



## The SIBO 3-Hour Breath Test - #900, #901

### Providing a Convenient Assessment of Bacterial Overgrowth with a Simple Breath Test

#### What Is This Test For?

The Small Intestine Bacterial Overgrowth (SIBO) Breath Test provides valuable information in the diagnosis of small bowel overgrowth of bacteria, otherwise known as SIBO. Small Intestine Bacterial Overgrowth describes a condition in which bacteria from the large intestine have migrated to the small intestine. SIBO can also occur when bacteria native to the small intestine have simply overgrown. Using a breath test to diagnose SIBO is simple, non-invasive and inexpensive. A breath test - requiring a substrate challenge of either glucose or lactulose - specifies which gases are present, in addition to the location and severity of bacterial overgrowth.

The large intestine (colon) has a quantity and variety of bacteria different from those of the small intestine. The small intestine houses approximately 10,000 bacteria per milliliter of fluid, as compared to the large intestine which houses approximately one trillion bacteria per milliliter of fluid. The primary function of the colonic bacteria is the fermentation of non-digestible carbohydrates, resulting in the formation of short chain fatty acids which stimulate epithelial growth and differentiation in the colonic epithelium.

The primary functions of the small intestine are those of digestion and absorption of nutrients from our food. The bacteria in our small intestine aid in digestion and absorption, produce valuable nutrients, support gut immunity and protect us from other invading organisms. Through enzymes produced by the pancreas and along the brush border of the small intestine, carbohydrates are digested and their nutrients absorbed into general circulation. Bile from the liver and gall bladder digest fats and promote the peristaltic action of the small intestine (migrating motor complex) that moves food through to be further digested and absorbed along the length of the small intestine.

#### Why is SIBO a Problem?

The misplacement of normal colonic bacteria into the small intestine results in fermentation, rather than the normal digestion and absorption that are the primary functions of the small intestine. When carbohydrates ferment rather than digest, hydrogen and methane can be produced in measurable quantities. The process of fermentation rather than digestion creates a host of symptoms that can be difficult to treat effectively without diagnosing and addressing the root cause.

#### What Does This Test Measure?

**Hydrogen** – Bacteria produce hydrogen through the process of fermentation of unabsorbed carbohydrates. A small amount of hydrogen is normally produced from limited amounts of unabsorbed carbohydrate reaching the colon. However, large amounts of hydrogen may be produced if there is malabsorption of carbohydrates and/or bacterial overgrowth in the small intestine, allowing a larger amount of hydrogen to reach the colon. The

hydrogen produced by the bacteria is absorbed through the wall of the small and large intestines. The hydrogen-containing blood travels to the lungs, where the hydrogen is released and exhaled in the breath. Elevated hydrogen levels tend to be associated with IBS-D (diarrhea) and faster transit times.

**Methane** - About 15 percent to 30 percent of people have gut flora that contain *Methanobrevibacter smithii*, which converts four atoms of hydrogen into one molecule of methane. These subjects may not exhale much hydrogen in the breath test despite having SIBO or carbohydrate malabsorption, as excess hydrogen produced as a result of fermentation is converted into methane. Elevated methane levels tend to be associated with IBS-C (constipation) and slower transit times.

Both hydrogen and methane are produced by bacteria and are not a normal product of human metabolism. Too much hydrogen, methane or both is a positive test for bacterial overgrowth of the small intestine.

## How Is The Test Performed?

1. There is a 24-hour preparation phase before the test is performed.
2. In the first 12 hours, dietary restrictions must be followed. The patient must avoid all grains, fruit in all its forms, sugar in all its forms, dairy in all its forms, vegetables, nuts and seeds, alcohol and beans. Refer to the test kit instructions for permitted foods.
3. The last 12 hours is a fasting period. Only water can be consumed.
4. Included in the test kit is a packet of glucose or lactulose that is to be mixed with 4 ounces of water then set aside.
5. Collect a baseline breath sample before consuming the mixture.
6. After collecting the baseline breath sample, drink the mixture.
7. Twenty minutes after consuming the mixture, breath sample #2 is collected. Breath samples are collected every 20 minutes thereafter until all tubes are used.
8. Please refer to test kit instructions for more specifics on how to perform the collections and detailed instructions on medications, circumstances, underlying medical conditions, supplements, diet, etc. that may affect the results of the test.

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## Interpretation of the Results

### Three Potential Positive Test Results:

- A 20 ppm or greater increase of Hydrogen over the lowest previous value within 120 minutes = positive for SIBO.
- A 12 ppm or greater increase of Methane over the lowest previous value within 120 minutes = positive for SIBO.
- A 15 ppm or greater increase over the lowest previous value in the combined sum of Hydrogen and Methane within 120 minutes = positive for SIBO.

Breath samples are taken every 20 minutes after giving the lactulose solution. The measurements of hydrogen and methane in each breath sample are plotted along a graph and entered into a table comparing the values for each collection. Each measurement is compared to the baseline values of hydrogen and methane as well as the previous samples. If there is a 20 ppm or greater increase in hydrogen from the baseline or previous values within a 120-minute collection period, the test is positive. If there is a 12 ppm or greater increase in methane from the baseline

or previous values within a 120-minute collection period, the test is positive. If there is a 15 ppm or greater increase in the combined sum of hydrogen and methane over the baseline or previous values within a 120-minute collection period, the test is positive (1).

There can be variations in the test result that may come from poor test preparation. If an individual does not follow the dietary recommendations and starts out with a high baseline value on their breath test that decreases over time, it is likely due to the overconsumption of carbohydrate-rich foods too close to the testing period. The 24-hour test preparation phase will need to be carried out and the test repeated.

Test results that start out with a high baseline value that remains high throughout the duration of the test, but do not show an increase in value within the positive parameters previously described, are likely consistent for a positive diagnosis of SIBO.

An early rise in breath test gases may be due to a faster bowel transit time. A late rise in breath test gases may be due to a slower bowel transit time.

## Causes of SIBO

- Overuse of antibiotics
- Dysbiosis (imbalance of normal flora)
- Overgrowth of Candida
- Use of acid blockers
- Presence of H. pylori
- Constipation/Low motility in the small intestine
- Gallbladder Disease/Liver Dysfunction leading to decreased bile secretion
- Poor digestive enzyme production
- Excessive carbohydrates/sugar/fructose in diet
- Ileocecal Valve Dysfunction
- Parasitic infections

## Effects of SIBO on the Small Intestine and Beyond

- The overgrowth of bacteria in the small intestine interferes with our normal digestion, leading to malabsorption – particularly of B12 and iron.
- The bacterial overgrowth is also associated with damage to the lining of the small intestine, leading to Leaky Gut. Leaky Gut is associated with several disorders, including an increase in food sensitivities, joint pain and autoimmune diseases.
- The toxins associated with these bacteria (endotoxin) cause further inflammation and damage to the small



intestine, leading to the systemic absorption of these toxins. Endotoxin is known to trigger a chronic low level of inflammation resulting in body pain, joint pain, metabolic syndrome, fatty liver, chronic fatigue syndrome, fibromyalgia and vascular inflammation.

### Primary Symptoms of SIBO

- Abdominal bloating
- Belching
- Heartburn/Reflux
- Gas
- Abdominal pain/Cramping
- Constipation
- Diarrhea
- Irritable Bowel Syndrome symptoms
- Carbohydrate intolerance

### Secondary Symptoms of SIBO Related to Leaky Gut

- Increased food sensitivities
- Increased allergies
- Headache
- Fatigue
- Joint pain
- Autoimmune activity
- Asthma
- Chronic fatigue/Fibromyalgia
- Generalized inflammation
- Brain fog

For a complete list of disorders associated with SIBO, please go to [www.siboinfo.com](http://www.siboinfo.com)

### Signs of SIBO

- Malabsorption leading to nutrient deficiencies
- Iron Deficiency Anemia
- B12 deficiency
- Weight loss
- Steatorrhea (fatty stool)
- NASH (Non-Alcoholic Steatohepatitis)

## What to do if Breath Test Gases Are Elevated:

### Additional Testing

- Perform a Metabolic Assessment Profile #101 to evaluate protein digestion and determine the need for digestive enzymes and further evaluation with a GI Screen #401H. Low antioxidant status may be due to poor digestion and malabsorption due to chronic gut inflammation and reduction in digestive capacity. Elevated bile acids may be due to poor liver function and detoxification capacity due to chronic inflammation and fatty infiltration through an overabundance of gram-negative bacteria. Refer to the MAP interpretive guide for further recommendations in treating abnormal values.
- Perform a GI Screen #401H to evaluate for parasitic and specific bacterial infections, including H. pylori. The presence of H. pylori can impede the production of HCL in the stomach, reducing overall digestive capacity and thereby contributing to the development and worsening of SIBO. All infections should be treated appropriately.

### Treatment

Treatment for SIBO is designed to reduce the types of carbohydrates that promote bacterial overgrowth, reduce bacteria through antibacterial botanicals or specific antibiotics, support digestion and elimination, and restore mucosal integrity and a healthy microbiome.

- Diet – all of the diets listed below have the goal of reducing overall and specific carbohydrates that contribute to the development of and worsen SIBO.

- 1. Specific Carbohydrate Diet (SCD)** – avoidance of all carbohydrates that are classified by their chemical structure as disaccharides or oligosaccharides. The only carbohydrates that are allowed on the diet are monosaccharides, as they do not require enzymatic cleavage of the bonds that hold sugar molecules together. For further information and lists of allowable foods, please go to the SCD website. [www.breakingtheviciouscycle.info](http://www.breakingtheviciouscycle.info)
- 2. GAPS Diet** – based on the SCD program with further refinement to enhance a healthy microbiome. For more information, please visit the GAPS Diet website. [www.gapsdiet.com](http://www.gapsdiet.com)
- 3. FODMAP Diet** – an acronym referring to certain types of carbohydrates that are not digested well in those with IBS. This diet is free of fermentable oligosaccharides, disaccharides, monosaccharides and polyols. For more information, please visit [www.shepardworks.com](http://www.shepardworks.com)
- 4. SIBO Specific Diet** – this diet is a combination of the SCD and low FODMAP programs. It too works well overall

for individuals with SIBO, but can be very restrictive –  
[www.siboinfo.com](http://www.siboinfo.com) (2).

- **Digestive Enzymes** - broad spectrum enzyme product containing HCL acid, pancreatic enzymes and bile salts or ox bile extract, taken 10 to 15 minutes before meals. Digestive enzymes promote digestion, absorption and motility.
- **Supporting Motility and Elimination** – use of products to promote motility would include magnesium citrate, Triphala, rhubarb, aloe, etc. Gentle fiber products may be needed for those who have constipation along with SIBO.
- **Botanical Treatments** – antibacterial botanicals containing a combination of berberine, allicin, oregano oil, grapeseed extract, black walnut, etc.
- **Antibiotic Treatments** – Rifaximin is an antibiotic specific for IBS-D and SIBO. Other antibiotics are available and are used under specific circumstances.
- **Dealing with Biofilms** – various enzyme products taken between meals to permeate biofilms and allow for botanicals or antibiotics to work more effectively.
- **Probiotics** – various combinations of bacterial strains. Can be used once major symptoms of gas, bloating and motility issues have been resolved. Use of probiotics too soon may make symptoms worse. Initially avoid products containing prebiotics as they tend to make symptoms worse by feeding the bacteria that are already overgrown.
- **Restore Mucosal Barrier and Function** – products containing anti-inflammatory herbs, turmeric, L-glutamine, zinc carnosine, MSM, quercetin, etc. Implement this phase of treatment once bacterial load has been reduced, as determined by follow-up SIBO breath testing.

## Follow Up Testing

Follow up testing should be performed 4-6 weeks after implementing a SIBO diet and treatment program.

(1) <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3155069/> How to Interpret Hydrogen Breath Tests by Uday C. Goshal.

(2) Siebecker, A., ND. Retrieved April 25, 2016 from <http://www.siboinfo.com/>