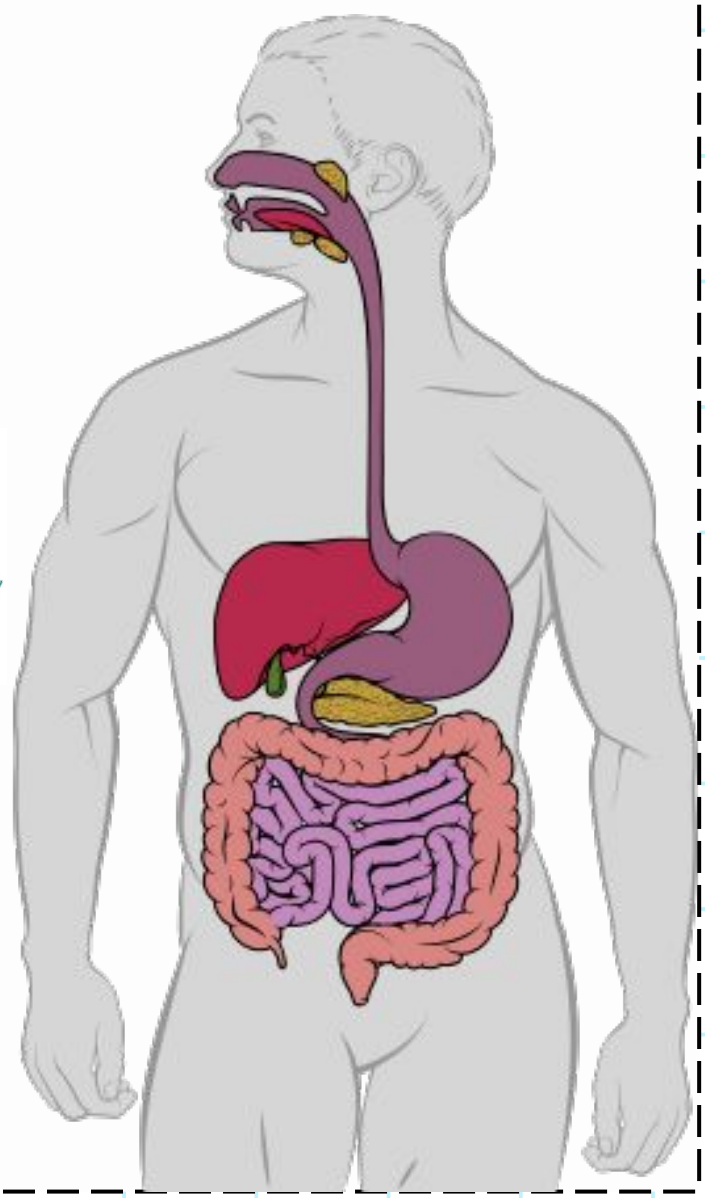
Mechanism of malabsorption and diarrhea



GNT BLOCK

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MED 443
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Editing File

Color index :
Main text (black)
Female Slides (Pink)
Male Slides (Blue)
Important (Red)
Dr's note (Green)
Extra Info (Grey)

OBJECTIVES

- Define diarrhea
- Understand the four categories of diarrheal diseases, and list the major causes in each category.
- List the causes of acute and chronic diarrhea
- Understand that the malabsorption is caused by either abnormal digestion or small intestinal mucosal disease
- Know that malabsorption can affect many organ systems (alimentary tract, hematopoietic system, musculoskeletal system, endocrine system, epidermis, nervous system)
- Know the following aspects of celiac disease:
  a. definition
  b. pathogenesis
  c. clinical features
  d. pathology (gross and microscopic features)
  e. complications (T-cell lymphoma and GI tract carcinoma)
- Know the cause and types of Lactose intolerance

THIS LECTURE WAS PRESENTED BY DR.MAHA ARAFAH & DR.AHMED ALHUMAIDI

IF YOU WANT TO READ THE LECTURE FROM ROBBINS

IF YOU WANT TO READ THE LECTURE FROM FIRST AID

IF YOU WANT TO WATCH OSMOSIS VIDEO

IF YOU WANT TO READ OSMOSIS SUMMARY

Malabsorption syndrome

Physiology

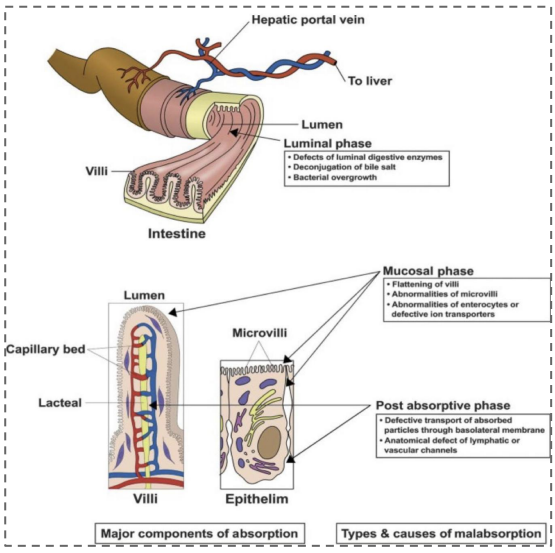
The main purpose of the gastrointestinal tract is to digests and absorbs nutrients (fat, carbohydrate,and protein),micronutrients (vitamins and trace minerals), water, minerals and electrolytes.

Malabsorption Syndrome

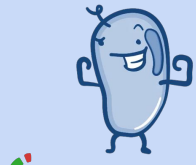
-Inability of the intestine to absorb nutrients adequately into the bloodstream
-Impairment can be of single or multiple nutrients depending on the abnormality

Extra Info.

Malabsorption results from disturbance in at least one of the four phases of nutrient absorption:
1-intraluminal digestion: Which Mean Break Down Complex Molecules To Absorbable Form
2-terminal digestion: which involves the hydrolysis of complex molecules in the brush border of the small intestinal mucosa
3-transepithelial transport: which nutrients, luid, and electrolytes are transported across and processed within the small intestinal epithelium
4-lymphatic transport: of absorbed lipids.



Malabsorption syndrome

Mechanisms And Causes Of Malabsorption Syndrome	
Inadequate Digestion ركز الدكتور على اننا نعرف المرض وش يسبب ؟ مثلا هل هو هضم سيء او الميوكس ضعيف وكذا	Postgastrectomy
	Deficiency of pancreatic lipase like in pancreatitis
	Chronic pancreatitis in previous lecture
	Cystic fibrosis autosomal recessive disorder caused by mutations in the gene CFTR. The mutations lead to dysfunction of chloride channels, which results in hyperviscous mucus and the accumulation of secretions.
	Pancreatic resection
	Zollinger-Ellison syndrome caused by gastrinoma is a tumor that secretes excessive levels of the hormone gastrin
Deficient bile salt	Obstructive jaundice type of jaundice, where it is due to a narrowed or blocked bile duct or pancreatic duct
	Bacterial overgrowth (due to stasis in blind loops, diverticula small, bulging pouches that can form in the lining of your digestive system or fistula abnormal connection between two body parts)
	Hypomotility states (diabetes)
	Terminal ileal resection
	Crohn's' disease in coming lecturers
	Precipitation of bile salts (neomycin) decreased total bile salt pool size
 **Primary Mucosal Abnormalities**	Celiac disease in this lecture
	Tropical sprue bacterial overgrowth, most commonly from klebsiella , E.Coli & enterobacter releasing toxin as the fermented food enter the SI leading to inflammation & flattening of intestinal villi (after visiting tropical areas)
	whipple's disease rare malabsorption syndrome with systemic manifestations (neurologic, cardiac, and musculoskeletal) caused by the bacterium Tropheryma whipplei.
	Amyloidosis abnormal extracellular tissue deposition of fibrils composed of various misfolded low-molecular-weight protein subunits.
	Radiation enteritis caused by the inflammation of small and/or large intestine from radiation treatments
	Abetalipoproteinemia rare autosomal recessive disorder marked by low or absent levels of plasma cholesterol, low-density lipoproteins (LDLs), and very-low-density lipoproteins (VLDLs). **CARDIO BLOCK.**
	Giardiasis infection with Giardia duodenalis

Malabsorption syndrome

Mechanisms And Causes Of Malabsorption Syndrome	
Inadequate small intestine	intestinal resection
	Crohn's disease same as mentioned before but in intestine
	Mesenteric vascular disease with infarction
	Jejunoileal bypass A procedure consisting of the surgical anastomosis of the proximal portion of the jejunum connected to the distal portion of the ileum, bypassing the nutrient-absorptive segment of the small intestine
Lymphatic obstruction	intestinal lymphangiectasia is a rare disorder characterized by dilated intestinal lacteals resulting in lymph leakage into the small bowel lumen
	Malignant lymphoma in coming lecturers
	Macroglobulinemia a malignant plasma cell disorder in which B cells produce excessive amounts of IgM M-proteins.

Clinical Note

Clinical presentation of Whipple's disease include :

- Arthralgia : Frequently the first presenting symptom, Involves large joints, Migratory and nondestructive
- Weight loss
- Diarrhea: Watery or steatorrhea Occult or gross gastrointestinal bleeding can also occur. Abdominal pain (intermittent, colicky)
- Cardiac: Endocarditis (valve involvement; most common) , Myocarditis, pericarditis, Congestive heart failure
- Neurologic: Confusion, Seizures, Delirium, Cognitive impairment , Hypersomnia, Extrapyramidal symptoms , Ataxia and clonus
- Pathognomonic findings: Oculomasticatory myorhythmia (continuous eye convergence movements with concurrent masticatory muscle contractions) , Oculo-facial-skeletal myorhythmia ,Vertical gaze palsy

Malabsorption syndrome

Pathophysiology

- **Malabsorption** =
Inadequate digestion or Small intestine abnormalities

Inadequate Digestion

Stomach	• Postgastrectomy
Pancreas	• Deficiency of pancreatic lipase • **Chronic pancreatitis** • **Cystic fibrosis** • Pancreatic resection e.g in case of pancreatic tumor
Bile	• Obstructive jaundice • Terminal ileal resection

Small Intestine Abnormalities

Mucosa	• **Celiac disease** • Tropical sprue • Whipple's disease • **Giardiasis**
Inadequate small intestine	• Intestinal resection • Crohn's disease
Lymphatic obstruction	• Intestinal lymphangiectasia • Malignant lymphoma

Malabsorption syndrome

Systemic Effects

Female Slides

- **Steatorrhea**, caused by malabsorption of fat (produces pale, foul smelling stools that characteristically float in water)
- Symptoms due to deficient nutrient e.g. Muscle wasting and others
- Weight loss and anorexia.
- Abdominal distension and borborygmi (Increased bowel sound). Due to increased gas content
- Diarrhoea (loose, bulky stools)

Clinical Features

- Growth retardation and failure to thrive in children.
- weight loss, despite increased oral intake of nutrients
- Steatorrhea: increase in fecal excretion of fat, soft yellowish, foul smelling, and greasy stools and the systemic effects of deficiency of fat soluble vitamins (A. K,E & D),minerals, protein and carbohydrate.

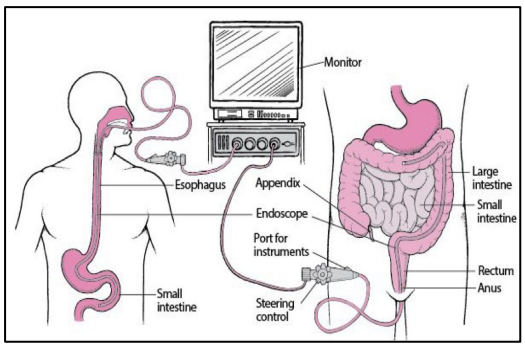
Depends on the type of the deficient nutrient:	
Deficiency of Protein	• Swelling or edema • Muscle wasting
Deficiency of Vitamin K, Other Coagulation Factors	• Bleeding tendencies intracranial hemorrhage and bleeding under skin
Deficiency of B12, folic acid and iron	• Anaemia • Fatigue and weakness
Deficiency of Vitamin D, Calcium	• Muscle cramp • Osteomalacia and Osteoporosis

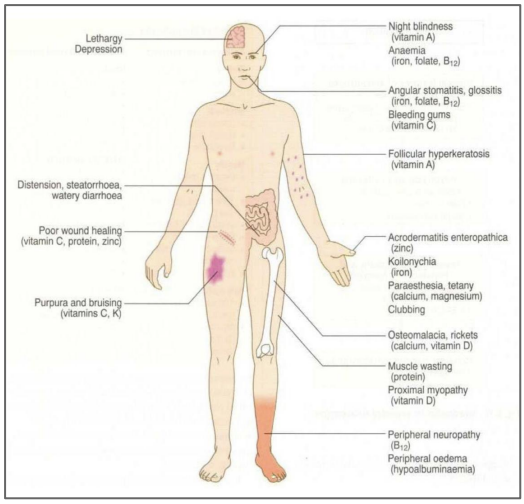
Malabsorption syndrome

Diagnosis

There is no specific test for malabsorption, investigation is guided by symptoms and signs:

- Stool studies : Fecal fat study/content to diagnose steatorrhoea
- Blood tests : iron deficiency anaemia, vitamins and albumin
- Endoscopy (for small bowel biopsy)





Deep Focus Question

Which of the following would NOT be a part of the evaluation for malabsorption?

A. D-xylose test
B. Hydrogen breath test
C. CT enterography
D. Serum vitamin, iron, and ferritin measurements
E. H. pylori test

Answer: E

Deep Focus Question

A surgeon decides to perform an extensive small bowel resection of 150 cm. Which of the following complications will the patient experience for life?

A. Iron-deficiency anemia
B. Ascites
C. Blood in the stool
D. Steatorrhea

Answer: D

Celiac Disease

Osmosis Vid

Introduction

IMPORTANT

An immune reaction to gliadin fraction of the wheat protein **gluten**
- Usually diagnosed in childhood – mid adult.
- Patients have raised antibodies to **gluten** **autoantibodies**
- Highly specific association with **class II HLA-DQ2 or HLA-DQ8 alleles, and to a lesser extent, DQ8 (haplotype DR-4)**

Clinical features (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 toddler → 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 (easier to diagnose)

There is also an association of celiac disease with other immune diseases including type 1 diabetes, thyroiditis, and Sjögren syndrome

Deep Focus Question

Which of the following diseases is NOT associated with malabsorption due to celiac sprue?

A. Pernicious anemia
B. Dermatitis herpetiformis
C. Hashimoto's thyroiditis
D. Iron-deficiency anemia
E. Osteomalacia

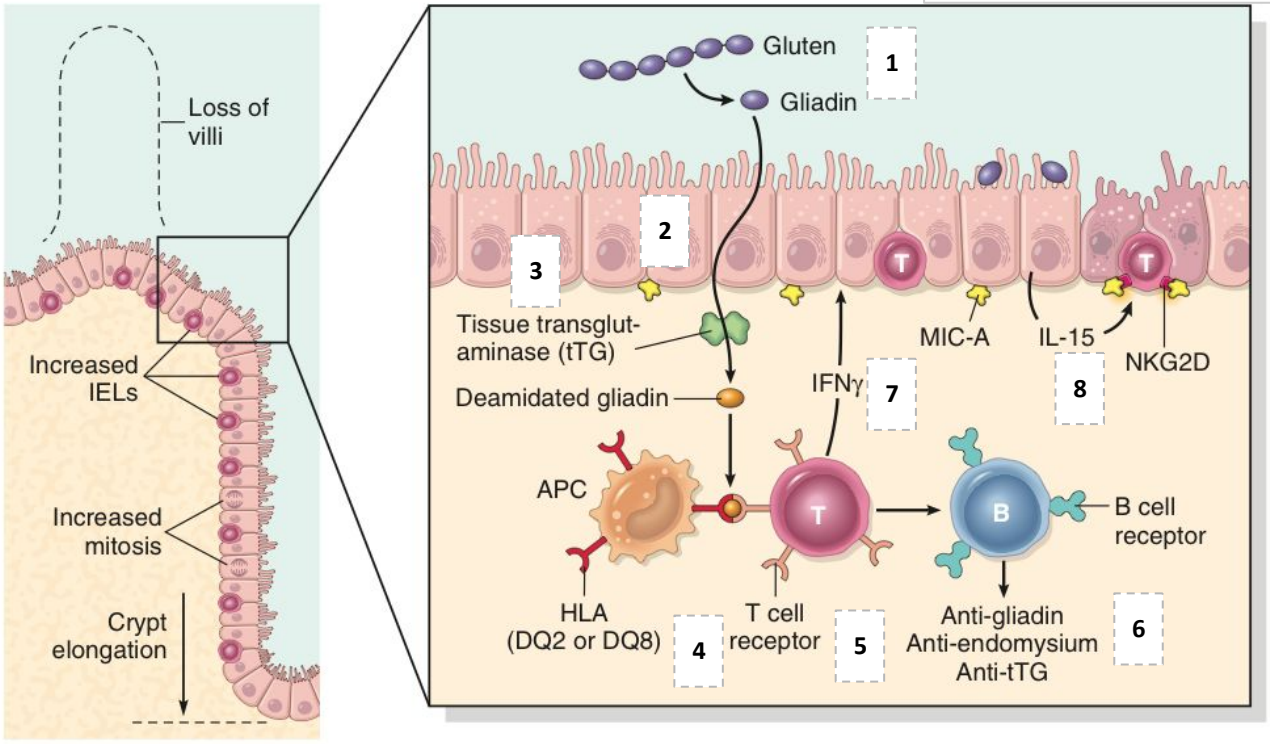
Answer: C

Celiac Disease

Pathogenesis

IMPORTANT

a 33-amino acid peptide resistant to degradation by gastric, pancreatic, and small intestinal proteases



1. Gluten breakdown into fragments of gliadin
2. then it get absorbed Into intestinal mucosa across lamina propria
3. it will become a Deamidated gliadin by the tissue transglutaminase (tTG)
4. people who Has HLA(DQ2 or DQ8) will recognize it by(APC) and presented to the T lymphocyte which will be activated
5. lymphocyte activate B lymphocyte
6. B lymphocyte produce Anti-gliadin, Anti-endomysium and anti-tTG (tissue transglutaminase)
7. T lymphocyte Will produce IFNγ and & more T lymphocytes will be infiltrated
8. Thus increase intraepithelial lymphocyte Producing factors eg: IL-15 and NKG2D and damage the epithelium causing villous atrophy and crypt elongation)

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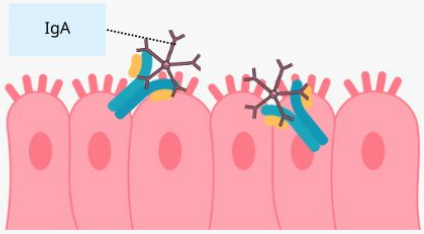
Need Further Explanation ?

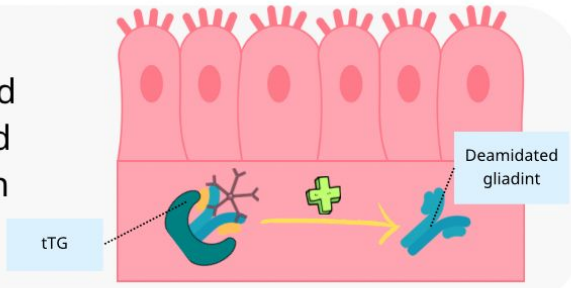
Extra Slide

1. Gluten is broken down into gliadin

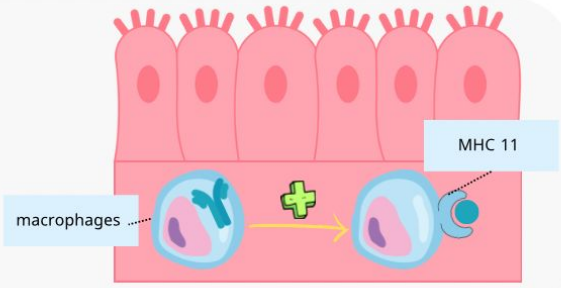
2. Then bind to secretory Ig on mucosal of duodenal cells



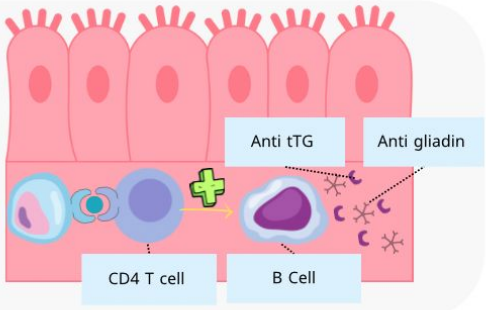
3. The gliadin IgA complex get transferred across the cell to laminate propria bind to tissue transglut-aminase (tTG) which cuts off an amide group



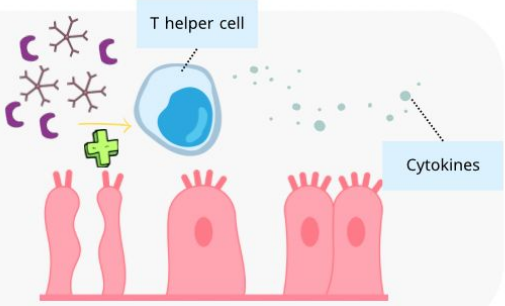
4. Deamidated gliadint then phagocytosed by macrophages & expressed on its MHC class ll molecule (only individuals who has HLA DQ2 & HLA DQ8)



5. Macrophages present the antigen to CD4 T cell in the lamina propria which will recognize the gliadin & stimulate B cell to secrete anti gliadin , anti endomysium & anti tTG bodies



6. Antibodies will stimulate helper T cell to release cytokines causing inflammation & damaging to epithelial cell on the villi of small intestine causing villous atrophy



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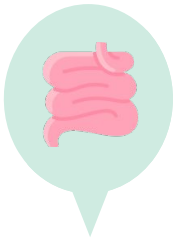
Celiac Disease

Diagnosis

Female Slides

Clinical documentations of malabsorption:

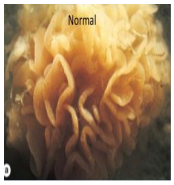


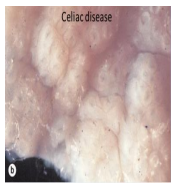


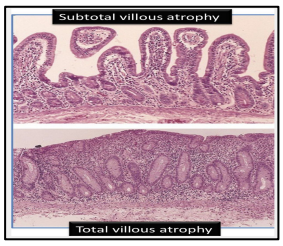

Increase fat in stool (steatorrhea).	Serologic tests for celiac disease (namely the anti-TTG-IgA) Serology is **+ve for IgA** antibodies to tissue transglutaminase or **IgG** to deamidated gliadin or **anti-endomysial** antibodies.	Small intestine biopsy demonstrate **villous atrophy .**	**Improvement** of symptom and mucosal histology on gluten withdrawal from diet (wheat, barley, lour Other grains, such as rice and corn flour, do not have such an effect).

IMPORTANT

Histological appearance	
Description	Mucosa is flattened with marked **villous atrophy.** ○ Increased intraepithelial lymphocytosis (IELs). ○ Crypt elongation(Hyperplasia)







complications

Osteopenia , osteoporosis	Infertility in women due to hypoalbuminemia	Short stature, delayed puberty, anemia	Malignancies: [**intestinal T-cell lymphoma**] 10 to 15% risk of developing GI lymphoma.

Lactose Intolerance

Osmosis Vid

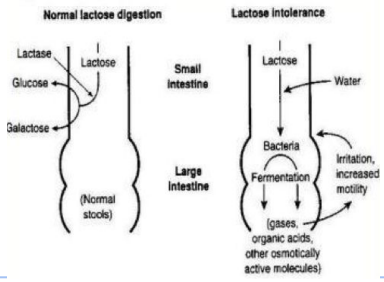
Definition and pathophysiology

Lactose intolerance is low or absent activity of the enzyme **lactase**, which is needed to digest lactose to glucose and galactose.

Lactose —(lactase, at the brush border of enterocyte)→ Glucose + Galactose

Etiology

443 Prof. Ahmed : Lactose intolerance Does not cause malnutrition in general !!

Inherited lactase deficiency	Acquired lactase deficiency
Congenital lactase deficiency : (extremely rare)	Transient
Childhood-onset and adult-onset lactase deficiency: common & genetically programmed progressive loss of the activity of the small intestinal enzyme lactase)	Secondary lactase deficiency due to intestinal mucosal injury by an infectious, allergic, or inflammatory process
	Gastroenteritis: Infectious diarrhea, particularly viral gastroenteritis in younger Acquired lactase deficiency children, may damage the intestinal mucosa enough to reduce the quantity of the lactase enzyme

Clinical features

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

1. Bloating
2. Abdominal discomfort
3. Flatulence / gases

Lactose Intolerance

Diagnosis

Hydrogen breath test :
specific test important in children

An oral dose of lactose is administered

The sole source of H2 is bacterial fermentation;

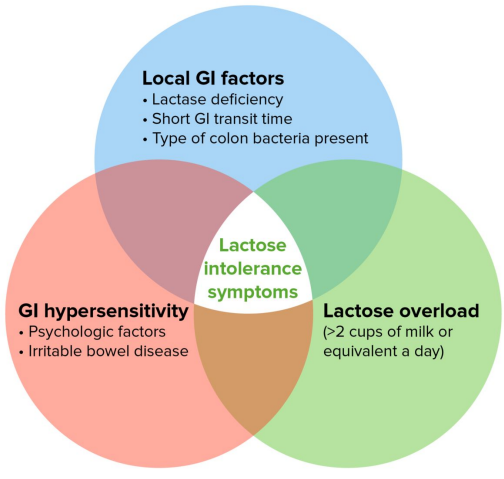
Unabsorbed lactose makes its way to colonic bacteria, resulting in excess breath H2.

Increased exhaled H2 after lactose ingestion suggests lactose malabsorption.

Empirical treatment: with a lactose-free diet, which results in resolution of symptoms , a 3-week trial of a diet that is free of milk and milk products is a satisfactory trial to diagnose lactose intolerance

Summary
from slides

- 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, CO2 and H2; acid is an irritant and exerts an osmotic effect.
- Causes diarrhea, gaseousness, bloating and abdominal cramps

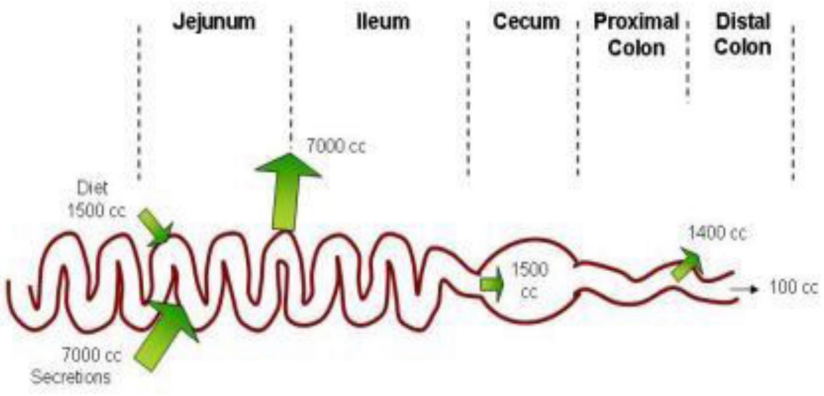


Extra Pic

Diarrhea

helpful video

Physiology of Fluid and small intestine



Approximately 8500 mL of fluid flow into the intestine daily :
1- from diet (1500mL).
2- Secretions (7000mL), EX (salivary, gastric, biliary, pancreatic, intestinal secretions).
3- Approximately (7000 mL) will be absorbed in the small intestines (most of the volume will be absorbed in the small intestines due to weaker tight junctions between enterocytes).
4- Approximately (1500 mL) cross the ileocecal valve.
5- The colon reabsorbed most of this fluid most of the fluid (1400 mL, but less than small intestines due to stronger tight junctions).
6- Finally, only (100mL) lost in the stool
- Most of the fluid is going to be absorbed in the jejunum & ileum
- In the large bowel, 1400 cc of fluid is absorbed and only 100 cc will be excreted.

Definition (WHO)

- 3 or more loose or liquid stools per day
- Abnormally high fluid content of stool → 200-300 gm/day (more than 250 g of stool per day) (normally 100)

Why is it important?
- The loss of fluids through diarrhea → can cause dehydration & electrolyte imbalances
- Easy to treat but if untreated, may lead to death especially in children.

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

01 Diarrhea

02 Malaria

03 neonatal infection

04 Pneumonia

05 preterm delivery

06 Lack of oxygen at birth

Fecal osmolarity

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

Under normal circumstances, the major osmoles are Na+, K+, Cl−, and HCO −3

Stool osmotic gap =Stool osmolarity - 2 x (stool Na + stool K)

Normal fecal fluid values:
Osmolality: ~290 mOsm/kg
Na+: ~30 mmol/L
K+: ~75 mmol/L

Fecal Osmotic Gap: 290 mosm/Kg H_2O-2([Na^+])+[K^+]) —>Osmotic Diarrhea > 125

Stool Osmotic Gap

Female Slides

is a calculation performed to distinguish among different causes of diarrhea.

A normal gap is between 50 and 100 mosm/kg

A low stool osmotic gap (<50 mosm/kg) can imply secretory diarrhea

A high gap (>125 mosm/kg) can imply osmotic diarrhea

The reason for this is that secreted sodium and potassium ions make up a greater percentage of the stool osmolality in secretory diarrhea, whereas in osmotic diarrhea, molecules such as unabsorbed carbohydrates are more significant contributors to stool osmolality.

Types of diarrhea

Osmotic Diarrhea
Loss of hypotonic fluid

Motility related Diarrhea

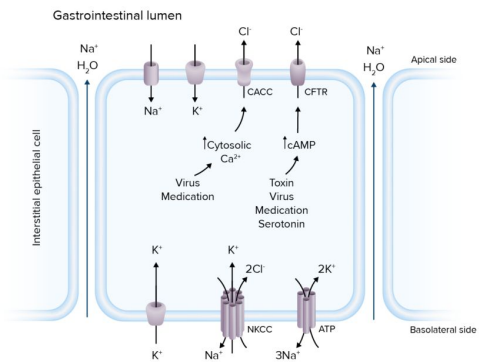
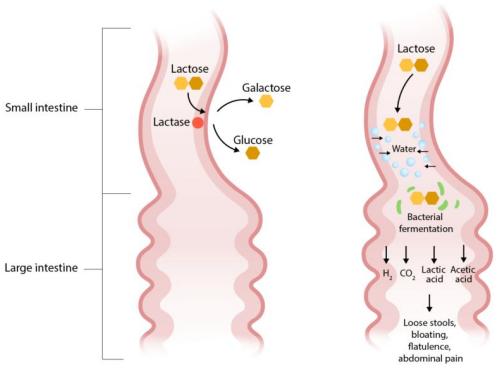
01 02 03 04

Secretory Diarrhea
Loss of isotonic fluid

Exodative Diarrhea
Inflammatory

IMPORTANT

Types of Diarrhea

	Secretory Active transport	Osmotic No active transport
Definition	• There is **an increase in the active secretion of water** • Enterotoxins stimulate Cl- channels regulated by cAMP and cGMP	• **Excess amount of poorly absorbed substances that exert osmotic effect** so water is drawn into the bowel causing diarrhea
Stool Output	• High stool output • Loss of isotonic fluid	• Stool output is usually not massive • Osmotically active substance is drawing hypotonic salt solution out of bowel • No inflammation in bowel mucosa
Fasting effect	**Lack** of response to fasting	Fasting **improve** the condition
Stool osmotic gap	Stool osmotic gap is normal or low< 100 mOsm/kg	Stool osmotic gap is high> 125 mOsm/kg (loss of hypotonic fluid)
Causes	The most common cause of this type of diarrhea is a bacterial toxin **(E. coli ,vibrio cholera)** that stimulates the secretion of anions. Other causes: • Also seen in neuro/Endocrine tumor: (carcinoid tumor, gastrinomas) • Enteropathogenic virus : **rotavirus** and norwalk virus • Rectal villous adenoma • Laxatives: Mechanisms melanosis coli with use of phenanthrene laxatives	• **Malabsorption** in which the nutrients are left in the lumen to pull in water e.g. lactose intolerance, chronic pancreatitis, celiac disease • Osmotic laxatives e.g. Lactulose(non absorbable sugar) • poorly absorbed Hexitols : (sorbitol,mannitol, xylitol) • Disaccharidase deficiency • Pancreatitis giardiasis • Ingestion of poorly absorbable solutes
Screening Tests	• Stool osmotic gap< 50 mOsm/kg • Fecal smear for leukocytes :negative	• Stool osmotic gap> 125 mOsm/kg • Fecal smear for leukocytes : negative
Concept Extra Pic		

IMPORTANT

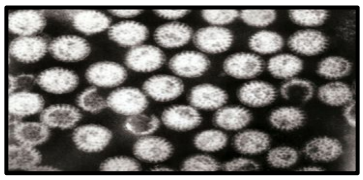
Types of Diarrhea

	Exudative Inflammatory	Motility related diarrhea
Definition	Results from the outpouring of blood protein, or mucus from an inflamed or ulcerated mucosa	Caused by the rapid movement of food through the intestines (hypermotility).
Stool output	Presence of blood , leukocytes and pus in the stool • Low-volume diarrhea	-
Fasting effect	Persists on fasting	-
Causes	• Inflammatory bowel diseases (crohn's disease & ulcerative colitis). • Invasive infections e.g E. coli, Clostridium difficile and Shigella. • Some bacterial infections cause damage by invasion of the mucosa. Many cause (bacterial dysentery) – **The main organisms of bacterial dysentery are:** • **Campylobacter** invades mucosa in the jejunum, ileum and colon, causing ulceration and acute inflammation. • **Salmonella typhi, S. paratyphi A, B, and C** • **Shigella infections** are mainly seen in young children. • **Enteroinvasive and enterohemorrhagic E.coli** • Entamoeba histolytica, can cause liver amebic abscess	• **Irritable bowel syndrome (IBS):** a motor disorder that causes abdominal pain and altered bowel habits with diarrhea predominating. • **Increased serotonin:** carcinoid syndrome: Serotonin increases bowel motility No inflammation in bowel mucosa • Other causes 1. Diabetic diarrhoea 2. hyperthyroid diarrhoea (442)Carcinoid syndrome : disease of neuroendocrine cell that produce 5-HT, this substance increases bowel motility → opening of bowel frequently → loss of fluid (diarrhea)
Screening Tests	• Fecal smear for leukocytes: Positive in most cases • stool culture and for O&P (Ova and parasites)	• Increase 5-HIAA (5-hydroxyindoleacetic acid)

Classification of Diarrhea | **Acute Diarrhea** If 2 weeks | Persistent if 2 to 4 weeks | Chronic Diarrhea If more than 4 weeks

Acute Diarrhea

Etiology



Rotavirus

Infections:Approximately 80% of acute diarrheas (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.

Rotavirus:

-The most common cause of severe childhood diarrhea and diarrhea related deaths worldwide.

-The cause of nearly 40% of hospitalizations from diarrhea in children under 5 .

-Cause 50% of ac diarrhea in infants.

Preformed toxin, Enterotoxin, Cytoxin or Invasive.

Food poisoning

Drugs: Antibiotic, NSAID, Antiacid, Bronchodilators, Antiarrhythmics

Others: Occlusive colitis, Ischemia, Toxin (insecticides).

Antibiotic associated diarrhea

IMPORTANT

- Diarrhea occurs in 20% of patients receiving broad-spectrum antibiotics; about 20% of these diarrheas are due to Clostridium difficile.
- Leading to pseudomembranous colitis.
- **441**: Broad spectrum antibiotics kill normal flora. Among the normal flora there's few amounts of clostridium difficile but they're resistant to antibiotics leading to injury of intestinal wall & pseudomembranous colitis

Acute Diarrhea

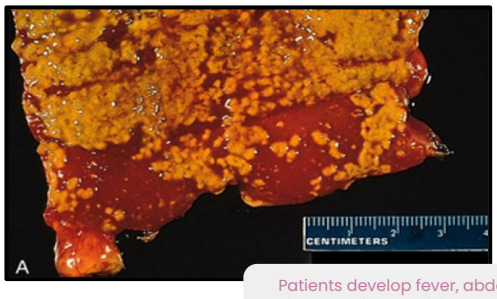
Clinical features

Female Slides

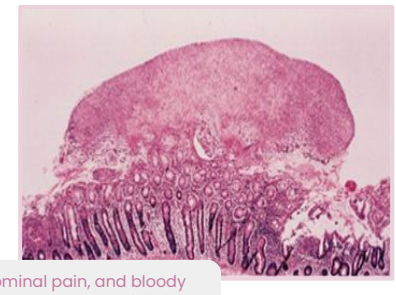
1. Clinically person become dehydrated with electrolyte disturbance and low bicarbonate in blood.

2. mild self limited, need rehydration.
442:"large amount of fluid contain electrolytes"

3. **Pseudomembranous colitis**: Patients develop fever, abdominal pain, and bloody diarrhea after receiving broad-spectrum antibiotics (Caused by Clostridium difficile)



Patients develop fever, abdominal pain, and bloody diarrhea after receiving broad-spectrum antibiotics (Clostridium difficile)



Clostridium species: Gram-positive rods

Evaluatory test

"examination for stool"

Fecal Leukocytes	
Non present	**Present**
Non-Inflammatory Diarrhea	Inflammatory Diarrhea
Suggests a small bowel source or colon but without mucosal injury. **441:** eg. cholera	Suggests colonic mucosa damage caused by: • invasive bacteria: Shigellosis, Salmonellosis, Campylobacter or Yersinia infection, amebiasis). • Toxin (C difficile, E coli O157:H7). • Inflammatory bowel diseases.

Chronic Diarrhea

Etiology

- **Most of the causes of chronic diarrhea are non-infectious.**

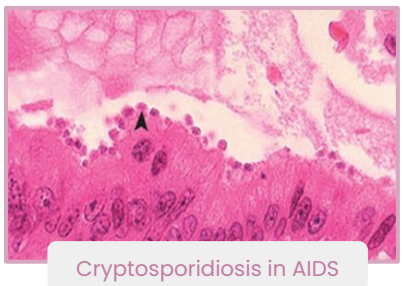
❖ **Infection:**
- ➢ *Giardia lamblia*
- ➢ ***AIDS*** AIDS often have chronic infections of their intestines (e.g. Cryptosporidiosis) that cause diarrhea
- ➢ **Parasitic and protozoal** infections affect over half of the world's population on a chronic or recurrent basis.

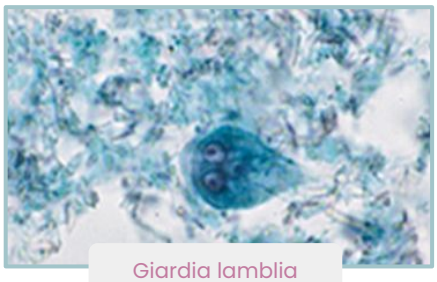
❖ **Post-infectious** :Following acute viral, bacterial or parasitic infections
❖ **Malabsorption**
❖ **Inflammatory bowel disease (IBD)**

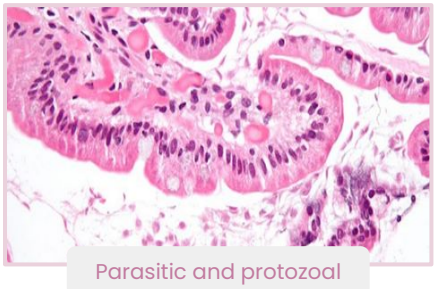
❖ **Endocrine diseases:**
- ➢ carcinoid.
- ➢ gastrinoma.

Colon cancer (villous adenoma)

Irritable bowel syndrome (high motility bowel)


Cryptosporidiosis in AIDS


Giardia lamblia


Parasitic and protozoal

Complications

Fluid loss	Dehydration
Electrolytes loss	Electrolytes imbalance
Low Sodium bicarbonate in blood	Metabolic acidosis
If persistent	malnutrition (iron deficiency anaemia, vitamins C & D deficiencies)

Chronic Diarrhea

Evalutory test

<table>
<tr><th colspan="3">Stool analysis ova, parasites</th></tr>
<tr><th>+Ve</th><th colspan="2">-Ve</th></tr>
<tr><td rowspan="3">Infection</td><td colspan="2">Stool fat test (normal <20%)</td></tr>
<tr><td>-Ve</td><td>+Ve</td></tr>
<tr><td>Secretory, Non infectious and Inflammatory diarrhea</td><td>Malabsorption
If malabsorption is +ve do:
• Quantitative stool for fat:
○ Best screening test
○ 72-hour collection of stool
○ Positive if test >7g of fat/24 hours
• Serum Anti-tissue transglutaminase antibodies.
• Anti-endomysial IgA antibodies.
• Antigliadin antibodies to check for celiac disease.
• Duodenal biopsy</td></tr>
</table>

Signs of dehydration

Female Slides

Early signs	Mature signs
Fatigue	Heartburn
Anxiety	Joint pain
Irritability	Back pain
Depression	Migraines
Cravings	Fibromyalgia(bone & muscle pain)
Cramps	Constipation
Headaches	Colitis

Keywords

Malabsorption Syndrome		• Steatorrhoea • weight loss • Swelling or edema (Deficiency of Protein) • Bleeding tendencies (Deficiency of Vit K) • Anaemia (Deficiency of B12 , folic acid , iron) • Osteomalacia -Osteoporosis (Deficiency of Vit D ,C)
Celiac Disease		• gluten autoantibodies • class II HLA-DQ2 or HLA-DQ8 alleles. • failure to thrive In Infants • anemia In adult & fat in stool • +VE : IgA antibodies to tissue transglutaminase • +VE : IgG to deamidated gliadin • +VE : anti-endomysial antibodies. • Histological appearance: villous atrophy , intraepithelial lymphocytosis , Crypt elongation. • intestinal T-cell lymphoma as complication
Lactose Intolerance		• low or absent activity of the enzyme lactase • Bloating & Flatulence when drinking milk products • Normal intestinal mucosa • Hydrogen breath test
diarrhea IMPORTANT	Secretory	• High volume Diarrhea & loss of isotonic fluid • No response with fasting • Low or normal osmotic gap : <100- 50 mOsm/kg • Due to bacteria toxin : (enterotoxins) (E. coli, Vibrio cholera) & Endocrine tumours & rotavirus • negative Fecal smear for leukocytes
	Osmotic	• Stool output is usually not massive & hypotonic • Improve with fasting • Stool osmotic gap is high > 125 mOsm/kg • Due to Malabsorption , Osmotic laxatives, Pancreatitis giardiasis & linked to steatorrhea due to osmotic pressure
	Exudative	• Stool has Bacterial dysentery diarrhea with blood and pus • No response with fasting • Due to IBD, Invasive infections , bacterial dysentery eg: Salmonella , Shigella, Entamoeba histolytica, cause liver amebic abscess • Positive : Fecal smear for leukocytes • stool culture and for O&P (Ova and parasites)
	Motility	• hypermotility • Due to IBS, carcinoid syndrome(serotonin) , Diabetic diarrhoea , hyperthyroid diarrhoea • Test : Increase 5-HIAA

IF YOU WANT A SUMMARY CLICK HERE

DR. MAHA CASES & QUESTIONS CLICK HERE

YOU Vs MCQs

1

Which alleles are highly associated with celiac disease?

A- HLA-DQ2 or HLA-DQ8

B- HLA-DR3 or HLA-DR4

C- HLA-DR2

D- HLA-A1 or HLA-B8

2

What is the most common cause of malabsorption due to inadequate digestion?

A- Celiac disease

B- Chronic pancreatitis

C- Tropical sprue

D- Zollinger-Ellison syndrome

3

What is the major histopathological appearance in an celiac disease patient?

A- Villous hypertrophy

B- ↑ intraepithelial lymphocytosis

C- ↓ intraepithelial lymphocytosis

D- Enlarged pancreatic ducts

4

A patient came to the clinic with high volume diarrhea his fecal smear for leukocytes was negative and gram stain identified E.coli , which of the diarrhea classification is he having ?

A- Secretory

B- Osmotic

C- Exudative

D- Motility-related

1-A / 2-B / 3-B / 4-A

YOU Vs MCQs

5

A patient came to the clinic with Acute diarrhea and you suggested him to fast for 5 days , after the fasting he is feeling much better , what type of diarrhea he represented ?

A- Secretory

B- Osmotic

C- Exudative

D- motility related

6

Which of the following is a cause of diarrhea with high osmotic gap?

A- Chronic pancreatitis

B- Carcinoid tumor

C- E.coli

D- Cholera

7

Which of the following is a complication for Celiac disease?

A- Hyperalbuminemia

B- excessive weight gain

C- Adenocarcinoma

D- intestinal T-cell lymphoma

8

A fecal smear for leukocytes was positive , this character is specific for which type of diarrhea ?

A- Secretory

B- Osmotic

C- Exudative

D- motility related

5-B / 6-A / 7-D / 8-C

YOU VS CASES

1. A 16-year-old girl complains of chronic abdominal distention, flatulence, and diarrhea after drinking milk. Elimination of milk and other dairy products from the patient's diet relieves these symptoms. This example of malabsorption is caused by a functional deficiency of which of the following enzymes associated with the intestinal brush border membrane?			
A.Disaccharidase	B.Glycogen phosphorylase	C.Hyaluronidase	D.Mannosidase
2.A 4-year-old girl is brought to the physician because her parents noticed that she has been having pale, fatty, foul-smelling stools. The patient is at the 50th percentile for height and 10th percentile for weight. Her symptoms respond dramatically to a gluten-free diet. Which of the following is the most likely diagnosis?			
A.Celiac sprue	B.Cystic fibrosis of the pancreas	C.Ménétrier disease	D.Tropical sprue
3.A 23-year-old man presents to his primary care physician complaining of weight loss and fatigue for the past 2 months. He has been experiencing foul-smelling, light-colored stools, which he attributes to not eating well recently. He has cystic fibrosis, which is well-controlled medically. He denies shortness of breath, chest or abdominal pain, nausea, vomiting, or melena. On physical examination, his skin is pale and dry. Which of the following is the most likely etiology of a malabsorption syndrome giving rise to this patient's current condition?			
A.Autoimmune damage to gastric parietal cells	B.Damage to the intestinal brush border	C.Chronic damage to the intestinal mucosa	D.Pancreatic insufficiency
4.A 32-year-old woman is referred to a gastroenterologist by her family practitioner for 8 months of abdominal pain, foul-smelling diarrhea with floating, bulky stools, weight loss, and macrocytic anemia. Her medical history is relevant for perennial allergic rhinitis. Physical examination shows grouped, erythematous papulovesicular lesions on her arms, torso, and abdomen . Laboratory test results are positive for IgA antibodies to tissue transglutaminase. Which of the following is the most appropriate management for this patient?			
A.Amitriptyline	B.Lactose-free diet	C.Gluten-free diet	D.Cyproheptadine

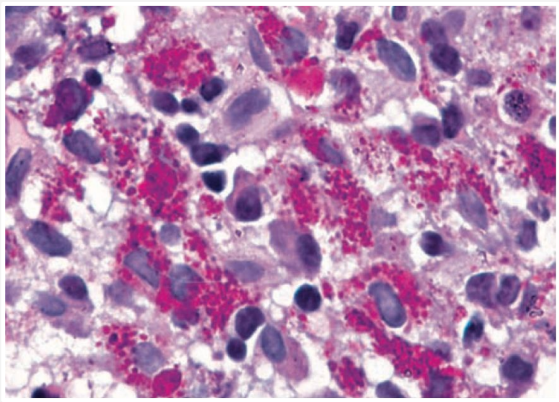
1-A / 2-A / 3-D/ 4-C

NEED EXPLANATION ? CLICK HERE

YOU Vs CASES

EXTRA CASES MAY REQUIRE EXTRA INFO

1.A 36-year-old man presents with fever and painful joints for 2 weeks. Physical examination shows skin pigmentation, glossitis, angular cheilitis, and generalized lymphadenopathy. The patient has lost 9 kg (20 lb) over the past 6 months. He reports that his stools are pale and foul smelling. Blood cultures are negative. The patient is started on antibiotic therapy and exhibits remarkable clinical improvement. Biopsy of the small intestine shows marked distortion of the intestinal villi, and a periodic acid-Schiff stain reveals



A.Crohn disease	B.Ménétrier disease	C.Peutz-Jeghers syndrome	D.Whipple disease

2.Which of the following cellular/biochemical mechanisms best explains the pathogenesis of malabsorption in the patient described in Question 1?

A.Bile salt inactivation	B.Blind loop syndrome	C.Extrahepatic cholestasis	D.Impaired mucosal function

3.A 19-year-old woman comes to the physician for evaluation of recurrent bloating and diarrhea. The symptoms began 2 months ago. During this time, she has had bulky and foul-smelling stools with no visible blood as well as an unintentional 9-lb weight loss. In addition, the patient has had a pruritic rash on her arms, which she attributes to “sensitive skin.” Past medical history is notable for vitiligo and hypothyroidism, which is well controlled with levothyroxine. Vital signs are within normal limits. Physical examination shows conjunctival pallor. Large patches of hypopigmentation are seen. There are multiple tense, grouped subepidermal blisters on the patient’s elbows and dorsal forearms bilaterally. Further evaluation of this patient’s gastrointestinal tract is likely to show which of the following findings?

A.Periodic-acid Schiff positive macrophages in the small intestine mucosa	B.Nodular collections of macrophages and giant cells in the intestinal epithelium	C.Normal intestinal architecture	D.Atrophic mucosa with loss of villi and crypt hyperplasia

1-D / 2-D / 3-D

YOU Vs CASES

EXTRA CASES MAY REQUIRE EXTRA INFO

4.A 29-year-old woman comes to the physician complaining of recurrent bloating and diarrhea over the past 2 months. She has bulky and foul-smelling diarrhea that is often difficult to flush. The patient had a Roux-en-Y reconstruction 5 years ago for morbid obesity that was refractory to diet and lifestyle modifications. Since then, she has lost 45-lbs, which has significantly improved her daily life. Physical examination reveals conjunctival pallor. Laboratory studies demonstrate a hemoglobin of 10.3 g/dL and mean corpuscular volume (MCV) of 101 µm3. Serum electrolytes are normal. Stool analysis shows no occult blood and stool culture is negative. The patient is asked to ingest 25 g of D-xylose following an overnight fast. Urine concentration of D-xylose after several hours is 3.0 g (normal ≥4.5 g). The physician prescribes her oral antibiotics, and the test is repeated after 2 weeks. Subsequent urine concentration is 9.2 g. Which of the following is the most likely cause of this patient's symptoms?

A.Autoimmune-mediated inflammation of the small bowel	B.Reduced secretion of pancreatic lipase and colipase	C.Microbial overgrowth in the small intestine	D.Villous blunting due to gliadin hypersensitivity

5..A previously healthy 19-year-old man comes to his physician complaining of recurrent bloating, abdominal pain, and flatulence for the past several months. The patient has not had any recent illnesses. He recently started training to become a competitive bodybuilder and has been on a diet consisting of mainly protein shakes and yogurts. Past medical history is noncontributory, and the patient takes only a multivitamin daily. He recently traveled to China to visit his relatives. Vital signs are within normal limits. Physical examination reveals normoactive bowel sounds with no tenderness to abdominal palpation. He is administered 50 g of lactose orally. Three hours later, there is an increase in breath hydrogen content. Stool sampling reveals a decreased pH. Which of the following is the most likely cause of this patient's symptoms?

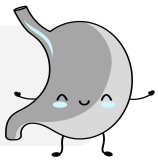
A.Congenital lactase deficiency	B.Loss of intestinal brush border enzyme due to gastroenteritis	C.Genetically regulated reduction of lactase enzyme activity	D.Small intestinal bacterial overgrowth

6.A 28-year-old man comes to the physician complaining of diarrhea for the last several weeks. He describes his stool as bulky, greasy, and "tends to float on top of the water in the toilet." The patient has not had similar symptoms in the past. He also unintentionally lost 11-lb over the past month. He is an avid hiker and most recently went on a hike in the Appalachians, where he regularly cooked his own meat and drank water from nearby fresh-water springs. The patient has not had fever, rashes, or any bloody stools. Vital signs are within normal limits. Physical examination shows a mildly tender abdomen with hyperactive bowel sounds. There are patches of skin with hyperkeratosis as well as several bruises. Stool samples are taken and stain positively with Sudan III. If this patient goes untreated, which of the following complications is he most likely to develop?

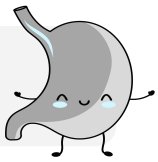
A.Sideroblastic anemia	B.Pathologic fractures	C.Dilated cardiomyopathy	D.Adrenal insufficiency

4-C / 5-C why not A ? Patient is much older for full deficiency + symptoms only appeared after heavy lactose intake when the body cannot regulate furthermore / 6-B

Pathology Team



Leader زياد العتيبي



Leader لمى العتيبي

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