



# Histology

Lec : 3

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# Body Tissues

## Epithelial Tissue

2

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**(2023)**

one layer كلمة simple تعني

## Simple Cuboidal epithelium

كيف نستدل عليها من المايكروسكوب؟

ج: من شكل النواة بتكون round nuclei

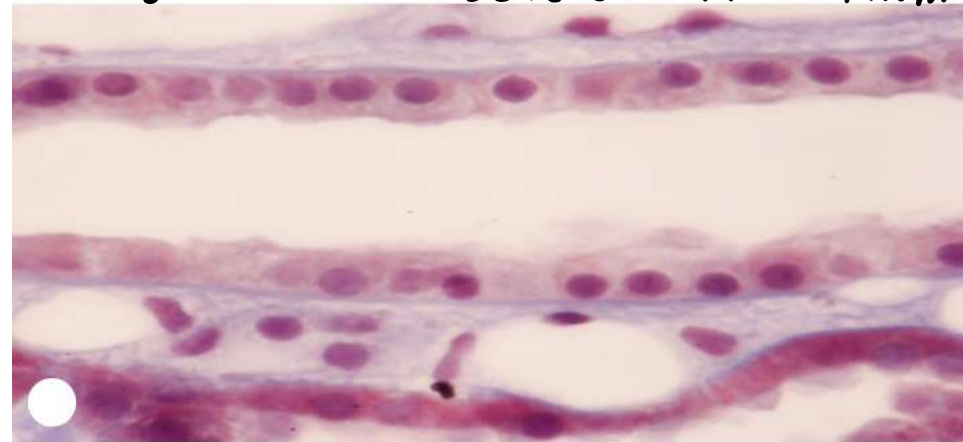
- Formed of a single layer of cubical cells. خلايا مكعبة الشكل



- It's found in:
  - Renal tubules الانابيب الكلوية
  - Covering the ovary
  - Glands

lined by simple cuboidal epithelium

- Function: Covering of organs. Involved in active transport.



لما توخذ مقطع من الovary رح تشوف على سطحه من الoutside طبقة من الsimple cuboidal كانوا يعتقدو انه هي التي تنتج البويضات ولكن اتضح انه ليس له علاقة بانتاج البويضات

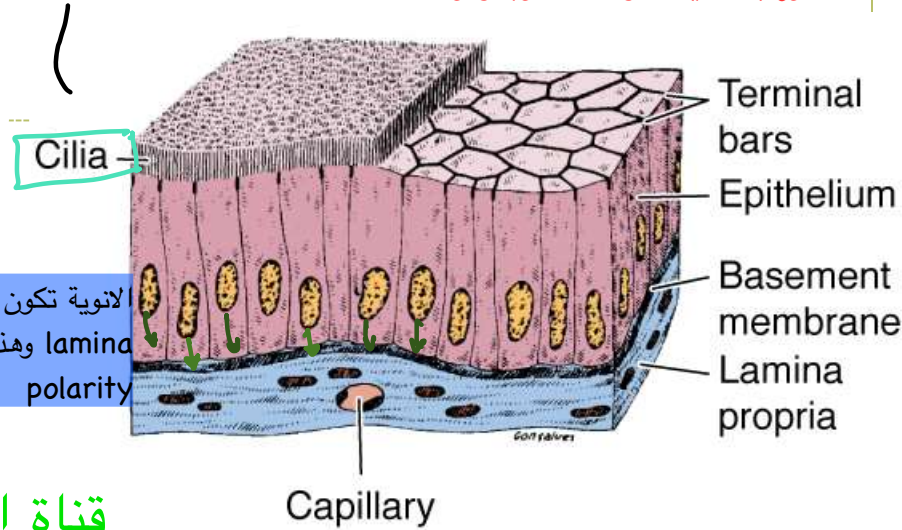
Fig.4: Simple cuboidal epithelium of the renal tubules. Note the round nuclei.



# Simple Columnar epithelium

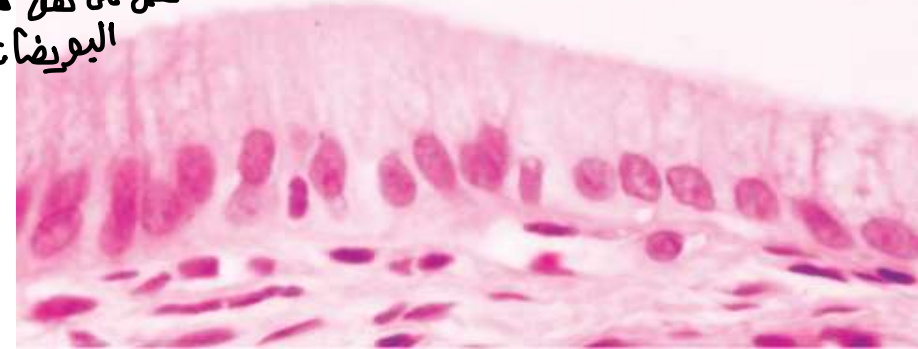
هذا النوع له structure جديدة موجودة على الtop surface اما تكون cilia او نوع ثاني غير مذكور بالسلايدات ولكنه مطلوب وهو microvilli

- Formed of a single layer of tall cells that could be ciliated or not.



microvilli الانوية تكون قريبة من الbasal cell وهذا دليل على polarity

- It's found in:
  - Ciliated: Uterine tubes قناة الرحم تعمل على نقل البويضات
  - Non-ciliated: most of the gastrointestinal tract. يقصد به stomach و small intestine و large intestine



- Function: Secretion as in the stomach. Absorption as in the small intestine.

Fig.5: Simple columnar epithelium of the gallbladder. Note the oval nuclei.

المرارة المرارة تكون non-ciliated

## Simple cuboidal epithelium

تتشكل من طبقة واحدة من خلايا مكعبة الشكل (cubical cells)

:Functions

تغطي الاعضاء

المشاركة في ال active transport

هذا النوع يوجد في :

Renal tubules (انابيب كلوية)

تغطي ال ovary

Renal tubules :lined by simple cuboidal epithelium

## Simple columnar epithelium

شكل النواة: oval nuclei

تتشكل من طبقة واحدة من خلايا طويلة

هذا النوع له structure جديدة موجودة على ال top surface اما تكون cilia او نوع ثاني غير مذكور بالسلايدات ولكنه مطلوب وهو microvilli وتعمل على increase the surface area

في هذا النوع الانوية تكون قريبة من ال basal lamina وهذا دليل على cell polarity

Functions:

1.secretion in stomach

2.absorb in small intestine

الخيلة تكون طويلة ولكن عرضها قليل

يوجد هذا النوع في :

• Ciliated :uterine tubes

• Non ciliated(microvilli):most of the gastrointestinal tract

وظيفة ال microvilli:

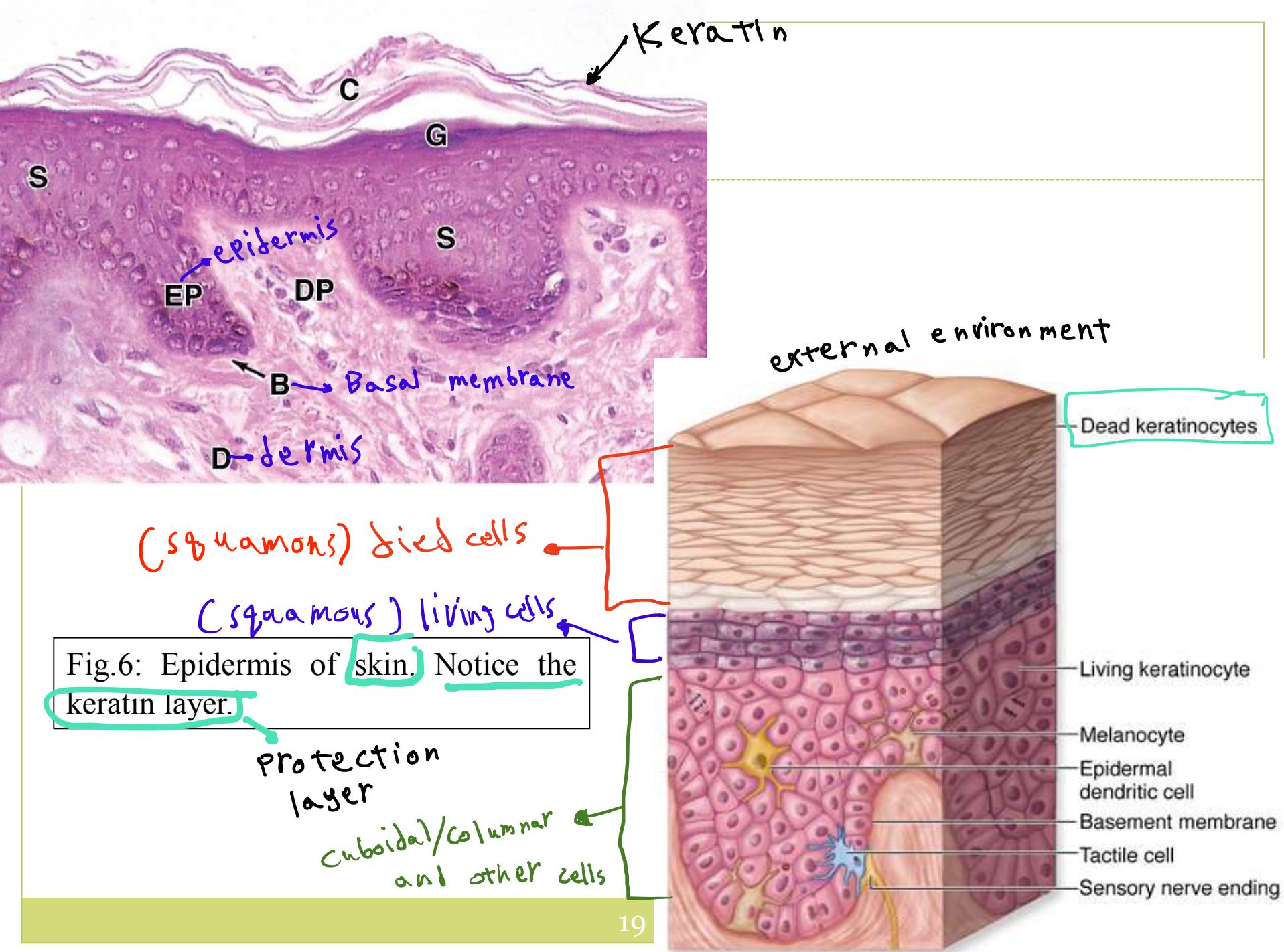
1. اذا كانت بال stomach فتعمل على زيادة ال secreti
2. اذا كانت بال small intestine فتعمل على زيادة ال absorb

Gastrointestinal tract :small intestin,large intestine, stomach

## Stratified Squamous epithelium - keratinized

- Formed of multiple layers of cells. The topmost layer is formed of squamous cells. The epithelium is covered by keratin (a non-living material).  
*died cells*
- It's found in areas that require great protection:
  - Skin → Epidermis

الـkeratinocytes هو اسم الخلايا الموجودة في الـepiderms  
واسم الجزي العلوي هو: died keratinocytes
- Function:
  - 1) Protection → كلما زادت عدد طبقات الـepi زادت قدرتها على حماية الـorgans
  - 2) Prevent water loss



Keratin

C

G

S

epidermis

EP

DP

S

Basal membrane

B

dermis

D

external environment

Dead keratinocytes

(squamous) died cells

(squamous) living cells

Fig.6: Epidermis of skin. Notice the keratin layer.

protection layer

cuboidal/columnar and other cells

Living keratinocyte

Melanocyte

Epidermal dendritic cell

Basement membrane

Tactile cell

Sensory nerve ending

# Stratified Squamous epithelium – Non-keratinized

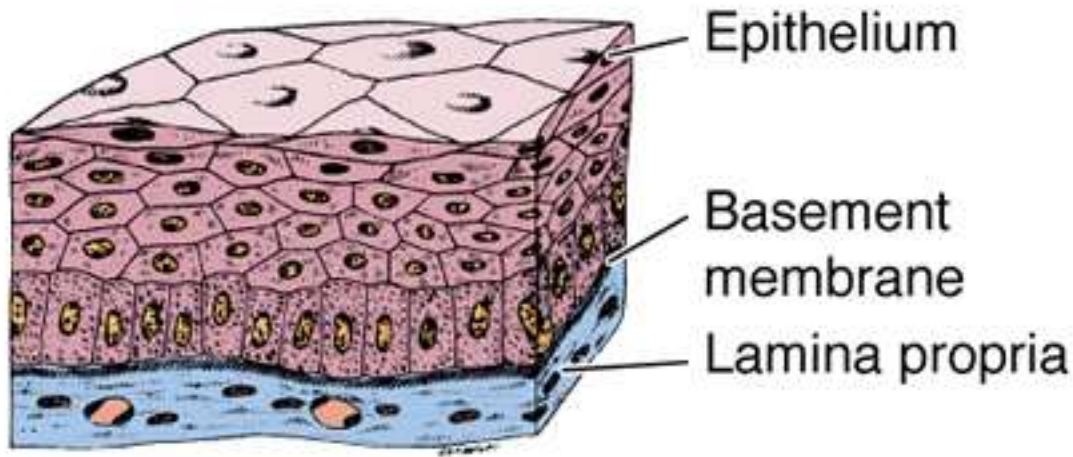


- Formed of multiple layers of cells. The topmost layer is formed of squamous cells. The epithelium is not covered by keratin.
- It's found in areas that require protection and water loss is not a big problem:
  - Mouth, esophagus, anal canal (lower half)
  - Vagina
- Function: protection, secretion.

GI tract : keratinized  
Anal canal:non

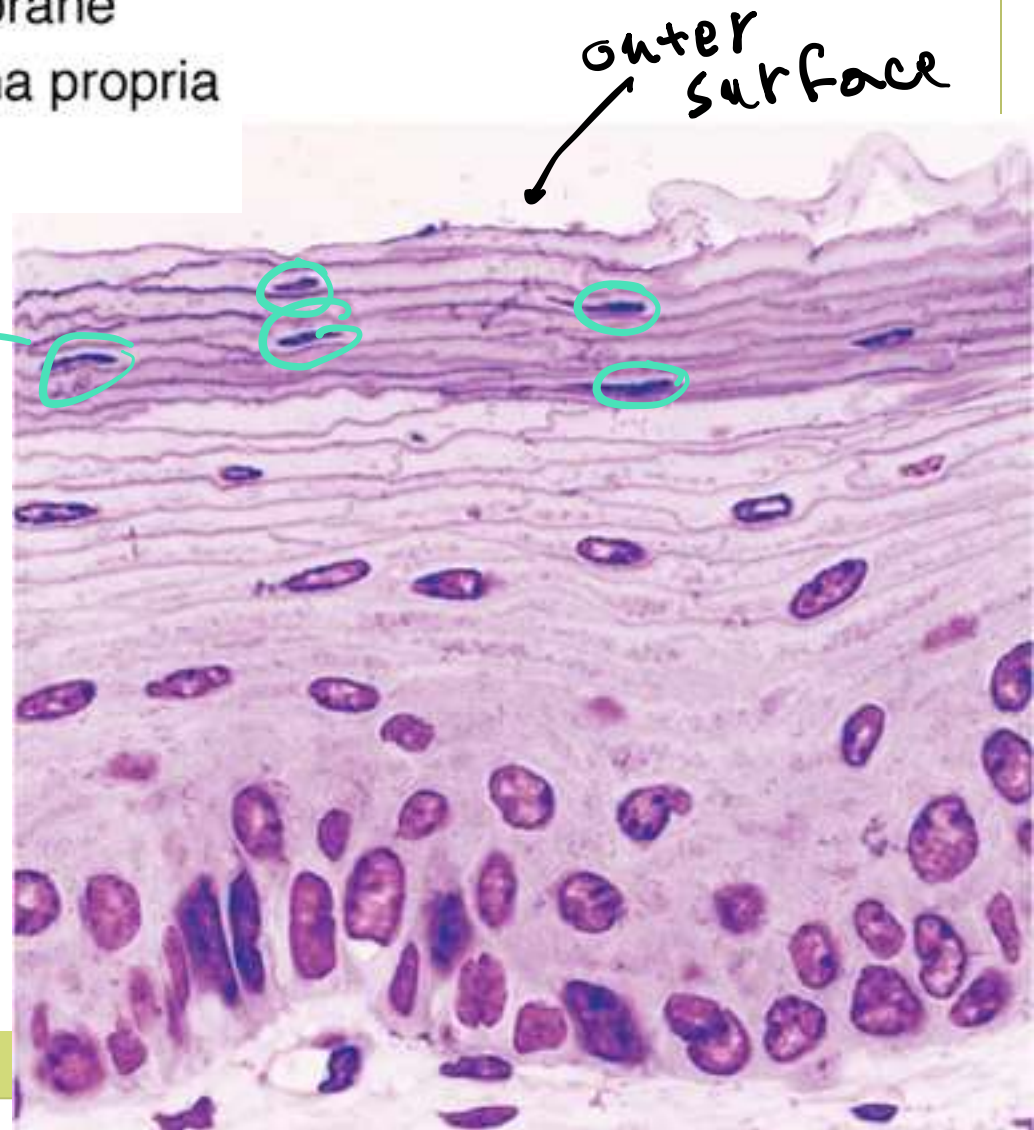
vagina sb glands sb gl / oral cavity sb glands sb





squamous cells flattened

Fig.7: Stratified squamous epithelium. To the right, we can see that this epithelium in the esophagus is non-keratinized (the topmost layer has nuclei).



# Stratified squamous epithelium:

↳ خلاياه بتكون flattened

ال stratified squamous epi له نوعين:

١. واحد عليه cover بلم، هو keratinized ٢. واحد ماعليه cover بلم، هو non keratinized

## 1.Keratinized: Keratinized covered with layer of died cells

✖ وظيفتها: حماية الاعضاء / ومنع خسارة الماء لانه الخلايا بطبيعتها وخصائصها تمنع فقدان الماء

✖ Died cells: هي خلايا معينة اسمها Program cells يعني مبرمجين يموتوا كل ما بعدو عن ال Basal lamina

## 2.Non-keratinized:

✖ لا يوجد عليها طبقة keratin وهاذ يعني انه الاعضاء الي مغطاي من هاذ النوع من النسيج لا يتاثر بفقدان الماء بسبب عدم وجود طبقة ال keratin

✖ وظيفتها: الحماية/ الافراز (secretion)

# Stratified Cuboidal and Columnar epithelium

	<b>Stratified Cuboidal</b>	<b>Stratified Columnar</b>
<b>Number of layers</b>	Multiple	Multiple
<b>Top-most layer</b>	Cuboidal	Columnar
<b>Location</b>	Large excretory ducts of salivary and sweat glands	Conjunctiva
<b>Function</b>	Protection and secretion	Protection and secretion



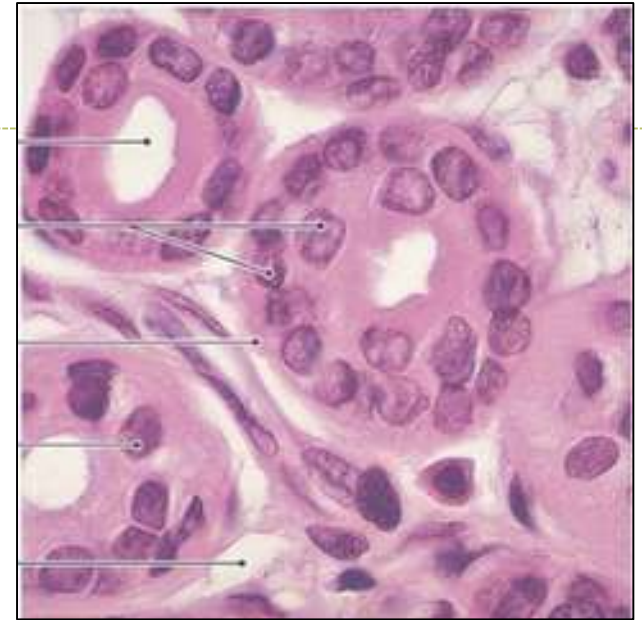
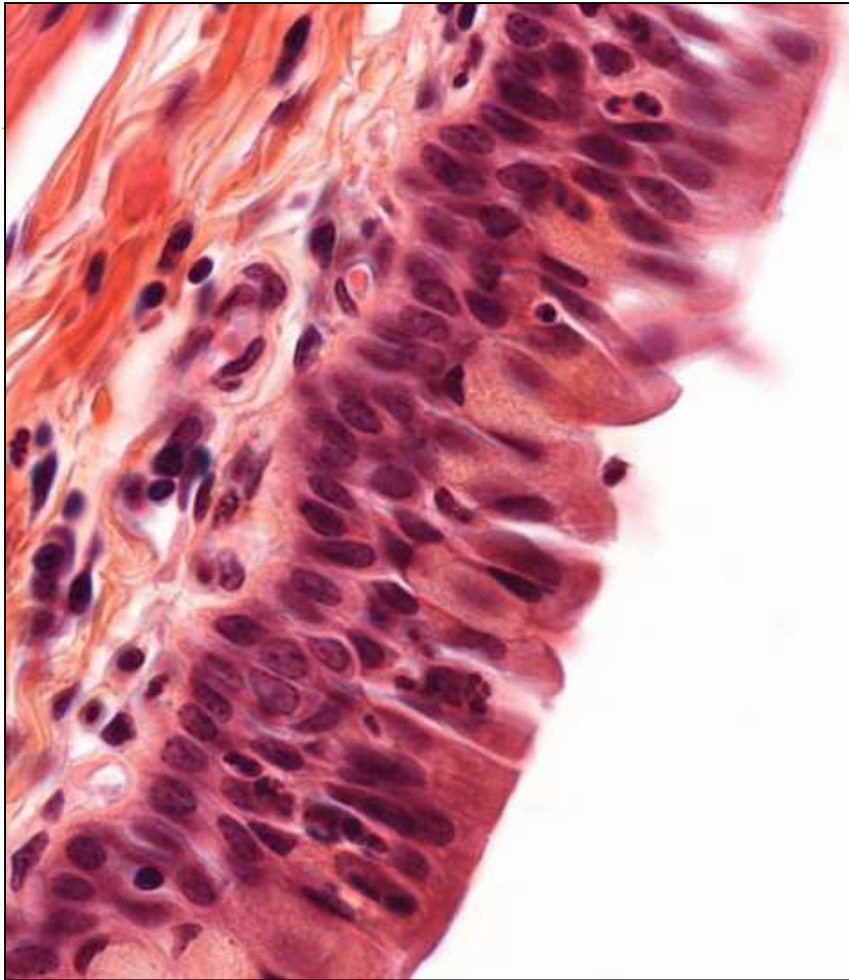


Fig.8: Above, stratified cuboidal epithelium in ducts of glands. To the left, stratified columnar epithelium of the conjunctiva

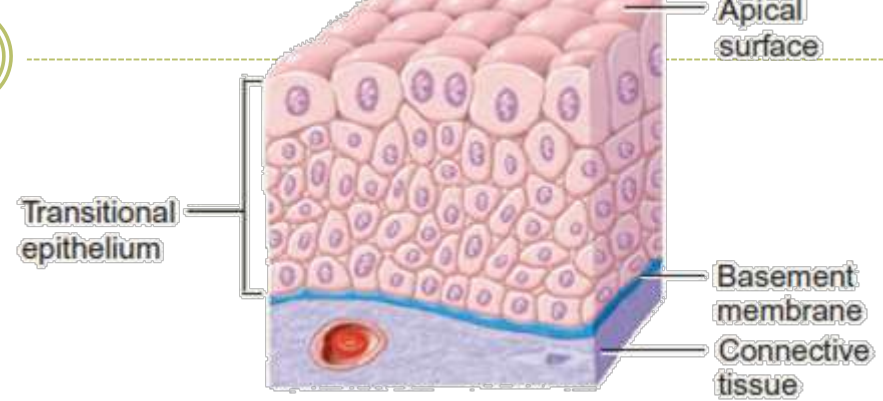


urinary system موجود بال

## Transitional epithelium (Urothelium):

هذا النوع أكثر من طبقة  
مضغو stratified

❖ The topmost cells of this stratified epithelium are dome-like (also called umbrella cells).



❖ Found in: { Urinary bladder, ureters and renal calyces. }  
المثانة - العالبي - بداية الكلية (duct) كل واحد من الأجزاء تابعة لـ urinary system

❖ The umbrella cells are dome-shaped when the bladder is empty. Once it's full, these cells will become flattened (hence the name transitional).  
فراغة قبل امتلاء المثانة رح تكون الخلايا cuboidal وبعد امتلاءها رح تكون الخلايا flattened (squamous) ولهذا سمي بـ

❖ Functions: Protection against the adverse effects of urine. Allow the bladder to change size.  
لجسمي urine bladder

Flexibility

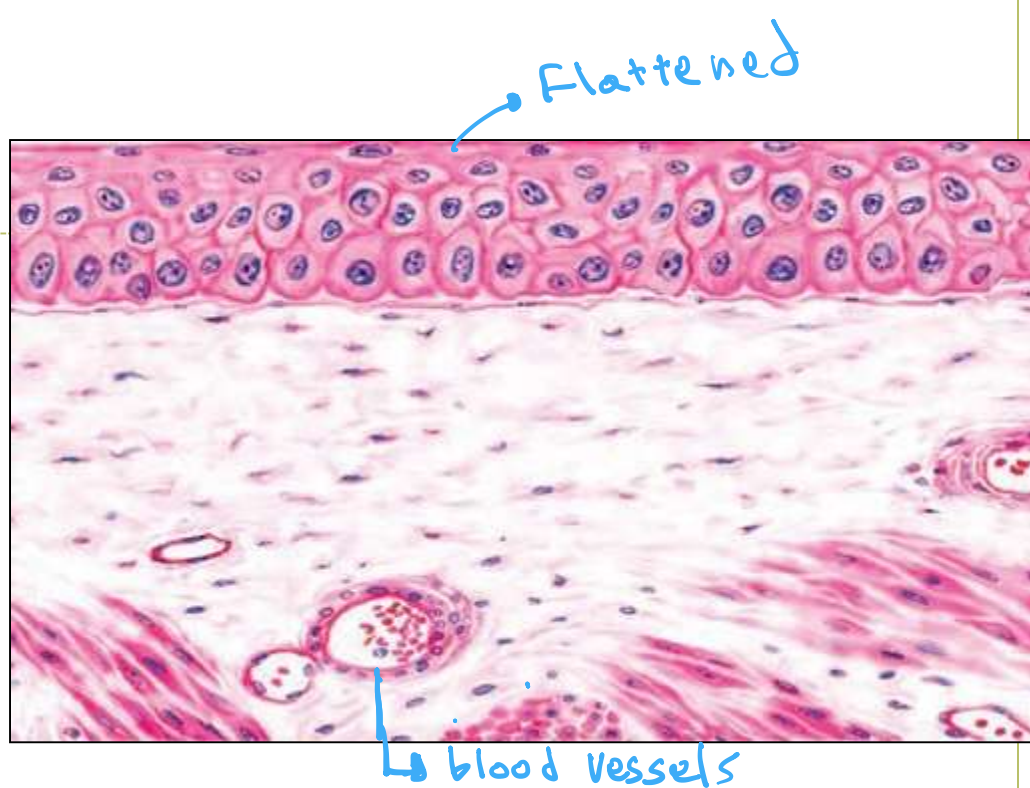


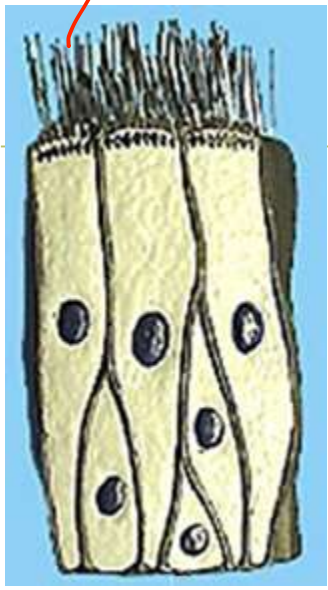
Fig.9: Transitional epithelium of the urinary bladder. To the left, when bladder is empty. Above, when the bladder is full. Note the change in shape of the upper most cells.

simple (one layer)  
**Pseudostratified epithelium:**

Have a two type of cells :

هذا النوع موجود بال respiratory system بال upper part

cilia or microvilli



➤ In this epithelium, the cells have different heights. All cells rest on the same basal lamina, but not all of them reach the surface. This makes the nuclei occupy different levels giving the epithelium a false stratified appearance.

➤ The *Respiratory epithelium* is a pseudostratified columnar ciliated epithelium found in the trachea, bronchi, and nasal cavity.

الخلايا تكون باطوال مختلفة ولكن كلها فاعدة ع نفس ال basal lamina  
وبسبب هاذ بيصير عندي اختلاف بمستويات ال nuclei

\* كل الخلايا واصله ال basal بس متى كلمهم و اصطلاح ال surface

➤ Functions: Protection and secretion. Ciliary movement remove particles from the airway passages.

يعني يكون في طبقة من المخاط في الجهاز التنفسي تلتقط ال dust particles و ال cilia بتحركهم



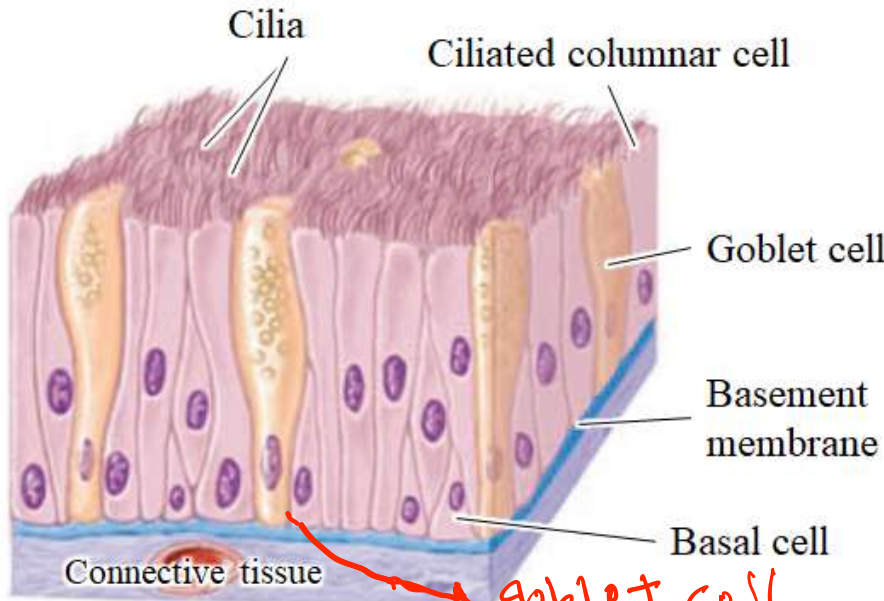
في ثلاث شروط لازم تكون موجودة لحتى  
يكون النوع هو pseudostratified:

١. الانوية بصورة متراكمة

٢. Cilia

٣. وجود ال goblet cells **فامعة حبه**

Goblet cell تفرز mucus



ال cell تفرز  
تسكها مثل الكأس



Fig.10: Respiratory epithelium. Note how the image below gives the impression that it's a stratified epithelium. Also note the presence of cilia and mucous secreting goblet cells (long white arrows)

Two types cilia موجودة  
Two types goblet موجودة



# Glandular Epithelium

- Is an epithelium specialized in secretion.

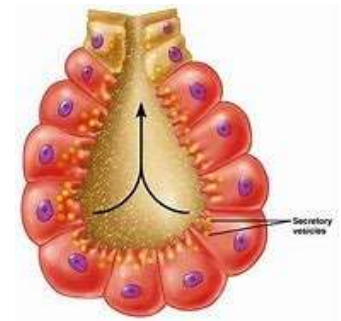
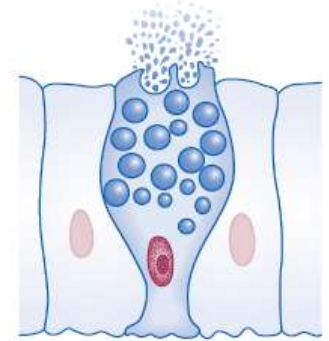
## Classification of glandular epithelium:

### 1) According to number of cells:

- **Unicellular** glands: formed of a single cell, like Goblet cells of the digestive and respiratory tracts.
- **Multicellular** glands: formed of clusters of cells, like: salivary and sweat glands.

→ most of glands

كل الغدد في الجسم تعتبر multicellular



## 2) According to presence of ducts:

- **Exocrine** glands: possess ducts that transfer the secretion to the outside of the body, like: salivary glands.
- **Endocrine** glands: they lack ducts. Their secretions are transferred to the target organs, usually, by blood. Example: Pancreatic Islets, Pituitary gland.

تفرز  
بالدم

تفرز الهرمونات ويتم نقلها عبر الدم

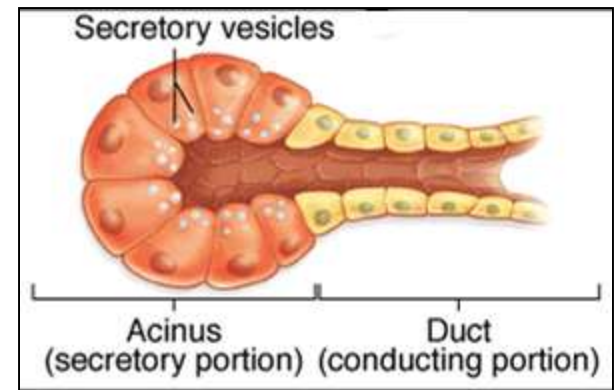
99% من الغدد بالجسم هي exocrine

الاعضاء يلي عندها خلايا تحتوي على endocrine :

جهاز الهضمي و الكبد والاعضاء التناسلية

## 3) Exocrine glands classified according to morphology of duct and secretory portion:

- Each exocrine gland has a secretory portion that produces the secretion and a duct that carries this secretion.



ducts doesn't produce, only carry

ليس له علاقة بالافراز

## 1. *Duct*

- If the duct is unbranched, the gland is called Simple
- If the duct is branched, the gland is called Compound

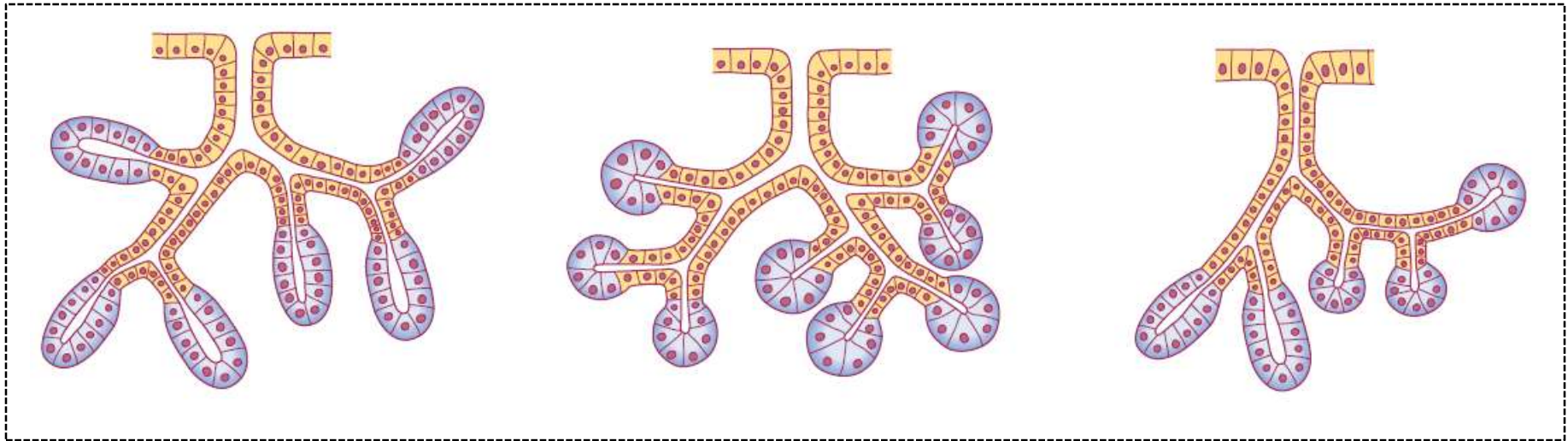
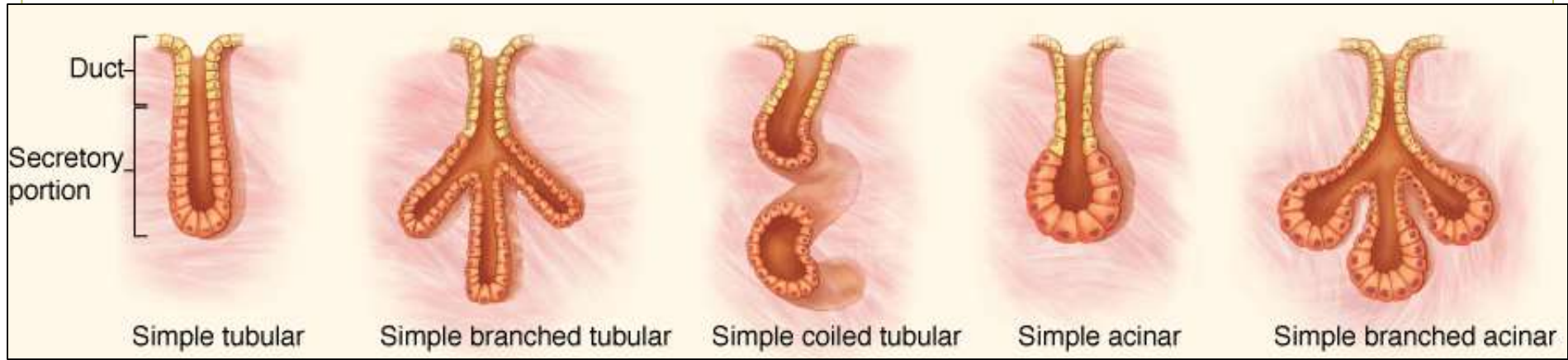
## 2. *Secretory portion*

- If the secretory portion is unbranched, the gland is called Unbranched
- If the secretory portion is branched, the gland is called Branched

## 3. *Secretory portion*

- If the secretory portion is tube-like in shape, the gland is called Tubular. If the tube is spiral in shape, it's called Coiled.
- If the secretory portion is ball-like in shape, the gland is called Acinar
- If there are both tubular and acinar secretory portions, the gland is called Tubuloacinar

- ❖ Unbranched secretory portion = 1 secretory portion opens into 1 duct
- ❖ Branched secretory portion = Several secretory portions open into 1 duct



Compound tubular

Compound acinar

Compound tubular-acinar



## 4) Exocrine glands classified according to method of secretion:

□ **Merocrine**: only the product is secreted by exocytosis. As in salivary glands.

released by exocytosis

merocrine



□ **Apocrine**: the product and the apical part of the cell is shed. As in mammary gland.

apocrine



□ **Holocrine**: the whole cell disintegrates and is shed with the secretion. As in sebaceous glands of the skin.



❖ Merocrine glands are either serous or mucous.

إذا كان secretion كان سائل

تصنيف حسب التركيب الكيميائي لل secretion  
لزج  
إذا كان ال secretion

thick or viscous

## :Merocrine

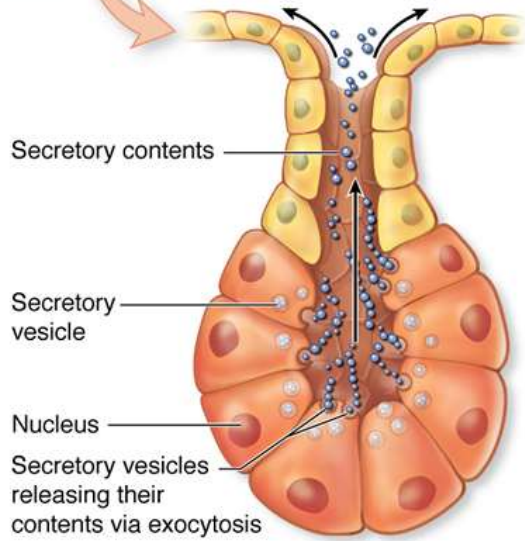
الخلية تقوم بانتاج product وبتحطه بالvesicles (تعبئة وتغليف) وبتعمله released والخلية بتصير فاضية ، بعدين نكرر الproduct وهون بيصير enclosed by a vesicle يلي اسمه secretory vesicle ما بيصير اشي للخلية

## :apocrine

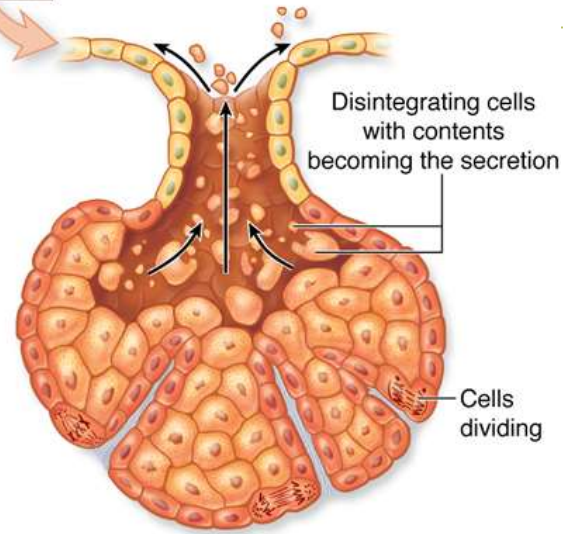
حكينا بالepi عندنا apical و basal هون يتم انتاج الproduct ويتم دفعه لل apical بعدين بيصيرله shedding للC.m مع الproduct هون الخلية بتخسر الapical part وجزء من السيتوبلازم

## :holocrine

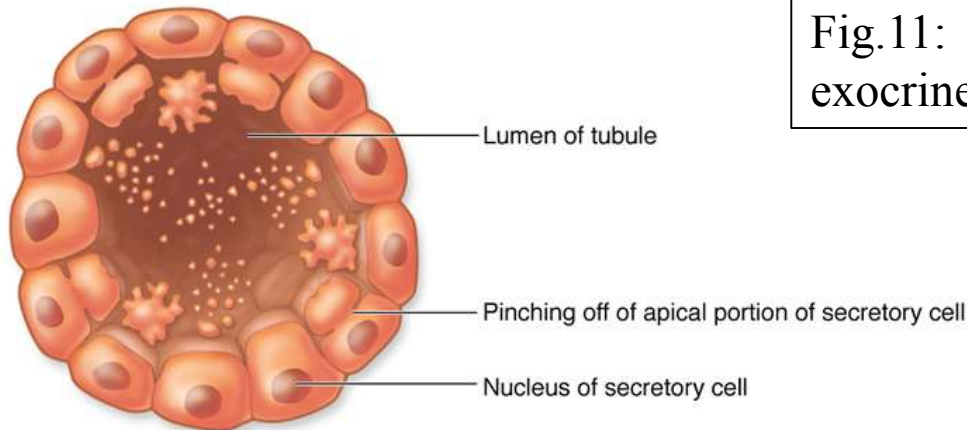
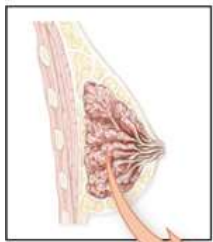
الخلية تنفجر وتطلق الافرازات



**a** Merocrine gland



**b** Holocrine gland



**c** Apocrine gland

**Fig.11: Methods of secretion of exocrine glands.**

هذ التفريغ عن روح جدي رحمة الله  
عليه

بتمنى تستفيدوا من التفريغ 🙏❤️