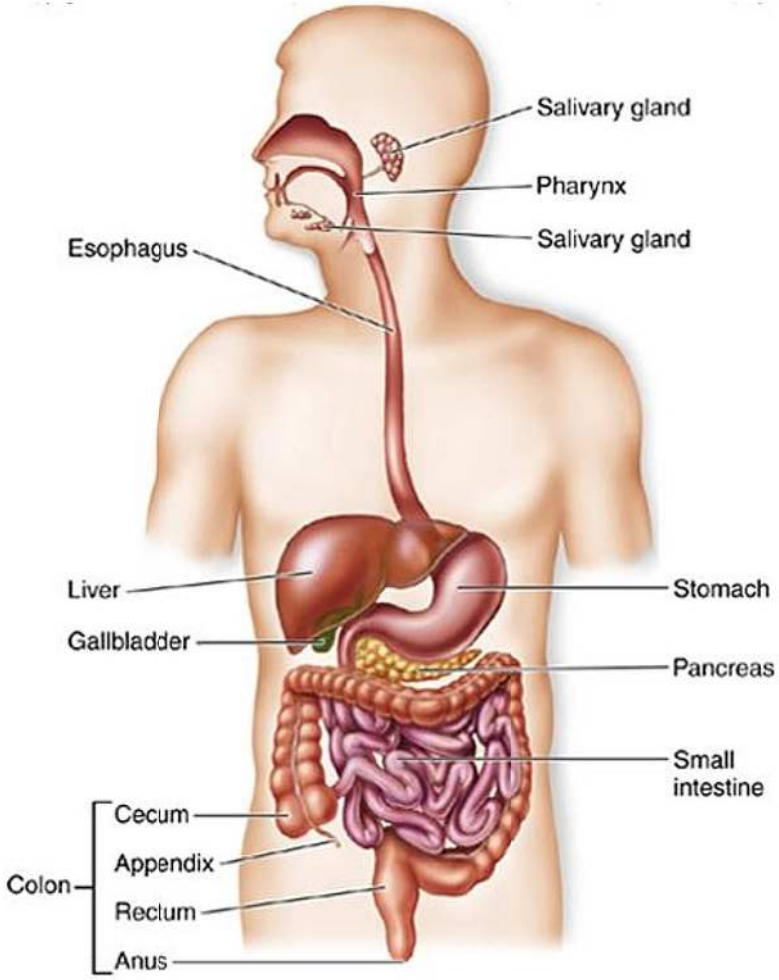
DR. Ahmed Ajrash

Disturbances of GastroIntestinal Tract (GIT)

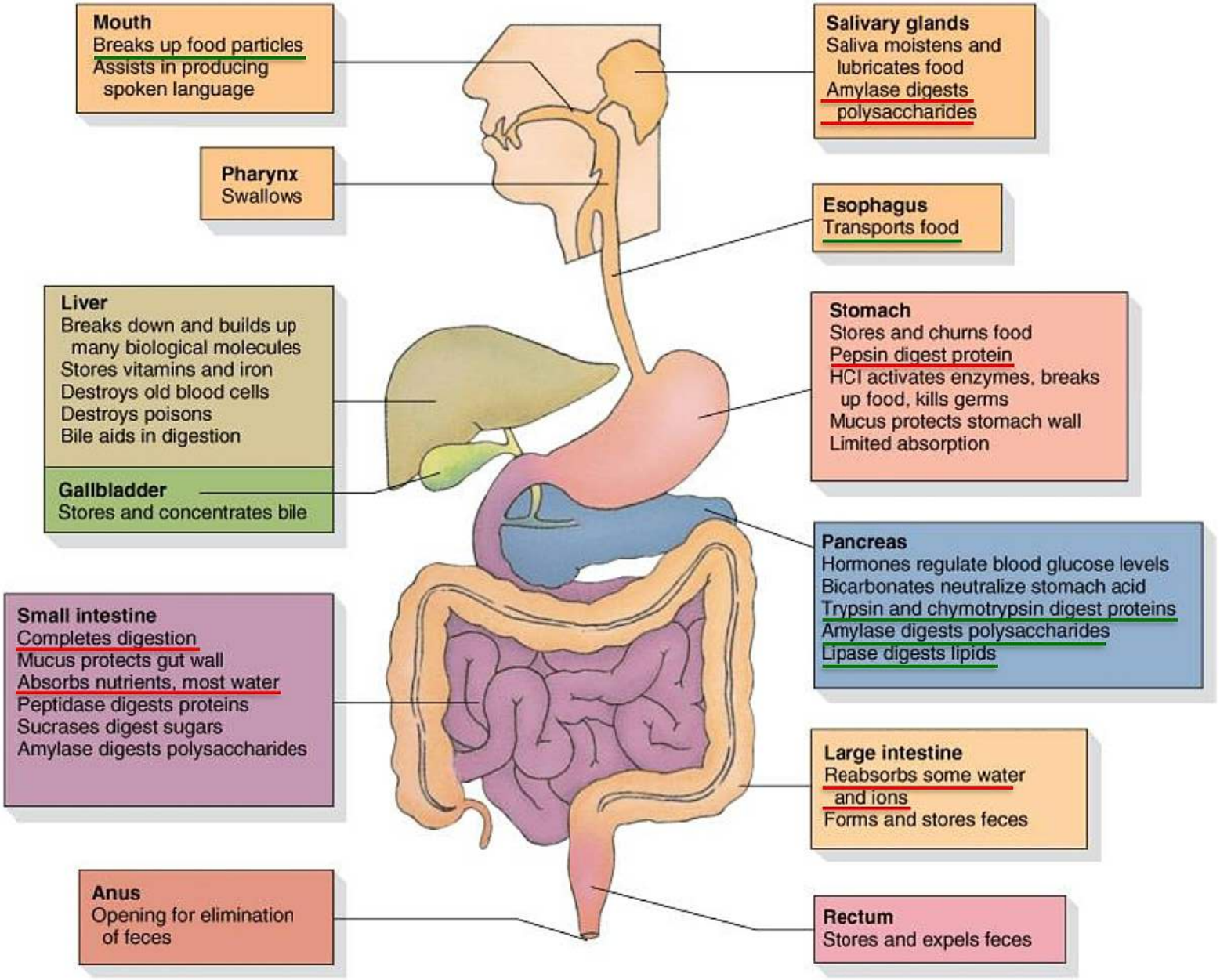
THE GASTROINTESTINAL TRACT - function

- ✓ ***Ingestion of food***
- ✓ ***Digestion***
  - *mechanical digestion of food particles*
  - breaks up food particles
- ✓ ***Motility***
  - movements of organs and food
  - *mechanical digestion of food particles*
- ✓ ***Secretion***
  - secretion of digestive juices
  - chemical digestion of food particles
- ✓ ***Absorption***
  - absorption of digestion products to blood or lymphatic vessels
- ✓ ***Storage and Elimination***
  - non-digested food particles

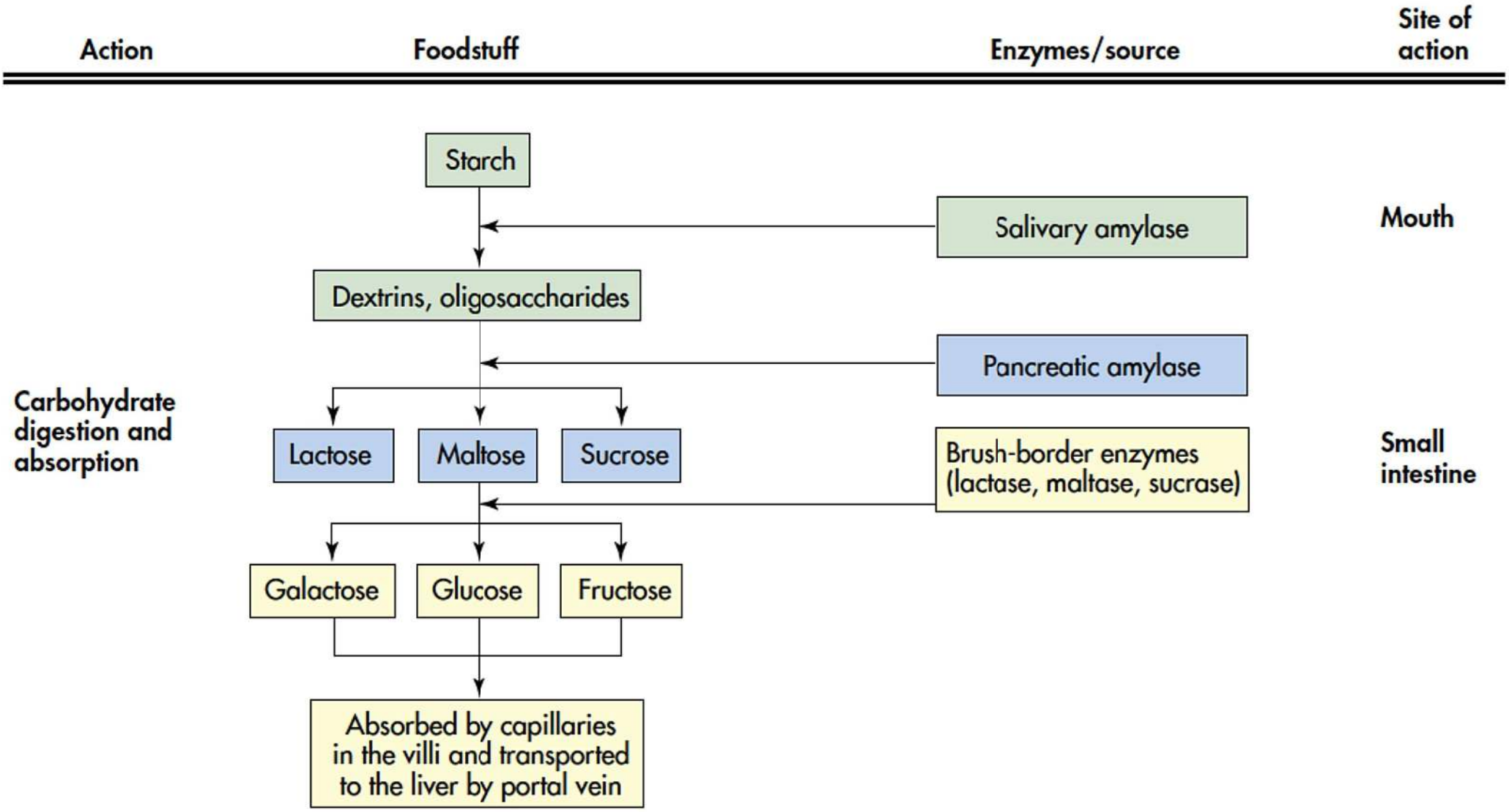


- ✓ ***Protective function – mechanical, chemical, immunological***
  - not only GIT organs but also the body as a whole, against the potential harmful food components

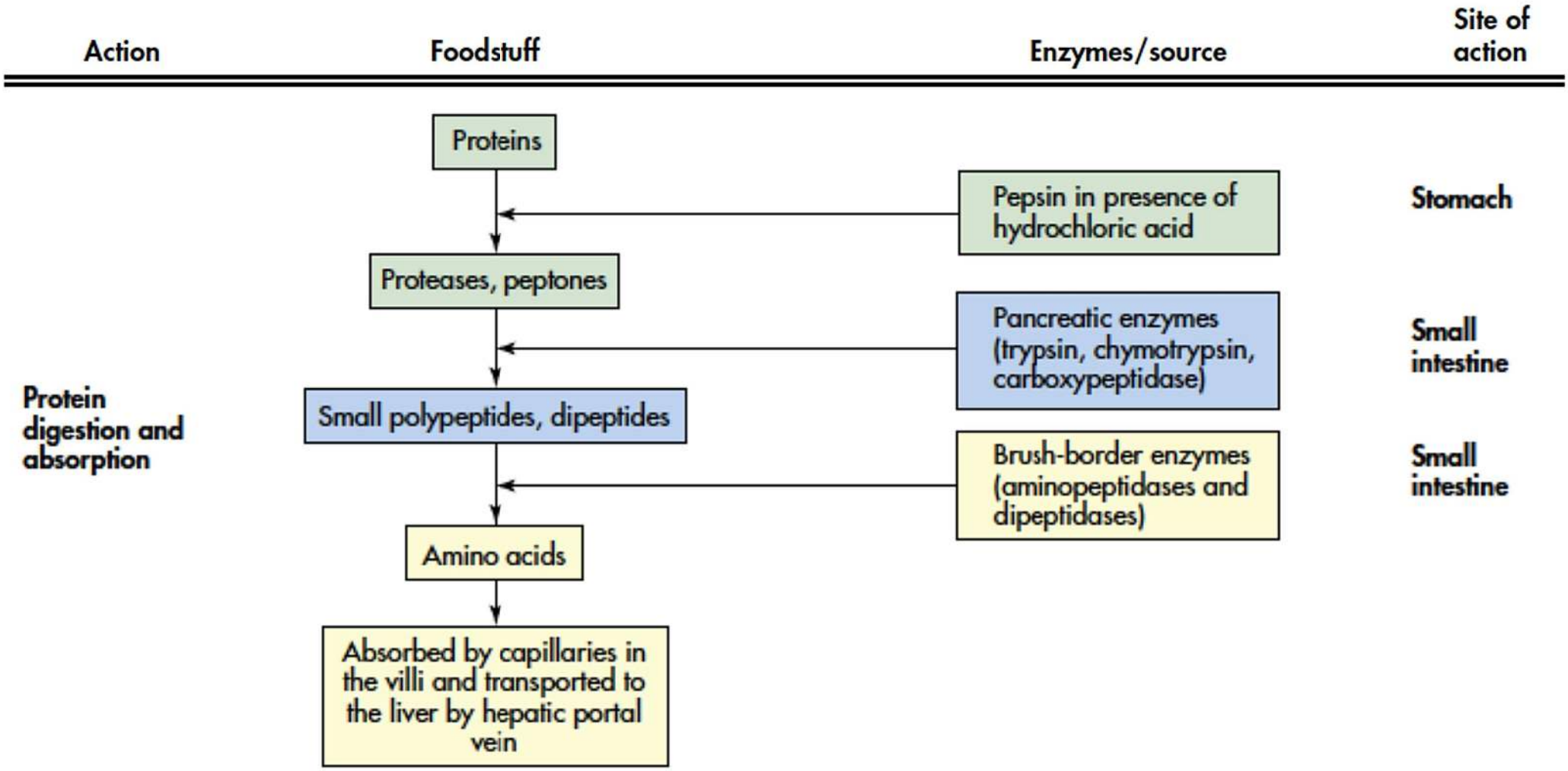
THE GASTROINTESTINAL TRACT - function



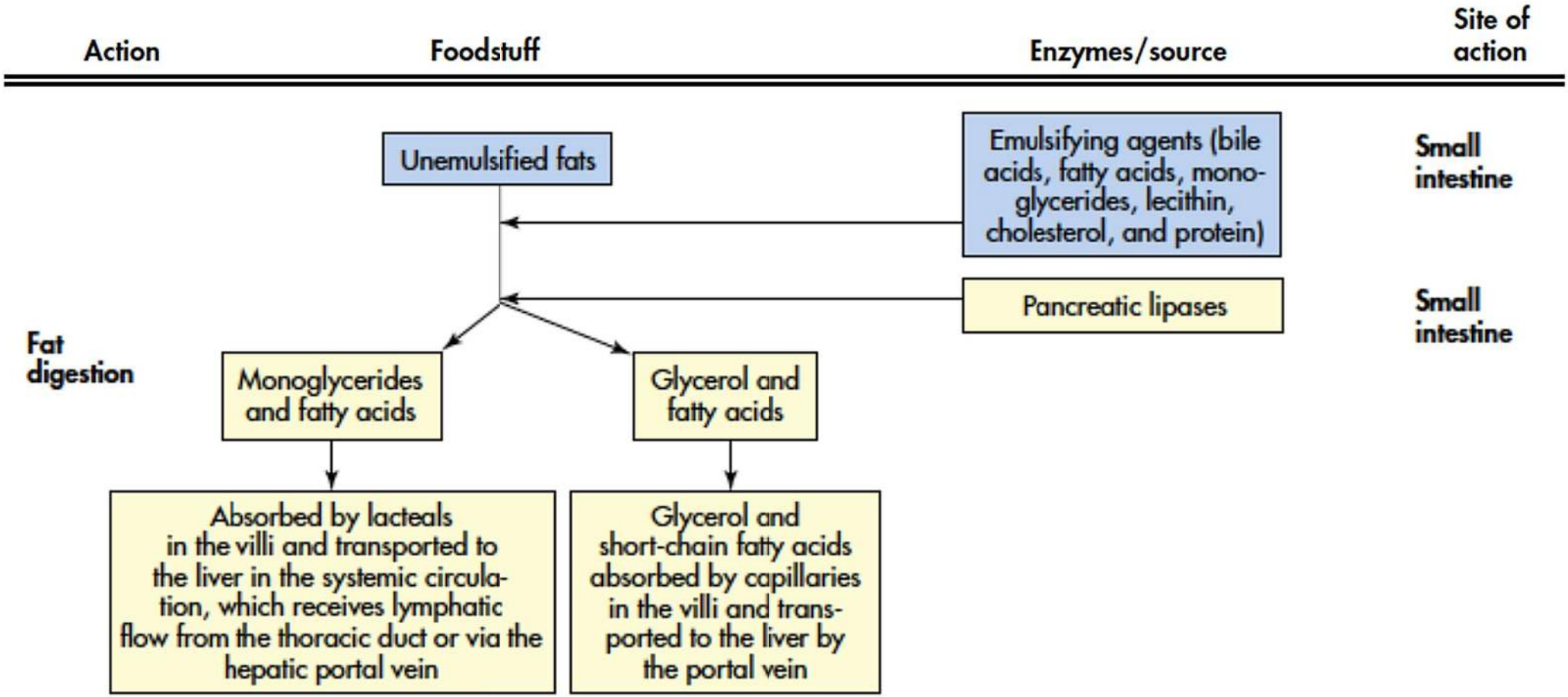
CARBOHYDRATE DIGESTION AND ABSORPTION



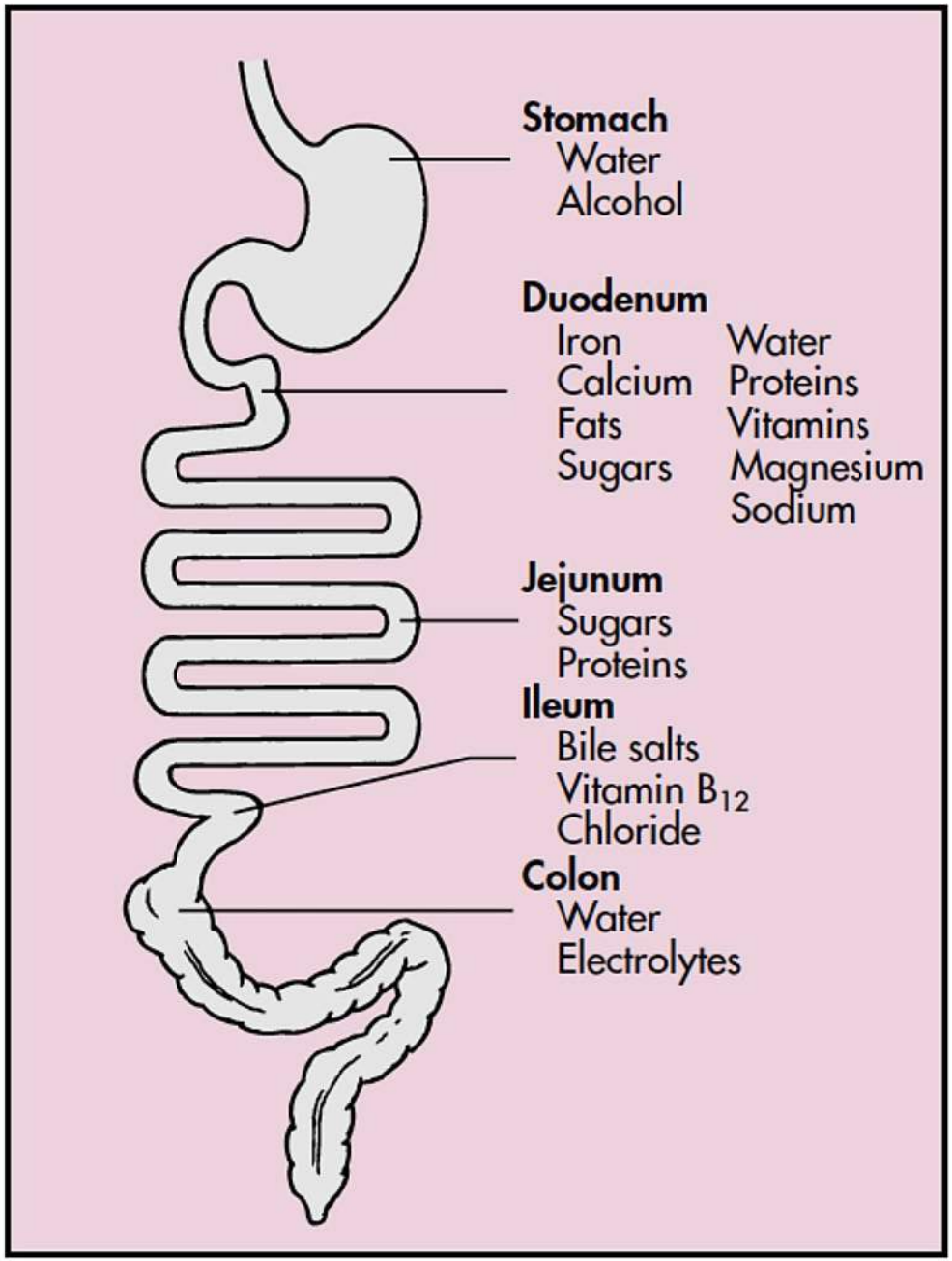
PROTEIN DIGESTION AND ABSORPTION



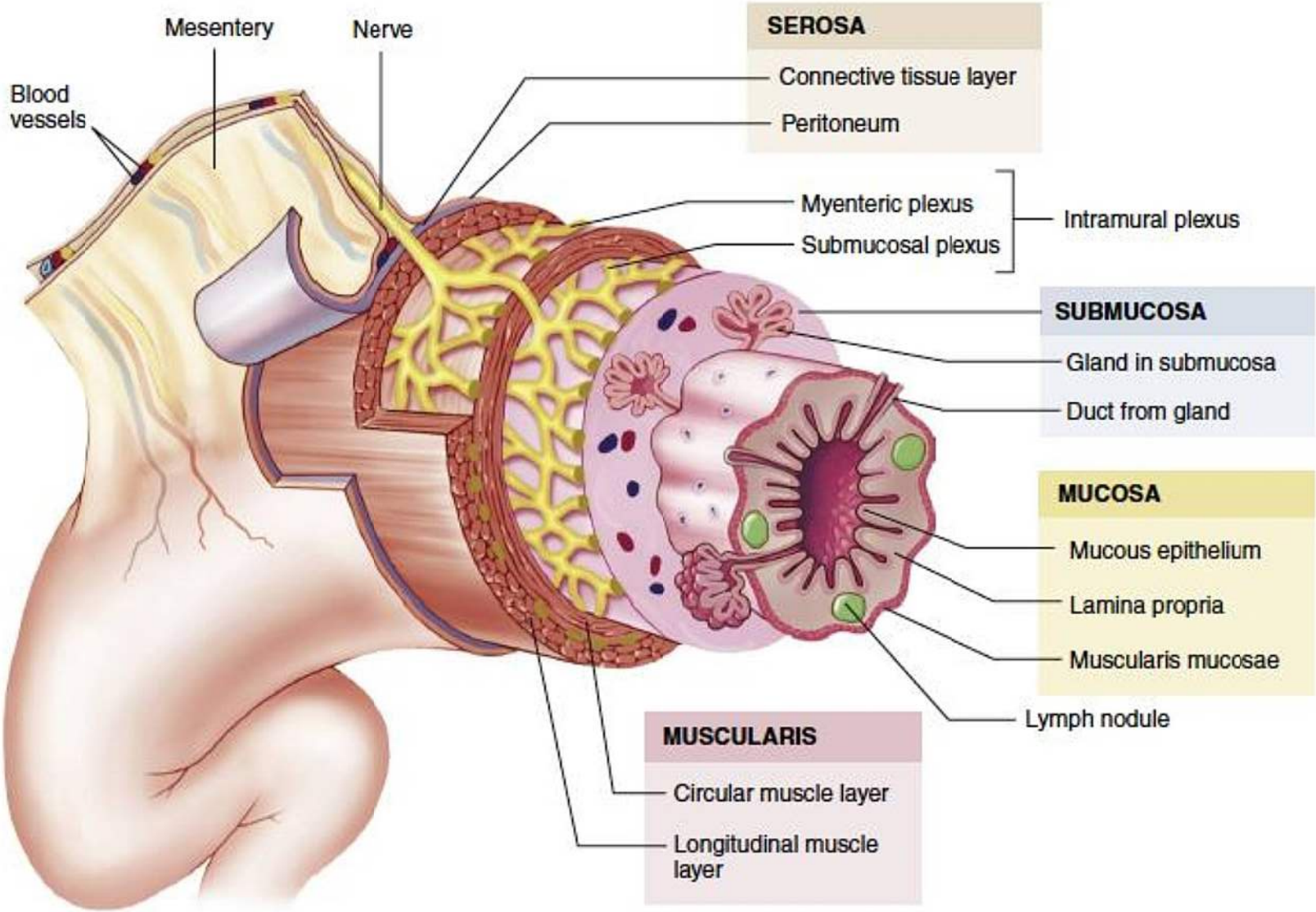
FAT DIGESTION AND ABSORPTION



THE GASTROINTESTINAL TRACT - absorption



THE GASTROINTESTINAL TRACT - structure



DISORDERS OF THE DIGESTIVE SYSTEM

- ***Disorders of the digestive system have serious consequences for the activity of the organism as a whole***

  - ✓ congenital malformations
  - ✓ inflammatory processes
  - ✓ infectious processes
  - ✓ traumatic processes
  - ✓ neoplastic processes

- ***Digestive system communicates with the external environment through the intake of fluids and food***

  - ✓ Toxic substances in food and fluids
  - ✓ GIT itself contains toxic substances
    - secretion components - enzymes, HCl
    - waste products of digestion of food, bacterial flora

THE MOST COMMON DISORDERS of the digestive system

- ✓ ***Motor dysfunction of smooth muscle*** *of the individual parts of the digestive system*
- ✓ ***Indigestion*** *of food and* ***absorption*** *of nutrients - malabsorption syndrome*
- ✓ ***Bleeding*** *into the individual parts of the digestive tract*
- ✓ ***Perforation of the wall of the digestive system*** *with subsequent leakage of the contents to the peritoneal cavity*
- ✓ ***Obstruction*** *in moving of the contents of one part of the digestive system to the next section*
- ✓ ***Circulation*** *disorders in the wall of the individual parts of the digestive system*

CLINICAL MANIFESTATIONS of GI dysfunction

- ✓ *Vomiting*
- ✓ *Dyspepsia*
- ✓ *Constipation*
- ✓ *Diarrhea*
- ✓ *Abdominal Pain*
- ✓ *Gastrointestinal Bleeding*

Clinical manifestations of GI dysfunction - VOMITING

- *is the forceful emptying of stomach and intestinal* contents through the mouth
- the vomiting center lies in *the medulla oblongata* and includes the reticular formation and tractus solitarius nucleus
- stimulation of the vomiting center occurs *directly by irritants or indirectly.*

Cause of:

- ✓ the sudden *expansion of the stomach and duodenum* in the sudden accumulation of contents
- ✓ ***Indirect*** - reflex response to intense pain - trauma of ovary, testis, uterus, bladder and kidneys
  - stimulating the vomiting center, for example. metabolic acidosis or brain lesions
- ✓ ***Direct*** - irritation of the stomach mucosa by toxic substances

Clinical manifestations of GI dysfunction - DYSPEPSIA *(malfunction of digestion)*

Symptoms	***Malfunction***	***Disease***
✓ abdominal pain	✓ esophagus	✓ peptic ulcer
✓ feeling of imperfect digestion	✓ stomach	✓ long-lasting reflux of stomach contents into the esophagus
✓ bloating	✓ duodenum	✓ gastritis
✓ nausea		

- frequently it is functional (non-ulcer) dyspepsia
- ***dyspepsia similar to ulcer symptomatology:*** pain predominates
- ***dyspepsia similar to dysmotility symptomatology:*** nausea, vomiting, bloating
- For individual diseases of the upper GI, these ***symptoms can be combined in various ways***

Clinical manifestations of GI dysfunction - DIARRHEA

- an ***increase in the frequency*** of defecation and the ***fluid content, volume, and weight*** of feces.

Clinical manifestation

- can be *acute* or *chronic*
- *systemic effects of prolonged diarrhea* – dehydration, electrolyte imbalance (hyponatremia, hypokalemia), metabolic acidosis, and weight loss
- *manifestations of acute bacterial or viral infection* - fever, with or without cramping pain, bloody stools
- *Steatorrhea* (fat in the stools) and diarrhea are common signs of malabsorption syndrome

Clinical manifestations of GI dysfunction - DIARRHEA

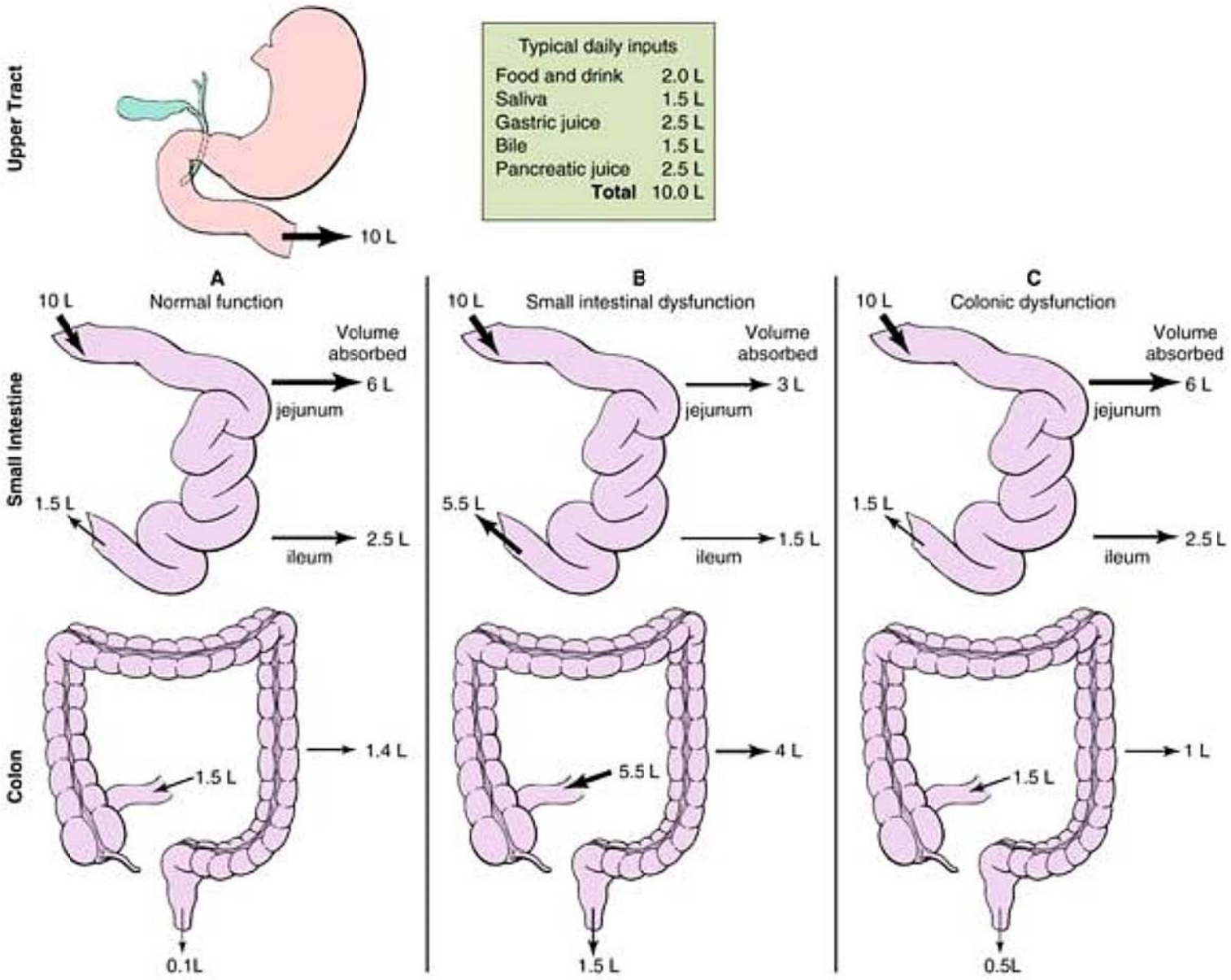
Factors determining the stool volume and consistency

- ✓ water volume
- ✓ the presence of undigested and resorbable food components
- ✓ increased production of intestinal secretions

Pathomechanisms involved in the origination of diarrhea

- ✓ osmotic activity of intestinal contents
- ✓ increased fluid secretion into the lumen of the intestine
- ✓ accelerated intestinal peristalsis

Clinical manifestations of GI dysfunction - DIARRHEA



Clinical manifestations of GI dysfunction - DIARRHEA

- ***Osmotic diarrhea (large-volume diarrhea)***
  - *non-absorbable substance in the intestine draws water into the lumen by osmosis* => excess of water and the non-absorbable substance => large-volume diarrhea
  - *large oral doses of poorly absorbed ions*, such as magnesium, sulfate, and phosphate, can increase intraluminal osmotic pressure
  - *osmotic diarrhea disappears when ingestion of the osmotic substance stops*
  - malabsorption related to lactase deficiency, pancreatic enzyme or bile salt deficiency, small intestine bacterial overgrowth, and celiac disease also cause diarrhea

lactase deficiency

lactose, milk sugar, is *not digested* by the intestine => *high osmotic activity* => binds water => increase in the intestine volume content

Clinical manifestations of GI dysfunction - DIARRHEA

- ***Secretory diarrhea (large-volume diarrhea)***
  - caused by *excessive mucosal secretion of chloride- or bicarbonate-rich f*luid or inhibition of net sodium absorption
  - *infectious causes include viruses* (e.g., rotavirus), bacterial enterotoxins (e.g., *E. coli, Vibrio cholerae*), or exotoxins from overgrowth of *Clostridium difficile* following antibiotic therapy

- ***Small-volume diarrhea***
  - caused by an *inflammatory disorder of the intestine*, such as ulcerative colitis, Crohn disease, or microscopic colitis
  - inflammation of the colon causes smooth muscle contraction, cramping pain, urgency, and frequency

Clinical manifestations of GI dysfunction - DIARRHEA

- ***Motility diarrhea***
  - caused by *resection of the small intestine* (short bowel syndrome), *surgical bypass of an area of the intestine* – diarrhea predominant, diabetic neuropathy, hyperthyroidism, and laxative abuse
  - *excessive motility decreases transit time*, mucosal surface contact, and opportunities for fluid absorption, resulting in diarrhea

Clinical manifestations of GI dysfunction - CONSTIPATION

- difficult or infrequent defecation
- it is associated with *difficulty emptying of solid stool*, which is usually painful

Clinical manifestation (min. two of the following for at least 3 months)

1) straining with defecation at least 25% of the time
2) lumpy or hard stools at least 25% of the time
3) sensation of incomplete emptying at least 25% of the time
4) manual maneuvers to facilitate stool evacuation for at least 25% of defecations
5) fewer than three bowel movements per week

- less frequent defecation
- smaller stool volume
- hard stools
- blood in the stools
- difficulty passing stools (straining)
- feeling of bowel fullness and discomfort

Clinical manifestations of GI dysfunction - CONSTIPATION

It is resulting from failure of:

- ✓ *transporting the contents* (mucus secretion -> colon - motion content)
- ✓ *damage of nerve cells in the intestinal wall* - regulation of peristalsis (congenital absence of the cells - a significant dilatation of the colon)
- ✓ *neurogenic disorders* (stroke, PD, spinal cord injury, MS) - neurotransmitters are altered or neural pathways are degenerated, resulting in delayed colon transit time
- ✓ *endocrine and metabolic disorders* associated with constipation (Diabetes mellitus, hypokalemia, hypercalcemia)
- ✓ *weakened muscles of the abdominal wall* - pain after operation
- ✓ *inflamed hemorrhoids* in the anal part - during defecation are quite painful
- ✓ *physical activity stimulates peristalsis* => sedentary lifestyle and lack of regular exercise are common causes of constipation

Clinical manifestations of GI dysfunction - GASTROINTESTINAL BLEEDING

- often the result of a large number of diseases

Bleeding in the upper GIT
(esophagus, stomach, duodenum)

- ✓ esophageal varices
- ✓ hemorrhagic gastritis
- ✓ gastric and duodenal ulcers

Bleeding in the lower GIT
(jejunum, ileum, colon, rectum)

- ✓ inflammation
- ✓ tumors
- ✓ hemorrhoids

Clinical manifestations of GI dysfunction - GASTROINTESTINAL BLEEDING

- ***sudden and intense bleeding in the GIT is life threatening*** and manifests the presence of *blood in the stool or vomit*

Signs of bleeding in GIT

✓ *Hematemesis*	presence of *blood in vomit*, in the form of *fresh blood or blood precipitates*
✓ blood in vomit in the form of "*coffee grounds*"	blood flows *more slowly in the stomach* - it's time for him to digest it - hemoglobin converts to acidic *hematin (black)*
✓ *Melena*	dark stool caused by digested blood
✓ *Occult bleeding*	chronically *recurrent losses* of small amounts of blood that usually results in anemia due to iron losses

Clinical manifestations of GI dysfunction - MALABSORPTION SYNDROMES

- malabsorption syndromes ***interfere with nutrient absorption***
- historically malabsorption disorders have been classified as *maldigestion* or *malabsorption*

maldigestion

- ✓ failure of the *chemical processes* of digestion (intestinal lumen)
- ✓ caused by *deficiencies of enzymes* (pancreatic lipase, intestinal lactase)
- ✓ *inadequate secretion of bile salts* and inadequate reabsorption of bile in the ileum

malabsorption

- ✓ failure of the intestinal mucosa to *absorb* (transport) the digested nutrients
- ✓ result of *mucosal disruption* (gastric or intestinal resection, vascular disorders, or intestinal disease)

- *Small intestine excretes certain digestive enzymes* and is also ***the most important area for the absorption*** of nutrients
- Resorption area depends on the construction of normal mucosa, which is shaped into the ***villi***.

Clinical manifestations of GI dysfunction - MALABSORPTION SYNDROMES

- Incomplete digestion of food *can occur at several levels GIT* due to malfunction of secretion of digestive juices

Disease	***Manifestation***
✓ after gastrectomy	- *malabsorption of proteins* (poor digestion)
✓ *pancreas* (chronic inflamation)	- *malabsorption of proteins, sugar and fat* (pancreas produces enzymes to digest all food components => undigested proteins, polysaccharides and lipids - present in the faeces)
✓ *liver* or *biliary tract*	- *malabsorption of fat* - reduced secretion of bile into the duodenum - important for the digestion of fats
✓ *secretion of bile into the duodenum*	- *malabsorption of vitamins* - failure of fat digestion => vitamins A, D, E and K (soluble only in fat) are not sufficiently resorbed

Clinical manifestations of GI dysfunction - MALABSORPTION SYNDROMES

- *celiac* and *lactose intolerance* are considered to be primary diseases of malabsorption in our geographical area.

✓ ***Celiac*** – *malabsortion of proteins*

- caused by the the *allergic response* in the small intestine to *gluten* - a protein present in different cereals
- resulting inflammation of the mucosa results in villus atrophy => *significantly reduced resorption* area/capacity of the small intestine

✓ ***Lactase Deficiency*** – *malabsorption of sugar*

- *Lactase - lack of activity* - enzyme which degrades lactose (milk sugar) => after the ingestion of milk, *lactose* present in the small intestine as *an osmotically active agent* (binds H_2O => *greatly increases the volume of the intestinal contents*. In addition, *lactose is decomposed by intestinal bacteria to gas and substances that irritate the mucous membranes*.

  This results in abdominal cramps, bloating and diarrhea often.

Disorders of the GastroIntestinal Tract

Esophagus

- ✓ Dysphagia
- ✓ Achalasia
- ✓ Gastroesophageal reflux

Stomach

- ✓ Gastritis
- ✓ Peptic Ulcer
- ✓ Gastric Cancer

Intestinal system

- ✓ inflammatory bowel disease
- ✓ Crohn disease
- ✓ Ulcerative colitis
- ✓ Colon Cancer
- ✓ Ileus

Disorders of the GIT - DYSPHAGIA

- ***Dysphagia*** is characterized as *swallowing disorders*, which may be due to *mechanical obstruction of the esophagus*, or *functional disorder that impairs esophageal motility*



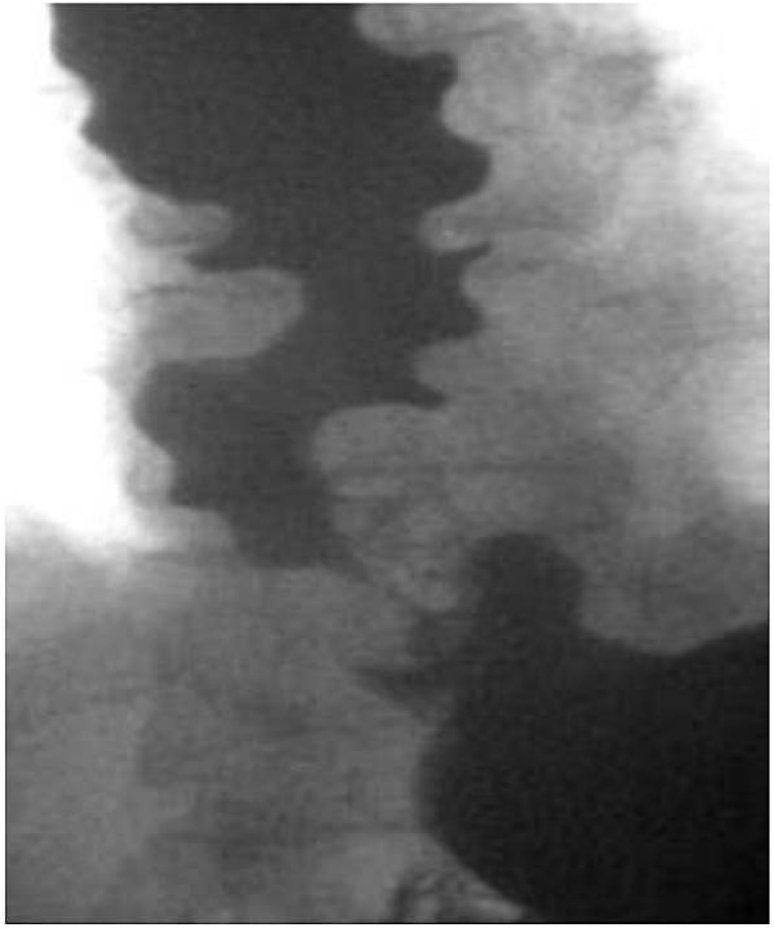
- ***Mechanical obstruction***
  - *intrinsic* - tumor, strictures
  - *extrinsic* - originate *outside the esophageal lumen* and *narrow the esophagus* by pressing inward on the esophageal wall. The most common cause of *extrinsic mechanical obstruction is tumor*

- ***Functional dysphagia***
  - caused by neural or muscular disorders that interfere with swallowing or peristalsis.
  - typical causes of functional dysphagia in the upper esophagus - *dermatomyositis* (a muscle disease) and neurologic impairments caused by stroke, MS, PD, ALS

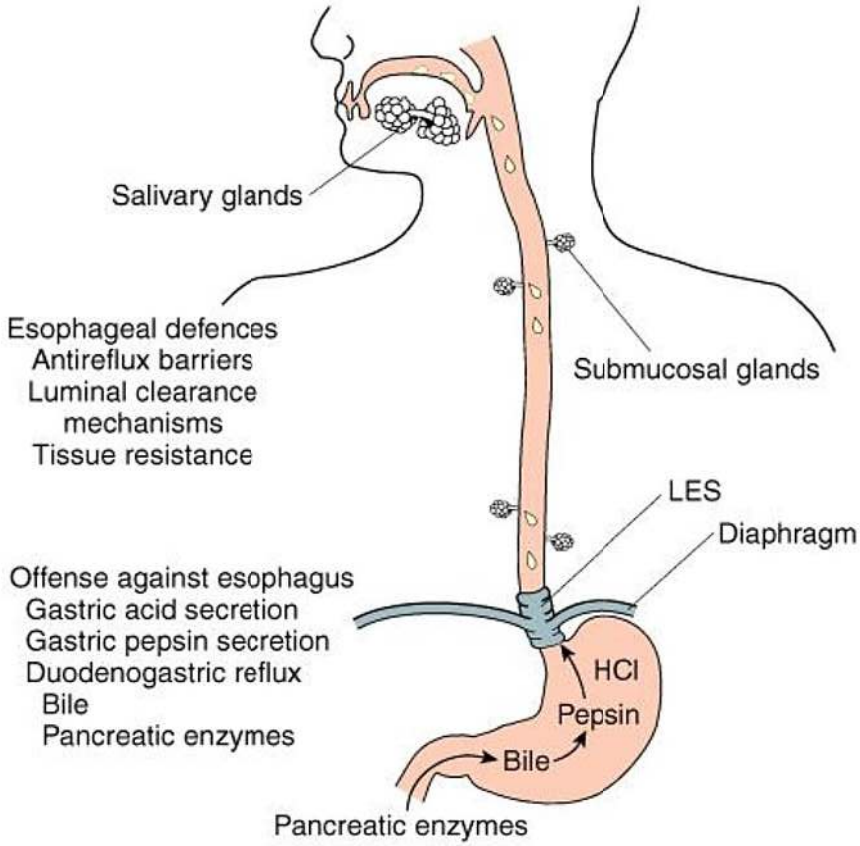
Disorders of the GIT - ACHALASIA

- ***Achalasia*** is a primary *esophageal motility disorder* characterized by an *inability of the lower esophageal sphincter to relax* and is constantly contracted

- *Food accumulates in the upper part* of the esophagus, which gradually dilates,
- *Food is degraded bacteria* and occasionally there is a regurgitation



Disorders of the GIT - GASTROESOPHAGEAL REFLUX DISEASE (GERD)



- ✓ ***Gastroesophageal reflux disease (GERD)*** is the reflux of acid and pepsin from the stomach to the esophagus that causes esophagitis.

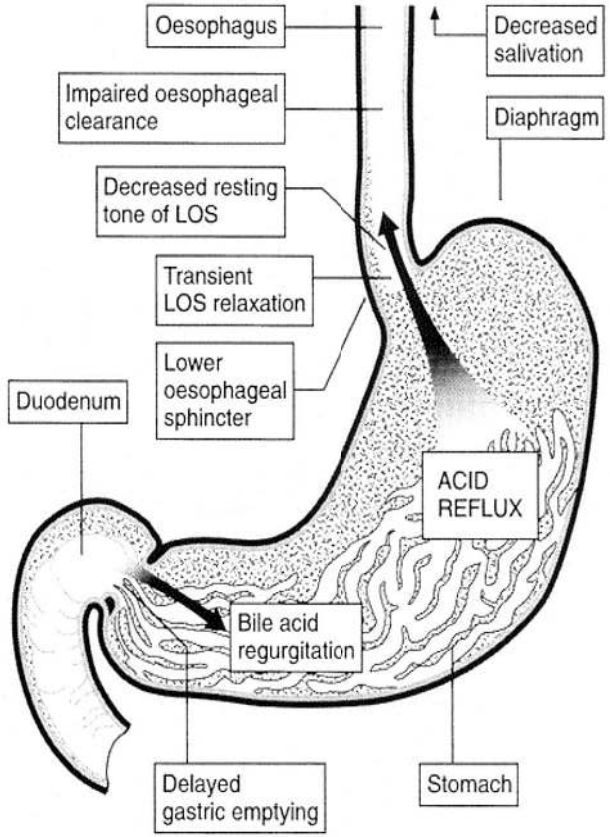
- ***HCl, pepsin and bile*** - induce mucosal inflammation, erosion and ulceration

- It is a *consequence of weaken function of the lower esophageal sphincter*, *delayed gastric emptying* with an increase in the pressure of its content and *weaken clearing function of the esophagus* (lack of saliva, poor esophageal peristalsis, and decreased production of the esophageal mucosal glands).

GASTROESOPHAGEAL REFLUX DISEASE (GERD)

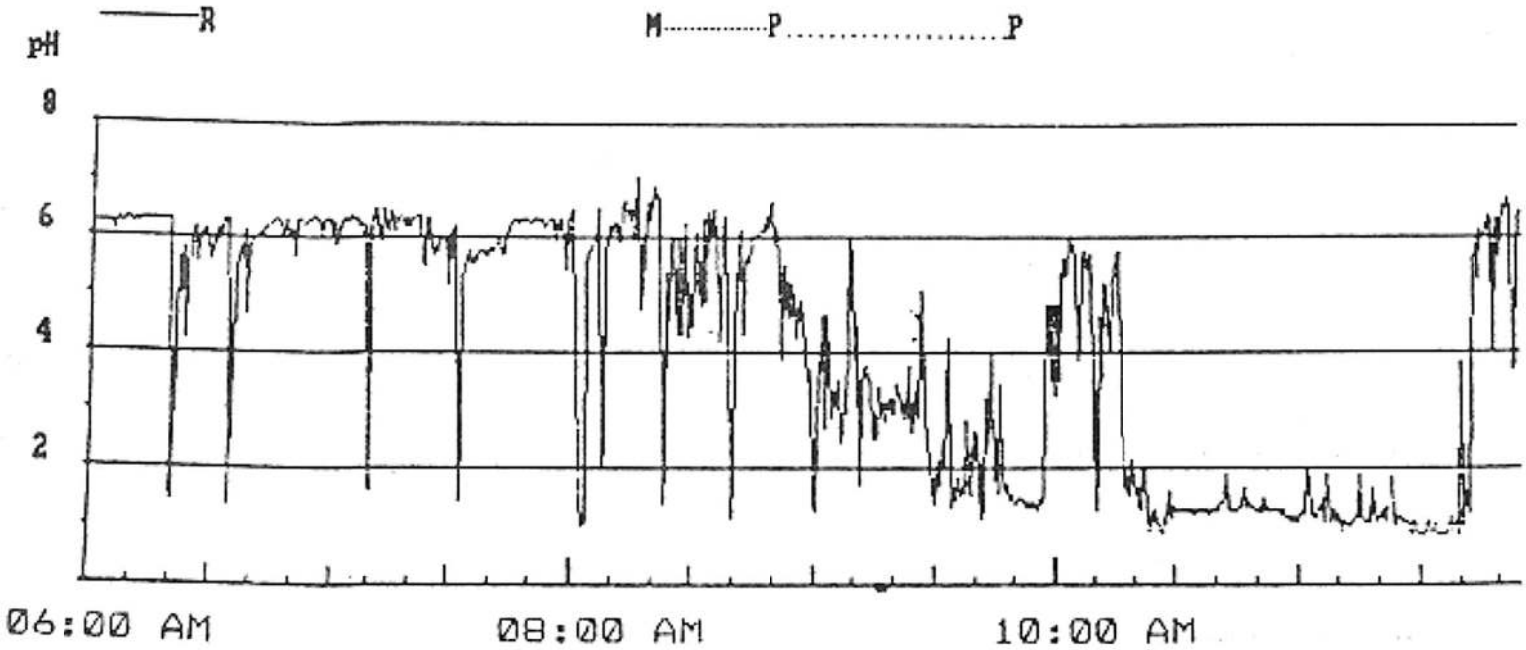
Clinical manifestation:

- *heartburn, chronic cough, asthma attacks*
- abdominal pain (within 1 hour after meals, repeating)
- symptoms may *worsen if the individual lies down*, or in the case *of increasing intra-abdominal pressure* (as a result of coughing, vomiting, or of hard stool)
- *symptoms may be present even if the acid is not present in the esophagus*



- *heartburn can be seen as chest pain, which requires the exclusion of cardiac ischemia*
- *alcohol* or foods that contain acid (*citrus fruits*) can cause discomfort and worsen the syptoms

GASTROESOPHAGEAL REFLUX DISEASE (GERD)

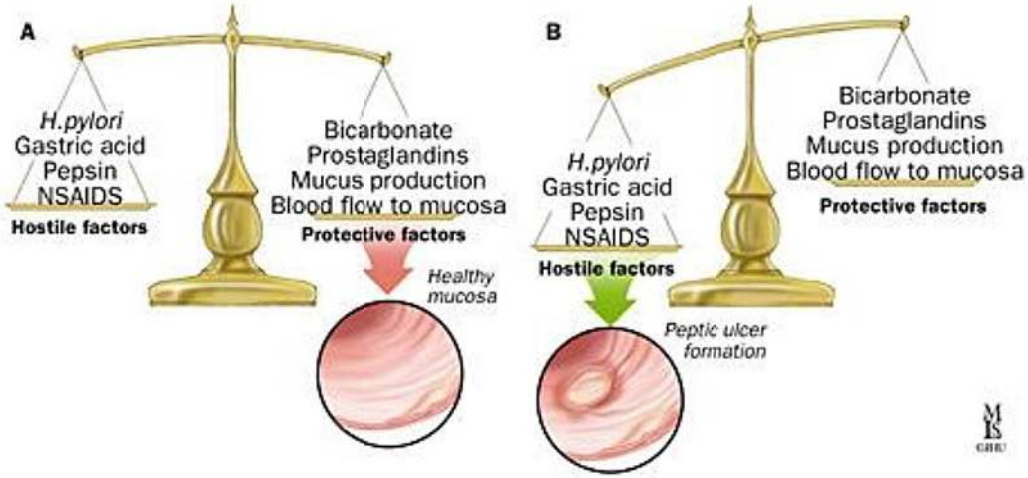


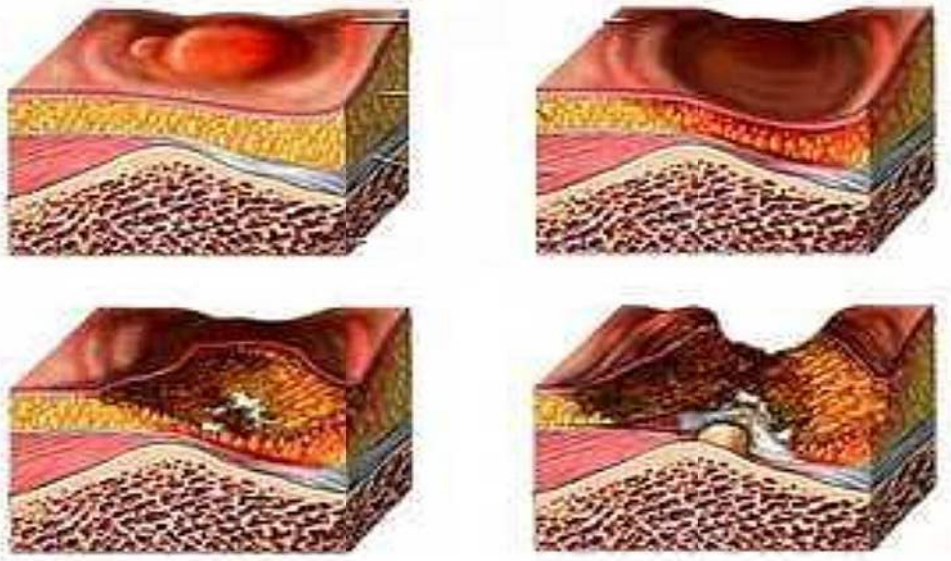
ACID REFLUX		Total	Uprght	Supine	Meal	PostP
Duration	(HH:MM)	24:00	15:55	08:05	01:15	04:00
Number of reflux episodes	(pcs)	107	91	17	8	32
Number of reflux episodes longer than 5.0 minutes	(pcs)	13	12	1	0	6
Longest reflux episode	(min)	99	99	29	2	31
Total time pH below 4.0	(min)	578	528	50	9	128
Fraction time pH below 4.0	(%)	40.1	55.3	10.3	11.6	53.2

Disorders of the GIT – PEPTIC ULCER

- is a result of ***imbalance*** between the ***mucosal defense mechanisms*** in the esophagus, stomach and duodenum, and ***gastric mucosa-damaging mechanisms***

- relates to digestion of *mucous membrane and lower parts of the stomach, duodenum, and lower esophagus* by HCl and pepsin

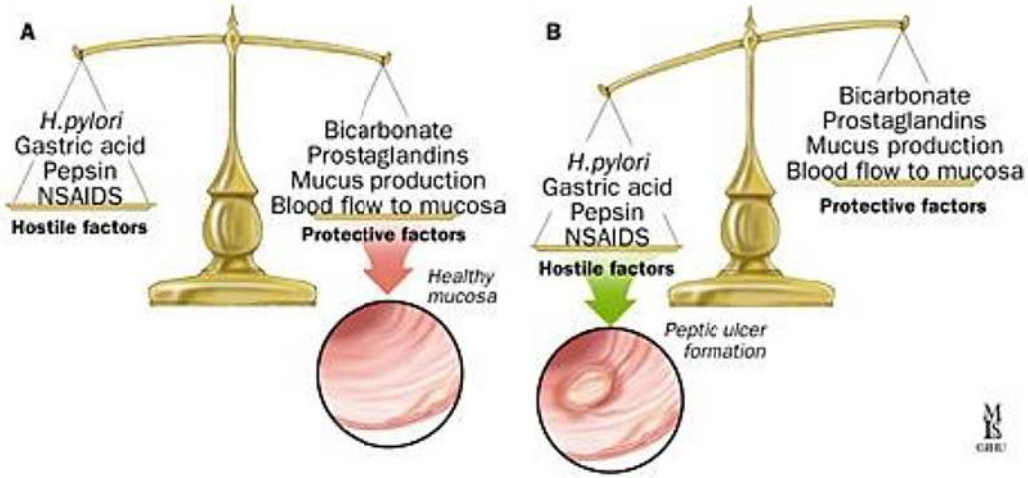


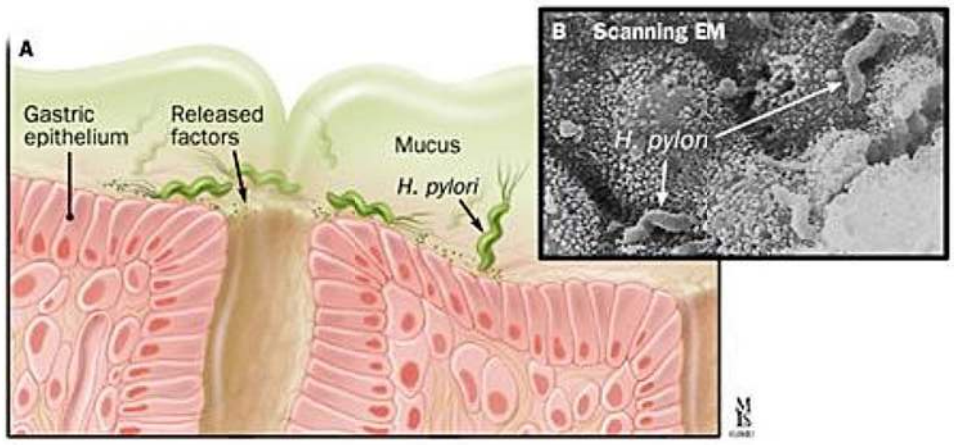


PEPTIC ULCER

Risk factors for peptic ulcer disease:

- genetic predisposition
- H.pylori infection of the gastric mucosa
- age greater than 65 years
- psychologic stress (mechanism unknown)
- excessive use of alcohol
- smoking
- acute pancreatitis
- chronic obstructive pulmonary disease
- obesity
- cirrhosis





PEPTIC ULCER





PEPTIC ULCER

CHARACTERISTICS	GASTRIC ULCER	DUODENAL ULCER
Incidence		
Age at onset	50-70 years	20-50 years
Family history	Usually negative	Positive
Gender (prevalence)	Equal in women and men	Equal in women and men
Stress factors	Increased	Average
Ulcerogenic drugs	Normal use	Increased use
Cancer risk	Increased	Not increased
Pathophysiology		
Helicobacter pylori infection	Often present (60-80%)	Often present (95-100%)
Abnormal mucus	May be present	May be present
Parietal cell mass	Normal or decreased	Increased
Acid production	Normal or decreased	Increased
Serum gastrin	Increased	Normal
Serum pepsinogen	Normal	Increased
Associated gastritis	More common	Usually not present
Clinical Manifestations		
Pain	Located in upper abdomen	Located in upper abdomen
	Intermittent	Intermittent
	Pain-antacid-relief pattern	Pain-antacid or food-relief pattern
	Food-pain pattern	Nocturnal pain common
Clinical course	Chronic ulcer without pattern of remission and exacerbation	Pattern of remissions and exacerbations for years

PEPTIC ULCER

- ***Types of Peptic Ulcers:***

  acute - quickly heal by the mucosa regeneration

  chronic - penetrate deeper into the tissue, healing takes several weeks or months

- ***Special types of ulcers:***

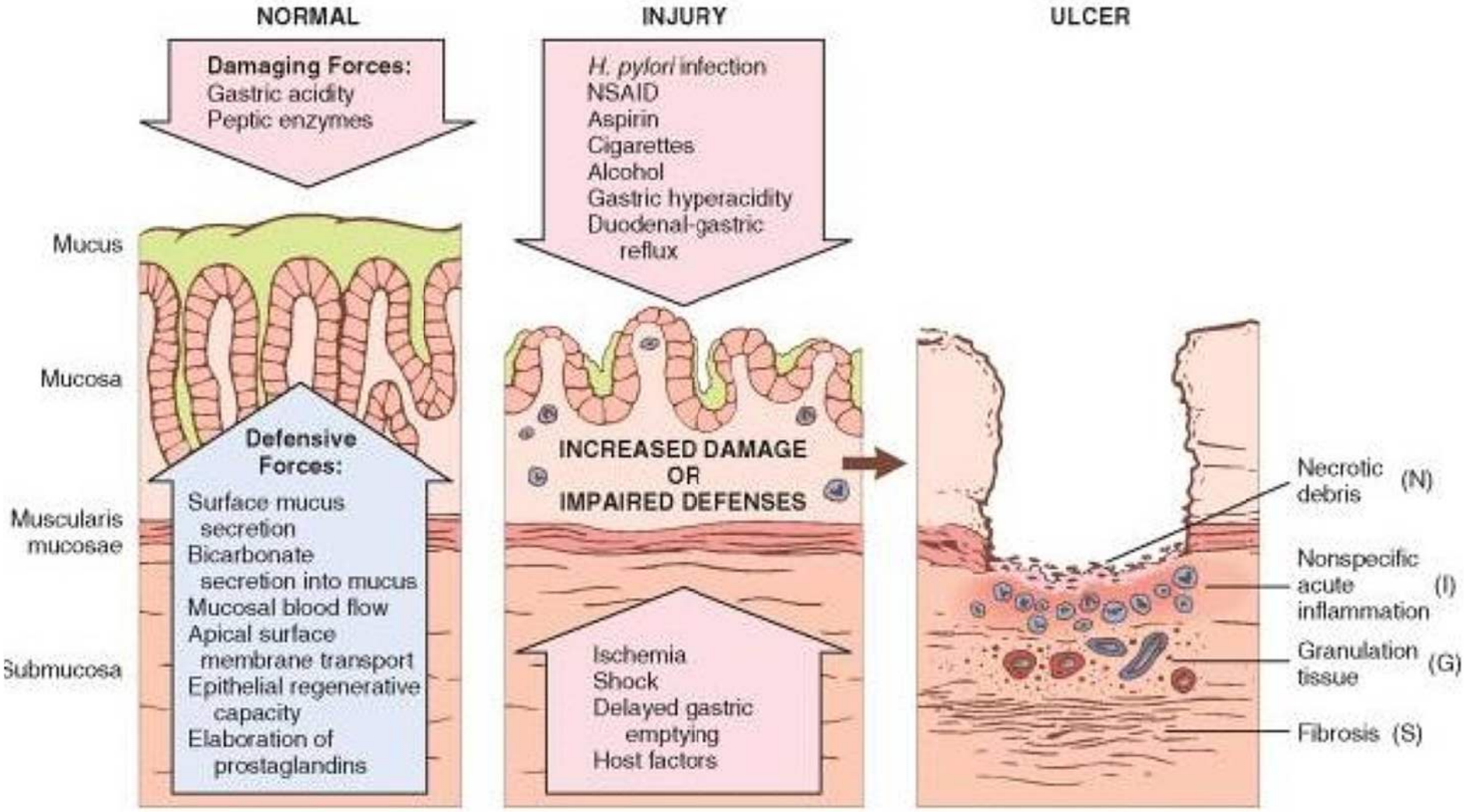
  Cushing - traumatic origin, or after surgery CNS (irritation of n. Vagus -> hypersecretion HCl)

  Curling - traumatic origin, after burns (↑ levels of histamin -> hypersecretion HCl)

  Zollinger - Ellison Syndrome - ↑ production of gastrin -> stimulates the secretion of HCl)

  Stress ulcers - mucosal perfusion defect

PEPTIC ULCER



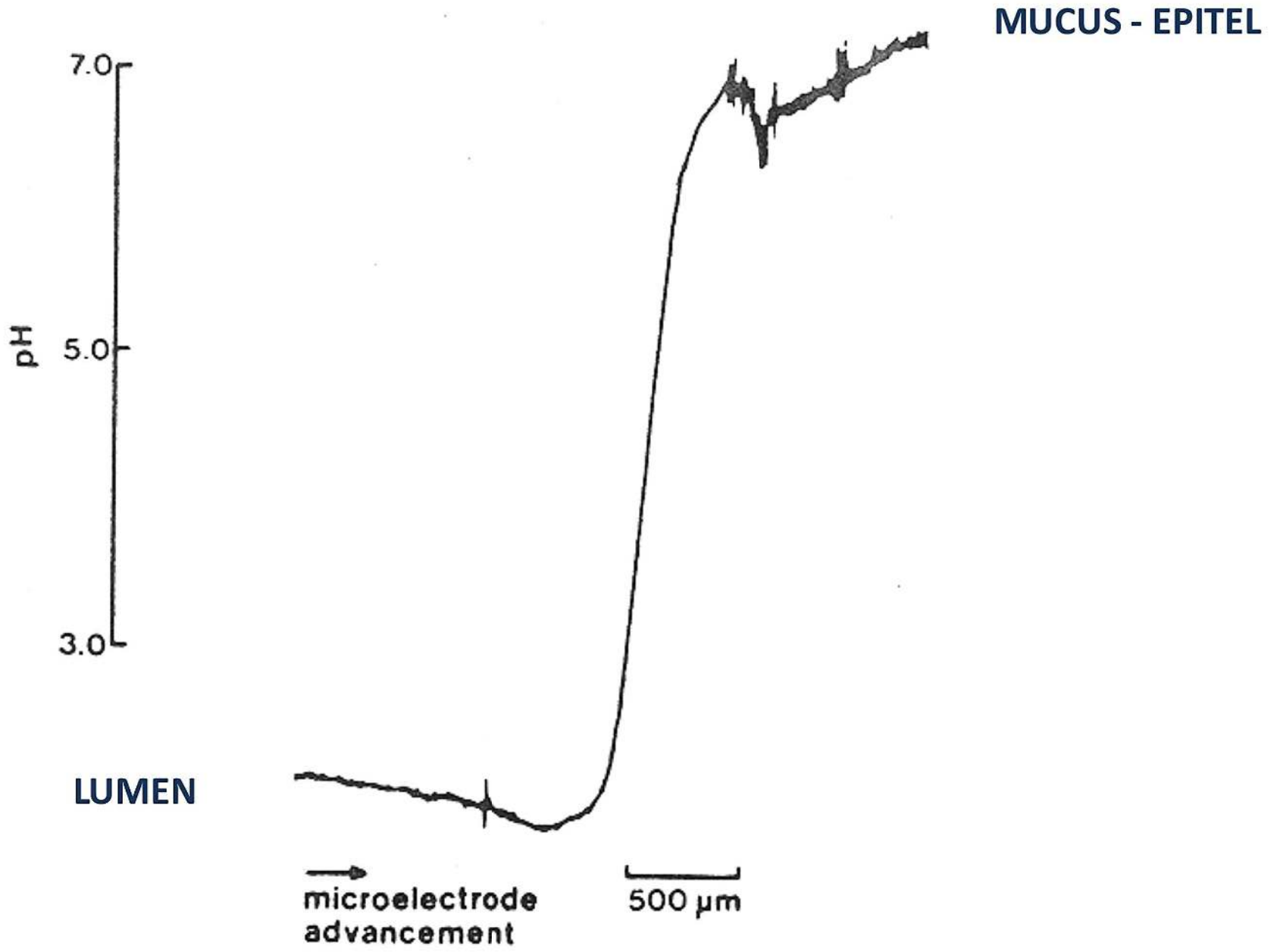
EPITHELIAL GASTRODUODENAL BARRIER

- ***Mucus-bicarbonate barrier***
  - smooth adhesive mucus layer
  - pH gradient (lumen – epithelial surfice)
  - bicarbonate secretion by epithelial cells

- ***H^+ disposal in gastric wall***
  - mucoid barrier damage
  - back diffusion of H^+ into the wall
  - *mucosal blood flow*

- ***Proliferation and epithelial repair***
  - mitosis and cell migration along the basal membrane
  - mucoid cap after epithelial damage

EPITHELIAL GASTRODUODENAL BARRIER



EPITHELIAL GASTRODUODENAL BARRIER

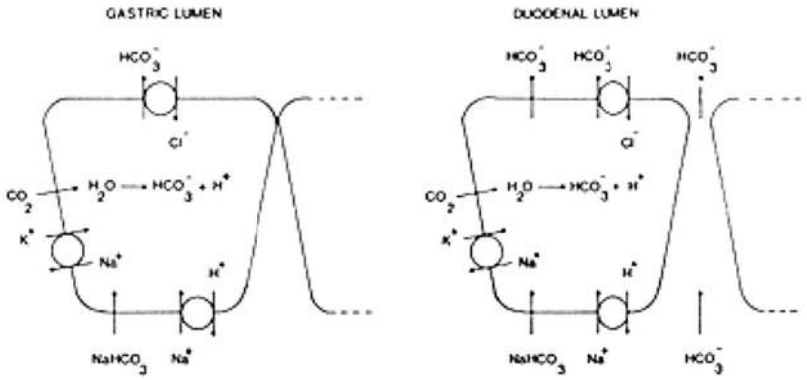
- ***Mucus - bicarbonate layer***

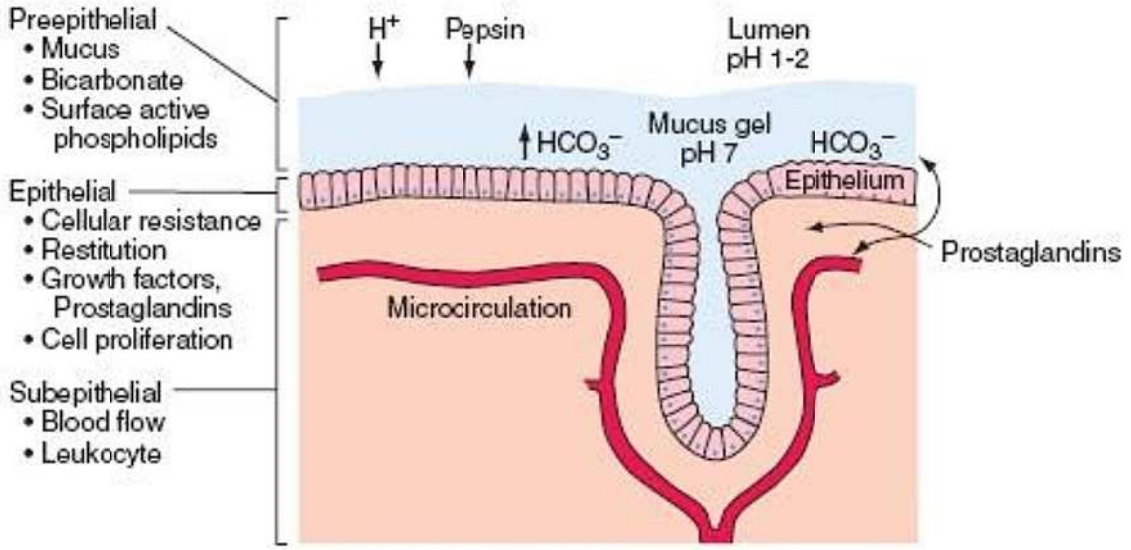
  - *protects the mucosa from autodigestion*

  - on the surface of the mucosa -> *layer of mucus – non-permeable layer for acid and pepsin* -> and prevent the intake of the hydrogen ion (H^+) to the mucosal tissue which causes damage to the cells and subsequent digestion with pepsin

  - in mucosa itself, a large amount of bicarbonate ions (HCO_3^-) is produced - buffering H^+ ions that penetrate mucosa

  - good blood flow

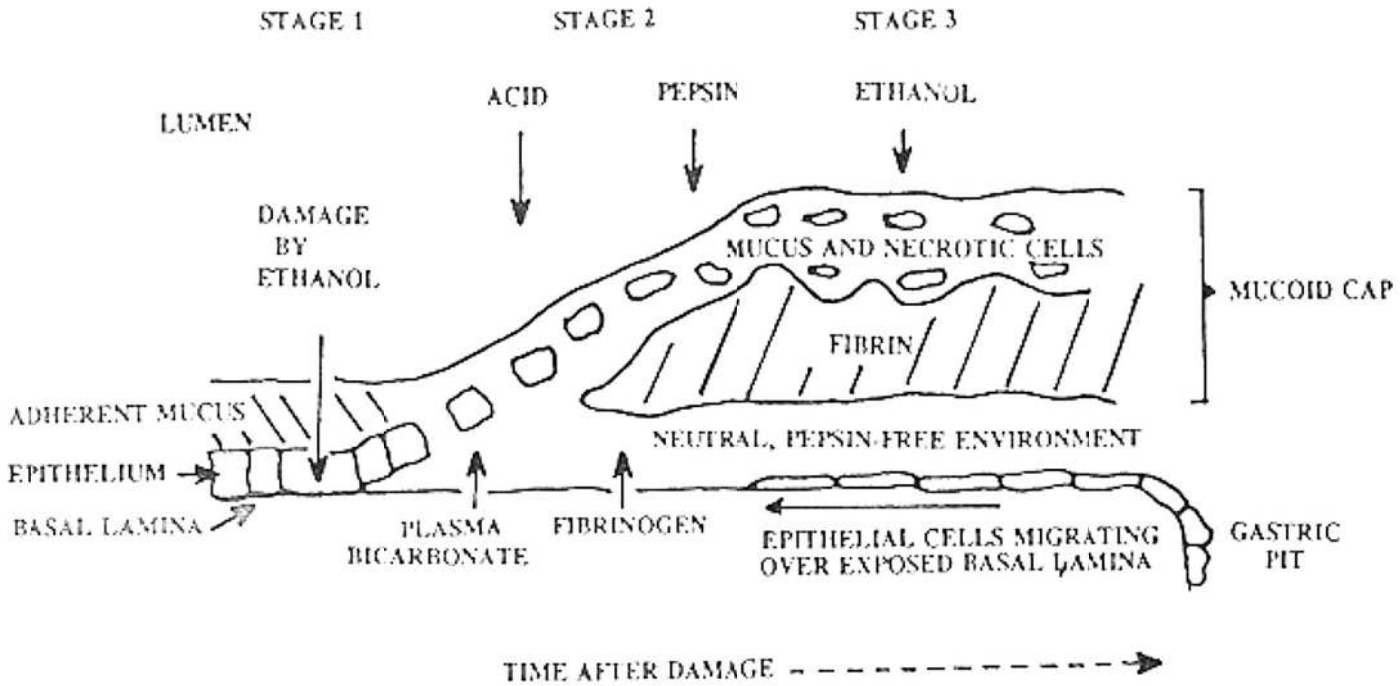




EPITHELIAL GASTRODUODENAL BARRIER

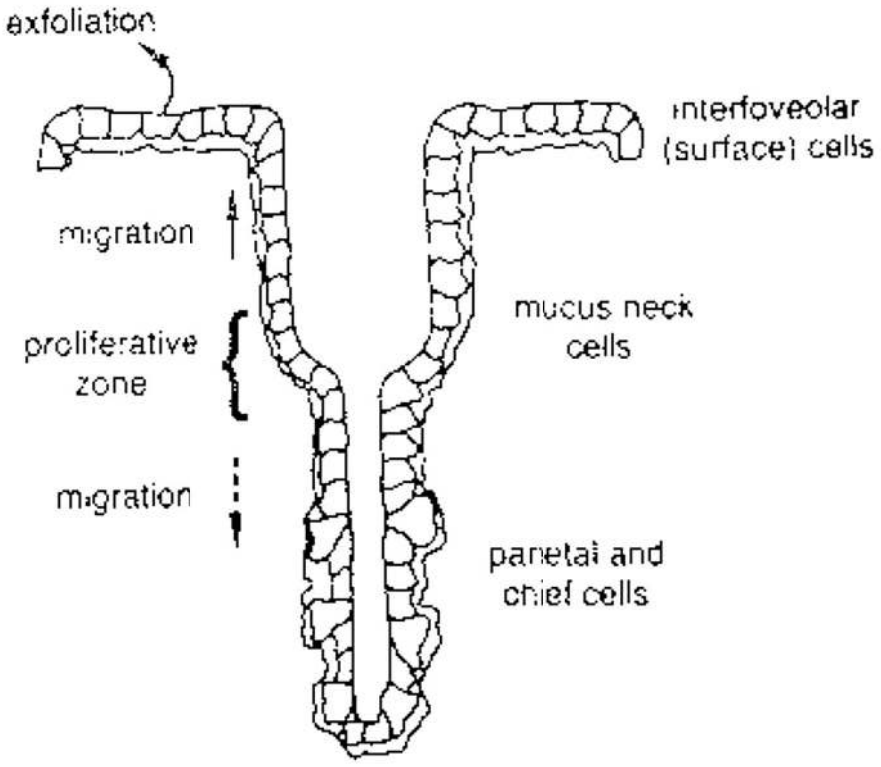
- ***Mucoid cap***

- mechanisms associated with *rapid repairing of the damage area*
- mucus with fibrin - form *"fibrin cap"* - strongly adhere to erosion - gives the condition *of regeneration of the epithelium under it* (*preventing further penetration of aggressive agents*)

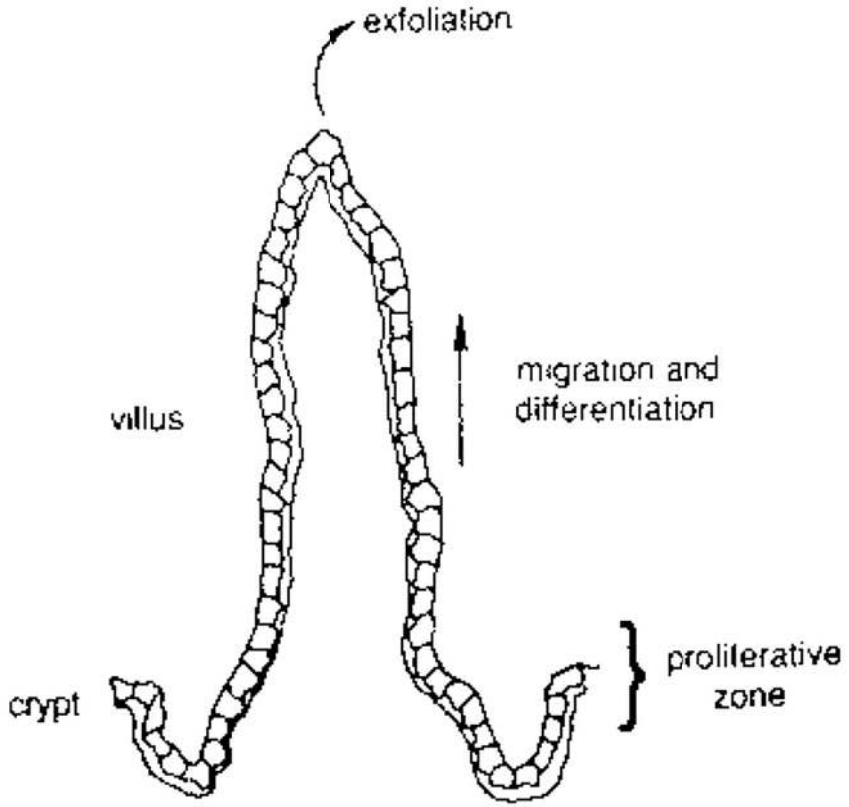


EPITHELIAL GASTRODUODENAL BARRIER

- **Mitosis and the cell migration along the basal layer**

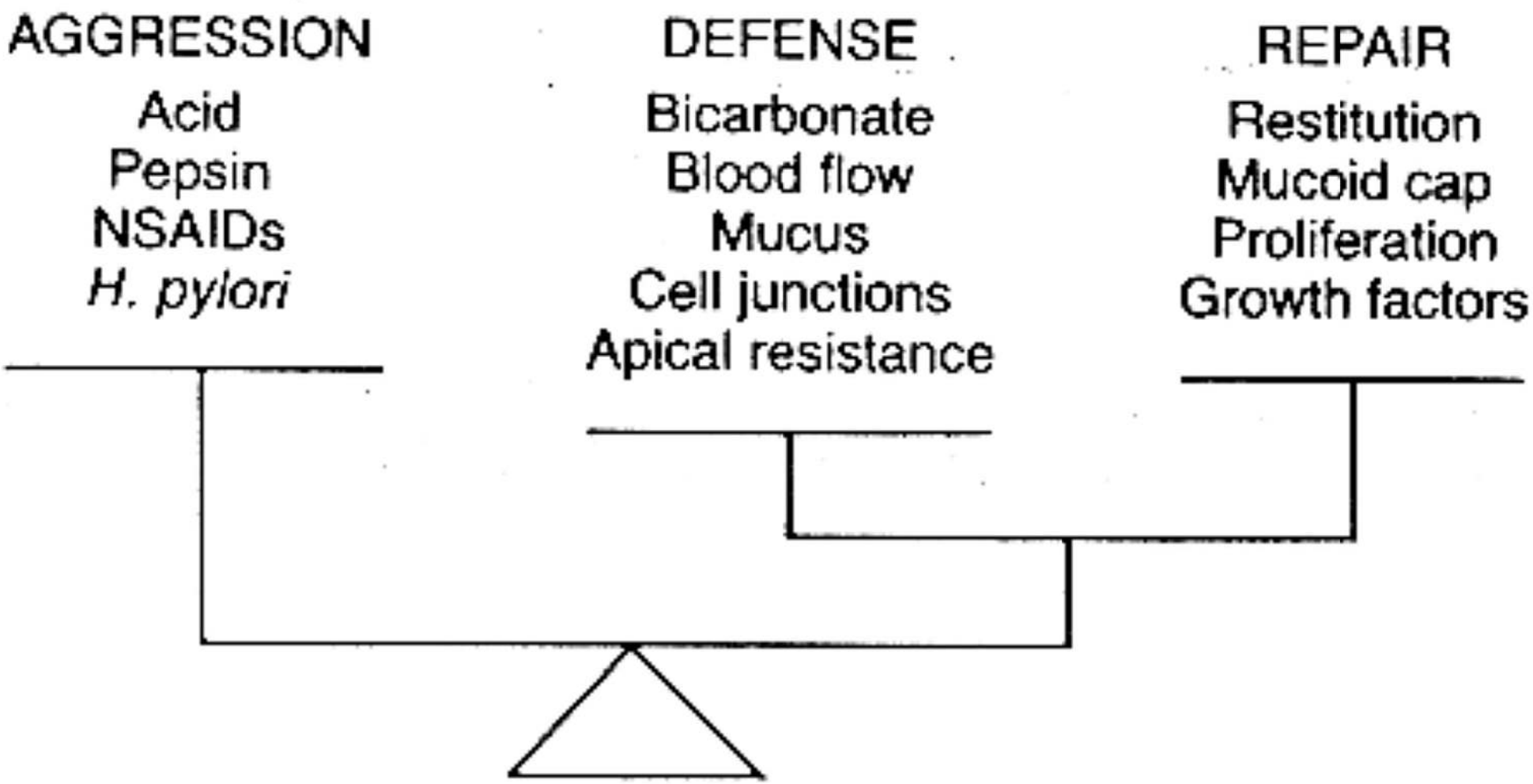


Gastric Mucosa



Duodenal Mucosa

Disorders of the GIT – PEPTIC ULCER



Disorders of the GIT – APPENDICITIS

Appendicitis is an inflammation of the vermiform appendix, which is a projection from the apex of the cecum

Clinical manifestation:

- *pain is initially diffuse and poorly localizable* (visceral pain), later when the inflammation transit to the parietal peritoneum, patients localize the pain in the right hypogastrium (*somatization visceral pain*)
- the pain may be vague at first, *increasing in intensity over 3 to 4 hours*
- *right lower quadrant pain* is associated with *extension of the inflammation* to the surrounding tissues
- *nausea, vomiting, and anorexia follow the onset of pain, and* fever is common
- *diarrhea occurs in some individuals, particularly children*; others have a sensation of constipation
- *perforation, peritonitis, and abscess formation are the most serious complications of appendicitis*

Disorders of the GIT – APPENDICITIS

The exact cause of appendicitis is controversial.

- *obstruction of the lumen with stool, tumors, or foreign bodies* with consequent increased intraluminal pressure, ischemia, bacterial infection, and inflammation is a common theory
- *regardless of the cause - intraluminal pressure increases* (secretion of mucus and fluids continues), propagation of bacteria and leukocytes continues
- the increased pressure *decreases mucosal blood flow*, and the appendix becomes hypoxic
- the *mucosa ulcerates, promoting bacterial or other microbial invasion* with further inflammation and edema.
- inflammation may involve the distal or entire appendix

Disorders of the GIT – INFLAMMATORY BOWEL DISEASE

- ***Ulcerative colitis*** and ***Crohn disease*** are *chronic, relapsing inflammatory bowel diseases* (IBDs) of unknown origin
- both diseases are associated with *genetic factors*, *alterations in epithelial cell barrier functions*, *immunopathology* related to abnormal T-cell reactions to microflora and other luminal antigens, and varying phenotypes

Disorders of the GIT –
INFLAMMATORY BOWEL DISEASE

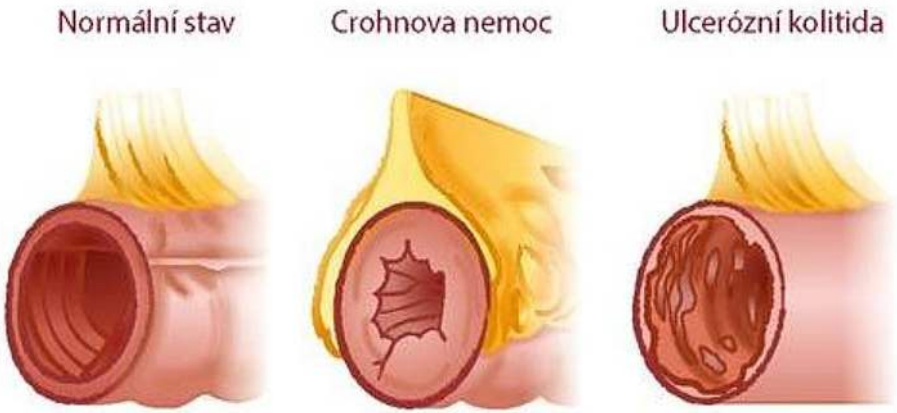
Crohn disease - *any part of the digestive tract* - the most common - terminal part of the ileum

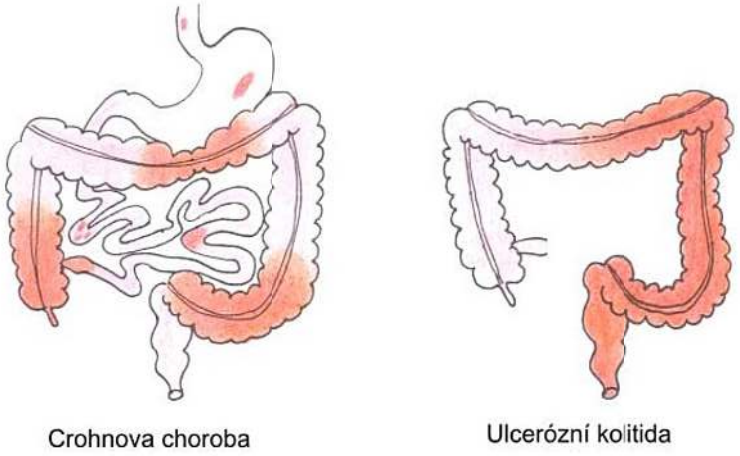
- inflammatory process affects all layers of the wall of the digestive tract

-> ulcerations in the wall, the formation of fistulas and abscesses

Ulcerative colitis - affects *colon a rectum*

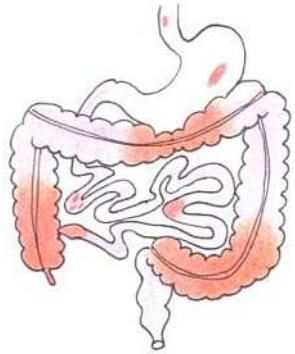
- the process of fibrosis is not intensified





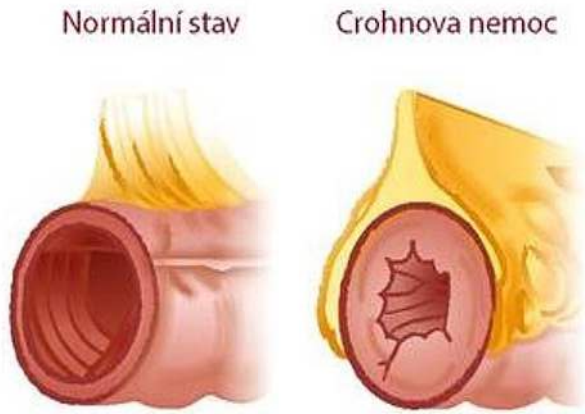
INFLAMMATORY BOWEL DISEASE

- Crohn disease

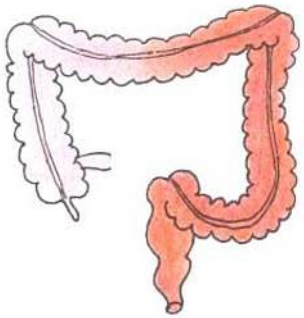


- is an *idiopathic inflammatory disorder* that affects any part of the gastrointestinal tract *from the mouth to the anus*
- the distal *small intestine and proximal large colon* are most commonly affected by the disease
- inflammation healing scars can lead to narrowing of the lumen and obstruction of the intestinal tract -> fibrosis

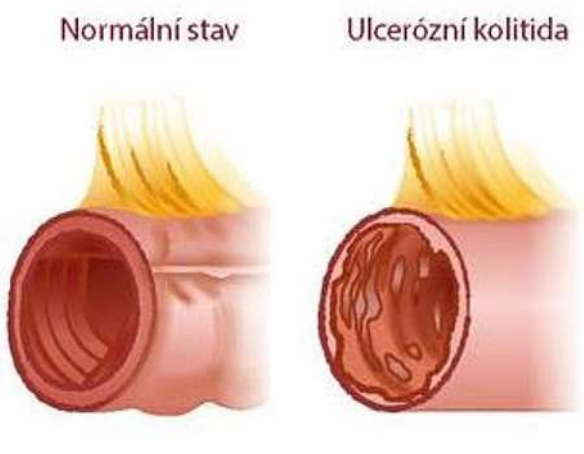
- characteristic symptoms are *abdominal pain and diarrhea*
- *malabsorptions* are the result of loss of functional mucosal absorptive surface
- most often it is deficit of several food components and dehydration



INFLAMMATORY BOWEL DISEASE
- Ulcerative Colitis



- is a *chronic inflammatory disease* that causes *ulceration of the colonic mucosa* and extends proximally from the rectum into the colon
- ***although the cause is unknown, dietary, infectious, genetic, and immunologic factors are all suggested causes*** (less common in smokers)
- in *oppposite to Crohn disease*, the fibrosis process is not intensified
- the primary lesions are continuous *with no skip lesions*, are limited to the mucosa, *and are not transmural*
- the mucous layer is thinner than normal - impairment of the epithelial barrier
- the inflammation damages the epithelial mucosal barrier with leak of fluids into the gut
- the clinical symptoms are *diarrhea, weight loss, abdominal pain and loss of blood in the faeces*



INFLAMMATORY BOWEL DISEASES

FEATURE	ULCERATIVE COLITIS	CROHN DISEASE
Incidence		
Age at onset	Any age; 10-40 years most common	Any age; 10-30 years most common
Family history	Less common	More common
Gender (prevalence)	Equal in women and men	About equal in women and men
Cancer risk	Increased	Increased
Pathophysiology		
Location of lesions	Colon and rectum, no "skip" lesions	All of GI tract: mouth to anus, "skip" lesions common
Inflammation and ulceration	Mucosal layer involved	Entire intestinal wall involved
Granulomas	Rare	Common
Friable mucosa	Common	Less common
Fistulae and abscesses	Rare	Common
Strictures and possible obstruction	Rare	Common
Clinical Manifestations		
Abdominal pain	Occasional	Common
Diarrhea	Common	Common
Bloody stools	Common	Less common
Abdominal mass	Rare	Common
Small intestinal malabsorption	Rare	Common
Steatorrhea	Rare	Common
Potential for malignancy	Common	Common
Antineutrophil cytoplasmic antibodies	Common	Rare
Anti–*Saccharomyces cerevisiae* antibodies	Rare	Common
Clinical course	Remissions and exacerbations	Remissions and exacerbations

ABDOMINAL EMERGENCY

Accident origin

- ✓ *traumatic Haemoperitoneum* - accumulation of large quantities of blood in the abdominal cavity due to e.g. traumatic rupture of the spleen, liver
- ✓ *Post-traumatic peritonitis* - an accident puncture of an internal organ and a consequent release of its contents into the peritoneal cavity

Nontraumatic origin

- ✓ *Abdominal emergency of an inflammatory origin* - ***1)*** inflammation limited to a single organ with minimal spread to the surrounding peritoneal structures (appendicitis, chole-cystitis) - results in intraperitoneal abscess formation. ***2)*** inflammation spreads to the peritoneal cavity - peritonitis
- ✓ *Abdominal emergency associated with intestinal obstruction*
- ✓ *Abdominal emergency associated with bleeding in the digestive system* - peptic ulcer and bowel disease, tumor process, bleeding disorder ...

Disorders of the GIT – ILEUS

- is a serious condition that can have many causes

- ✓ ***mechanical obstruction*** - obstruction in the lumen of the intestine and leads to compression of the wall
- ✓ ***vascular obstruction*** - strangulation of blood vessel due to thrombosis or embolism
- ✓ ***functional obstruction*** - due to the "paralysis" of the intestinal muscles

Pathogenesis – stagnation od the content, absorption and secretion, bacterial overgrowth, and hypoxia intestinal wall

Clinical manifestation

- *vary according to the type of obstruction and its location* in the intestinal system
- may be colic pain (obstruction of the lumen) or permanent
- vomiting and abdominal distension

ILEUS – Mechanical Ileus

- ✓ ***Caused by the obstruction of the intestinal lumen***

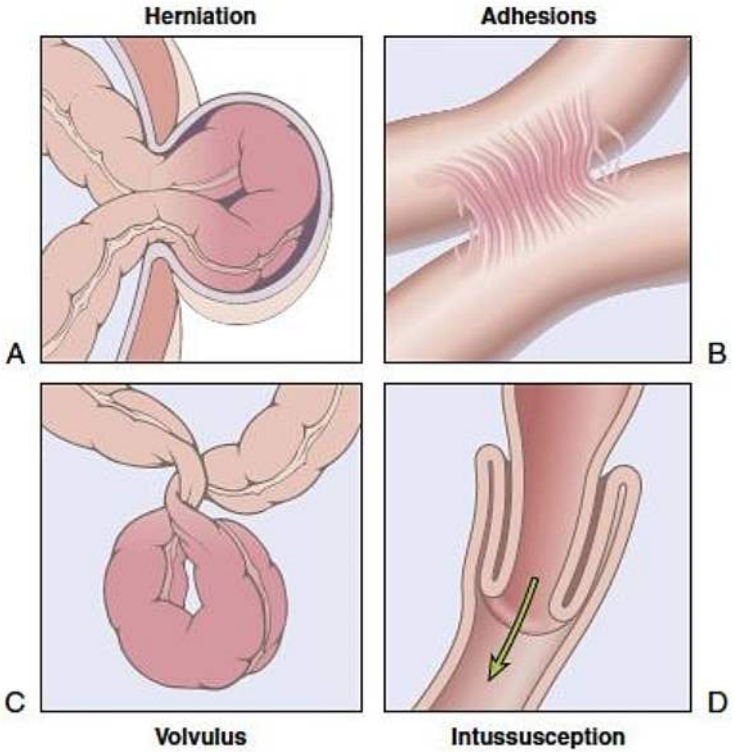
  - *Intraluminal obturation* - gallstones, swallowed foreign body lying in the lumen of the intestine

  - *Intramural obturation* - malignant-benign tumors of the intestinal wall - obstacle is located in the walls of the intestines - cause intestinal obstruction and narrowing

  - *Extramural obturation* - tumors in the peritoneal area, peritoneal adhesions - obstacle is outside of the intestine and acts of ambient pressure

ILEUS – Mechanical Ileus

- ✓ ***interruption of intestinal passage through the lumen***
  - strangulation of the of blood vessels with an interruption of the blood circulation, impaired nutrition of the intestinal wall (ischemia, ischemic necrosis of the intestinal wall)
  - arising from the ***adhesions in abdominal sur***gery, ***herniation, intussusception*** (intestinal segment is inserted into an adjacent segment)



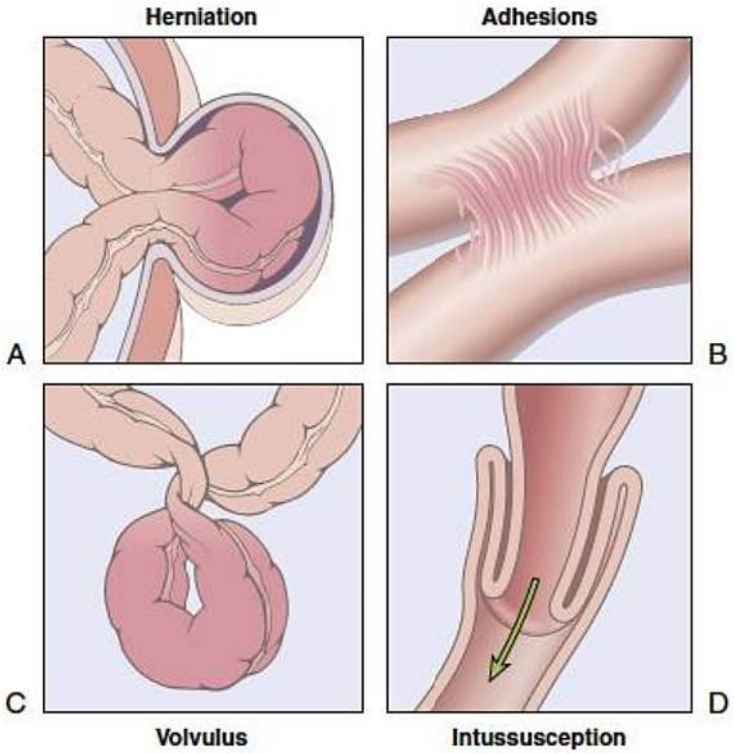
ILEUS – Dynamic ileus

- ✓ *Paralytic ileus* - in paralysis, intestinal immobility, intestine vasculature failure, CNS disorders
- ✓ *Spastic ileus* - there is a long spasm of various segments of the intestine
  - metabolic disorders, parathyroid diseases, spinal cord injury
  - this happens very rarely

INTESTINAL OBSTRUCTION

Small intestine obstruction

- most often caused by postoperative adhesions, Crohn's disease and hernias
- proximal to the obstruction of the intestine, leads to dilatation, due to the accumulation of fluid and gas swallowed
- dilate in turn stimulates secretion - increases peristalsis and intraluminal pressure leading to loss of fluid and electrolytes in the 'third space'



- vomiting occurs in the proximal localization of obstruction.

Obstruction of the colon

- *tumors or anatomical abnormalities such as volvulus* (part of the intestine completely turns around the mesenteric hinge)
- constipation, abdominal pain, anorexia and vomiting later