OVERGROWTH BATTERICO: DIAGNOSI E TRATTAMENTO

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GUT MICROBIOTA

In a state of eubiosis within the gut microbiota, the human body relies on a diverse array of host defense mechanisms:

- Gastric acid secretion
- Intestinal motility
- Intestinal anatomic integrity
- Innate and adaptive immunity (i.e. IgA)
- Pancreatobiliary secretions

The deregulation of any of these protective mechanisms can lead to microbiota dysbiosis, a potential pathway for the development of **Small Intestinal Bacterial Overgrowth (SIBO)**

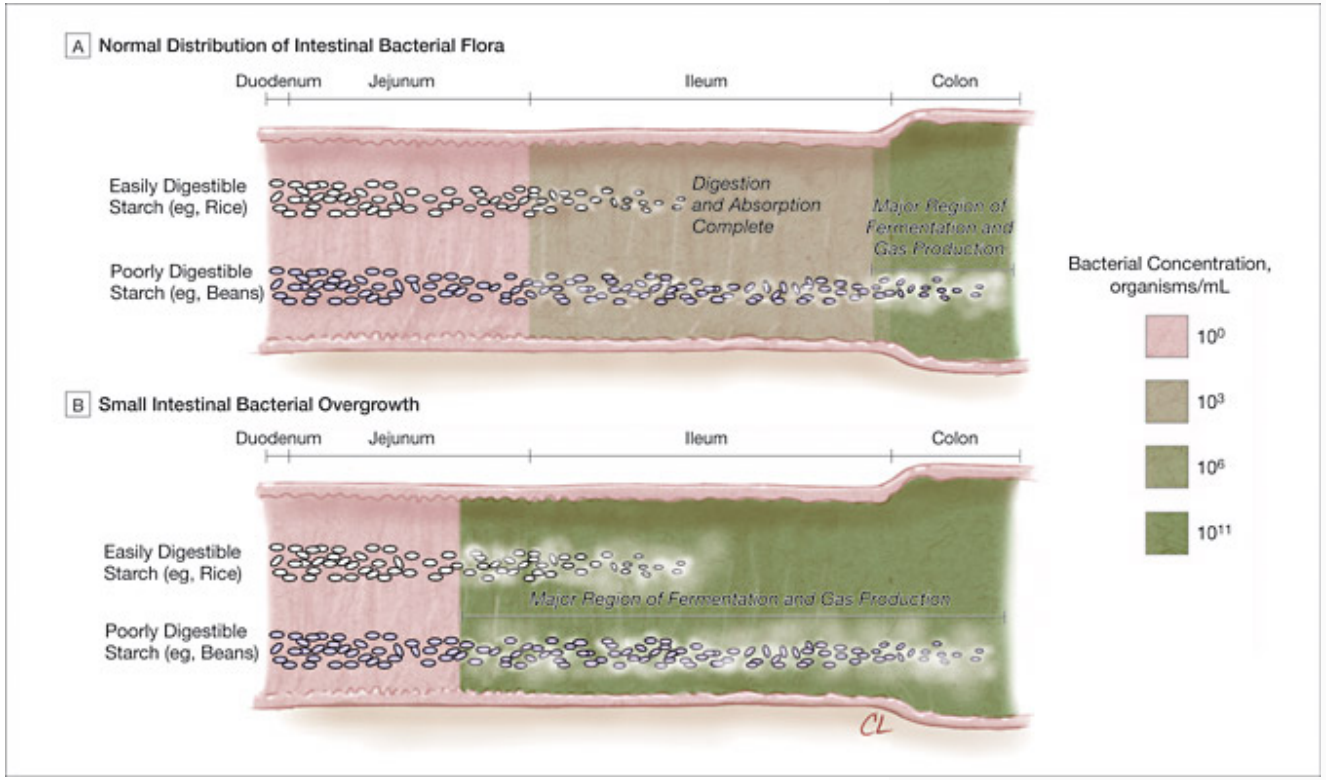
Table 1
Protective measures against small intestinal bacterial overgrowth and common associated disorders

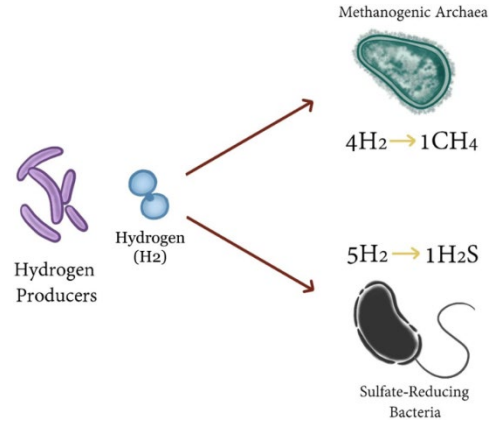
Gastric Acid Secretion	Pancreaticobiliary Secretions	Intestinal Motility	Anatomic Integrity	Innate and Adaptive Immunity
Acid-suppressing medications • Proton pump inhibitor Autoimmune gastritis Surgery (vagotomy)	Chronic pancreatitis Exocrine pancreatic insufficiency Cirrhosis	Medications (ie, opioids) Autonomic Neuropathy Scleroderma	Small bowel diverticulum Surgical revision • Roux-en-y • Lack of ileocecal valve Fistulae/Stricture • Inflammatory bowel disease • Radiation	Immunosuppressive medications Combined variable immunodeficiency Immunoglobulin A deficiency Human immunodeficiency virus/AIDS

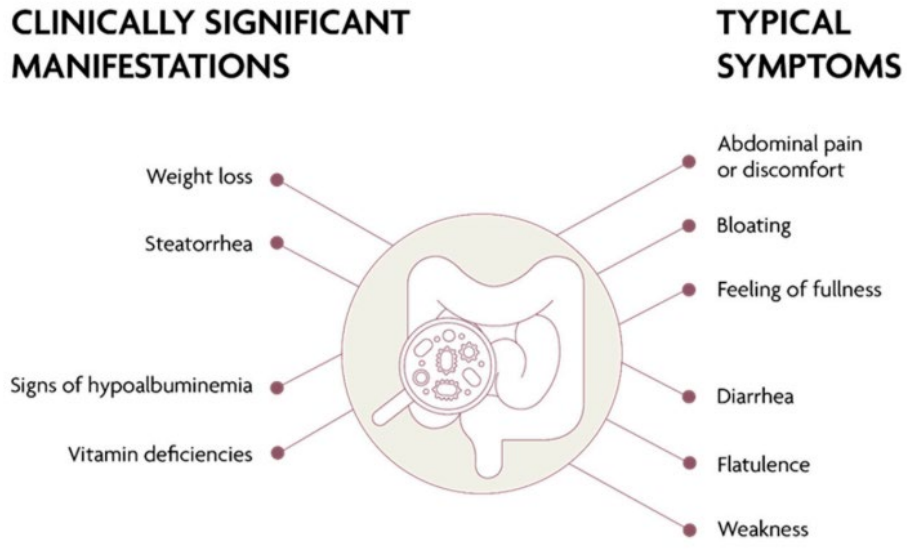
Ginnebaugh, et al. Gastroenterol. Clin. N. Am. 2020

SIBO

- SIBO is characterized by increased colonization of anaerobic and aerobic microorganisms within the small intestine, predominantly Gram-negative







Lin et al. JAMA 2004

Skrzydło-Radomańska et al. J Clin Med. 2022

SIBO DIAGNOSIS

Small Intestinal Fluid Aspiration for Quantitative Culture

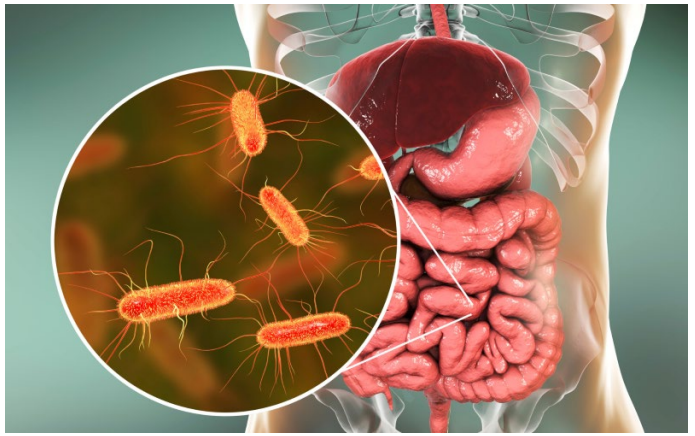
- standard EGD
- enteroscopy

→

3 to 5 mL of fluid aspirated.

→

sample placed into a sterile container and immediately transported to the microbiology laboratory to undergo quantitative culture.



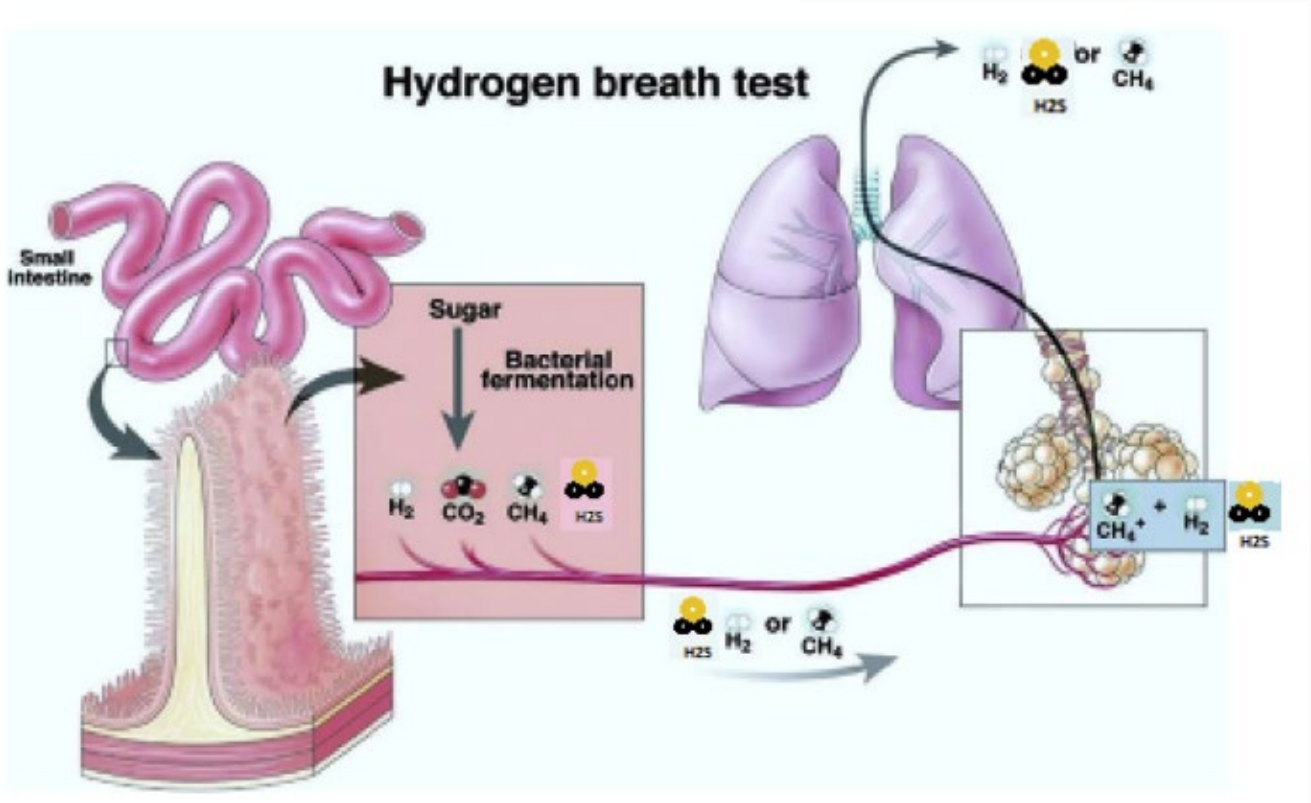
- significant risk of contamination
- sampling error
- sample mishandling

Alternatively, to traditional culture-based methods, microbial identification can be achieved via genetic 16S ribosomal RNA PCR-based analysis

Ginnebaugh, et al. Gastroenterol. Clin. N. Am. 2020
Skrzydło-Radomańska et al. J Clin Med. 2022

SIBO DIAGNOSIS

Breath Testing



- glucose breath test (GBT)
- lactulose breath test (LBT)

Noninvasive, accessible, cost-effective

Limited sensitivity and specificity

The diagnostic concordance between small intestinal aspirate culture and routinely used breath testing is approximately 65%

Skrzydło-Radomańska et al. J Clin Med. 2022
Mattio et al. Neurogastroenterology & Motility. 2024

Pros and Cons of Breath Testing for Small Intestinal Bacterial Overgrowth and Intestinal Methanogen Overgrowth

Jane Lim, MD, MS, and Ali Rezaie, MD, MSc

GI Motility Program, Karsh Division of Gastroenterology and Hepatology, Department of Medicine, Cedars-Sinai Medical Center, Los Angeles, California

Table 1. Recommended preparation for breath testing.

Period before the Breath Test	Drugs/Activities to Be Avoided
4 weeks	Oral or intravenous antibiotics Prokinetic agents
2 weeks	Probiotics
1 week	Proton pump inhibitors
48 h	Motility regulators: loperamide, metoclopramide, trimebutine
24 h	Alcohol Fiber (particularly non-soluble fiber)
12 h	Oral food intake (only water is allowed)
The morning on the day of the test	Smoking Physical exertion Food Regularly used medications are allowed

Strengths
Exhaled breath hydrogen and methane are exclusive biomarkers of metabolically active gut microbes
Safe, simple, and noninvasive
Widely accessible and inexpensive with home testing option
Antibiotic therapy can be tailored based on breath test pattern[a]
• Breath testing is the only diagnostic test for IMO • IMO test results are not affected by OCTT
Spot methane measurement is a rapid point-of-care method to diagnosis IMO and assess treatment response
Lactulose breath test can help identify patients with diarrhea-predominant irritable bowel syndrome who are more likely to be rifaximin responders
Limitations
Indirectly measures microbial overgrowth
Accuracy of result relies on patient compliance to protocol: • Oral care • Avoid exercise or smoking on day of test • Avoid fermentable foods on day prior to test • No antibiotics 4 weeks before test • Discontinuation of promotility agents or laxatives 1 week before test • Avoid colonoscopy bowel preparation at least 2 weeks before test
Various commercial home tests: • May use thresholds for breath hydrogen and methane that are different from cutoffs outlined in clinical guidelines • May include a combined criteria of hydrogen and methane, which are not supported by data and can lead to false-positive results
Low breath hydrogen can occur when excessive methanogens and hydrogenotrophic bacteria are present
SIBO test results can be affected by variations in OCTT: • Rapid OCTT can result in false-positive result • Slow OCTT can result in false-negative result
Conditions that impair delivery of the carbohydrate substrate to the small intestine can result in false-negative results (ie, gastroparesis, gastric outlet obstruction, achalasia, and enterocutaneous fistula)

Gastroenterology & Hepatology 2023

Obesity Surgery (2024) 34:947–958
https://doi.org/10.1007/s11695-024-07080-0

IFSO

ORIGINAL CONTRIBUTIONS

Prospective Monitoring of Small Intestinal Bacterial Overgrowth After Gastric Bypass: Clinical, Biological, and Gas Chromatographic Aspects

Vincent Florent[1,2] · Solen Dennetiere[1,4] · Bulle Gaudrat[1,3] · Severine Andrieux[1] · Emmanuel Mulliez[4] · Laurene Norberciak[5] · Kathleen Jacquez[6]

Received: 18 September 2023 / Revised: 24 January 2024 / Accepted: 24 January 2024 / Published online: 1 February 2024

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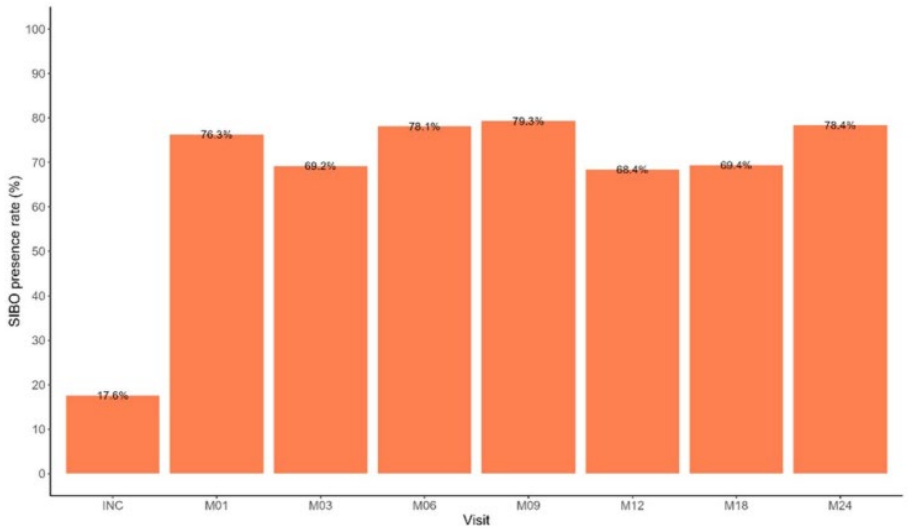
All subjects underwent a glucose breath test, blood sample, physical examination with anthropometric data, digestive anamnesis, food survey, and fecalogram.

All patients underwent a Lanroth-type RYGB: a biliary limb length of 40 cm, an alimentary limb length of 150 cm, and the length of the common channel depending on the total length of the small intestine

These explorations were performed before surgery and up to 2 years after surgery (1, 3, 6, 9, 12, 18, and 24 months).

- Lipid excretion was positively correlated with the hydrogen concentration in expired air
- An increase of 5 g of lipids in the stool increased by 5% the concentration of hydrogen.



- PPI therapy
- Carbohydrates in the diet
- Surgical technique

- High prevalence of bacterial overgrowth before and immediately after RYGB, affecting 89.5% of the patients.
- Positive correlation between exhaled hydrogen and lipid malabsorption.

OBSU 2024

SIBO DIAGNOSIS

MYTH OR FUTURE?

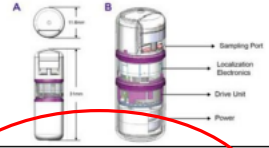
Current Gastroenterology Reports
https://doi.org/10.1007/s11894-024-00926-8

Capsules for the Diagnosis and Treatm Disorders- A Game Changer

Irene Sonu[1] · Sun Jung Oh[2] · Satish S. C. Rao[3]

Accepted: 15 February 2024

Table 2 Investigational capsules

Product	FDA status	Indication	Contra-indications	What it measures	Key clinical trials	Comments
Intestinal Fluid Sampling Capsule (CAPSCAN®) 	Investigational	Microbial, metabolomic, proteomic profiling	None noted	Fluid collection	n/a	
Smart Capsule Bacterial Detection System (Biora ®) 	Investigational	Fluid analysis and drug delivery	Not suitable for IBD patients with significant strictures	Fluid collection, SCBDS assay to detect metabolically active bacteria	66 patients suspected SIBO: SCBDS assay vs. TBC – 94% agree of assay, 100% sensitivity, 91% specificity[7]	Localization algorithm requires intact IC valve for accurate detection of cecum
Gas Sensing Capsule Device® (ATMO®) 	Investigational	Gastroparesis, slow colonic transit, whole gut dysmotility and SIBO	None noted	Intraluminal gas and transit time	Study 1: 50 healthy volunteers, GSCD vs. WMC with minimal difference in transit time[8].	

SIBO TREATMENT

DIET

- **Published data regarding dietary therapy for SIBO are scarce and largely extrapolated from studies in patients with IBS**

✓ A diet low FODMAP diet deprives bacteria of their source of energy necessary for proliferation and reduces bacterial fermentation, as evidenced by low levels of hydrogen in breath tests.

✓ The period of complete elimination of FODMAP from the diet of SIBO patients should not exceed six weeks.

✓ There is no evidence supporting the use of a gluten-free diet in the treatment of SIBO.

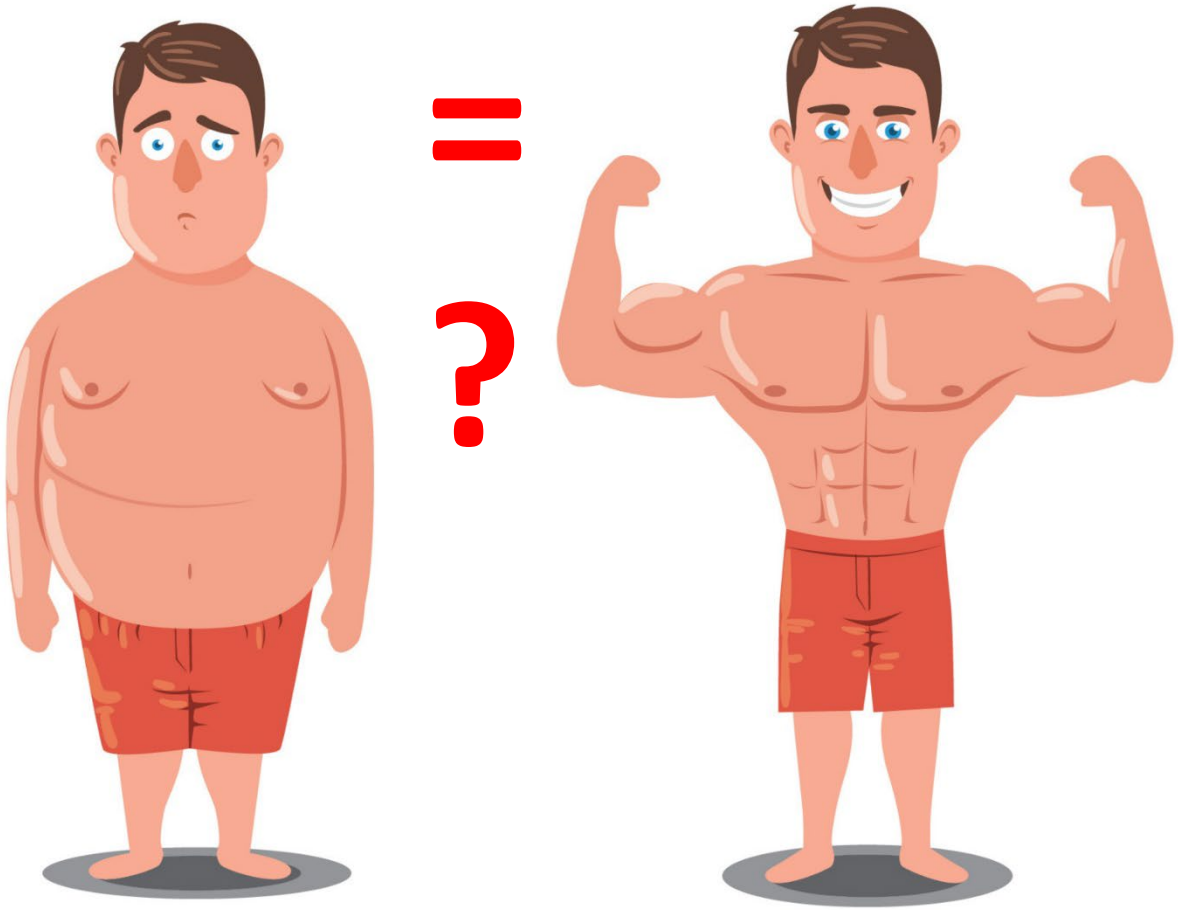
✓ The use of elemental diets, which contain pre-digested nutrients, is not recommended in SIBO despite some promising study reports.

Dionne et al. Am. J. Gastroenterol. 2018
McIntosh et al. Gut 2017

SIBO TREATMENT

- ✓ Probiotics moc
  colonization by
- ✓ Probiotics are a
  microorganism
- ✓ Probiotics com

Probiotic therapy
slightly decrease
Patients with SIB
although this pre
significantly high
statistically signif
rate compared w



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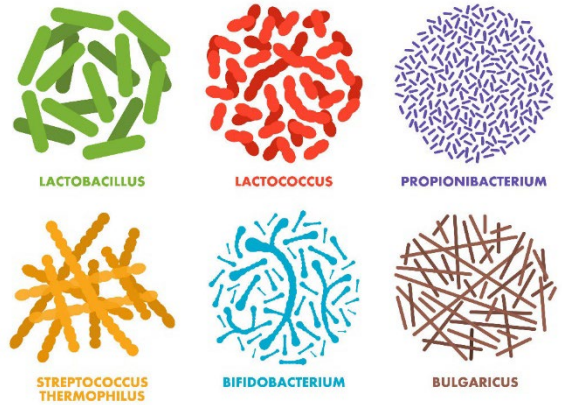

Zhong et al. J Clin Gastroenterol 2017

Obesity Surgery (2024) 34:1306–1315
https://doi.org/10.1007/s11695-024-07117-4

IFSO

ORIGINAL CONTRIBUTIONS

Effects of Probiotic Use on Gastrointestinal Symptoms in the Late Postoperative Period of Bariatric Surgery: A Cross-Over, Randomized, Triple-Blind, Placebo-Controlled Study

Nathalia Ramori Farinha Wagner[1,5] · Maria Clara Peixoto Lopes[1] · Ricardo Fernandes[2] · Cesar Augusto Taconelli[3] · Giovanna Mozzaquatro Nascimento[4] · Julia Pessini[4] · Erasmo Benicio Santos de Moraes Trindade[4] · Antonio Carlos Ligocki Campos[1]

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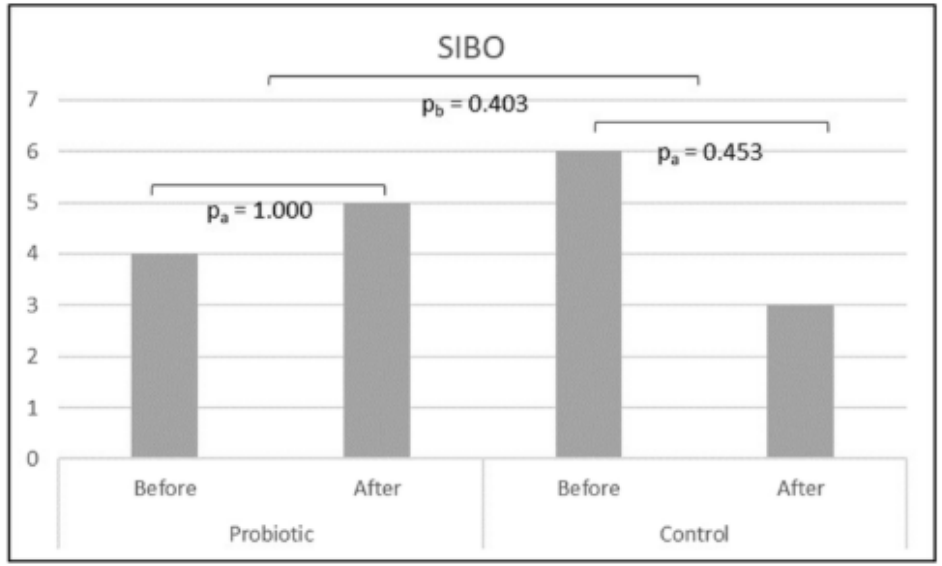
55 RYGB patients
Probiotic group n=36; Control group n=39

- *Probiotic 50B® (Pure Encapsulations, Nestlé Health Science, Hoboken, NJ, USA) composed of 50 billion CFU per capsule (Lactobacillus acidophilus La-14, Bifdobacterium lactis Bl-04, Lactobacillus rhamnosus GG, Bifdobacterium longum Bl-05, Lactobacillus plantarum Lp-115, Bifdobacterium bifdum Bb-06, Lactobacillus gasseri Lg-36)*



- GSRS questionnaire for GI symptoms evaluation
- Hydrogen breath test with 25 g of glucose for SIBO assessment

Conclusion

Supplementation of *Lactobacillus acidophilus* La-14, *Bifidobacterium lactis* Bl-04, *Lactobacillus rhamnosus* GG, *Bifidobacterium longum* Bl-05, *Lactobacillus plantarum* Lp-115, *Bifidobacterium bifidum* Bb-06 and *Lactobacillus gasseri* Lg-36 in symptomatic patients after 1 year of RYGB (reviewer #2 comment #5) does not seem to alleviate GIS or influence the improvement of SIBO.

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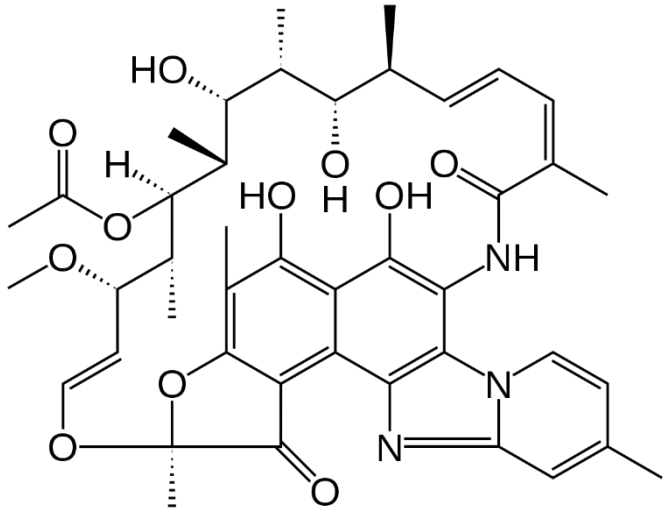
SIBO TREATMENT

ANTIBIOTIC THERAPY

lack of large randomized clinical trials evaluating the effects of antibiotics in the treatment of SIBO
limited data comparing the efficacy of different antibiotics

Rifaximin is the antibiotic of choice
- good safety profile,
- placebo-like adverse event rates,
- low rate of resistance
- broad-spectrum antibacterial effects against Gram-positive and Gram-negative aerobic and anaerobic bacteria
- eubiotic effect through increasing beneficial bacterial strains



Systematic review with meta-analysis: rifaximin is effective and safe for the treatment of small intestine bacterial overgrowth

L. Gatta*,† & C. Scarpignato*

Aliment. Pharmacol. Ther. 2017

•Overall eradication rate of rifaximin for SIBO is 70%;
•Efficacy of rifaximin in treating SIBO is dose-dependent, with 1600 mg/day for 1 week having the highest eradication rate;

Obesity Surgery (2024) 34:250–257
https://doi.org/10.1007/s11695-023-06974-9

REVIEW

The Prevalence of Small Intestinal Bacterial Overgrowth After Roux-en-Y Gastric Bypass (RYGB): a Systematic Review and Meta-analysis

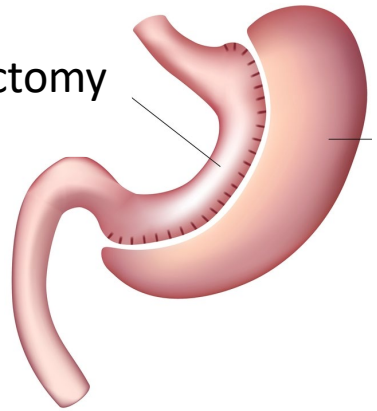
Fidele Kakule Kitaghenda[1] · Jian Hong[1] · Yong Shao[1] · Libin Yao[1] · Xiaocheng Zhu[1]

Author	Surgery types	Mean interval time of diagnosis in months (ranges) from the time of surgery	Symptoms
Shah et al. [37]	RYGB	57	Constipation
Andalib et al. [24]	RYGB	65 (6–228)	-
Sabate et al. [2]	RYGB, AGB	19.45 (9.2–36)	Diarrhea, constipation, abdominal pain, rumbling, dumping syndrome, vomiting/regurgitation
Jirapinyo et al. [26]	RYGB	96	Abdominal pain, bloating, constipation, diarrhea, gas/flatulence
Wagner et al. [29]	RYGB	3	Abdominal pain, soft stools, nausea
Mouillot et al. [6]	RYGB, SG, OAGB	40	Diarrhea, abdominal pain, bloating
Dolan et al. [18]	RYGB	-	Nausea, vomiting, bloating, diarrhea
Novljan et al. [23]	RYGB, OAGB	26.98 (2–108)	Frequent defecation, scleroderma, irritable bowel syndrome, diabetes

RYGB, Roux-en-Y gastric bypass; *AGB*, adjustable gastric band; *SG*, sleeve gastrectomy; *OAGB*, one anastomosis gastric bypass

- Antibiotic therapy has been shown to effectively treat and improve digestive symptoms in bariatric patients diagnosed with SIBO after surgery
- Up to this date, **there is no consensus** on the choice, dosage, and duration of antibiotic therapy for SIBO; therefore, different therapies have been tested.

Sleeve gastrectomy



Obesity Surgery (2024) 34:1075–1085
https://doi.org/10.1007/s11695-024-07118-3

ORIGINAL CONTRIBUTIONS

IFSO Worldwide Survey 2020–2021: Current Trends for Bariatric and Metabolic Procedures

Luigi Angrisani[1] · Antonella Santonicola[2] · Paola Iovino[2] · Rossella Palma[3] · Lilian Kow[4] · Gerhard Prager[5] · Almino Ramos[6] · Scott Shikora[7] · the Collaborative Study Group for the IFSO Worldwide Survey

	2018	2020	2021
Sleeve gastrectomy (SG)	386,096	304,352	351,689
Roux-en-Y gastric bypass (RYGB)	203,769	133,007	159,543
One anastomosis gastric bypass (OAGB)	46,406	29,117	46,113
Biliopancreatic diversion (BPD)	6506	6896	7973
Adjustable gastric banding (AGB)	9757	6116	5010
Other surgical operations	14,346	13,949	13,238
Intragastric balloons	27,780	11,492	12,421
Other endoluminal procedures	1531	2877	2707
Total	**696,191**	**507,806**	**604,099**

SIBO TREATMENT

PROKINETICS & HERBAL THERAPY

ORIGINAL CONTRIBUTION: PDF ONLY

Long-Term Treatment With Cisapride and Antibiotics in Liver Cirrhosis: Effect on Small Intestinal Motility, Bacterial Overgrowth, and Liver Function

Madrid, Ana Maria MD; Hurtado, Carmen PhD; Venegas, Mauricio PhD; Cumsille, Francisco Dr PH; Defilippi, Carlos MD

American Journal of Gastroenterology 2001

EFFECT OF OCTREOTIDE ON INTESTINAL MOTILITY AND BACTERIAL OVERGROWTH IN SCLERODERMA

HANI C. SOUDAH, M.D., WILLIAM L. HASLER, M.D., AND CHUNG OWYANG, M.D.

N Engl J Med 1991;

Article

Do Herbal Supplements and Probiotics Complement Antibiotics and Diet in the Management of SIBO? A Randomized Clinical Trial

Lucia Redondo-Cuevas [1,†], Lucia Belloch [1,†], Vanesa Martín-Carbonell [1,2], Angela Nicolás [1], Iulia Alexandra [2], Laura Sanchis [1,2,*], Marina Ynfante [1], Michel Colmenares [1], María Mora [1], Ana Reyes Liebana [1], Beatriz Antequera [1], Francisco Grau [1], José Ramón Molés [1,2], Rubén Cuesta [2], Samuel Díaz [1], Noelia Sancho [1], Héctor Tomás [1], José Gonzalvo [2], Mercedes Jaén [1,2], Eva Sánchez [1,2], Ana Garayoa [2], Nadia Moreno [1], Ana Gallén [1], Ernesto Cortés-Castell [3] and Xavier Cortés-Rizo [1,2]

Nutrients 2024

Although the results showed no significant differences in the normalization of exhaled gas curves between groups, the patients treated with herbal supplements and probiotics showed an improved response in gastrointestinal symptoms,

CONCLUSIONS

- ✓ **On many levels, SIBO remains an enigma.**
- ✓ **Data about SIBO after BS are scattered in the literature and mainly focused on RYGB.**
- ✓ **There is limited information about the role of SIBO in the increase in digestive symptoms, yet SIBO by itself might be a contributing factor, increasing vitamin deficiencies and affecting weight loss after BS.**

- ✓ **The main challenge is the lack of a scientifically validated diagnostic gold standard.**
- ✓ **Though there are many treatment options, few can claim being truly evidence-based.**
- ✓ **Thus, when confronted with a patient in whom SIBO is a concern, a provider is faced with a difficult choice: ordering an imperfect test or empirically recommending a course of treatment that offers marginal efficacy.**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THANKS