Initial paradoxical peaks on breath testing (first sample high) do not affect the diagnostic utility of the spot-methane breath test

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BACKGROUND

It has recently been shown by us and others (1,2) that a single sample methane (CH\textsubscript{4}) breath test (without substrate) can substitute for the traditional 10-sample lactulose breath test when only CH\textsubscript{4} is of interest. Sensitivities and specificities compared with the 10-sample LBT were around 95% for a cut-off of 5 ppm to separate high from low CH\textsubscript{4} emitters. There are no data about the impact of a little known but well documented paradox: the initial peak or first sample high (FSH). An initial peak was originally described by several authors as inexplicable small H\textsubscript{2} increments, recognizable within 30 min of substrate ingestion, that wear off to baseline within 90 min. Rumessen (1987) observed FSH in 25% of patients, an experience consistent with other investigators at the time, and advised that they may be ‘neglected’ (3).

Many explanations for the initial peak have been advanced, none of them fully satisfactory. The leading hypothesis is that oral microorganisms could produce H\textsubscript{2}. This could happen at baseline ("first sample high") or following substrate administration ("early peak"). Indeed, studies with 0.20 % chlorhexidine solution showed an amelioration of this phenomenon and the use of a mouthwash prior to breath testing has become part of standard practice (4).

AIMS

Previous authors suggested that the initial hydrogen peak could be neglected. If, however, only one sample is taken (spot-methane breath test), the possible impact of this phenomenon needs to be clarified and the following established:
1) Does the FSH also occur with methane?
2) If so, how does this affect its diagnostic utility of the spot-methane breath test?

METHODS

We analyzed 10-sample lactulose breath test (LBT) data from 11,874 consecutive subjects who had samples sent to Commonwealth Laboratories (Salem, MA) over a 1-year period. The first sample was obtained prior to ingestion of lactulose, and then measurements were repeated every 20 minutes post-lactulose. We defined FSH (first sample high) as any first sample result (H\textsubscript{2} or CH\textsubscript{4}) that was higher than the results of any of the following four samples. The reclassification frequency for CH\textsubscript{4} using the North American consensus criteria (any CH\textsubscript{4} ≥10 ppm positive) was calculated by evaluating how the classification would change if the first sample results were ignored. The same sensitivity analysis is more problematic for H\textsubscript{2} because – by definition – a rise of ≥ 20 ppm H\textsubscript{2} over baseline is built into the definition, and presumably, this includes a baseline regardless of the effect of FSH. The analyses were conducted with and without a correction factor applied. The CF is determined as follows: A CO\textsubscript{2} concentration reflecting ideal collection conditions (by convention set at 5 %) is divided by the measured CO\textsubscript{2} concentration, and measured H\textsubscript{2} and CH\textsubscript{4} concentrations are then adjusted by multiplication by the CF, overwhelmingly upwards (5).

RESULTS

• A first-sample high for CH\textsubscript{4} was observed in 12.9 % of cases but would have a small impact on the classification results (5.8 % reclassification).
• The FSH has traditionally been explained biologically and may not be an artefact. However, our findings suggest that instrumentation and workflow cannot be ruled out as causative or contributory. This should be further investigated.
• The data from this study give additional support to the clinical validity and usefulness of a spot (single sample) breath methane test.

REFERENCES