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Journal
Gut, 66(Suppl 2)

ISSN
0017-5749

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Publication Date
2017-07-01

DOI
10.1136/gutjnl-2017-314472.250

PWE-005 NEW IN VITRO HUMAN FAECAL FERMENTATION SYSTEM FOR DIAGNOSIS AND TREATMENT OF GASTROINTESTINAL DISORDERS USING CONTINUOUS INTESTINAL GAS PROFILING

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10.1136/gutjnl-2017-314472.250

Introduction The medical and biological aspects of human intestinal gases have received significant attention in the recent years, particularly in their roles as biomarkers of several gastrointestinal diseases that are directly or indirectly connected to the intestinal microbiota. Current approaches for measuring and calculating the profile of intestinal gas production (quantity, composition and kinetics) are limited and lack of the ability of measuring with high accuracy, reproducibility and real-time processes, while not exploiting the full potential for providing insights into the attributes of the resulted fermentation patterns. This study aimed to correct that deficiency.

Method A low cost, portable sensing array capable of sensing concentrations of hydrogen (H_2), methane (CH_4), carbon dioxide (CO_2), hydrogen sulfide (H_2S) and nitrogen oxide (NOx) was developed and combined with an *in-vitro* anaerobic fermentation technique, and specially designed for the profiling intestinal gas produced in real time during incubation of fresh human faecal samples in a simulated colonic environment. Simulations included the effects of adding fermentable (fructo-oligosaccharides and resistant starch) and poorly-fermentable fibre (psyllium and sterculia), cysteine, sodium sulfate, nitrate and mesalazine alone or in combination on gas profiles over 4 hour incubation.

Results Unspiked faeces produced CO_2, H_2, and CH4 in an approximate ratio of 36:14:1, with good repeatability and acceptable reproducibility. Patterns of H_2S response varied greatly with various substrates, it was markedly stimulated (22fold) by the addition of (1 g) cysteine and slightly increased only with (6.5 mmol) sulfate. NOx was barely detectable, unless the samples were spiked with nitrate. Readily-fermentable fibres consistently and actively stimulated H_2 and CO_2 by a mean 8 fold (SD 3) and significantly suppressed H_2S production by 90 (2)% ($p<0.001$; Two-way ANOVA). Poorly fermentable fibres had little effect on gas profiles or amounts, but passively suppressed H_2S production by about 20%. Mesalazine reduced H_2S production by a mean of 30%.

Conclusion This unique methodology has clear advantages over conventional off-line, expensive and bulky *in-vitro* fermentation systems with continuous and simultaneous real-time measurement of multiple gases. Its utility in showing the effects of dietary components and drugs suggests that this method deserves further study to determine its place as a medical tool that might have roles in diagnostics, and in assessing the effects of diet and therapeutic agents on the gut microbiota.

Disclosure of Interest None Declared