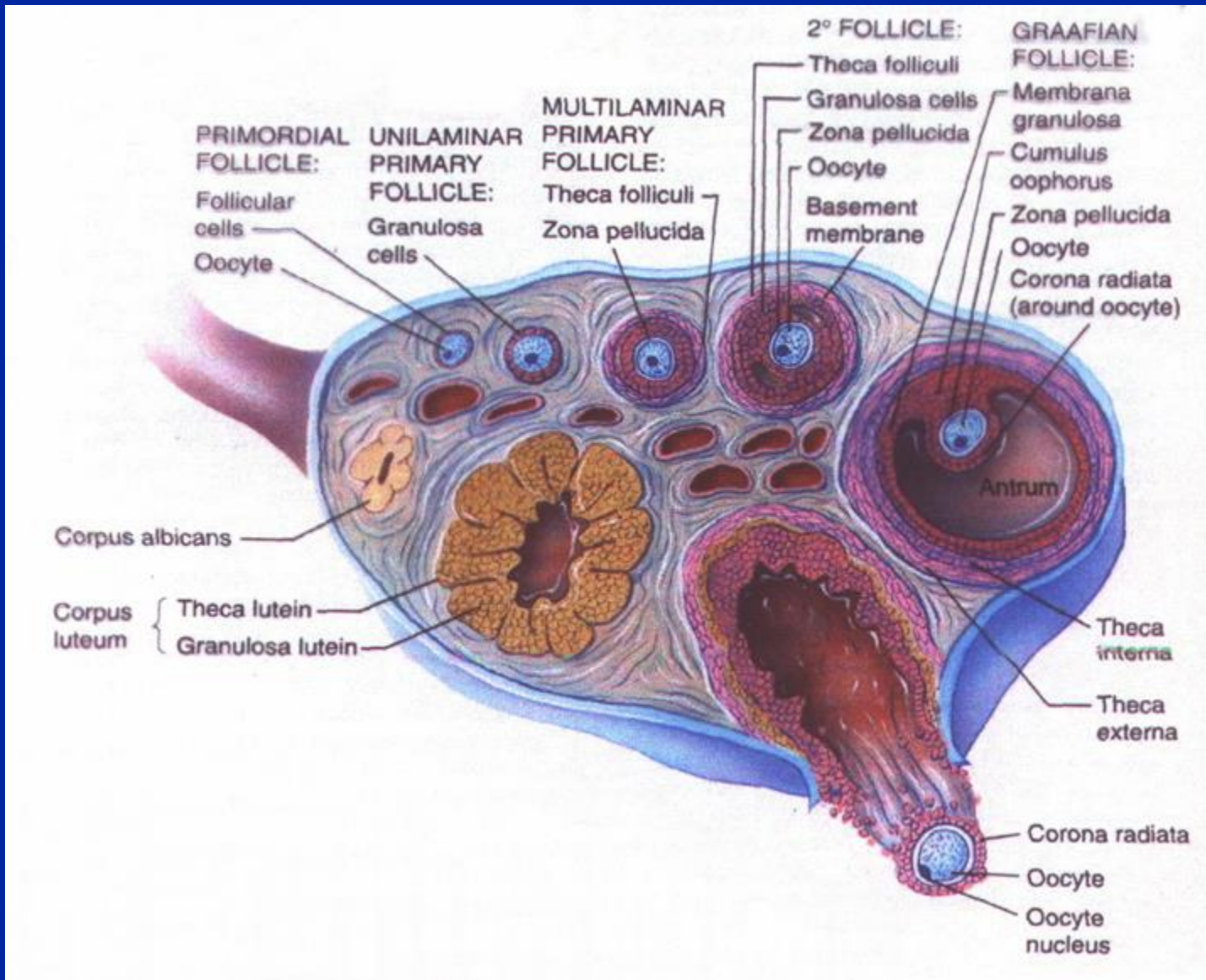


# ADULT OVARY

- 1- **Germinal epithelium:** outer layer of flat cells.
- 2- **Tunica albuginea:** dense C.T layer.
- 3- **Outer cortex:** ovarian follicles and interstitial cells.
- 4- **Inner medulla:** highly vascular loose C.T.



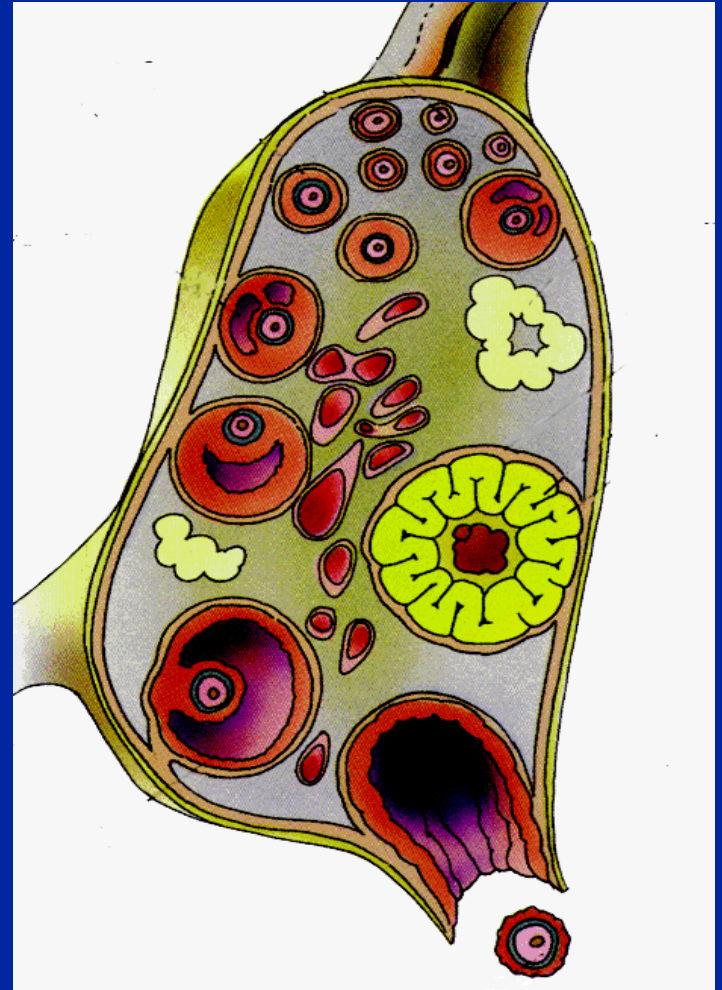
# Ovarian Cycle: Overview



# Ovarian Follicles

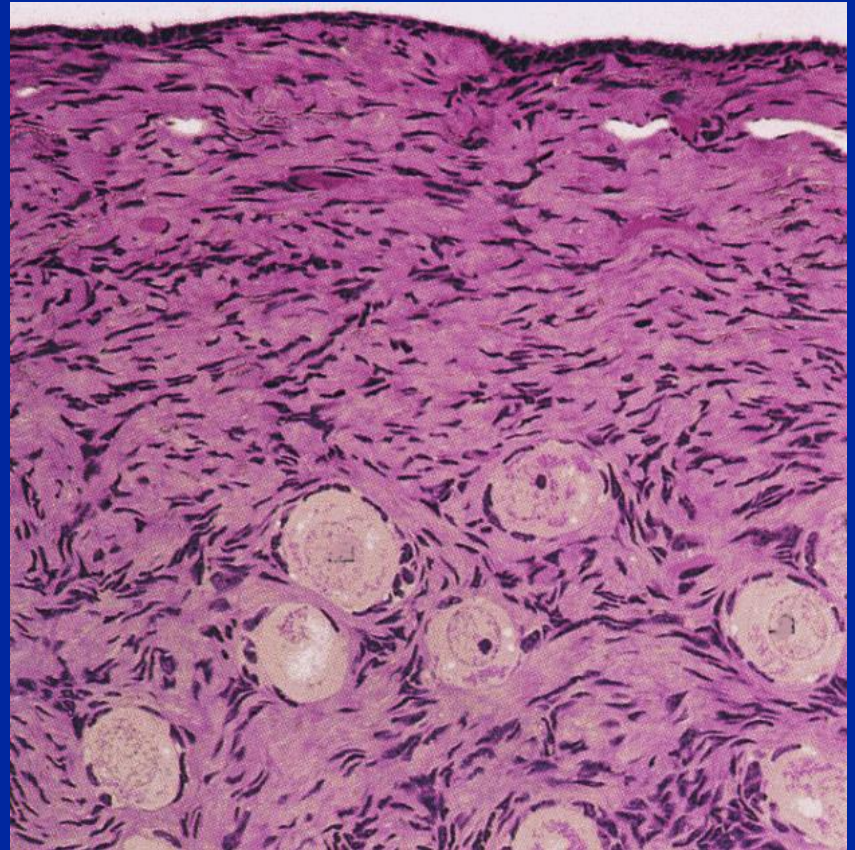
The cortex of the ovary in adults contains the following types (stages) of follicles:

1. **PRIMORDIAL** follicles.
2. **PRIMARY** follicles:
  - a) Unilaminar
  - b) Multilaminar
3. **SECONDARY (ANTRAL)** follicles.
4. **MATURE Graafian** follicles.



# 1. Primordial Follicles

- The only follicles present before puberty.
- The earliest and most numerous stage.
- Located superficially under the tunica albuginea.
- Each is formed of a primary oocyte (25  $\mu\text{m}$ ), surrounded by a single layer of flat follicular cells.



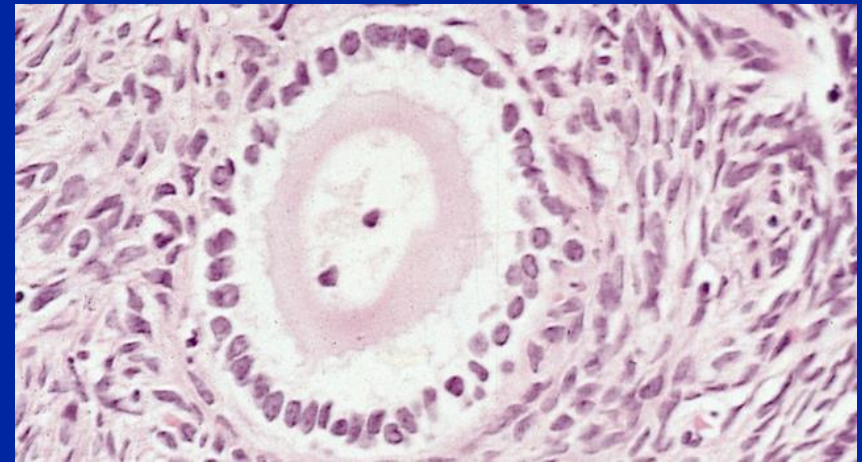
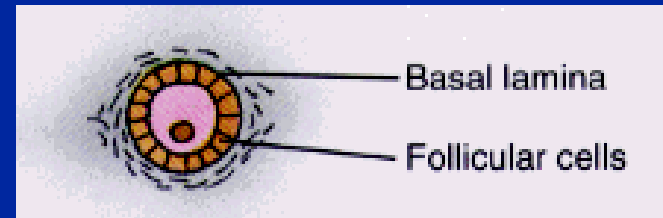
## 2. Primary Follicles

They develop from the primordial follicles, at puberty under the effect of FSH.

### a) Unilaminar primary follicles:

are similar to primordial follicles, but:

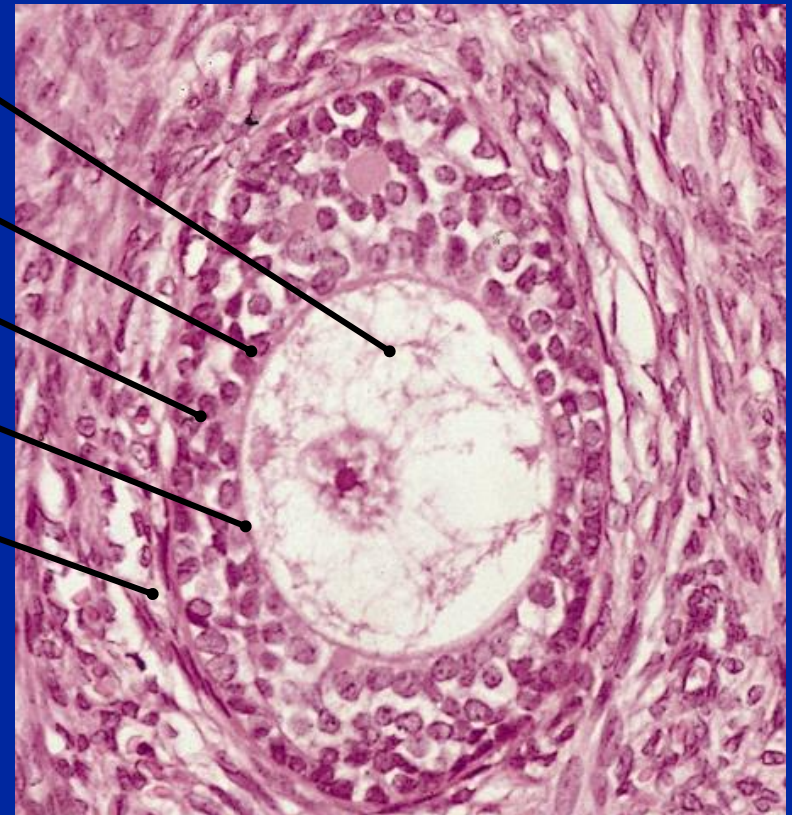
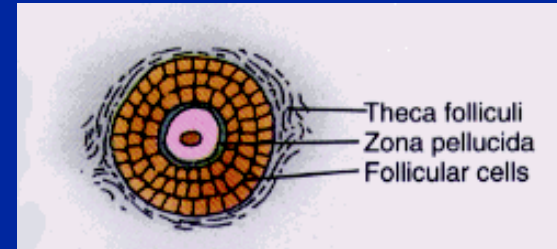
- the primary oocyte is larger ( $40\ \mu\text{m}$ ).
- the follicular cells are cuboidal in shape.



# 2. Primary Follicles

## b) Multilaminar primary follicles:

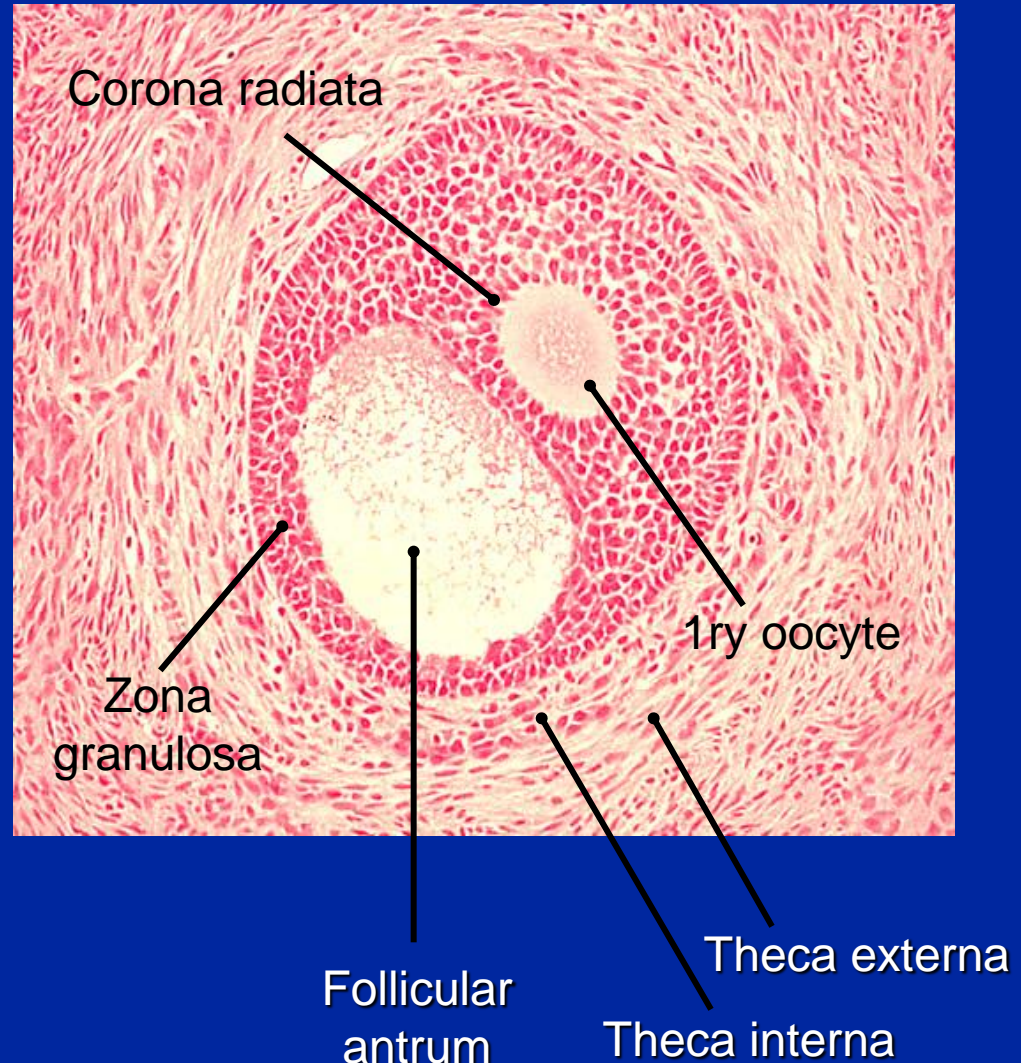
- 1ry oocyte larger
- corona radiata
- granulosa cells
- zona pellucida
- theca folliculi
- follicular fluid (liquor folliculi)





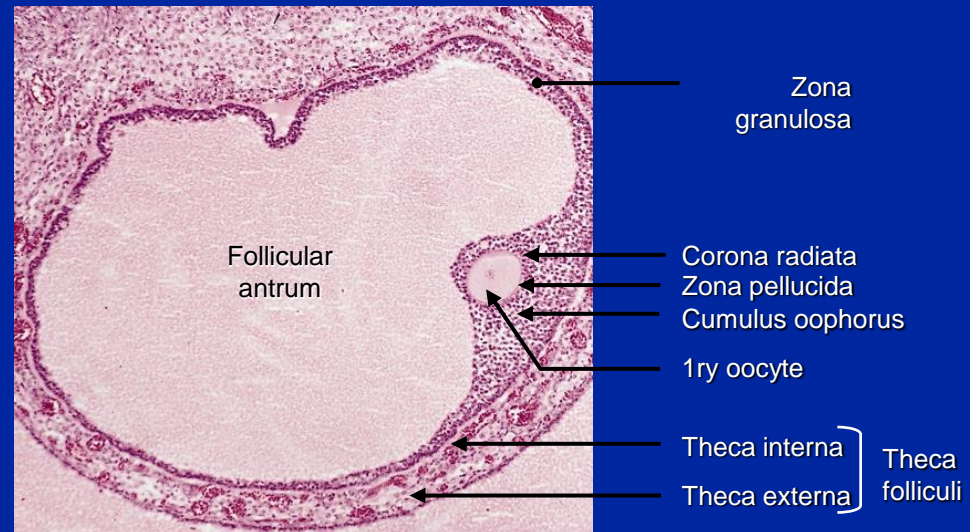
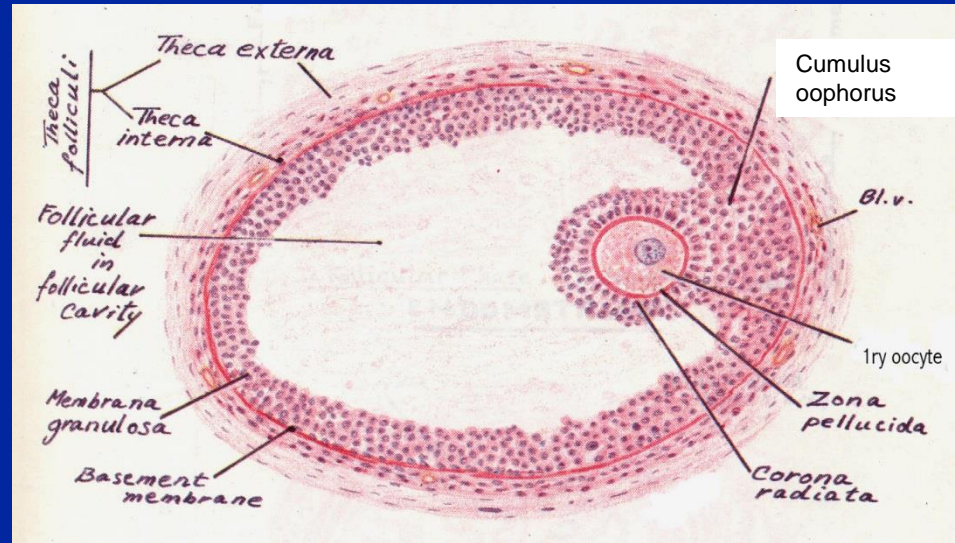
# 3. Secondary (Antral) Follicles

- Multilaminar primary follicles become secondary follicles when a complete antrum filled with liquor folliculi is formed.
- 1ry oocyte is larger & pushed to one side.
- Theca folliculi differentiates into theca interna and theca externa.



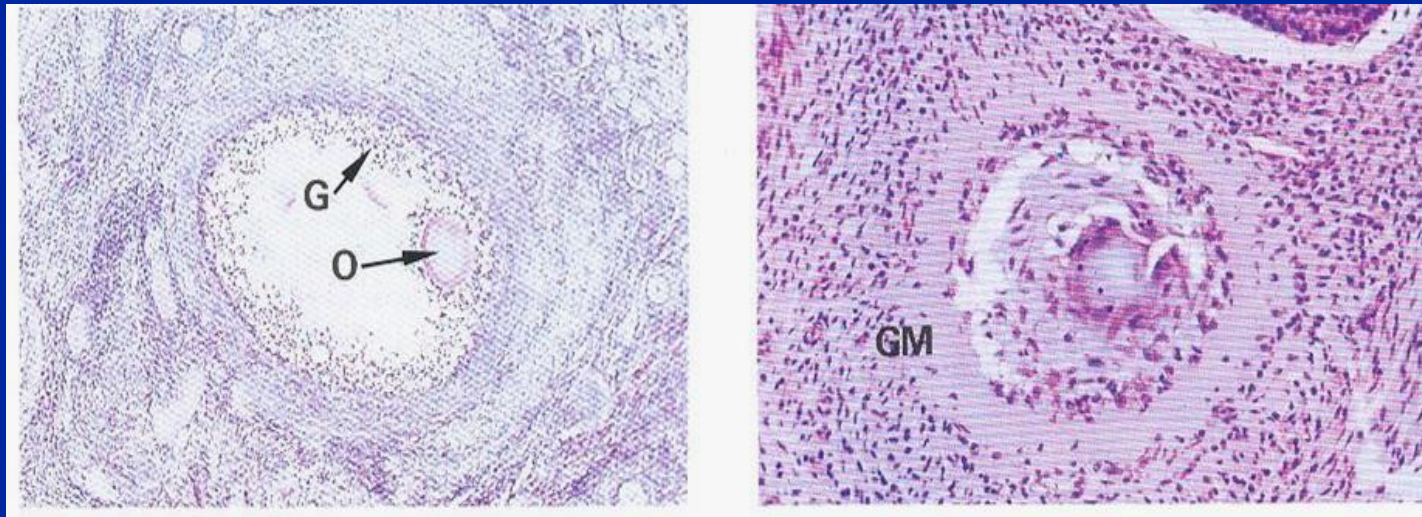
# 4. Mature (Graafian) Follicle

- large, thin walled
- wide follicular antrum
- large 1ry oocyte
- zona pellucida
- corona radiata
- cumulus oophorus
- zona granulosa
- basement membrane
- theca folliculi: theca interna & theca externa



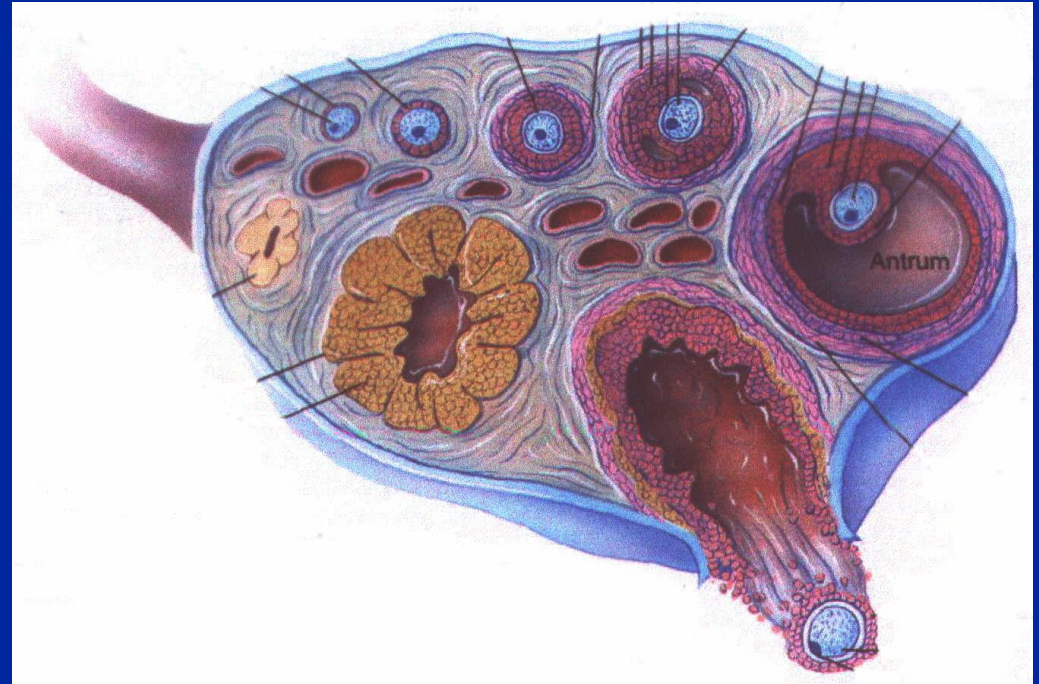
# Atretic Follicles

- During growth of the ovarian follicles, many of them do not reach maturation and they degenerate, and are finally replaced completely by fibrous tissue and are called atretic follicles or corpora atretica.



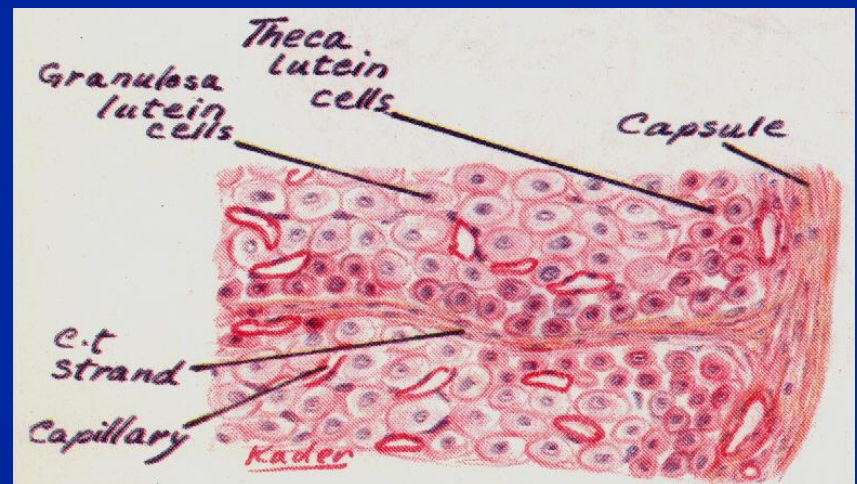
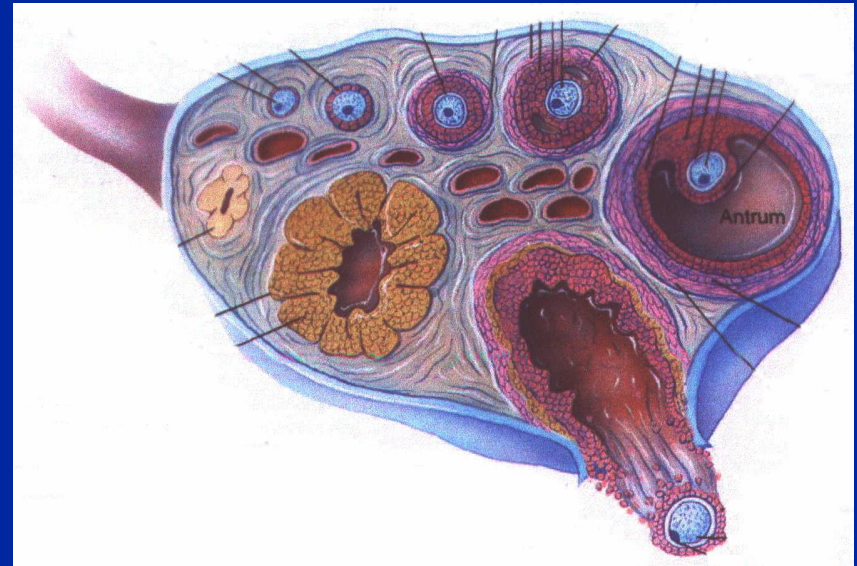
# Ovulation and Corpus Luteum Formation

- Ovulation occurs at day 14 of the cycle, under the effect of LH.
- The follicle collapses and forms a corpus luteum.



# Corpus Luteum

- zona granulosa → **granulosa lutein cells.**
- Theca interna → **theca lutein cells.**
- Bleeding may occur → corpus haemorrhagicum.
- Fertilization → corpus luteum of pregnancy.
- No fertilization → corpus luteum of menstruation.
- At the end → corpus albicans.

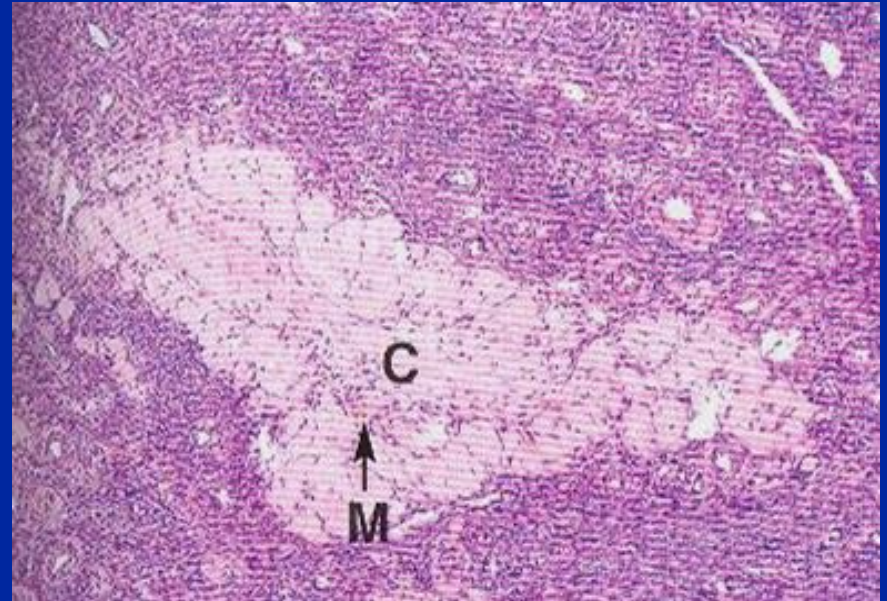


# Corpus Luteum

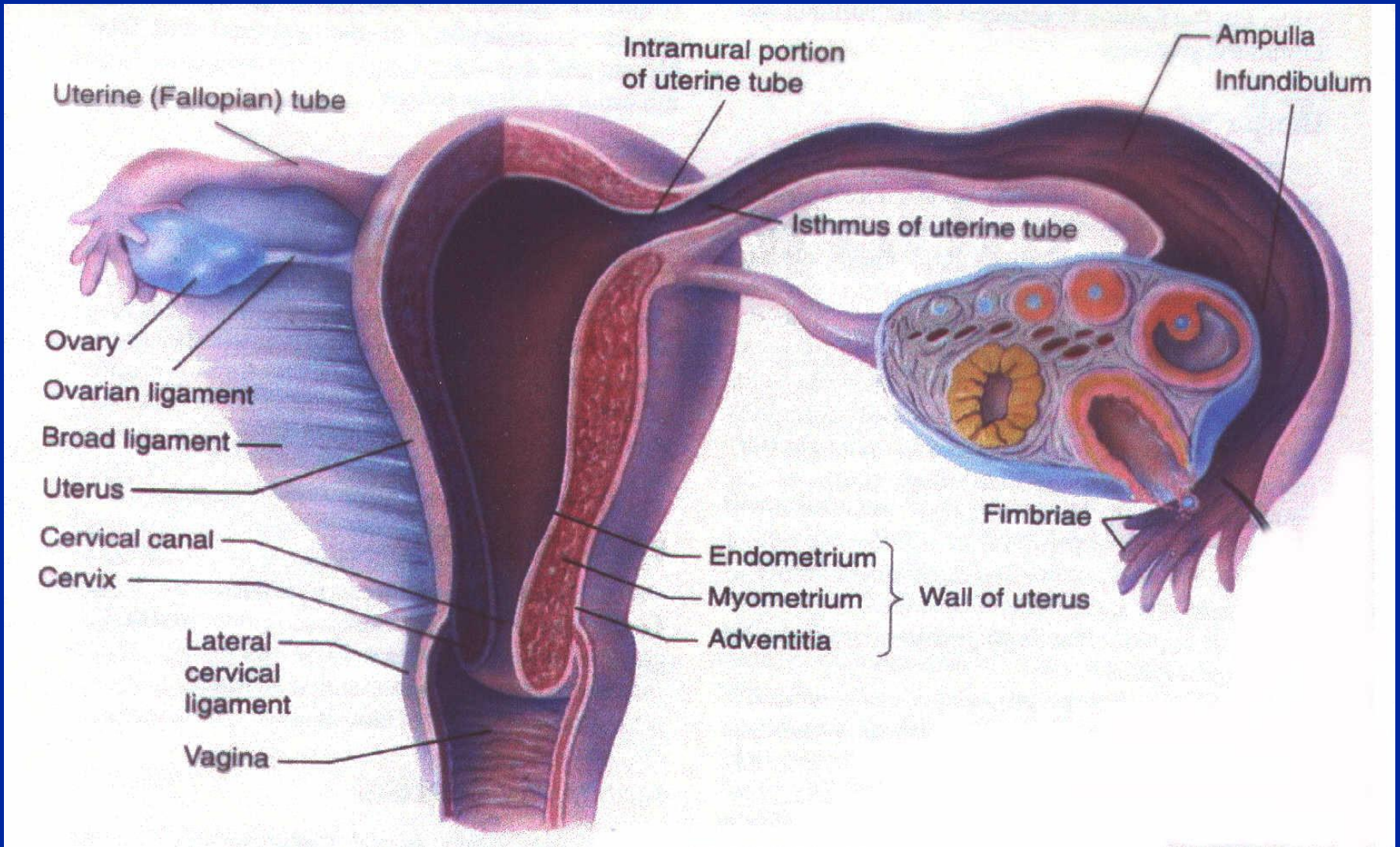
- **Corpus luteum of menstruation** lasts about 10 days.
- **Corpus luteum of pregnancy** persists for six months.
- **Fate of corpus luteum:** formation of a white degenerated fibrous body, corpus albicans.
- **Function of corpus luteum:**
  - Granulosa lutein cells: secrete progesterone
  - Theca lutein cells: secrete estrogen.

# Corpus Albicans

- It is a white degenerated fibrous body formed by involution of corpus luteum (degenerated corpus luteum).
- Secretory cells of corpus luteum degenerate and are phagocytosed by macrophages.



# OVIDUCTS (FALLOPIAN TUBES)





# Oviducts (Fallopian Tubes)

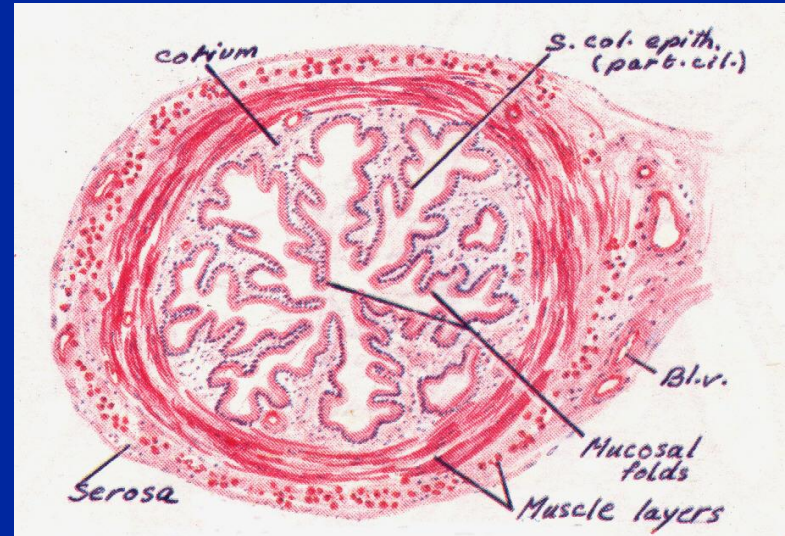
## ■ Mucosa:

- Highly folded.
- Epithelium: Simple columnar partially ciliated.
- Corium of C.T.

## ■ Musculosa:

- Inner circular.
- Outer longitudinal.

## ■ Serosa



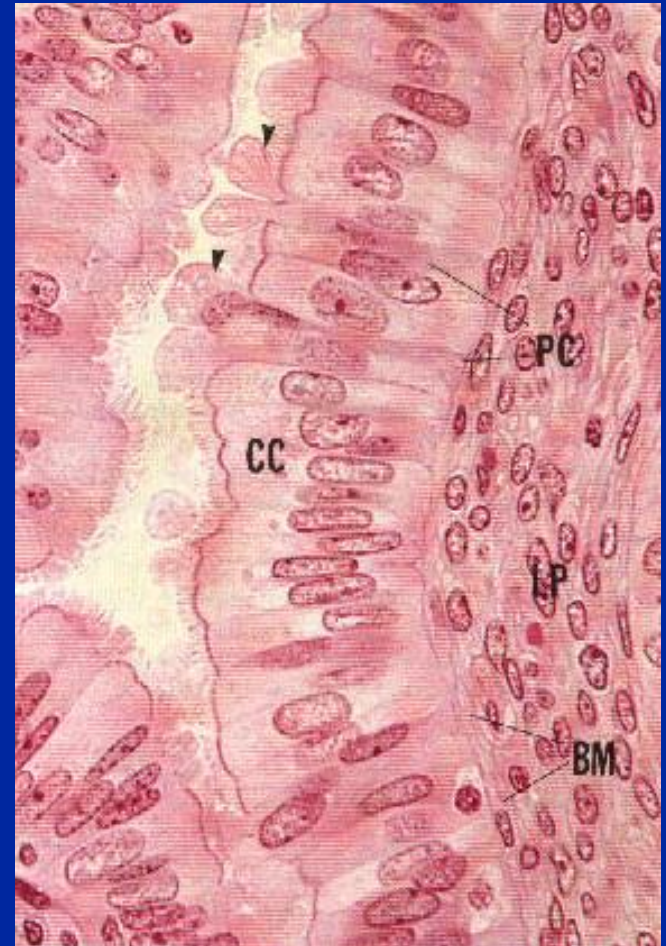
# Oviducts (Fallopian Tubes)

## ■ Ciliated cells:

- Non-secretory.
- Cilia beat toward uterus.

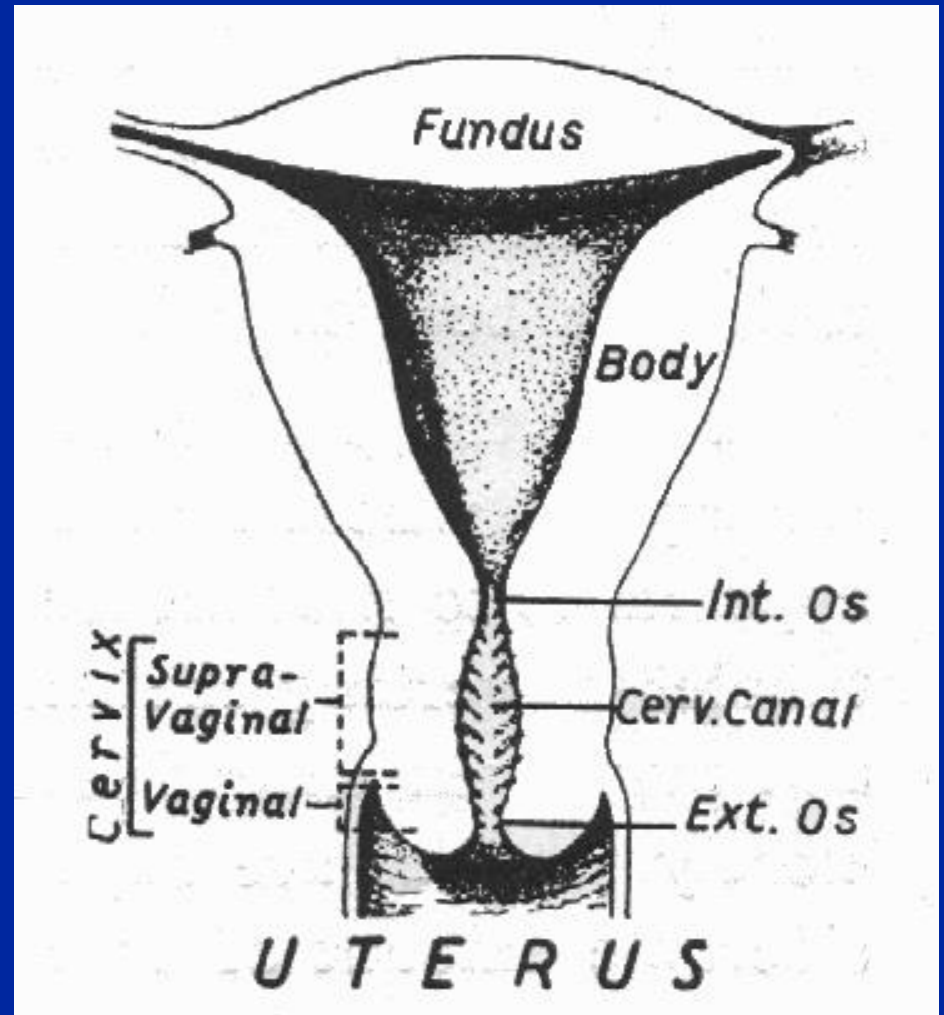
## ■ Non-ciliated cells:

- Thinner, also called peg cells.
- Secretory cells.
- Apices bulge above ciliated cells.
- Their apices contain nutritive material to nourish gametes.



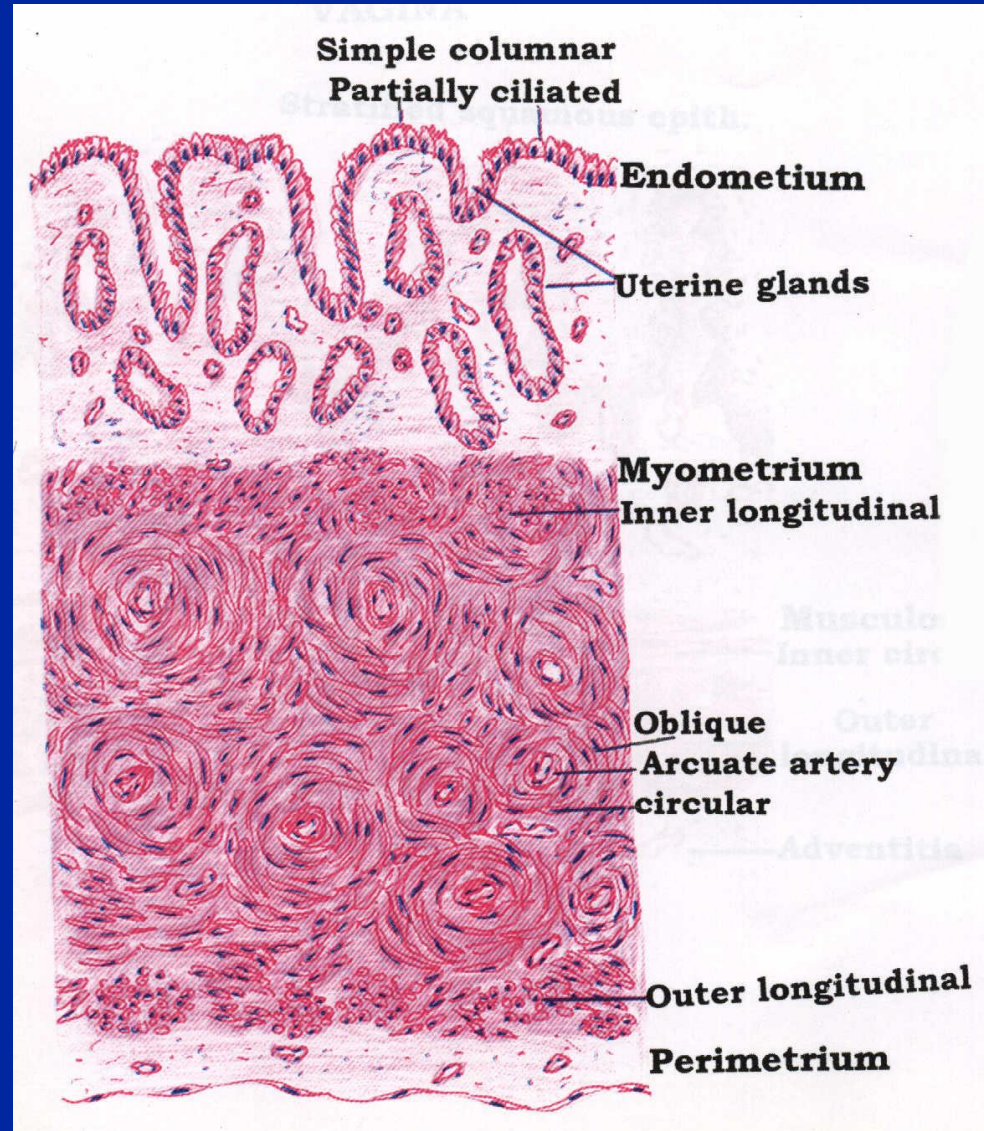
# UTERUS

- Thick-walled muscular organ.
- Inverted pear shape.
- Anatomically:
  - **Body:** upper 2/3.
  - **Cervix:** lower 1/3.
  - **Fundus:** the rounded dome-shaped top of the body.



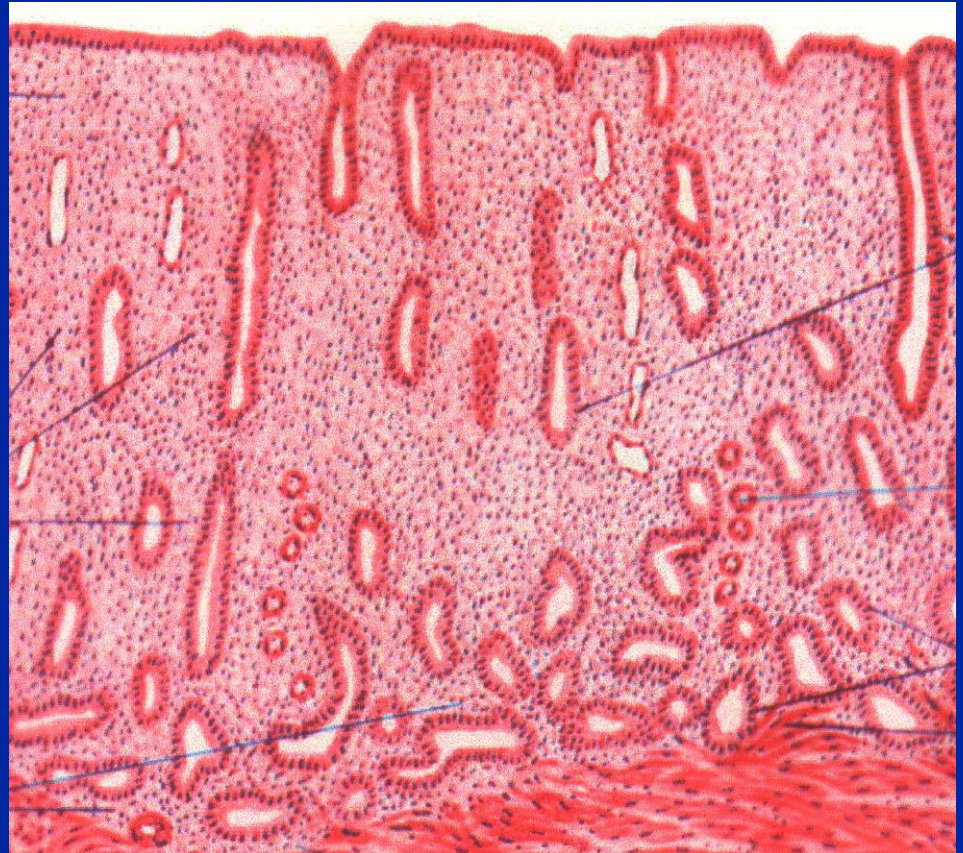
# Fundus & Body

- **Consist of:**
  - **Endometrium**  
(mucosa)
  - **Myometrium**  
(musculosa)
  - **Perimetrium**  
(serosa)



# Endometrium

- **Epithelium:** simple columnar partially ciliated.
- **Corium:**
  - Endometrial glands: simple tubular.
  - Stromal cells.
  - Blood vessels.
  - Leucocytes.
  - Reticular fibers.



# Endometrium; Blood supply

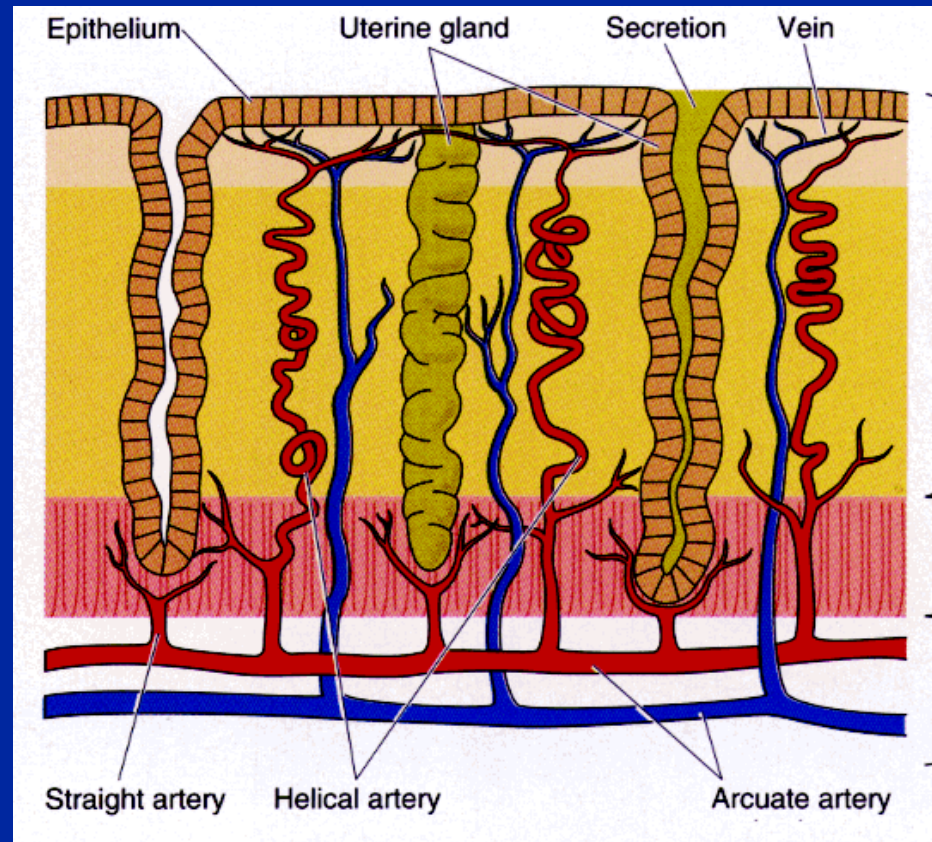
Two types of arteries derived from vessels in the myometrium:

- **Coiled arteries:**

- extend into the functional zone.
- cyclic changes.

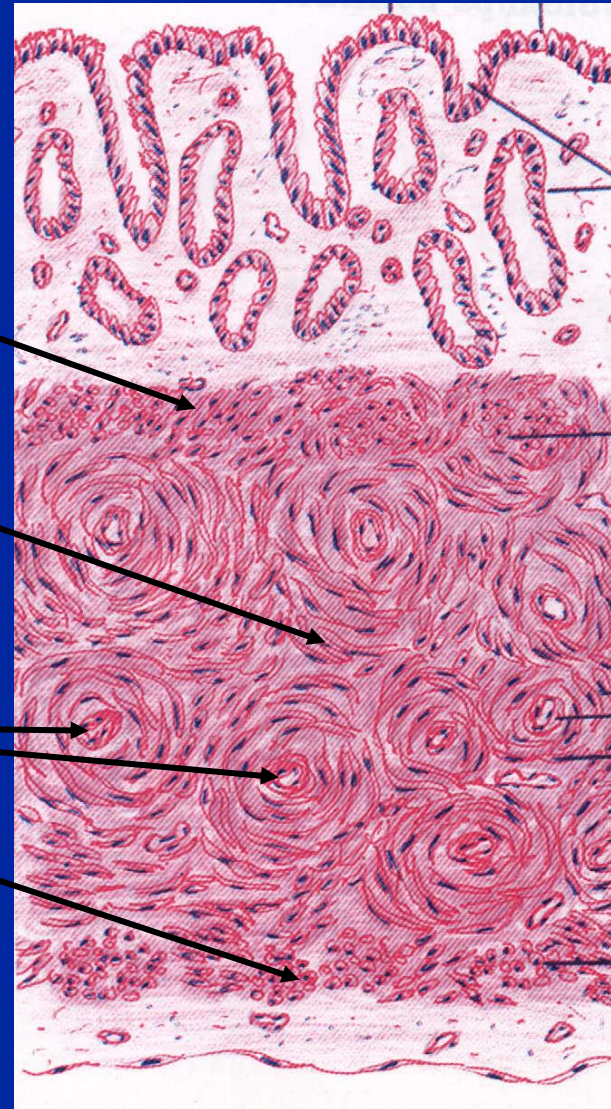
- **Straight arteries:**

- terminate in basal zone.
- no cyclic changes.



# Myometrium

- 3 ill-defined smooth muscle layers:
  - **Stratum submucosum:** longitudinal.
  - **Stratum vasculare:** circular smooth muscle fibres in figure of 8 arrangement around large blood vessels.
  - **Stratum supravasculare:** longitudinal.

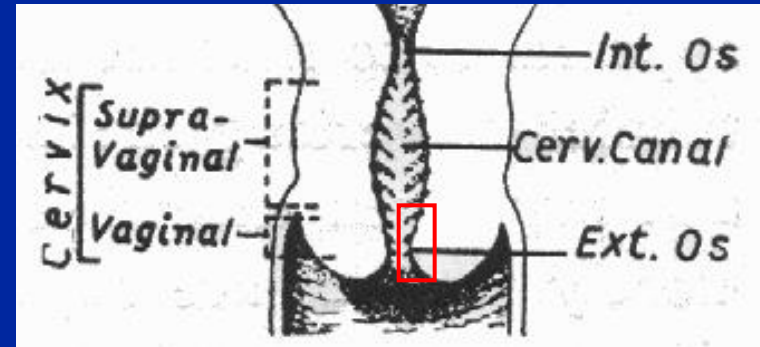


# Uterine Cervix

## ■ Mucosa:

- **Epithelium:** simple columnar in the cervical canal, but it changes to stratified squamous epith. (non-keratinized) at the external os.
- **Corium:** CT containing tubulo-alveolar glands.

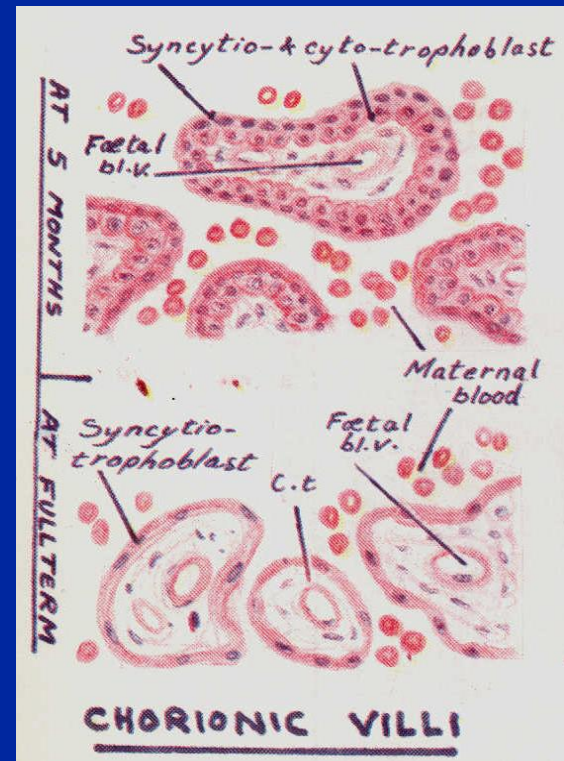
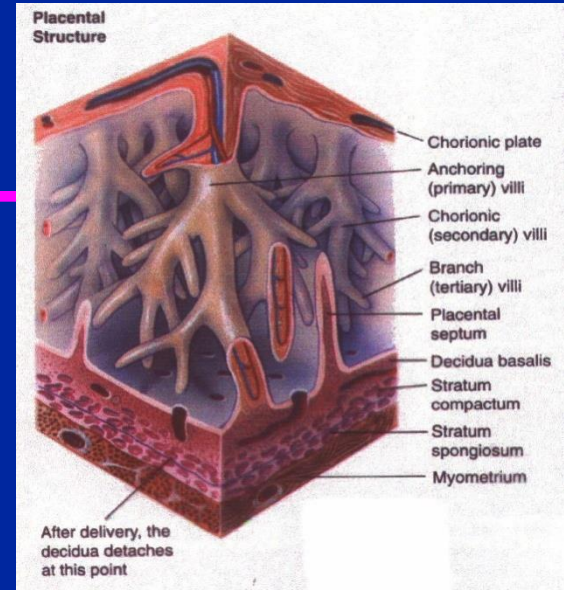
- ## ■ Substance of the cervix:
- dense fibrous tissue with few smooth muscle fibers.





# PLACENTA

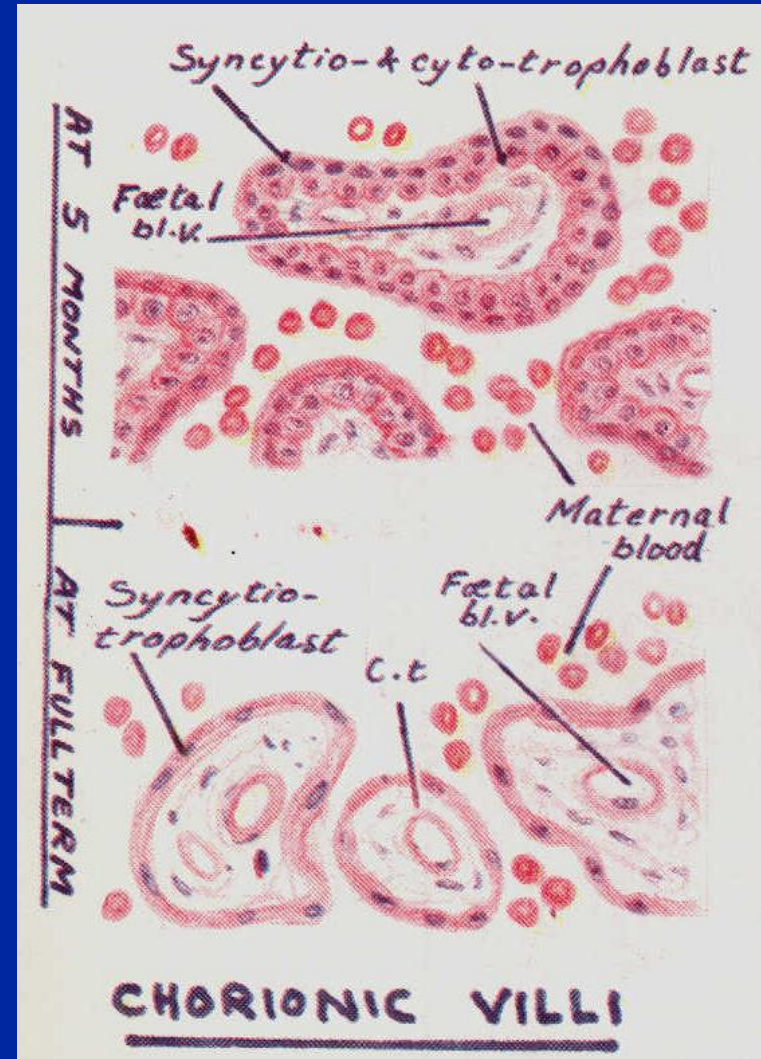
- **Maternal part (decidua basalis)**
- **Foetal part (chorionic villi):** finger-like projections separated by intervillous spaces containing maternal blood. Each chorionic villus consists of:
  - Mesenchymal CT core containing fetal blood vessels.
  - Epithelial covering (trophoblast), made of 2 layers:
    - a) Outer syncytiotrophoblast: deeply stained with no cell boundaries.
    - b) Inner cytotrophoblast: disappears late in pregnancy.



# Placental Barrier

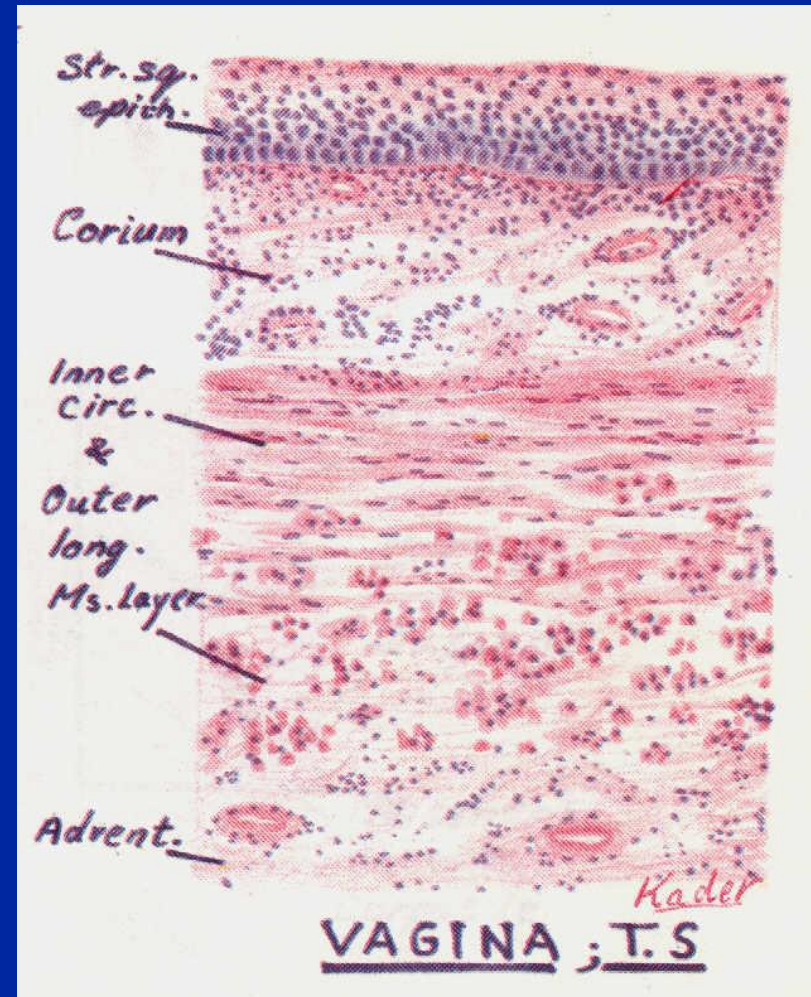
It is the barrier between the maternal and foetal blood. It consists of:

1. The trophoblast covering the villus.
2. The basement membrane of the trophoblast.
3. The C.T. core of the villus.
4. The basement membrane of foetal capillaries.
5. The endothelium of foetal capillaries.



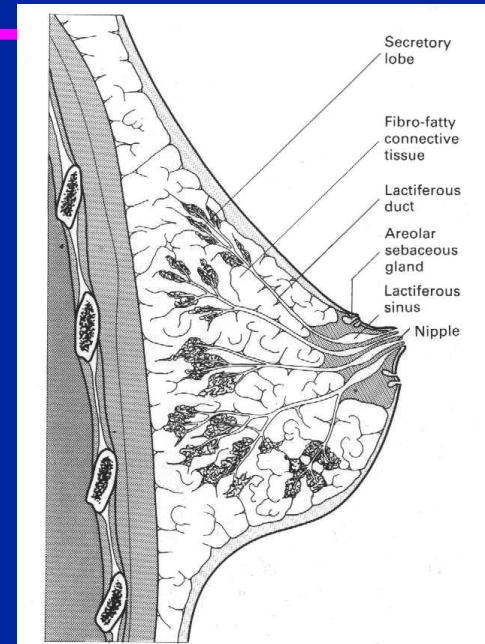
# VAGINA

- **Mucosa**: shows transverse folds and is made of:
  - **Epithelium**: stratified squamous epithelium non-keratinized, rich in glycogen.
  - **Corium**: of dense C.T., very rich in blood vessels, elastic fibres and leucocytes.
- **Musculosa**: formed of interlacing inner circular and outer longitudinal layers of smooth muscle fibres.
- **Adventitia**: formed of loose C.T.



# MAMMARY GLAND

- At puberty they enlarge by accumulation of fat, but contain only a duct system.
- Secretory units appear only during pregnancy and are functioning only during lactation.
- **Resting Mammary Gland:**
  - It is divided into lobes and lobules.
  - The **interlobular** C.T. is dense and contains numerous fat cells.
  - The **intralobular** C.T. is loose and contains no fat cells.
  - Within the lobules, there are widely separated **ducts** lined by simple cuboidal epithelium.
  - Ducts collect to form **lactiferous ducts** lined by stratified columnar epithelium and open at the top of the nipple.

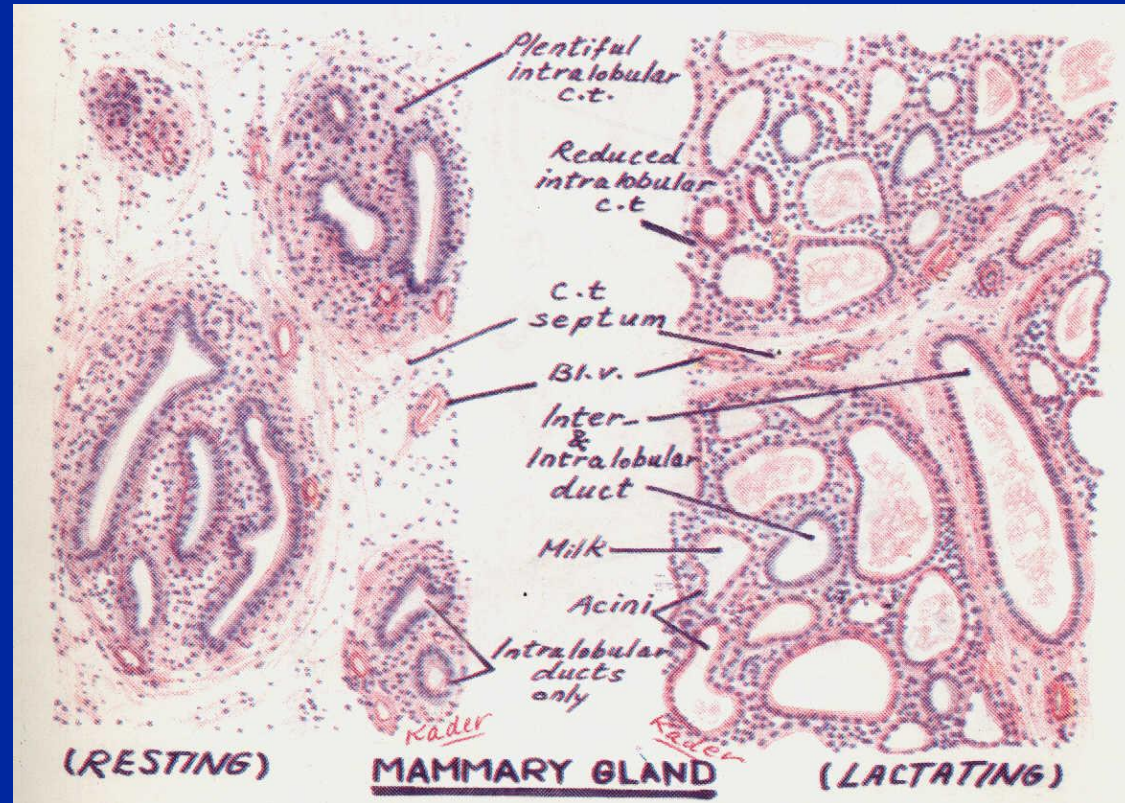


# Mammary Gland

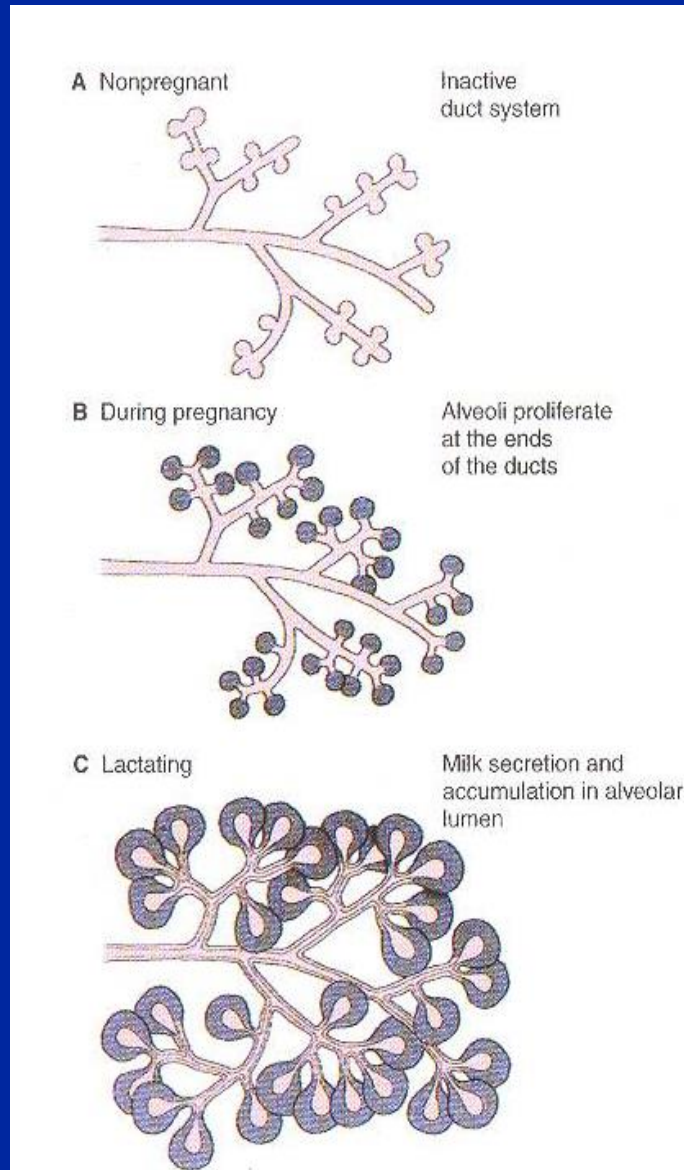
## Lactating Mammary

### Gland:

- Interlobular and intralobular C.T. become reduced.
- Lobules are made of ducts and alveoli.
- **Alveoli** are distended with milk and lined by cuboidal or flat cells surrounded by myoepithelial cells.
- **Milk** appears acidophilic with vacuoles of dissolved fat.



# Mammary Gland



# Mammary Gland

