trio smart®
malabsorption test
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(855)888-1230

FINAL REPORT

gemelli biotech

Patient Information		Sample Information	
Lab Accession:	**zohotesting01**	Sample Type:	**Breath gas - Malabsorption**
First Name:	**Genaveve test**	Substrate:	**Fructose**
Last Name:	**Henson**	Collected:	**06/21/2023**
DOB:	**10/1/1998**	Received:	**06/22/2023**
Sex:	**Female**	Reported:	**08/15/2023**

Ordering Physician			
Account No:	**123456789**	Address:	**Test**
Physician Name:		City, State:	**New York, NY**
Practice Name:	**TrueMedIT Test Facility - 123456789**	ZIP, Country:	**10001, United States of America**

CO□QC Check	Pass

Gases	Expected	Observed	Normal/Abnormal
H□□	<35.00 ppm	38.00	Abnor□□
CH□□	<10.00 ppm	6.21	Normal
H□S□	<3.00 ppm	2.61	* See Interp□□ation Sec□□n

Methodology

The trio-smart malabsorption breath test is performed by measuring levels of H, □ogen (□) in the □reath of patients collected every 30 minutes after lactose, fructose or sucrose consump□□n. The □-smart □□sorption breath test follows the recommendations provided by the North American Consensus □ Hydroge□ased Bre□□ Testing in Gastrointestinal Disorders [1].

H□: The "Expected" threshold of H_2 is calculated by adding 20.0 □□ to the □aseline (first viable sample prior to substrate ingestion). A rise in H_2 levels of ≥20.00 ppm is supportive of malab□□p□□n for t□ □ubstrate ingested (lactose, fructose or sucrose).

In□□retati□

Indicative of Fructose Malabsorption,* Hy□□ Sulfide m□□e elevated. See the H2S notations in the About the Assay sectio□

*NOTE: Elevated hydrogen sulfide w□s detecte□ which while not relevant to carbohydrate malabsorption, can be indicative of bacterial overgrowth. □nce bacte□l overgrowth is not validated using this carbohydrate we strongly recommend using a lactulose or glu□ose based □eath test to rule out these conditions.

CAUTION: As the North American Co□□ensu□□dicates, it is very important to rule out SIBO and IMO before concluding malabsoriton for lac□□e, fructose an□or sucrose. This can be done by conducting a lactulose or glucose breath test. See the "About the As□□" section below □ further detail.

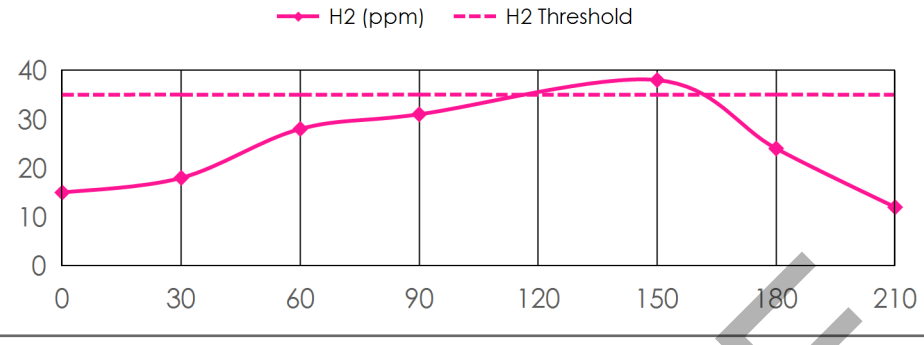
Results

Samples	T1	T2	T3	T4	T5	T6	T7	T8
Interval (min)	0	30	60	90	120	150	180	210
Gases								
H_2 (ppm)	15.00	18.00	28.00	31.00	IVR	38.00	24.00	12.00
CH_4(ppm)	4.00	4.35	4.65	6.21	IVR	5.23	4.52	3.58
H_2S (ppm)	1.50	1.67	2.15	2.61	IVR	1.88	1.82	1.51

eSignature: *Boaz Kurtis, MD*
Gemelli Biotech Laboratory Director
08/15/23 8:14:53 PM

Patient Name: Genaveve test Henson	Physician: Asif Physician	Lab Accession: zohotesting01

H_2 BREATH GAS ANALYSIS



About the Assay

The North American Consensus on Hydrogen and Methane-Based Breath Testing in Gastrointestinal Disorders[1] establishes common standards utilized by trio-smart.
According to the North American Consensus[1], a rise of ≥20.00 ppm of hydrogen (H_2) after ingestion of lactose, fructose or sucrose is suggestive of malabsorption for that carbohydrate.

RULING OUT SIBO AND IMO:
As the North American Consensus[1] indicates, it is very important to rule out SIBO and IMO before concluding malabsorption for lactose, fructose and/or sucrose because IMO can also cause elevated hydrogen following lactose, fructose or sucrose ingestion. A false positive for carbohydrate malabsorption can be ruled out by conducting a lactulose or glucose breath test as per Consensus Statement 6 in Table 3 of the North American Consensus on Hydrogen and Methane-Based Breath Testing in Gastrointestinal Disorders.

OTHER GASES MEASURED:
While not clinically significant to carbohydrate malabsorption, methane (CH_4) has been determined to be an important detectable gas in breath related to intestinal methanogen overgrowth. Methane is generally produced from conversion of H_2 to CH_4 by archaea (not bacteria). The North American Consensus[1] further defines abnormal methane as a level at any point during the breath test of ≥10.00 ppm after lactulose or glucose ingestion. Elevated levels of methane are associated with constipation and indicative of Intestinal Methanogenic Overgrowth (IMO).

While not clinically significant to carbohydrate malabsorption, a third fermented gas, hydrogen sulfide (H_2S), is produced by sulfate-reducing bacteria utilizing H_2 to produce H_2S. Clinical trials have noted that H_2S is associated with diarrhea in patients. In a 2021 study[4], it was found that healthy subjects had H_2S levels of <3.00 ppm. Levels of hydrogen sulfide ≥3.00 ppm are associated with diarrhea and indicative of excess hydrogen sulfide. Higher levels of hydrogen sulfide predict more severe diarrhea.

As data continue to accumulate around the increasing importance of H_2S and its relationship to symptoms such as diarrhea and abdominal pain, a 2022 study[5] demonstrated that in diarrheal IBS patients, $H_2S \geq 2.00$ ppm was notably distinguishable from patients with constipation IBS. This level was also associated with greater H_2S-producing bacteria in the gut. This correlation adds to the growing support for the importance of measuring H2S. For patients with a level ≥ 2.00 ppm, it is recommended to use good clinical judgment to determine the merit of treatment for this result. The trio-smart breath test will continue to adapt if and when the evidence supports further changes to the interpretation of the three gas breath test.

Patient Name: Genaveve test Henson	Physician: Asif Physician	Lab Accession: zohotesting01

References

1. Rezaie, A., Buresi, M., Lembo, A., et al. Hydrogen and Methane-Based Breath Testing in Gastrointestinal Disorders: The North American Consensus. The American Journal of Gastroenterology, 2017.
2. Pimentel, M., Saad, R., et al. ACG Clinical Guideline: Small Intestinal Bacterial Overgrowth. The American Journal of Gastroenterology, 2020.
3. Singer-Englar, T., Rezaie, A., Gupta, K., et al. Validation of a 4-Gas Device for Breath Testing in the Determination of Small Intestinal Bacterial Overgrowth. Gastroenterology, 2018.
4. Pimentel, M., Hosseini, A., Chang, C., et al. Exhaled Hydrogen Sulfide Is Increased in Patients With Diarrhea: Results of a Novel Collection and Breath Testing Device. AGA Abstracts, 2021.
5. Villanueva-Millan, M., Leite, G., Wang, J., et al. Methanogens and Hydrogen Sulfide-Producing Bacteria Guide Distinct Gut Microbe Profiles and Irritable Bowel Syndrome Subtypes.