Breath Hydrogen & Methane

Indications
For small intestinal bacterial overgrowth and intestinal motility, or, using a different protocol, for lactose malabsorption.

Normally the human small intestine contains few bacteria as compared to the colon. Structural or functional disorders of the gastrointestinal tract can lead to bacterial overgrowth of the small intestine, where colonic bacteria proliferate in the ileum and jejenum. Small bowel bacterial overgrowth is characterized by steatorrhea (fat malabsorption), diarrhoea, vitamin deficiencies, and carbohydrate malabsorption, but is difficult to diagnose with accuracy. Bacteria in the small and large intestines can break down carbohydrates to produce hydrogen and methane. The sole source of these gases in alveolar air is bacterial fermentation of carbohydrate in the gut, so estimation of hydrogen and methane in breath samples can be used to derive conclusions about the passage of carbohydrates through the gut and the presence of pathogenic bacteria in the gastro-intestinal lumen.

Synonyms
Lactulose breath test for small intestinal dysbiosis, lactose breath test for lactase deficiency.

Patient preparation
No food and no alcohol for 12 hours prior to the test, with only water to drink. Avoid slowly digesting foods such as beans on the day before the test. Recent antibiotic therapy may interfere with the result.

Specimen requirements
Alveolar breath samples.

Test Protocol
For the lactulose breath test, the patient is given 10 gm of lactulose in 200 ml of water and alveolar air samples are collected every 20 minutes for 3 hours.

For the lactose breath test, the patient is given 25 gm of lactose in 200 ml of water and alveolar air samples are collected every 60 minutes for 4 hours. If the patient is a child, the dose of lactose should be reduced to 1gm per kg body weight.

Price: £95.00 for the lactulose breath test, £55.00 for the lactose breath test.

Methodology
Breath hydrogen and methane are measured by gas-liquid chromatography.

Turn around time
Same day; the test must be booked in advance.

P.T.O.

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Interpretation
Normally there is a peak in hydrogen production two hours after lactulose ingestion, reflecting the passage of this non-absorbable carbohydrate into the colon. With increased intestinal transit time, the appearance of the hydrogen peak may be delayed, as often occurs where there is significant methane production. In small intestinal bacterial dysbiosis there is also an earlier peak of hydrogen production, reflecting the breakdown of lactulose in the jejunum and ileum. Some subjects produce little or no hydrogen, but display a substantial output of methane, due to the particular metabolism of the species of bacteria proliferating in their gut.

A lactulose breath test for small intestinal bacterial overgrowth is positive if there is a biphasic pattern of breath hydrogen or methane production. Either the hydrogen or methane production in a positive test peaks by ≥10 ppm, compared to the basal sample, in the first 2 hours of the test, with a larger second increase in hydrogen or methane production later in the test.

The lactulose breath test can also detect impaired intestinal transit time; transit time can be *normal* if the physiological peak of colonic hydrogen production (≥10 ppm) is detected at 100 minutes, *slow* if the peak is detected later than 100 minutes, or *fast* if the peak is detected earlier than 100 minutes.

In subjects who do not absorb lactose (a disaccharide which is normally broken down into glucose and galactose and then absorbed) there is abnormally high production of hydrogen and perhaps methane as this carbohydrate passes into the lower gut.

A lactose breath test is positive if either the hydrogen peaks by ≥20 ppm compared to the basal sample or if the methane peaks by ≥12 ppm compared to the basal sample .

Key references

1. Drossman DA. The functional gastrointestinal disorders and the Rome III process. In: Drossman DA, Corazziari E, Delvaux M, Spiller R, Talley NJ, Thompson WG, et al., eds. Rome III: The Functional Gastrointestinal Disorders. 3rd ed. McLean, VA: Degnon Associates; 2006:1-30.
2. Drossman DA. The functional gastrointestinal disorders and the Rome III process. Gastroenterology. 2006;130:1377-90.

Suggested further reading

Environmental Medicine in Clinical Practice, H Anthony, S Birtwistle, K Eaton & J Maberly. British Society for Allergy, Environmental and Nutritional Medicine Publications, Southampton, UK (Tel: 01703-812124).