



Breath Testing Thresholds for Small Intestinal Bacterial Overgrowth Need a Standardised Reporting Format

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Article Info

Volume 1, Issue 1, 2026

doi: [10.62715/ijg.2026.v1.i1.pp26-30](https://doi.org/10.62715/ijg.2026.v1.i1.pp26-30)

Received: 29 October 2025

Accepted: 27 December 2025

Published: 06 March 2026

Abstract

Hydrogen and methane breath tests are the most widely used investigations for small intestinal bacterial overgrowth, and they are also among the least standardised tests in gastroenterology. Consensus documents from North America and Europe differ on the dose of glucose, on whether lactulose should be used at all, and on the rise in hydrogen that counts as a positive result. Laboratories commonly issue a report that states only positive or negative, without saying which substrate, dose and criterion were applied. The same set of breath values can therefore be reported as positive by one laboratory and negative by another, and neither the referring clinician nor a later reader can tell why. This commentary argues that agreement on a single threshold is unlikely in the near future, because the reference standard is itself disputed, and that a more achievable step is a minimum reporting format. The format proposed here has three parts: the conditions of the test, the raw timed measurements, and the interpretation with the criteria and their source named explicitly. Such a report would let results be reinterpreted when criteria change, compared between centres, and pooled in research. The proposal draws on existing guidance and on reporting standards for diagnostic accuracy studies, and it presents no new data.

Keywords: *Small intestinal bacterial overgrowth, Hydrogen breath test, Methane, Diagnostic thresholds, Reporting standards, Lactulose*

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1. Introduction

Small intestinal bacterial overgrowth is suspected far more often than it can be proved. The symptoms attributed to it, bloating, abdominal discomfort, diarrhoea and flatulence, are shared with irritable bowel syndrome and many other conditions. Culture of a small bowel aspirate, the traditional reference test, is invasive, prone to contamination and rarely performed outside research. Breath testing has filled the gap. It relies on the fact that hydrogen and methane in exhaled air come from microbial fermentation in the gut, so that an early rise after a carbohydrate load is taken to indicate fermentation in the small intestine (Rezaie et al., 2017).

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The test is cheap and safe, and its results influence the prescription of antibiotics. Yet the criteria by which it is read vary from one guideline, and one laboratory, to the next. This commentary does not attempt to settle which threshold is correct. Its argument is that the immediate problem is one of reporting, and that a standard format for the report would remove much of the confusion that different thresholds now cause.

2. Why Thresholds Disagree

Table 1 compares the two consensus statements most often cited. The North American Consensus recommends 75 g of glucose or 10 g of lactulose and defines a positive test for overgrowth as a rise in hydrogen of at least 20 parts per million above baseline within 90 minutes; a methane level of at least 10 parts per million at any time is reported as positive for methane (Rezaie *et al.*, 2017). The earlier Rome Consensus Conference favoured 50 g of glucose, read with a lower hydrogen threshold of about 12 parts per million, and advised against lactulose for this indication (Gasbarrini *et al.*, 2009). The American College of Gastroenterology guideline adopted the North American criteria and introduced the term intestinal methanogen overgrowth for the methane-positive state (Pimentel *et al.*, 2020). The European guideline on breath testing lays its emphasis on standardised conduct of the test and on recording symptoms during it (Hammer *et al.*, 2022).

Table 1: Principal differences between the North American and Rome consensus statements on breath testing for small intestinal bacterial overgrowth			
Element	North American Consensus (2017)	Rome Consensus (2009)	Consequence for the report
Glucose dose	75 g	50 g	Dose must be stated
Lactulose	10 g accepted	Not recommended for overgrowth	Substrate must be stated
Hydrogen criterion	Rise of 20 ppm or more by 90 minutes	Rise of about 12 ppm over baseline	Same curve may be read either way
Methane criterion	10 ppm or more at any time	No separate threshold set	Methane values should always be shown
Culture reference	1,000 or more organisms per mL	100,000 or more organisms per mL	Accuracy figures are not comparable

These differences are not arbitrary. They reflect a reference standard that is itself contested. The classical culture threshold was derived from patients with altered surgical anatomy, and the North American group proposed a lower count for aspirates from the proximal small bowel. A systematic review found that no breath test had been validated against a satisfactory gold standard (Khoshini *et al.*, 2008), and a later meta-analysis reported only moderate sensitivity for both glucose and lactulose tests (Losurdo *et al.*, 2020). Direct comparison of duodenal aspiration with the glucose breath test showed imperfect agreement (Erdogan *et al.*, 2015). With no fixed point to calibrate against, a single agreed threshold is not in prospect.

3. What a Threshold Cannot Capture

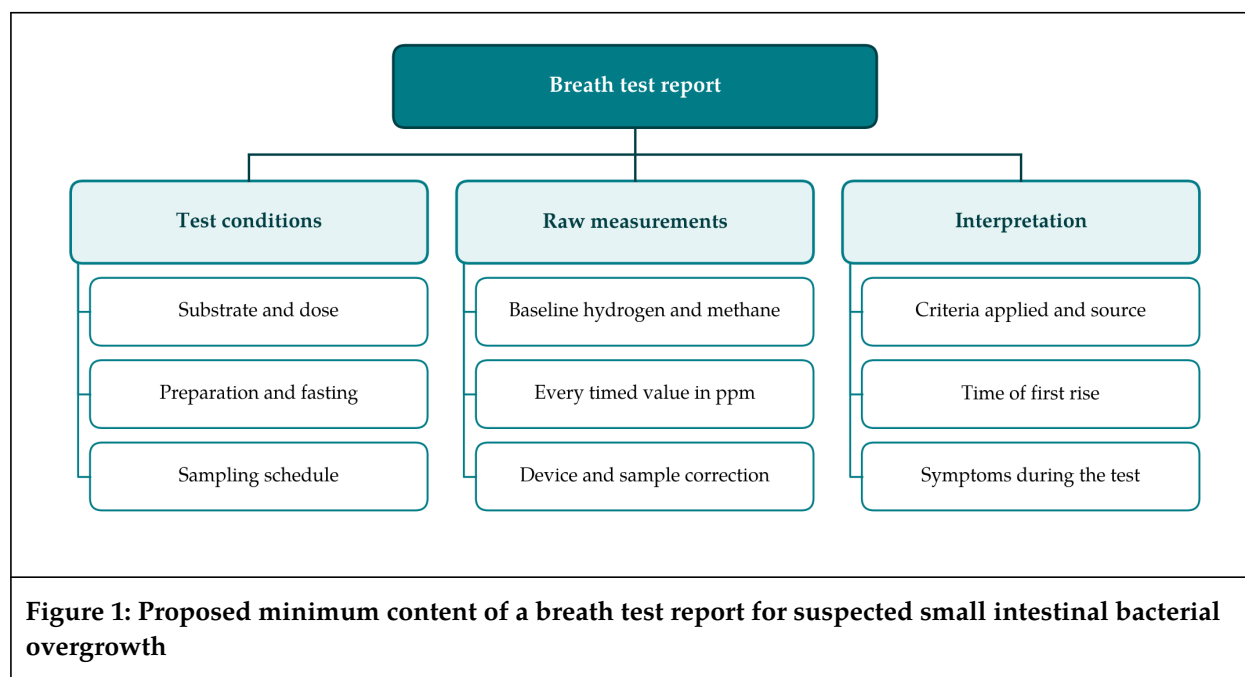
Even an agreed number would leave a second problem. A rise in breath hydrogen shows that the substrate has met fermenting organisms, not where. Lactulose is not absorbed and always reaches the colon; when transit is fast, colonic fermentation can begin within the 90-minute window. Yu *et al.* (2011) combined scintigraphy with lactulose breath testing in patients with irritable bowel syndrome and found that the hydrogen rise usually coincided with arrival of the test meal in the caecum. Glucose is absorbed proximally and is less affected, but it may miss distal overgrowth and can give a false positive result after gastric surgery or with rapid transit (Massey and Wald, 2021). Methane adds a further complication, since it is produced by archaea, is associated with slower transit and constipation (Pimentel *et al.*, 2006),

and is often raised at baseline. A report reduced to one word hides all of this. The time at which the rise occurred, the shape of the curve and the baseline values are exactly what a clinician needs in order to judge how much weight the result will bear.

Conduct of the test matters as much as the cut-off. The North American Consensus asks that antibiotics be avoided for four weeks and promotility drugs and laxatives for at least one week before testing, that fermentable foods be avoided on the preceding day, and that the person tested fast for eight to twelve hours and refrain from smoking and vigorous exercise around the test ([Rezaie et al., 2017](#)). A high baseline hydrogen often signals that preparation was incomplete. Departures from these instructions shift the curve, and a reader who is not told about them cannot allow for them. The sampling interval has a similar effect: a rise that would be caught with samples every fifteen minutes may fall between samples taken every thirty.

4. A Minimum Reporting Format

The proposal is modest. Every breath test report should contain three groups of information, set out in Figure 1. The first is the conditions of the test: the substrate and its dose, the preparation instructions issued, including the period free of antibiotics and the diet and fast beforehand, and the sampling schedule. The second is the raw data: baseline hydrogen and methane, every timed value in parts per million, the device used, and whether values were corrected for sample quality, for instance by reference to carbon dioxide.



The third group is the interpretation. It should name the criteria applied and the document they come from, give the time of the first qualifying rise, state hydrogen and methane conclusions separately, and record symptoms during the test, as the European guideline recommends ([Hammer et al., 2022](#)). A positive or negative label may still head the report, but it would be accompanied by the means to check it.

The model is the reporting guideline for diagnostic accuracy studies, STARD, which improved the literature by asking authors to state what was done without telling them what to do ([Bossuyt et al., 2015](#)). A reporting format for breath tests has the same character. It does not require laboratories to change their protocol or professional societies to resolve their differences first.

5. Implications

A standard report would have three practical effects. A clinician could reinterpret a result under a different set of criteria, or after a guideline is revised, without repeating the test. Results from different

centres could be compared when a patient moves between them. And researchers could pool raw curves, which is the only realistic route to testing alternative thresholds against clinical outcomes such as response to treatment. The expert review of the American Gastroenterological Association notes how weak the present evidence base is on precisely this point (Quigley et al., 2020).

Adoption would cost little. Modern analysers already store timed values, and most laboratory information systems can print a table and a curve. The main work lies in agreeing on the list of items and in persuading laboratories that a report of several lines is worth more than one word. Referrers have a part to play as well, since a request that states the clinical question, any previous abdominal surgery and current medication allows the interpretation to be written with those facts in view.

There are limits to what reporting can achieve. It does not make an inaccurate test accurate, and it does not solve the transit problem. The content proposed here is an outline that has not been tested with laboratories or referrers, and the exact items would need to be agreed through a formal consensus process involving both. Newer analysers that also measure hydrogen sulfide will add items to the list.

6. Conclusion

Disagreement over breath test thresholds for small intestinal bacterial overgrowth stems from an uncertain reference standard and will not be resolved quickly. Its practical harm can be reduced now if every report states the test conditions, shows the raw timed values and names the criteria used. Professional societies that have not been able to agree on a number may find it easier to agree on a format.

Conflict of interest

To be declared by the author(s) before publication.

Funding

To be declared by the author(s) before publication.

References

- Bossuyt, P.M., Reitsma, J.B., Bruns, D.E., Gatsonis, C.A., Glasziou, P.P., Irwig, L., et al. (2015). [STARD 2015: An updated list of essential items for reporting diagnostic accuracy studies](#). *BMJ*, 351: h5527. <https://doi.org/10.1136/bmj.h5527>
- Erdogan, A., Rao, S.S.C., Gulley, D., Jacobs, C., Lee, Y.Y. and Badger, C. (2015). [Small intestinal bacterial overgrowth: Duodenal aspiration vs glucose breath test](#). *Neurogastroenterology & Motility*, 27(4): 481-489.
- Gasbarrini, A., Corazza, G.R., Gasbarrini, G., Montalto, M., Di Stefano, M., Basilisco, G., et al. (2009). [Methodology and indications of H2-breath testing in gastrointestinal diseases: The Rome Consensus Conference](#). *Alimentary Pharmacology & Therapeutics*, 29(Suppl. 1): 1-49.
- Hammer, H.F., Fox, M.R., Keller, J., Salvatore, S., Basilisco, G., Hammer, J., et al. (2022). [European guideline on indications, performance, and clinical impact of hydrogen and methane breath tests in adult and pediatric patients: European Association for Gastroenterology, Endoscopy and Nutrition, European Society of Neurogastroenterology and Motility, and European Society for Paediatric Gastroenterology Hepatology and Nutrition consensus](#). *United European Gastroenterology Journal*, 10(1): 15-40. <https://doi.org/10.1002/ueg2.12133>
- Khoshini, R., Dai, S.-C., Lezcano, S. and Pimentel, M. (2008). [A systematic review of diagnostic tests for small intestinal bacterial overgrowth](#). *Digestive Diseases and Sciences*, 53(6): 1443-1454. <https://doi.org/10.1007/s10620-007-0065-1>
- Losurdo, G., Leandro, G., Ierardi, E., Perri, F., Barone, M., Principi, M. and Di Leo, A. (2020). [Breath tests for the non-invasive diagnosis of small intestinal bacterial overgrowth: A systematic review with meta-analysis](#). *Journal of Neurogastroenterology and Motility*, 26(1): 16-28.

- Massey, B.T. and Wald, A. (2021). [Small intestinal bacterial overgrowth syndrome: A guide for the appropriate use of breath testing.](#) *Digestive Diseases and Sciences*, 66(2): 338-347.
- Pimentel, M., Lin, H.C., Enayati, P., van den Burg, B., Lee, H.-R., Chen, J.H., Park, S., Kong, Y. and Conklin, J. (2006). [Methane, a gas produced by enteric bacteria, slows intestinal transit and augments small intestinal contractile activity.](#) *American Journal of Physiology - Gastrointestinal and Liver Physiology*, 290(6): G1089-G1095. <https://doi.org/10.1152/ajpgi.00574.2004>
- Pimentel, M., Saad, R.J., Long, M.D. and Rao, S.S.C. (2020). [ACG clinical guideline: Small intestinal bacterial overgrowth.](#) *American Journal of Gastroenterology*, 115(2): 165-178. <https://doi.org/10.14309/ajg.0000000000000501>
- Quigley, E.M.M., Murray, J.A. and Pimentel, M. (2020). [AGA clinical practice update on small intestinal bacterial overgrowth: Expert review.](#) *Gastroenterology*, 159(4): 1526-1532. <https://doi.org/10.1053/j.gastro.2020.06.090>
- Rezaie, A., Buresi, M., Lembo, A., Lin, H., McCallum, R., Rao, S., Schmulson, M., Valdovinos, M., Zakko, S. and Pimentel, M. (2017). [Hydrogen and methane-based breath testing in gastrointestinal disorders: The North American Consensus.](#) *American Journal of Gastroenterology*, 112(5): 775-784. <https://doi.org/10.1038/ajg.2017.46>
- Yu, D., Cheeseman, F. and Vanner, S. (2011). [Combined oro-caecal scintigraphy and lactulose hydrogen breath testing demonstrate that breath testing detects oro-caecal transit, not small intestinal bacterial overgrowth in patients with IBS.](#) *Gut*, 60(3): 334-340. <https://doi.org/10.1136/gut.2009.205476>