

The Who, What, and How of Small Intestinal Bacterial Overgrowth

Christopher Vélez, MD

Program Director, Mass General Brigham Advanced Fellowship
in Neurogastroenterology and Motility Disorders



MASSACHUSETTS
GENERAL HOSPITAL



Mass General Brigham



HARVARD
MEDICAL SCHOOL

Outline

- Case presentation
- Overview of SIBO pathophysiology
- Summarize key guideline recommendations
 - *American Journal of Gastroenterology* 2020 SIBO Guidelines
 - *American Journal of Gastroenterology* 2017 North American Breath Testing Consensus.
- Case wrap-up and take-home points

Outline

- **Case presentation**
- Overview of SIBO pathophysiology
- Summarize key guideline recommendations
 - *American Journal of Gastroenterology* 2020 SIBO Guidelines
 - *American Journal of Gastroenterology* 2017 North American Breath Testing Consensus.
- Case wrap-up and take-home points

Referral for abdominal pain and altered bowel habits

- 42-year-old man presents as a second opinion regarding chronic abdominal pain and altered bowel habits (more constipated).
- Symptoms are principally chronic perturbation of bowel habits associated with abdominal pain.
 - Man who has sex with men.
 - Impacting sexual function.
- Has been told it was was “irritable bowel syndrome,” which he was frustrated with hearing as he “knows there is something there.”
- Avoidance of lactose has not impacted symptoms.
- No prior bowel surgery, last antibiotics > 6 months ago, no scleroderma.
- Relatively remote colonoscopy (over 2-years ago), no gastroscopy.
 - Unclear if biopsies were taken for microscopic colitis.

Referral for abdominal pain and altered bowel habits

- Physical exam unremarkable.
- He requests laboratory testing, including serologies and stool sample.
- He is ordered for gastroscopy and colonoscopy.
- He requests testing for SIBO, as he has had intermittent antimicrobial exposures and is concerned about dysbiosis.
 - He also seeks prescription for rifaximin.
 - He presents a form for prior authorization (as he has already contacted his commercial insurance company about this intervention).

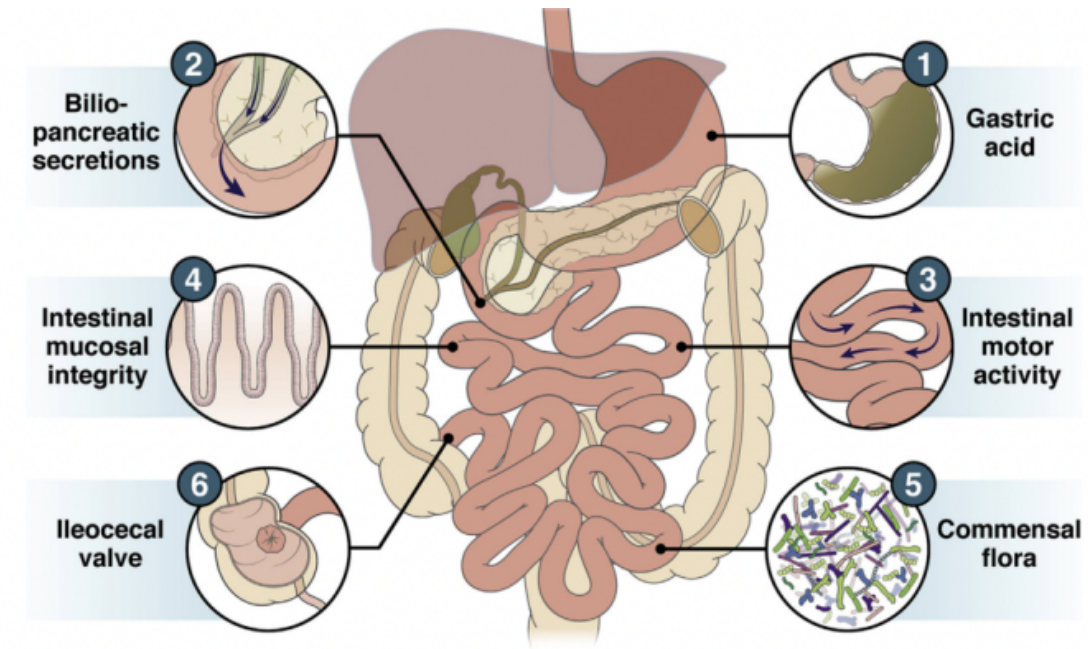
How do you counsel the patient?

Outline

- Case presentation
- **Overview of SIBO pathophysiology**
- Summarize key guideline recommendations
 - *American Journal of Gastroenterology* 2020 SIBO Guidelines
 - *American Journal of Gastroenterology* 2017 North American Breath Testing Consensus.
- Case wrap-up and take-home points

What is SIBO?

- Previously referred to as the “blind loop syndrome.”
- Now recognized as secondary to overgrowth/contamination of the small bowel.
 - Various factors (right) protect against.
- Challenges exist in its diagnosis, including clinical tests with limited validation.
- Has been thought of as a “common denominator” of various illnesses.
- Two opposite sides of the spectrum exist.



Bushyhead D, Quigley EMM. Small Intestinal Bacterial Overgrowth-Pathophysiology and Its Implications for Definition and Management. *Gastroenterology*. 2022 Sep;163(3):593-607.

What is SIBO?

- One approach:
 - SIBO is a cause of malabsorption/maldigestion.
 - As such, findings should be measurable clinically, such as through steatorrhea, protein losing enteropathies, and/or vitamin deficiencies.
- On the other hand:
 - SIBO may be associated with other clinical entities such as irritable bowel syndrome, with a murkier pathophysiological linkage.

Table 3. Mechanisms for maintaining small bowel ecological homeostasis

Mechanism	Rationale
Gastric acid	Most ingested bacteria in food cannot survive the acidic stomach.
Pancreatic enzymes	Digestive enzymes in the proximal small bowel may also digest bacterial products. Efficient digestion of nutrients leaves less substrates for bacteria.
Bile acids	As detergents, bile acids can have an effect on bacterial membranes.
Small bowel motility	Migrating motor complexes and other events cleanse the small intestine of debris during fasting.
IC valve	The IC valve protects the small bowel from retrograde movement of colonic flora into the small bowel.
Immune system	Mucosal immunity may be important in the maintenance of a stable microbiota of the intestinal lumen.
IC, ileocecal.	

Epidemiology and risk factors:

- Difficult to assess clinical prevalence.
- Various risk factors are thought to promote overgrowth:
 - Abnormal motility
 - Autonomic neuropathy
 - Systemic sclerosis
 - Gastroparesis
 - Opiate use
 - Anatomic abnormalities
 - Small bowel diverticulosis
 - Fistulous disease
 - Ileocecal reresection
 - Hypochlorhydria
 - Immune deficiencies
 - Multifactorial
 - Cystic fibrosis, chronic pancreatitis, celiac disease, radiation enteropathy.

Bushyhead D, Quigley EMM. Small Intestinal Bacterial Overgrowth-Pathophysiology and Its Implications for Definition and Management. Gastroenterology. 2022 Sep;163(3):593-607.

SIBO has captured the popular imagination

www.instagram.com › reel ⋮

Small intestinal bacterial overgrowth (SIBO) has become more ...

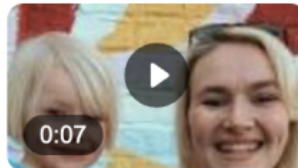


... **social media** on the back burner. It has been a stress-reliever that I didn't know I needed. Super therapeutic! I still will keep updates on ...

Instagram · Oct 14, 2024

www.instagram.com › reel ⋮

THE RESULT... As many of you know, I've been battling SIBO ...



I really think that **social media** has made everything seem so black and white- but that isn't real life! I think we spend so much time ...

Instagram · Mar 31, 2025

www.facebook.com › videos › day-9-sibo-when-your-gu... ⋮

Day 9 SIBO: When your gut decides to act up ...



Digital creator. Video Transcript. There is a condition that makes it ... Small intestine **bacterial overgrowth** or **Sibo** happens when bacteria ...

Facebook · Dr Erin Nance · 1 month ago

Outline

- Case presentation
- Overview of SIBO pathophysiology
- **Summarize key guideline recommendations**
 - ***American Journal of Gastroenterology* 2020 SIBO Guidelines**
 - ***American Journal of Gastroenterology* 2017 North American Breath Testing Consensus.**
- Case wrap-up and take-home points

Clinicians have help to grapple with SIBO

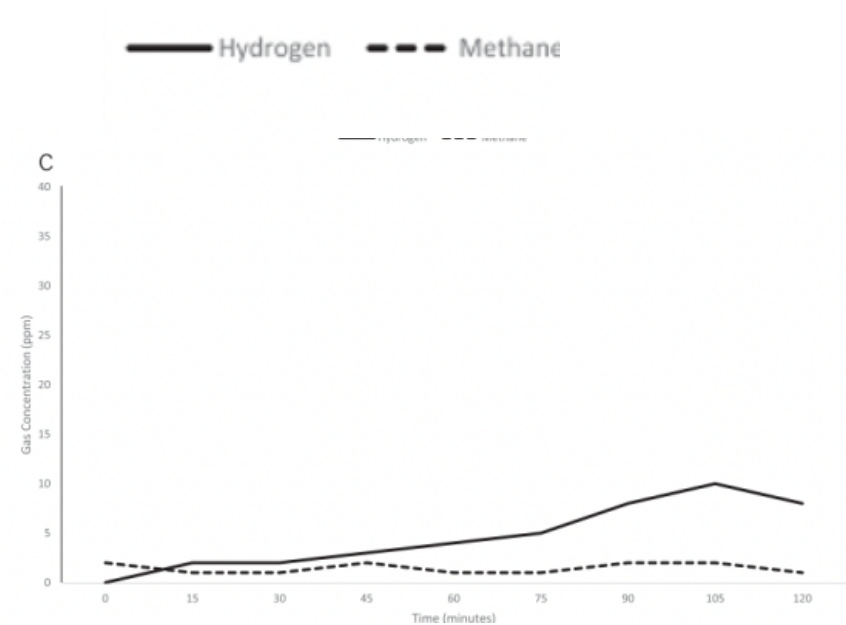
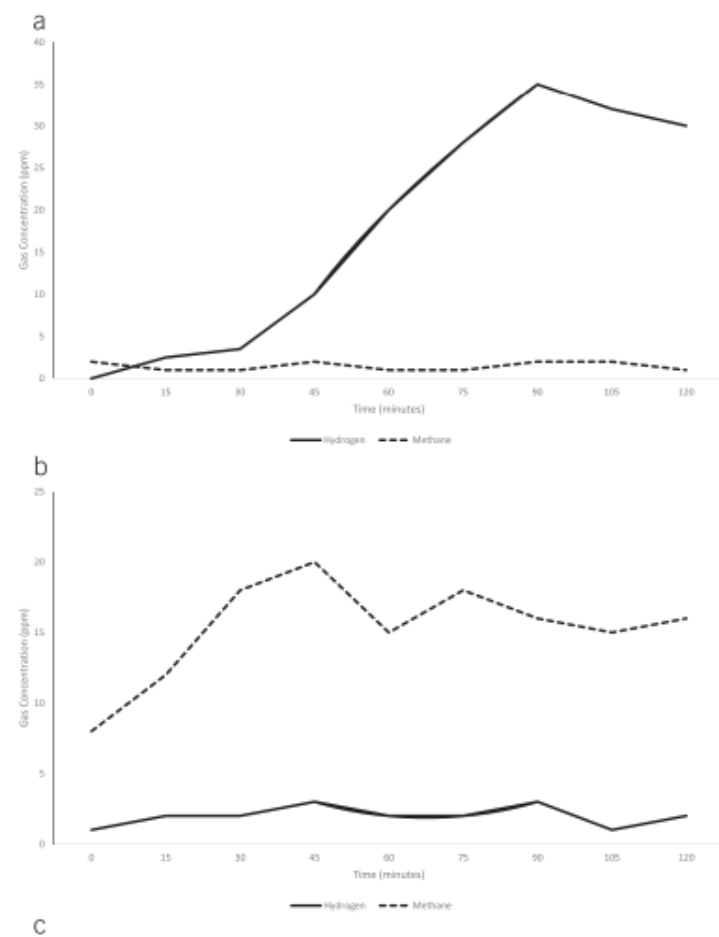
ACG Clinical Guideline: Small Intestinal Bacterial Overgrowth

Mark Pimentel, MD, FRCP(C), FACP¹, Richard J. Saad, MD, FACP², Millie D. Long, MD, MPH, FACP (GRADE Methodologist)³ and Satish S. C. Rao, MD, PhD, FRCP, FACP⁴

Small intestinal bacterial overgrowth is defined as the presence of excessive numbers of bacteria in the small bowel, causing gastrointestinal symptoms. This guideline statement evaluates criteria for diagnosis, defines the optimal methods for diagnostic testing, and summarizes treatment options for small intestinal bacterial overgrowth. This guideline provides an evidence-based evaluation of the literature through the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) process. In instances where the available evidence was not appropriate for a formal GRADE recommendation, key concepts were developed using expert consensus.

Am J Gastroenterol 2020;115:165–178. <https://doi.org/10.14309/ajg.0000000000000501>; published online January 8, 2020

ACG Guidelines: SIBO Diagnosis



Pimentel M, Saad RJ, Long MD, Rao SSC. ACG Clinical Guideline: Small Intestinal Bacterial Overgrowth. Am J Gastroenterol. 2020 Feb;115(2):165-178. doi: 10.14309/ajg.0000000000000501. PMID: 32023228.

Breath testing

- Rationale:

- Human cells do not produce hydrogen and methane.
 - Methanogens technically not bacteria – intestinal methanogen overgrowth (IMO).
- Produced by fermentation, gases absorbed into blood stream (measured in breath).
- Provide a carbohydrate load to be fermented – measured, less invasive.
- Typically use glucose and lactulose.
 - Correct dose of glucose (75 g) and lactulose (10 g) for standardization purposes.
- Increase in hydrogen concentrations of ≥ 20 ppm from baseline within 90 minutes.
- For methane, a concentration of ≥ 10 ppm at any point during the test.

- Breath testing limitations:

- Significant dietary/medication recommendations which may be challenging to follow.

Rezaie A, Buresi M, Lembo A, Lin H, McCallum R, Rao S, Schmulson M, Valdovinos M, Zakko S, Pimentel M. Hydrogen and Methane-Based Breath Testing in Gastrointestinal Disorders: The North American Consensus. Am J Gastroenterol. 2017 May;112(5):775-784.

Pimentel M, Saad RJ, Long MD, Rao SSC. ACG Clinical Guideline: Small Intestinal Bacterial Overgrowth. Am J Gastroenterol. 2020 Feb;115(2):165-178.

North American SIBO Breath Testing Consensus:

- Antibiotics should be avoided for 4 weeks prior to the breath test.
- Lack of conclusive data on probiotics or prebiotics prior to breath testing.
- Pro motility drugs/laxatives should be stopped at least one week prior to breath testing.
- Fermentable foods and complex carbohydrates should be avoided on the day prior.
- Fasting period prior to breath testing should be 8–12 h.
- Smoking should be avoided on the day of breath testing.
- Physical activity should be limited during breath testing.
- It is not necessary to stop proton pump inhibitors prior to breath testing.

Rezaie A, Buresi M, Lembo A, Lin H, McCallum R, Rao S, Schmulson M, Valdovinos M, Zakko S, Pimentel M. Hydrogen and Methane-Based Breath Testing in Gastrointestinal Disorders: The North American Consensus. *Am J Gastroenterol*. 2017 May;112(5):775-784.

Who to test?

- Most common symptom is bloating, vitamin deficiencies rarer in the absence of bowel surgical intervention (may note excess folate).
- Recommendation against testing for asymptomatic disease in people using acid suppression.
- Conditional recommendation, very low level evidence to test for SIBO in IBS.
 - Methanogens such as *Methanobrevibacter smithii* can cause constipation.

Table 4. Conditions associated with small intestinal bacterial overgrowth	
Category	Specific condition
Mechanical causes	Small bowel tumor Volvulus Intussusception Postsurgical causes
Systemic disease	Diabetes Scleroderma Amyloidosis
Motility	IBS Pseudo-obstruction Visceral myopathies Mitochondrial diseases
Medications	Opiates Potent antisecretory agents
Malabsorptive conditions	Pancreatic insufficiency Cirrhosis (altered bile acid composition) Other malabsorptive conditions
Immune-related	Human immunodeficiency virus Combined variable immunodeficiency IgA deficiency
Other	Aging (the elderly) Small bowel diverticulosis
IBS, irritable bowel syndrome; IgA, immunoglobulin A.	

How to treat: antibiotics

- Use of antibiotics has been cornerstone.
- Practices have included empiric treatment (particularly in those with risk factors for disease).
- Try to reverse underlying condition.
- Given risk for antibiotic-related complications (e.g. *C difficile*-associated diarrhea), reasonable to test.
- Limitations of studies include heterogeneity, method of diagnoses.
- Retreat? Retest?

Table 5. Suggested antibiotics for treatment of small intestinal bacterial overgrowth

Antibiotic	Recommended dose	Efficacy
Nonabsorbable antibiotic		
Rifaximin	550 mg t.i.d.	61%–78%
Systemic antibiotic		
Amoxicillin-clavulanic acid	875 mg b.i.d.	50%
Ciprofloxacin	500 mg b.i.d.	43%–100%
Doxycycline	100 mg q.d. to b.i.d.	^a
Metronidazole	250 mg t.i.d.	43%–87%
Neomycin	500 mg b.i.d.	33%–55%
Norfloxacin	400 mg q.d.	30%–100%
Tetracycline	250 mg q.i.d.	87.5%
Trimethoprim-sulfamethoxazole	160 mg/800 mg b.i.d.	95%

^aIn the study, no testing performed to reassess small intestinal bacterial overgrowth, although all participants had other objective measures of improvement.

How to treat: beyond antibiotics

- Diet
 - Very limited data, generally in setting of IBS.
 - Generally centers on elimination of FODMAPs.
- Probiotics - “lack of consistent data for specific probiotics”
 - No good data to support use.
 - Give more bacteria in a condition where there are too many bacteria?
 - Perhaps could have a role in altering microbiota communities?
- Fecal microbiota transplant – “no basis for the use”
 - Would seem like a good treatment target.
 - There are risks inherent in FMT even in conditions where it is accepted treatment, such as *C difficile* associated diarrhea.

SIBO...IMO...and SIFO?

- Small intestinal *fungal* overgrowth.
- Typically thought of in setting of Candidiasis in the immunocompromised.
 - Counterpart to esophageal candidiasis.
- May have a role even in the immunocompetent.
 - *Candida* species found in the bowels in 70% of healthy individuals in studies.
- Degree of fungal representation vs burden not well defined.
- Risk factors likely similar to SIBO.
- Unlike SIBO, main way it is diagnosed remains small bowel aspiration.
- Antifungals like the azoles play a role.
- Autobrewery syndrome?

Erdogan A, Rao SS. Small intestinal fungal overgrowth. Curr Gastroenterol Rep. 2015 Apr;17(4):16. doi: 10.1007/s11894-015-0436-2. PMID: 25786900.

Paramsothy J, Gutlapalli SD, Ganipineni VDP, Okorie IJ, Ugwendum D, Piccione G, Ducey J, Kouyate G, Onana A, Emmer L, Arulthasan V, Otterbeck P, Nfonoyim J. Understanding Auto-Brewery Syndrome in 2023: A Clinical and Comprehensive Review of a Rare Medical Condition. Cureus. 2023 Apr 17;15(4):e37678. doi: 10.7759/cureus.37678. PMID: 37206535; PMCID: PMC10189828.

Outline

- Case presentation
- Overview of SIBO pathophysiology
- Summarize key guideline recommendations
 - *American Journal of Gastroenterology* 2020 SIBO Guidelines
 - *American Journal of Gastroenterology* 2017 North American Breath Testing Consensus.
- **Case wrap-up and take-home points**

Case wrap up

- 42-year-old man presents as a second opinion regarding chronic abdominal pain and altered bowel habits (more constipated).
- Sympathized with him regarding the impact his symptoms are having on quality of life.
- I felt that his desire to treat empirically (without risk factor) for SIBO was premature.
- Recommended traditional evaluation included non-invasive stool/serology, anorectal manometry, and colonoscopy.
- Still felt that symptoms were too burdensome and did not want to wait for sequential evaluation. Also concerned about false negative SIBO testing.
 - Reviewed risks vs benefits of empiric approach.
 - Opted for prescribing rifaximin, without further rounds of retreatment.

Take home points:

- SIBO is a challenging disease entity to define, determine who needs testing for it, and to treat.
- No matter what your perception of the validity of SIBO is in patients, they are likely being influenced by social media descriptions.
- I tend to think more highly about SIBO when conditions are present that could explain dysbiosis/greater bacterial colonization.
- I tend to think less highly about SIBO when there are no such conditions are present, although I struggle with IBS.
- An ideal opportunity for shared decision making between clinician and patient.