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### **Product development and role of prebiotics, probiotics and synbiotics in managing obesity, T2DM and undernutrition and its co-morbidities: A meta-analysis**

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**Background:** Most Indian citizens are either undernourished or suffering from NCDs and related comorbidities resulting in huge economic and man hour losses. In both the situations the gut health of the individual is compromised and the answer to this problem could be a "Gut-Check". In view of this background, the investigators at the department of Foods and Nutrition, The M.S. University of Baroda initiated a series of studies since past decade. Various clinical trials were undertaken in varied groups such as elderly, adults and children using Prebiotics, Probiotics and Synbiotics. Simultaneously several food products were developed using Fructooligosaccharide (FOS), Inulin and Resistant Starch and their organoleptic qualities was determined.

**Methodology:** Meta-analysis of 9 studies was carried out and gut health of the 669 human subjects (aged 4-65 years) was determined in terms of colonization of Lactic acid bacteria, Bifidobacteria, enteric pathogens, *Clostridium* and *Bacteriodes* in stool samples using selective media. Using standard methods, bio chemical, biophysical parameters and anthropometry was determined in children, adults and elderly subjects with respect to BMI, blood pressure, percent body fat, BMR, serum lipid profile, HsCRP, HbA1c, FBS, PP2BS, GLP, GIP, PYY, Leptin, LPS, Ghrelin, Insulin. Serum IgA and morbidity profile (common colds and diarrheal episodes) was determined in case of undernourished children. Most of the studies were undertaken using RCT design whereas some studies used cross-over as well as double blind placebo control designs. The intervening food (Fructooligosaccharide, Resistant Starch and Inulin) was supplemented in the range of 7-20 g and the period of supplementation ranged from 4-12 weeks.

**Results:** Supplementation with synbiotics, prebiotics and probiotics in adult diabetic subjects (n=256, 25-65 years age) resulted in reduction in Enteric pathogens, HbA1C, FBS, PP2BS, TC, TG, LDL and HsCRP by 6%, 11.78, 9.19, 13.3, 8.42, 6.27, 8.44 and 38% respectively along with a mean rise in Bifidobacteria, Lactic acid bacteria and HDL by 33%, 25% and 24.57%. Intervention trials in obese subjects (n=208, 25-50 years age) with FOS (10-20 g) resulted in significant rise in Bifidobacteria, Lactic acid bacteria, Ghrelin, GIP, GLP, PYY by 11%, 20%, 17%, 6.37%, 9.22% and 1.02% respectively. A reduction in the mean values for *Clostridium*, *Bacteriodes*, Insulin and Leptin were observed as 1.9%, 11.4%, 5.83% and 5.78% respectively. Intervening undernourished children (n=205, 4-12 years age) with FOS also revealed an increased colonization of Bifidobacteria by 19% and Lactic acid bacteria by 13.61%, whereas the mean reduction in colonization of enteric pathogens and incidence of GI problems and infections were 26%, 65% and 37% respectively. Non-significant impact was observed in terms of Serum IgA levels. FOS supplementation in school going children resulted in improved oral hygiene by 70% with 16% reduction in *S. mitis*. Prebiotics could be successfully substituted or added in 35 foods in the range of 10-20% with high sensory qualities except for chapattis. Some foods (cake, patra, idli, kheer) and most beverages (buttermilk, milk, tea and lemon water) scored higher or were similar to standard foods.

#### **Biography**

Pranjal Yadava has earned his BSc in Agriculture from Pantnagar University, MSc in Biotechnology from Tamil Nadu Agricultural University and PhD in Plant Genetic Engineering from International Centre for Genetic Engineering and Biotechnology, New Delhi. He has extensively worked in private and government sector on agricultural biotechnology and GM foods. As a member of Central Compliance Committee for monitoring GM maize field trials in India, he has close understanding on issues of GM food commercialization. He is also a Member of the Institutional Biosafety Committee. He has firsthand experience of development GM tomato and GM maize. He has widely travelled in India and abroad and constantly speaks and writes about the potential of GM crops and other scientific innovations in the agriculture sector.

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