A NOVEL SMALL INTESTINAL MICROBIOME ASPIRATION (SIMBA) CAPSULE DEVICE TO DETECT AND SAMPLE PROBIOTICS RELEASE IN THE HUMAN SMALL INTESTINE

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Objective:
The SIMBA capsule is a novel ingestible device aiming to sample luminal fluid in the small intestine. We aim to test performance characteristics of SIMBA in healthy volunteers and demonstrate SIMBA's safety and efficacy in tracking the microbiome profile's change in small intestine during oral probiotics ingestion in real time.

Methods:
20 healthy volunteers ingested 2 SIMBA capsules after fasting and underwent abdominal X-rays every 30 mins out to 210 min to assess capsules' location and deployment. Capsules were independently collected and returned with a stool sample. One week later, 2 further SIMBA capsules were ingested simultaneously with a dual strain probiotic and collected when passed. Endpoints: sampling location at baseline, capsule sample and stool microbiota analysis using 16S sequencing, qPCR probiotic strain detection, safety, and subject usability assessment for both capsule sets (total 80 capsules).

Results:
78/80 SIMBA capsules were successfully retrieved for analysis. 65/66 selected SIMBA capsules had sufficient DNA for 16s sequencing, which showed clearly different microbiota composition between SIMBA samples and stools, and between baseline and intervention SIMBA samples. Absolute quantification using probiotic strain-specific qPCR results showed SIMBA capsules detect an increase of the probiotics concentration in the small intestine after oral ingestion of the probiotics. The rest 12 capsules were sent for metabolomic analysis and results will be published in future.

Conclusion:
The SIMBA capsule appears safe and reliable for collection of SI content which can be used for tracking spatial and temporal microbiome change in small intestine without the need for deep endoscopy.

INVESTIGATING THE SUSCEPTIBILITY OF THE NEXT GENERATION PROBIOTIC *FAECALIBACTERIUM PRAUSNITZII* UNDER STRESS CONDITIONS

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Objective:
Faecalibacterium prausnitzii is a multi-skilled intestinal bacterium proposed as a next generation probiotic. However, detailed information addressing the safety of this novel probiotic (in terms of antimicrobial susceptibility) and its technological fitness is still lacking. These data are important when developing probiotic products. This work aimed to evaluate *F. prausnitzii* DSM17677 susceptibility when exposed to selected antimicrobials, oxygen, acidic pH and bile.

Methods:
Antimicrobial susceptibility of *F. prausnitzii* DSM17677 to ampicillin, vancomycin, gentamicin, kanamycin, streptomycin, erythromycin, clindamycin, tetracycline and chloramphenicol was assessed following European Food Safety Authority guideline. *Faecalibacterium prausnitzii* DSM17677 cultures were exposed to: 1) ambient air up to 5-minutes; 2) acidic pH (3 and 5) during 2-hours; 3) bile concentrations (0.1, 0.25 and 0.5 %) up to 3-hours. Viability was determined by colony-forming units plating (CFU) at defined time-points.

Results:
Faecalibacterium prausnitzii DSM17677 was susceptible to vancomycin, clindamycin, tetracycline and chloramphenicol. Moreover, this strain exhibited high viability reductions (>4 log CFU/ml) after 1-minute of aerobic exposure of inoculated plates, and after 1-hour exposure to pH 3 and in all bile concentrations tested. However, this strain tolerated well the exposure to pH 5 for 2-hours.

Conclusions:
Given high *F. prausnitzii* DSM17677 sensitivity to aerobic atmosphere, pH 3 and bile, our data revealed the need to develop delivery systems able to promote the viability and stability of this bacterium when subject to such environmental stresses, envisaging its future application as a probiotic strain. Furthermore, this work contributes to the establishment of *F. prausnitzii* DSM17677 antimicrobial susceptibility profile.