

## LETTER TO THE EDITOR

### Small Intestinal Bacterial Overgrowth H<sub>2</sub>/CH<sub>4</sub> Breath Testing

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Small intestinal bacterial overgrowth (SIBO) is a condition characterized by excessive colonization of the small intestine, particularly with bacteria from the colon microbiota. In many affected individuals, this abnormal presence of bacteria leads to a disruption of normal small intestine function, which can result in various gastrointestinal symptoms such as abdominal pain, bloating, diarrhea or constipation, and even non-specific extraintestinal symptoms. Many people suffer from these symptoms for years because diagnosing SIBO is challenging, as is differentiating it from other gastrointestinal symptoms (e.g., food intolerances, irritable bowel syndrome, etc.).

Duodenal aspirate is proposed as the gold standard method for diagnosing SIBO with the presence of more than 10<sup>3</sup> colony-forming units (CFUs)/mL indicating bacterial overgrowth in the intestine [1]. However, this is a time-consuming, expensive, and invasive technique for the patient and not generally established or standardized. Moreover, this procedure is also limited due to the difficulty of obtaining a sufficient aspirate sample without gastric or oropharyngeal cross-contamination [2,3]. For these reasons, laboratory hydrogen (H<sub>2</sub>) breath tests with glucose and lactulose have become widely accepted in clinical routine. Modern breath test devices can also detect methane (CH<sub>4</sub>), which can be produced by archaea in the small intestine and colon. Archaea are prokaryotes, but they form a third inde-

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pendent domain separate from bacteria. Since the term “bacterial overgrowth” is misleading in this context, the term “intestinal methanogenic overgrowth (IMO)” is used [4]. Individuals with CH<sub>4</sub>-positive IMO may have increased prevalence of abdominal bloating and abdominal distension with constipation and not diarrhea, unlike H<sub>2</sub>-positive SIBO [4].

Regarding diagnostic criteria and interpretation of H<sub>2</sub>/CH<sub>4</sub> breath testing results, it is recommended that an H<sub>2</sub>-increase of  $\geq 20$  ppm from the baseline H<sub>2</sub> level during the first 90 minutes should be considered indicative for SIBO [1,3]. Additionally, a CH<sub>4</sub>  $\geq 10$  ppm at any measuring point during the CH<sub>4</sub> breath test should be considered positive as intestinal methanogen overgrowth (IMO), since these individuals show a tendency to have increased CH<sub>4</sub> levels right from the beginning of the breath test [1,3]. The European Guideline [5] recommends performing the H<sub>2</sub>/CH<sub>4</sub> breath test with 50 g glucose diluted in 250 mL water for SIBO diagnosis. A single “early” H<sub>2</sub> increase of  $\geq 10 - 12$  ppm or an absolute measured CH<sub>4</sub> value of  $\geq 10$  ppm is considered indicative for SIBO [4-6]. In comparison, the American College of Gastroenterology (ACG) Clinical Guideline [7] suggests performing a 75 g glucose H<sub>2</sub>/CH<sub>4</sub> breath test with an H<sub>2</sub>-increase of  $\geq 20$  ppm from baseline within the first 90 minutes to be indicative for SIBO or an elevated CH<sub>4</sub>  $\geq 10$  ppm at any measuring point during the test to be diagnostic of IMO.

Multifactorial influencing factors may cause false-positive or false-negative breath test results: contamination by oral flora, smoking, medications (e.g., antibiotics), condition after intestinal lavage, rapid orocecal transit, constipation, inadequate breath sample, colonization with non-H<sub>2</sub>-producing bacteria, history of gastrointestinal surgery and/or an altered anatomy [2]. Therefore, before H<sub>2</sub>/CH<sub>4</sub> breath testing patients have to avoid antibiotics for four and laxatives and promotility agents for at least one week before testing [7]. Moreover, breath tests should be performed after a 12-hour fasting state and fermentable foods (e.g., complex carbohydrates) should be avoided one day before the breath test. During the test, smoking and excessive exercise also may be confounding factors [7]. When considering the utilization and interpretation of H<sub>2</sub>/CH<sub>4</sub> breath tests diagnosing SIBO/IMO, many confounding factors which contribute to gas dynamics in the gastrointestinal tract must be taken into account. Otherwise, all these limitations lead to suboptimal sensitivity and specificity [8]. Subsequently, therapeutic options may be incorrectly derived based on an incorrect laboratory diagnosis.

A standardized procedure of implementation, performance and interpretation of H<sub>2</sub>/CH<sub>4</sub> breath tests, especially in the diagnosis of “SIBO/IMO”, is still lacking in hospitals. Variations across professional guidelines exist. Hence, harmonized guidelines on this topic with the development of a new diagnostic gold standard, e.g., based on sequencing or metabolomics, are recommended.

### Declaration of Interest:

The authors declare that they have no conflicts of interest.

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