MED439
KING SAUD UNIVERSITY

Revised & Approved
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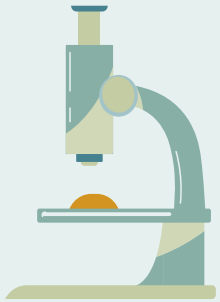
1957



Female reproductive system

Histology Team
439

Color index:

Slides

Important

Doctors notes

Extra

Editing file

Objectives:

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

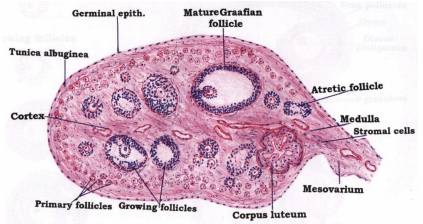
- Describe the histological structure and fate of ovarian follicles.
- Describe the histological structure of:
  - Ovary.
  - Oviducts (Fallopian tubes).
  - Uterus.
  - Vagina.
  - Resting and lactating mammary gland.

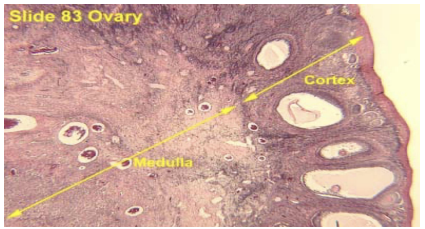
Click here for a summary of the first lecture

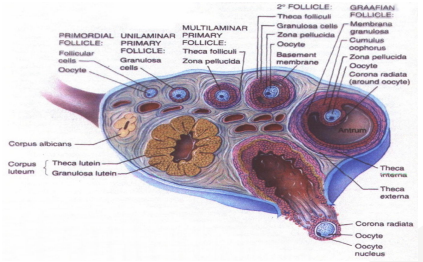
Special thanks to Sarah Alobaid ♥

Adult Ovary

Germinal epithelium	outer layer of flat cells.
Tunica albuginea	dense C.T layer.
Outer cortex	ovarian follicles and interstitial cells.
Inner medulla	highly vascular loose C.T.







Ovarian Follicles

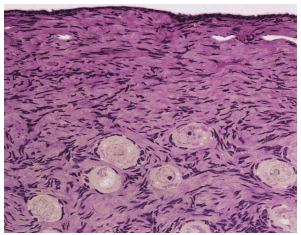
The cortex of the ovary in adults contains the following types (stages) of follicles:

- **1-Primordial Follicles**
- **2-Primary Follicles**
- **3-Secondary (Antral) Follicles**
- **4-Mature Graafian Follicles**

Ovarian Follicles

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 µm), surrounded by a single layer of flat follicular cells.



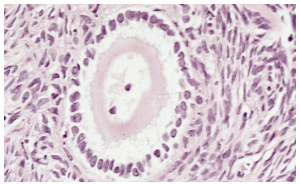
Primary follicles

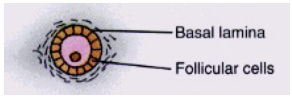
They develop from the primordial follicles, at puberty under the effect of FSH.

Unilaminar primary follicles

Are similar to primordial follicles, but:
- The primary oocyte is larger (40 µm).
- The follicular cells are cuboidal in shape.

one layer of cuboidal cells surrounding the oocytes

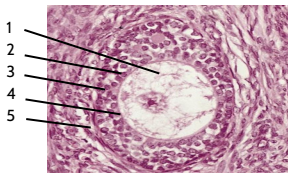


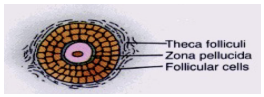


Multilaminar primary follicles

1. 1ry oocyte larger
2. corona radiata
3. granulosa cells
4. zona pellucida
5. theca folliculi
6. follicular fluid (liquor folliculi)

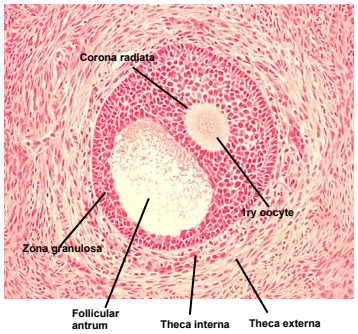
more than one layer of cuboidal cells surrounding the oocytes





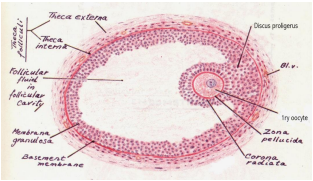
Secondary (Antral) Follicles

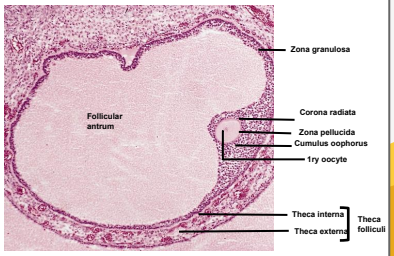
- Multilaminar primary follicles become secondary follicles when a complete antrum filled with liquor folliculi is formed.
- 1ry oocyte is larger & folliculi is pushed to one side.
- Theca folliculi differentiates into theca interna and theca externa.



Mature (Graafian) Follicles

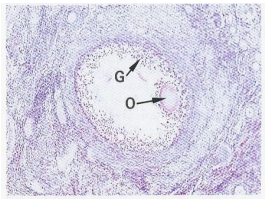
- Large, thin walled Cumulus oophorus
- Wide follicular antrum
- Large 1ry oocyte
- Zona pellucida
- Corona radiata
- Cumulus oophorus
- Zona granulosa
- Basement membrane
- Theca folliculi: theca interna & theca externa

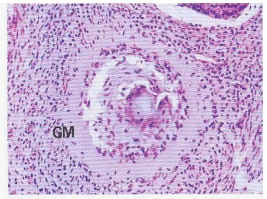




Ovaries

- **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.



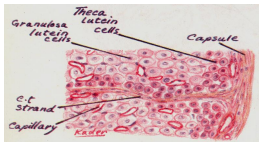


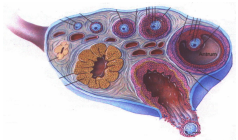
Corpus Luteum

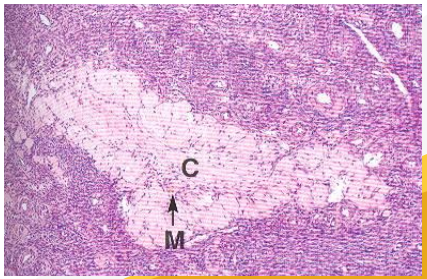
- Ovulation occurs at day 14 of the cycle, under the effect of LH.
- The follicle collapses and forms a corpus luteum.
- zona granulosa → granulosa lutein cells.
- Theca interna → theca lutein cells.
- Bleeding may occur → corpus haemorrhagicum.
- Fertilization → corpus luteum of pregnancy.
- No fertilization → corpus luteum of menstruation.
- At the end → corpus albicans.
- Corpus luteum 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.
- **<u>Function of corpus luteum:</u>**
  - Granulosa lutein cells: secrete progesterone
  - Theca lutein cells: secrete estrogen.

Corpus Albicans

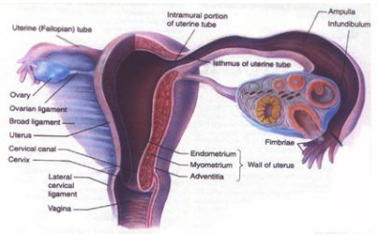
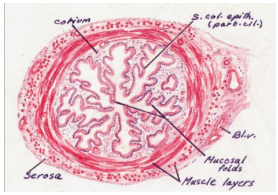
- It is a white degenerated fibrous body formed by involution of corpus luteum (degenerated corpus luteum).
- Secretory cells of corpus luteum degenerate and are phagocytosed by macrophages.

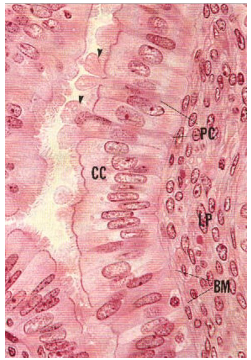




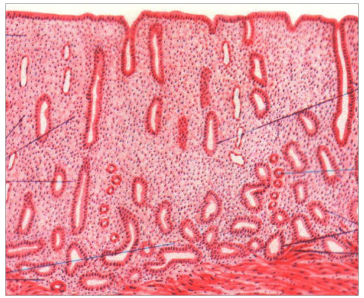
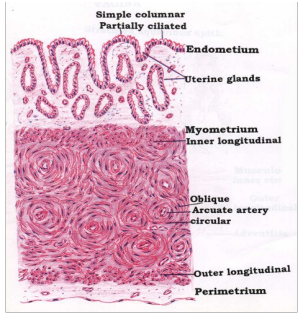
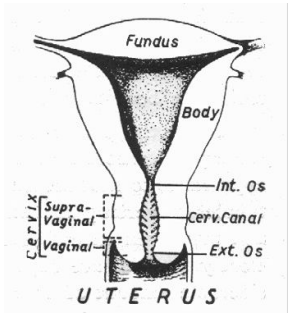
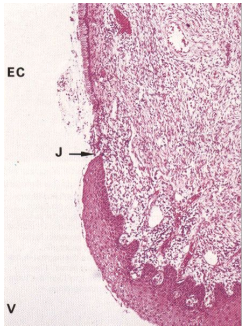
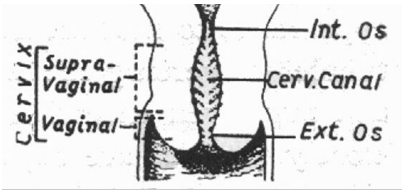


Oviduct (Fallopian Tubes)

Mucosa	• Highly folded. • Epithelium: Simple columnar partially ciliated. • Corium of C.T.	
Musculosa	• Inner circular. • Outer longitudinal.	 
Serosa		

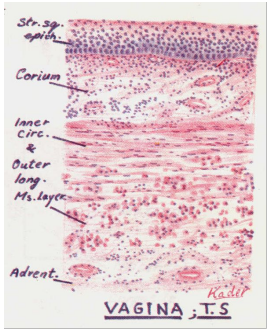
Ciliated cells	• Non-secretory. • Cilia beat toward uterus.	
Non-ciliated cells	• Thinner, also called peg cells. • Secretory cells. • Apices bulge above ciliated cells. • Their apices contain nutritive material to nourish gametes	

Uterus

1) Fundus & Body			2) Uterine Cervix	
Endometrium (mucosa)	**Myometrium (musculosa)**	**Perimetrium (serosa)**	**Mucosa**	**Substance of the cervix**
• Epithelium: simple columnar partially ciliated. • Corium: - Endometrial glands: simple tubular. - Stromal cells. - Blood vessels. - Leucocytes. - Reticular fibers.	• 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.	Formed of simple squamous epithelium (mesothelium) and sub-epithelial C.T.	• Epithelium: simple columnar in the cervical canal, but it changes to stratified squamous Epithelium non-keratinized at the external os. • Corium: CT containing tubulo-alveolar glands.	dense fibrous tissue with few smooth muscle fibers.
				

Vagina

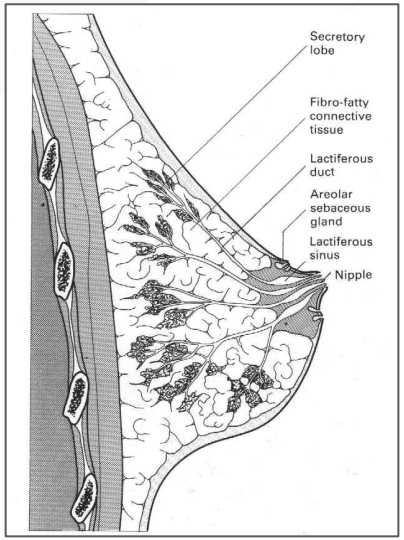
Mucosa	shows transverse folds and is made of: • Epithelium: stratified squamous epithelium non-keratinized, rich in glycogen. • Corium: of dense C.T., very rich in blood vessels, elastic fibres and leukocytes.
Musculosa	• formed of interlacing inner circular and outer longitudinal layers of smooth muscle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

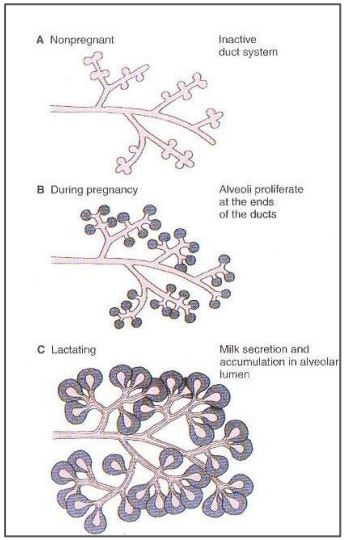


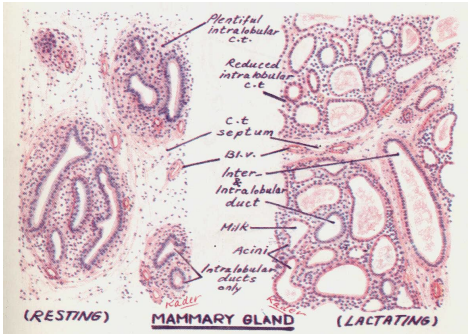
Mammary Glands

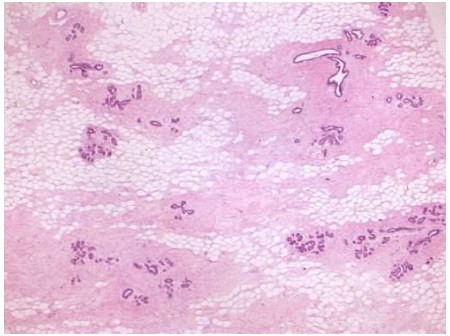
• At puberty they enlarge by accumulation of fat, but contain only a duct system.
• Secretory units appear only during pregnancy and are functioning only during lactation.

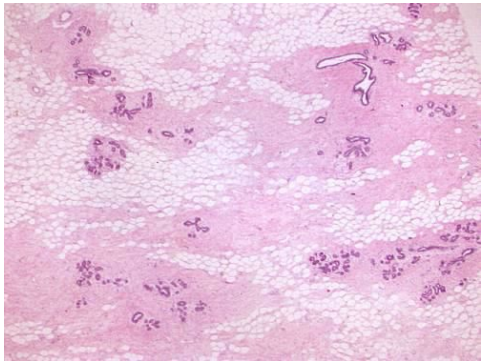
Resting Mammary Gland	Lactating Mammary Gland
• It is divided into lobes and lobules. • The interlobular C.T. is dense and contains numerous fat cells. • The intralobular C.T. is loose and contains no fat cells. • Within the lobules, there are widely separated ducts lined by simple cuboidal epithelium. • Ducts collect to form lactiferous ducts lined by stratified columnar epithelium and open at the top of the nipple. Have more adipose tissue	• 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. Less adipose tissue Milk is secreted by myoepithelial cells by the action of oxytocin (remember endo 🥲)



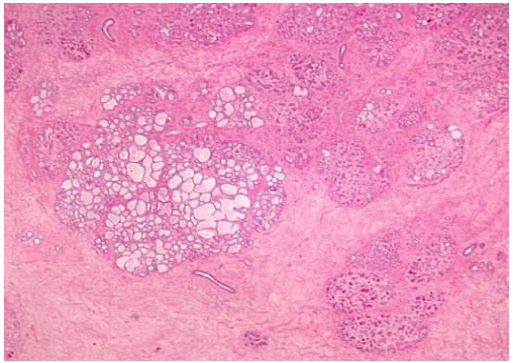




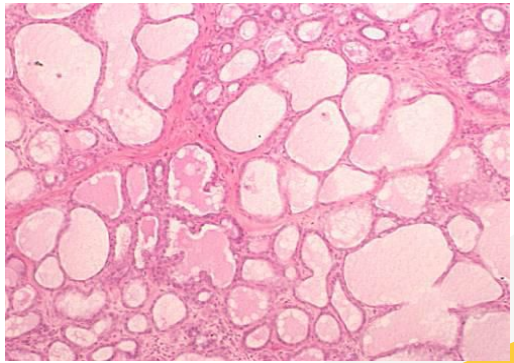




Resting (Non-Pregnant)



Lactating (Low Magnification)



Lactating (High Magnification)

Doctor's notes (female)

- Ovaries are intra-pelvic organs covered by peritoneum.
- Tunica albuginea: bundles of collagen type I
- (Tunica=layer) (Albu=white) and it's considered a very thick capsule
- The parenchyma of the ovary is formed of outer cortex and inner medulla
- The cortex of the ovary in adults (from puberty to before menopause) contains:
    - **1- Primordial:** small ova surrounded by a single layer of flat small cells
    - **2- Primary follicle:** surrounded by cuboidal cells
        - Unilaminar: single layer of cuboidal cells
        - Multilaminar: multiple layer of cuboidal cells
    - Not all primordial is converted to primary and not all primary is converted to secondary as well, most of them are arrested.
    - **3- Secondary (Antral):** presence of multiple cavities containing collection of fluid. (Antrum=cavity containing fluid)
    - **4- Mature Graafian follicles:** the fluid filled cavities combine together to form a big antrum.
- Corpus luteum = yellow body
- Oviduct:
    - Ciliated cells: cilia moves in one direction toward the uterus to allows the movements of the ovum.
    - Non-ciliated cells: called peg (wedge shaped)
- Uterus is a very muscular organ & Metrium= uterus

Doctor's notes (male)

The features of lactating mammary gland are:

1-presence of acini (alveoli): these are the secretory part

2- marked reduction of stroma including interlobar and interlobular septa with marked reduction of fat cells The interlobular septa become very thin Also the intralobular CT is markedly reduced In addition of marked increase of ducts

MCQs

Q1) Ovarian follicles are found in?
A- Tunica albuginea
B- Outer cortex
C- Inner medulla
D- Germinal epithelium

Q2) Which one of the following is true about Primordial Follicles?
A- Surrounded by a single layer of cuboidal follicular cells.
B- Present at puberty
C- Present before puberty
D- Under the effect of FSH

Q3) What is the epithelium found in the endometrium?
A- Non ciliated simple columnar epithelium
B- Partially ciliated columnar epithelium
C- Stratified columnar epithelium
D- Simple squamous epithelium

Q4) What is the epithelium found in the Vagina?
A- Simple columnar epithelium
B- Partially ciliated simple columnar epithelium
C- Non-keratinized stratified squamous epithelium
D- Stratified squamous keratinized epithelium

Q5) What is the epithelium at the Uterine Cervix?
A- Simple columnar epithelium
B- Partially ciliated simple columnar epithelium
C- Non-keratinized stratified squamous epithelium
D- Both B & C

Q6) Which of the following is true regarding the resting mammary gland?
A- The interlobular C.T. is loose
B- The intralobular C.T. is dense
C- Ducts lined by simple cuboidal epithelium
D- Ducts lined by simple squamous epithelium

Q1: B
Q2: C
Q3: B
Q4: C
Q5: D
Q6: C

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