



Hydrogen/Methane Breath Testing

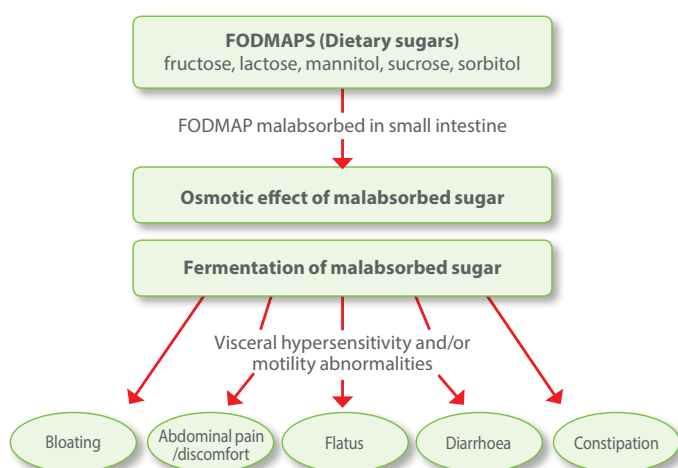
Advantages of the Hydrogen/Methane Breath Test

- IBS is a common and debilitating condition that markedly affects quality of life
- Symptoms of IBS are difficult to treat in the absence of an organic cause
- Luminal distension and visceral hypersensitivity are the basis of most functional gut symptoms in IBS
- Luminal distension caused by FODMAP malabsorption is a common trigger
- Breath tests are reliable, non-invasive tools for diagnosing FODMAP intolerance and small intestinal bacterial overgrowth
- FODMAP restriction guided by breath tests is an effective IBS treatment in the majority of patients

Functional gut disorders such as irritable bowel syndrome (IBS) are some of the most common complaints seen in primary medical care, and the most common causes for referral to a gastroenterologist. IBS affects over 20% of Australians.

Carbohydrate malabsorption and small intestinal bacterial overgrowth are leading causes of IBS symptoms. Rapidly fermented, short-chain carbohydrates such as lactose, fructose, sorbitol and sucrose (known as *FODMAPs* – fermentable oligo-, di- and mono-saccharides and polyols) are common trigger foods¹. FODMAPs are naturally occurring sugars found in milk and dairy products, fruit and vegetables, cereals and processed foods. These dietary sugars are poorly absorbed in the gut, and may result in gut symptoms in patients with IBS, as well as in some patients with inflammatory bowel disease and coeliac disease². Carbohydrate malabsorption in the small bowel results in an osmotic effect and gas production secondary to fermentation of the sugar in the colon by gut flora (*Figure 1*). In individuals with motility abnormalities and/or visceral hypersensitivity, this results in functional gut symptoms. Restricted intake of FODMAPS has been shown in controlled clinical trials to relieve symptoms of IBS in approximately 75% of sufferers^{3,4}.

Figure 1: Mechanism of functional gut symptoms related to FODMAP ingestion.



Who should be tested?

Hydrogen/methane breath testing is useful in the following clinical scenarios to assess FODMAP malabsorption and to guide dietary intervention.

- Symptoms of bloating, abdominal pain/discomfort, altered bowel habit or nausea
- Irritable bowel syndrome or other functional gut disorder
- Investigation of chronic diarrhoea in adults^{5,6}
- Organic gut disorders with suspected carbohydrate malabsorption² e.g. IBD, coeliac disease
- Suspected lactose intolerance or lactase deficiency e.g. positive family history
- Suspected small intestinal bacterial overgrowth (SIBO)

How does breath testing work?

- Fermentation of poorly absorbed carbohydrates in the gut results in the generation of hydrogen and methane which are detectable in expired air.
- As hydrogen and methane are only produced by intestinal anaerobic bacteria upon metabolism of malabsorbed carbohydrates, the test is highly specific.
- The test procedure involves breath sampling at defined intervals following oral administration of a sugar solution.
- Glucose and lactulose are tested for investigation of small intestinal bacterial overgrowth (SIBO). Glucose testing is superior for the detection of proximal SIBO, whereas lactulose testing is superior for the detection of distal SIBO. Testing for both sugars provides the highest diagnostic accuracy for SIBO diagnosis.
- Interpretation is facilitated by low baseline levels; patients are advised to follow a low FODMAP diet for 24 hours prior to testing, and fasting is required.
- Testing is simple, non-invasive and safe, even in pregnancy and in children and individuals with diabetes. Some patients may experience symptoms such as bloating, flatulence and diarrhoea during testing.
- Breath test kits are simple to use and available for testing at home.

Why should you order breath testing?

- Breath tests are highly specific and sensitive diagnostic tools.**
 - Accurate prediction of fructose and lactose malabsorption
 - Reliable and non-invasive alternative to other diagnostic modalities (e.g. biopsy for disaccharidase activity, blood tolerance tests, stool reducing substances and genetic testing)
- Breath tests should precede any dietary intervention.**
 - A low-FODMAP diet should not be instituted long-term without objective evidence of carbohydrate malabsorption due to the risk of adverse effects on colonic flora⁴
- There is high-level evidence for the efficacy of FODMAP restriction guided by breath tests³.**
 - Breath testing is a first line consideration in the diagnostic work up of IBS symptoms⁷
 - Breath tests guide subsequent dietary management, avoid unnecessary food restrictions, and provide prognostic information⁷
- Alternative approaches to dietary manipulation in IBS patients are poorly substantiated.**
 - Prevalence of food chemical sensitivity (e.g. salicylates, amines, benzoates, etc.) in IBS and other gut disorders is low (< 10%)⁸
 - Scarce evidence exists for the use of elimination diet and food chemical challenges in the management of IBS⁸

Interpretation of results

- A specific rise in breath hydrogen or methane (expressed in parts per million, ppm) above baseline provides an indication of sugar malabsorption.
- Results are reported semi-quantitatively indicating the presence or absence of sugar malabsorption, and the severity of the disorder. The glucose and lactulose results for SIBO are reported qualitatively.
- All patients with positive breath test results should be referred to a trained dietitian for instruction regarding a low FODMAP diet. The abnormalities on breath testing can be used to tailor specific dietary intervention, allowing the least restrictive diet possible².
- A four week dietary trial with reduced FODMAP intake is sufficient to improve symptoms in most patients.
- Up to 5% of individuals produce neither hydrogen nor methane, and are unsuitable for breath testing.

REFERENCES

- Barrett JS, Gibson PR. Fructose and lactose testing. Australian Family Physician 2012; 41: 293-296
- Barrett JS et al. Comparison of the prevalence of fructose and lactose malabsorption across chronic intestinal disorders. Aliment Pharmacol Ther. 2009;30:165-74
- Staudacher HM, Irving PM, Lomer MC, Whelan K. Mechanisms and efficacy of dietary FODMAP restriction in IBS. Nat Rev Gastroenterol Hepatol. 2014;11:256-66
- Halmos EP et al. Diets that differ in their FODMAP content alter the colonic luminal microenvironment. Gut. 2014. dx.doi.org/10.1136/gutjnl-2014-307264
- Thomas et al. Guidelines for the investigation of chronic diarrhoea, 2nd edition. Gut 2003;52 (Suppl V):v1-v15
- Fine KD, Schiller LR. AGA Technical Review on the Evaluation and Management of Chronic Diarrhea. Gastroenterology 1999;116:1464-1486.
- McKenzie YA, et al. British Dietetic Association evidence-based guidelines for the dietary management of irritable bowel syndrome in adults. J Hum Nutr Diet. 2012;25:260-74
- Barrett JS, Gibson PR. Fermentable oligosaccharides, disaccharides, monosaccharides and polyols (FODMAPs) and nonallergic food intolerance: FODMAPs or food chemicals? Therap Adv Gastroenterol. 2012;5:261-8

HOW TO ORDER

- Request "Hydrogen/methane breath test" – choose from the options below according to clinical need:

<input type="checkbox"/> Fructose	For fructose malabsorption, recommended in all IBS patients , especially those with symptoms related to fruit ingestion
<input type="checkbox"/> Lactose	For lactose malabsorption (lactase deficiency), recommended in all IBS patients , especially those with symptoms related to milk/dairy products
<input type="checkbox"/> Sorbitol	For suspected malabsorption of sorbitol, found in some fruits (e.g. stone fruits) and as a sweetener in sugar-free foods
<input type="checkbox"/> Sucrose	For suspected sucrose malabsorption (sucrase-isomaltase deficiency). Sucrose is found in processed foods, fruits and vegetables
<input type="checkbox"/> Mannitol	For suspected mannitol malabsorption, particularly in vegetarians. Mannitol is used as a sugar substitute and occurs naturally in some vegetables e.g. mushroom, cauliflower
<input type="checkbox"/> Glucose & Lactulose	Recommended for investigation of proximal and distal small intestinal bacterial overgrowth

- Each test takes up to 3 hours and must be performed on a separate day
- Breath testing will be subject to an out-of-pocket expense of \$105 per sugar
- Testing for SIBO with glucose and lactulose is subject to an out-of-pocket expense of \$210
- Further information is available at the following website: <http://www.gastrolab.com.au>

For any further enquiries regarding these tests, please contact:

Dr Devika Thomas, Head of Biochemistry or David Mitchell, Chief Scientist, Biochemistry or Jorge Tchongue, Gastrolab on (03) 9244 0444.