

The Individualized Gut Microbiome Response to 2'-Fucosyllactose (2'-FL) is Captured Using An-app Connected Breath Tester

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Introduction

- The gut microbiota strongly influences human health. Prebiotic supplementation has the potential to positively alter this microenvironment.
- 2'-Fucosyllactose (2'-FL) is the most abundant oligo-saccharide found in human breast milk and can boost host immunity and stimulate the growth of Bifidobacteria in the gut.
- Prebiotic metabolism is dependent on the host's microbiome. Breath testing may provide real-time feedback on prebiotic metabolism in the gut.

Aims

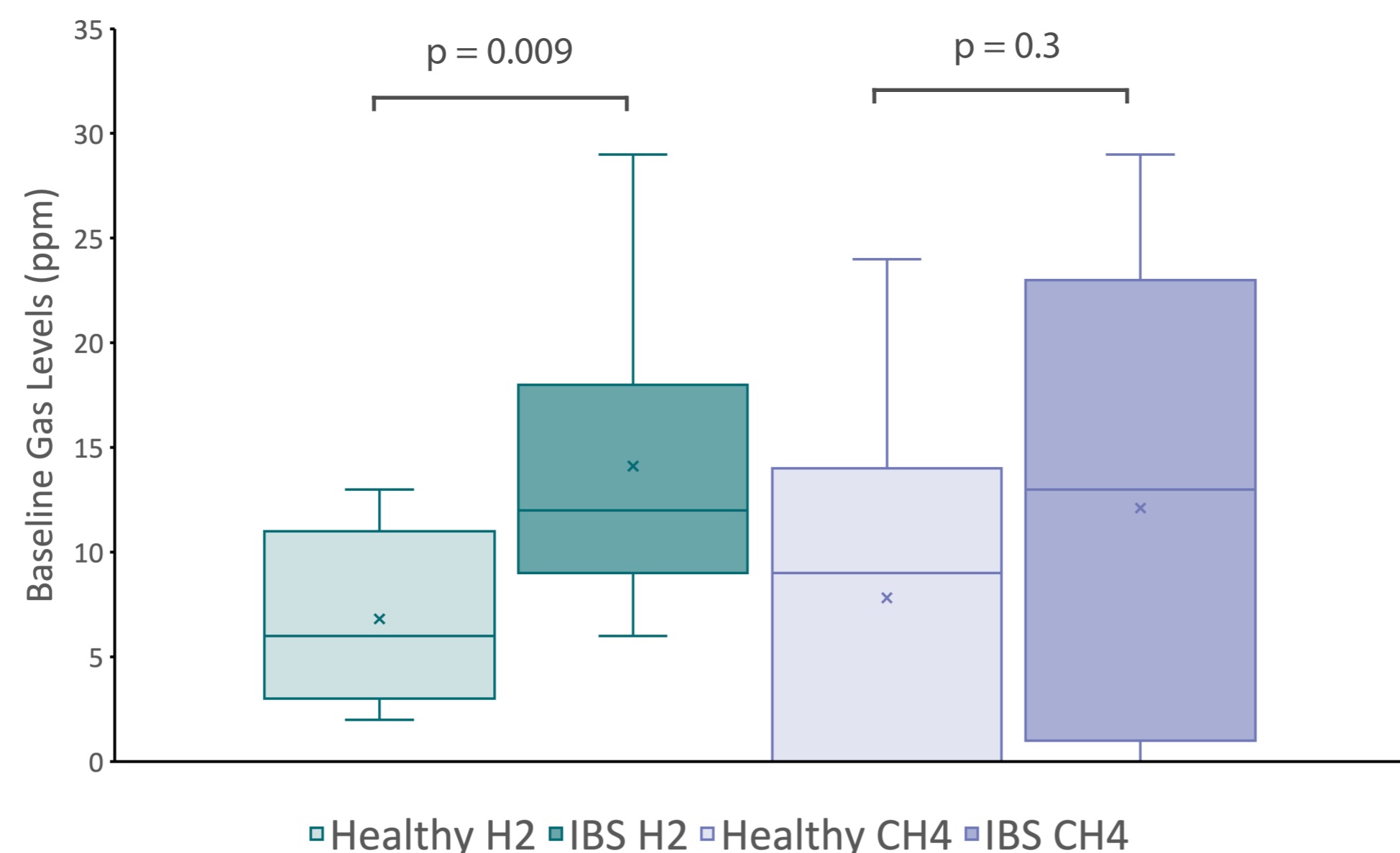
- To assess gut microbial fermentation of 2'-FL by measuring breath hydrogen (H₂) and methane (CH₄).
- To compare the fermentation profile of IBS patients and healthy controls.

Methods

- 9 IBS and 11 healthy subjects were provided with an app-connected H₂ and CH₄ breath tester (AIRE 2[®], FoodMarble).
- All subjects followed standard breath test preparation and fasted for 12 hours prior to testing.
- Subjects recorded a baseline breath test before ingesting a 2'-FL (Aequival[®] 2'-FL, FrieslandCampina, The Netherlands) sample (10g healthy, 5g IBS).
- Breath was measured every 15 min for a total of 3 hr.
- A positive response was defined as a rise in ≥ 20 ppm and/or ≥ 10 ppm from baseline for H₂ and CH₄ respectively.

Results

IBS patients have higher fasting breath H₂ and CH₄ levels



- Overall, 75% of subjects had a positive CH₄ response (4 healthy, 5 IBS) or positive H₂ response (7 healthy, 2 IBS).
- Only 15% (2 healthy, 1 IBS) were positive for both gases.
- 25% (2 healthy, 3 IBS) did not reach the positive criteria for either gas.
- 30% (2 healthy, 4 IBS) were positive for CH₄ only and 30% (5 healthy, 1 IBS) were positive for H₂ only.
- The IBS group had significantly higher ($p = 0.009$) H₂ baseline (14.1 ± 7.1 ppm (mean \pm SD)) than controls (6.8 ± 3.9 ppm).
- The IBS group baseline CH₄ ($12.1 + 11.5$ ppm) was 36% higher than the healthy controls (7.8 ± 7.8 ppm) but didn't reach statistical significance ($p = 0.3$).

Breath testing identifies the individualized microbiome response to prebiotics in healthy & IBS populations

	H ₂ or CH ₄ responder	H ₂ responder	CH ₄ responder	H ₂ and CH ₄ responder	Non-responder
All (n=20)	75% (15)	30% (6)	30% (6)	15% (3)	25% (5)
IBS (n=9)	66% (6)	11% (1)	44% (4)	11% (1)	15% (3)
Healthy (n=11)	81% (9)	45% (5)	18% (2)	18% (2)	10% (2)

Table 1: Breath H₂ and CH₄ response of healthy (10g 2'-FL) and IBS (5g 2'-FL) subjects in response to prebiotic supplementation after a 12 hour fast. A H₂ responder is defined as a ≥ 20 ppm rise in breath H₂ above baseline and a CH₄ responder is defined as a ≥ 10 ppm rise in breath CH₄ above baseline.

Conclusion

- Given the connection between diverse gut microflora and health, finding mechanisms to influence this environment is favourable.
- Prebiotic fibers, like 2'-FL, have the potential to enrich this microenvironment through microbial fermentation.
- Our data demonstrates the individualized nature of host-microbiome fermentation response across subjects and supports the use of a more personalized approach to prebiotic supplementation.
- Breath analysis of both hydrogen and methane has the potential to identify microbial responders, as well as being used to help optimize dosing and tolerance over time.