

Establishing Normal Values For Gastrointestinal Hydrogen Sulphide Production in Breath Using Selected-Ion Flow-Tube Mass Spectrometry (SIFT-MS)

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INTRODUCTION

- Hydrogen and methane breath testing (HMBT) is well established for the diagnosis of SIBO, IMO and CM
- Microbial fermentation also produces hydrogen sulphide (H₂S) which is associated with diarrhoea and inflammation in IBD and IBS.
- Current techniques can measure H₂S in the parts per million range which may not be sensitive to detect pathological changes.
- Using SIFT-MS we can detect parts per billion range to establish normal values.

METHODS

- 25 healthy volunteers completed a 3hr lactulose breath test.
- H₂S samples were taken at baseline (0mins) and 45,90 and 180-minutes post lactulose ingestion.
- H₂S sample collection was with 500ml polyvinylidene fluoride bags (PVDF) and analysed using SIFT-MS.
- The breath samples repeated after 28 days of iron supplementation.

RESULTS

- Prior stability testing of H₂S in PVDF bags showed that samples are stable for up to 8 days.
- H₂S samples pre-iron supplementation demonstrated levels in the parts per billion range (mean H₂S = 20±5 ppb) at baseline (**Figure 1**).
- There was no significant change in H₂S after lactulose ingestion (p=0.62).
- 28 days of iron supplementation caused a significant decrease in baseline H₂S (p=0.027) (**Figure 2**).
- Hydrogen and methane breath samples were taken to confirm intestinal fermentation of the lactulose (**Figure 3**).

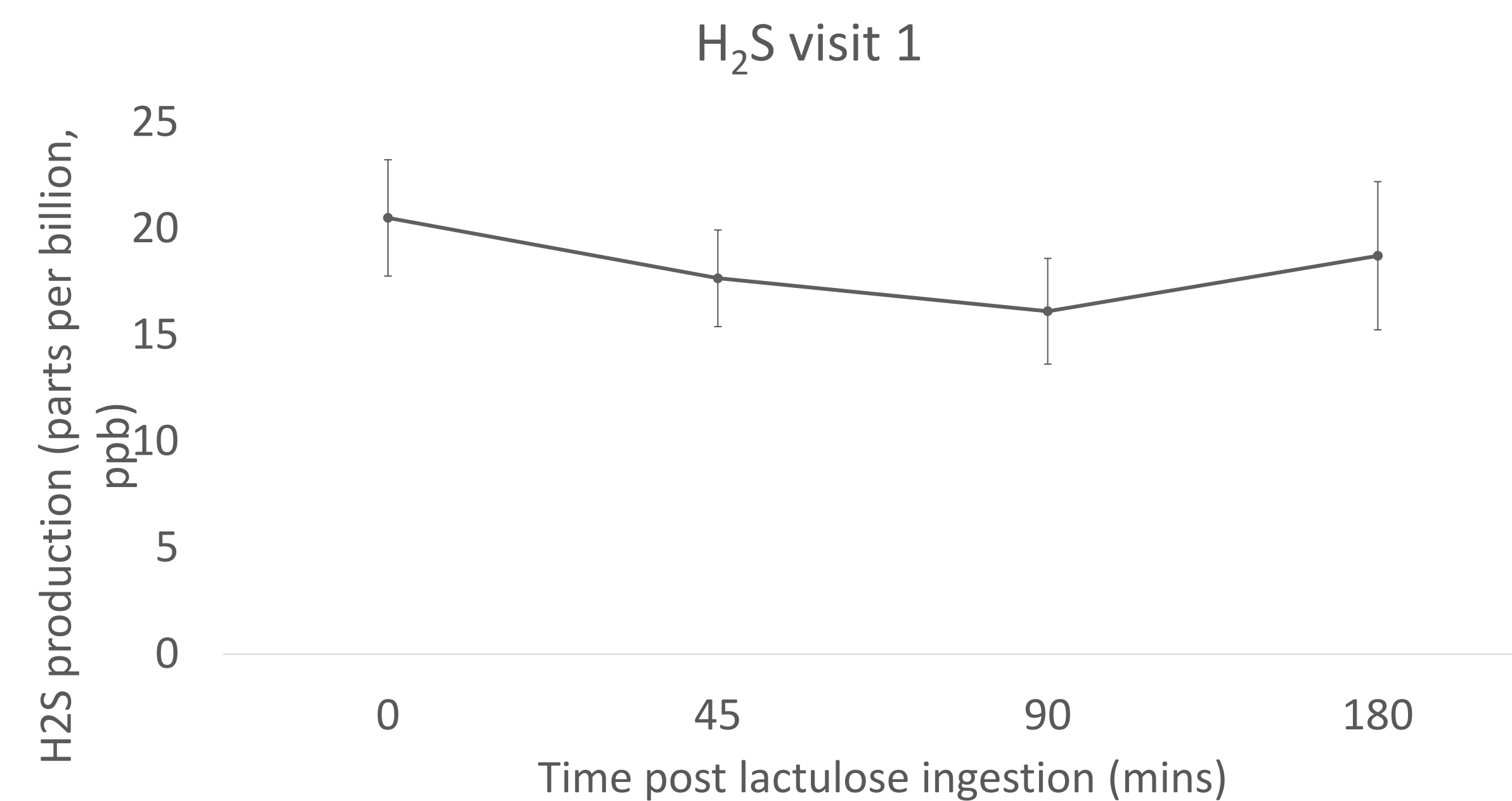


Figure 1: Hydrogen sulphide values pre-iron supplementation in healthy volunteers

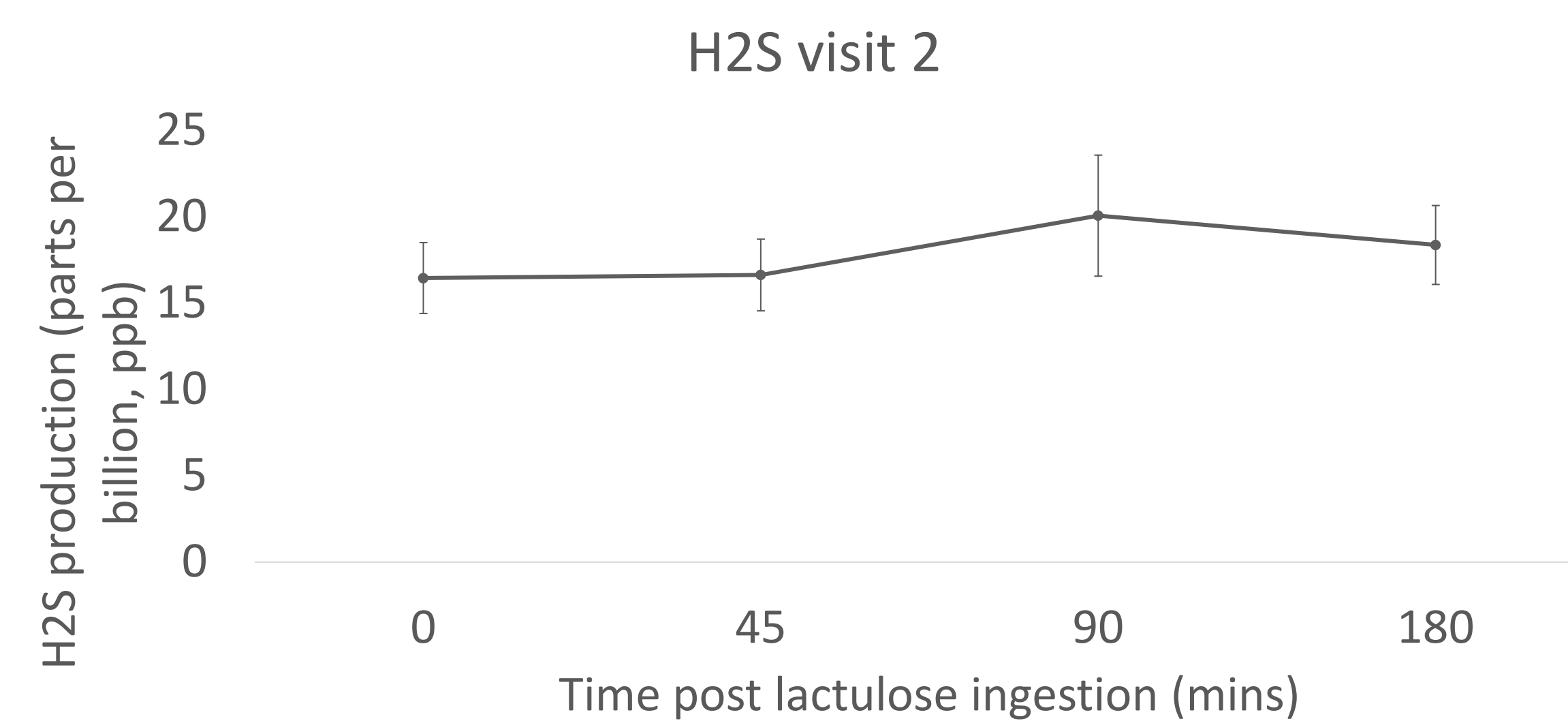


Figure 2: Decrease in Hydrogen sulphide values post-iron supplementation in healthy volunteers

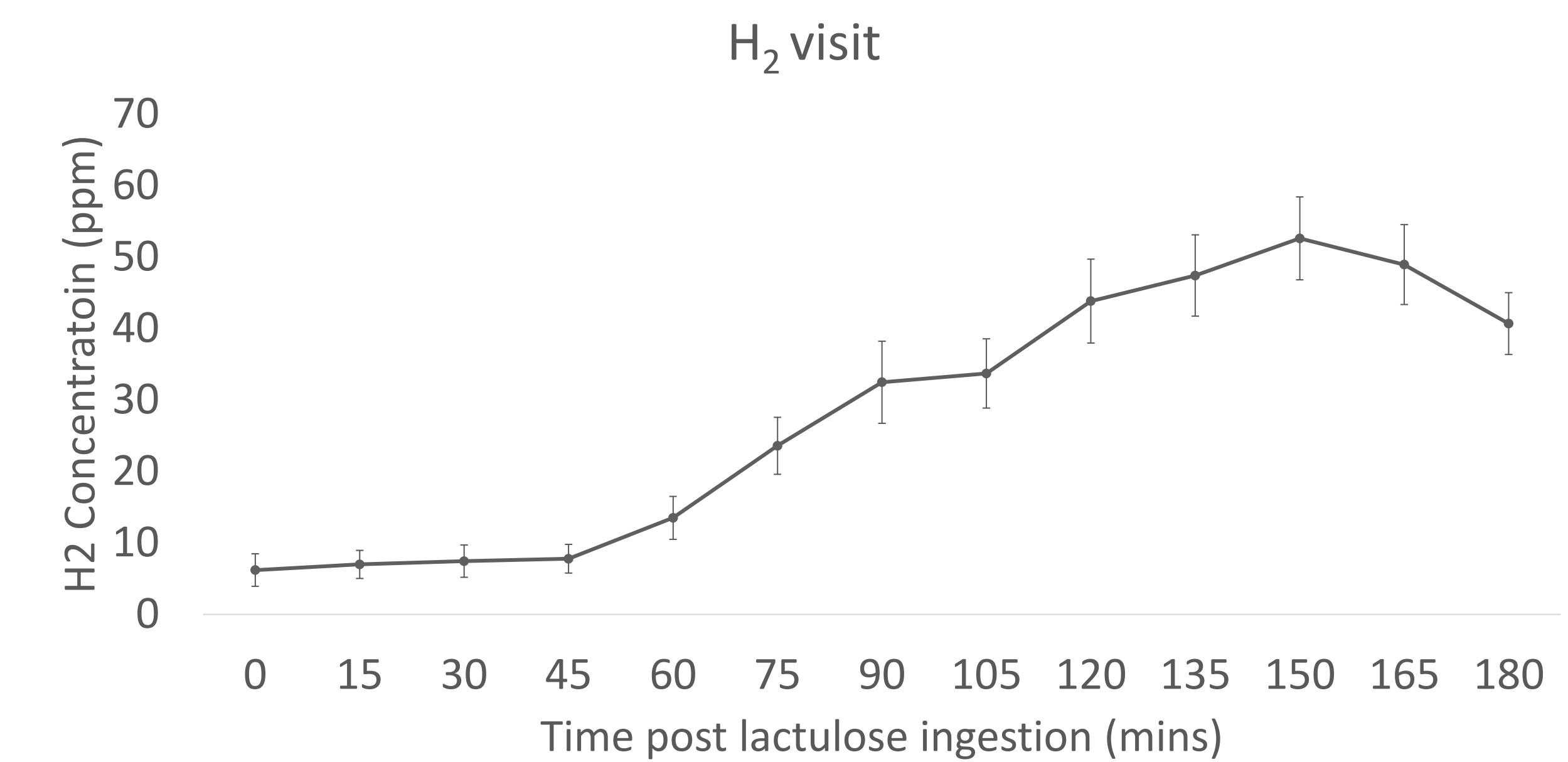


Figure 3: Hydrogen values pre-iron supplementation in healthy volunteers

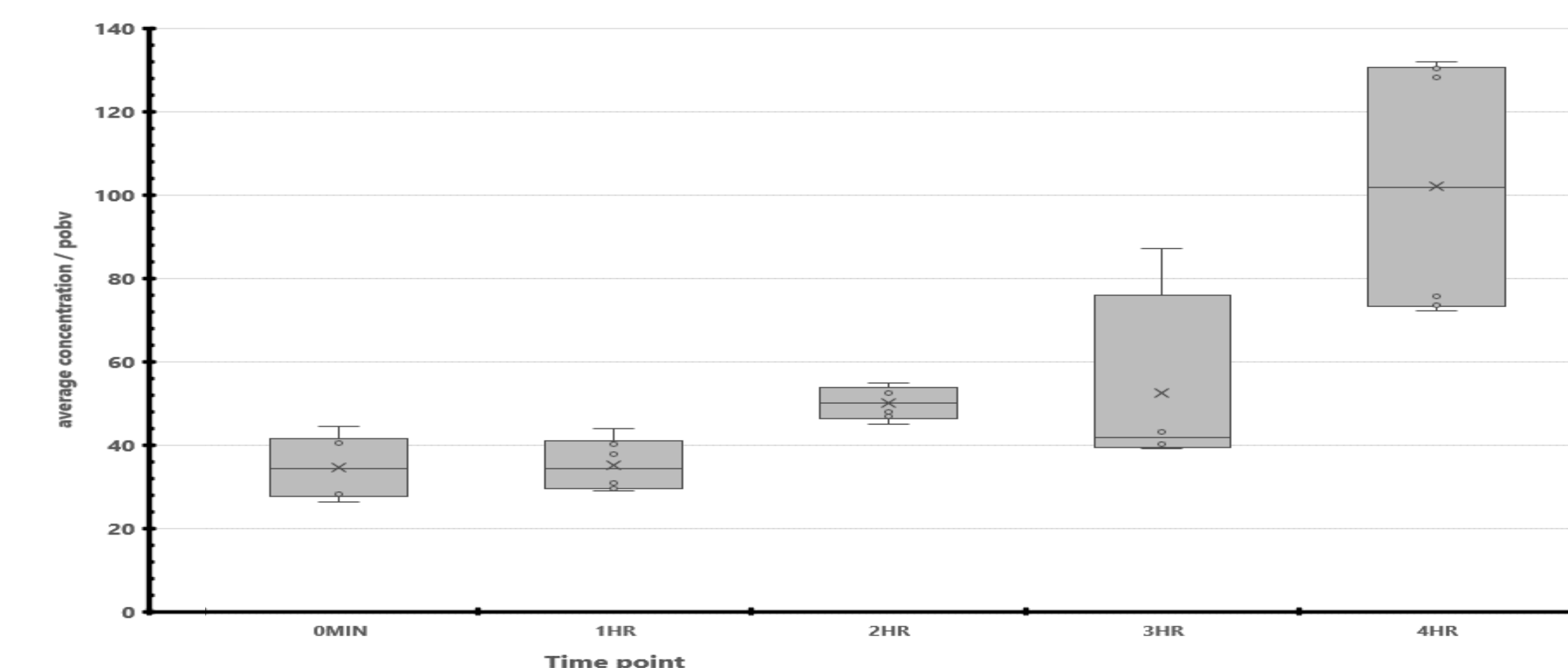


Figure 4: Hydrogen sulphide levels in a symptomatic patient, shows significant rise at 180 and 240 minutes.

CONCLUSION

- H₂S can be reliably detected in ppb range using SIFT-MS.
- Stability of H₂S in PVDF bags means it is a viable technique for at home and in clinic testing.
- The lack of response to lactulose ingestion may be due to the use of healthy volunteers/healthy microbiome population.
- Further studies in patients with IBS and IBD are needed to establish pathological range of H₂S production.

