

# 高中生物人才培育計畫

## 組織學 與 比較解剖學

教師

黃宏圖教授

# 比較解剖學(Comparative Anatomy)

- 探討人類及各類脊椎動物: 魚類、兩棲類、爬蟲類、鳥類與哺乳類個體結構的相似性和差異性。
- 人體解剖學 (Anatomy of Human Body) 是基礎醫學很重要的學門，深入探討人體各部位包括頭部 (Head)、胸部(Thorax)、腹部(Abdomen)、上肢 (Upper Limbs)和下肢(Lower Limbs)的結構。
- 以及各器官系統(Organ-systems) 包括皮膚系統、骨骼系統、肌肉系統、神經系統、感覺器官系統、循環系統、呼吸系統、消化系統、泌尿系統、男性生殖系統、女性生殖系統和內分泌系統之結構與功能。

# 組織學(Histology)

- 主要討人體和實驗動物器官的正常組織與細胞結構、組織功能和細胞種類。
- 組織學是病理組織學 (Histopathology) 的基礎。
- 如何取得器官的組織塊 (tissue blocks)? (1) 人體: 外科手術、穿刺、抽血...等等。(2) 實驗動物: 以動物實驗取得器官系統。
- 顯微研究技術: 光學顯微鏡簡術 (Light Microscopy) 和 電子顯微鏡檢術 (Electron Microscopy)。其中包含處理組織塊、用組織切片機做石蠟/塑膠包埋切片、切片染色和顯微照相。

# 組織學 (Histology)

## 上皮組織 (Epithelial Tissue)

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# 上皮組織的定義 (Definition of Epithelial Tissue)

- 上皮組織也簡稱為上皮 (Epithelium).
- The epithelia are a diverse group of tissues that include both surface epithelia and glandular epithelia.
- Surface epithelia (表面上皮) cover or line all body surfaces, cavities and tubes.
- Epithelium that is primarily involved in secretion is often arranged into structures called glands (分泌腺).

# 表面上皮的分類 (Classification of Surface Epithelium)

依據上皮裡的細胞層數 (According to **number of cell layers**)。組織切片 切割的方向是 和上皮表面垂直。

## **Simple epithelium (單層上皮)**

with one layer of epithelial cells.

只具有單一層上皮細胞。

## **Stratified epithelium (複層上皮)**

with multiple layers of epithelial cells.

至少含有兩層上皮細胞。

# Classification of Surface Epithelium

- 根據上皮表面的細胞類型 (According to **type of cells**)

**Squamous epithelium (鱗狀上皮)**

鱗片狀 或扁平細胞

**Cuboidal epithelium (立方上皮)**

立方形細胞

**Columnar epithelium (柱狀上皮)**

柱狀細胞

# 同時考慮表面上皮的細胞層數 和形態 可以區分為 6種上皮

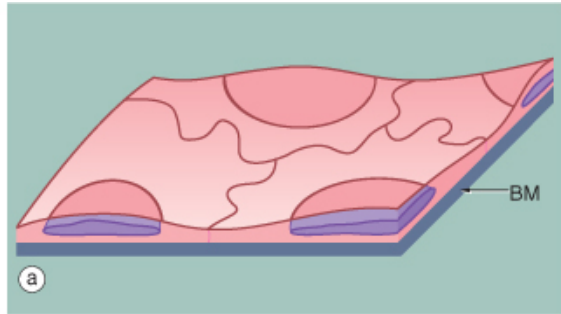
- 1. 單層鱗狀上皮(Simple Squamous Epithelium)
- 2. 單層立方上皮(Simple Cuboidal Epithelium)
- 3. 單層柱狀上皮(Simple Columnar Epithelium)
- 4. 複層鱗狀上皮(Stratified Squamous Epithelium)
- 5. 複層立方上皮(Stratified Cuboidal Epithelium)
- 6. 複層柱狀上皮(Stratified columnar Epithelium)

## 另有兩種特別的 表面上皮

1. Pseudostratified Columnar Epithelium(偽複層柱狀上皮)。  
上皮含單層細胞，有兩種柱狀細胞、第三種方形細胞，最初誤以為是複層上皮。
2. Transitional Epithelium (過渡上皮/移行上皮)。輸尿管腔、膀胱腔 俱有這種上皮，上皮的厚度和細胞層數隨尿壓改變。其實它也是複層上皮。



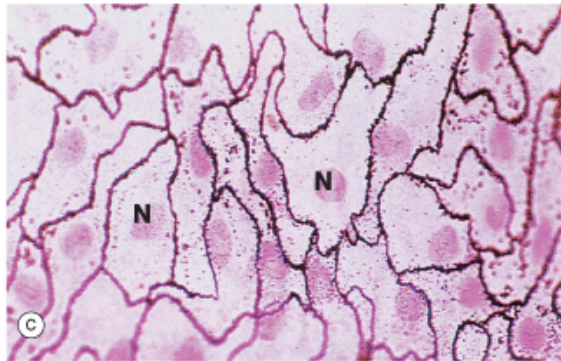
# Simple squamous epithelium



手繪圖。 Simple squamous epithelium(單層鱗狀上皮) is supported by the basement membrane (BM). 鱗片狀上皮細胞 寬度 20-30  $\mu\text{m}$ , 高度 1-2  $\mu\text{m}$ .



顯微照片。小動脈縱切面，E, simple squamous epithelium (單層鱗狀上皮) lining the lumen of arteriole (小動脈)。切片染色: Hematoxylin and eosin。

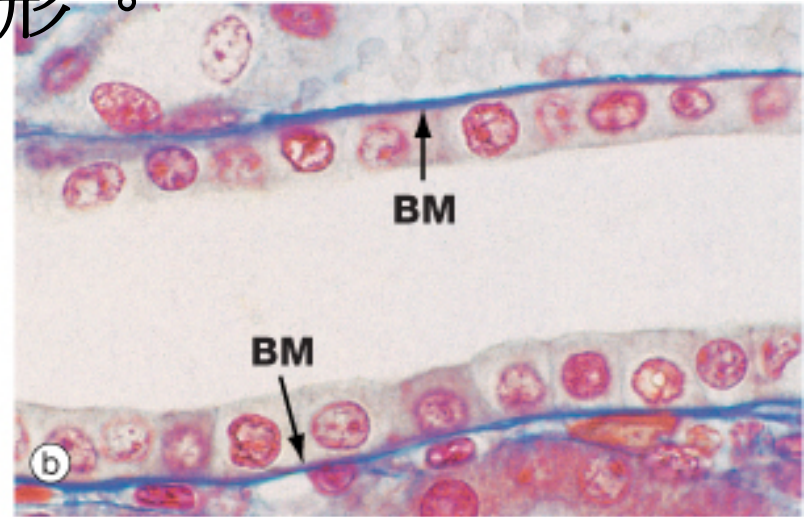
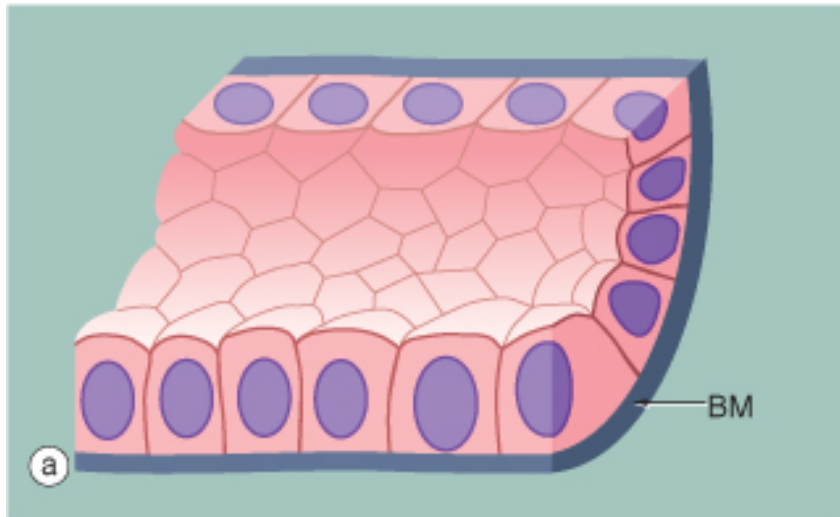


腹膜的 simple squamous epithelium , 染色: silver method and neutral red

# 單層立方上皮 (Simple cuboidal epithelium)

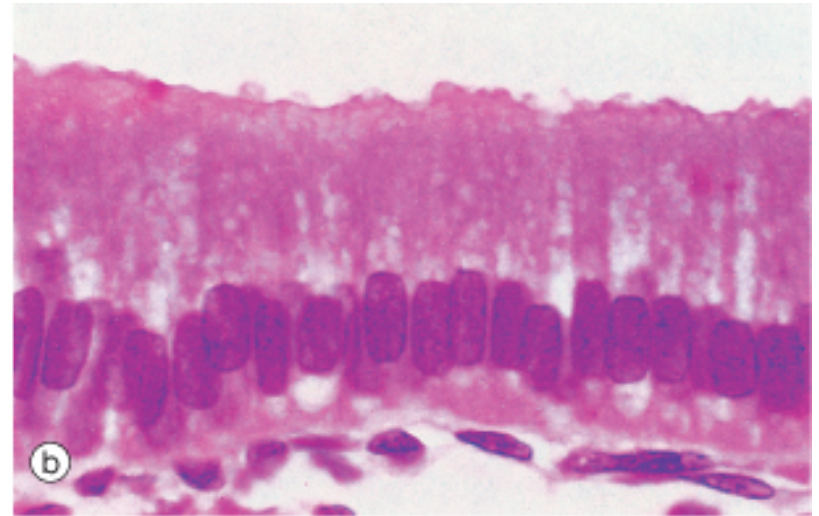
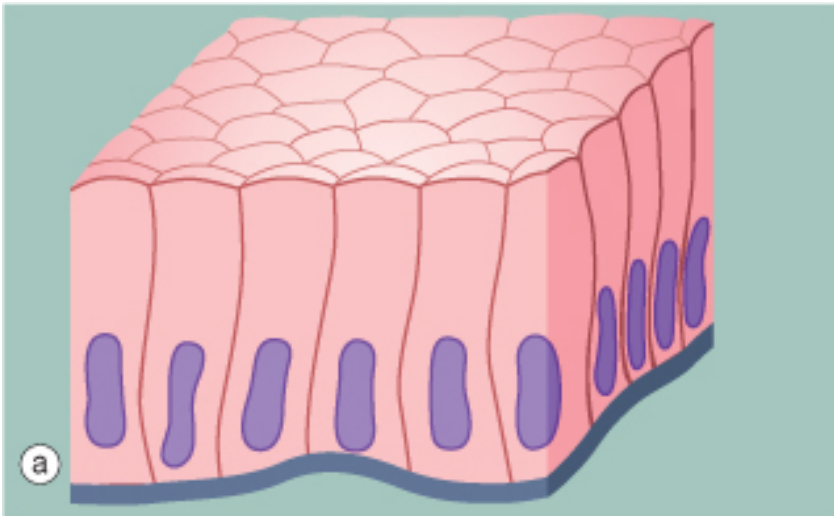
Simple cuboidal epithelium  
The epithelial cells appear square(四方形). The nucleus is usually round and located in the center of the cell.

Simple cuboidal epithelium in a collecting tubule of the kidney. Azan staining method  
這種上皮存在於腎臟的收集管。細胞的寬度和高度都約為  $10\ \mu\text{m}$ ，因此像四方形。



# 俱有微絨毛的單層柱狀上皮 (Simple columnar epithelium with microvilli)

這種上皮的細胞都是高柱狀，高度約20-30  $\mu\text{m}$ ，寬度約 5  $\mu\text{m}$ 。

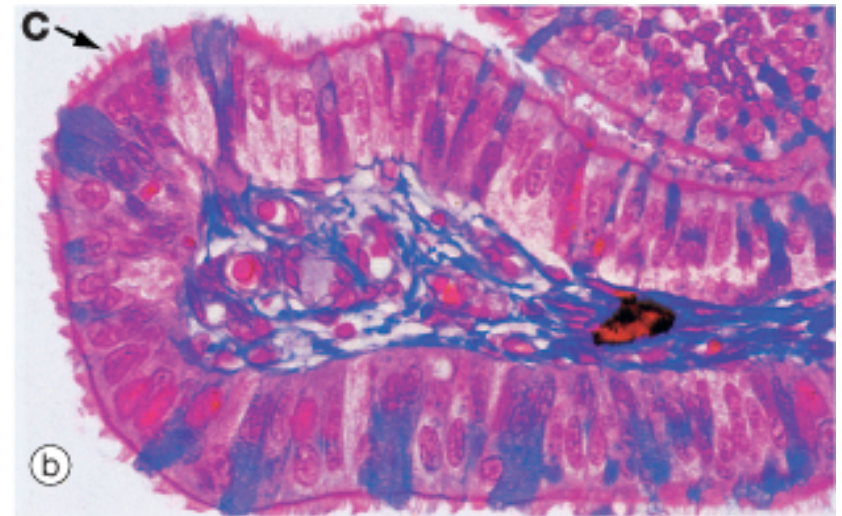
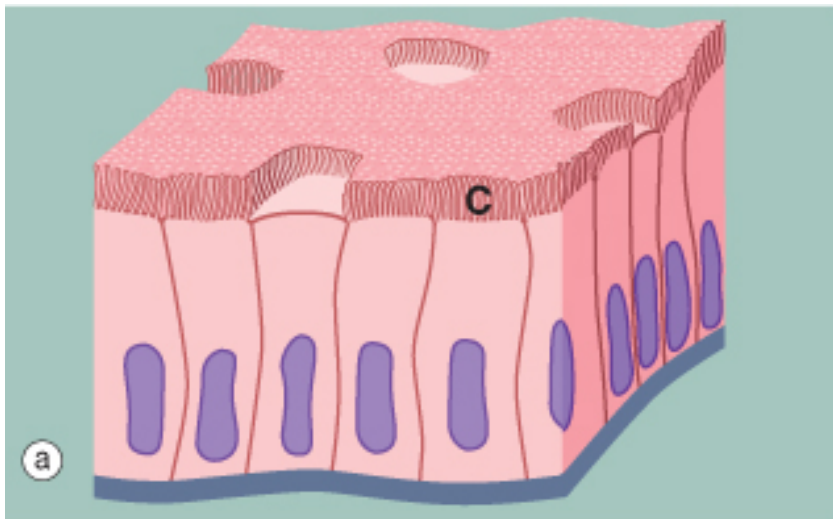


# Simple columnar epithelium with cilia

C, cilia

Cilia project from the apical surface of ciliated epithelial cells.

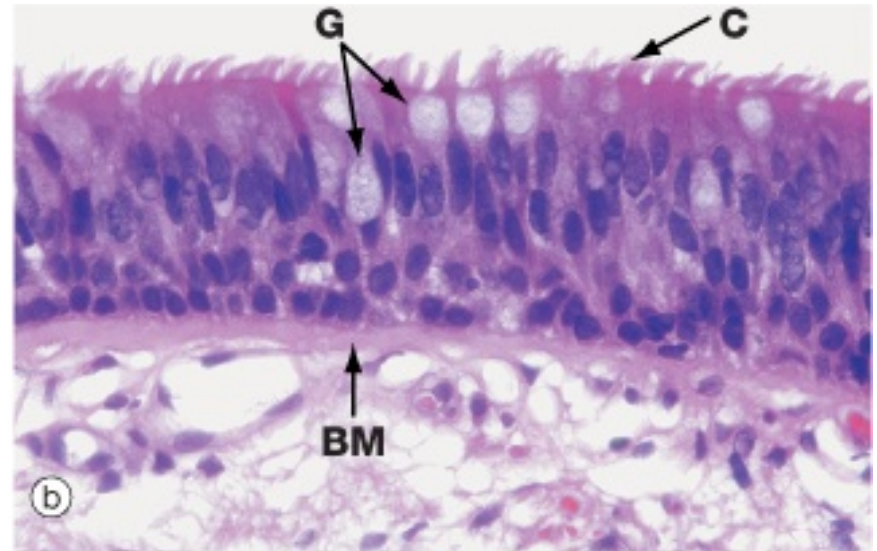
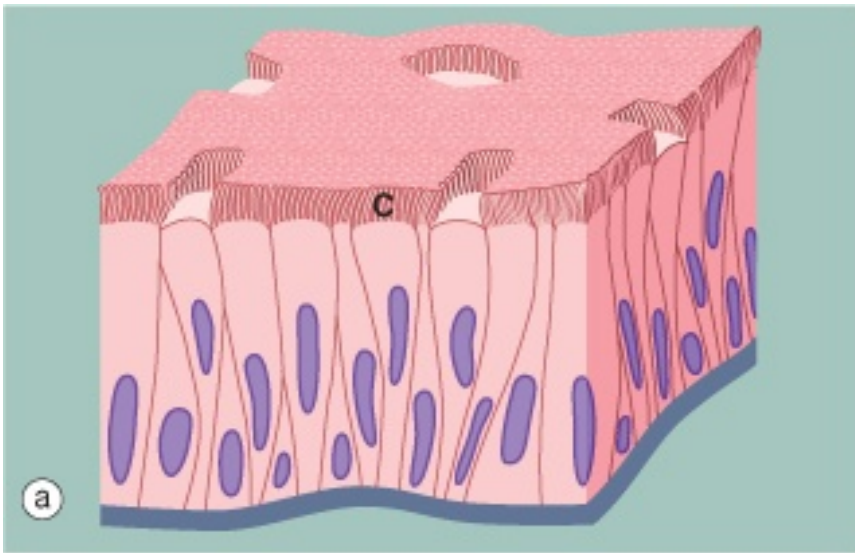
Ciliated cells of simple columnar epithelium of the oviduct





# Pseudostratified columnar ciliated epithelium

G, goblet cells  
C, ciliated cells

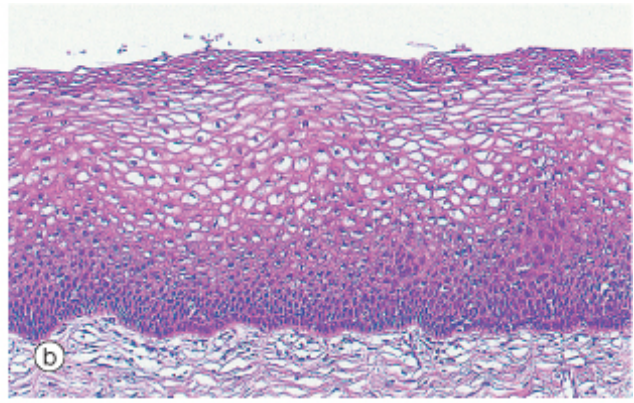
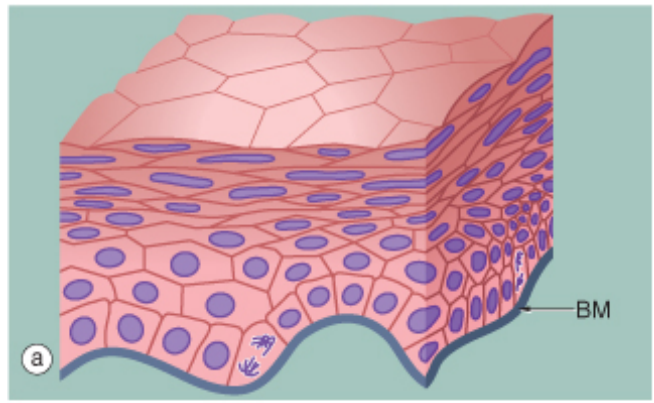


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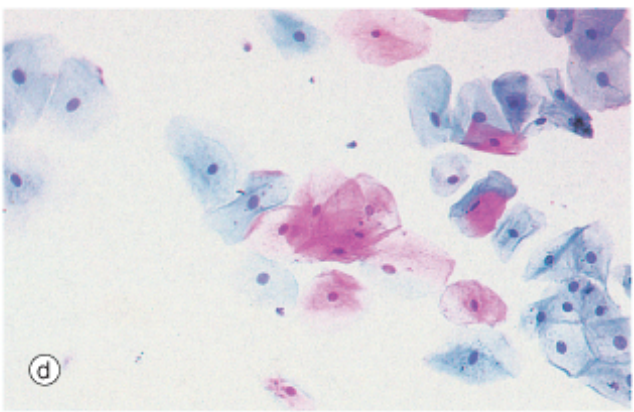
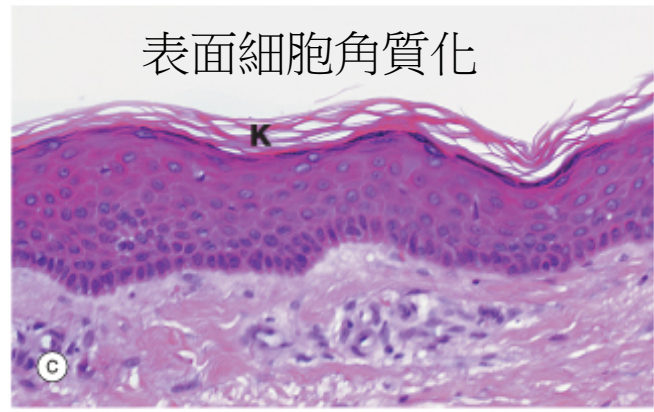
# Stratified squamous epithelium(複層鱗狀上皮) present in esophagus(食道), uterine cervix(子宮頸), **anus(肛門)** and skin (皮膚)

此上皮面最表面的細胞 是扁平鱗片狀，在底部的細胞 為四方形。

### Stratified squamous epithelium in uterine cervix



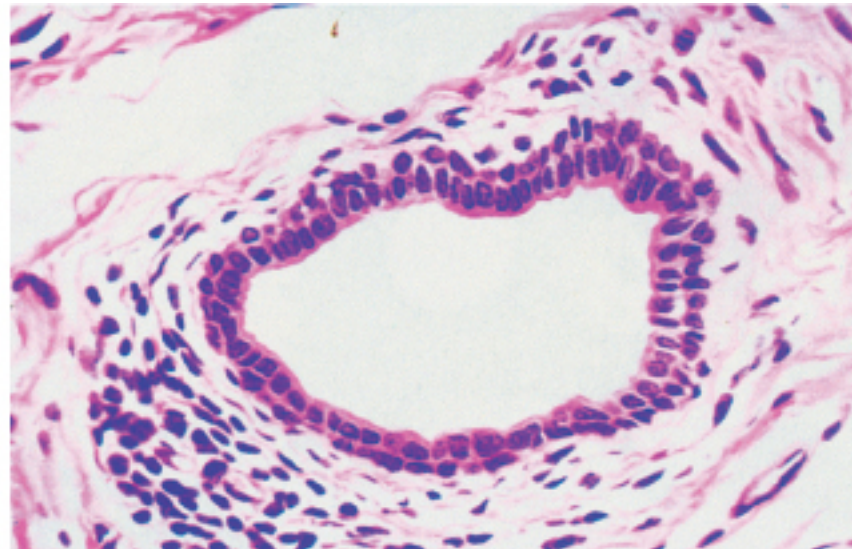
### Keratinizing stratified squamous epithelium in the skin



### 子宮頸抹片 Smear made from normal cells scraped from uterine cervix

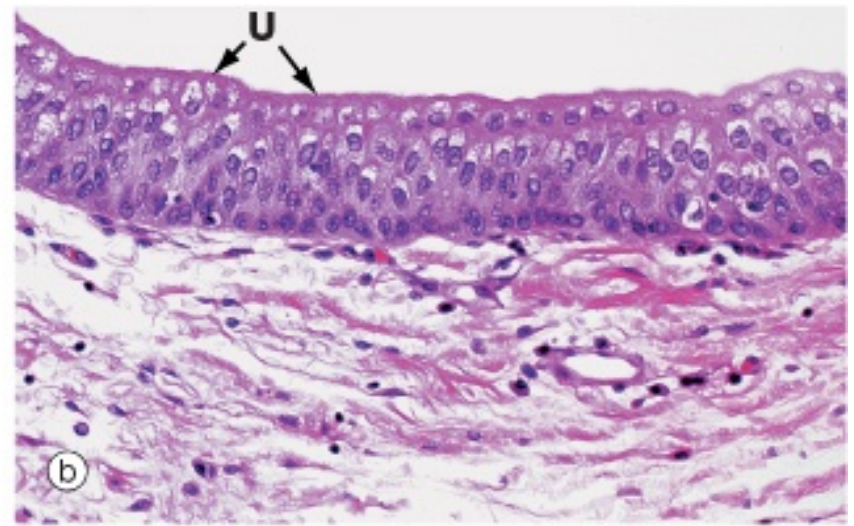
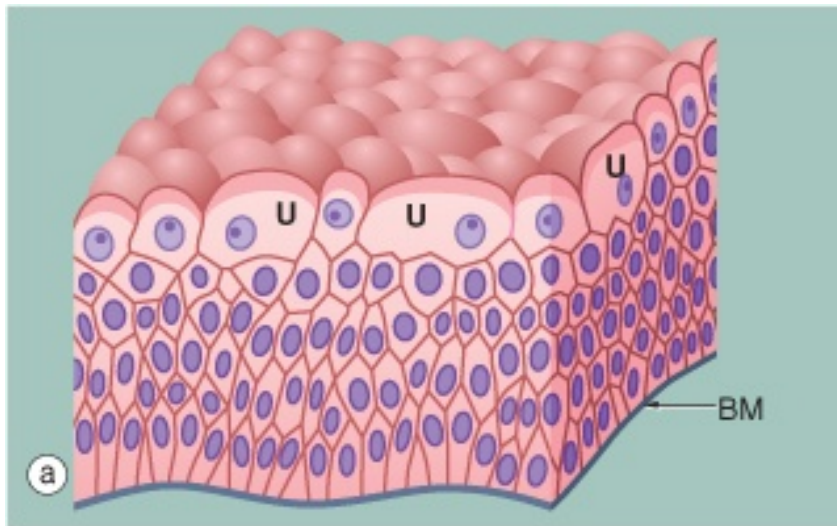
Stratified cuboidal epithelium  
is present in the duct of sweat gland

複層柱狀上皮存在於皮膚汗腺的管子





# Transitional epithelium present in the urinary bladder and ureter



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# 上皮特化結構 (Specializations of Epithelia)

- Intercellular Surfaces (細胞之間的表面)

The adjacent or lateral surfaces of epithelial cells are linked by cell junctions(細胞聯結) so that the epithelium forms a continuous, cohesive layer.

- Luminal Surfaces (管腔表面)

Three main types of specializations: cilia(纖毛), microvilli(微絨毛) and stereocilia(不動纖毛).

- Basal Surfaces(底部表面)

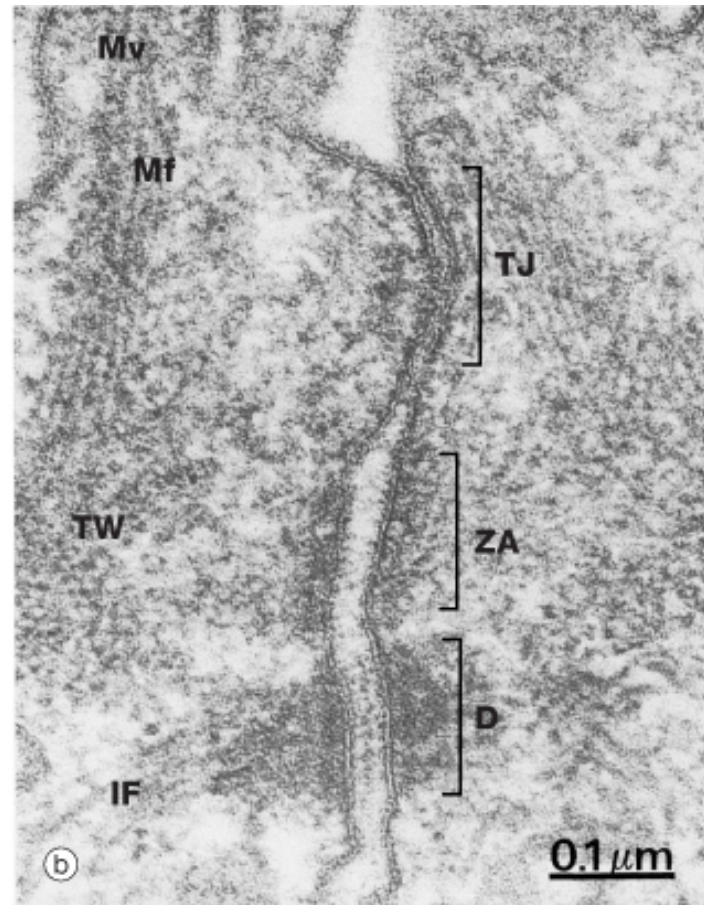
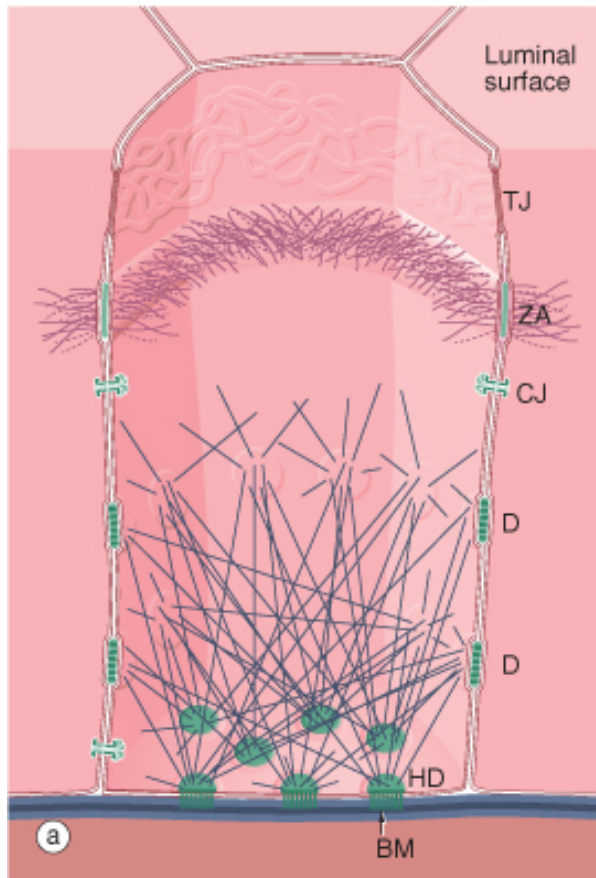
Basement membrane(基底膜)

Desmosomes (鍵結)

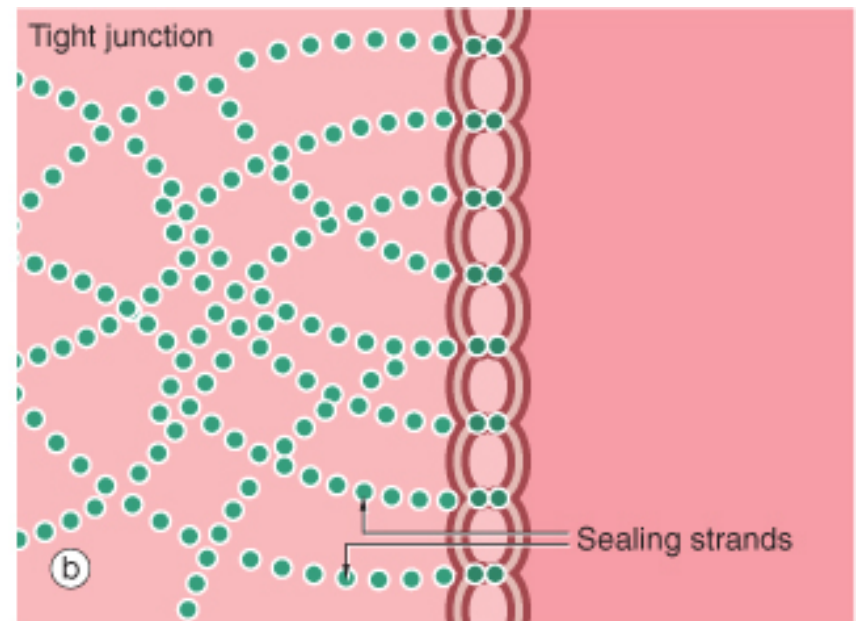
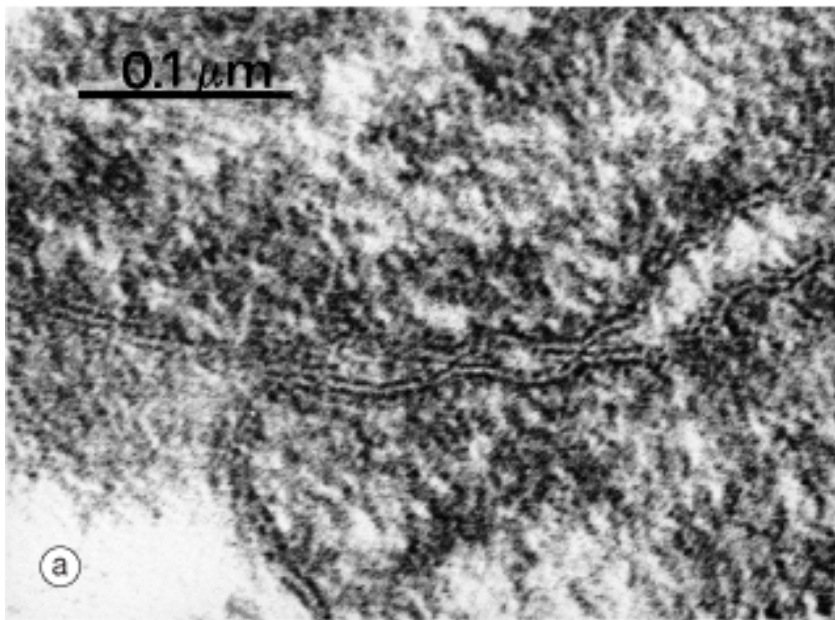
# Cell Junctions (細胞聯結)

- Tight junction (緊密聯結)
- Adhering belt (附著帶)
- Desmosome (鍵結)
- Hemidesmosome (半鍵結)
- Gap junction (隙聯結)

# Junctional Complexes (聯結複合體)

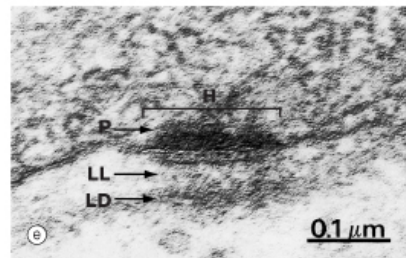
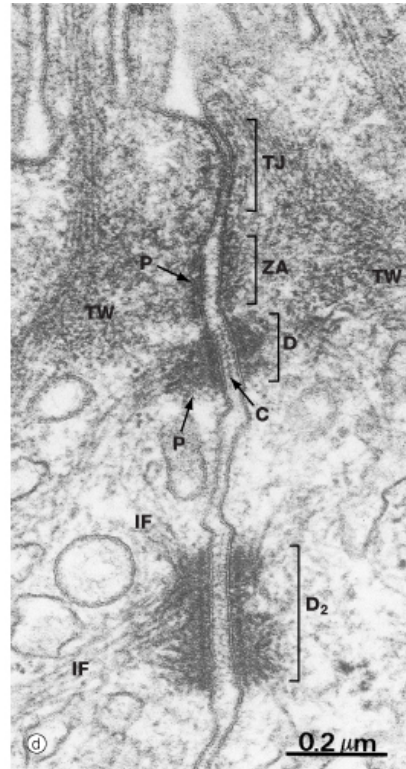
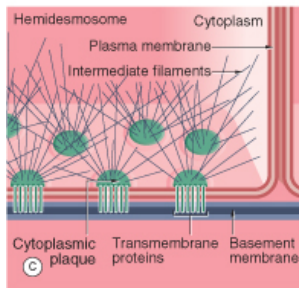
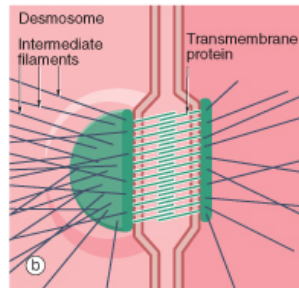
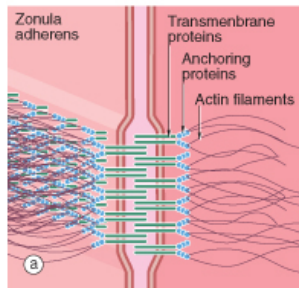


# Tight Junction



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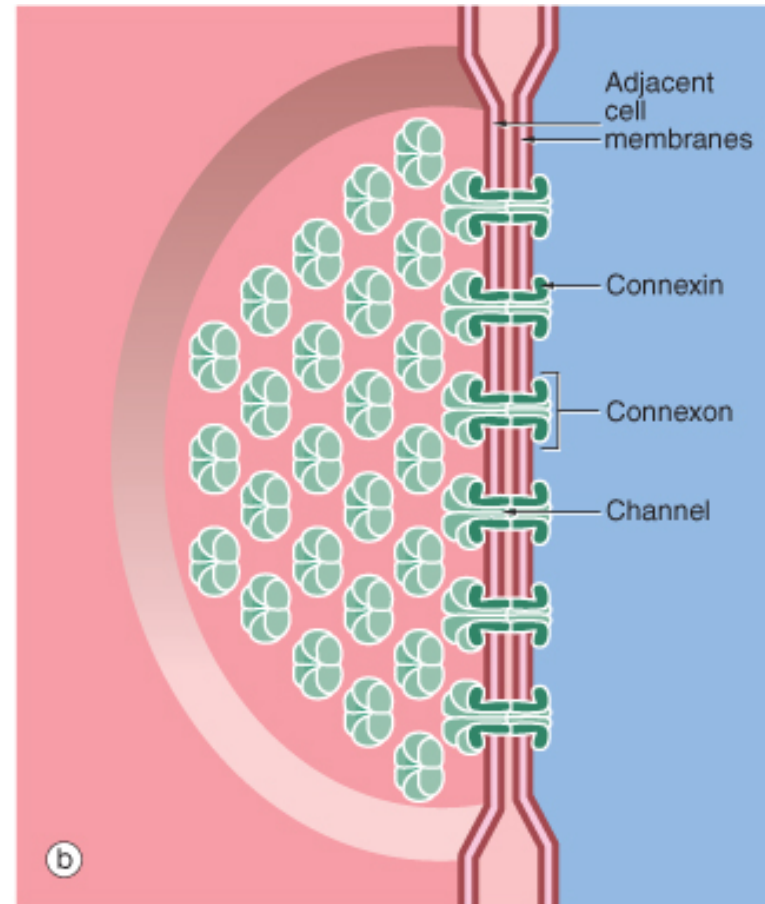
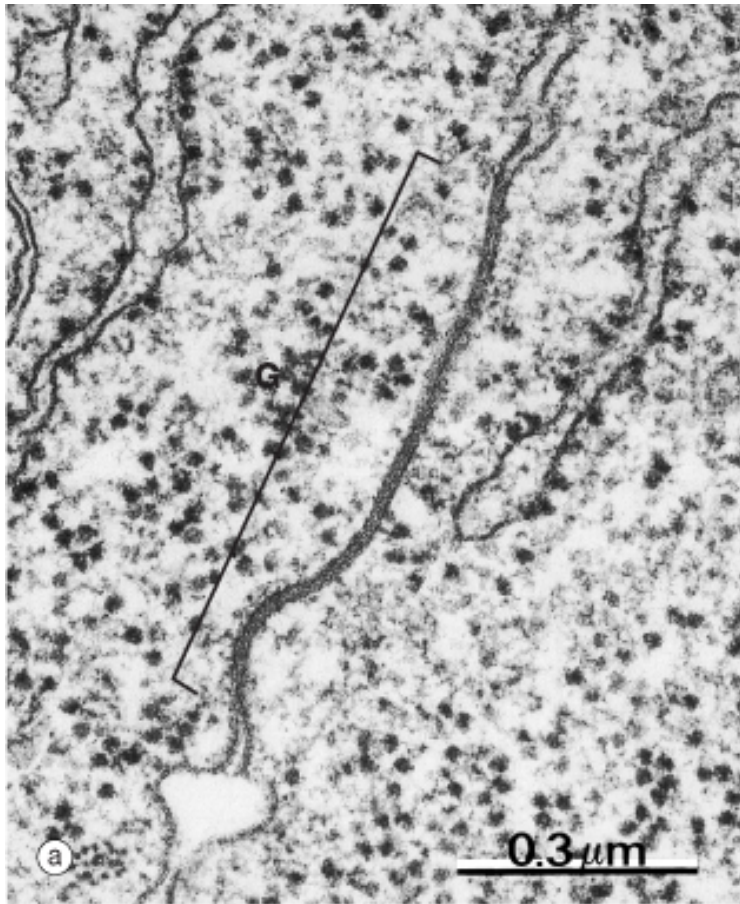
# Adhering Belt and Desmosome



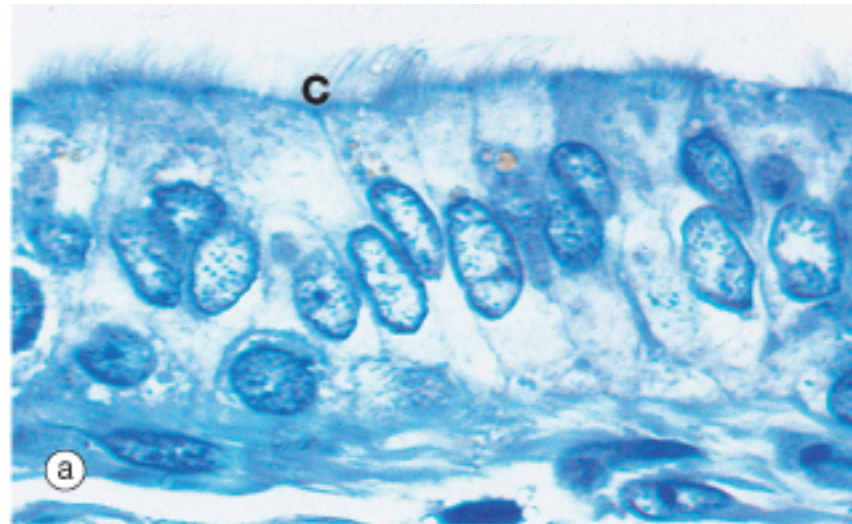


# Gap Junction

contains transmembrane ion channels  
(connexons)

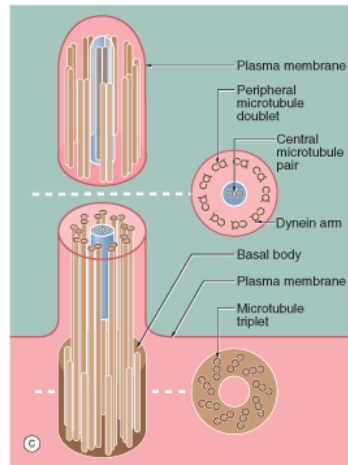


# Cilia



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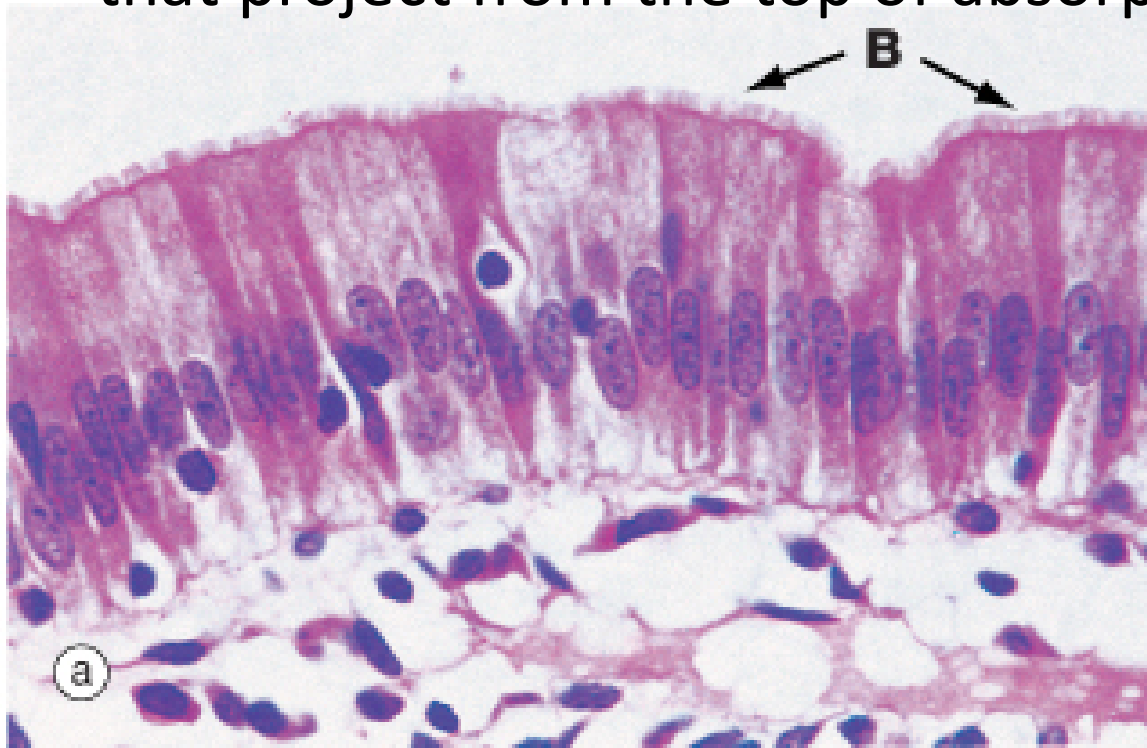
# Cilia



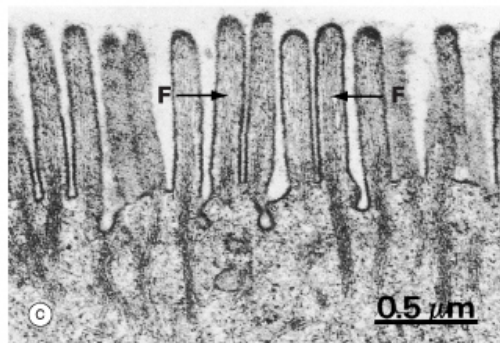
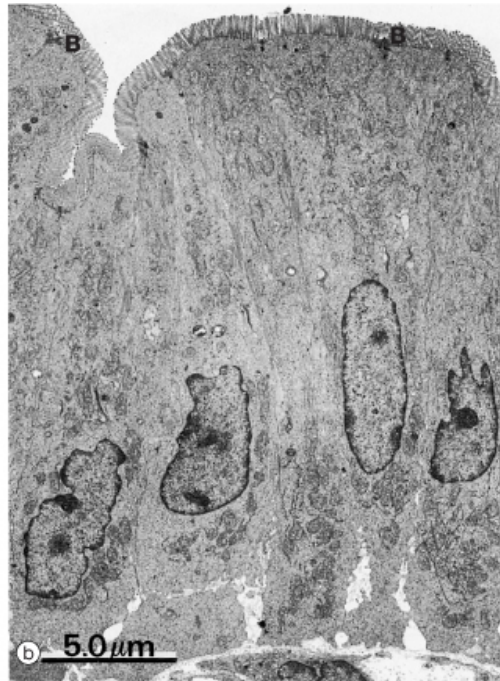


# Brush border (刷緣) of simple columnar epithelium in small intestine

Brush border of absorptive cells consists of microvilli. Microvilli are cytoplasmic processes that project from the top of absorptive cells.



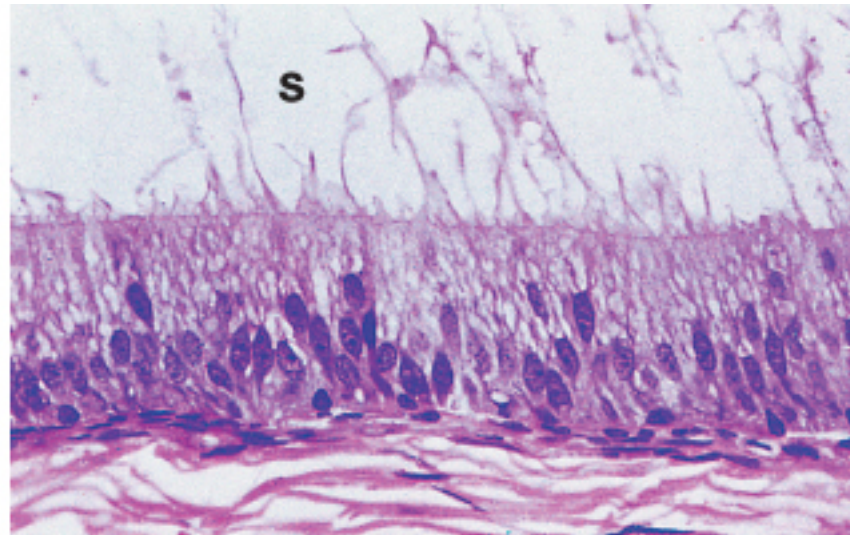
Electron micrograph showing microvilli on the top of columnar epithelial cells (absorptive cells)



柱狀上皮細胞  
最頂端的刷緣  
其實是微絨毛  
(microvilli)組成的

**Microvilli at  
higher  
magnification**

**Stereocilia (S) 不動纖毛**  
consists of long microvilli, not cilia



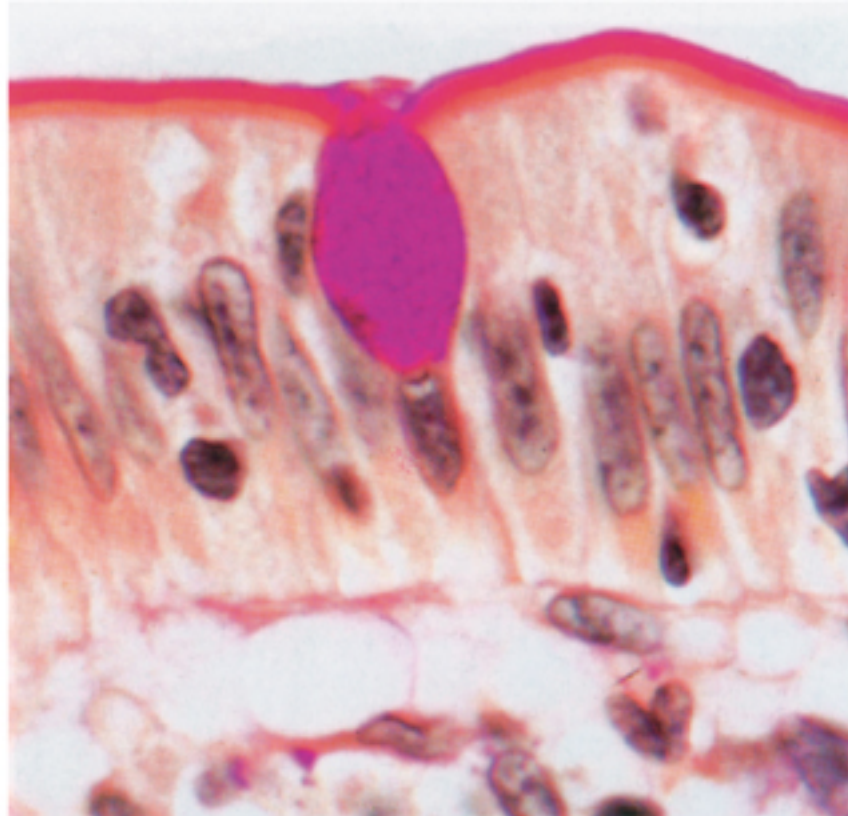
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# 分泌腺 (Glands)

- Unicellular Gland (單細胞腺)
- Multicellular Gland (多細胞腺)

Goblet cell is unicellular gland.

Goblet cell (杯狀細胞) is present in intestinal epithelium and airway epithelium.



# Electron micrograph showing goblet cells.



# Multicellular Glands

- Exocrine glands 外分泌腺
- Endocrine glands 内分泌腺

# Morphology of exocrine glands

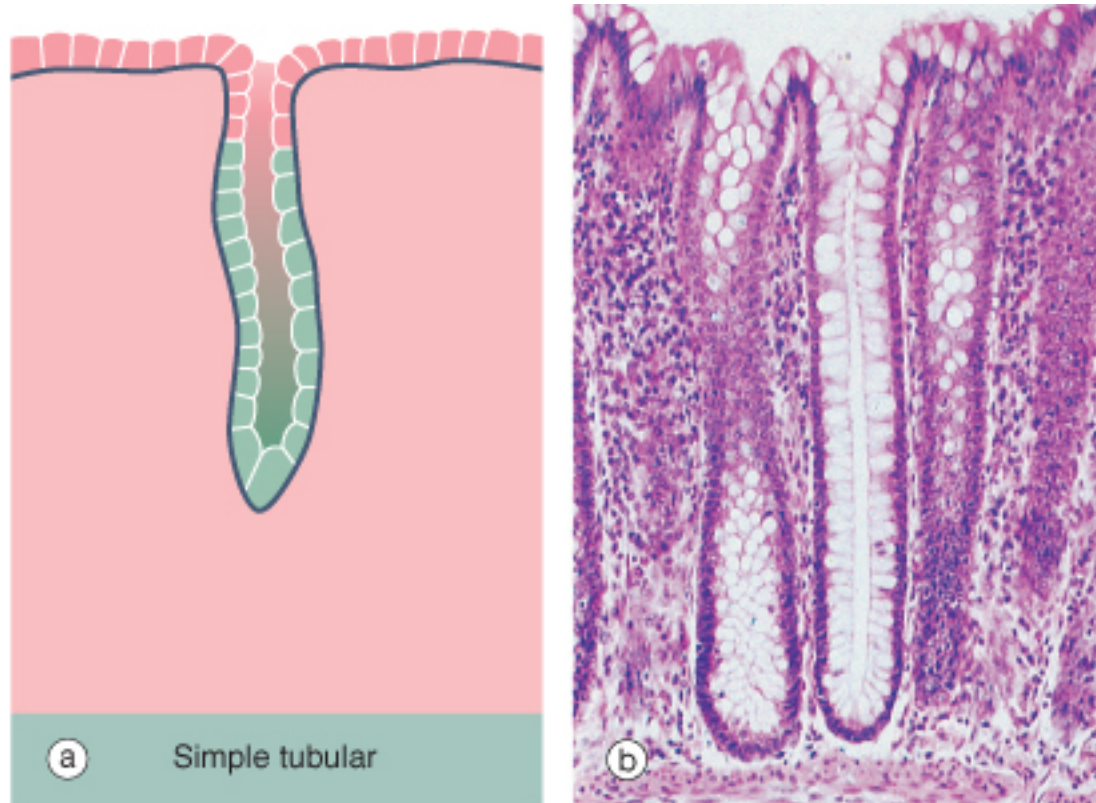
- The duct system
  - (1) Simple gland (單純腺) with unbranched duct
  - (2) Compound gland(複合腺) with branched ducts
- The secretory component may be tubular or acinar. 分泌部有的呈管狀(tubular)，有的是泡狀(acinar)。



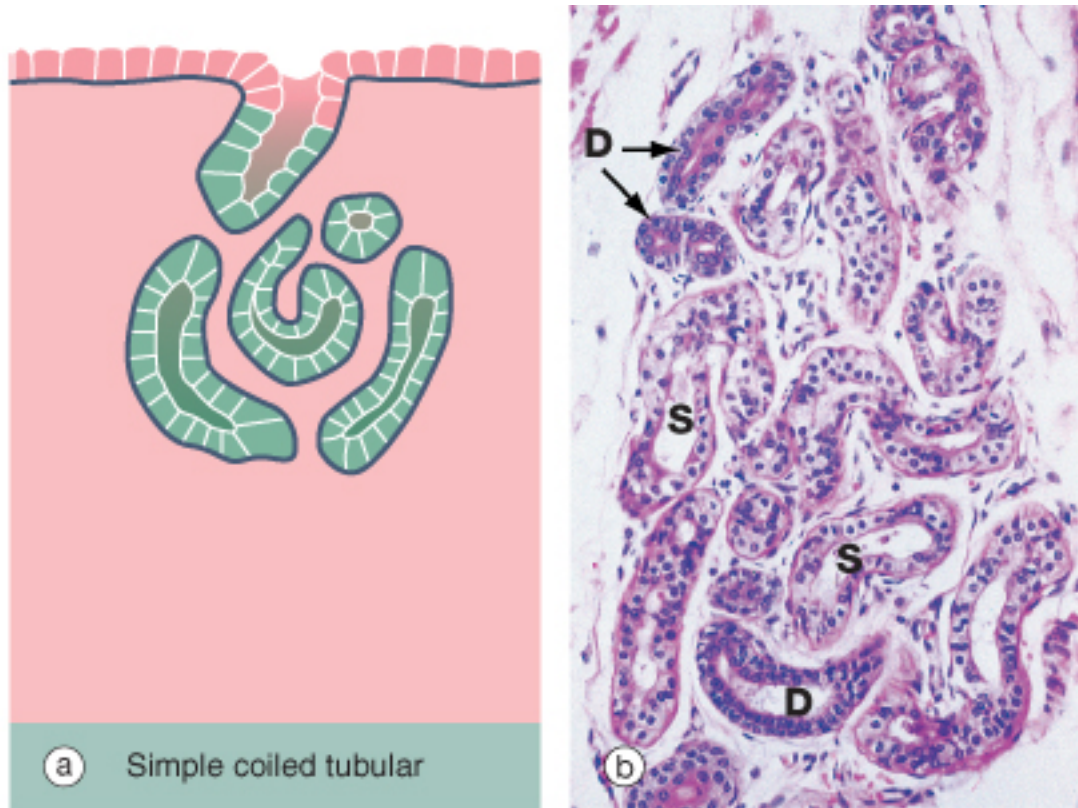
# The means of secretion by secretory cells 分泌細胞的分泌方式

- Merocrine (ecrine) secretion (胞吐分泌方式)
- Apocrine secretion (頂端分泌方式)
- Holocrine secretion (全分泌方式)

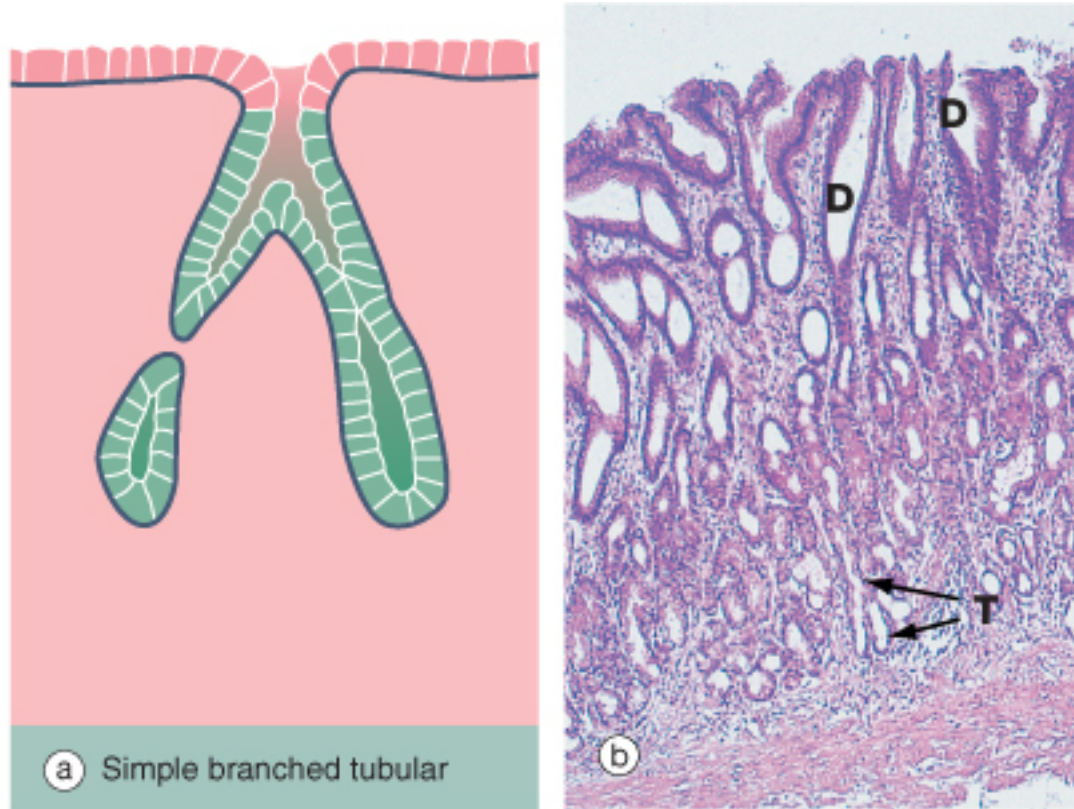
# Simple tubular gland



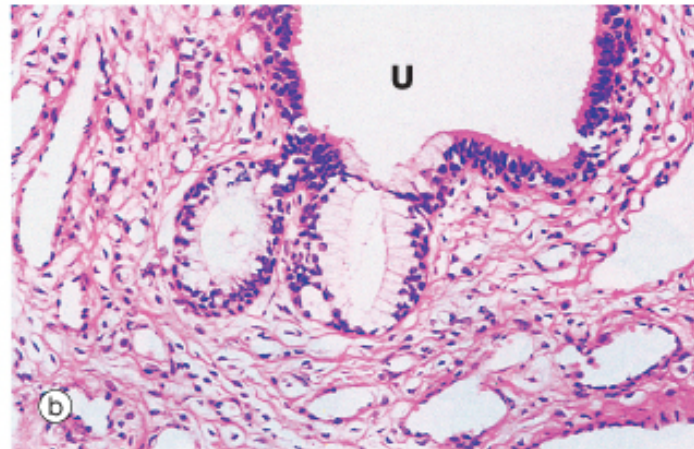
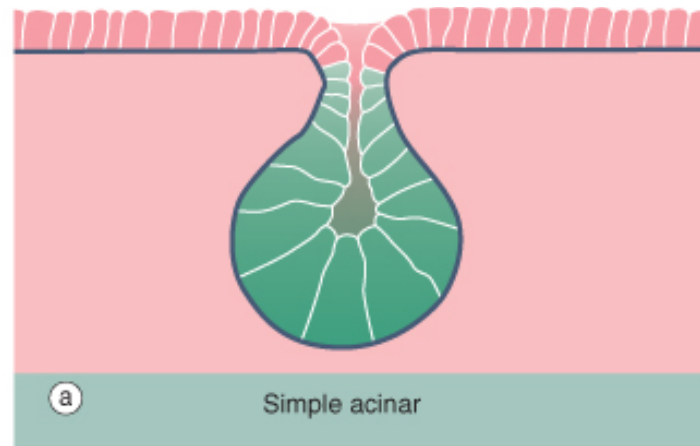
# Simple coiled tubular gland



# Simple branched tubular gland

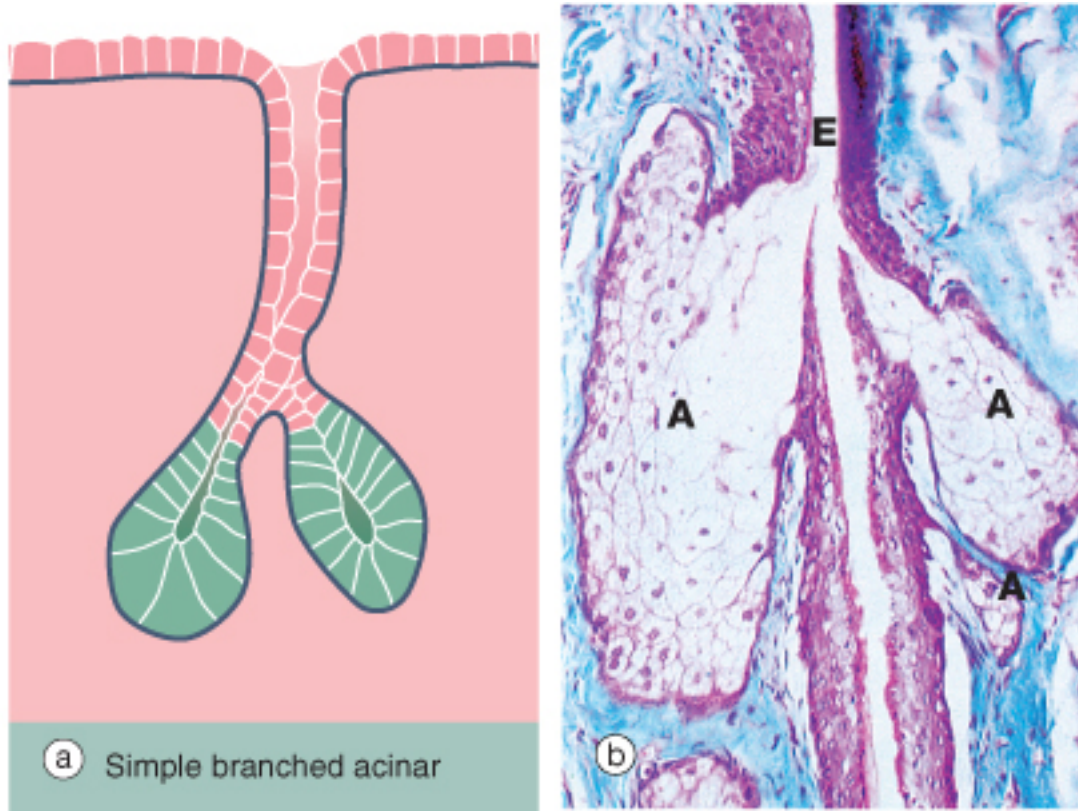


# Simple acinar gland

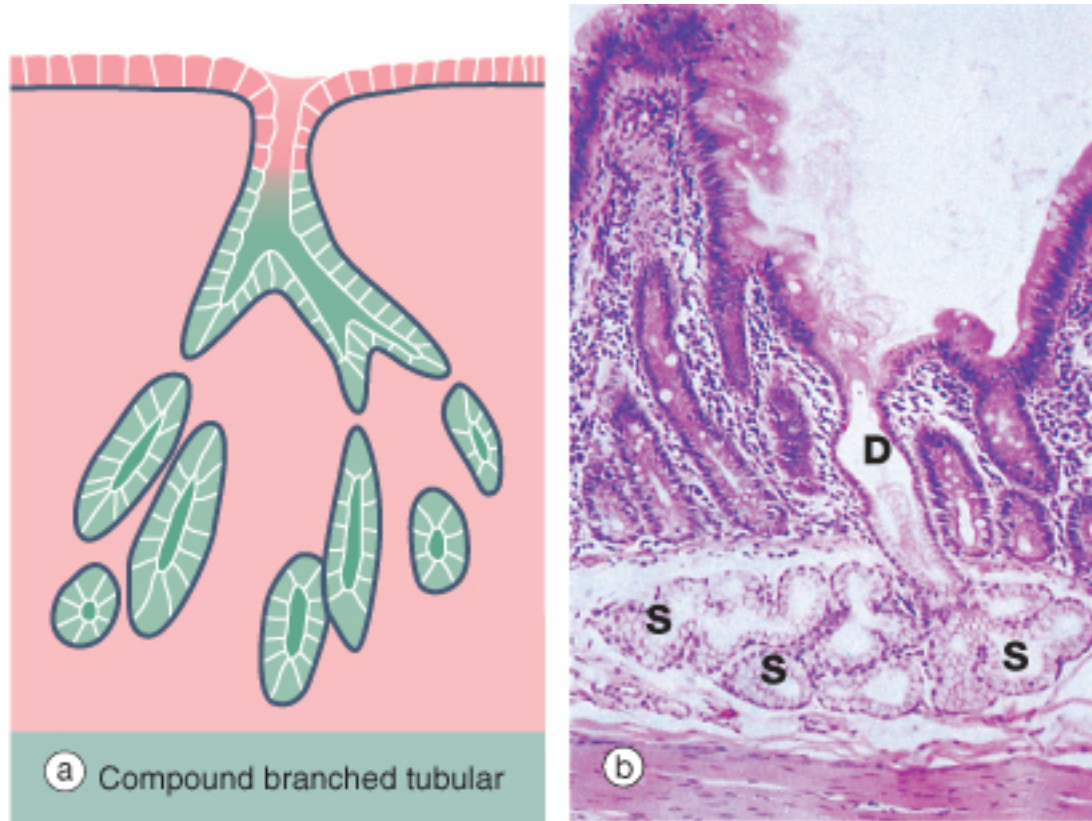




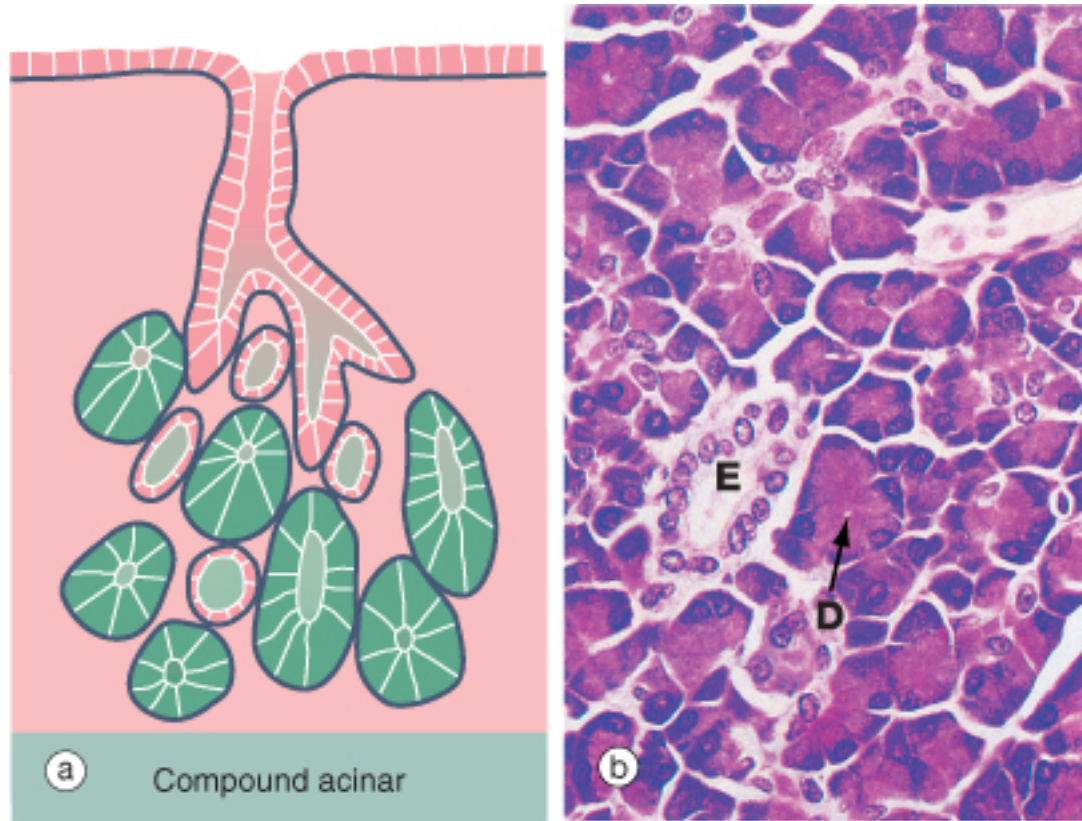
# Simple branched acinar gland



# Compound branched tubular gland

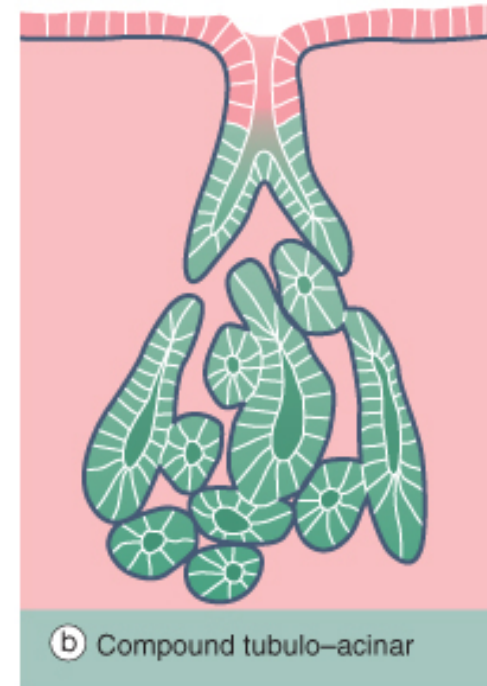
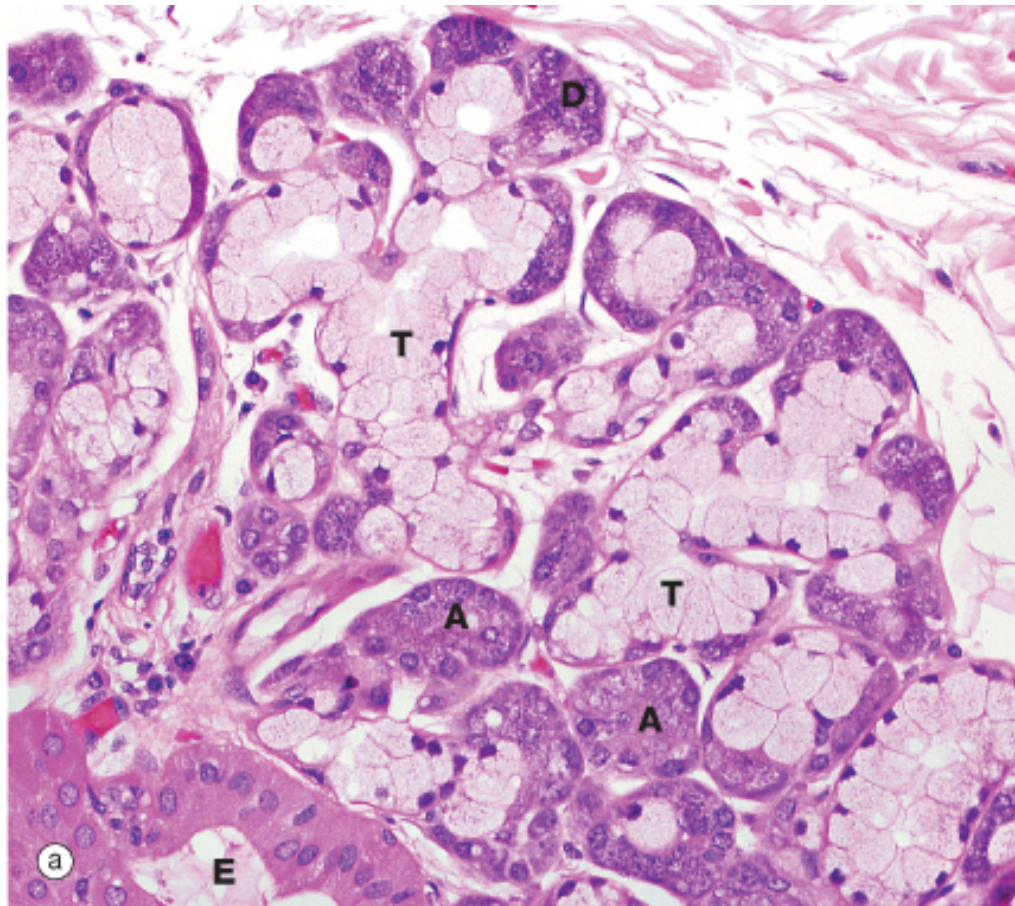


# Compound acinar gland





# Compound tubulo-acinar gland

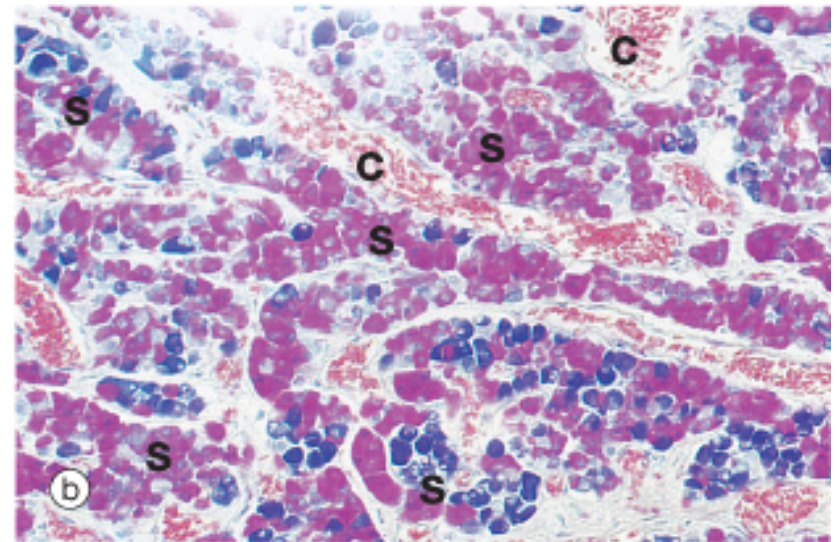
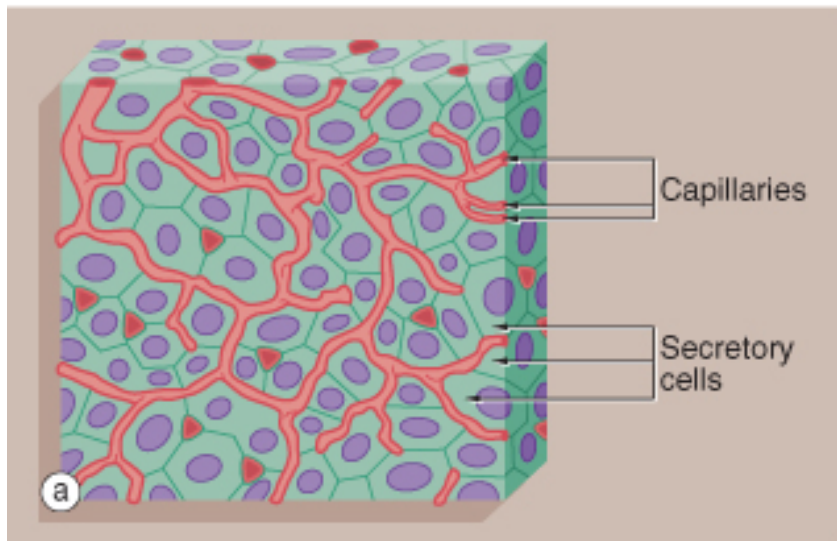


# Endocrine gland (ductless gland)

S, secretory cells

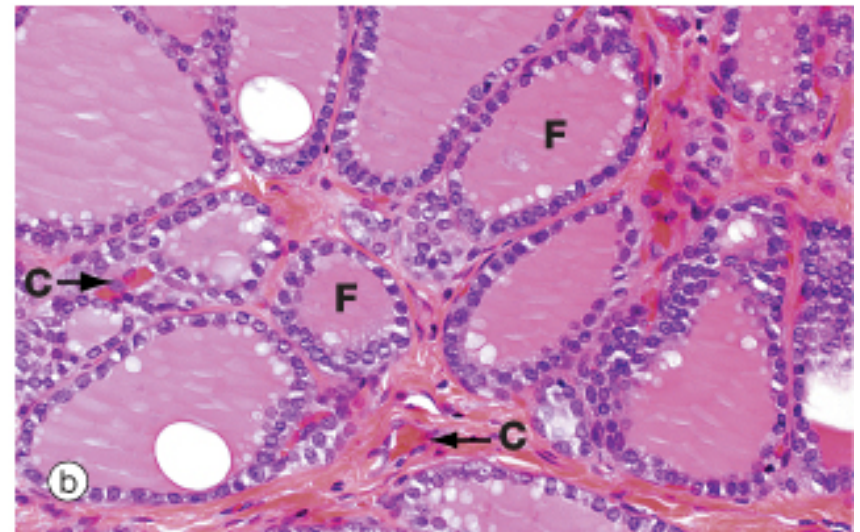
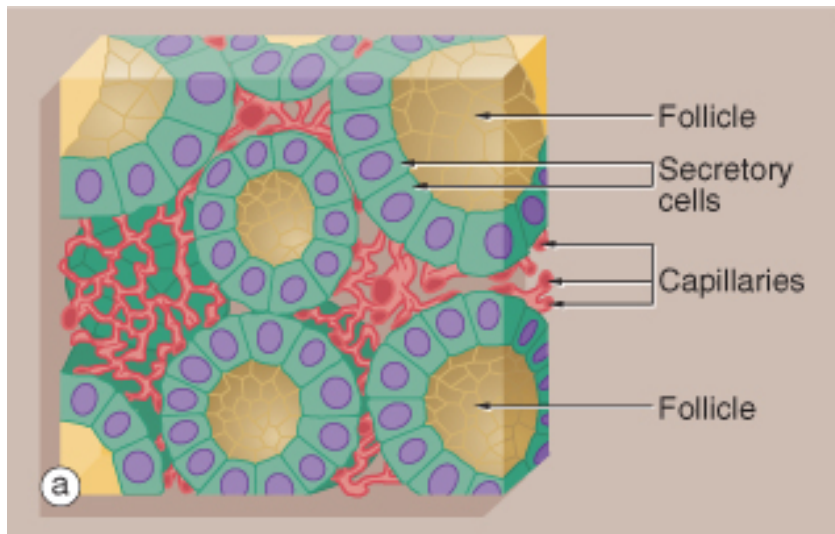
C, capillary

Anterior lobe of pituitary gland



# Follicular endocrine gland

## Follicles of thyroid gland



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