Satellite Symposium
Probiotics: Current Challenges and New Opportunities

*Lactobacillus GG: probiotic activity and criteria for new probiotics*

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**Background** – A probiotic has been defined as a viable microbial food supplement, which beneficially influences the health of the host (1). *Lactobacillus rhamnosus* GG (=ATCC 53013) is one of the best-documented probiotics in the human studies and this experience forms the basis for future developments.

**Objectives** – We evaluated the mechanisms of probiotics and the target identification for probiotic use. Based on the assessment a rationale for probiotics and future probiotic developments has been formulated.

**Design** – Mechanistic and human studies on probiotics and especially on *Lactobacillus* GG were reviewed to identify targets for probiotic action and mechanisms of action. Based on the review and outlook for new criteria has been formulated.

**Outcomes** – Individual probiotics have defined strain-specific actions in the human studies and all probiotics are unique. Clinical efficacy has been demonstrated in clearly identified target aberrancies related to intestinal microbiota development. Based on meta-analyses, *Lactobacillus* GG and *Saccharomyces boulardii* and *Bifidobacterium lactis a & Streptococcus thermophilus* are identified as efficient in preventing antibiotic associated diarrhea. As studies have also indicated new probiotic combinations effective for specific aberrancies such developments should be further characterized. Based on these the future selection criteria for specific probiotics and probiotic combinations can be established.

**Conclusion** – The available demonstrations indicate that microbiota targets should be identified for probiotic action. Genetic information on the specific strains and their action can assist in finding new probiotics and combinations for future target specific preparations with increased efficacy in the human studies.

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**How to develop a new probiotic combination**

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**Background** – New probiotic combinations are an opportunity to develop more targeted products for different consumer groups or health problems. The general criteria for an industrially interesting probiotic are safety, survival in the gastrointestinal tract, adhesion, colonisation, documented physiological effects shown in clinical trials, and technological feasibility.

**Objective** – The aim was to develop a clinically effective and technologically applicable probiotic combination.

**Design** – Microbiological and biochemical screening combined with cell line studies were used in order to screen for the most suitable combination for clinical interventions.

**Outcomes** – The screening resulted in a combination of four strains: *Lactobacillus rhamnosus* GG, *Lactobacillus rhamnosus* Lc705, *Propionibacterium freudenreichii* ssp. *shermanii* JS and *Bifidobacterium* Bb-12. Clinical efficacy was demonstrated in subjects suffering from irritable bowel syndrome, and in subjects undergoing *Helicobacter pylori* eradication treatment. All the strains were capable of colonising the intestinal tract. The combination was technologically feasible for industrial scale production, and the stability of all the strains in a fermented milk drink was good during a five-week shelf life.

**Conclusions** – This development process show that the combination of LGG, *L. rhamnosus* Lc705, *P. freudenreichii* ssp. *shermanii* JS and Bb-12 is a promising probiotic ingredient for functional foods targeted to relieve symptoms of irritable bowel syndrome.