



Pathophysiology of gastro-intestinal tract

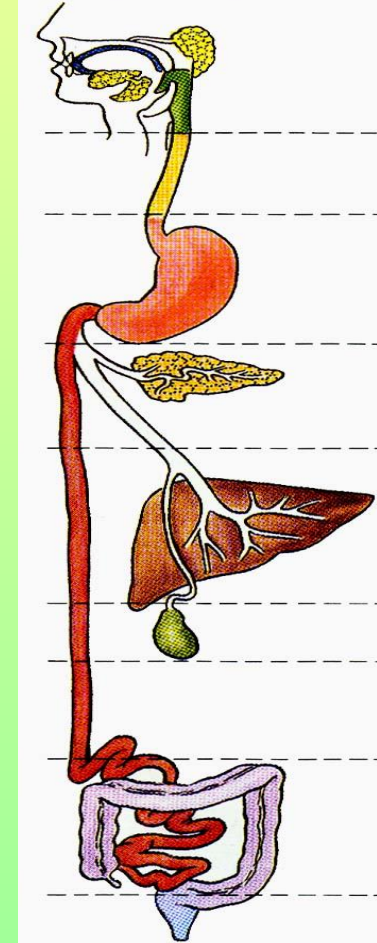


Gastro-intestinal tract

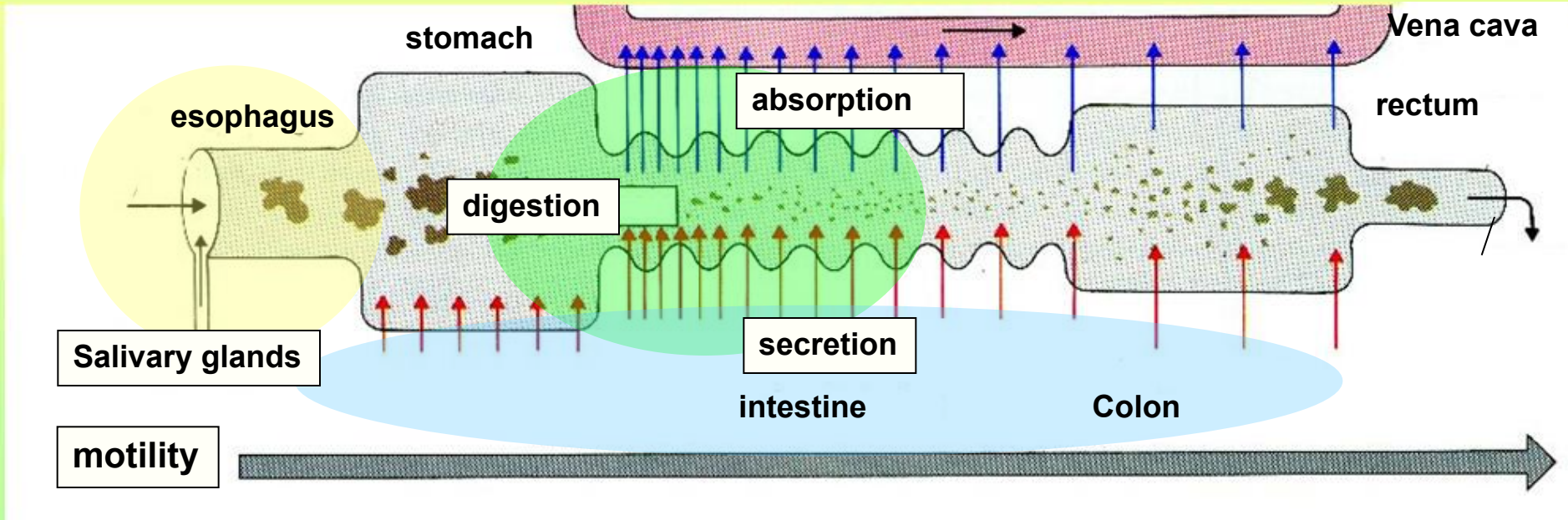


- Organs of oral cavity
- Esophagus
- Stomach
- Small and large intestine
- Secretory function of salivary glands, liver, pancreas

Neurohormonal regulation



Major processes in GIT



nutrition

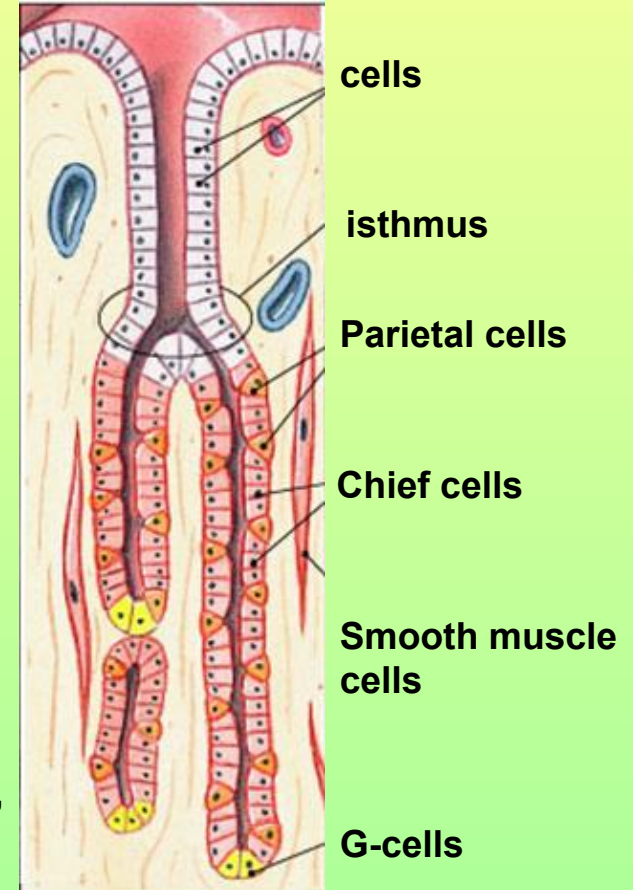
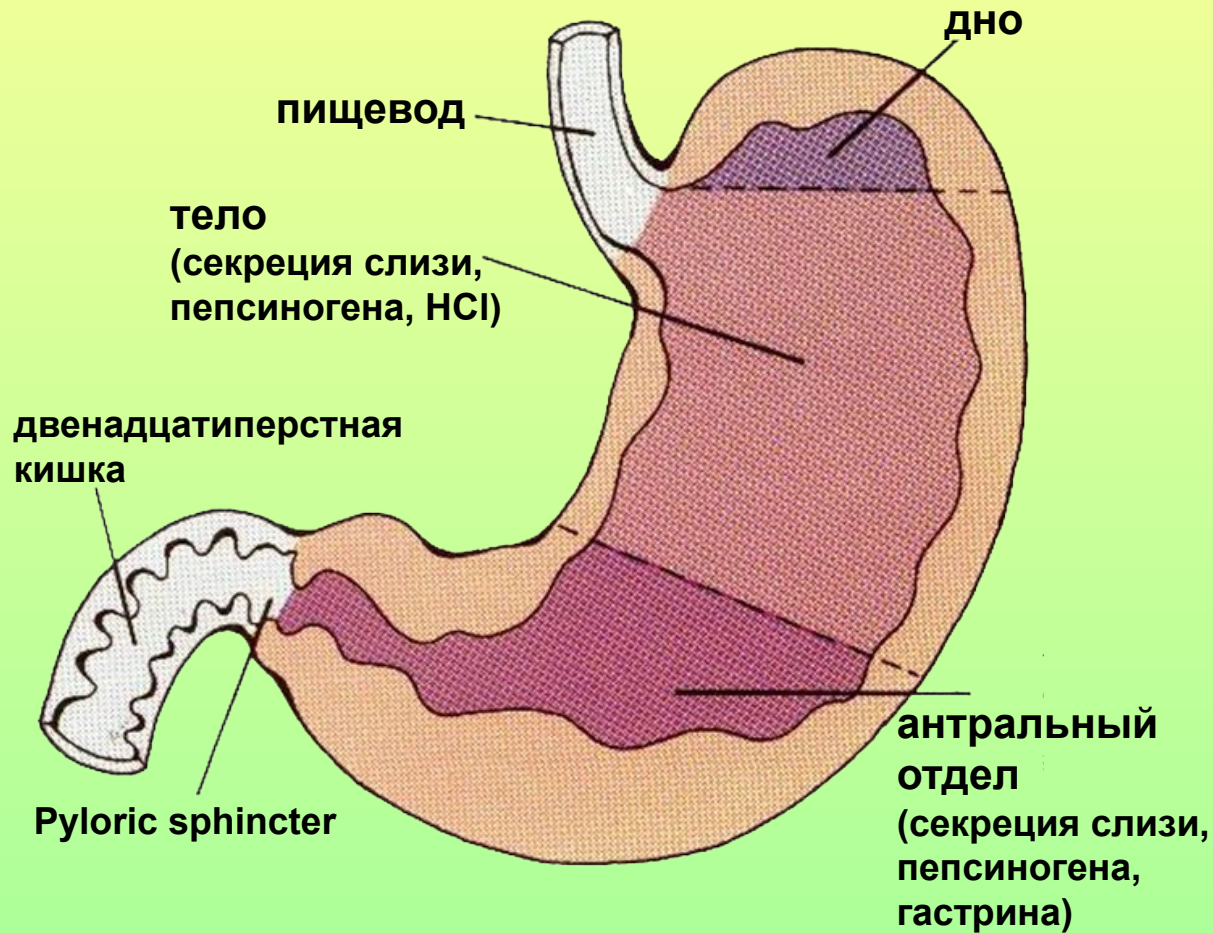


digestion, absorption



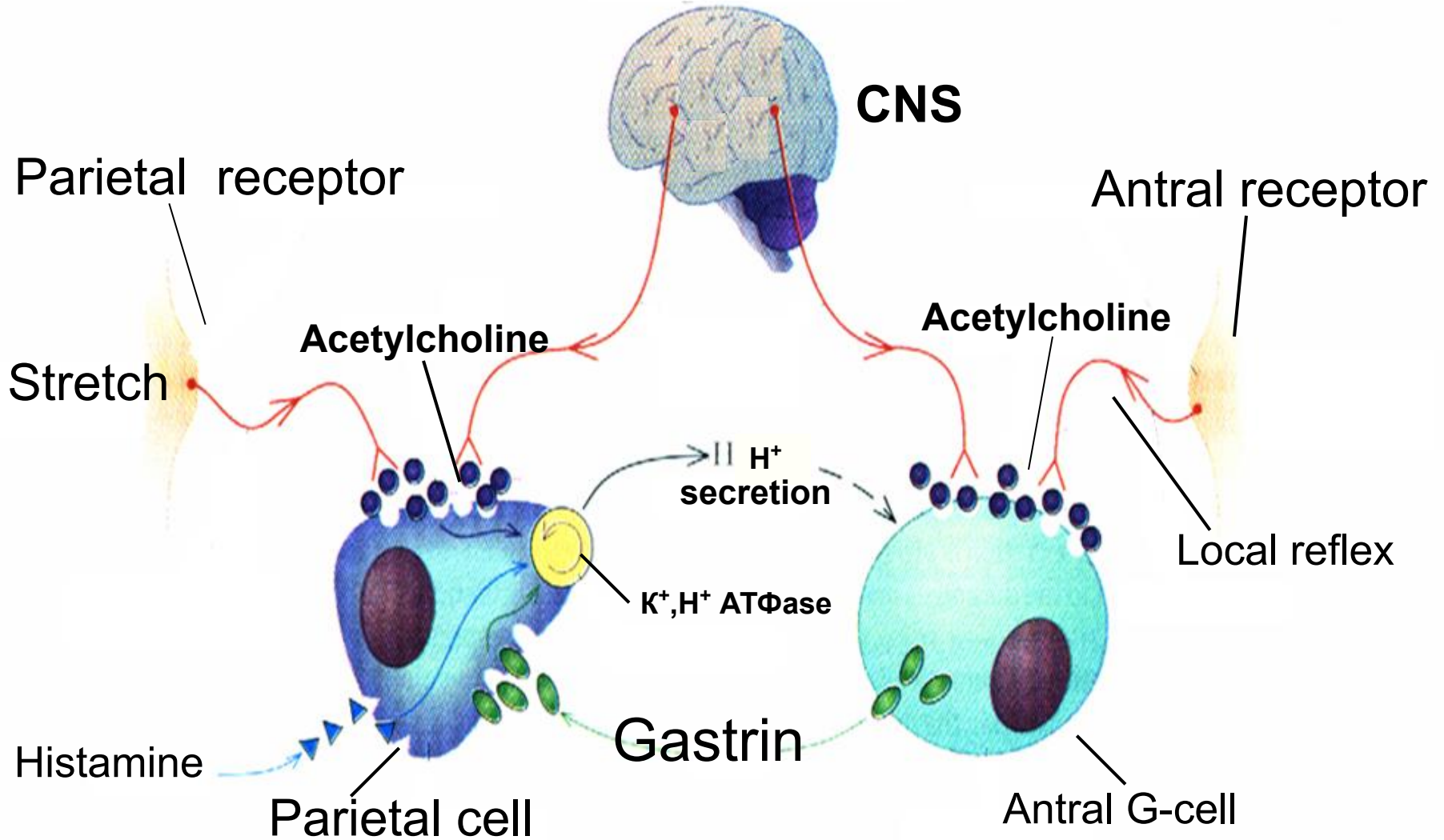
movement

Physiology of the stomach



Regulation of gastric secretion

Food (view, smell, test)





Mechanisms of gastric hypersecretion



- Stimulation:
 - neurogenic (vagotonia),
 - hormonal (gastrin, histamine, $\uparrow\text{Ca}^{2+}$ in hyperparathyroidism...)
- Failure of inhibitory mechanisms (antral, duodenal)
- Hyperplasia of the gastric glands

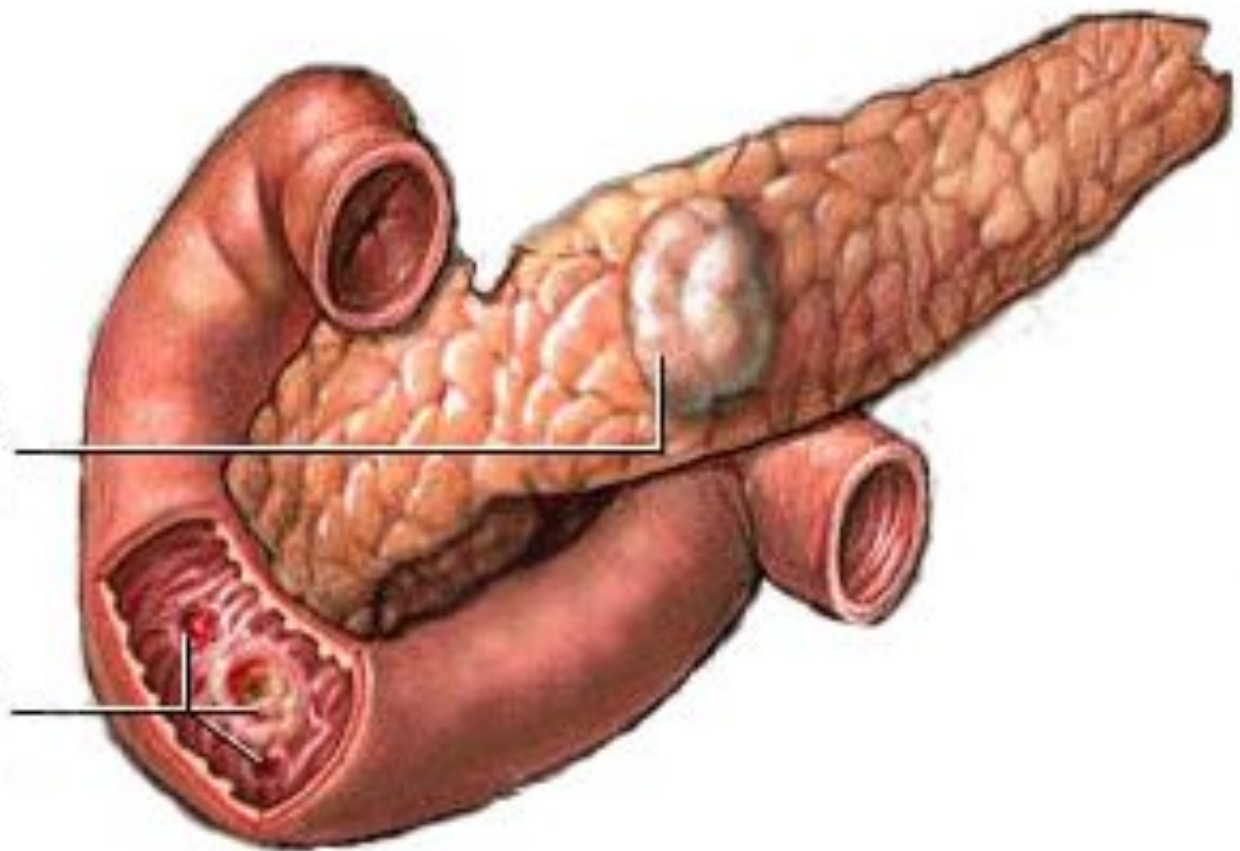
Gastrinoma (Zollinger-Ellison syndrome)

- Marked gastric hypersecretion
- Diarrhea
- Abdominal pain
- Peptic ulcer(s) of upper GI tract
- Gastro-esophageal reflux
- Gastrin-secreting tumor of the duodenum (75%), pancreas (24%), stomach, liver, ovary (1%).

Zollinger Ellison Syndrome

Pancreas with
a Z-E Tumor

Duodenum with
scattered
ulcers

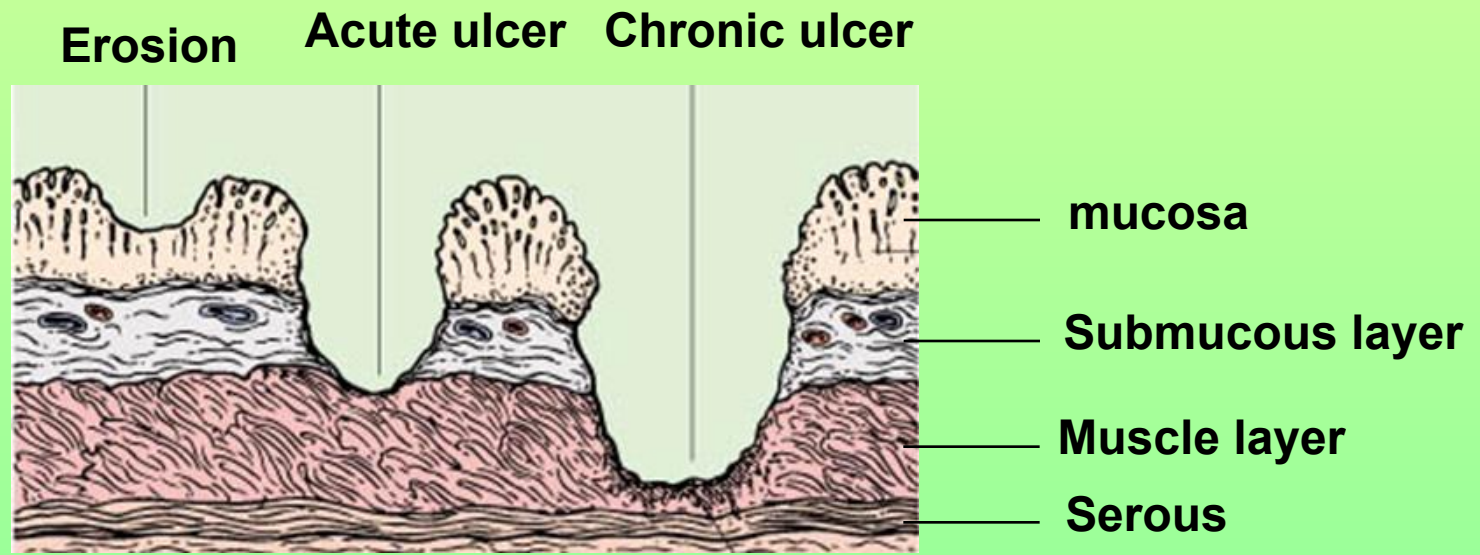




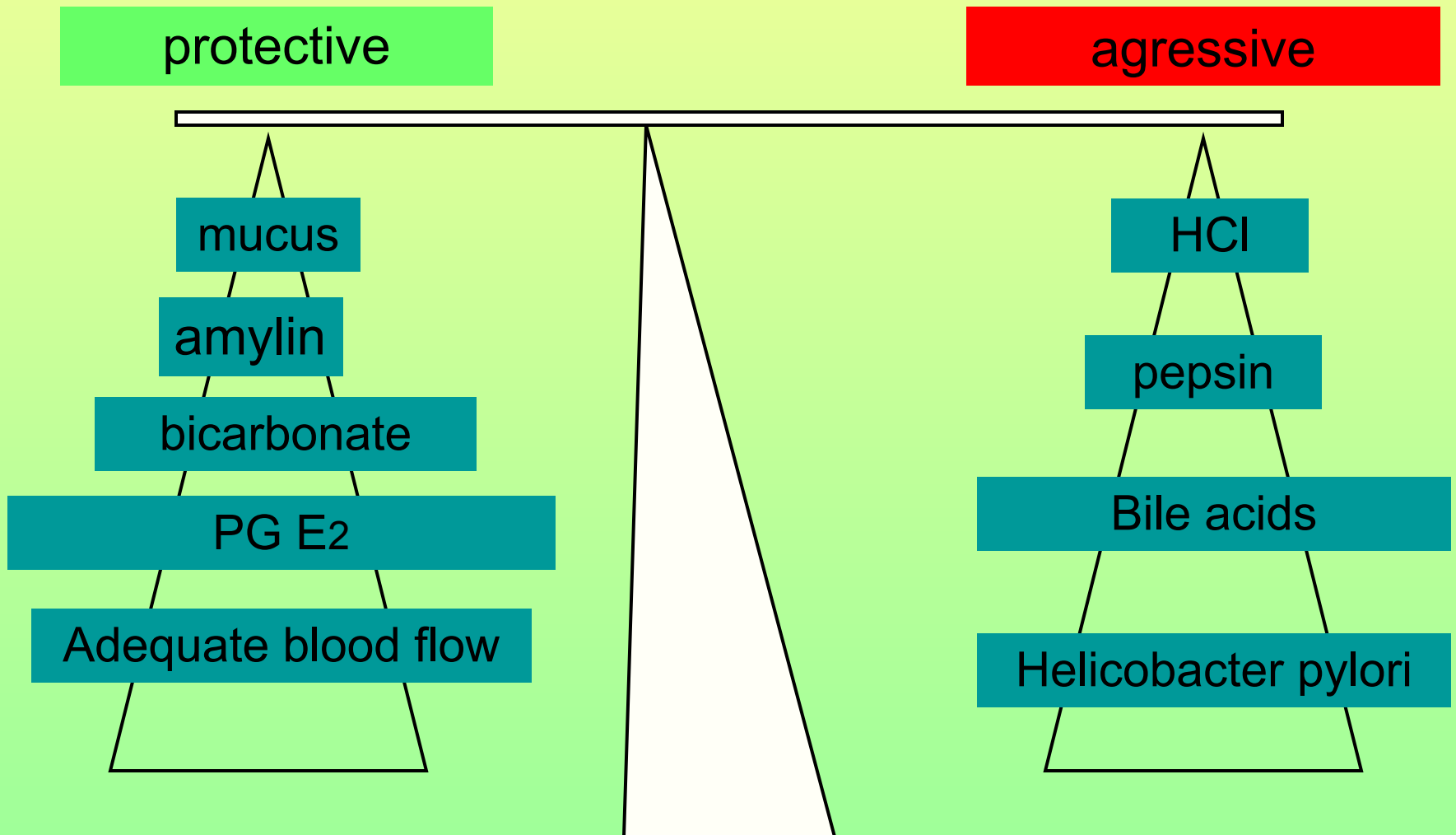
Pathogenic consequences of gastric hypersecretion

- Disorders of gastric motility (hypercontraction)
- Disorders of digestion
- Hyperkinesia
- Disorders of water-electrolyte and acid-base balance

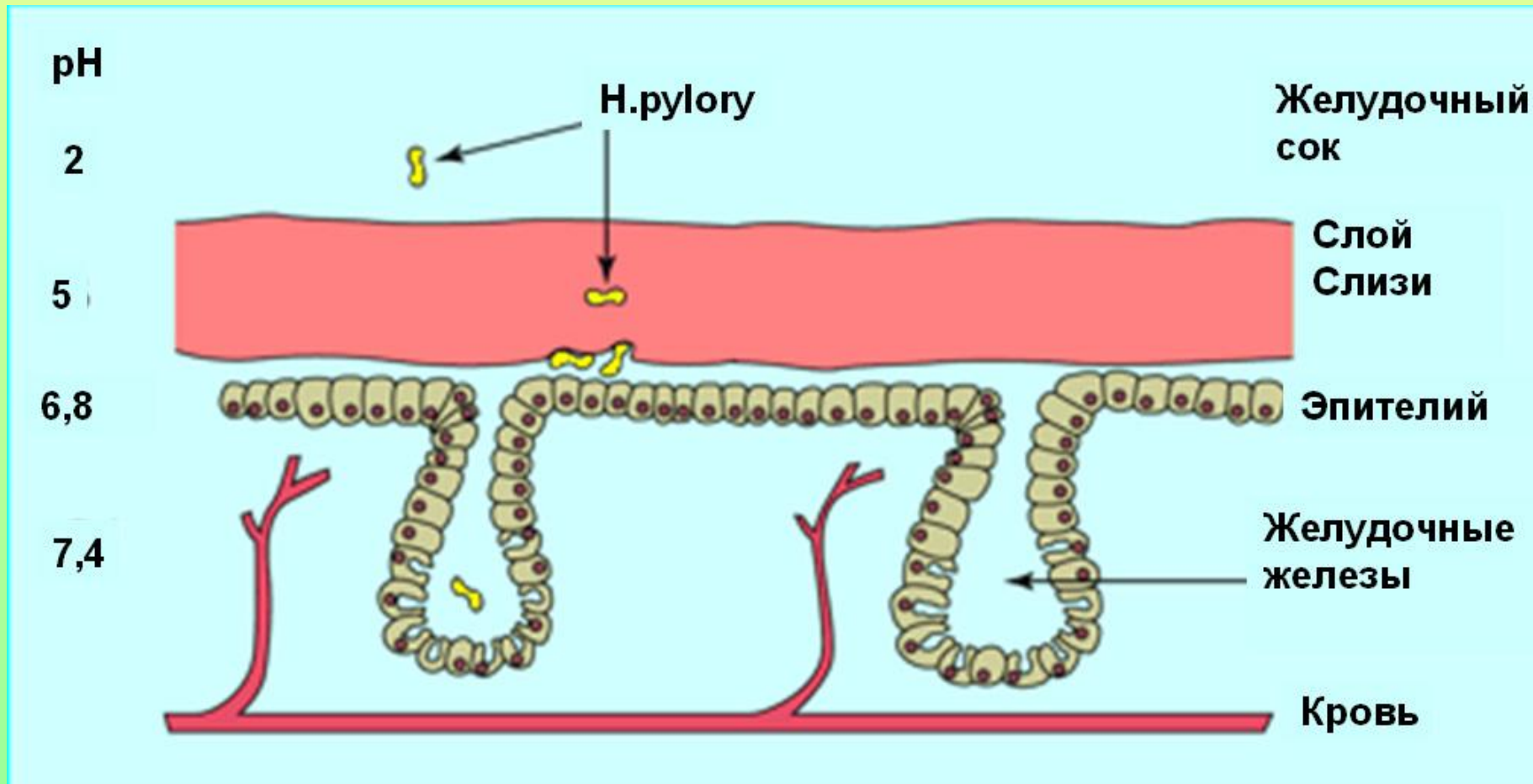
Development of acid-dependent diseases



Aggressive and protective factors of gastric juice

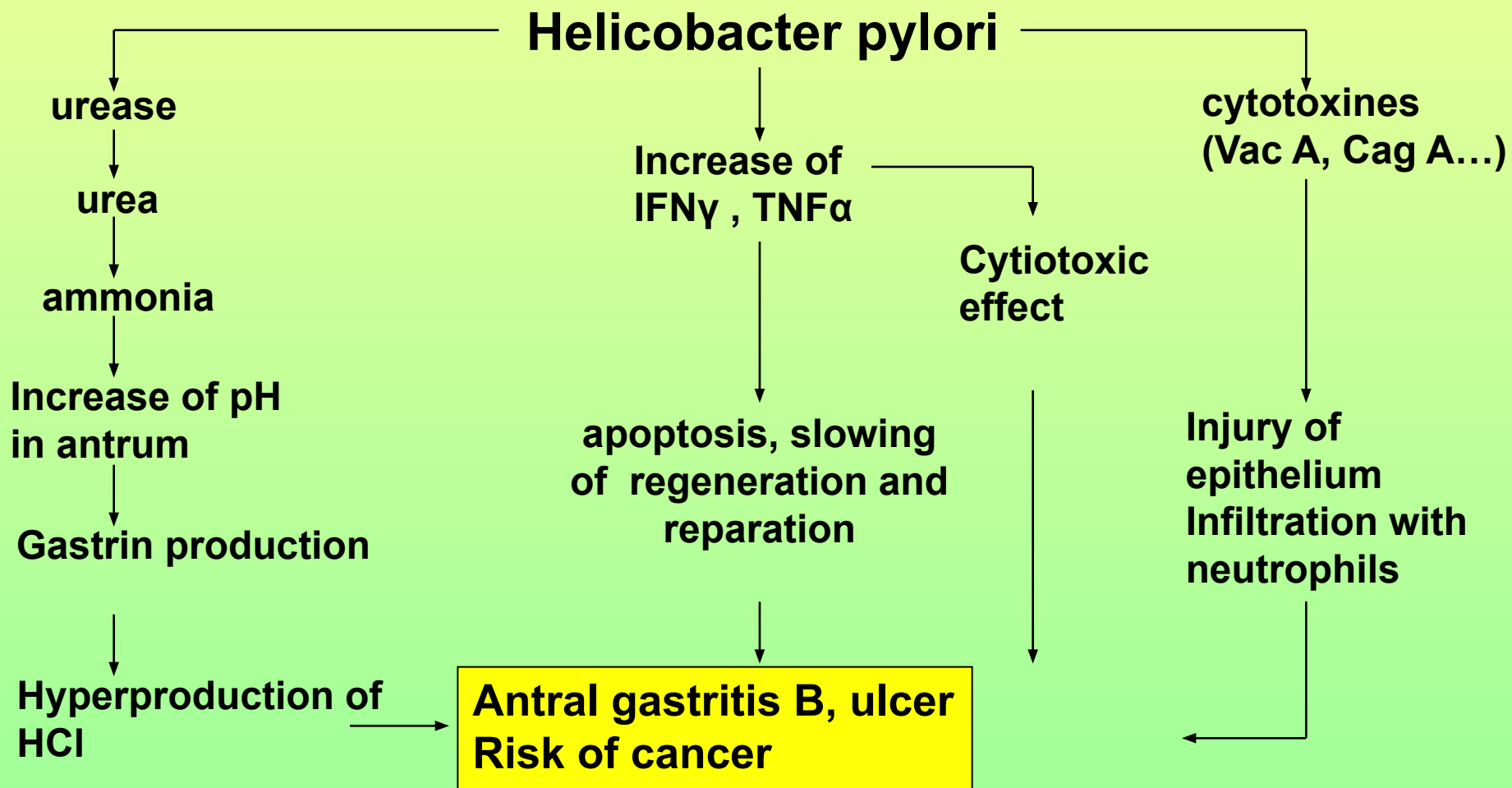


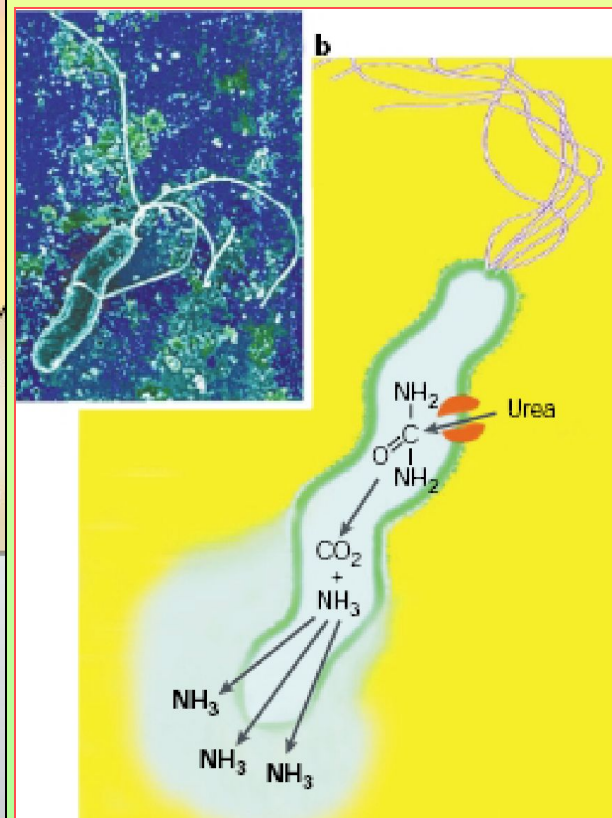
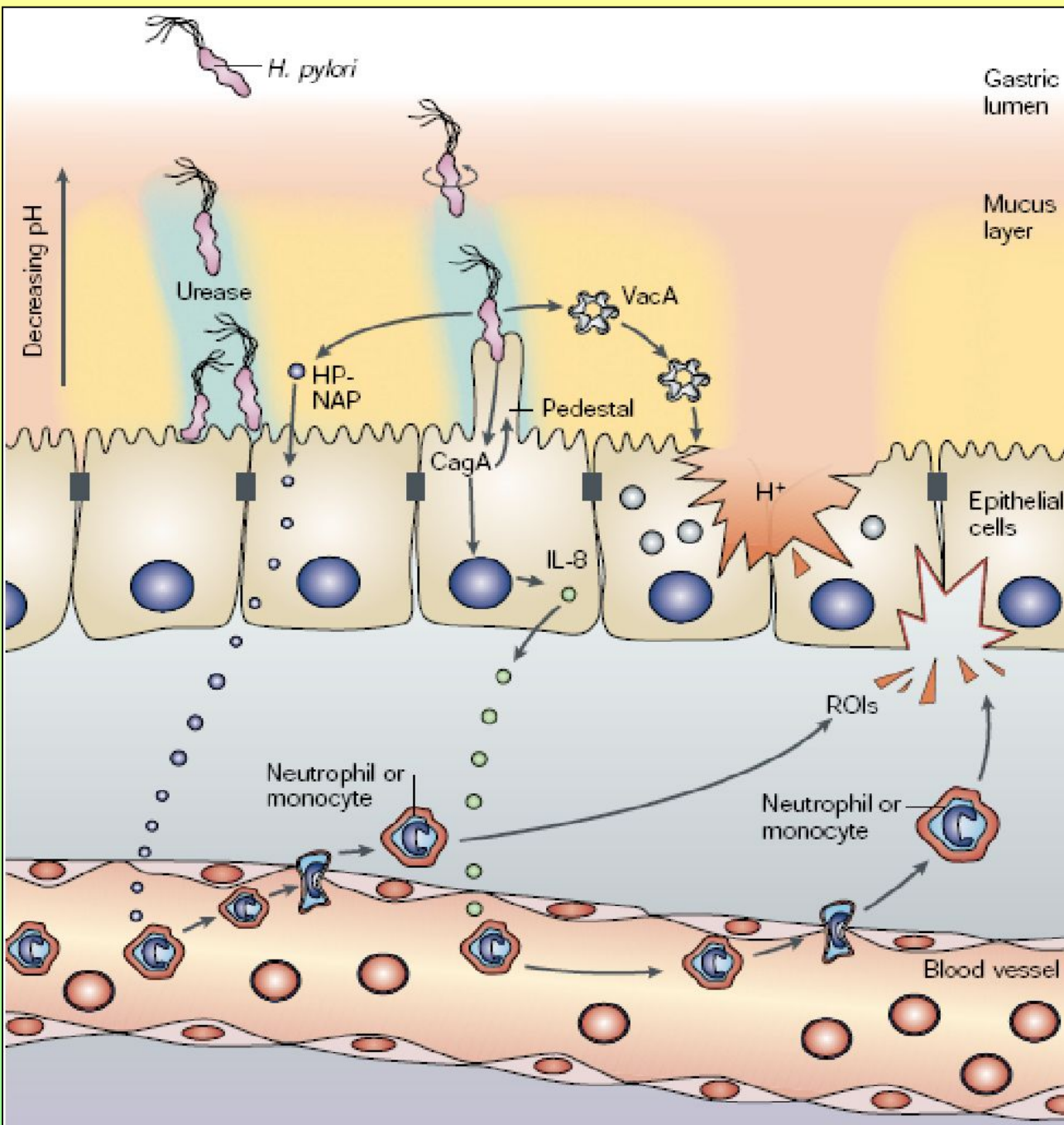
Helicobacter pylori





The role of Helicobacter pylori

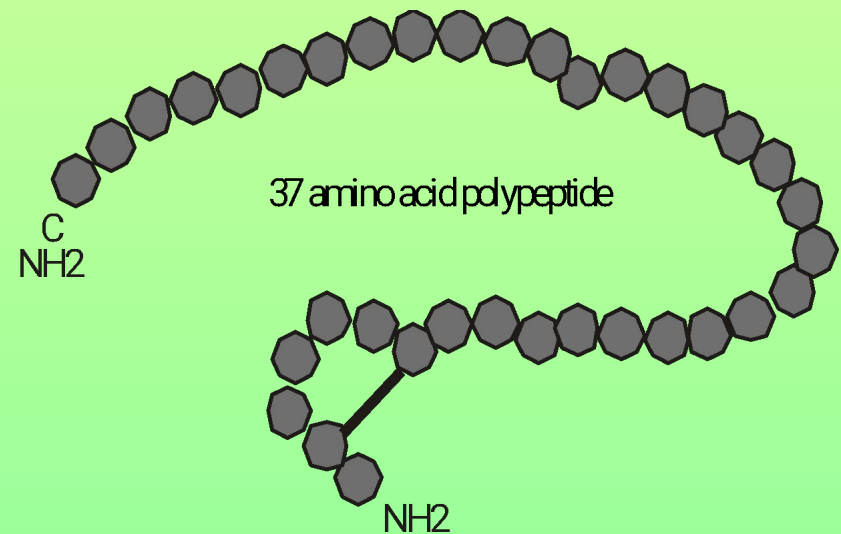






Ulceroprotective effect of amylin

- Inhibition of gastric secretion
- Stimulation of production of mucus
- Acceleration of healing of mucosa





Pathogenesis of gastro-esophageal reflux disease (GERD)

Motor dysfunction of the lower esophageal sphincter

Decreased mucosal resistance

Gastro-esophageal reflux

Increase in intragastric pressure

Saliva → Decreased esophageal clearance

Gravity

Esophageal peristaltics

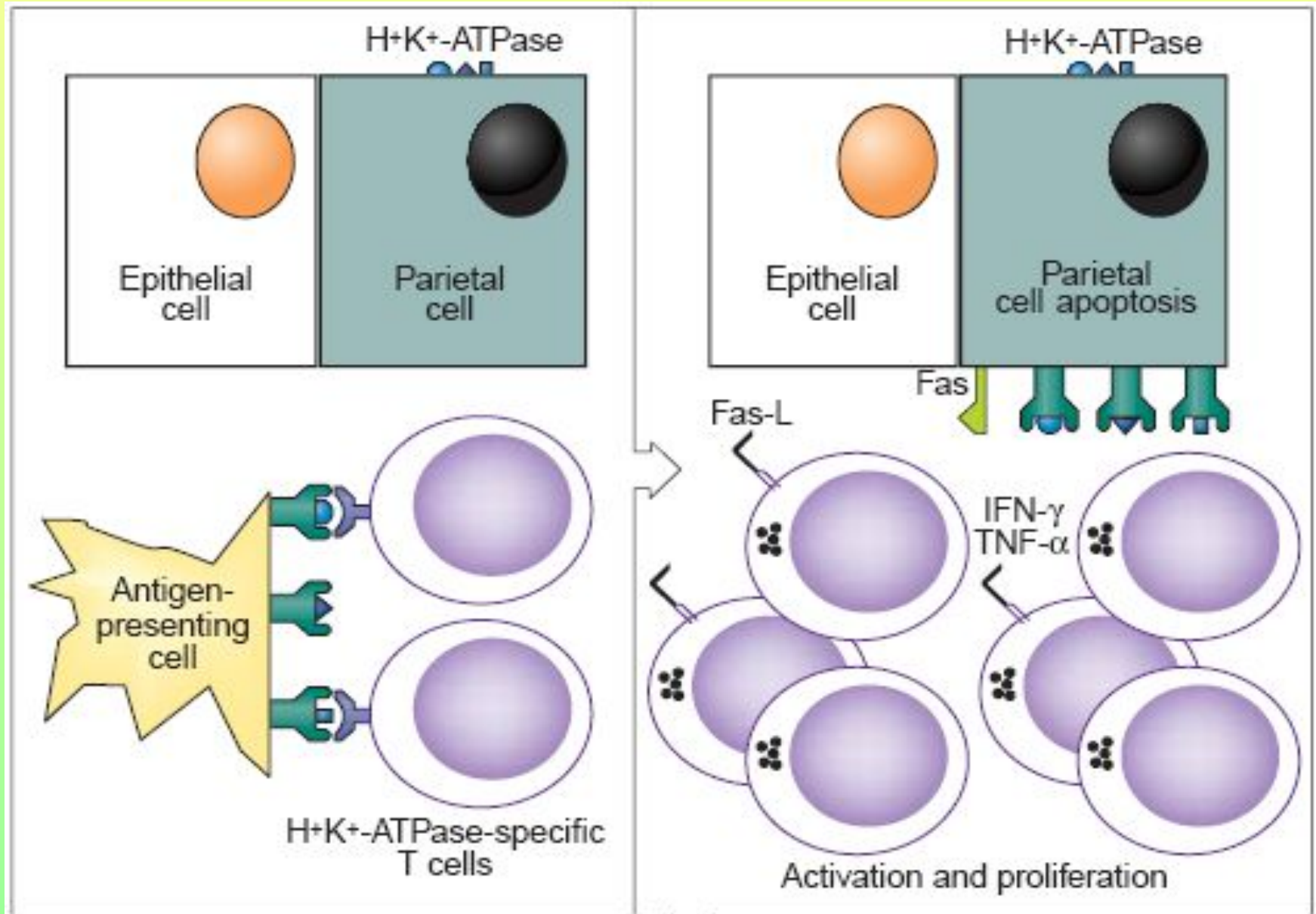
Renewal of the epithelium



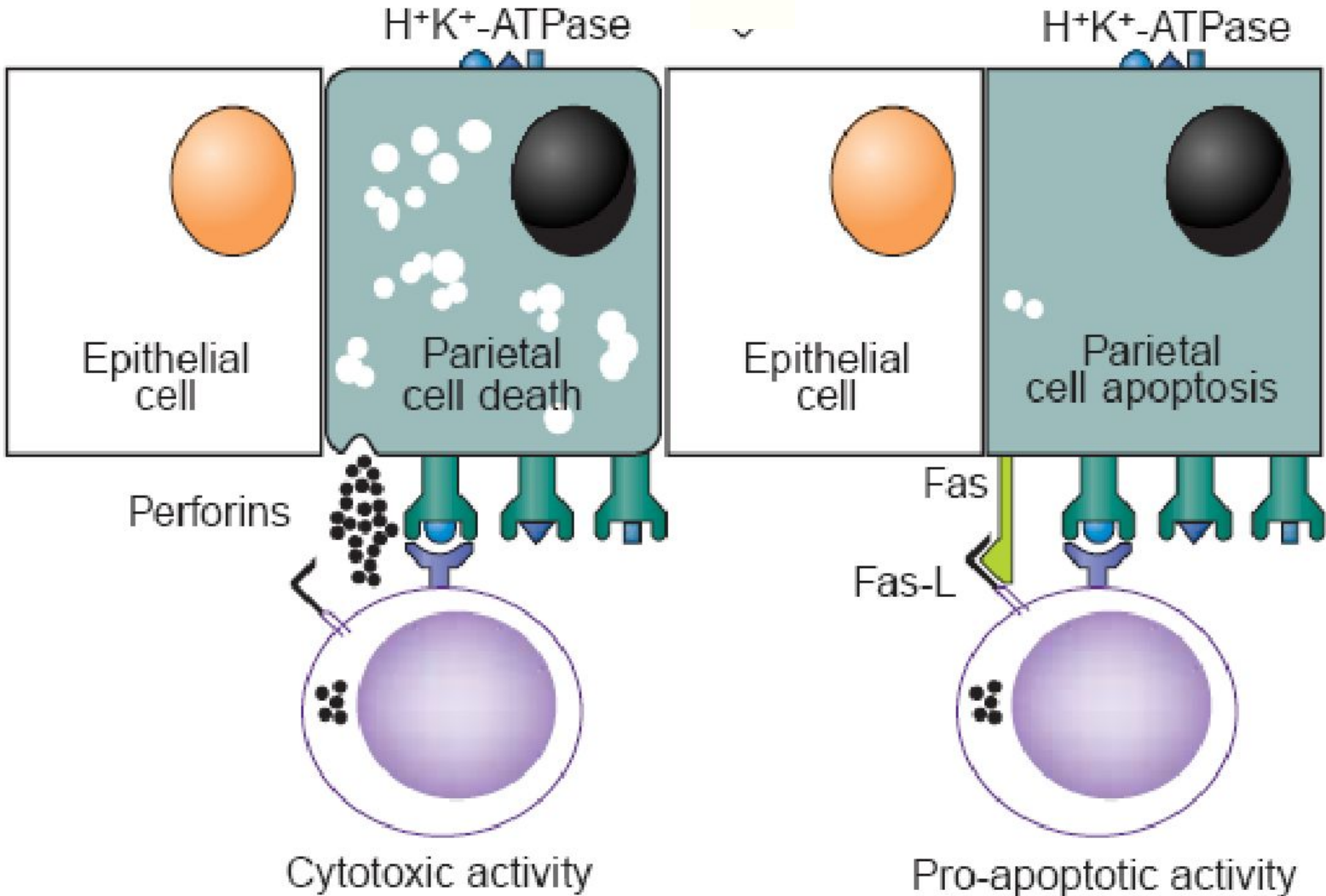
Mechanisms of gastric hyposecretion

- Disorders of regulation (neurogenic, hormonal)
- Atrophy of mucosa (autoimmune gastritis)
- Resection of the stomach

Induction of autoimmunity against parietal cells



Mechanisms of immune-mediated parietal cell death leading to gastric atrophy





Complications of gastric hyposecretion

- Disorders of protein digestion
- Hypokinesia
- Disorders in barrier function
- Disorders of iron and vitamin B₁₂ absorption
- Disorders of intestinal secretion and digestion



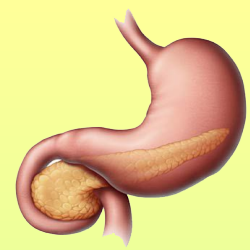
Increased gastric motility (gastric hyperkinesia)



- Neurogenic
- Increased production of HCl, gastrin, motilin ...
- Hypercalcemia
- Pylorostenosis

Complications:

- Decrease volume adaptation
- Increase in intragastric pressure
- Increased tone of the stomach
- Dyspepsia

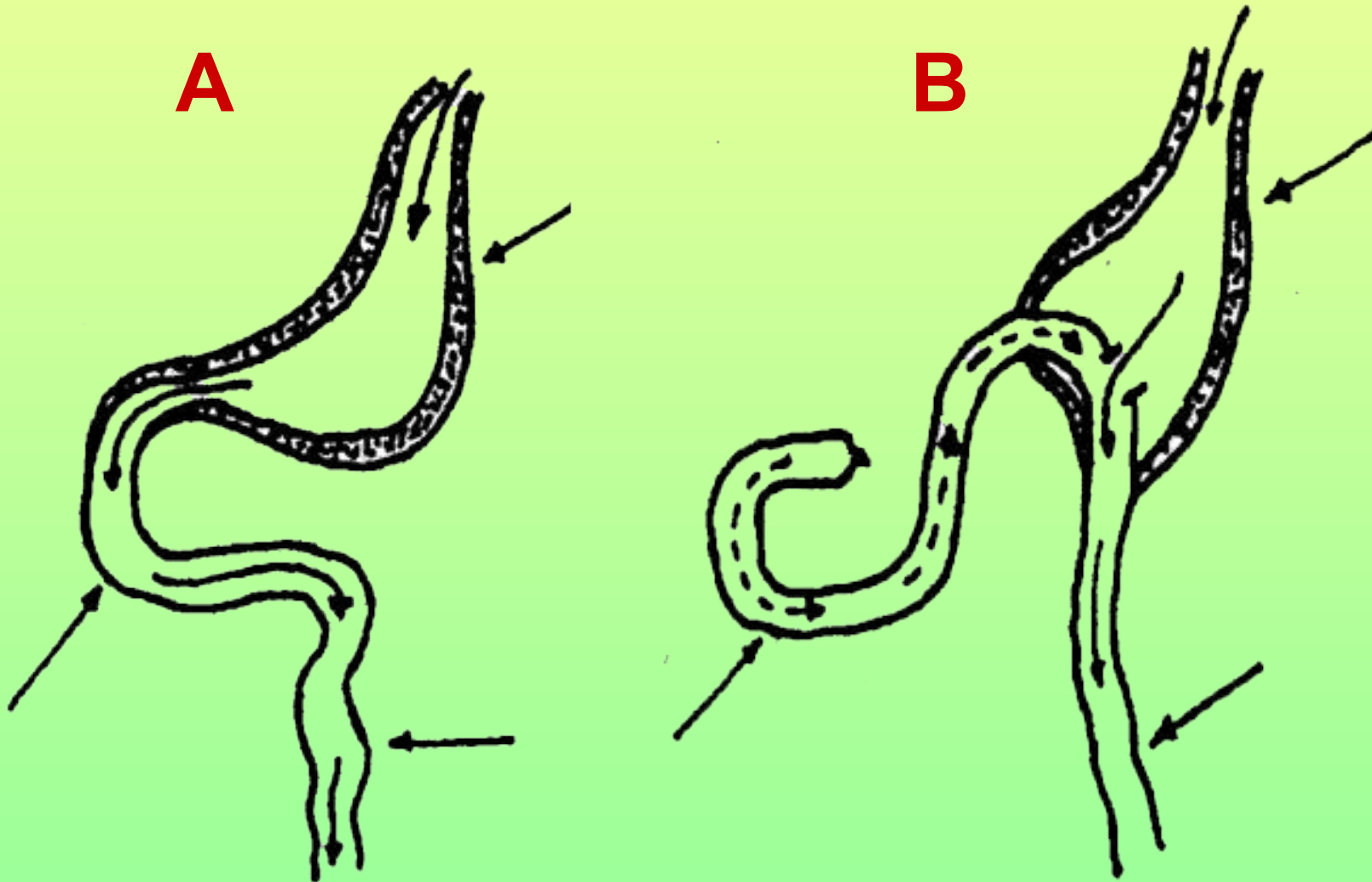


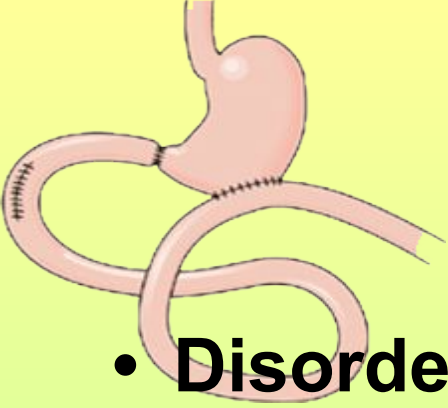
Decrease of gastric motility



- Neurogenic
 - reflex gastroparesis
 - autonomic neuropathy (diabetes, alcoholism)
 - vagotomy
- Humoral
 - hyposecretion of HCL
 - increased production of HCl, GIP, amylin...
- Disorders of smooth muscle cell metabolism
 - anorexia
 - chronic intoxication
 - hypokalemia
 - ischemia

The passage of chyme through GI tract in normal conditions (A) and after resection of stomach (B)





The consequences of stomach resection



- **Disorders in reservoir function of the stomach**
- **Decreased number of secretory cells (achlorhydria)**
- **Vitamin B₁₂ deficiency → anemia**
- **Disturbance of fractional influx of chyme into the duodenum**
- **Disturbances in the regulation of secretory function of pancreas and liver**
- **Accelerated passage of chyme through the small intestine**



Mechanisms of jejunal (postgastrectomy, dumping) syndrome



□ Early (~75%)

Dumping of the hyperosmolar chyme into the intestine

- Influx of water into the lumen
- Stimulation of intestinal peristaltics
- Stimulation of BAS formation (5-HT, VIP, kinins etc.)

□ Late (~25%)

Absorption of high amount of carbohydrates into the blood

- Hyperglycemia \Rightarrow insulin release \Rightarrow hypoglycemia \Rightarrow activation of sympathetic nervous system \Rightarrow tachycardia, perspiration