Small Bowel
Carbohydrate
- Increased gas, distention and possibly diarrhea
- Get extensive dietary hx to r/o dietary causes
- A fecal pH less than 6 is evidence of carbohydrate malabsorption
- Hydrogen breath test
  - Increase of 20 parts/million → colonic fermentation of the lactose by bacteria
  - False + can occur in bacterial overgrowth
  - False – recent antibiotic use
Malabsorption

Fat
- 72-hour collection; normal is 6–8g/24 hours
- High fat intake (100g/d) necessary for accurate results

Protein
- Rare
- Alpha–1 antitrypsin clearance
Celiac disease “gluten enteropathy”

- genetically inherited associated with the HLA locus found on the short arm of chromosome 6. HLA–DQ2 is present in 95% of patients.
- pathology: flattening of the small bowel villi.
Celiac serology

- Antigliadin Ab
  - IgG: good sensitivity
  - IgA: good specificity

- Antiendomysial Ab
  - False(-) in IgA deficiency

- Anti–tissue transglutaminase Ab (IgA and IgG)
  - Highly sensitive and specific
Celiac diagnosis

- Biopsies should be performed in all pts who are suspected of having celiac, regardless of serologic evidence
  - Small # of people have + serology but normal biopsies
  - Negative serology does not preclude presence of disease
Complications

- Refractory sprue
  - Severe complications can develop
    - Ulcerative jejunitis, collagenous sprue, lymphoma
- T-cell lymphoma
  - High mortality rate
Pt with celiac has followed a gluten free diet for 6 months and was doing well but now diarrhea has returned. Review of her diet shows compliance. Endomysial antibody testing is now normal. What is the next step?

a. Repeat small bowel biopsy
b. SBFT
c. CT scan of abdomen
d. Colonoscopy with biopsies
e. Bacterial aspirate if small bowel contents
Pt had responded to gluten-free diet
Common cause of recurrent diarrhea is microscopic colitis, detected with random biopsies in a normal appearing colon.
About 15% of time the 2 diseases coexist.
52 yo recently traveled to Puerto Rico for 3 months. He developed fatigue, malaise and abdominal cramps 1 week after returning, followed by diarrhea and dyspepsia. Stools are “oatmeal-like”. Lab Hgb 11.3 with MCV 103. Stool studies neg. Enteroscopy is performed. Likely diagnosis?

a. Celiac sprue
b. Giardia
c. Tropical sprue
d. Lactase def.
Answer: c tropical sprue

- Can mimic celiac sprue.
- Etiology unknown although it is suspected to be infectious.
- Tx: tetracycline 250mg QID and folate 5mg daily for 6–12 months

KEY:
Diarrhea+ tropics+ macrocytic anemia = Tropical sprue
Types of Lactase deficiencies

- **congenital form**: Present at birth, very rare.
- **primary form**: genetically determined and dependent on population (most common in Saharan and sub-Saharan Africa and East Asian and Pacific)
- **secondary or acquired**: occurs after intestinal injury.
A 35-year-old female presents for a second opinion concerning IBS

She states 2 years ago she was in Mexico and got severe diarrhea that got better with antibiotics. However, since that time she experiences increased abdominal bloating, cramps, and diarrhea after eating. She has kept a food diary and you notice her symptoms are worse after she has cereal, pizza, or chocolate. What is her likely diagnosis?

- a. Secondary lactase deficiency
- b. Congenital lactase deficiency
- c. Celiac Sprue
- d. Irritable bowel syndrome
Answer: a, secondary lactase def
Bacterial Overgrowth

- A direct consequence of the presence of increased amounts of colonic-type bacterial flora in the small intestine.
- Can result in fat, carbo, and protein malabsorption
- Macrocytic anemia $\rightarrow$ cobalamin def.
Bacterial Overgrowth Etiology

- Small bowel diverticula
- Fistulas from crohn’s
- Bypass of intestine
  - Jejunoileal for obesity
- Functional stasis
  - Scleroderma
  - Diabetes
direct aspiration of aerobes and anaerobes from small bowel is the standard.
Alternatives: carbon dioxide and hydrogen breath tests.

**Therapy:** If the cause is not correctable, can trial antibiotics. largely empirical
A 29 yo develops a mild watery diarrhea after camping in the Cascade Mountains of Washington. He drank water from the mountain streams. On PE he has no abdominal pain or masses. He is afebrile, +BS. Stool neg for occult blood. Diarrhea abates after 3 weeks. His children have similar symptoms. Which of the following infectious agents most likely caused his disease?
a. Rotavirus
b. *Shigella flexneri*
c. *Vibrio cholerae*
d. *Giardia lamblila*
e. *Salmonella enteritidis*
Giardia
Giardia

- Intestinal tract infection caused by protozoal parasite *Giardia lamblia*.

- Predominant age in US:
  - Preschool; especially daycare
  - Homosexual men

- Contaminates fresh water sources worldwide
  - (mountain streams)
Clinical findings:

- 70% have intestinal symptoms
  - Diarrhea
  - Flatulence
  - Cramps
  - Bloating
  - Nausea

- Chronic diarrhea, malabsorption, and weight loss

- 20–25% of infected pts are asymptomatic
Workup

- Stool
  - Immunoassays for Giardia antigen routinely used in labs
- r/o malabsorption
  - B12
  - Albumin
  - Stool fat test
- Tx:
  - Metronidazole, Nitazoxanide, Paromomycin
Small Bowel

45 yo has had malabsorption for the last year with low volume diarrhea, polyarthritis and occasional visual hallucinations. PE is neg. CT shows generalized lymphadenopathy. EGD shows broad flattened villi in the duodenum. Bx show numerous PAS + macrophages in the submucosa. Which therapy may be useful for this pt?

a. Gluten free diet
b. Steroids
c. Antibiotics
d. antacids
Answer: c antibiotics

- Whipples disease
  - *Trotherma whippelii*
  - May get a description of “foamy macrophages”
- Most common sx: arthralgias, weight loss, recurrent abd pain, diarrhea. CNS manifestations also classic
Water soluble vitamins

- **B12**
  - Cobalamin
    - Requires ingestion of animal products
    - Deficiencies:
      - Megaloblastic anemia and hyperhomocystinemia
      - Identical to folic acid def
      - Neuropsychiatric abnormalities
      - Posterior column of spinal cord degeneration
      - Loss of taste, anorexia, diarrhea
  - Serum methylmalonic acid levels
    - Normal in folate def
    - Increased in B12 def (or before)
B12 deficiency causes

- Achlorhydria in elderly
- Pernicious anemia
  - Lack of IF and acid
- ZE syndrome
- Bacterial overgrowth
- Gastric bypass
Other water-soluble vitamins

- **Folic acid**: Macrocytic anemia, glossitis, increased risk colon ca and CV disease
- **Vit C**: scurvy
- **Thiamine (b1)**: beriberi with cardiac or neurologic disorders. May be exacerbated by glucose administration to thiamine–def patients
- **Riboflavin (b2)**: angular stomatitis, cheilosis, dermatitis, visual impairment
- **Niacin (b3)**: pellagra (diarrhea, dermatitis, dementia)
- **Pyridoxine (b6)**: def cause of increased ratio of AST to ALT in alcoholic hepatitis
Fat-soluble vitamins

- A: night blindness
- D: nausea, vomiting, weakness
- E: neurologic symptoms, hemolysis
- K: excessive bruising and bleeding
- Absorption requires luminal bile salts and pancreatic esterases, assembly into chylomicrons and lymphatic transport
- Excess can cause toxicity
Minerals

- Iron
  - Microcytic hypochromic anemia

- Zinc
  - Required as a cofactor for many enzymes
  - Def impairs growth, development and reproductive and immune functions

- Copper
  - Microcytic hypochromic anemia, leukopenia, neutropenia, diarrhea and bony changes
Minerals

- Selenium
  - Cardiomyopathy
  - Myositis

- Manganese
  - Night blindness, tachycardia, tachypnea, HA

- May develop deficiency in pts receiving long-term TPN or TF
Matching Vitamin/Mineral def with symptoms/signs

- Vitamin A
- Vitamin C
- Vitamin K
- Zinc
- Chromium
- Copper

- Glucose intolerance
- Night blindness
- Hypogonadism
- Impaired wound healing
- Menkes (kinky hair) syndrome
- Easy bruising
Vitamin A: night blindness
Vitamin C: impaired wound healing, bleeding gums, depression
Vitamin K: easy bruising, bleeding
Zinc: hypogonadism, growth arrest, poor wound healing
Chromium: glucose intolerance
Copper: Menkes syndrome, microcytic anemia
What is the most consistent laboratory abnormality that may occur in small bowel bacterial overgrowth?

a. Vitamin K malabsorption
b. Gapped PT/INR
c. Vitamin C Malabsorption
d. Vitamin B12 malabsorption
e. Iron deficiency anemia
Answer: d B12 malabsorption