

**Provider:** Healthcare Provider

**Patient:** Sample Name

**Clinic:** Clinic Name

**DOB:**

**Phone:** 604-123-4567

**Collection Date:** Date of collection

**Fax:** 604-123-6789

**Date Received:** Date received

**Substrate:** Lactulose

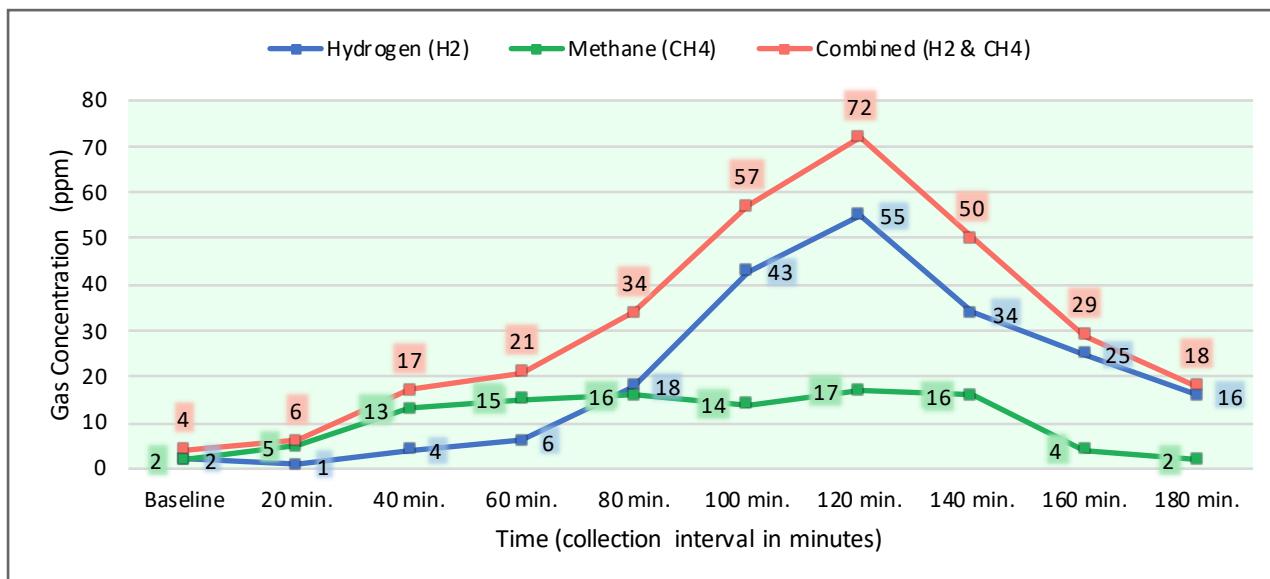
**Phone:** 604-123-1234

**Status:** Complete, no collection errors

**Report Date:** Report date

## Data

Hydrogen (H<sub>2</sub>) & Methane (CH<sub>4</sub>) Breath Sample Data



Sample	Interval	H2 (ppm)	CH4 (ppm)	H2 + CH4 (ppm)	CO2%**
B	Baseline	2	2	4	✓
1	20 min.	1	5	6	✓
2	40 min.	4	13	17	✓
3	60 min.	6	15	21	✓
4	80 min.	18	16	34	✓
5	100 min.	43	14	57	✓
6	120 min.	55	17	72	✓
7	140 min.	34	16	50	✓
8	160 min.	25	4	29	✓
9	180 min.	16	2	18	✓

\*\*CO2 is measured for quality assurance. ✓ indicates the CO2 level is acceptable. X indicates room air contamination of sample exceeded acceptable limits.

## Analysis

### Expected and Measured Gas Values from Breath Sample Data

Breath (gas) levels and analysis of increase	Result (ppm)	Status	Reference
Baseline Hydrogen (H <sub>2</sub> )	2	Expected	<20 ppm
Greatest H <sub>2</sub> increase over lowest preceding value within first 120 minutes	54	High	<20 ppm
Greatest CH <sub>4</sub> increase over lowest preceding value within first 120 minutes	15	High	<12 ppm (< 3 ppm*)
*Peak methane value at any point	17	High	<12 ppm (< 3 ppm*)
Greatest combined CH <sub>4</sub> and H <sub>2</sub> increase over lowest previous sum value within first 120 minutes	68	High	<15 ppm

## Interpretation

### SIBO Results: Hydrogen (H<sub>2</sub>), Methane (CH<sub>4</sub>), and Combined Gas Interpretation

SIBO Indication - Hydrogen	Increases of hydrogen greater than 20 ppm over the lowest preceding value within the first 120 minutes (+/- 5 min deviation) are indicative of bacterial overgrowth	<b>POSITIVE</b>
SIBO Indication - Methane	Increases of methane greater than 12 ppm (> 3 ppm*) over the lowest preceding value within the first 120 minutes (+/- 5 min deviation) are indicative of bacterial overgrowth	<b>POSITIVE</b>
SIBO Indication - Combined Hydrogen & Methane Gases	Increases in combined hydrogen and methane gas values greater than 15 ppm over the lowest preceding value within the first 120 minutes (+/- 5 min deviation) are indicative of bacterial overgrowth	<b>POSITIVE</b>

\* methane values  $\geq$  3 ppm at any point may indicate methanogen overgrowth—correlated to IBS constipation-type (IBS-C) and chronic constipation

## Important Information: Please Read

A diagnosis can only be made by a qualified medical professional that combines clinical information with the results of this breath analysis. SIBO Canada does not assess, diagnose, or treat individuals and provides this hydrogen (H<sub>2</sub>) and methane (CH<sub>4</sub>) breath analysis as a guideline only.

## Commentary

Information in this commentary is intended for the practitioner for educational purposes. None of the information contained in this report and commentary should be interpreted as diagnostic or directive of treatment.

### BREATH TESTING CONSIDERATIONS

SIBO Canada's breath test measures hydrogen (H<sub>2</sub>) and methane (CH<sub>4</sub>) gases produced by microbiota in the intestines after ingestion of lactulose by the fasting patient. Data and test results may be influenced by individual bowel transit time, poor compliance with the preparation diet, poor collection technique, medications, and health status.

Oro-cecal transit time (OCTT) is the duration it takes a substance to travel from the mouth to the junction between the small and large intestine. For lactulose (10 g) in a fasting individual, OCTT is approximately 90 minutes. Variation in transit times in humans is common and should be taken into consideration when interpreting breath testing. Laxatives, antidiarrheal medications, and other substances that may alter transit time may influence the outcome of these results. Chronic constipation, recurrent diarrhea, and other physiological conditions should also be considered.

Poor compliance with the test preparation diet is a common cause of inconclusive or falsely elevated test results. To preclude elevated breath levels of hydrogen and methane prior to ingestion of lactulose (at baseline), judicious patient preparation and sample collection are imperative. Gas levels may be falsely elevated if there is incomplete avoidance of high-fiber foods, residual fiber in the intestine due to delayed transit time, residual oropharyngeal (mouth and throat) bacteria, exposure to tobacco smoke, or napping during collection. If applicable, patients should discuss any of these factors with their clinician.

## Commentary

### LOW BREATH GASES

A breath test result with no CH<sub>4</sub> and low H<sub>2</sub> throughout the entire test may be due to an abundance of hydrogen sulfide (H<sub>2</sub>S)-producing bacteria, which compete for available hydrogen for production of the H<sub>2</sub>S gas.

### EVALUATION FOR HYDROGEN (H<sub>2</sub>)

In healthy humans, hydrogen gas is exclusively produced by intestinal bacteria—primarily a result of carbohydrate fermentation by anaerobic bacteria in the colon (large intestine). In SIBO, fermentation of the malabsorbed lactulose substrate by bacteria residing in the small intestine results in an increase of exhaled hydrogen (H<sub>2</sub>).

A rise of H<sub>2</sub> of  $\geq 20$  ppm over baseline or the lowest preceding value in the first 120 minutes of testing is positive for SIBO.

A rise of H<sub>2</sub> of  $\geq 20$  ppm over baseline in those samples collected after the 120 minutes may be positive for SIBO in patient with slower transit time or constipation.

An ELEVATED HYDROGEN BASELINE in patients who report strict adherence to fasting and dietary guidelines is not entirely understood. In a symptomatic patient, some clinicians consider an elevated hydrogen baseline a positive test.

Approximately 8 to 27% of individuals do not produce H<sub>2</sub> due to the presence of methanogenic microbiota which consume hydrogen molecules to produce methane gas. As a result, low H<sub>2</sub> findings through all time points in a symptomatic patient may reflect a false negative result. In this instance, clinical attention should be shifted to evaluation of methane (CH<sub>4</sub>).

### EVALUATION FOR METHANE (CH<sub>4</sub>)

Assessment of breath methane (CH<sub>4</sub>) concentration is controversial for SIBO assessment due to limited validation of diagnostic parameters such as timing and peak gas concentration. However, clinicians may find methane gas analysis helpful as CH<sub>4</sub> production is correlated with clinical conditions including irritable bowel syndrome (IBS), constipation, and obesity.

A peak methane level  $>12$  ppm at any point during collection is indicative of a methane-positive result

CH<sub>4</sub> values between 3 and 9 have been associated with methanogen overgrowth and certain clinical conditions. Clinical intervention may be indicated in the symptomatic patient with CH<sub>4</sub> levels  $\geq 3$  ppm at any point.

An ELEVATED METHANE BASELINE may occur more often than an elevated hydrogen baseline. This is attributed to the ability of methanogens to ferment in the absence of ingested carbohydrate substrate (e.g. lactulose).

Transit time may be slowed in the presence of methane gas. CH<sub>4</sub>-predominant bacterial overgrowth is five times more likely to occur in constipated individuals compared to cases of predominantly H<sub>2</sub> elevated results. The severity of constipation has been directly correlated to the level of CH<sub>4</sub> gas values.

### TOTAL OF COMBINED GASES — HYDROGEN (H<sub>2</sub>) AND METHANE (CH<sub>4</sub>)

A rise in combined hydrogen and methane gas values have historically been interpreted as a positive result for SIBO. In 2017, a consensus paper on breath testing in North America resulted offered no guidelines for a combined gas value. The combined values are provided for clinicians who find it clinically helpful.

### CARBON DIOXIDE (CO<sub>2</sub>)

Carbon Dioxide (CO<sub>2</sub>) is measured in every breath sample to control for collection error. Room air contamination of the sample typically results in CO<sub>2</sub> levels exceeding acceptable limits. The integrity of the sample is questionable if room air is suspected. If this occurs, it will be noted on the sample data.

### NOTES

References: Rezaie A, Buresi M, Lembo A, et al. Hydrogen and Methane-Based Breath Testing in Gastrointestinal Disorders: The North American Consensus. *Am J Gastroenterol*. 2017;112(5):775-784.  
doi:10.1038/ajg.2017.46