

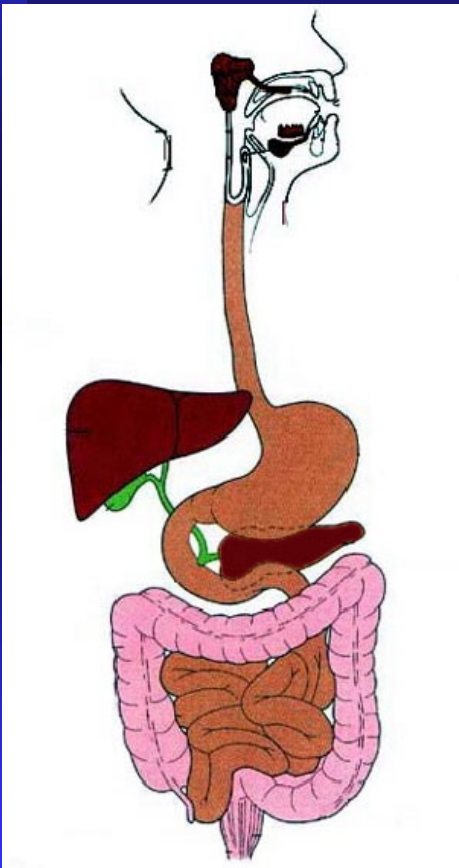
# Digestive System

## —Digestive Tract

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# *Introduction of digestive system*



\* a long tube extending from the mouth to the anus, and associated with glands.

\* its main function:

*-digestion: physical/chemical*

*-absorption*

\* three major sections

*-the oral cavity including oropharynx*

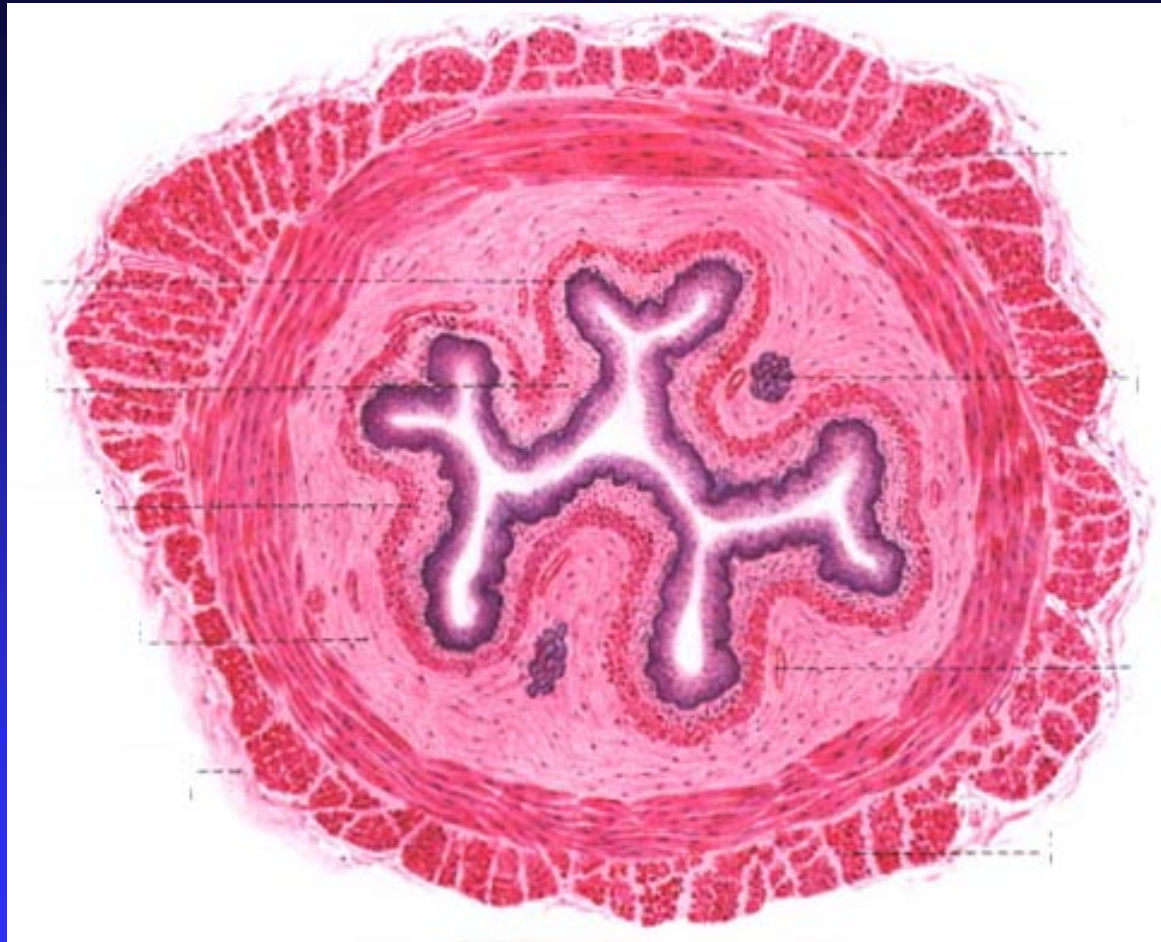
*-the tubular digestive tract*

*-the major digestive glands:*

*salivary glands,*

*pancreas,*

*liver,*



the general structure of the digestive tract

# I . General Structure of the Digestive Tract

## 1. mucosa

(1) epithelium: stratified squamous epithelium in two ends, the rest simple columnar epithelium

(2) lamina propria: loose connective tissue rich in glands, lymphoid tissue and blood vessel

(3) muscularis mucosa: thin layer of smooth muscle cells (inner circular and outer longitudinal )

2. Submucosa: CT, esophageal glands and duodenum glands, submucosa(Meissner) nerve plexus
3. muscularis: inner circular and outer longitudinal smooth muscle cells  
myenteric nerve plexus
4. Adventitia:  
fibrosa or serosa

## II. The Oral Cavity

1. General Structure of Mucosa of Oral Cavity

2. tongue: mucosa and tongue muscle ( skeletal muscle)

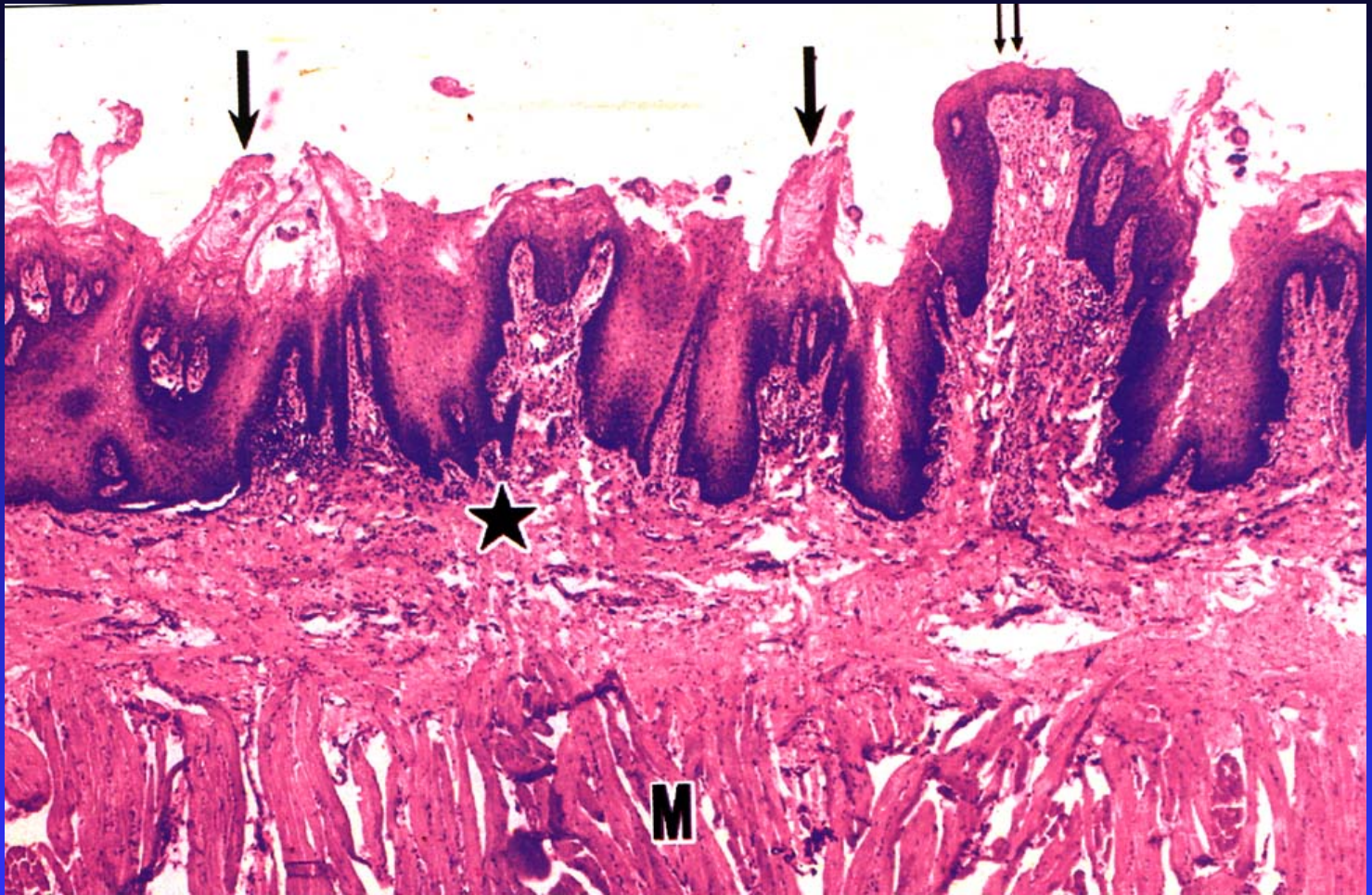
- lingual papillae

- (1) filiform papillae

- (2) fungiform papillae

- (3) circumvallate papillae



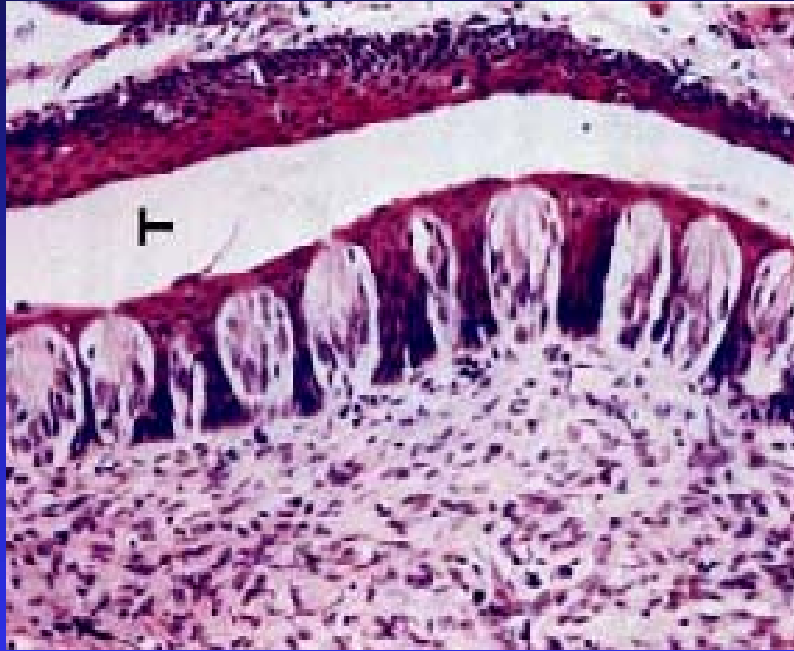


lingual papillae

# Taste Bud

- taste sensory apparatus
- Three kinds of cells in HE:
  - dark cells and light cells  
(taste cells)
  - basal cells



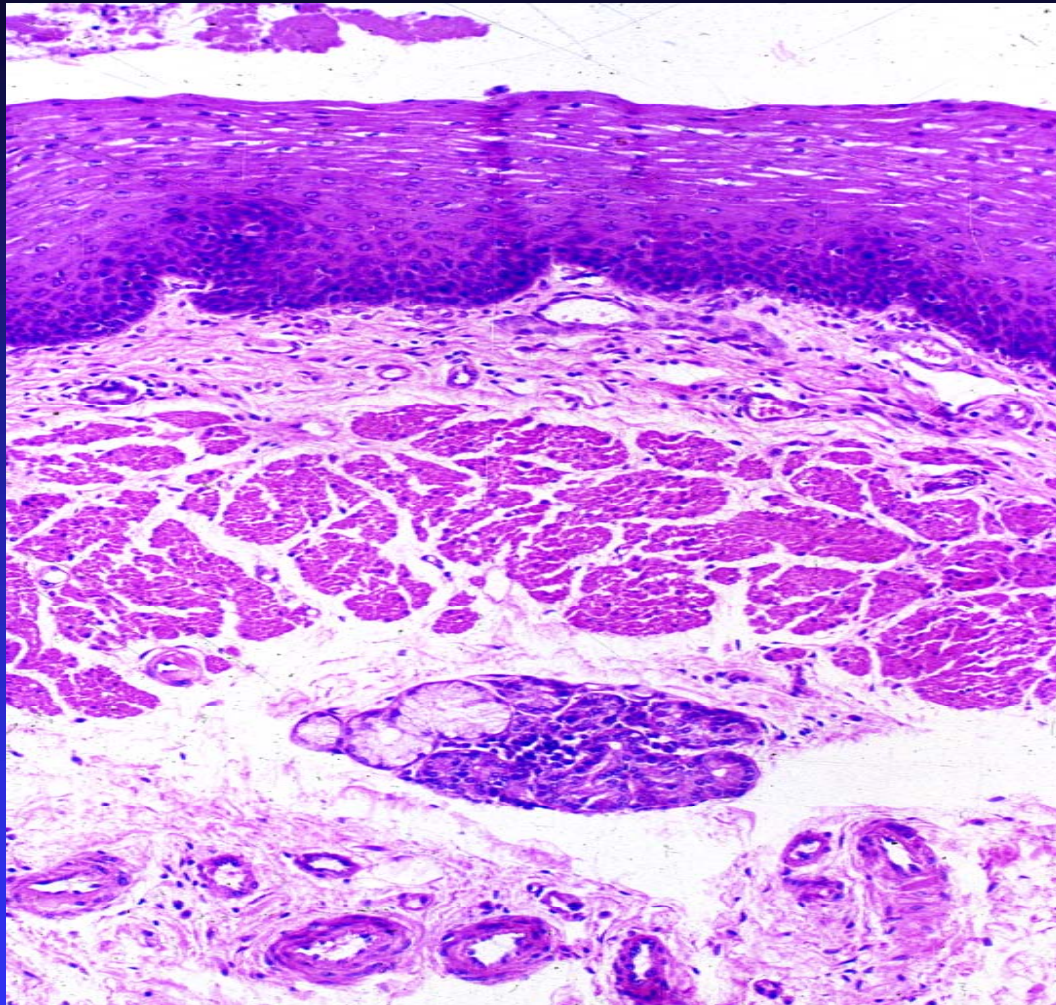


Taste bud

# III. Esophagus

longitudinal plica

1. mucosa: unkeratinized stratified squamous epithelium
2. muscularis mucosa: longitudinal bunches of smooth muscle cells



**Esophagus**

### 3. Submucosa:

CT, esophageal glands and lymphoid tissue in it

### 4. muscularis: internal circular and external longitudinal muscle

proximal end: skeletal muscle cells

distal end: smooth muscle cells

mid portion: mixture muscle cells

### 5. Adventitia: fibrosa

## **IV Stomach**

**gastric area, gastric pits**

### **1. mucosa**

#### **(1) epithelium:**

**surface mucous cell:**

**LM:**

**Function: producing mucous with high concentration of  $\text{HCO}_3^-$**

#### **(2) lamina propria:**

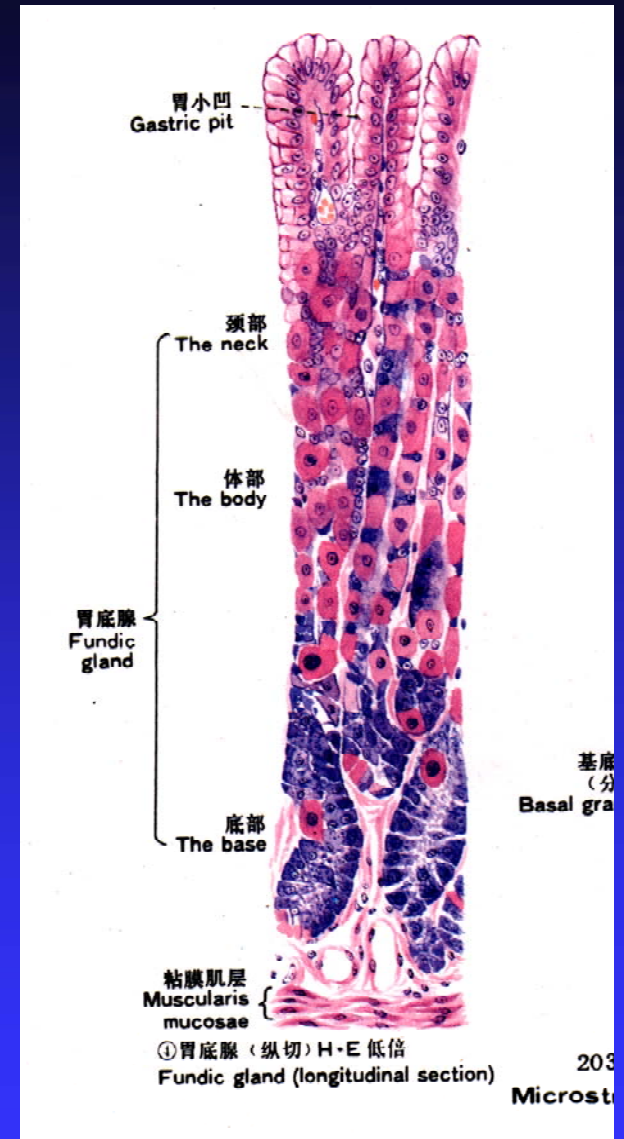
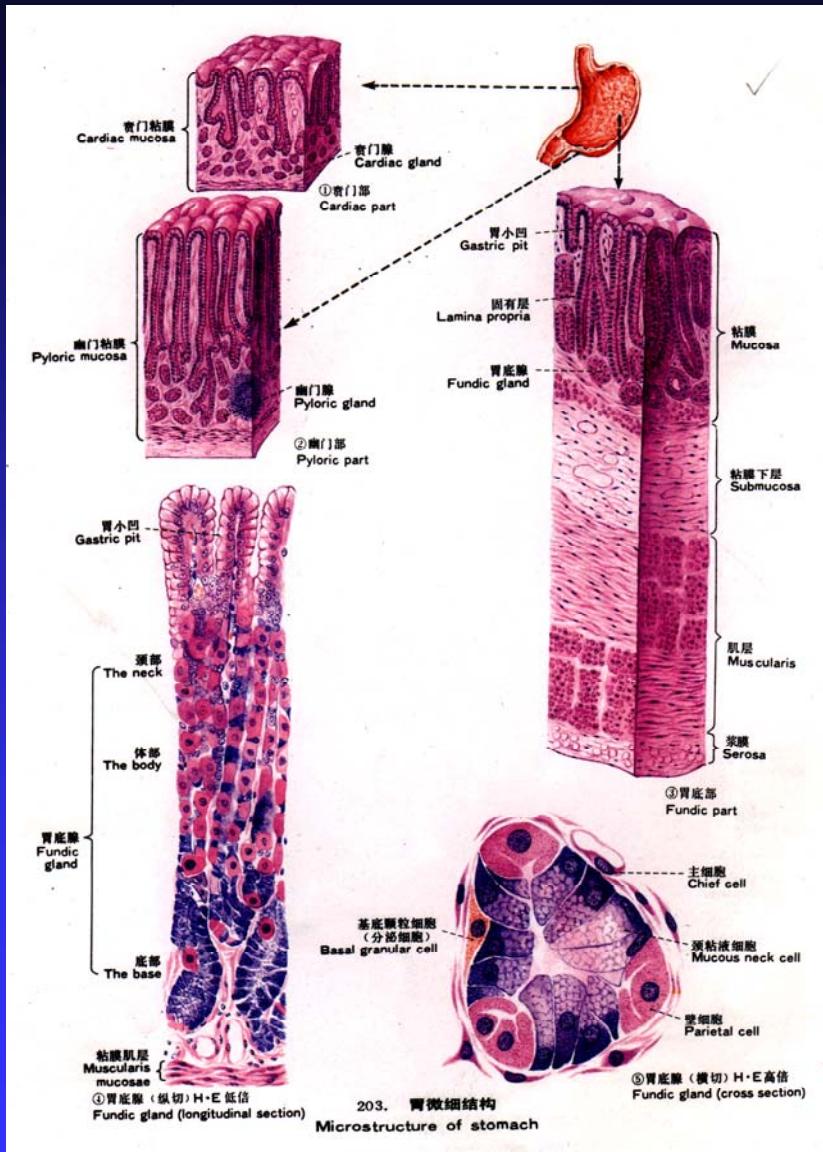
**fundic glands, cardiac glands and pyloric glands,**





**gastric pit**





# Stomach

## ■ Fundic glands

The organization:

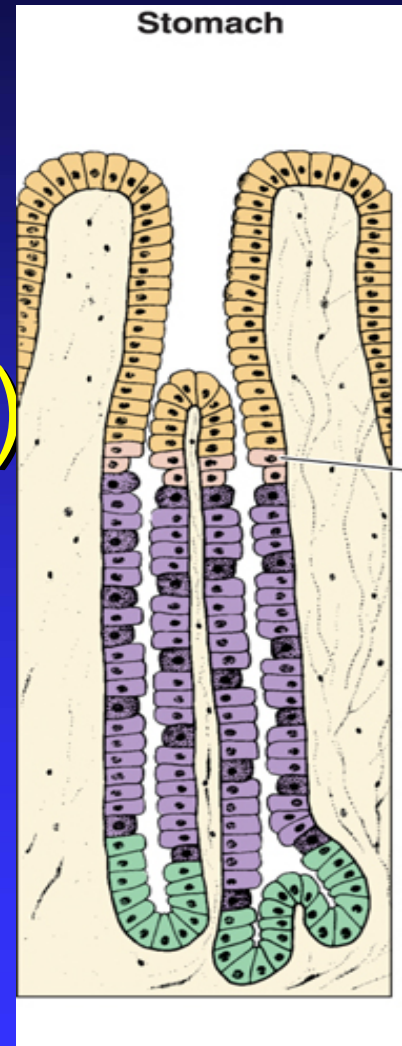
parietal cells (oxyntic cells)

chief cells (zymogenic cells)

mucous neck cells

stem cells

endocrine cells

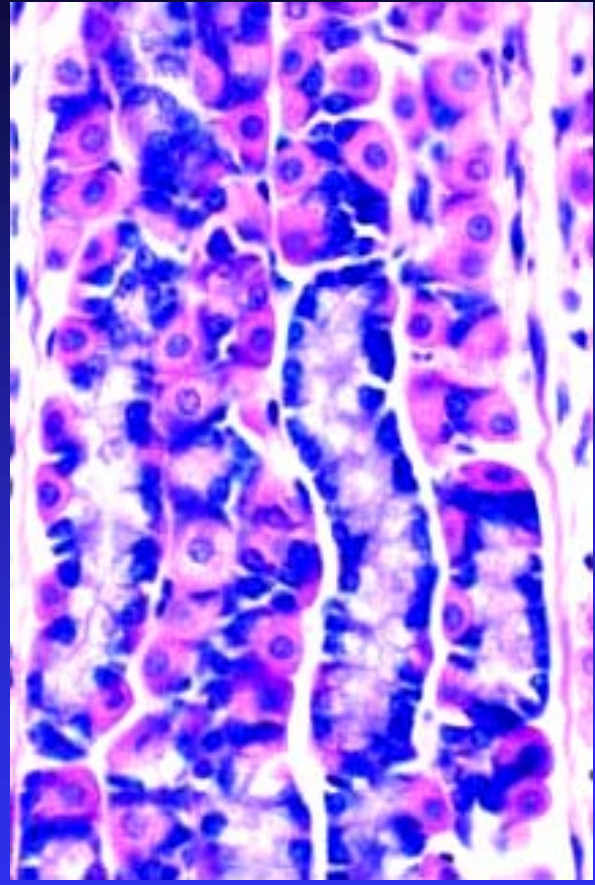


# ① Parietal Cells

So called oxyntic cells

LM: see Fig. EM:

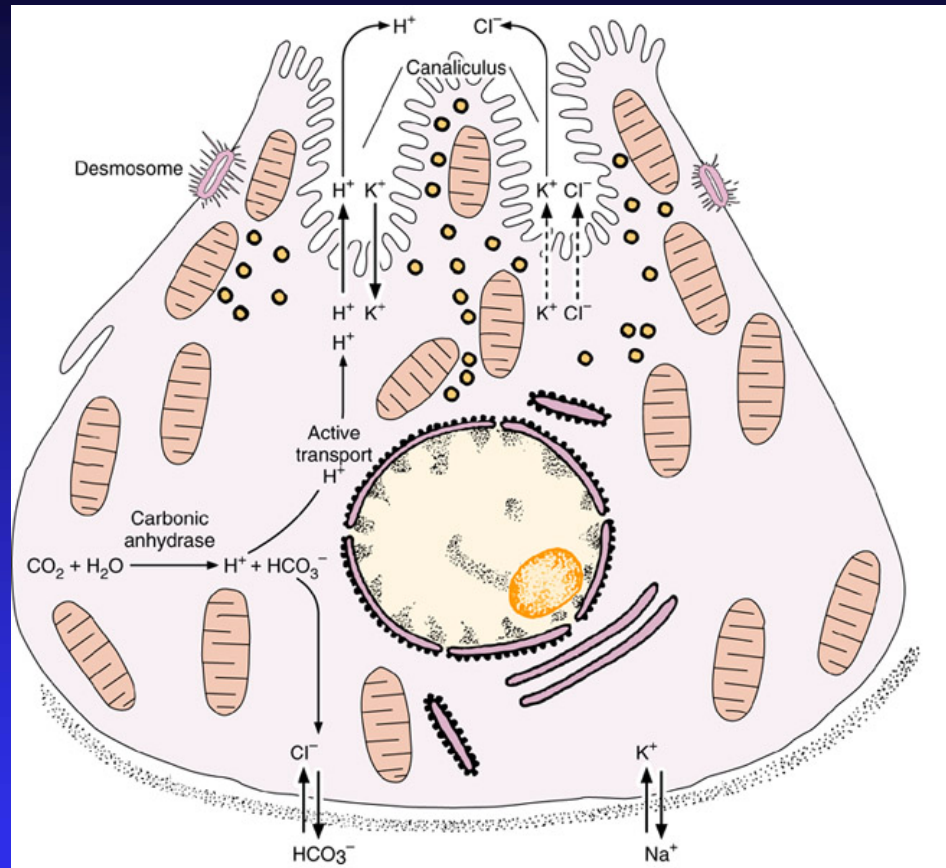
- ① intracellular secretory canaliculus
- ② microvillus
- ③ tubulovesicular system
- ④ mitochondria



**Fundic glands**







Function: HCl and intrinsic factor  
 For example:



## ② Chief cells (zymogenic cells)

LM:

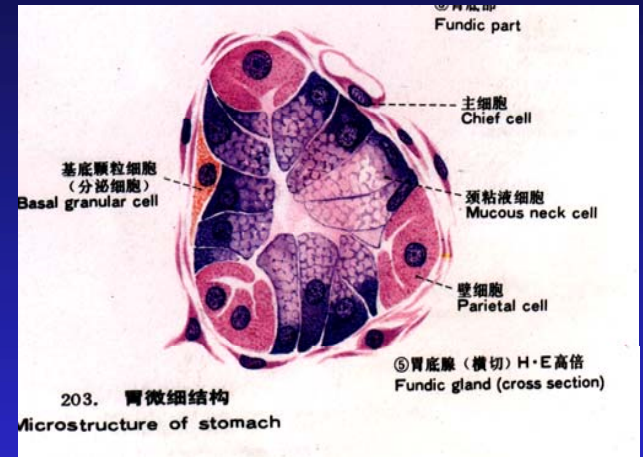
EM:

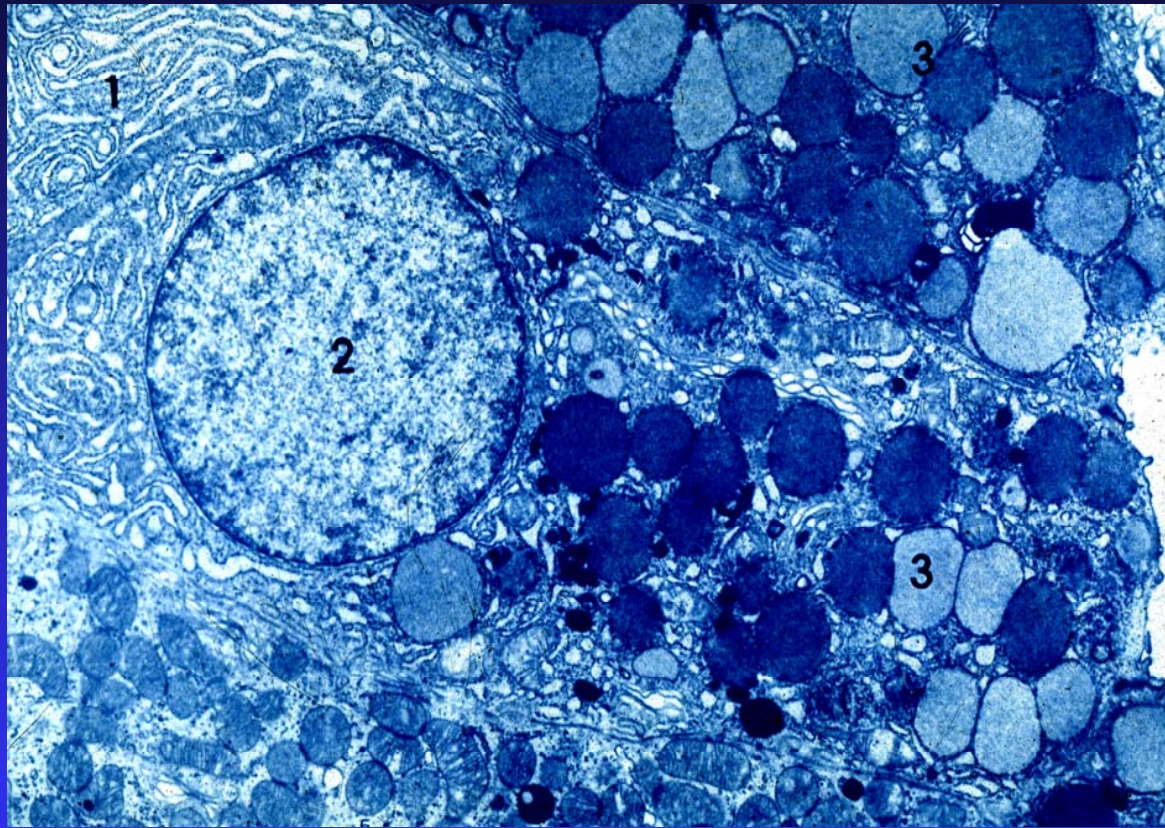
Function:

secreting pepsinogen

HCl  
→ → pepsin

Rennin





**Chief cells in EM**

### ③ Neck mucous cells

LM: see Fig.

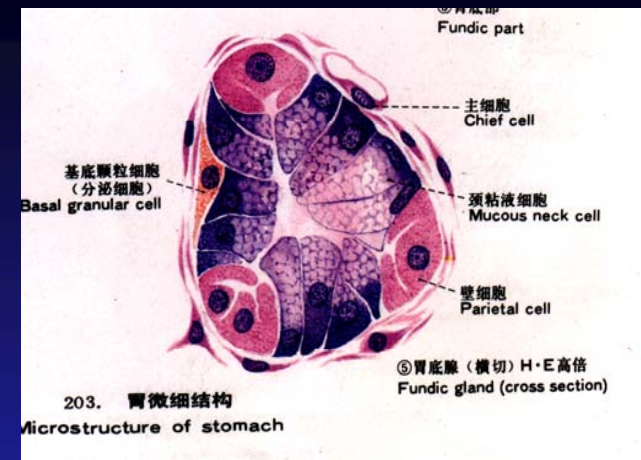
Function: secreting acidic mucous

### ④ stem cells:

### ⑤ endocrine cells: ECL cells

(secreting histamine to promote producing HCl) D cells

(secreting somatostatin to inhibit parietal cells of function)



Cardiac gland: mucous type

Pyloric gland: mucous type, more numerous G cells in it secreting gastrin to promote producing HCl

Gastric fluid: 1.5-2.5L, pH 1.5

Mucous- $\text{HCO}_3^-$  barrier:  
undissolved mucin gel with large amount of  $\text{HCO}_3^-$

2. Submucosa

3. muscularis:

internal sublayer: oblique smooth muscle cells

middle sublayer: circular smooth muscle cells

external sublayer: longitudinal smooth muscle cells

4. adventitia: serosa

# V. Small Intestine

To be divided into three parts:

duodenum

jejunum

ileum

Function:

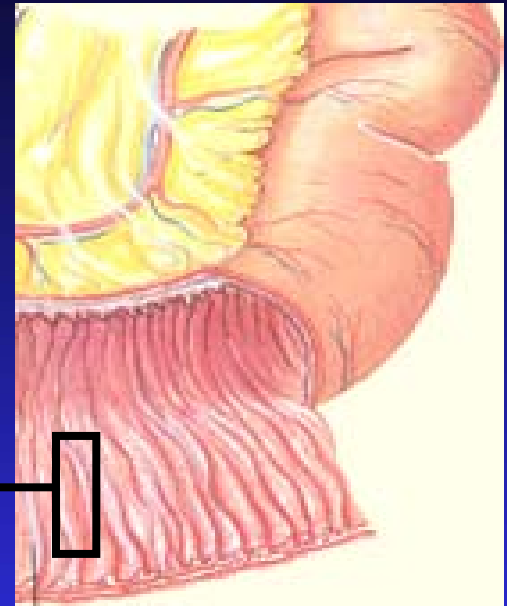
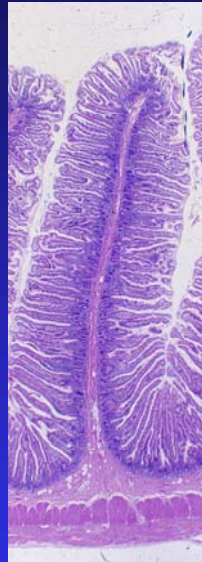
- \*digestion

- \*absorption

- \*secreted certain hormones

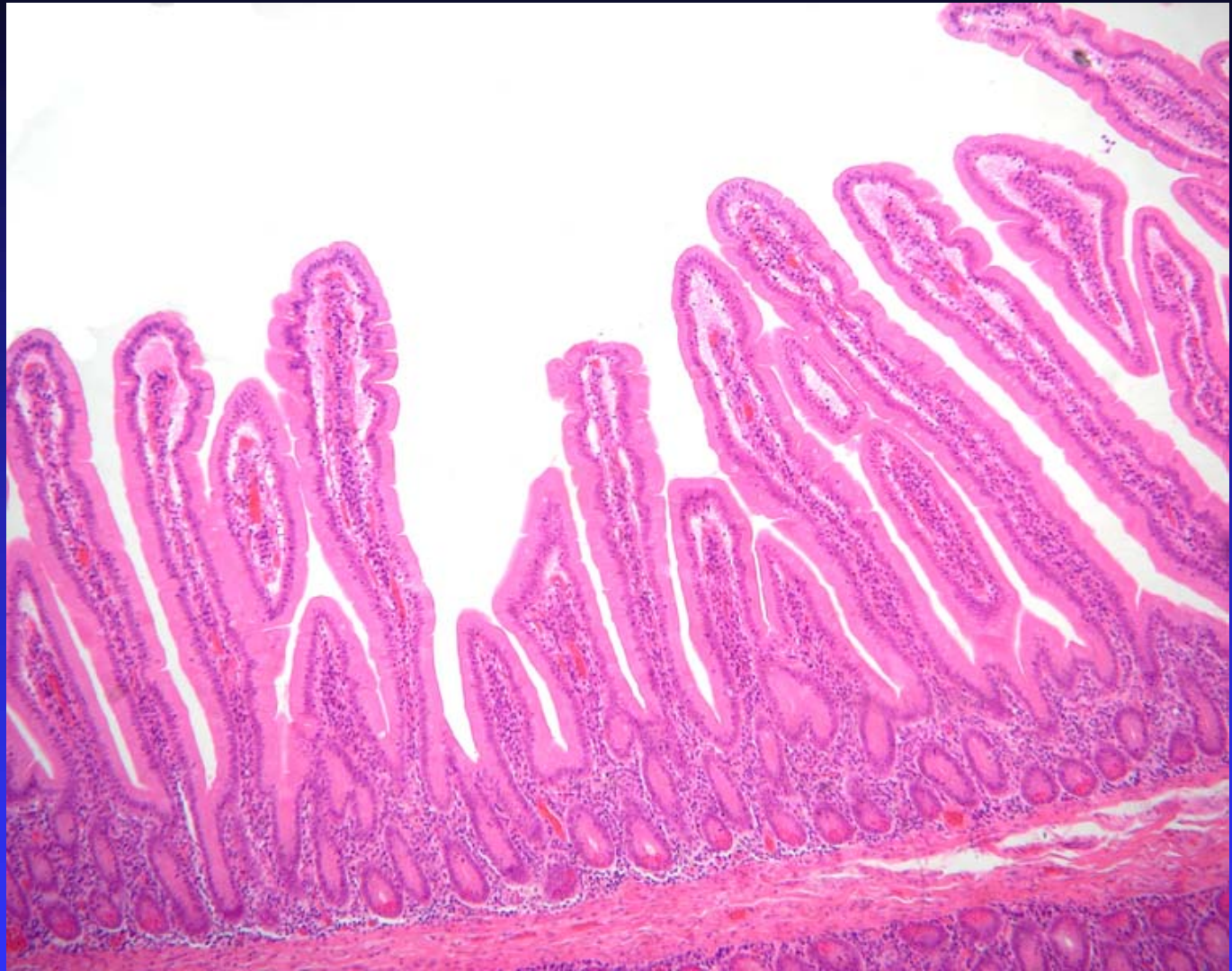


1. Mucosa  
circular plica  
intestinal villus  
small intestinal glands



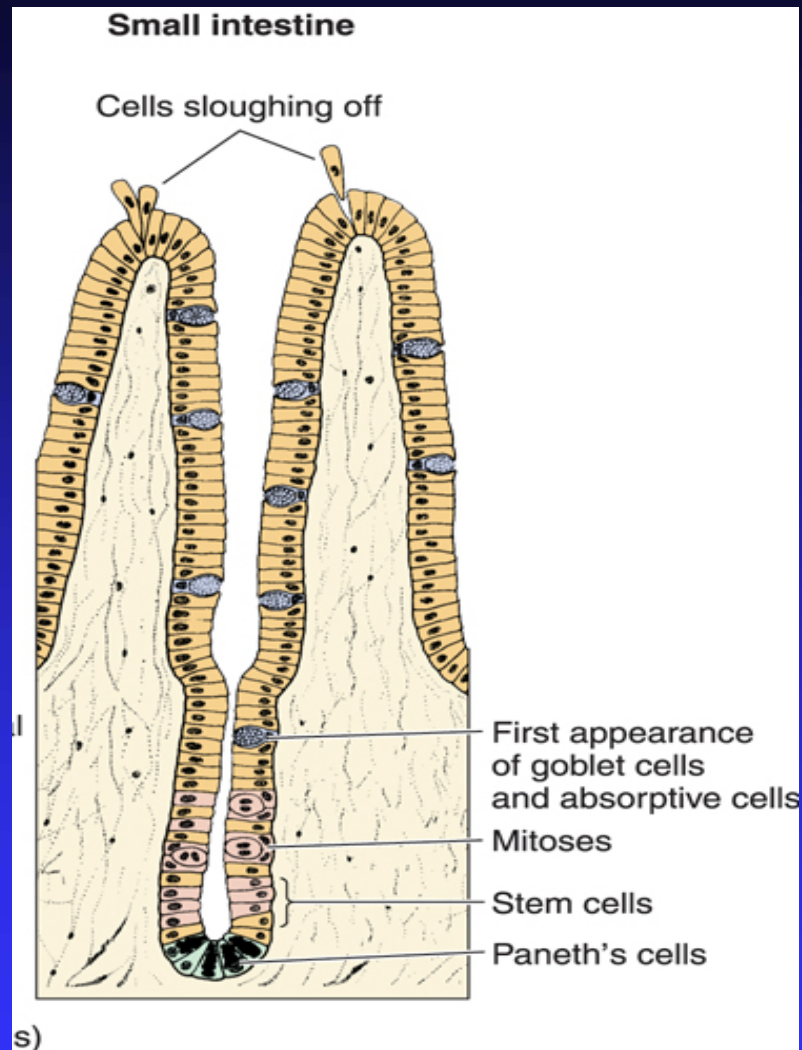


Small intestine



Intestinal villus and small intestinal glands





Small intestinal gland

## 2. Submucosa

LCT, duodenal glands

3. Muscularis: internal circular  
sublayer and external  
longitudinal sublayer smooth  
muscle cells

4. Adventitia: serosa

# 1. mucosa

## (1) Intestinal villus

### ① Epithelium:

simple columnar epithelium  
including absorptive cells

goblet cells

less numerous endocrine cells



# Absorptive cells:

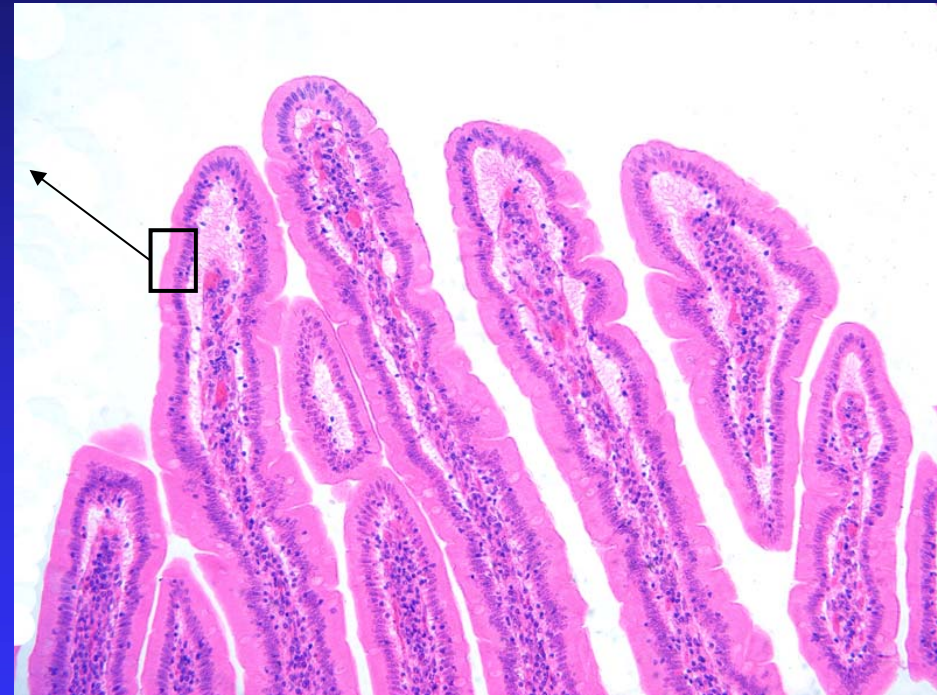
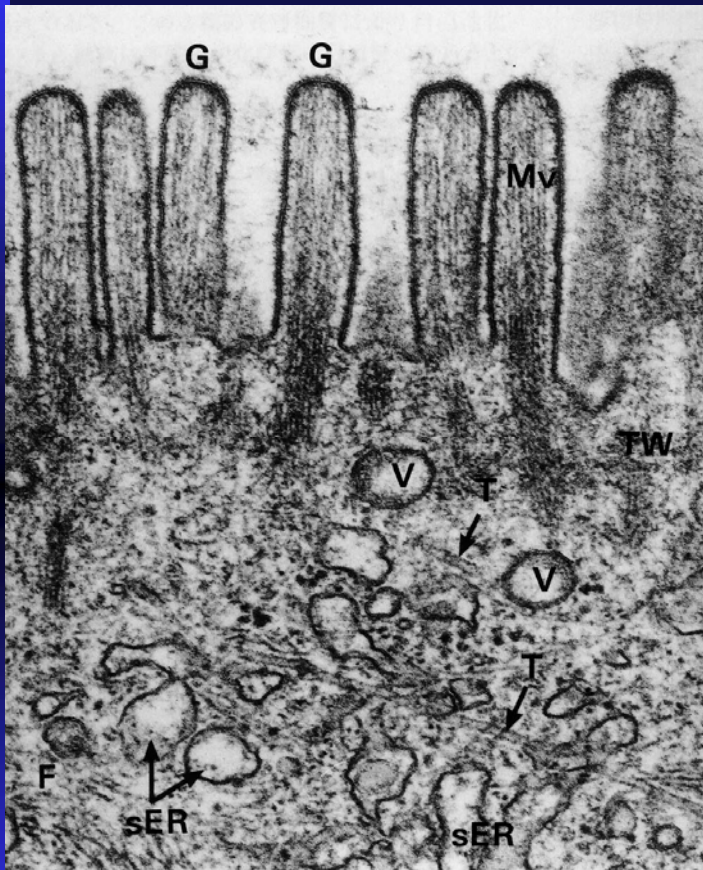
LM: striated border

EM: microvillus, cell coat,  
SER and Golgi complex

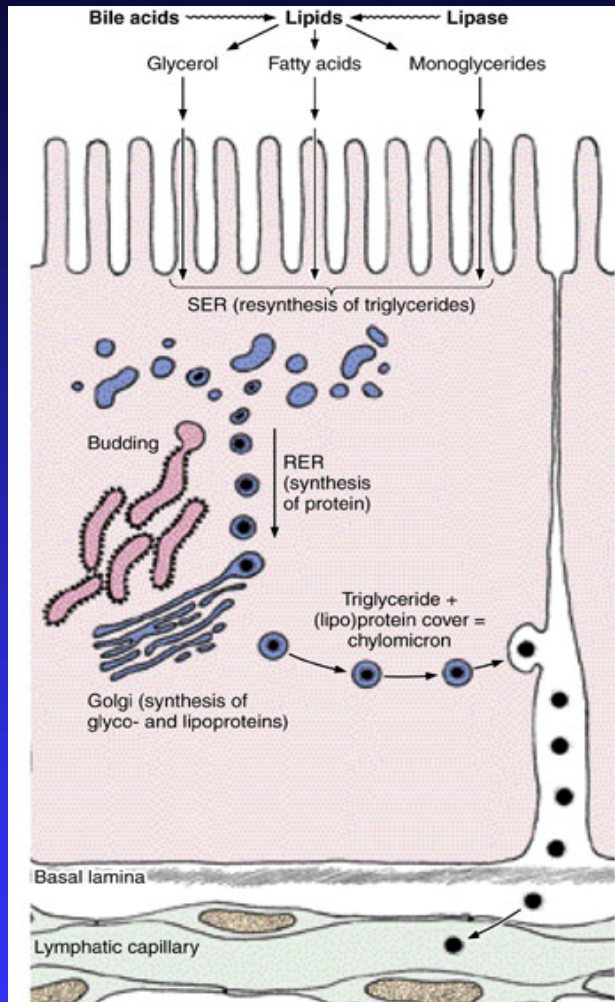
Junction complex

Function: digestion

absorption



**Villi of small intestine (LM and EM)**



Absorptive cells (EM)



Endocrine cells:

I cells: cholecystokinin-  
pancreozymin

(胆囊收缩素-促胰酶素, CCK-PZ)

S cells: secretin (促胰液素)

Goblet cells:

## ② lamina propria:

CT, central lacteal,  
fenestrated capillary , less  
numerous smooth muscle cells,  
lymphocytes, plasma cells,  
macrophages, eosinophilic  
cells and mast cells



Lamina propria of intestinal villus



## (2) small intestinal glands

The organization:

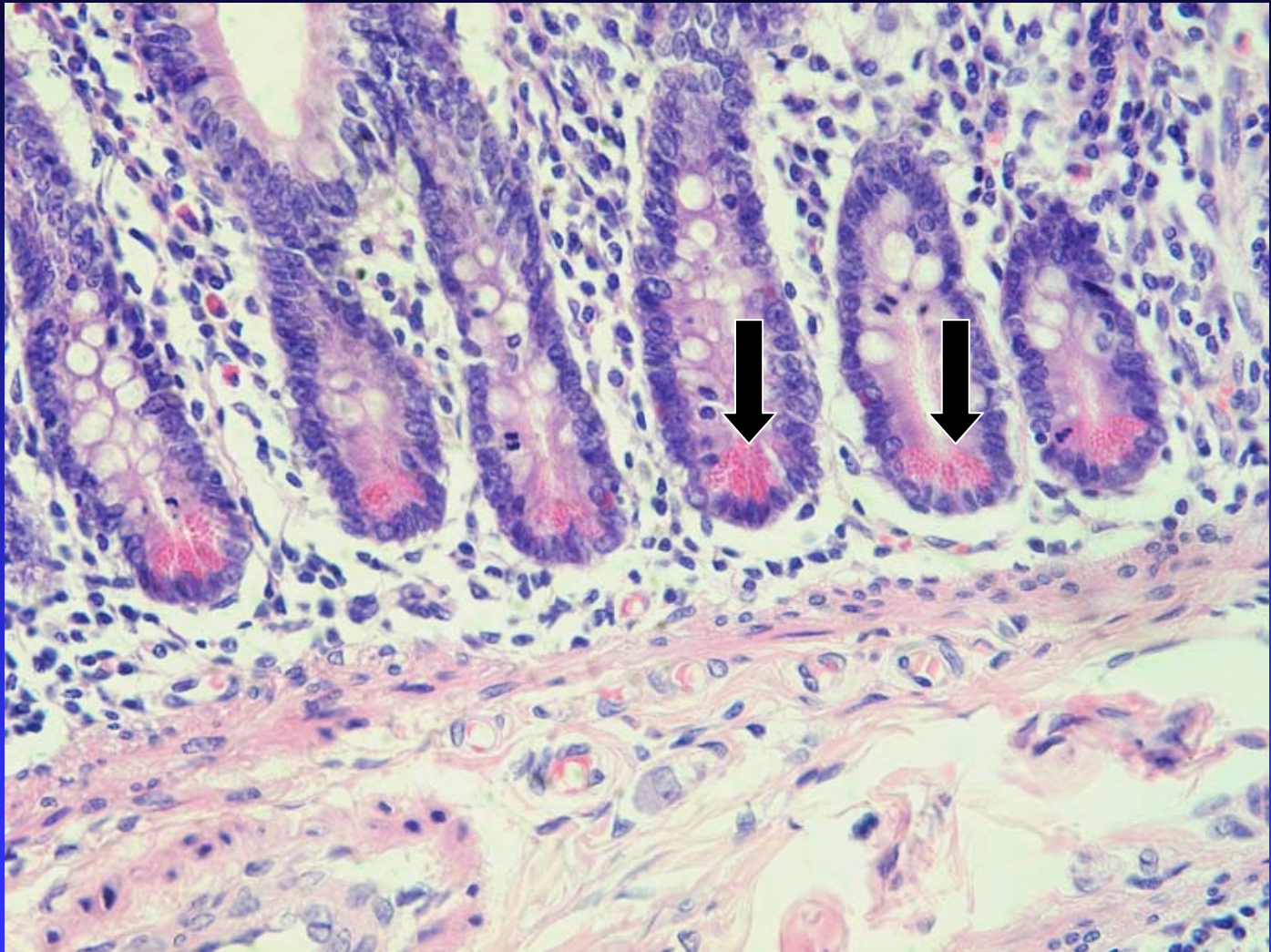
- Absorptive cells
- Goblet cells
- Paneth cells

LM: see Fig.

function: defensin and lysozyme

Endocrine cells (I cells S cells)

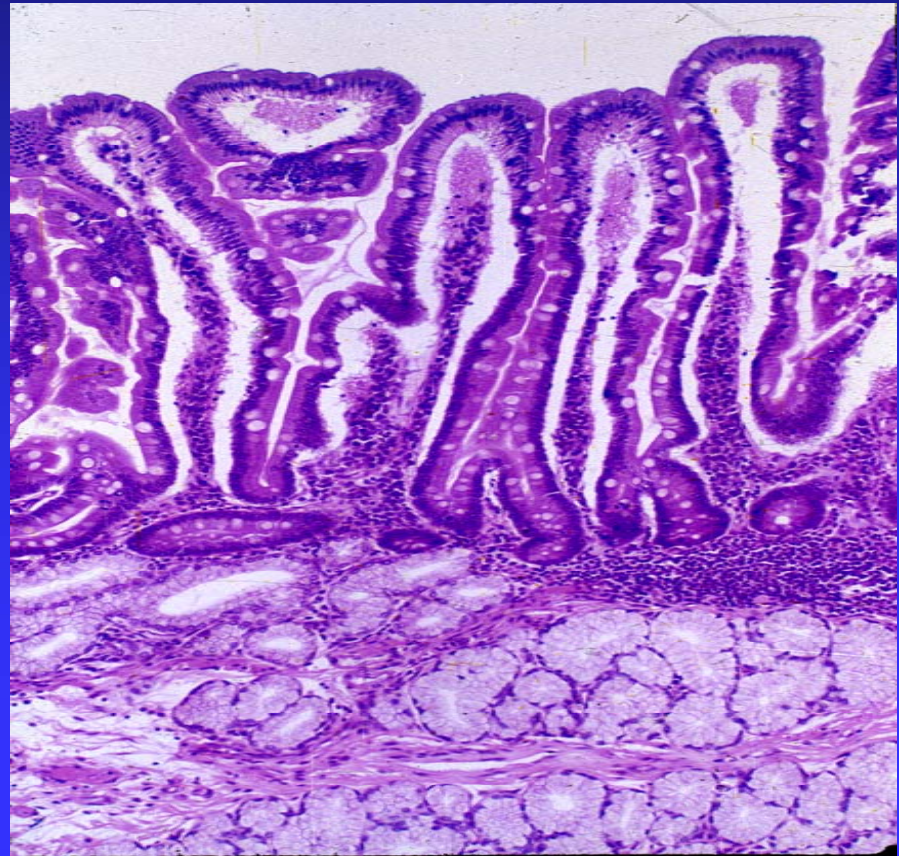
- Stem cells



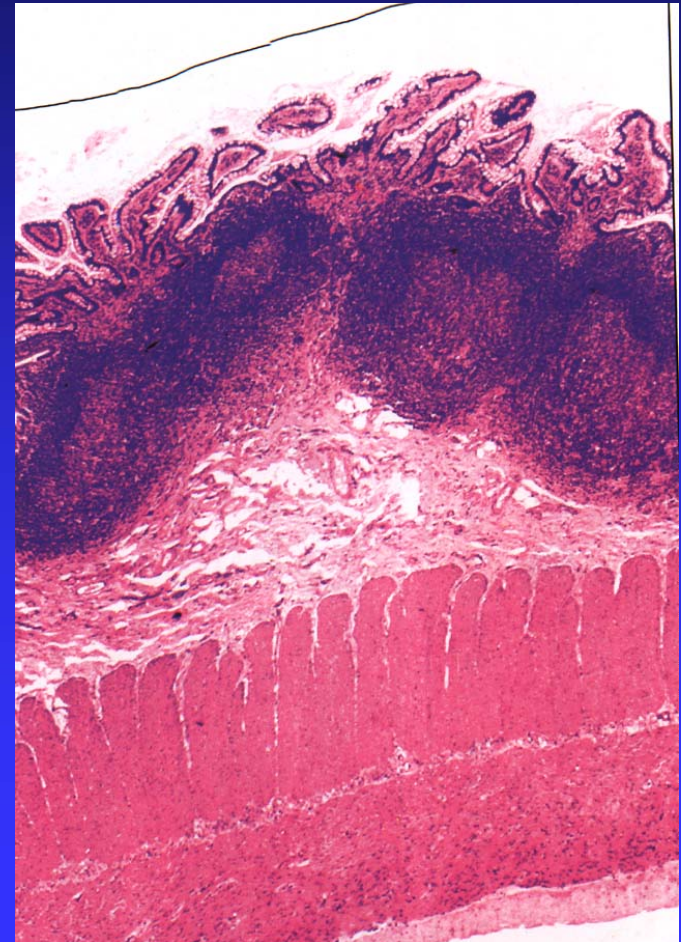
Paneth cells



Duodenal glands in submucosa ,  
mucous type, urogastrone(尿抑胃素)



- Solitary lymphoid nodules in submucosa of jejunum
- Aggregated lymphatic nodules in submucosa of ileum



# VI. Large Intestine

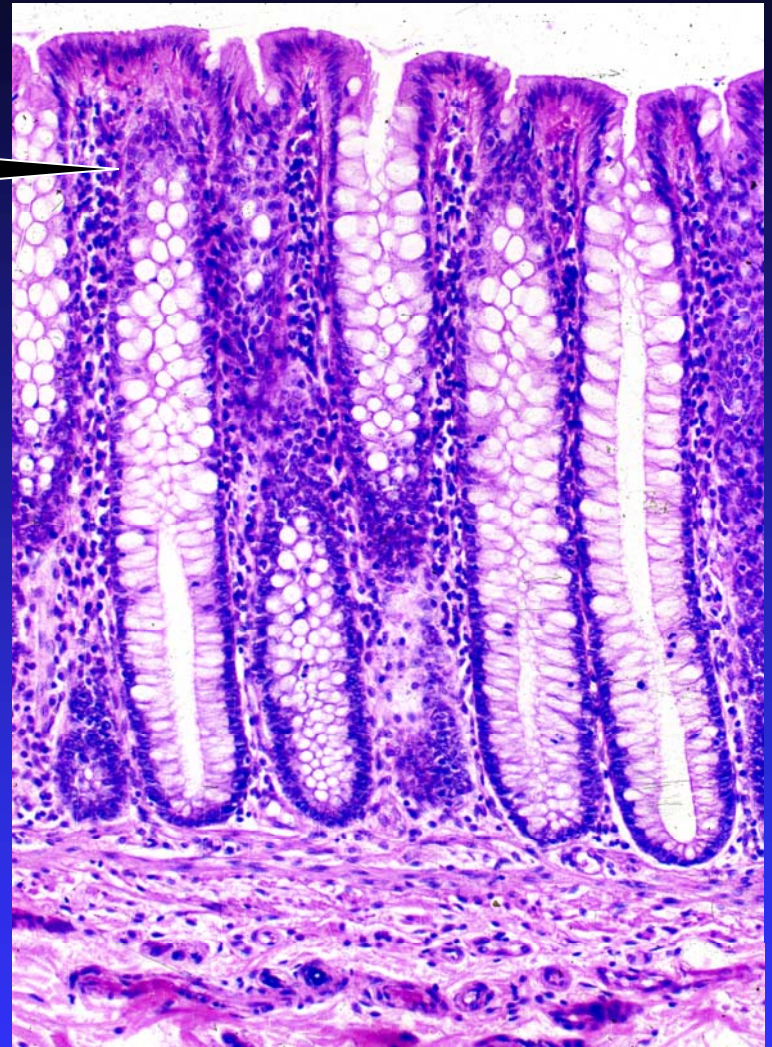
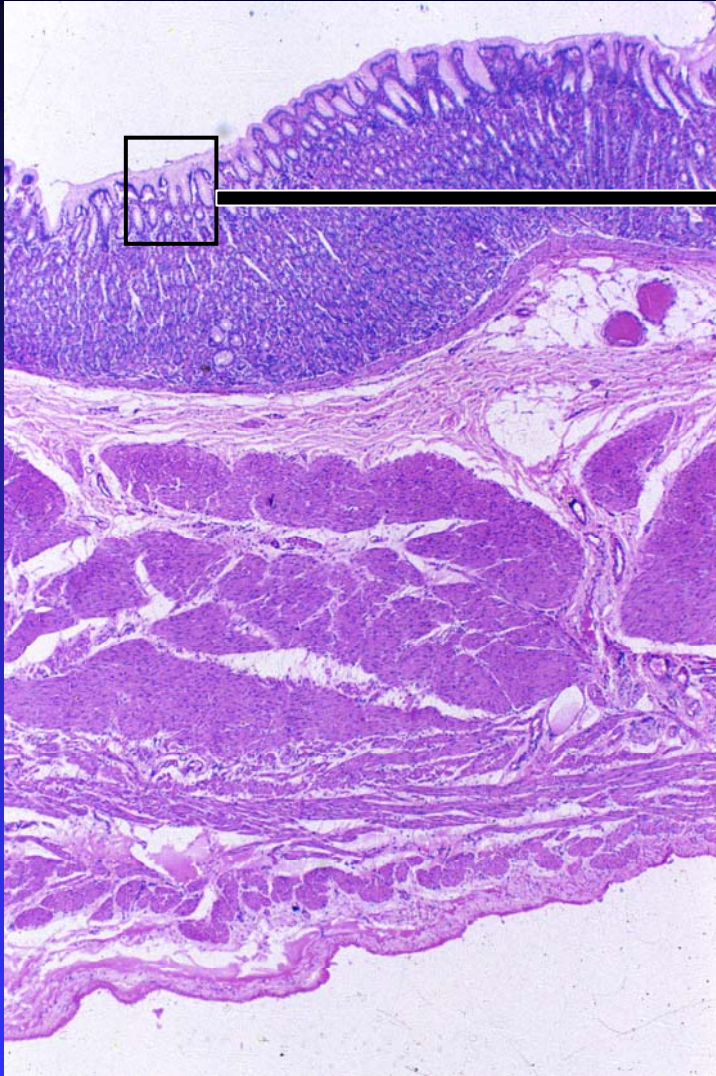
## 1. The colon

(1) mucosa: Plicae

no villus, epithelium including absorptive cells and large numbers of goblet cells

Large intestine glands with abundant goblet cells in lamina propria, stem cells and endocrine cells





Colon

Function: secreting mucous

(2) tenia coli ( longitudinal muscle)

(3) adventitia: fibrosa, serosa  
epiploica ( adipose tissue )

## 2. Appendix

- A great abundance of lymphoid cells and nodules in lamina propria, submucosa and muscularis mucosa





# Lymphoid Tissue of Digestive Tract and Immune Function

- gut –associated lymphoid tissue: including lymphoid nodules in mucosa, lymphocytes, plasma cells and macrophages in lamina propria and lymphocytes between epithelial cells

# Function: microfold cells, IgA, secretory piece, sIgA

