8 LECTURES

- Gastro-esophageal reflux disease
- Peptic Ulcer Disease
- Diarrhea
- Malabsorption
- Inflammatory bowel disease-1
- Inflammatory bowel disease-2
- Colonic polyps and carcinoma-1
- Colonic polyps and carcinoma-2

8 LECTURES

Diarrhea

Malabsorption

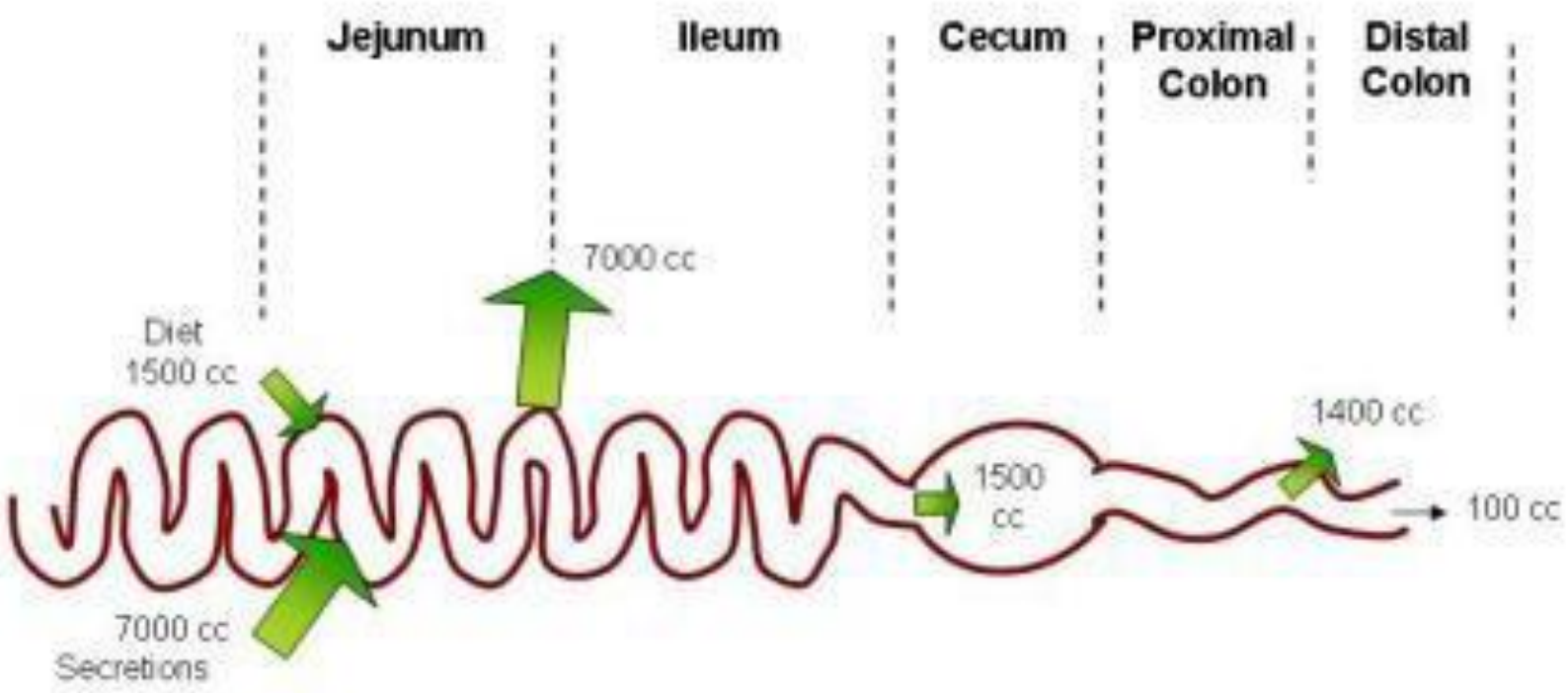
DIARREAHA

Objectives

Upon completion of this lecture the students should :

1. *Understand the physiology of fluid in small intestine*
2. *Describe the pathophysiology and causes of various types of diarrhea (Secretory, osmotic, Exudative, Motility-related)*
3. *Define acute diarrhea and enumerate its common causes*
4. *Define chronic diarrhea and enumerate its common causes*

Physiology of Fluid and small intestine



DIARREAHA
DEFINITION

- World Health Organization

➢ 3 or more loose or liquid stools per day

- Abnormally high fluid content of stool

  > 200-300 gm/day

Fecal osmolarity

- As stool leaves the colon, fecal osmolality is equal to the serum osmolality i.e. 290 mosm/kg.

- Under normal circumstances, the major osmoles are Na^+, K^+, Cl^-, and HCO_3^-.

Fecal Osmotic Gap

290 mosm/kg H_2O - 2 ($[Na^+] + [K^+]$)

Osmotic diarrhea: > 125

CLASSIFICATION

1. ***Acute*** *……..if* 2 weeks,
2. ***Persistent*** *……. if 2 to 4 weeks,*
3. ***Chronic*** *……..if 4 weeks in* duration.

Why important?

- The loss of fluids through diarrhea can cause dehydration and electrolyte imbalances
- Easy to treat but if untreated, may lead to death especially in children

Why important?

More than 70 % of almost 11 million child deaths every year are attributable to 6 causes:

1. Diarrhea
2. Malaria
3. neonatal infection
4. Pneumonia
5. preterm delivery
6. lack of oxygen at birth.

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Pathophysiology
Categories of diarrhea

1. **Secretory**
2. **Osmotic**
3. **Exudative (inflammatory)**
4. **Motility-related**

Secretory

- There is an increase in the active secretion
- High stool output
- Lack of response to fasting
- Normal stool osmotic gap < 100 mOsm/kg
- The most common cause of this type of diarrhea is a bacterial toxin (E. coli , cholera) that stimulates the secretion of anions.

- Also seen in Endocrine tumours

Osmotic

- Excess amount of poorly absorbed substances that exert osmotic effect……water is drawn into the bowels……diarrhea
- Stool output is usually not massive
- Fasting improve the condition
- Stool osmotic gap is high, > 125 mOsm/kg
- **Can be the result of**

1. Malabsorption in which the nutrients are left in the lumen to pull in water e.g. lactose intolerance
2. osmotic laxatives.

Exudative (inflammatory)

- Results from the outpouring of blood protein, or mucus from an inflamed or ulcerated mucosa
- Presence of blood and pus in the stool.
- Persists on fasting
- Occurs with inflammatory bowel diseases, and invasive infections.

Motility-related

- Caused by the rapid movement of food through the intestines (hypermotility).
- Irritable bowel syndrome (IBS) – a motor disorder that causes abdominal pain and altered bowel habits with diarrhea predominating

Other causes:

1. Diabetic diarrhoea
2. hyperthyroid diarrhoea

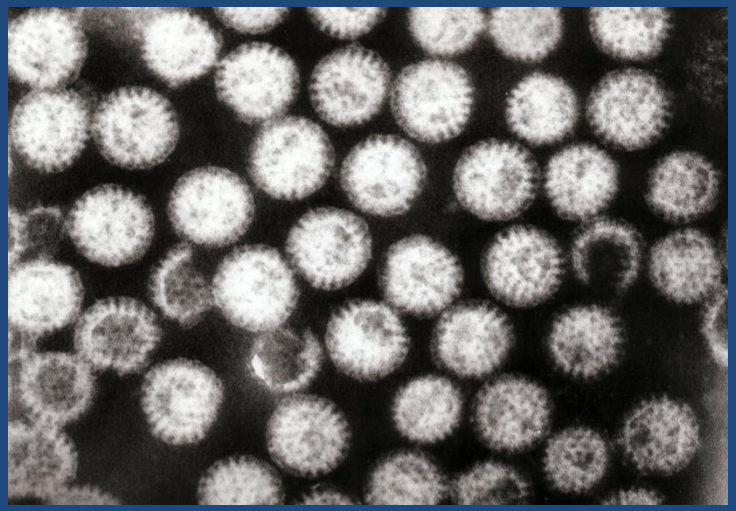
Pathophysiology
Categories of diarrhea

1. **Secretory**
2. **Osmotic**
3. **Exudative (inflammatory)**
4. **Motility-related**

Aetiology

Acute diarrhea?

- Approximately 80% of acute diarrheas are due to ***infections*** (viruses, bacteria, helminths, and protozoa).
- Viral gastroenteritis (viral infection of the stomach and the small intestine) is the most common cause of acute diarrhea worldwide.
- **Food poisoning**
- **Drugs**
- **Others**



Rotavirus the cause of nearly 40% of hospitalizations from diarrhea in children under 5

Antibiotic-Associated Diarrheas

- **Diarrhea occurs in 20% of patients receiving broad-spectrum antibiotics; about 20% of these diarrheas are due to *Clostridium difficile***

Aetiology

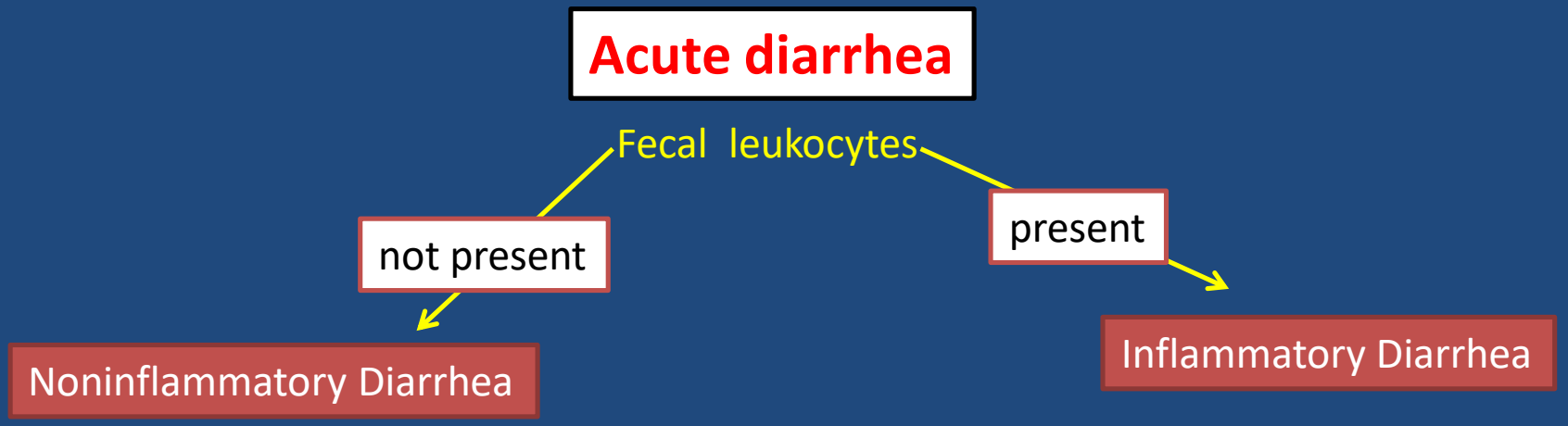
- **Chronic diarrhea?**

1. **Infection** ---------- **e.g.***Giardia lamblia* . AIDS often have chronic infections of their intestines that cause diarrhea.
2. **Post-infectious.** Following acute viral, bacterial or parasitic infections
3. **Malabsorption**
4. **Inflammatory bowel disease (IBD)**
5. **Endocrine diseases.**
6. **Colon cancer**
7. **Irritable bowel syndrome.**

Complications

1. Fluids ……Dehydration
2. Electrolytes …….. Electrolytes imbalance
3. *Sodium bicarbonate…….* Metabolic acidosis
4. If persistent ……Malnutrition

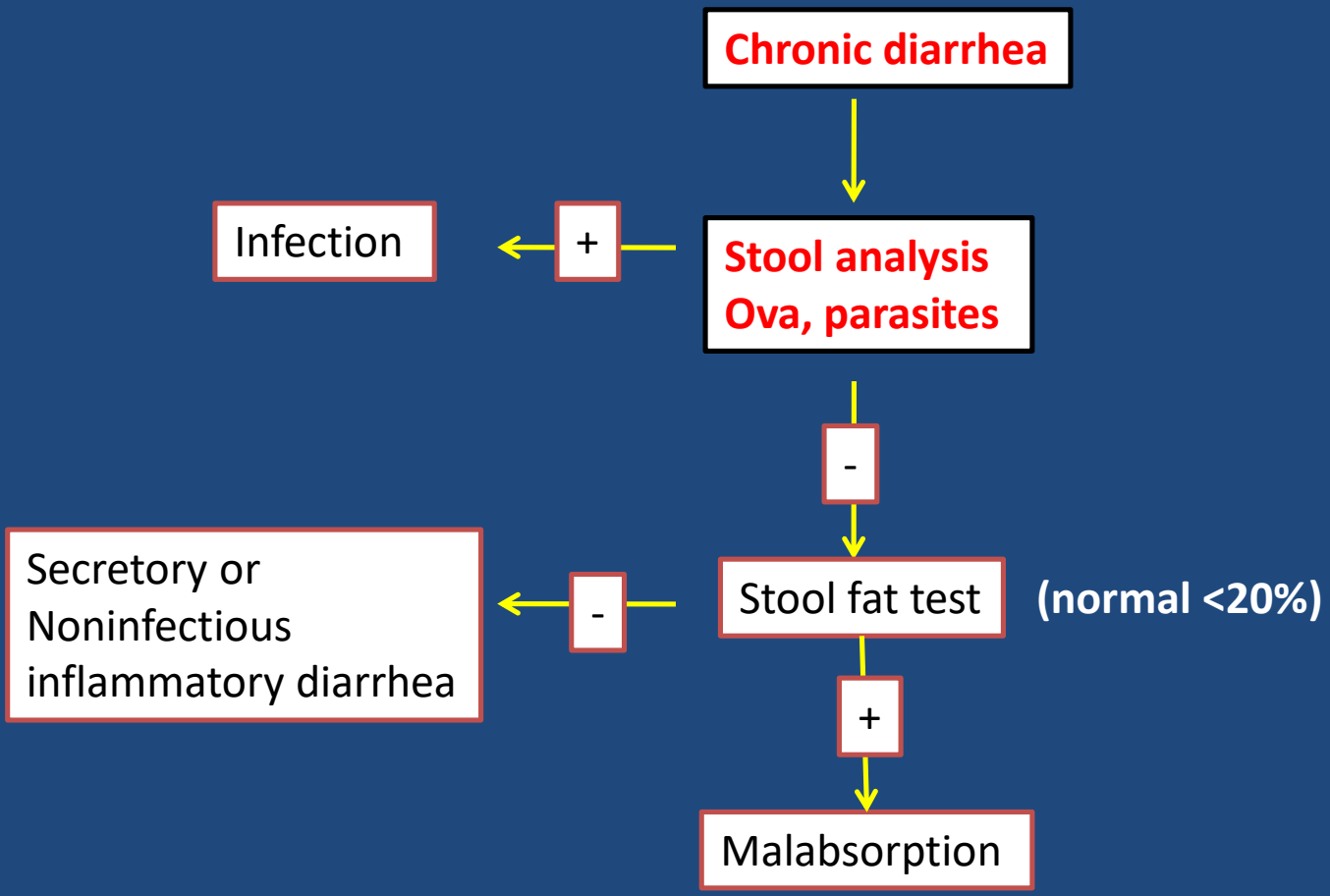
Tests useful in the evaluation of diarrhea



Suggests a small bowel source
Or colon but without mucosal injury

Suggests colonic mucosa damage caused by invasion

- shigellosis, salmonellosis, *Campylobacter* or *Yersinia* infection, amebiasis)
- toxin (*C difficile, E coli* O157:H7).
- Inflammatory bowel diseases


Chronic diarrhea
Stool analysis
Ova, parasites
+
Infection
-
Stool fat test
(normal <20%)
-
Secretory or
Noninfectious
inflammatory diarrhea
+
Malabsorption

- **Understand the physiology of fluid in small intestine**
  - 1.5 liter food
  - 7 liters secretions and reabsorbed in small intestine
  - 1.4 reabsorbed in large intestine

- **Describe the pathophysiology and causes of various types of diarrhea**
  - **Secretory** Normal stool osmotic gap {bacterial toxin (E. coli , cholera) Endocrine tumours}
  - **osmotic,** osmotic gap is high , {Malabsorption, osmotic laxatives}
  - **Exudative,** blood and pus in the stool, { inflammatory bowel diseases, and invasive infections}
  - **Motility-related** {Irritable bowel syndrome (IBS)}

- **Define acute diarrhea and enumerate its common causes**
  - Less than 2 weeks
  - infections (viruses, bacteria, helminths, and protozoa). Food poisoning

- **Define chronic diarrhea and enumerate its common causes**
  - More than one month
  - **Infection, post Infection malabsorption, Inflammatory bowel disease (IBD), cancer**

8 LECTURES

Diarrhea

Malabsorption

Objectives

Upon completion of this lecture the students will :

1. Understand that the malabsorption is caused by either abnormal digestion or small intestinal mucosa
2. Know that malabsorption can affect many organ systems (alimentary tract, hematopoietic system, musculoskeletal system, endocrine system, epidermis, nervous system)
3. Concentrate on celiac disease and lactose intolerance as two examples of malabsoption syndrome.

Malabsorption Syndrome

Inability of the intestine to absorb nutrients adequately into the bloodstream.

Impairment can be of single or multiple nutrients depending on the abnormality.

Physiology

- The main purpose of the gastrointestinal tract is to digests and absorbs nutrients (fat, carbohydrate, and protein), micronutrients (vitamins and trace minerals), water, and electrolytes.

Mechanisms and Causes of Malabsorption Syndrome

Inadequate digestion
- Postgastrectomy
- Deficiency of pancreatic lipase
- Chronic pancreatitis
- Cystic fibrosis
- Pancreatic resection
- Zollinger-Ellison syndrome

Deficient bile salt
- Obstructive jaundice
- Bacterial overgrowth
- Stasis in blind loops, diverticu
- Fistulas
- Hypomotility states (dia
- Terminal ileal resecti
- Crohns' disease
- Precipitation of bile salts ycin)

Many causes

Primary mucosal abnormalities
- Celiac disease
- pical sprue
- ple's disease
- osis
- tion enteritis
- etalipoproteinemia
- Giardiasis

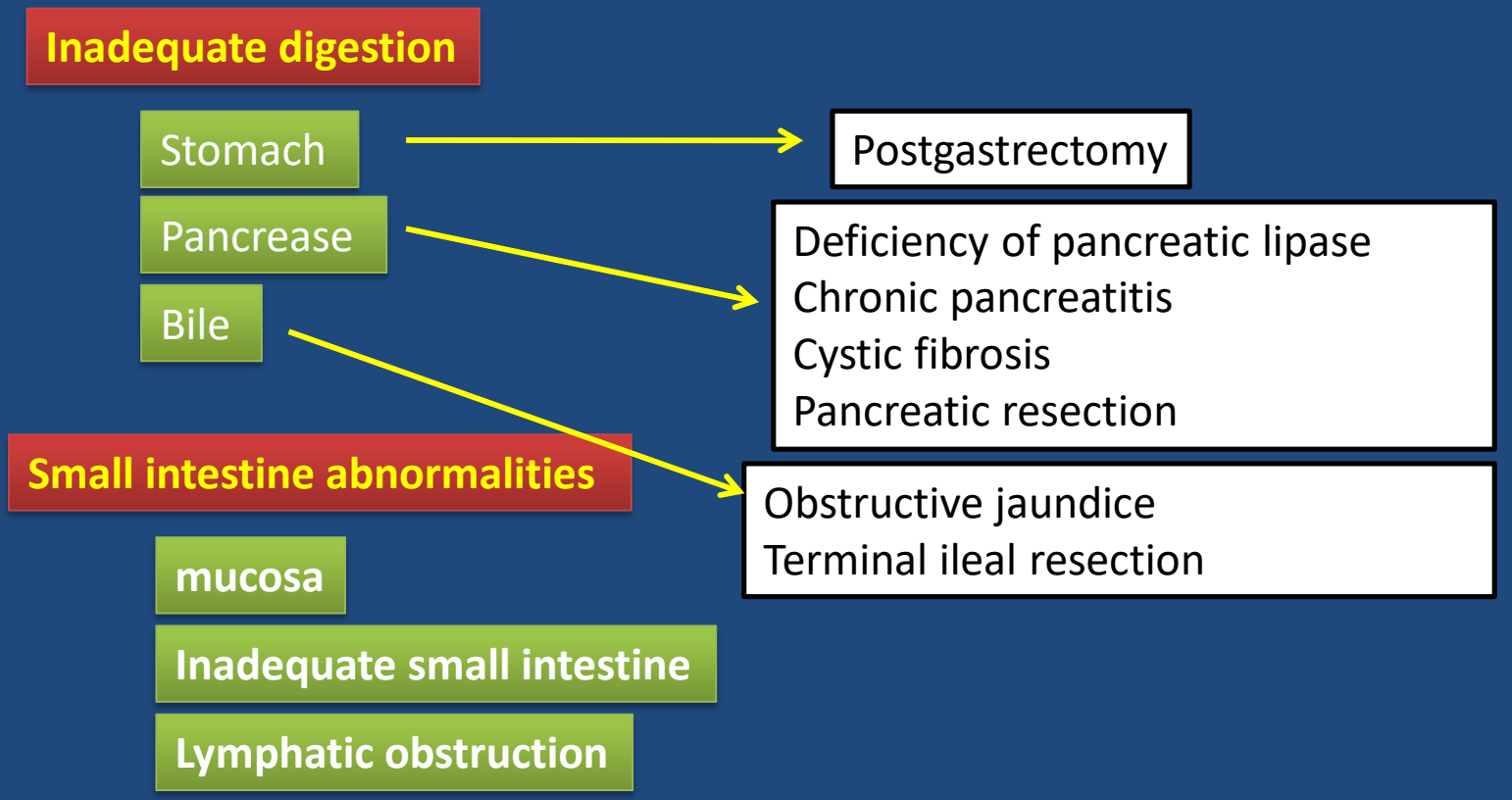
Inadequate small intestine
- Intestinal resection
- Crohn's disease
- Mesenteric vascular disease with infarction
- Jejunoileal bypass

Lymphatic obstruction
- Intestinal lymphangiectasia
- Malignant lymphoma
- Macroglobulinemia

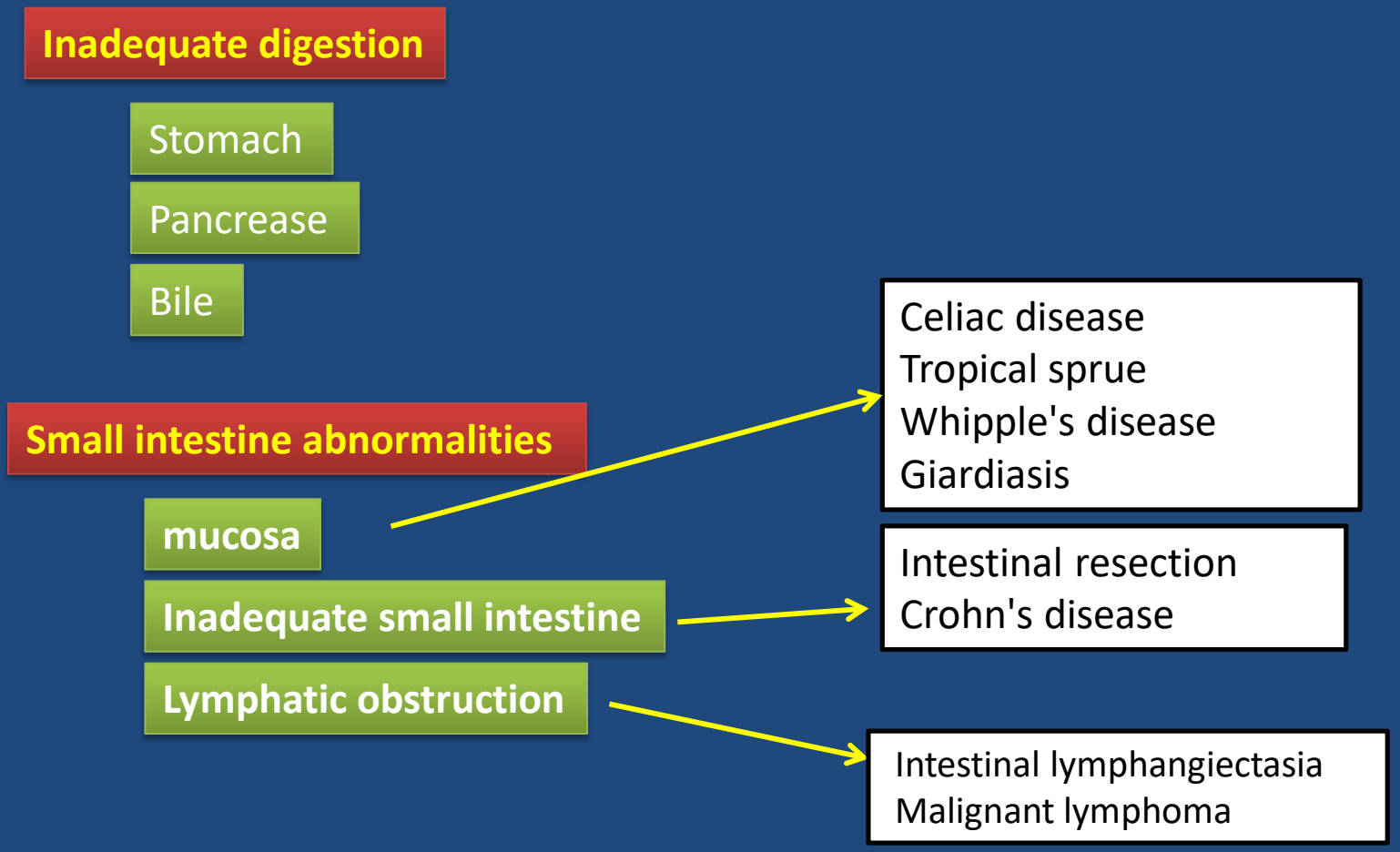
Pathophysiology

Inadequate digestion Or **Small intestine abnormalities** = **Malabsorption**

Pathophysiology



Pathophysiology



Pathophysiology

Pancrease

Bile

mucosa

Malabsorption Syndrome

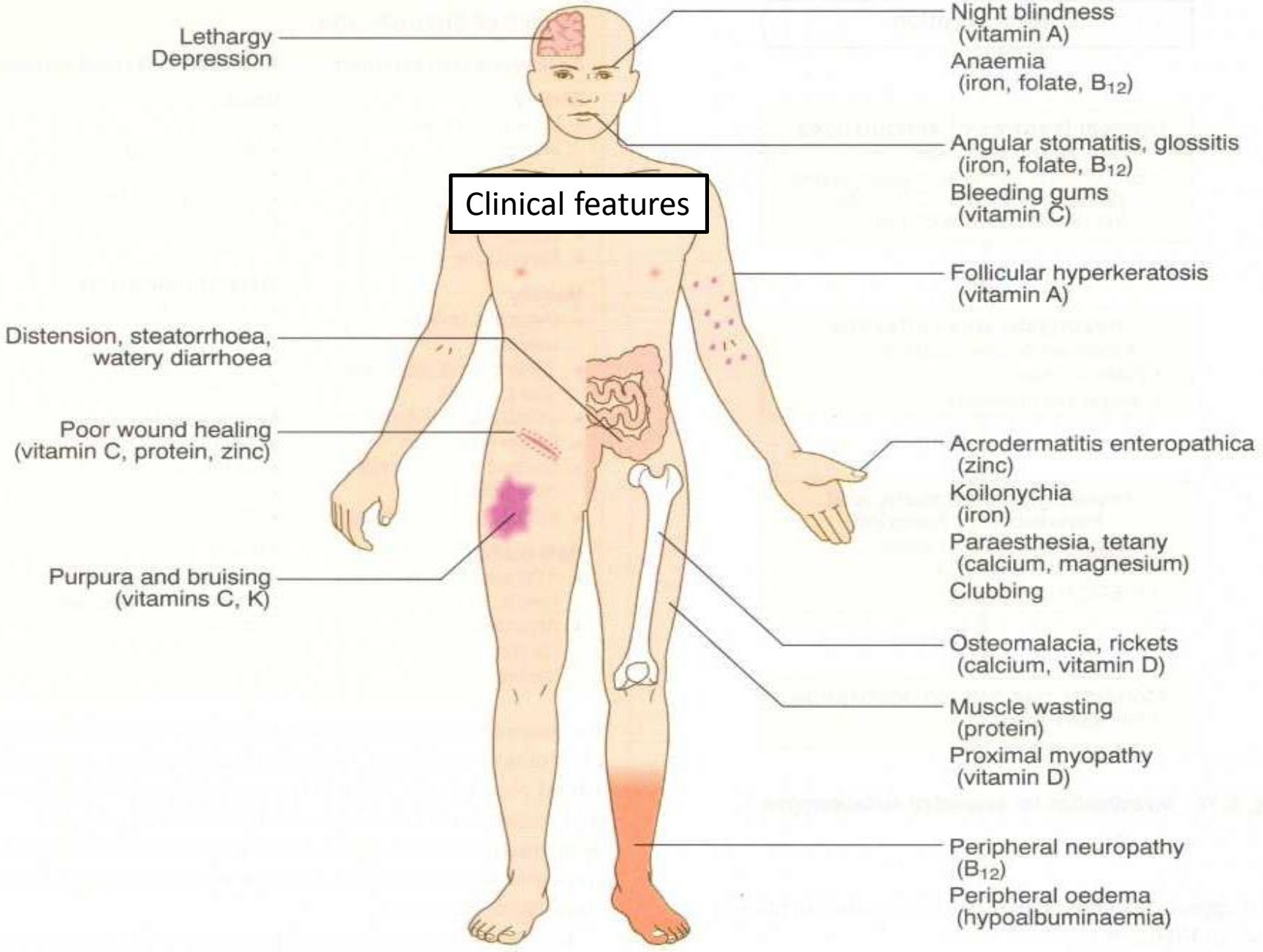
Clinical features

There is increased fecal excretion of fat (steatorrhea) and the systemic effects of deficiency of vitamins, minerals, protein and carbohydrates.

Steatorrhea is passage of soft, yellowish, greasy stools containing an increased amount of fat.

Growth retardation, failure to thrive in children

Weight loss despite increased oral intake of nutrients.


Clinical features
Lethargy
Depression
Night blindness
(vitamin A)
Anaemia
(iron, folate, B_{12})
Angular stomatitis, glossitis
(iron, folate, B_{12})
Bleeding gums
(vitamin C)
Follicular hyperkeratosis
(vitamin A)
Distension, steatorrhoea,
watery diarrhoea
Poor wound healing
(vitamin C, protein, zinc)
Acrodermatitis enteropathica
(zinc)
Koilonychia
(iron)
Paraesthesia, tetany
(calcium, magnesium)
Clubbing
Purpura and bruising
(vitamins C, K)
Osteomalacia, rickets
(calcium, vitamin D)
Muscle wasting
(protein)
Proximal myopathy
(vitamin D)
Peripheral neuropathy
(B_{12})
Peripheral oedema
(hypoalbuminaemia)

Malabsorption Syndrome

Clinical features

Depend on the deficient nutrient

- Protein → Musle wasting, Swelling or oedema
- B_{12}, folic acid and iron deficiency → Anaemia (fatigue and weakness)
- vitamin D, calcium → Muscle cramp; Osteomalacia and osteoporosis
- vitamin K and other coagulation factor → Bleeding tendencies

Diagnosis

There is no specific test for malabsorption.

Investigation is guided by symptoms and signs.

1. Fecal fat study to diagnose steatorrhoea
2. Blood tests
3. Stool studies
4. Endoscopy

Biopsy of small bowel

Malabsorption Syndrome

Celiac disease

An immune reaction to gliadin fraction of the wheat protein gluten

Usually diagnosed in childhood – mid adult.

Patients have raised antibodies to gluten

Highly specific association with class II HLA (DQ2 or DQ8) and, to a lesser extent, DQ8 (haplotype DR-4).

Clinical features

Celiac disease

Typical presentation

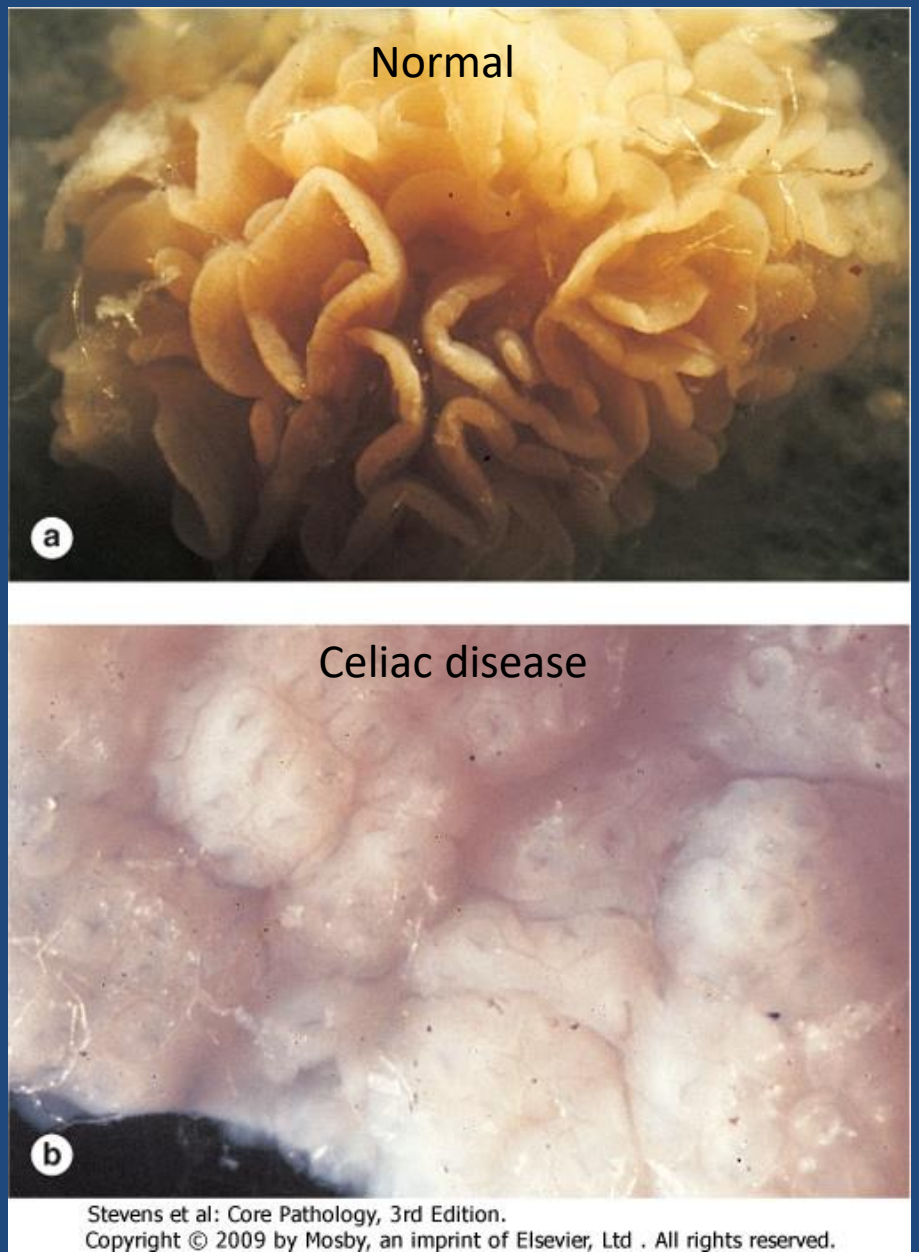
GI symptoms that characteristically appear at age 9-24 months.

Symptoms begin at various times after the introduction of foods that contain gluten.

A relationship between the age of onset and the type of presentation;

Infants and toddlers….GI symptoms and failure to thrive
Childhood……minor GI symptoms, inadequate rate of weight gain,
Young adults……anemia is the most common form of presentation.
Adults and elderly……GI symptoms are more prevalent

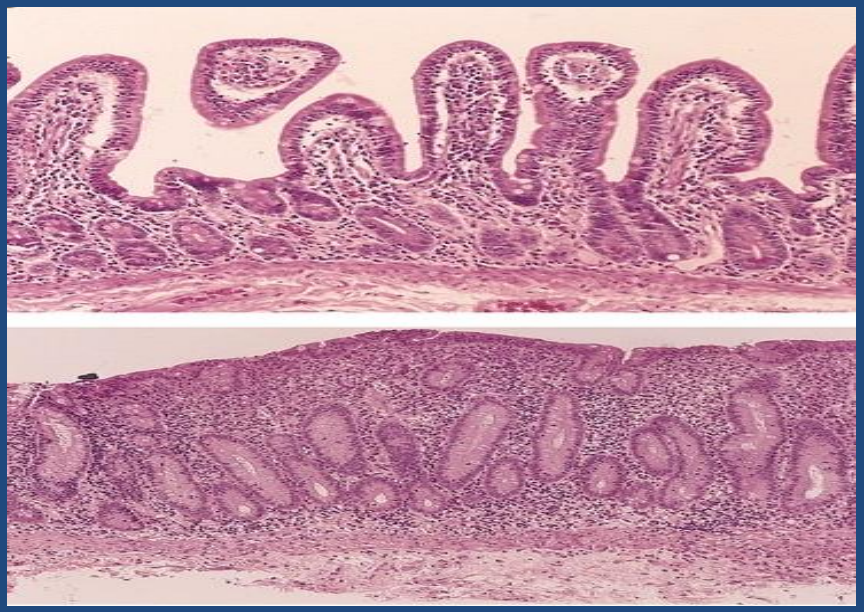
Endoscopy



Celiac Disease

Histology

- Mucosa is flattened with marked villous atrophy.
- Crypt hyperplasia
- Increased intraepithelial lymphocytosis



Celiac Disease

Diagnosis

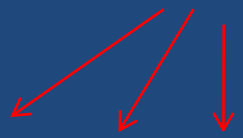
Clinical documentations of malabsorption.

Stool ……. ↑ Fat

Serologic tests for celiac disease (namely the anti-TTG-IgA)

Small intestine biopsy demonstrate villous atrophy.

Improvement of symptom and mucosal histology on gluten withdrawal from diet.



wheat, barley, rye

Other grains, such as rice and corn flour, do not have such an effect.

rye الشليم

Celiac Disease

Complications

Osteopenia , osteoporosis

Infertility in women

Short stature, delayed puberty, anemia,

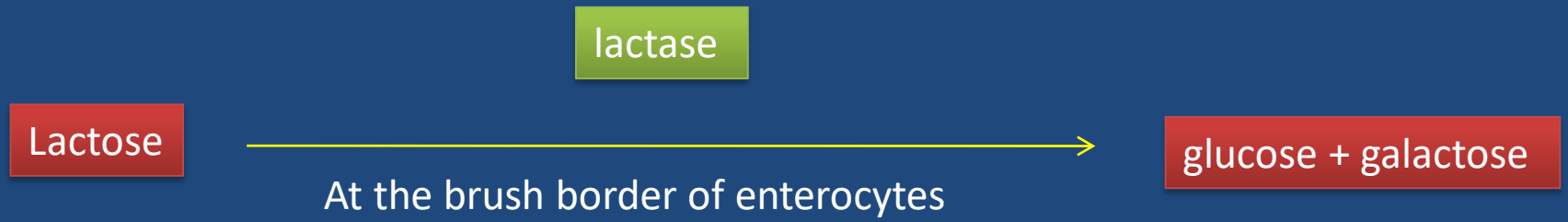
Malignancies,[intestinal T-cell lymphoma]

10 to 15% risk of developing GI lymphoma.

Lactose Intolerance

Lactose Intolerance

Pathophysiology



Lactose Intolerance — Low or absent activity of the enzyme lactase

Lactose Intolerance causes

Inherited lactase deficiency

Congenital lactase deficiency

extremely rare

Childhood-onset and adult-onset lactase deficiency

common

Genetically programmed progressive loss of the activity of the small intestinal enzyme lactase.

Acquired lactase deficiency

Transient

Secondary lactase deficiency due to intestinal mucosal injury by an infectious, allergic, or inflammatory process

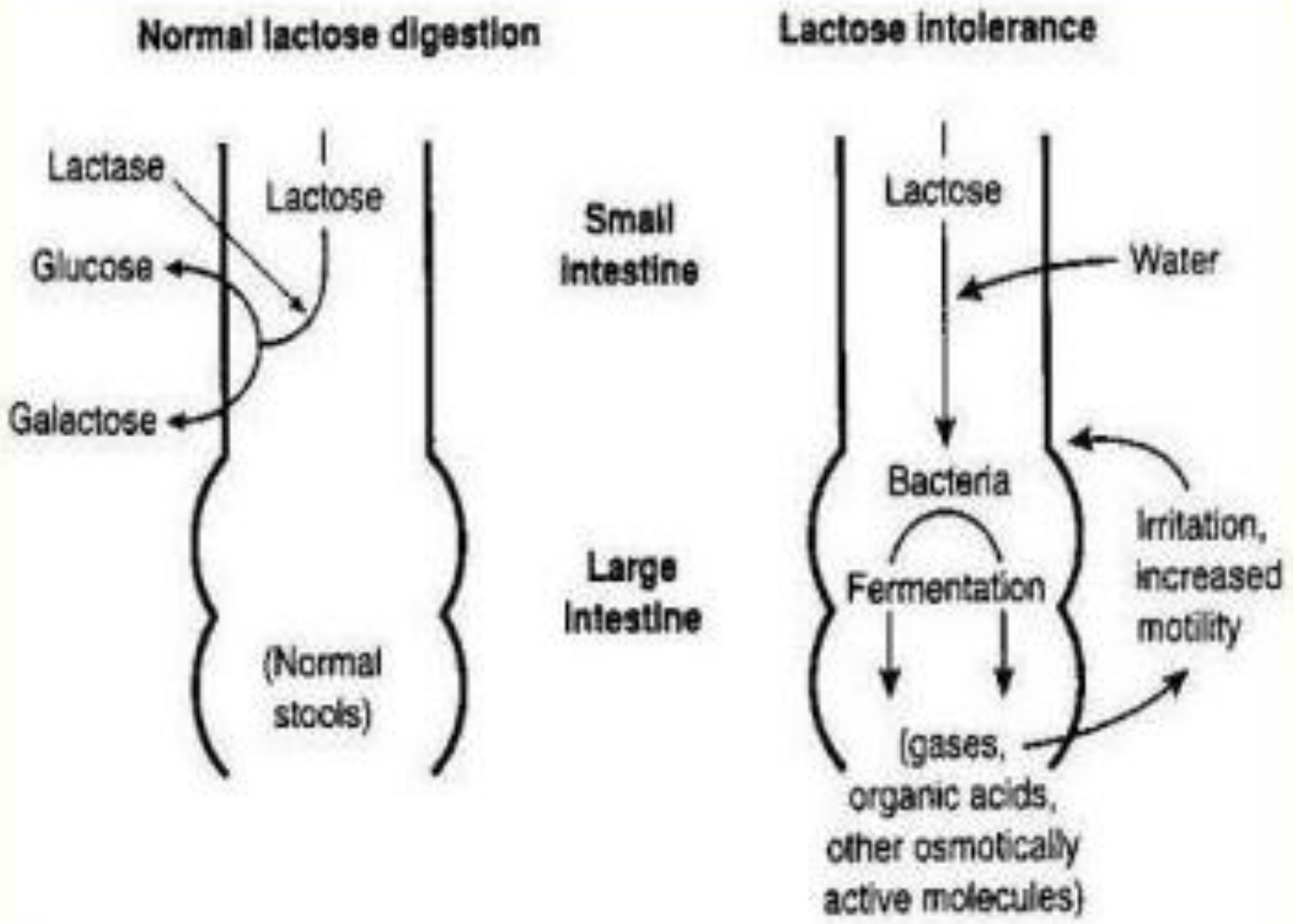
Gastroenteritis: Infectious diarrhea, particularly viral gastroenteritis in younger children, may damage the intestinal mucosa enough to reduce the quantity of the lactase enzyme.

Clinical

Bloating, abdominal discomfort, and flatulence

……1 hour to a few hours after ingestion of milk products

Lactose Intolerance



Lactose Intolerance
Diagnosis

Empirical treatment with a lactose-free diet, which results in resolution of symptoms;

Hydrogen breath test

Hydrogen breath test .

- An oral dose of lactose is administered
- The sole source of H_2 is bacterial fermentation;
- Unabsorbed lactose makes its way to colonic bacteria, resulting in excess breath H_2.
- Increased exhaled H_2 after lactose ingestion suggests lactose malabsorption.

A 3-week trial of a diet that is free of milk and milk products is a satisfactory trial to diagnose lactose intolerance

Lactose Intolerance summary

- Deficiency/absence of the enzyme lactase in the brush border of the intestinal mucosa ⟶ maldigestion and malabsorption of lactose
- Unabsorbed lactose draws water in the intestinal lumen
- In the colon, lactose is metabolized by bacteria to organic acid, CO_2 and H_2; acid is an irritant and exerts an osmotic effect
- Causes diarrhea, gaseousness, bloating and abdominal cramps

Objectives

- malabsorption = abnormal digestion or small intestinal mucosa

- Know that malabsorption can affect many organ systems

1. alimentary tract,
2. hematopoietic system,
3. musculoskeletal system,
4. endocrine system,
5. skin,
6. nervous system
7. Anaemia, Osteomalacia and osteoporosis Bleeding failure to thrive

➢ Lactose Intolerance

Low or absent activity of the enzyme lactase

Lactose not absrbed

Lactose…….colon

In colon ….fermentation Gases

immune reaction to gliadin fraction of the wheat protein gluten

➢ *Celiac disease*

1. villous atrophy
2. Crypt hyperplasia
3. Increased intraepithelial lymphocytosis