Abstract

Data from Rezaie et al. were extracted from the American College of Gastroenterology 2015 meeting. Air collection techniques are known to influence the results of breath tests for hydrogen and methane. We examined the Commonwealth Laboratories (Salem, MA) nationwide database of consecutive multiple sample breath tests performed for Small Intestinal Bacterial Overgrowth (SIBO) from October 2014 to September 2015. De Rezaie et al. (Los Angeles Sample) identified patients based on the 10 sample lactulose breath test for SIBO in the overall sample. Put differently, of those who test positive, 15.7% are also methane positive, and of those who test methane positive, 27% are also hydrogen positive. Not shown in this figure: the use of a correction factor (6% CO2 as numerator) led to reclassifications Methane-High to Methane-Low in 0.7% and Methane-Low to Methane-High in 2.1%.

Figure 2 (left): These graphs compare how sensitivity and specificity correlate with increasing cut-off values from 3 ppm to 10 ppm. The Los Angeles Sample is in dark blue, the US Sample is in light blue. Our data are similar to the single institution results of Rezaie et al. In our US Sample, employing the Commonwealth methodology, the optimal cut-off to maximize sensitivity and specificity was 24 ppm CH4 (94.5% and 99.5%), which is within a minimal difference to the previously proposed 25 ppm cut-off. The sensitivities of both studies follow a parallel course, decreasing with increasing cut-off values. Our US Sample shows the expected reversed course for specificity, i.e., increasing specificity with higher cut-off values, while the curve from the Los Angeles Sample is relatively flat, with higher reported specificities along the spectrum of examined cut-off values.

Figure 3 (above): X-axis = sample number, y-axis = ppm methane. This graph shows the time course of the average hydrogen production (blue) and methane production (red) in subjects who were either high or low methane producers based on the reference standard (North American Consensus) (mean ± Standard Error) over 10 samples spaced 20 minutes apart (from 1 to 10). Note that the hydrogen measurements of hydrogen positive subjects that are also methane positive are significantly (p = 0.05) lower than the methane measurements for the subjects who are hydrogen positive but methane negative.

From top to bottom: Solid blue line: Mean methane values for high-methane emitters. Dashed red line: Mean hydrogen values for low-methane emitters. Solid red line: Mean hydrogen values for high-methane emitters. Blue dashed line: Mean methane values for low-methane emitters. Error bar mean ± Standard Error.

Methods

We identified 11,675 consecutive unique subjects who underwent breath testing for SIBO with lactulose as substrate by Commonwealth Laboratories from all 50 states (US Sample). We also examined our database for the influence of a single institution results of Rezaie et al. (Los Angeles Sample) (9). Our test relies on a different breath collection technique, but is generally comparable to the methodology employed by Rezaie et al. In contrast to the study by Rezaie et al., our samples were sent to a central laboratory for analysis from numerous sites from all 50 states (US Sample). We also examined our database for the influence of a widely-used correction factor that ties to correct for sample contamination with room air.

Results

A cut-off value for methane at baseline of either 3 ppm, as our US sample, or 25 ppm, as described in the Los Angeles Sample, are both highly accurate in identifying subjects at baseline that would have been diagnosed as ‘methane-positive’ in a lactulose breath test for SIBO. The use of a carbon dioxide correction factor led to few recategorisations, but both raw and corrected data should be reported in research studies.

• A spot methane breath test performed after an overnight fast sensitively and specifically identifies high methane emitters: with a 90 minute interval until 10 samples have been obtained. Frequent sampling is required to catch a rise of hydrogen emissions, which typically occurs at later time points during the test as the substrate is metabolized by bacteria. In contrast, breath methane levels are typically elevated at baseline and are less prone to variability. In our US Sample, employing the Commonwealth methodology, the optimal cut-off to maximize sensitivity and specificity was 24 ppm CH4 (94.5% and 99.5%), which is within a minimal difference to the previously proposed 25 ppm cut-off. The sensitivities of both studies follow a parallel course, decreasing with increasing cut-off values. Our US Sample shows the expected reversed course for specificity, i.e., increasing specificity with higher cut-off values, while the curve from the Los Angeles Sample is relatively flat, with higher reported specificities along the spectrum of examined cut-off values.

Conclusions

• A cut-off value of 25 ppm for hydrogen and methane (based on the 10 sample lactulose breath test for SIBO) in the overall sample. Put differently, of those who test positive, 15.7% are also methane positive, and of those who test methane positive, 27% are also hydrogen positive. Not shown in this figure: the use of a correction factor (6% CO2 as numerator) led to reclassifications Methane-High to Methane-Low in 0.7% and Methane-Low to Methane-High in 2.1%.

• Breath methane levels are typically elevated at baseline and are less prone to variability. In our US Sample, employing the Commonwealth methodology, the optimal cut-off to maximize sensitivity and specificity was 24 ppm CH4 (94.5% and 99.5%), which is within a minimal difference to the previously proposed 25 ppm cut-off. The sensitivities of both studies follow a parallel course, decreasing with increasing cut-off values. Our US Sample shows the expected reversed course for specificity, i.e., increasing specificity with higher cut-off values, while the curve from the Los Angeles Sample is relatively flat, with higher reported specificities along the spectrum of examined cut-off values.

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References