Medanta Institute of Education and Research

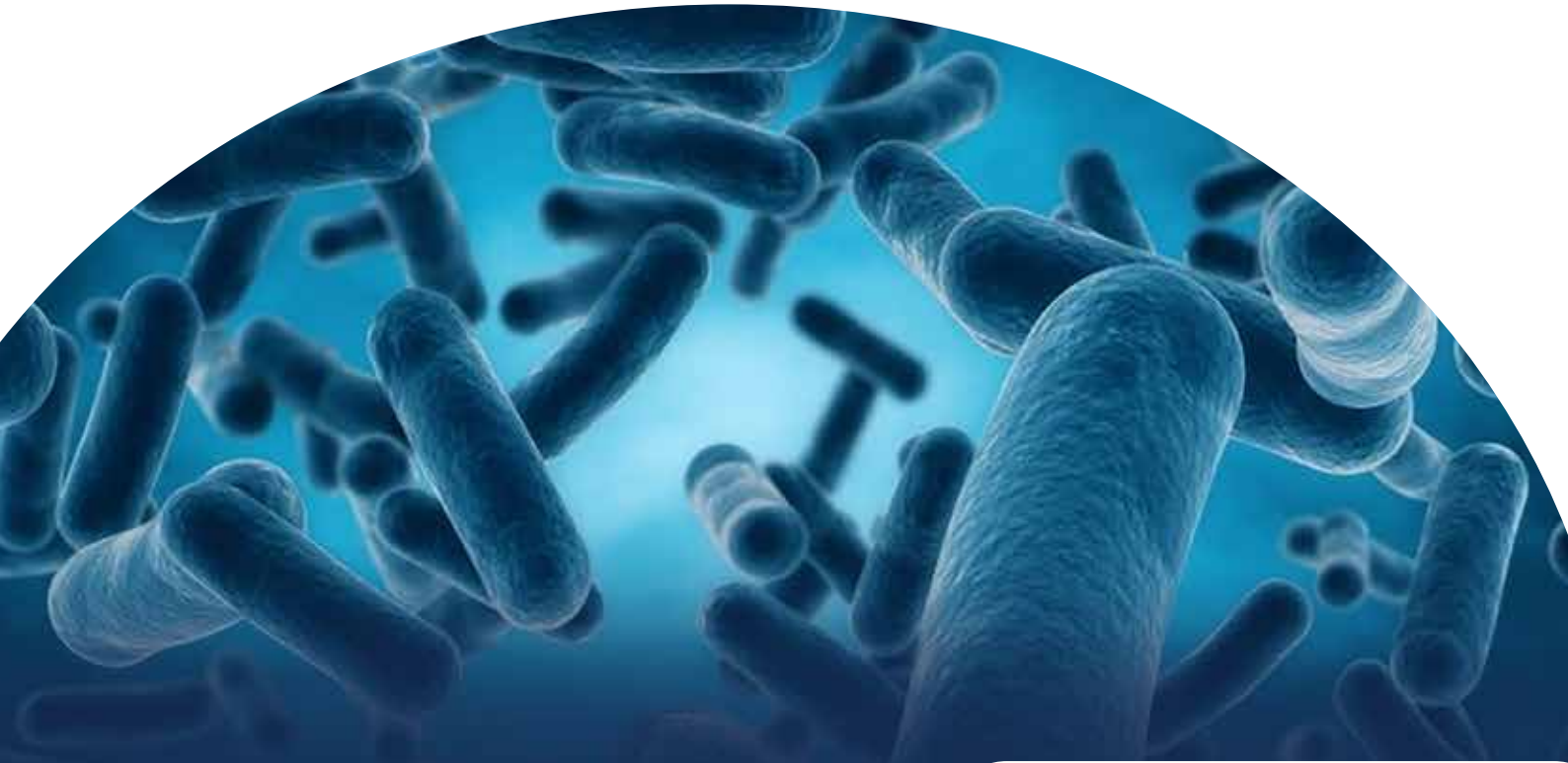
AMITY UNIVERSITY GURUGRAM

THE GUT MICROBIOTA AND PROBIOTIC SCIENCE FOUNDATION (INDIA)

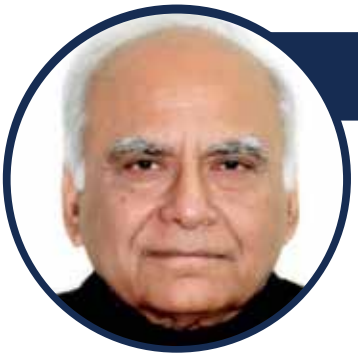
12th INDIA PROBIOTIC SYMPOSIUM

"Good Microbiome, Probiotics and Good Health – The Evidence Gets Stronger"

5th & 6th MARCH 2022



ABSTRACT BOOK



Welcome note by Prof. N.K. Ganguly

Dear Colleagues,

Warm greetings from the Gut Microbiota and Probiotic Science Foundation (India).

It gives me immense pleasure to welcome our distinguished participants to the series 12 th India Probiotic Symposium that is being held in a hybrid mode on 5 March and 6 March 2022.

The symposium with the theme, "Good Microbiome, Probiotics and Good Health – The Evidence gets stronger" is being organized by the Foundation in association with Medanta Institute of Education and Research, Gurugram and Amity University, Gurugram.

The presentations by International and National experts will delve and provide deeper insights on the evidence that has been generated in the recent past on the role of the gut microbiota in maternal, neonatal and infant health. It will also throw light on the dysbiotic state of the gut microbes in severe COVID infections, in the elderly, following an antibiotic challenge and in metabolic disorders. It brings hope for the use of beneficial microbes in reducing anxiety and stress and the possible discovery of novel species of bacteria for their benefit in human health. Interesting areas for the use of these microbes include reducing green house emission and combatting antimicrobial resistance.
The symposium has been made all the more interesting because of the unique ideas being presented by young scientists under the age of 40 years who after a rigorous selection were selected for the Young Investigator Awards. They will present their work during the symposium.

I also request you to visit the mobile friendly Foundation website (www.gutfoundation.org.in) which is a valuable source of information for students, scientists and researchers in the area. The presentation of the previous symposia are also archived on the website of the Foundation.

On behalf of the Scientific Advisory Committee of the Foundation, we welcome you to the symposium and hope you will find the two days both exciting and enriching.

Nirmal Kumar Ganguly

Prof. N.K. Ganguly
President
Gut Microbiota and Probiotic Science Foundation (India)

About the Gut Microbiota & Probiotic Science Foundation (India)

The Gut Microbiota and Probiotic Science Foundation (India) was registered as a society on 9th November 2011 by expert scientists under the Presidentship of Professor Nirmal Kumar Ganguly under the Societies Registration Act XX1 of 1860.The objective of the Foundation is to provide a thrust to the science of Gut Microbiota and Probiotics in the country. The Foundation aims to channelize International knowledge and expertise in the field and promotes collaborative research for the development of probiotics. It will also foster and maintain research links with scientists of similar interest.

To meets its objective the Foundation will:

- Organize an Annual International symposium for providing a common scientific platform for basic scientists, clinicians, regulators and students to share and exchange knowledge and views and delve into newer areas of research.
- Webcast the symposium for wider viewership.
- Publish the proceedings of the symposium in the form of a book for distribution to libraries and healthcare professionals across the country.
- Publish an Annual newsletter that will capture the latest scientific developments in the area.
- Promote research in the area and felicitate young talent by giving Young Investigator Awards.

Governing Body Members

Prof. N. K. Ganguly
President

Dr. B. Sesikeran
Vice-President

Prof. G. Balakrish Nair
Vice-President

Dr. Neerja Hajela
Secretary

Prof. B.S. Ramakrishna

Prof. J. B. Prajapati

Prof. Ajay Bhalla

Prof. A.K Srivastava

Scientific Advisory Committee Members

Prof. A.P. Dash

Dr. Keya Lahiri

Prof. S.K. Mittal

Prof. Jyoti Prakash Tamang

Co-opted Members

Mr. Shinji Hashimoto

Dr. Sara Thompson

Mr. Tomoyuki Iwama

Mr. Junji Fujimoto

DAY 1 5TH MARCH 2022

13:00-14:00 hrs — **LUNCH**

14:00-14:10 — **Inaugural Session**

Welcome Address: Prof. N.K. Ganguly
Former Director General, Indian Council of Medical Research, Senior Advisor-Global Health Strategies, Delhi, India.

14:10-14:30 — **Opening Remarks: Dr. Naresh Trehan**
Chairman & Managing Director, Medanta,TM- The Medicity, Gurugram, India

14:30-14:50 — **Opening Speech: Dr. Padmakali Banerjee**
Pro-Vice Chancellor, Dean Academics, Amity University,Haryana, India

14:50-15:30 — **Inaugural address: Mr. Arun Singhal**
CEO, Food Safety & Standards Authority of India (FSSAI), Delhi, India

15:30-17:00 — **Scientific Session One**

Chairpersons:

Dr. Pramod Garg
Executive Director, Translational Health Science and Technology Institute (THSTI), Faridabad,India

Dr. Palok Aich
Associate Professor, School of Biological Sciences (SBS), National Institute of Science Education and Research (NISER), Bhubaneswar, India

15:30-16:00 — **Keynote Address**
"Modulation of Gut Microbiome in COVID-19: Emerging Evidence"
Prof. Siew C NG
Director, Microbiota I-Center (MagIC), The Chinese University of Hong Kong, China

16:00-16:20 — **"Effect of *L. paracasei* strain Shirota Intake on the Stability of Gut Microbiota in the Elderly"**
Dr. Ryuta Amamoto
Associate Senior Researcher, Yakult Central Institute, Food Research Department, Tokyo, Japan.

16:20-16:40 — **"Psychobiotics: Workable Approach in Sports?"**
Dr Mahenderan Appukutty
Associate Professor & Nutritionist, Sport Science Programme, Faculty of Sports Science & Recreation, University Teknologi MARA (UiTM), Malaysia.

16:40-17:00 — **"Harnessing the Microbiome for Maternal, Neonatal, and Infant Health"**
Prof. Sourabh Dutta
Professor, Division of Neonatology, Postgraduate Institute of Medical Education & Research (PGIMER), Chandigarh, India

17:00-18:00 — **Panel Discussion 1**
EMERGING CRITICAL ISSUES

Moderator

Prof. B. S. Ramakrishna
Director, SIMS Institute of Gastroenterology, Hepatobiliary Sciences and Transplantation, SRM Institutes for Medical Science (SIMS), Chennai, India.

Panel Members

"Pediatric COVID -19 Vaccines - A Perspective"
Dr Nithya Gogtay
Professor & Head, Clinical Pharmacology, King Edward Memorial Hospital (KEM), Mumbai, India.

"Reducing Greenhouse Emission through Probiotics"
Prof A.K. Srivastava
Member, Agricultural Scientists Recruitment Board (ASRB), New Delhi, India.

"Gut Microbiota in combatting Anti Microbial Resistance"
Dr. Kamini Walia
Scientist F and Program Officer- Anti Microbial Resistance, Indian Council of Medical Research (ICMR), New Delhi.

"Probiotics in Managing the Altered Gut in Autism Spectrum Disorder"
Prof. Asna Urooj
Professor, DOS in Food Science & Nutrition, University of Mysore, Mysore, India.

1900 hrs onwards — **DINNER**

DAY 2 — 06TH MARCH 2022

10:00-11:30 — **Scientific Session Two**

Chairpersons:

Dr. Sridevi Annapurna Singh
Director, CSIR- Central Food Technological Research Institute(CFTRI), Mysuru, India

Dr. Jagmeet Madan
National President, Indian Dietetic Association, India, Professor, Principal. Dept of Foodand Nutrition, Sir Vithaldas Thackersey College of Home Science (Autonomous) SNDT Women's University, Mumbai, India

10:00-10:30 — Keynote Address
"IgA Drug Development as a Gut Microbial Regulator"
Prof. Reiko Shinkura
The University of Tokyo, Institute for Quantitative Biosciences, Laboratory of Immunology and infection control, Tokyo, Japan.

10:30-11:00 — **"Our Gut Microbiota as a Source of Novel Bacteria Beneficial for Human Health"**
Dr. Philippe Langella
INRAE, Research Institute for Agriculture, Food and Environment, Paris, France.

11:00-11:30 — **"Effect of Multistrain Product on Gut microbiota following an Antibiotic Challenge"**
Dr. Muriel Derrien
Senior Researcher, Danone Research Centre, Paris, France.

11:30-12:00 — **YOUNG INVESTIGATOR PRESENTATIONS**

Chairpersons:

Prof. J.B. Prajapati
Chairman, VKCoE, Institute of Rural Management, Anand, Gujarat, India

Prof. Jyoti Tamang
Professor in Microbiology and Former-Dean, Sikkim University, Sikkim, India.

12:00- 13:00

Panel Discussion 2
APPLICATION OF PROBIOTICS

Moderator

Prof. Anura Kurpad
Professor, Physiology and Nutrition Dept, St John's Medical College, Bengaluru, Karnataka, India.

Panel Members

"Promoting Good Health through Industry Partnered Quality Probiotic Clinical Trials"
Dr. B. Sesikeran
Former Director, National Institute of Nutrition, Hyderabad, India.

"Patient Reported Outcome- Functional Constipation"
Prof. Ajay Bhalla
Director & HOD, Department of Gastroenterology, Fortis Hospital, Noida, India.

"Revisiting Probiotics in Acute Childhood Diarrhoea"
Prof. Keya Lahiri
Professor & Former Head, Department of Pediatrics, DY Patil Medical college & Hospital, Mumbai, India.

"Diabetes and Probiotics"
Prof. V. Mohan
Chairman, Mohan Diabetes Centre, Chennai, India

"Ameliorating Dysbiosis of the Gut Microbiota"
Dr. Anil Arora
Chairman, Senior Consultant, Instt of Liver Gastro & Pancreatico Biliary Sciences , Sir Ganga Ram Hospital, New Delhi

13:00-13:20

VALEDICTORY SESSION

Chairpersons:

Prof. G. Balakrish Nair
Honorary Distinguished Professor, Microbiome Laboratory Rajiv Gandhi Centre of Biotechnology, Kerala, India

Prof. S.K. Mittal
Chairman & Sr. Consultant, Department of Pediatrics, Max Super Speciality Hospital, Ghaziabad, India.

Concluding Remarks: Dr. B. Sesikeran
Former Director, National Institute of Nutrition, Hyderabad, India

13:20–13:30 Vote of Thanks

13:30 hrs onwards LUNCH

Inaugural Session

Welcome Address: Prof. N.K. Ganguly 'Padma Bhushan'

Former Director General, Indian Council of Medical Research, New Delhi, India
Senior Advisor - Global Health Strategies, New Delhi, India
President, Gut Microbiota and Probiotic Science Foundation (India)

Nirmal Kumar Ganguly, M.D., Ph.D. is a Former Director General of the Indian Council of Medical Research, Former Director PGI Chandigarh and National Institute of Biologicals, Former Presidents of the National Academy of Medical Sciences, Indian Science Congress, JIPMER – Puducherry. He is Fellow of Imperial College and the Royal College of Pathologists and the Tropical School, London, Fellow of all the medical and Science academies in India, third world academy. He is member of the Advisory Committee to the Minister of Health on COVID-19. He was the member of Board of Grand Challenges Canada, Canada Innovation Fund. He is the Chairman of the Research Council of the Institute of Advanced Virology, and Chairman, Indian Pharmacopeia Commission. He was on the Advisory Board of NIH Fogarty International Center, the Health Vaccine Center, the U.S. Centers for Disease Control (CDC). He was in the Scientific Advisory board of IVI, icddr,b Dhaka. Prof. Ganguly is Chairman of the Advisory Committee for Health Research of the World Health Organization-SEARO, the International Vaccine Institute Cholera Board (CHOVI), and the United Nations Children's Fund SAG TDR, NTD Scientific board. He is also the Chair of Scientific Advisory Committee of Eminent Institutes like CCMB, CDFD, CDRI IMTECH, NCCS, RGCB, Bose Institute etc. Currently, he is President of the Gut Microbiota and Probiotic Science Foundation (India), Immunology Foundation of India and Indian Society of Translational Research. He has published more than 775 research papers and supervised or co-supervised 130 Ph.D. candidate dissertations and more than 20 book chapters. Prof. Ganguly has been honoured with the 7 International and 113 National awards along with the prestigious "Padma Bhushan" Award in the field of "Medicine" for the year 2008.

Opening Remarks: Dr. Naresh Trehan

Chairman & Managing Director, Medanta, India

Dr. Naresh Trehan, an Indian national, is a renowned Cardiovascular and Cardiothoracic surgeon, a graduate from King George Medical College and subsequently trained and practiced at New York University Medical Center, Manhattan, USA from 1971 to 1988, where he obtained a Diplomat from the American Board of Surgery and the American Board of Cardiothoracic Surgery.

Dr Naresh Trehan is the Chairman & Managing Director and Chief Cardiac Surgeon, MedantaTM-The MediCity, a 1500 bedded multi super speciality institute, which offers cutting edge technology and state of art treatment facilities at an affordable cost. The Institute is governed under the guiding principles of providing medical services to patients with care, compassion and commitment.

Dr. Naresh Trehan founded the Escorts Heart Institute and Research Centre where he was the Executive Director. Escorts was conceptualised, created and managed by Dr. Trehan from November 1987 to May 2007.

Dr. Naresh Trehan has received many prestigious awards, including the Padma Shree and the Padma Bhushan Award, presented by the Government of India.

Dr Naresh Trehan was the President of the International Society for Minimally Invasive Cardiac Surgery (ISMICS), Minneapolis, USA 2004-05 and has also received Honorary Doctorate Degrees from three prestigious universities.

Opening Speech: Dr. Padmakali Banerjee

Pro-Vice Chancellor, Dean Academics, Amity University,Haryana, India

Dr. Padmakali Banerjee is an Eminent Management Professional, a thought leader, an Institution Builder, a Leadership Coach, a Celebrated Author, and an influencer. A doctorate from University of Delhi, she is the Fellow of the prestigious Somatic Inkblot Society (FSIS–US). Her current research interests include Leadership Studies, Optimism and Wellbeing, Psychometric Assessment, Curriculum Design, Entrepreneurship and Sustainability. She heads Centre for BRICS Studies, a centre of excellence-practice, research and outreach. As the Pro Vice Chancellor, she has been involved in strategic planning and leads the development and implementation of the university's academic processes. She spearheaded many innovative initiatives including the introduction of a flexible credit system, industry academic integration and internationalization. She pioneered the skill development programme at the university. Her concepts and contributions on the Indian Skill development ecosystem have been widely recognized and acclaimed on both national and international platforms. Some of her recent awards include prestigious 2018 Greenbuild Leadership Award from US GBC for her contribution towards sustainability & Award of Excellence from InSPA, the prestigious Indian School Psychology Association, for her contribution in the field of psychology. Her book "The Power of Positivity - Optimism and the 7th Sense" published by SAGE is a popular choice globally. She is the creator of several psychometric test tools including 'Optimism index', a predictive tool for success, used as screening tool for selection and training in corporates.In her professional career, she has exhibited a passion for entrepreneurship by empowering youth and developing leaders in different walks of life. Her dream is to transform the world into a happier place to live in by instilling hope and optimism in today's youth.

Inaugural address: Mr. Arun Singhal

CEO, Food Safety & Standards Authority of India (FSSAI), Delhi, India

Shri Arun Singhal, IAS has been appointed as the Chief Executive Officer of FSSAIstarting from June 01, 2020. Shri Singhal belongs to the 1987 Batch of Indian Administrative Service. With his vast experience as Additional Secretary in MoHFW, he has been proactively working towards Drugs & Food Regulation, medical education, implementation of Pradhan Mantri Swasthya Suraksha Yojana (PMSSY) under which new AIIMS are being set up in the country, and in administration and expansion of Institutes of National Importance like AIIMS Delhi, PGI Chandigarh and JIPMER Puducherry.He has been closely associated with reforms in medical education over the past 2 years. He has also been associated with National Medical Commission Act from the drafting to final stage and with processing of the National Commission for Allied and Healthcare Profession Bill.After completing B.Tech. and M.Tech. from IIT, Kanpur in Electrical Engineering, Singhal joined IAS in 1987. He has a rich and varied experience of administrative work in diverse areas including Petroleum and Natural Gas, Industrial Development, Rural Development, Agriculture Marketing and Health & Family Welfare.

Scientific Session One 15:30-17:00

Modulation of Gut Microbiome in COVID-19: Emerging Evidence

Prof. Siew C NG

Director, Microbiota I-Center (MagIC), Assistant Dean (Development), Faculty of Medicine Associate Director, Center for Gut Microbiota Research Professor, Department of Medicine and Therapeutics, Division of Gastroenterology and Hepatology, State Key Laboratory of Digestive Disease, The Chinese University of Hong Kong, Hong Kong

Professor Siew-Chien Ng is Professor at the Department of Medicine and Therapeutics and Associate Director for the Centre for Gut Microbiota Research, The Chinese University of Hong Kong. She is also Director for the Microbiota I-Center at Hong Kong Science and Technology Park.
She received her Bachelor of Medicine and Surgery degree from the University of London and the Doctor of Philosophy degree (PhD) from Imperial College London. She pioneered IBD epidemiologic and microbiota research in Asia-Pacific. She is also Associate editor of Gut.
She has published over 260 original papers in International journals and won over 20 prestigious awards.

Abstract

The variety and volume of bacteria in the gut, known as the microbiome, may influence the severity of COVID-19 infection as well as the magnitude of the immune system response to the infection. COVID patients lack certain good bacteria known to regulate our immune system and the abnormal gut microbiota (dysbiosis) persists after clearance of the virus, which could contribute to lingering symptoms, known as "long COVID". Clinical management not only should aim at clearing the virus but also restoring the abnormal gut microbiota. Bolstering of beneficial gut species depleted in COVID-19 could serve as a novel avenue to mitigate severe disease, underscoring the importance of managing patients' gut microbiota during and after COVID-19" CU Medicine has developed a microbiome immunity formula (SIM01) that targets gut dysbiosis. Compared with patients who had standard care, our research team found that more COVID-19 patients who received the microbiome immunity formula achieved complete symptom resolution, showed significantly reduced proinflammatory markers in their blood, had increased favourable bacteria in their stool; and developed neutralising antibody. Studies have also shown that the gut microbiota plays a vital role in immune response after vaccination. Preliminary study in our laboratory using blood samples from individuals who have received COVID-19 vaccine showed that addition of a beneficial bacteria consortia is effective in reducing inflammatory cytokines and enhancing antibody level. We have also identified bacteria species linked to improved COVID-19 vaccine antibody response and less adverse effects. Clinical trials to investigate the impact of modulation of gut microbiota in reducing vaccine-related adverse reactions and improving efficacy of COVID-19 vaccine on underway.

References:

1. YK Yeoh, T Zuo, GCY Lui,.... SC Ng, Gut Microbiota Composition Reflects Disease Severity and Dysfunctional Immune Responses in Covid-19 Patients. Gut, 2020
2. Zuo T, Ng SC. Depicting SARS-CoV-2 faecal viral activity in association with gut microbiota composition in patients with COVID-19. Gut 2020.
3. T Zuo, H Zhan, F Zhang, ...SC Ng, Alterations in Fecal Fungal Microbiome of Patients with Covid-19 During Time of Hospitalization until Discharge. Gastroenterology 2020
4. T Zuo, F Zhang, GCY Lui, ...SC Ng, Alterations in Gut Microbiota of Patients with Covid-19 During Time of Hospitalization. Gastroenterology, 2020.
5. SC Ng et al. Gut microbiota composition is associated with SARS-CoV-2 vaccine immunogenicity and adverse events. Gut 2022.

Effect of L. paracasei strain Shirota Intake on the Stability of Gut Microbiota in the Elderly

Dr. Ryuta Amamoto

Associate Senior Researcher, Yakult Central Institute, Food Research Department, Tokyo, Japan.

Dr. Ryuta Amamoto is currently the Associate Senior Researcher at the Food Research Department of Yakult Central Institute. Specialized in Microbiology. He has been involved in community- based long-term cohort study among Japanese elderly, and has previously shown that the relative risks of hypertension and constipation were lower in subjects taking fermented milk products containing *Lacticaseibacillus paracasei* strain Shirota (formerly known as *Lactobacillus casei* strain Shirota). His main interest is to contribute to the development of means to prevent common age-related health problems, so that each citizen can live a healthy and lively life.

Abstract

Lacticaseibacillus paracasei strain Shirota (LcS, previously known as *Lactobacillus casei* strain Shirota) is one of the most intensively studied probiotics. Its benefits include regulation of intestinal motility, protection against infection, immunoregulation and prevention of carcinogenesis. However, the impact of LcS on major lifestyle-related diseases and gastrointestinal health in the elderly has not been clearly defined.

Since 2014, we have been collaborating with an epidemiological study (the Nakanojo Study) to evaluate the relationship between the consumption of fermented milk products containing LcS (LcS products) and health status in people aged 65 years and older. From this project, we have previously reported the risks of developing hypertension and infrequent bowel movements were reduced in elderly people who habitually consumed LcS products.

Today's main topic is the effect of LcS intake on the stability of gut microbiota in the elderly, which is our latest findings. We have evaluated the yearly variation of individual gut microbiota and the relationship with LcS products intake in 218 Japanese subjects aged 66–91 years, and found that 19 subjects showed a substantial change in their gut microbiota, as their formerly predominant bacterial families were replaced over the year. Moreover, subjects who consumed LcS products ≥ 3 days/week over the past 10 years experienced statistically lower substantive changes in their gut microbiota than the < 3 days/week group. Our results suggest that about one-tenth of the elderly Japanese could experience a substantial change in their gut microbiota during a 1-year period, and that the long-term intake of probiotics, particularly LcS, may stabilize the elderly's gut microbiota. Elucidating the mechanism of gut microbiota stabilization through the intake of probiotics and how this gut microbiota stabilization affects the health of the elderly may provide hints for the construction of a healthy society with longevity.

Reference: Amamoto R, Shimamoto K, Park S, Matsumoto H, Shimizu K, Katto M, Tsuji H, Matsubara S, Shephard R. J, Aoyagi Y. Scientific Reports, 2021, 11(1):12765.

Key Words: *Lacticaseibacillus paracasei*, probiotics, stability of gut microbiota, epidemiology, elderly

Psychobiotics: Workable Approach in Sports?

Dr. Mahenderan Appukutty

Associate Professor & Nutritionist, Sport Science Programme, Faculty of Sports Science & Recreation, University Teknologi MARA (UiTM), Malaysia

Assoc Prof Dr Mahenderan Appukutty is a lecturer at Faculty of Sports Science & Recreation, Universiti Teknologi MARA, Shah Alam. He holds a PhD in Nutritional Sciences focusing on nutrition, immunity and exercise performance from Universiti Kebangsaan Malaysia, MSc in Sports Science from Universiti Sains Malaysia and BSc (Hons) in Nutrition and Community Health from Universiti Putra Malaysia. At present, he is the Vice President of Nutrition Society of Malaysia (NSM) and he receives the Fellow of NSM (FNSM) in 2016. He also serves as Vice President of Malaysian Association of Sports Medicine (MASM), Vice President of Malaysian Society of Body Composition (MSBC) and Council Member of Malaysian Association for the Study of Obesity (MASO). In 2021, he has been elected as the Scientific Advisor of the International Life Sciences Institute (ILSI) Southeast East Asia Region. He also serves in the Clinical Care Committee for World Obesity (WO) Federation as Specialist Representative for Exercise Physiology/Sports Medicine. His research interests and focus are on functional food and exercise science. He chairs the Malaysian Vegetarian Dietary Guidelines (MoH) and contributed as a key writer for the Malaysian Dietary Guidelines. He has worked closely in the capacity building of Nutritionists in the region (Southeast Asia Nutrition Leadership Program, SEAMEO-RECFON, Indonesia and also serve as Chairperson of the Malaysian Nutrition Leadership Program (MyNLP) and South East Asia Public Health Nutrition Leadership Programme (SEAPHN LP)

Abstract

Achieving and sustaining peak performance can be challenging for athletes. Competitive athletes who engage in strenuous training and frequent competitions are prone to psychological disorders. Psychological conditions can activate the sympathetic nervous system and modulate physiological responses. In recent studies, there is emerging evidence that probiotics administration has the potential of reducing these psychological disorders. Probiotics, also known as friendly gut bacteria, are found in the gut and can provide a variety of health benefits to the host when administered appropriately. The psychology issue such as stress and anxiety can be managed with nutritional therapy namely probiotics is referred to as "psychobiotics". In sport, psychophysiological monitoring can be used to attain a better understanding of the processes underlying athletic performance and to help athletes improve their performance. The most frequently used ecological techniques include electromyography (EMG), electrocardiography (ECG), electroencephalography (EEG), electrodermal activity (GSR) and breathing rhythm. The purpose of this presentation is to offer an overview of the application of these techniques in applied interventions in sport and physical exercise and to provide athletes, coaches and sports scientists, particularly sports nutritionists and sports psychologists with new insights on performance improvement using probiotics. The understanding of Microbiota-Gut-Brain Axis theory has provided another approach for optimizing and diversifying gut flora through psychobiotics that confer mental (brain health) benefits on athletes. Nevertheless, further research is needed to elucidate the mechanism of current findings and may soon become the standard practice of using probiotics in conjunction with conventional psychology or psychiatric treatment modalities such as pharmacotherapy and psychotherapy.

Harnessing the Microbiome for Maternal, Neonatal, and Infant Health

Prof. Sourabh Dutta

Professor, Division of Neonatology, Postgraduate Institute of Medical Education & Research (PGIMER), Chandigarh, India

- Professor, Neonatology Unit, PGIMER, Chandigarh, and
- Adjunct Clinical Professor, McMaster University, Canada
- MBBS, MD & Senior Residency from AIIMS, New Delhi
- PhD (Neonatology) from PGI
- FRCPC by academic certification (Royal College, Canada)
- Fellow of National Academy of Medical Sciences (FAMS)
- Fellow of National Neonatology Forum (FNNF)
- Editorial Board member: PlosOne, Frontiers in Pediatrics
- Areas of interest: research methodology, neonatal sepsis, microbiome, retinopathy of prematurity
- Several publications, presentations, orations, awards

Abstract

We are living in an era of dysbiosis. There are numerous factors in our environment that promote dysbiosis, and these factors are almost impossible to avoid lifelong. Dysbiosis has been associated with a wide variety of illnesses in pregnant women and their infants. Meta-analyses of observational studies show that dysbiosis precedes the onset of NEC. Several meta-analyses show that prophylactic probiotics may prevent NEC and sepsis in neonates. Postpartum probiotics to mothers show a trend towards less NEC in their infants. Maternal Caesarian section and prenatal antibiotics have been associated with atopy and asthma in the infants and combination of pre-and postnatal probiotics have been shown to prevent atopy. Dysbiosis has been associated with infantile colic. While there is no clear-cut evidence, L reuteri has been shown to reduce crying time. A dysbiotic maternal microbiome may increase the risk of preterm birth but robust evidence is still lacking regarding the role of probiotics in preventing preterm birth. Dysbiosis has been associated with maternal gestational diabetes mellitus and a meta-analysis of trials comparing probiotics with placebo show better glucose homeostasis. Observational studies show an association between maternal prenatal antibiotics and childhood obesity risk.

Panel Discussion 1 17:00-18:00

Emerging Critical Issues

Pediatric COVID -19 Vaccines - A Perspective

Dr Nithya Gogtay

Professor & Head, Clinical Pharmacology, King Edward Memorial Hospital (KEM), Mumbai, India.

Date of birth: 21st September 1968

Qualifications:
M.D (Pharmacology) Jan 1994
DNB (Pharmacology) Aug 1994
DNB (Clinical Pharmacology) Dec 1996
PhD (Applied Biology) July 2013
FRCP, May 2015

Registration number 66234, registered with the Maharashtra Medical Council, Mumbai, India

Registered as a speaker with Maharashtra Medical Council – MMC/MAS/04236/2015

Current position: Professor and Head of Clinical Pharmacology, MS Building, 1st Floor
Seth GS Medical College & KEM Hospital,Parel, Mumbai - 400 012, INDIA

Phone: 91 22 24133767 or 24174420(Work)
91 22 24149778/24124359 (Residence)
Facsimile: 91 22 2411 2871
E mail: njgogtay@hotmail.com and nithyagogtay@kem.edu

Past positions held and affiliations

- Editor – Journal of Postgraduate Medicine [2012-2016]
- Member editorial board- British Journal of Clinical Pharmacology [2017-19]
- Life member [L-759] of the APCRI- Association for the Prevention and Control of Rabies in India.
- Member of Working Group – Indian Council of Medical Research [ICMR] guidelines for biomedical and health research involving human participants

Current affiliations

- Chairperson – Institutional Ethics Committee- 1, Tata Memorial Hospital, Mumbai
- Chairperson- Institutional Ethics Committee, PD Hinduja Hospital and Research Center, Mumbai
- Member of Human Infection Challenge [HIC]- Vaccine network, UK, Aug 2019 onwards

Patent

- Srivastava S, Patankar S, Ray S, Thatte U, Gogtay N, Durairaj R, Dikshit J, Subramanian K et al. Protein markers for Plasmodium vivax malaria, application number 2195/MUM/2012, under Indian Patents Act [1970] along with Indian Institute of Technology, Bombay

Abstract

Early use of COVID -19 vaccines to mitigate the impact of the pandemic began with adults, elderly and the vulnerable populations. Though severe illness is less common in children, there is a small proportion of children who do need hospitalization and deaths have also been seen. Thus, vaccinations are needed for this group as well. In addition, the multi-system inflammatory syndrome is a complication seen in children. Several vaccines are now licensed for use in older children worldwide and many are in clinical development and are being tested in very young children as well. Vaccinating children protects the child, reduces the spread of the virus within the family and community and ensures continuity of education. However, building public trust, nuanced education of parents and caregivers and ongoing Pharmacovigilance for benefit -risk assessment remains paramount as mass vaccination in this population is rolled out. Ethical issues of clinical trials/ studies in children and very young children, post study access for children in placebo controlled trials, ensuring equitable vaccine distribution, challenges in implementation prior to large scale roll out, and adherence of the parent/caregiver need to be given careful thought. Microbiota play a key role in shaping immune system maturation and activity. Probiotics may influence the immunomodulatory effects of vaccines, and this offers an exciting area for both research and potential implementation with both COVID -19 and non COVID -19 vaccines once there is a strong evidence base.

Reducing Greenhouse Emission through Probiotics

Prof A.K. Srivastava

Member, Agricultural Scientists Recruitment Board (ASRB), New Delhi, India

Prof. (Dr.) A.K. Srivastava, the former Director and Vice Chancellor of National Dairy Research Institute, Karnal is a distinguished Dairy and Animal Scientist. He is presently working as Member (Animal Sciences), Agricultural Scientists Recruitment Board, Ministry of Agriculture and Farmers Welfare, GoI. He is graduate and postgraduate from Veterinary College Mathura. He obtained Ph.D. from PAU Ludhiana and Post Doctorate from Institute of Toxicology, München, Germany. Prof. (Dr.) Srivastava is honoured with Degree of Doctor of Science (D.Sc. Honoris Causa) from Veterinary University, Mathura and Veterinary University Jabalpur. Presently Prof. Srivastava is President National Academy of Dairy Science (India), and Patron of Indian Dairy Association. He is President of Probiotic Association of India and also President, Association of Mastitis. Earlier, Prof. Srivastava was Vice President and Secretary, NAAS, and also the President, Indian Society of Veterinary Pharmacology and Toxicology. He was also Chairman Indian Dairy Association; Chairman, FAD 19, Bureau of Indian Standard Committee, BIS, Govt. of India. Dr. Srivastava was Founder Authority Member of "Food Safety and Standard Authority of India (FSSAI)" and member of International Dairy Federation.

Abstract

The green house gas emission and Climate change are continuously transforming the ecosystem and threatening the health of human generations. Livestock are believed to be a significant contributor of climate change, because 14%-18% of total global anthropogenic greenhouse gas (GHG) emissions is coming from this sector. The United Nations' Food and Agricultural Organization calculated that between 2005 and 2015, the dairy cattle industry's greenhouse gas emissions increased by 18% as demand for milk grows. Worldwide, cattle for dairy and beef production account for 20% and 41% respectively, of the emissions of this sectors followed by buffalo milk and meat, with 8% of the emissions. Methane is by far the largest contributor to total GHG emissions from the dairy sector-accounting for over half of total emissions, while nitrous oxide contributes to between 30 and 40 percent of total emissions. India is the world's largest milk producer, with 22 percent of global production, followed by the United States of America, China, Pakistan and Brazil. Global demand for livestock products is expected to double by 2050. This means more intensive dairy farming and more GHG production. In India, in spite of significant gains in production efficiency, the greenhouse gas (GHG) emissions from livestock are on the rise. Rapid population growth and shifting trends in dietary patterns towards more dairy and meat products will further result in increased emissions unless the production efficiencies and management are significantly improved. As such a successful action on reducing the green emission from livestock food production systems is a priority. There is an urgent need to reduce the GHG emissions from livestock to tackle the human health. Enteric fermentation is the largest GHG contributor in the animal food production system. Hydrogen and methyl containing compounds generated as fermentation end products of rumen fermentation are used by different group of rumen methanogenic archaea to form methane (CH_4). Microbial feed additives with probiotics, based on *Saccharomyces cerevisiae* and *Aspergillus oryzae* have been found to reduce the methane production by 50% which is directly related to reduction in protozoa growth by 45%. The methanogens are known to be associated with ciliate protozoa, which contribute upto 37% of rumen methanogenesis. The sufficient literature on the use of several probiotics including *Lactobacillus* (LAB) either alone or in combination to reduce the CH_4 production in rumen of livestock are available. However, it is not clearly understood whether the probiotics/ LAB or their metabolites affect the methanogens themselves, or whether they affect the other rumen microbes that produce substrate necessary for methanogenesis. It is also recommended that the use of probiotics for mitigation of GHG can be used in combination with other mitigation options such as vaccines, CH_4 inhibiter etc. Further, by increasing the number of sulphate reducing bacteria, *Denitrobacterium detoxificans* and *Wolinella succinogens* in rumen, the availability of hydrogen to for synthesis of methane can be reduced.

Gut Microbiota in combatting Anti Microbial Resistance

Dr. Kamini Walia

Scientist F and Program Officer- Anti Microbial Resistance, Indian Council of Medical Research (ICMR), New Delhi.

Dr. Kamini Walia is a microbiologist by training and has subsequently trained in public health from Johns Hopkins. She is working as Senior Scientist in the Division of Epidemiology and Communicable Diseases Division of Indian Council of Medical Research. She spent 2 years in PATH, as Director, Research and Development. During her 20 years of experience in public health space she has initiated and successfully steered numerous projects and programs of public health importance in the field of infectious diseases, reproductive and child health and noncommunicable diseases. Dr Walia's experience spans working on nfectious diseases, including HIV/AIDS programs and heath technologies including vaccines and diagnostics. Dr Walia is currently leading the
Antimicrobial Resistance Initiative of ICMR which focusing at various aspects of AMR, including surveillance, antimicrobial stewardship and OneHealth aspects . She curated the National Essential Diagnostics for the country to improve availability of diagnostics at all levels of health care. She is former member WHO Scientific Advisory Group of Experts on Essential Diagnostics.
She is member:

- WHO Scientific Advisory Group of Experts on AMR Diagnostics
- Scientific Advisory Committee of GARDP
- Commissioner on Lancet Commission on Diagnostics

She is recipient if ICMR's Shakuntala Amir Chand award , Indian National Science academy, Young Scientist Award and NIH's Fogarty Fellowship. She has received numerous fellowships and trainings from WHO, NIH, USA, IVI, Seoul, Pasteur Institute, France. She has more than sixty publications in peer reviewed journals.

Probiotics in Managing the Altered Gut in Autism Spectrum Disorder

Prof. Asna Urooj

Professor, DOS in Food Science & Nutrition, University of Mysore, Mysore, India

Dr Asna Urooj, is a Professor of Food science & Nutrition, University of Mysore, Mysore, with research interest in NR-NCD's, Medicinal plants, functional foods and Autism. She has completed 14 research projects funded by UGC, DST, MHRD, BBSRC, MRC -UK. She is a reviewer for several National and International journals,has 205 publications in peer reviewed journals, with 4415 citations and h-index of 32. 20 candidates have completed PhD, 8 are working. She is a recipient many awards - Dr. Kalpana Chawla State award, Prof G.S. Bains Lifetime achievement award and Dr Rajammal Devadas Oration award, Young scientist and 50 best paper awards. She is a member of FSSAI, IDA-RD Board and NAAC peer team.

Abstract

Autism spectrum disorder (ASD), a group of neuro developmental disorder characterized by difficulties in social interaction, communication, restrictive and repetitive behaviour. Children display eating problems and picky eating, which places them at risk of nutritional deficiencies impacting growth and development. The causal relationship between GI symptoms and autism is supported by studies that show frequency of GIS; chronic diarrhoea and constipation tend to increase with the severity of autism. A reliable quantification of GIS rates is not available, current data suggest an approximation of 40%. To date, only one study in India reports the gut microbial dysbiosis and association of selected *Lactobacillus* species with gut microbiome.

We have investigated the nutritional status, food behaviour issues in ASD children and compared with typically growing counterparts in Mysore city. Overweight, obesity and micronutrient deficiencies were prevalent in ASD children. Meal time behaviour issues and eating problems were higher among ASD than TD controls. Food behaviour and GI issues were observed along with restricted use of gluten and casein sources with limited food diversity compared to TD controls. Dietary intervention showed improvement in food behaviour and GI issues.

Analysis of 16S rRNA metagenomic sequence datasets of 30 out of 206 autism subjects retrieved from American gut project archives revealed a 5 and 2-fold increase in *Prevotella* sp. and *Sutterella* sp. in ASD cases. The constructed pathway revealed succinate and butyrate as the significant metabolites for the bacterial signature species identified. In-silico analysis of PTEN gene established plausible genotypic predictors of ASD-associated phenotypic outcomes. The link between GI symptoms and derangement of the gut microbiota, opens up avenues to investigate the modulation of the gut microbiota in ASD by means of probiotics as potentially safe therapeutic option.

Scientific Session Two 10:00-11:30

IgA Drug Development as a Gut Microbial Regulator

Prof. Reiko Shinkura

The University of Tokyo, Institute for Quantitative Biosciences, Laboratory of Immunology and infection control, Tokyo, Japan

Since 2018, **Dr. Shinkura** has been a professor in Institute for Quantitative Biosciences (the University of Tokyo, Japan). She graduated from Kyoto University (MD, 1986) and worked as a clinician for six years. She obtained PhD in 1997 (under Dr. Tasuku Honjo). Then she continued research with Dr. Frederick W Alt at Harvard Medical School in Boston, USA. In 2003, she rejoined Dr. Honjo's group. In 2010, she established a new laboratory in Nagahama Institute of Biosciences and Technology, Nara Institute of Biosciences and Technology and present institute. She focuses on IgA drug development as a gut microbial regulator.

Abstract

Recently dysbiosis is frequently reported to be associated with illnesses such as inflammatory bowel disease (IBD), obesity, cancer, etc. Immunoglobulin A (IgA) is the main antibody isotype secreted into the intestinal lumen. IgA plays a critical role in the defense against pathogens and in the maintenance of intestinal homeostasis through gut microbial control. However, how secreted IgA regulates gut microbiota is not completely understood. In the previous study, we found that the high-affinity intestinal IgA produced by somatic hypermutation process is important to control non-pathogenic gut bacteria as well as pathogens. Our main question is what kind of bacterial molecule an intestinal high-affinity IgA recognizes and targets.

To address this question, we generated hybridomas from IgA producing cells in small intestine of wild type mice. As a candidate of efficient gut microbiota modulator, we selected a W27 IgA that binds to multiple bacteria but not beneficial ones such as *Lactobacillus casei*. Via specific recognition of an epitope in serine hydroxymethyltransferase (SHMT), a bacterial metabolic enzyme, W27 IgA selectively inhibited the in vitro growth of bound bacteria, including *Escherichia coli (E. coli)*, while having no effect on unbound beneficial bacteria such as *L. casei*. It indicates that W27 IgA has an ability to improve the intestinal environment. Indeed, W27 oral treatment could modulate gut microbiota composition and have therapeutic effect on both lymphoproliferative disease and colitis models in mice.
In addition, we have shown that W27, a mouse IgA antibody, can modulate human gut microbial composition in *in vitro* culture. Thus, W27 IgA oral treatment is a potential remedy for a variety of diseases associated with dysbiosis, acting through restoration of the host-microbial symbiosis. I will discuss the possibilities of oral IgA drug as a gut microbial modulator.

Our Gut Microbiota as a Source of Novel Bacteria Beneficial for Human Health

Dr. Philippe Langella

INRAE, Research Institute for Agriculture, Food and Environment, Paris, France.

I am Research Director at INRAE and Head of the Laboratory of Commensals and Probiotics-Host Interactions. I am expert in the genetics of lactic acid bacteria (LAB), and the use of LAB as live delivery vehicles to improve human health. Since 2004, I'm involved in both commensals and probiotics domains to better understand the mechanisms of these bacteria and to enhance their use in human and animal health. My main goal is to gain a better understanding of the crosstalk between these resident and transiting bacteria and the host in order to unravel the mechanisms of their beneficial effects on human health. I'm more particularly studying anti-inflammatory effects of commensals and probiotics in murine models have authored 249 peer-reviewed International publications at the interface between microbiology and human health (WoK h-index 64). I'm co-inventor of 23 patents in the domain of the use of commensal and probiotic bacteria in health domain. I have participated in numerous National and European research projects and have strong research collaborations with several agro-food and pharmaceutical companies. I'm a referee for many International journals and consulting expert for several agro-food and pharmaceutical companies.

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Abstract

[1]Commensal and Probiotics-Host Interactions Laboratory, Université Paris-Saclay, INRAE, AgroParisTech, Micalis Institute, 78350, Jouy-en-Josas, France.

In 2008, we have identified *Faecalibacterium prausnitzii* as the first anti-inflammatory commensal bacterium detected on the basis of human clinical data and validated in acute TNBS-induced colitis model1. Since this finding, diminished prevalence and abundance of *F. prausnitzii* have been reported in gastrointestinal disorders as Inflammatory Bowel Disease (IBD)[2] and Irritable Bowel Syndrome (IBS)[3]. Today, it is well established that the absence of *F. prausnitzii* is associated with several human dysbiotic diseases and can be thus considered as a biomarker of human health[4].
F. prausnitzii is thus now a major actor in novel preventive and curative strategies required to prevent and to treat gastrointestinal disorders and diseases. Here, we will present all our last results on *F. prausnitzii* and human health. We will thus describe its beneficial effects in i) a chronic inflammation model[5]; ii) in a chronic low-grade inflammation model to mimic the disorders observed in IBS patients[6],[7]; and iii) in acute stress models which are neomaternal separation mice model and partial restrain stress in rats[8]. More recent data on the mode of action (MoA) will be also described including i) the novel gnotobiotic model which led us to the identification of anti-inflammatory metabolites potentially produced by *F. prausnitzii*[9]; and ii) the identification of a potential anti-inflammatory *F. prausnitzii* MAM (for Microbial Anti-inflammatory Molecule) protein[10]. All these MoAs have been summarized in a mini-review[11].
All these recent results confirm the high potential of F. prausnitzii as a potential next-generation probiotic for both IBS and IBD patients.

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Effect of Multistrain Product on Gut microbiota following an Antibiotic Challenge

Dr. Muriel Derrien

Senior Researcher, Danone Research Centre, Paris, France

Dr Muriel Derrien is senior scientist at Danone Research (Palaiseau, France). She has a long-standing experience in gut microbiota, that started in 2002 at Wageningen University. Her PhD, part of an European project, focussed on the characterization of mucin-degrading bacterial communities in human, and their association with host. Notably, she isolated *Akkermansia muciniphila*, which is now of the most promising next-generation beneficial microbe. During her post-doc research, she worked on more inter-disciplinary projects within the Dutch consortium Top Institute in Food and Nutrition, where she was part of several projects to elucidate the interaction between gut microbiota and host, following dietary interventions. In 2010, she joined Danone Research in France, where she is currently leading National and International projects on the topic of nutrition, and is a driver of the Gut microbiota research. Her major ambition is to elucidate how diet and especially probiotics, selected for specific functional trait, may enrich gut microbiota function and ultimately improve human health.

Abstract

Probiotics have been used for decades to alleviate the negative side-effects of oral antibiotics, but our mechanistic understanding on how they work is so far incomplete. Here, we performed a metagenomic analysis of the faecal microbiota in participants of a randomized, double-blinded, controlled clinical trial that tested the effects of a 7-strain fermented milk product on microbiome recovery after a 14-day *Helicobacter pylori* eradication-therapy including proton pump inhibitors and antibiotics. Ingested strains were detected transiently in faecal samples and shown to be replicating in the gut despite antibiotic administration. Consumption of the fermented milk product led to a significant improvement in the recovery of microbiota composition. Stratification of participants into two groups based on the degree to which their microbiome recovered showed i) a higher faecal abundance of the *L. paracasei* and *L. rhamnosus* strains and ii) an elevated replication rate of one strain (*L. paracasei* CNCMI-1518) in the recovery group. Collectively, our findings suggest that abundance and in vivo activity of probiotics is a lever to ameliorate efficacy of probiotic-based intervention aimed to protect gut microbiome from drug treatments.

Panel Discussion 2 12:00-13:00

Application of Probiotics

Promoting Good Health through Industry Partnered Quality Probiotic Clinical Trials

Dr. B. Sesikeran

Former Director, National Institute of Nutrition, Hyderabad, India.

Dr. Sesikeran is the Former Director of NIN, ICMR Hyderabad. He is a Pathologist by training and has carried out research in the area of Nutrition, Food Safety, and Toxicology for 30 years. He has over 120 publications and Chapters in 3 Books. He has developed guidelines for Probiotics in foods, Guidelines for GM food safety, Guidelines for Biosimilar Drugs, Recommended Dietary Allowances and Dietary Guidelines. He was the Director NIN between 2006 and 2012. He is a Fellow of the National Academy of Medical Sciences and Fellow of the International Medical Scientists Academy. He is Fellow of AP & Telangana Academies of Sciences. Past President Nutrition Society of India. He is Public Trustee of ILSI India. Member Governing Body of Nutrition Foundation India, Member- Advisory Council on Science -Coca Cola India. Member Scientific Advisory Committee Gut Microbiota and Probiotic Science Foundation (India). He is also the Chairman of the Scientific Advisory Committee of PFNDAI.

Abstract

With increasing understanding of the gut microbiota and probiotic science there was an increasing need for well-designed randomized controlled clinical trials to establish the efficacy and safety of several probiotics and probiotic formulations in India. This brief presentation is intended to capture the completed and ongoing or planned clinical trials wherein industry has collaborated with reputed National Institutions and Public sector institutes to come out with reliable evidence based proof of efficacy in specific clinical situations.

Patient Reported Outcome- Functional Constipation

Prof. Ajay Bhalla

Director & HOD, Department of Gastroenterology, Fortis Hospital, Noida, India

Prof. Ajay Bhalla is Director and HOD-Gastroenterology, Fortis Hospital, Noida. He pursued a fellowship in Advanced Therapeutic Endoscopy from Harvard Medical School in 2004 and went through an advanced training in Liver Transplant in 2006 from the Gleneagles Hospital in Singapore. Prof. Bhalla is member of the Indian Society of Gastroenterology (ISG), Indian Association of Study of Liver Disease (INASL), and the Society of Gastrointestinal Endoscopy of India. He is also a fellow member at the Indian Association of Clinical Medicine, a member of API and the Indian Medical Association.
He was the first person to perform ERCP (Endoscopic Retrograde Cholangiopancreatography) in Noida and has the highest number of PEG (Percutaneous Endoscopic Gastrostomy) procedures under his belt in the last 5 years in India.

Abstract

Objective: Chronic constipation is a common gastrointestinal disorder with limited treatment options. Role of probiotics is well established in infective & antibiotic associated Diarrhea but emerging trends show a possible role in Irritable Bowel Syndrome & constipation. In slow transit constipation (STC) improvement of colonic transit time by acceleration of transit in rectum & sigmoid.

Methods: This pilot study was done on 40 patients with functional constipation. Patients were selected on the basis of constipation assessment scale questionnaire where a score of 0 was no constipation and 14 was worst possible constipation. 20 patients were given standard of care (lifestyle changes, including increased exercise, a high- fiber diet, toilet training & pharmacologic options- fiber supplementation, prokinetics and laxatives). The other 20 were given standard of care + probiotic (Yakult) twice for 6 weeks. Patients were reassessed at 2 weeks and 6 weeks after treatment to see change in score

Results: Probiotics along with standard of care improved the overall constipation assessment score more than standard of care alone with maximum change in bowel movement, rectal pain, abdominal distension & incomplete evacuation. No adverse effects were observed.

Conclusions: In this pilot study, Probiotics improved bowel habits and symptoms of patients with chronic constipation. Further, randomized controlled trials were warranted.

Revisiting Probiotics in Acute Childhood Diarrhoea

Prof. Keya Lahiri

Professor & Former Head, Department of Pediatrics, DY Patil Medical college & Hospital, Mumbai, India

- Professor, D Y Patil University School of Medicine, Navi Mumbai, India
- Former Professor & Head Paediatrics , Seth G S Medical College, KEM hospital , Mumbai, India
- Teaching Experience (UG/PG) : 41 years
- Invitation for National and International Speaker Programmes on Probiotics in Childhood Diarrhoea (Latin America; Europe & South East Asia)
- National Coordinator (NC), Principal Investigator (PI) & Steering Committee member : Major Clinical
- Global Studies
- Multiple Publications
- Chairperson (Respiratory Chapter IAP)
- Fellow of IAP (F-2003/L-2)
- Felicitated by Hon Mayor & Medical Director for services during Mumbai Deluge (2005)

Abstract

From: Department of Paediatrics, D Y Patil University School of Medicine, Nerul, Navi Mumbai, 400706

Healthy microbiota is paramount for good quality of life and Global registry observational study **(REMAD 2)** in sixteen countries revealed probiotic usage in acute childhood diarrhoea. **(Guarner F, Lahiri K et al.)**

We studied the **efficacy** of probiotic ***Lactobacillus casei* strain Shirota** (LcS) with regards to the **duration** and **frequency** of acute diarrhoea. We also compared the **rehydration** status , along with the **hospital stay** and **economic burden** in the study and control groups.

We conducted an open label, prospective, randomized, comparative study at a tertiary care hospital in Navi Mumbai. Institutional Ethics committee approval and informed consent were obtained. Subjects were divided into **study group (ORT + Zinc + Probiotics)** and **control group (ORT + Zinc)**. We studied **122** cases ranging between six months- 12 years of whom 78 (64%) were males and 44 (36%) were females. Majority of the cases i.e., 55% and 58% were less than one year of age in the study and control group respectively.

There was a significant difference **(27.28 hours)** in the **duration** of diarrhoea between the study and control group with reduction in the **frequency** of stools at **24.36 and 48 hours.** The study group **rehydrated 9.5 hours earlier**, thereby reducing hospital stay by 1.69 days. The reduction in treatment and social cost were **INR 194** and **INR 524** respectively between the groups.

LcS seems promising as an adjuvant therapy with ORS and Zinc in reducing the duration and frequency of diarrhoea in children. It simultaneously aided in reducing the economic burden and the hospital stay of children and care-givers significantly.

Diabetes and Probiotics

Prof. V. Mohan

Chairman, Mohan Diabetes Centre, Chennai, India

- **Dr.V. Mohan**, M.D., FRCP (London, Edinburgh, Glasgow & Ireland), Ph.D., D.Sc. D.Sc (Hon. Causa), FNASc, FASc, FNA, FACE, FACP, FTWAS, MACP, FRSE
- Chairman & Chief of Diabetology, Dr. Mohan's Diabetes Specialities Centre & Madras Diabetes Research Foundation, Chennai, India
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Abstract

There is increasing evidence that gut microbiota-host interactions play a key role in the pathophysiology of type 2 diabetes and modulates energy homeostasis and glucose homeostasis and alters insulin secretion as well as insulin sensitivity and action. Gut-derived endotoxins (metabolic endotoxemia) may contribute to subclinical meta-inflammation resulting in insulin-resistance. We have demonstrated increased circulatory lipopolysaccharide (LPS) levels and LPS activity in patients with type 2 diabetes mellitus (T2DM) that showed positive correlation with inflammatory markers and poor glycemic/lipid control. Cross-sectional clinical studies have also confirmed that the composition of the gut microbiota is altered in subjects with prediabetes or type 2 diabetes patients compared to healthy individuals. In a large Indo-Danish metagenomics studies, our group has recently identified ethnic-specific and robust gut microbiome signatures characterizing the
prediabetic and T2DM states. Several studies are underway to unravel the new biology insights of gut microbiome and type 2 diabetes with drug targeting focus on branched chain amino acids (BCAAs), short-chain fatty acids (SCFAs), bile acids (BAs), free fatty acid receptors (FFARs) and G-protein Receptors (GPRs). Owing to the emerging role of the gut microbiome in T2DM, the interaction between gut microbes and anti-diabetic drugs and the microbiome influence on drug functions has also become a thrust research area. A meta-analysis (comprising of 15 randomized controlled trials) which evaluated the effectiveness of probiotics indicated that probiotics treatment may reduce HbA1c, fasting blood glucose and insulin resistance level in T2DM patients. In one of our animal model studies where mice fed with high-fat diet were characterized as insulin resistant and diabetic, we have demonstrated increased gut permeability, increased circulatory levels of LPS, decreased gene expression patterns of intestinal tight junction markers (occludin and ZO-1), and increased proinflammatory gene markers. Interestingly these molecular perturbations were negated by
probiotics treatment suggesting a beneficial role of probiotics both in prevention and management of diabetes. There is also a paradigm shift of developing next generation probiotics (NGP) as pharmaceutical agents rather than just nutraceutical components.Such NGPs in the pipeline testing against insulin resistance and diabetes include *Prevotella copri, Christensenella minuta, Parabacteroides goldsteinii, Akkermansia muciniphila, Bacteroides thetaiotaomicron, Faecalibacterium prausnitzii* and *Bacteroides fragilis*. In a recent study, anti-diabetic effects of *Clostridium butyricum* CGMCC0313.1 has been shown to occur through promoting the growth of gutbutyrate-producing bacteria intype 2 diabetic mice. Future research should address the interactions among diet, prebiotics, probiotics and microbiota with much more focus on impact of habitual dietary intake, single versus multiple probiotic strain effects and use of probiotics as an adjunct to glucose-lowering drugs. In the future, we can expect targeted colonic delivery of SCFAs, use of pasteurised probiotics and genetically modified bacteria- but all these would need appropriate randomized controlled trials (RCTs) to assess their efficacy and safety.

Characterization of Dysbiotic Vaginal Microbiome Associated with Preterm Birth in a Longitudinal Cohort Study (GARBH-Ini) on Pregnant Women from India

Mousumi Sarkar (First Prize)

Authors: Mousumi Sarkar[1], Naina Kumari[1], Shakti Kumar[2], Daizee Talukdar[2], Akansha Kothidar[2], Ojasvi Mehta[2], Pallavi Kshetrapal[2], Nitya Wadhwa[2], Ramachandran Thiruvengadam[2], BapuKoundinya Desiraju[2], G. Balakrish Nair[2], GARBH-Ini study group, Shinjini Bhatnagar[2], Bhabatosh Das[2], Souvik Mukherjee[1]
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2Molecular Genetics Laboratory, Translational Health Science and Technology Institute, NCR Biotech Science Cluster, Faridabad, India
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Full Name Mousumi Sarkar Permanent Address- Vidyashram, Dhupguri, Jalpaiguri, Pin-735210 Current position- 3rd year Ph.D student at National Institute of Biomedical Genomics, Kalyani, West Bengal. I have Completed M.Sc. in Zoology from Cooch Bihar Panchanan Barma University in 2016 and B.Sc in Zoology from North Bengal University in 2014. I have qualified GATE in 2017 and CSIR-UGC Net in 2018 with UGC JRF rank 60. I have attended India|EMBO Symposium on Human Microbiome: Resistance and Disease at NIBMG.

Abstract

Introduction: Preterm birth (PTB) is defined as any live birth before 37 completed weeks of gestation. India has the highest number of Preterm births/year (13%). Vaginal microbiome plays an important role during pregnancy by protecting vaginal microenvironment against foreign pathogen invaders. Alteration of microbiome composition could lead to bacterial vaginosis which facilitates early inflammation eventually leading to PTB.
Objectives: To investigate the difference in microbiome composition and diversity between Term and Preterm delivering mothers during the progression of pregnancy

Methods: Vaginal swab has been collected longitudinally from nulliparous pregnant women (140 Term and 60 Preterm) from the GARBH-Ini cohort. Microbiome DNA was isolated and subjected to massively parallel sequencing of V3-V4 region of 16S gene to identify bacterial taxa upto species level.

Results: Among mothers who delivered Preterm (a) in 1st Trimester, *Lactobacillus crispatus* (TB:21.3%, PTB:6.8%; p=0.007), *Lactobacillus jensenii*, *Lactobacillus acidophilus* were significantly lower, whereas *Lactobacillus iners* (TB:20.9%, PTB:33.7%; p=0.03) was significantly higher; (b) in 2nd Trimester, non-Lactobacillus taxa *(Gardnerella vaginalis, Megasphaera sp, Veillonella montpellierensis)* were significantly higher ($p<0.05$). *Lactobacillus iners* and *Gardnerella vaginalis* were found to coexist (rho=1, p=2 x 10-16). Community-State-Type (CST) analysis also revealed CST-I (dominated by *L. crispatus*) and CST-III (dominated by *L. iners*) to be significantly higher in Term and Preterm samples in the 1st trimester.

Discussion: Alteration of vaginal microbiome in 1st and 2nd trimesters are significant predictors of PTB. Presence of Lactobacillus crispatus in vaginal samples protects against foreign pathogens by its antimicrobial activity. Presence of Lactobacillus iners and non-Lactobacillus taxa in 1st and 2nd trimesters elicits a state of inflammation associated with bacterial vaginosis and Preterm birth.

Conclusion: Lactobacillus crispatus is a keystone species which can make the vaginal micro- environment less diverse by inhibiting the invasive microbes.

Key message: Lactobacillus crispatus could be an influential probiotic for healthy pregnancy.

Gut Microbial functions linked with the Non-alcoholic fatty liver disease of Indian patients

Ayushi Purohit (Second Prize)

Authors: Ayushi Purohit, Agila Kumari Pragasam, Deepjyoti Paul, Sanjay. K. Banerjee, Bhabatosh Das
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Currently I Ayushi is pursuing my Ph.D. at Translational Health Science and Technology Institute (THSTI). I am working in a research area from two distinct domain area to understand a complex disease, Non-alcoholic Fatty Liver Disease (NAFLD) and solve new challenges in the field of metabolic disorder. My topic of research is Insights into the pathophysiology of NAFLD: Exploring the role of Microbial Functions and developing animal Model under the supreme guidance of Dr. Bhabatosh Das, Associate Professor, Translational Health Science and Technology Institute (THSTI) Faridabad, INDIA and Dr. Sanjay Banerjee, Associate Professor (Supervisor) National Institute of Pharmaceutical Education and Research (NIPER), Guwahati, INDIA. The primary focus of our research is Non-alcoholic fatty liver disease (NAFLD) is a chronic metabolic disorder, which primarily affects liver by inducing accumulation of extra fat. The prevalence of NAFLD is directly linked with Type II diabetes and obesity. Etiology of NAFLD is not precisely defined, but gut microbial dysbiosis plays a critical role in the development of NAFLD. Increase abundance of proteobacteria with pro-inflammatory functions are potential risk factor for NAFLD.

Abstract

Introduction: Non-alcoholic fatty liver disease (NAFLD) is an emerging global health problem and a potential risk factor for type 2 diabetes, cardiovascular disease, and chronic kidney disease. The global prevalence of NAFLD has increased from 15% in 2005 to 24% in 2016. However, the etiology of NAFLD is not precisely defined. The emerging evidences indicated gut microbial dysbiosis plays a critical role in the development of NAFLD. In the present study we identified gut microbiota signatures in biopsy proven NASH subjects that can directly induce fat deposition, inflammation and hepatocellular ballooning.

Objectives: (i) Identify gut microbial taxa associated with NAFLD. (ii) Decipher the whole genome sequences of bacterial taxa associated with NAFLD (iii) Functional evaluation of the microbial functions linked with the prognosis of disease.

Methods: (i) Bacterial taxa were isolated from the fecal samples of biopsy proven NASH patients. (ii) Whole genome sequencing of the isolated bacterial taxa was done in MiSeq platform. Sequences were assembled and annotated using in house developed pipeline. (iii) Supplementation of the bacterium to the mice with normal or choline deficient high fat diet and examined the steatohepatitis and inflammation in hepatic cells.

Result: We have isolated *Collinsella aerofaciens* from the fecal samples of biopsy proven NASH patients. *C. aerofaciens* genome is ~2.30-Mb in size with 60.1% GC content. The genome has 276 subsystems and is enriched with protein (n=135), carbohydrate (n=120), and vitamin (n=102) biosynthetic functions. In addition, the *C. aerofaciens* genome has 29 genes with potential virulence, pathogenicity, and disease development. We observed that compared to the normal diet, mice fed with choline deficient high fat diet accumulates substantial amount of fat in the hepatic cells. Fat accumulation was further augmented when mice fed with choline deficient high fat diet were supplemented with *C. aerofaciens*.

Discussion: Recent studies have reported changes in the microbiota in the gut of NAFLD patients compared to the healthy subjects. Microbiota with potential inflammatory functions and ethanol producing capacity are enriched in the gut of NAFLD patients, while the abundance of microbiota with anti-inflammatory functions are significantly decreased. Increased abundance of microbial taxa enriched with Pro-inflammatory functions could be a potential biomarker for early prediction of NAFLD. Hence, the microbial taxa we identified and sequenced have strong clinical and commercial interests.

Conclusion: We have first time isolated, sequenced and analyzed the genome of C. aerofaciens from Indian patients suffering from NASH. We evaluated the role of C. aerofaciens in the progression of NAFLD in a mice model. The current study, for the first time, reported the enrich carbohydrate and fat metabolic pathways and the pro-inflammatory functions of C. aerofaciens are potential risk factors for the progression of NAFLD.

Key Message: The insights from the current findings will help us to understand the importance of C. aerofaciens in the progression of NAFLD. It could be a potential geospecific biomarker for early prediction of NAFLD.

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Development of shelf-stable probiotic curd and its cholesterol lowering effect in mice and patients through downregulation of FXR

Meena Kumari P. (Third Prize)

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Ms. Meena Kumari P. is doing her Ph.D. from Academy of Scientific and Innovative Research (AcSIR), CSIR-Central Food Technological Research Institute (CFTRI), Mysuru. On the surface, she is an M. Sc. graduate in Nutrition Biology. As a biological science researcher, she is working on the probiotics and molecular mechanisms that connects hypercholesterolemia and gut microbiome. She has received many prestigious awards, viz SADHNA- All India Best Publication Award, DAAD award for bi-nationally supervised doctoral degree program (Germany), Recognized as reviewer for InSC, InSC- Young Achiever Award, All India Best Research at Master's level - SADHNA, The Young Scientist Award - NSI, The Best Student Award - AFSTI, Author of the Year Award - Agriculture & Food e-newsletter and many more. She has also published a research and review articles in reputed National and International journals.

Abstract

Introduction: Marketed fermented dairy products must be stored in refrigeration yet exhibits limited shelf-life. Thus, this study aimed to develop a shelf-stable probiotic curd using *Lactococcus lactis* (L11), a bacteriocin producer, isolated from a native dairy product and *Lactobacillus fermentum* MCC2760. This potential probiotic culture is proven for hypocholesterolemic properties in vitro and in vivo. With this background, the following objectives are framed.

Objectives:
1. To optimize the formulation of shelf-stable probiotic curd with a good probiotic count, sensory acceptability
2. To study the cholesterol-lowering effects of probiotic curd and the mechanisms involved in high-fat-fed C57BL6
3. To validate the cholesterol-lowering and cytokines modulatory effects of probiotic curd in hypercholesterolemic patients.

Methods: Metabolic characterization by FT-IR, storage study, proximate analysis, sensory analysis of developed probiotic curd was done. Further, the developed probiotic curd was tested on high fat-fed C57BL6 mice for 12 weeks. The changes in serum biochemical parameters, gut microbiota by 16S metagenomics and cholesterol-lowering mechanisms by qRT-PCR were studied. Further, the efficacy of probiotic curd was validated on a total of forty hypercholesterolemic patients by two weeks probiotic intervention clinical trial with the focus on cytokines modulation by the kit based method.

Results & Discussion: The formulated probiotic curd was stable at room temperature for 15 days without contamination and had better sensory acceptability. Further, shelf-stable probiotic curd supplemented C57BL6 mice showed a reduction in serum cholesterol, triglycerides, LDL-C, glucose, pathogenic bacteria count in the faeces. 16S metagenomics data displayed the higher abundance of Firmicutes, high Firmicutes/Bacteroidetes ratio and lower Verrucomicrobia phylum in the high fat-fed group.

Probiotics could regulate bile acid metabolism by downregulating the FXR gene and reducing the absorption of exogenous cholesterol by regulating NPC1L1. Probiotic treated hypercholesterolemic patients showed a reduction in plasma total cholesterol by 13.9%, low-density lipoprotein - cholesterol by 9.8%, triglycerides by 7.5%, glucose by 3.8% ($P < 0.001$ for all). 8.5% of the increase in the level of high-density lipoprotein was also noticed ($P<0.0005$). < 0.001 for all). 8.5% of the increase in the level of high-density lipoprotein was also noticed ($P<0.0005$).

Conclusion & key message:

- The formulated probiotic curd can be stored at room temperature for 15 days without contamination. It also had better sensory acceptability than market curd.
- Proven for cholesterol-lowering properties both in the preclinical and clinical trial
- Modulate gut microbiome positively and reduce cholesterol via down-regulating FXR pathway.

What is the effect of a dietary resistant starch intervention on the colonic luminal environment and HIV-related immunity and is a feeding trial feasible in HIV-positive adults in India?

Zaiba Hasan Khan

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Zaiba Hasan Khan has obtained her Masters degree in Biotechnology from MLSU Udaipur Rajasthan with a specialization in Biotechnology. She has obtained her Ph.D. from BITS-PILANI, Goa campus, in Plant Molecular biology and Bioinformatics. While she was working at BITS-PILANI, Goa campus, her doctoral dissertation was entitled Genome wide analysis of AAAG-ACGT cis-elements across plant genomes and its in-silico characterization using Protein Phosphatase 2A promoter (PP2A) from *Arabidopsis thaliana*. She is currently working as a Postdoctoral fellow in AIIMS Bhubaneswar where she is working on multi-centric projects based on the association of gut microbiome with diseases such as anemia, COVID-19, cancers, and data analysis of metagenomes.

Abstract

Hypothesis: We hypothesized that high amylose maize starch (RS) by managing gastrointestinal symptoms and side-effects would help in improving patient morbidity and facilitate better adherence to anti-retro viral therapy, thus reducing the population HIV viral load and decreasing onwards transmission risk.

Objective: To determine the effect of a dietary resistant starch intervention on colonic luminal environment, HIV-related immunity, gastrointestinal symptoms in HIV positive Indian adults.

Methods: A dosage of 40 grams/day of resistant starch was fed to HIV-positive adults living in and around Bhubaneswar, Odisha and this was supplemented to the normal diet in the form of 95 grams of High Amylose Maize Starch (HAMS) which was added to roti. A 'control starch intervention' of regular cornstarch at the same digestible starch fraction as the HAMS was used as the comparator. Fourteen day feeding periods with these two starches were separated by fourteen day 'washout periods' when no supplements were added to the diet and participants consumed their usual diet. Improvement of the colonic luminal environment was measured via increased SCFA, decreased pH and increased absolute and relative abundance of bacterial species. For HIV-related immunity CD4+ T-cell count and HIV viral load was measured.

Results: In some treatment by period interactions were observed resulting in a few significant effects recorded between treatments in period 2 – but not in period. The structure of the gut microbial community determined based on alpha diversity measures showed a trend of larger decreases in microbial richness and diversity following HAMS as compared to the regular cornstarch.

Conclusions: The prebiotic effect of RS resulted in increased SCFA and decreased pH, increased CD4+ T-cell count and decreased HIV viral load.

Key Message: Dynamic microbial composition following prebiotic RS intervention has been found to be linked with increased SCFA, decreased pH, increased CD4+ T-cell count and decreased HIV viral load in HIV positive adults.

Fermentation enhances antidiabetic, ACE inhibitory and Anti-inflammatory activities and release of bioactive peptides during fermentation of camel milk (Indian breed)

Subrota Hati

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Abstract

Introduction: The inhibitory activities of ACE are considered to be an effective way to treat hypertension (Krichen et al 2018). ACE-inhibitory peptides were found to be present in the primary structure of many food protein sources including camel milk proteins (Meisel et al 2006; Moslehishad et al 2013; Quan, Tsuda, Miyamoto, 2008). The addition of *Lactobacillus rhamnosus* to camel milk was found to exhibit ACE inhibition activity (Moslehishad et al 2013). Alhaj, 2016 Isolated seven ACE-inhibitory peptides KVLPVPQ, LHLPLPL, KVLPVPQQMVPYPQ, VLPFQEPVPDPVRG, FQEPFPDPVR, VMVPFLQPK were identified from camel milk fermented with *L. helveticus* strain.

Objectives: The aim of the study was to evaluate the fermented camel mil with bio-functional attributes viz. antidiabetic, ACE inhibitory and Anti-inflammatory against lipopolysaccharide-treated murine macrophages (RAW 264.7) efficacy and release of bioactive peptides with antidiabetic and ACE-inhibitory activity by employing Pepsin.

Methods: The antidiabetic, Anti-inflammatory, ACE inhibitory and proteolytic activities of the fermented camel milk were studied followed by SDS-PAGE analysis, FTIR and IEF. Anti-inflammatory activity of fermented camel milk was also studied on RAW 264.7 cell line. The separation of the bioactive peptides from whey protein hydrolysate was achieved by RP-HPLC. The purified bioactive peptides were identified and characterized using RPLC/MS using BIOPEP and AHTDB databases.

Results and Discussion: Various permeate and retentate samples (3 kDa, 10 kDa) were analysed for the anti-diabetic and ACE-inhibitory activities. α-amylase inhibition, α-glucosidase inhibition and lipase inhibition of 3 kDa permeate samples of fermented camel milk was 80.26%, 61.83% and 70.45% respectively. In case of 3 kDa retentate the. α-amylase inhibition, α-glucosidase inhibition and lipase inhibition of samples was 75.44%, 44.05% and 50.94% respectively. 10 kDa permeate fraction of fermented camel milk 79.29%, 58.57% and 65.08 % inhibition of α-amylase, α-glucosidase and lipase enzyme was observed. Fraction contain > 10 kDa showed 73.61%, 37.22% and 56.09% inhibition of α-amylase, α-
glucosidase and lipase enzyme was observed. ACE inhibition activity of <3 kDa fraction showed highest percentage inhibition 80.25% as compare to >3 kDa fraction which exhibited 72.31% inhibition. In <10 kDa peptide fraction percentage ACE inhibition was 77.39% which is slightly higher than >10 kDa fraction which exhibited 69.12% inhibition.

WSE obtained from fermented camel milk produced by M11 culture was analysed on SDS-PAGE using low molecular weight proteins (M.W. 10–180 kDa). Most of the protein bands of unfermented camel milk were in the range of 10 to 130 kDa while fermented camel milk showed protein bands of 10 to 100 kDa. 2D-PAGE of fermented camel milk was conducted for purification of protein dependent on isoelectric point and sub-atomic weight. Total 21 spots were observed on 2D PAGE of camel milk proteins fermented with M11. Following treatment with M11 for 24 h, cell viability exhibited 86% effect at 0.25 mg/mL. The effect of cell viability with M11 was in a dose dependent manner till 2mg/mL. Therefore, we conclude that the 0.25 mg/mL
concentration of M11 would be appropriate for further subsequent analysis. The nitrite production, TNF-α, IL-6, & IL-1β measured to assess the anti-inflammatory effects of M11 in LPS-induced RAW 264.7 cells. As shown in the figure 5b, LPS significantly induced the overproduction of nitric oxide (NO) relative to that in the control group whereas the stimulated effect was significantly downregulated by M11.

Conclusion: Identified antidiabetic and ACE-inhibitory peptides from Dromedary camel milk (Indian breed) has shown to have Tyr (Y), Arg (R) and Pro (P) at their ultimate C-terminal position, considering them as a possible candidate for ACE-inhibitory activity. These amino acids within the peptides were
previously found to contribute substantially to ACE-inhibitory potency. The strain L. paracasei is superior in respect toproduction of antidiabetic and ACE-inhibitory peptides, due to having high proteolytic activity as it requires all amino acids to fulfil its exceptional need of amino acids. Regular consumption of lactic fermented camel milk might assist in reducing cardiovascular diseases resulting from hypertension and also to stimulating the insulin production, which helps in absorption of glucose in human body.

Key Message: Fermented camel milk with L. paracasei M11 showed promising antidiabetic effect along with ACE inhibitory property.

Probiotics and Postbiotics : A Safer Alternative Antimicrobial therapy against Multi-Drug Resistant (MDR) Bacteria

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Dr. Rashmi H M obtained her Masters degree in Dairy Microbiology in 2010 and also Ph. D. in Dairy Microbiology in 2017 from ICAR-National Dairy Research Institute, Karnal. In 2011, she started her career as Scientist at ICAR-NDRI, Karnal in the Dairy Microbiology Division. She has made invaluable scientific contributions through her work in frontier areas of probiotics and gut microbiota. She also investigated the gut microbiota of malnourished children, and healthy adults of north and north-eastern region of India. Her scientific contributions are well supported by peer reviewed publications (25 research papers, 6 reviews, etc.) in high impact journals of National and International repute and scientific awards (young investigator award from Probiotic Association of India,2014 and best poster) at various National and International conferences.

Abstract

Introduction: Antimicrobial resistance (AMR) poses a major threat to human health around the world. Intestinal and extra-intestinal colonization of deadly superbugs like ESBL *Escherichia coli* and Methicillin-Resistant *Staphylococcus aureus* (MRSA) have markedly increased the global burden of mortality and morbidity among hospitalized patients and communities. Therefore, unraveling the alternatives toantibiotics should be of high priority for the furtherance of mankind.

Objective: The objective of the present study was to evaluate the functional efficacy of probiotics and postbiotics (heat-killed probiotic cells, cell surface proteins, and biosurfactants) against two leading multi-drug resistant pathogens *viz.* ESBL *E. coli* and MRSA.

Methods:A total of ten indigenous probiotic strains of Indian gut origin *Lactiplantibacillus plantarum* (A1, A5, Lp9, Lp91), *Limosilactobacillus fermentum* (LbS4, Lf1, Ad06), *Lacticaseibacillus rhamnosus* LrhS3, *Limosilactobacillus reuteri* Lre120 and *Lacticaseibacillus casei* LbS2 were screened for cell surface, mucin adhesion, and antagonistic properties against six clinical isolates of ESBL *E. coli* and MRSA. Subsequently, the two indigenous probiotic candidates (LbS4 and Lf1) were selected against these robust pathogens for postbiotics (surface proteins, heat-killed cells, and biosurfactants) preparations and studying their antagonistic activity (antibiofilm and anti-adhesion) and gut barrier protective functions in HT-29 cell line.

Results & Discussion: The live cells of these probiotics (Lf1 and LbS4), heat-killed cells, and surface proteins significantly ($p \leq 0.05$) lowered the adhesion of ESBL 9/234 and 23/208 by protection, competition, and displacement mechanisms. More interestingly, the live cells and their surface proteins preparations could significantly ($p \leq 0.05$) reduce the FITC-transflux across the *E. coli* stimulated HT-29 monolayer. On the other hand, probiotics (Lf1 and A5) exhibited favorable cell surface properties with significant ($p \leq 0.05$) antagonistic abilities against two potentially robust MRSA isolates (12/206 and 5/255) in the bacterial interference assays, Besides, the live probiotics and their surface proteins significantly improved ($p \leq 0.05$) the MRSA altered epithelial permeability of the HT-29 monolayer.

Conclusion: The probiotics and their postbiotic preparations of viz. Lf1, A5, and LbS4 exhibited a greater tendency to resist the colonization of clinical isolates of ESBL E. coli and MRSA. Therefore, these strains and or their postbiotic preparations can be further explored for in vivo and clinical trials aiming to develop adjuvant microbial therapies to combat drug-resistant E. coli and MRSA fostered intestinal and extra-intestinal infections.

Key Message: In response to the "One Health" approach, probiotics and their derived bioactive molecules (postbiotics) could serve as potential candidates to fight against difficult to treat infections of superbug origin.

Probiotic properties of lactic acid bacteria isolated from naturally fermented artisan milk products of Arunachal Pradesh

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Recently, I have just submitted my Ph.D. Thesis entitled Phenotypic and Genotypic Identification of Microorganisms from Some Naturally Fermented Milk Products of Arunachal Pradesh which I have been working under the supervision of Prof. Dr. Jyoti Prakash Tamang. Our field of interest is in the exploration of microbial diversity from naturally fermented milk (NFM) products of Arunachal Pradesh (India) using both culture-dependent and culture-independent methods. We have also screened the isolated LAB strains for their probiotic potential and industrial application. I have qualified ARS-NET (2016) and GATE (2018) and have published papers in peer-reviewed journals during my Ph.D. tenure.

Abstract

Introduction: In Arunachal Pradesh, naturally fermented milk (NFM) products are usually prepared from either cow or yak's milk, only by the indigenous people belonging to the *monpa* community known as *brokpas*. Some of the NFM products under study includes *mar* (artisanal butter), chhurpi (artisanal soft cheese), and *churkam* (artisanal hard cheese). Using culture-independent study, we have previously reported the predominance of lactic acid bacteria (LAB) from these products whereby leading to the isolation and investigating them for their technological properties and potential probiotic attributes.

Objectives: We aim to identify the predominant isolated LAB group and investigation of potential probiotic attributes

Methods: After isolation and purification of the LAB from these exotic products, preliminary identification was carried using basic phenotypic characterization for grouping. Representative groups were then identify using Sanger sequencing by targeting the 16S rRNA gene. Quality of the raw sequences was checked using Sequence Scanner v2.0, and good contigs of >1200 bp were assembled using Chromas Pro v1.34. Chimera was then checked using Mallard, which was followed by identification using BLAST and EzTaxon. Phylogenetic tree of the LAB strains was then constructed against the closest type strains after alignment with clustalW and neighbouring-joining algorithm using Molecular Evolutionary Genetics Analysis version 7 (MEGA7.0.26). All identified LAB strains were then screened for selective technological and probiotic properties as per the ICMR-DBT guidelines which includes- acidification and coagulation, acid tolerance, bile tolerance, microbial attachments to hydrocarbons (MATH), auto-aggregation, co-aggregation, bile salt hydrolysis and antimicrobial activity. Few extra tests of interest were also evaluated which includes- cholesterol reduction, beta-galactosidase, exopolysaccharide production and GABA production. Lastly, using *in silico* analysis- heatmap and Principal component analysis (PCA), the top best LAB strains were then
selected.

Results and Discussion: Exotic naturally fermented milk of cow and yak products of Arunachal Pradesh in India such as *mar, chhurpi* and *churkam* were analysed for identification of lactic acid bacteria (LAB). The pH of samples was 5.32±0.01 to 6.62±0.01 with viable LAB count of 6.27±0.01 to 6.49±0.02 log cfu g^{-1}. A total of 307 LAB isolates were isolated from 30 samples, and out of which 76 isolates were randomly grouped on the basis phenotypic characteristics, and were identified using 16S rRNA gene sequence analysis into 9 species of LAB from cow-milk products, and 5 LAB species from yak-milk products, respectively.

These includes: Enterococcus durans, Leuconostoc mesenteroides subsp. mesenteroides, Lactococcus lactis subsp. lactis, Lc. lactis subsp. cremoris, Lc. lactis subsp. hordniae, Lacticaseibacillus paracasei subsp. tolerans, Levilactobacillus brevis, Loigolactobacillus coryniformis subsp. torquens and Lentilactobacillus parabuchneri, Lacticaseibacillus paracasei subsp. tolerans. Based on the in silico analysis of all the overall recorded technological properties, Levilactobacillus brevis (AcCh91) was then selected as the best potential probiotic strain.

Conclusion and Key Messages: NFM products of Arunachal Pradesh have not been explored for their microbiological composition. The report of lactic acid bacteria from these products is of great importance to the nature of the products. This present report of potential probiotic LAB strains also suggests the significance of these traditional foods which could be correlated to the health benefits of these products.

Comparative Anti-Inflammatory Effect of Postbiotic (Heat Killed Cells) and Live Cells of Indigenous Probiotics in dual models of HT-29 Cell Line and Colitis Mice

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Diwas Pradhan is working as a Scientist in Dairy Microbiology Division, ICAR-NDRI, Karnal from the last 8 years. He has experience in working in the area of probiotics, antimicrobial resistance and food biopreservation. He has filed 2 patents, published 17 research/review papers, 8 book chapters and has made more than 100 gene bank submissions. He has also currently PI of an ICMR project and Co-PIs of many other external and in-house projects.

Abstract

Introduction: Postbiotics are functional components derived from probiotics, which can be explored to emulate the health effects of live probiotics in order to overcome the issues of maintenance and safety involved with live cells particularly in immuno-compromised individuals or under diseased conditions.

Objective: The objective of the study was to investigate the efficacy of postbiotic [heat killed (HK) cells] *vis-à-vis* live cells of Indigenous probiotic lactobacilli in dual model of Lipopolysaccharide (LPS) stimulated HT-29 cell line and colitis mice model.

Methods: HK preparation of probiotic strains, *Lactiplantibacillus plantarum* MTCC5690, *Limosilactobacillus fermentum* MTCC5689 of Indian gut origin and *Lacticaseibacillus rhamnosus* GG (reference) was checked for safety by Tryphan blue assay and Endotoxin test. Standardized dose of live and HK cells was then tested in LPS stimulated HT-29 cell lines. Further, both the preparations were also tested in DSS induced colitis mice and the level of inflammation was measured using feed/water intake, weight loss, colon length, colonic Myeloperoxidase (MPO), TNF-α and IL-10 cytokines and histopathology.

Results & Discussion: HK preparations of the three probiotics were found to be safe in the tested assays. In the LPS stimulated HT-29 cell lines, a significant reduction ($p<0.05$) was observed in the TNF-α levels by both live and HK probiotic, however, no evident increase was seen in the IL-10 levels in any group. In the colitis mice study, HK MTCC5689 significantly increased shortened colon length. Histological score based on colon morphology was also markedly improved by HK LGG followed by HK MTCC5689. Similarly, significant decrease in MPO levels was observed in HK LGG fed mice followed by HK MTCC5690. Finally, the pro-
inflammatory TNF-α was significantly reduced particularly by HK LGG and HK MTCC5690, whereas HK MTCC5689 and HK LGG treatments considerably increased IL-10 levels.

Conclusion: HK probiotic preparations (especially LGG & MTCC5689) showed effective reduction of colitis symptoms better than their live cell counterparts.

Key Messages: Postbiotic *viz.* heat-killed cells could offer a safer alternative to live probiotics in combating inflammatory bowel disorders.

Development and evaluation of self-nanoemulsifying drug delivery system containing fecal microbiota and curcumin for colon targeted action

Leander Corrie

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Leander Corrie has research career started in the year 2017 as an intern at M/S Aizant Drug Research Solutions Pvt. Ltd. where he underwent extensive training for 9 months on the application of QbD for OSDs. He was also a member for exhibit and scale up batches for anti retroviral drug and a drug to treat idiopathic pulmonary fibrosis. He has received the GPAT scholarship from AICTE, Govt of India and has also secured top ranks in pharma entrance exams. Being an avid researcher in his field, he has more than 15 publications to his name in reputed journals such as Life Sciences, Carbohydrate Polymers etc with citations over 100 and an I-10 index of 4. As well as, a patent filed to his name. He is also a reviewer for Journal of Pharmacy and Pharmacology (IF 3.76) (Oxford Academic Publishers). He has also been invited as a guest speaker for various student skill development programmes. He volunteered for various social causes as a public relations officer. His current interests lies in the use of lipid based carriers for the treatment of cancer and metabolic diseases.

Abstract

Introduction: Gut dysbiosis is a common phenomenon in various metabolic diseases. Fecal microbiota could be used in the treatment of gut dysbiosis. Many drugs developed have poor solubility and permeability. There is no report on the concomitant use of fecal microbiota and these poorly soluble drugs.

Objectives: Formulation of Liquid-Self Nanoemulsifying Drug Delivery System (L-SNEDDS) containing poorly soluble drug and solidifying it along with fecal microbiota.

Methods: The solubility of curcumin was checked in various oils and surfactants. Following which 54 prototypes containing the drug were developed and based on the solubility data which was followed by the use of Box Behnken design and selection of the optimized formulation. The L-SNEDDS were formulated into Solid-SNEDDS using a carrier, cryoprotectant, polysaccharide and fecal microbiota. The developed S-SNEDDS were evaluated for particle size, morphology, size and dissolution.

Results and Discussions: The optimized formulation showed good flow properties. The optimized S-SNEDDS formulation showed a particle size of 76.24 nm and a zeta potential of -29 mV which was co-related to the TEM data. XRD, DSC, FESEM data indicated that the final formulation was amorphous in nature. Robustness to dilution study indicated that there was no change to the developed SNEDDS with change in pH. Metagenomic studies using 16s rRNA identified no significant change in the OTUs of the rat fecal sample and the developed S-SNEDDS. Dissolution studies indicated that it was colon targeted in action. Stability studies indicated that aged and fresh formulations showed no change in dissolution and metagenomic analysis.

Conclusion: The developed S-SNEDDS formulation is the first report using SNEDDS and fecal microbiota to be developed into a unit dosage form. The fecal microbiota can be used to replenish the gut microbiota in colorectal diseases. The developed formulation provides a state of the art for the concomitant administration of fecal microbiota which can be scalable.

Key messages:

• First known formulation containing emulsion type for poorly soluble model drug and fecal microbiota.

• Successful formulation delivery and characterization for the development of fecal microbiota to be given through the oral route.

• Aid in treating gut dysbiosis and various colorectal diseases

Strain-specific effects of probiotic Lactobacilli on epigenetic modifiers in intestinal epithelial cell line

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Ankita has completed her master's in Biochemistry from Punjab Agricultural University and Ph.D. in Animal biochemistry from National Dairy Research Institute (NDRI). She wants to explore the area of host-microbiome interactions in the gut through immune signaling infectious diseases and the effect of probiotics in the treatment of these diseases.

Abstract

Introduction: The epigenome of an organism consists of chemical tags that modify DNA and associated proteins such as histones. These chemical tags are either added or removed by the machinery of enzymes known as epigenetic modifiers. The human epigenome can be affected by various environmental factors including diet, pollutants, microorganisms including pathogens or probiotics. permeability. There is no report on the concomitant use of fecal microbiota and these poorly soluble drugs.

Objectives: The present study aimed to study that probiotic *Lactobacilli* mediate their health-promoting effects by affecting epigenetic modifiers.

Methods: Human colon intestinal epithelial cells (Caco-2) were treated separately with probiotic strains *Lactobacillus fermentum* (MTCC 5898), *Lactobacillus rhamnosus* (MTCC 5897) and an opportunistic commensal pathogen *Escherichia coli* K12 (ATCC 14849) for different durations (3, 6, 12, 18 and 24hrs) and temporal changes in gene expression among DNA and histone modifiers were analyzed. To determine the epigenetic changes during exclusion assay, the cells were first treated with probiotic *Lactobacillus fermentum* for 12hrs followed by the treatment with *Escherichia coli* for the next 12hrs and gene expression of DNA and histone modifiers were analyzed by RT-qPCRmicrobiota. The developed S-SNEDDS were evaluated for particle size, morphology, size and dissolution.

Results and Discussions: Treatment with probiotic strain *L. fermentum* increased the expression of all DNA and histone modifiers *(DNMT1, TET2, p300, HDAC1, KMT2A, KDM5B, EzH2 and JMJD3)* at 12hrs in contrast to E. coli which led to the suppression of gene expression at 12hrs of treatment. On other hand, probiotic *L. rhamnosus* did not make any significant changes in mRNA expression of selected epigenetic modifiers. During the exclusion assay, the pre-treatment of intestinal cells with *Lactobacillus fermentum* improved the mRNA expression of DNMT1, TET2, p300 and EzH2 which was otherwise diminished on individual
treatment with *E. coli*.

Discussion: Out of two probiotic strains, only *L. fermentum* modulated the expression of epigenetic modifiers. Modulations in mRNA expression of epigenetic modifiers during the exclusion of *E. coli* further established the influence of probiotic *L. fermentum* during the exclusion of *E. coli.*

Conclusion: Probiotics *Lactobacilli* and *E. coli* have the opposite effect on the expression of DNA and histone modifiers respectively.

Key Message: Each probiotic strain has a unique mechanism of action, therefore, it is important to decipher the mechanism of the action of probiotic strains before their use in therapeutics.

Evaluation of Anti-obesity effect of probiotic composite fermented food: An in vivo rat study

Deepti Suman

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Ms. Deepti Suman has completed her M.Tech in Dairy Microbiology from SMC College of Dairy Science, Anand. She has received 5 best research paper awards from various International Conferences and also published two review articles in International Journals. She is currently working as Junior Executive in Dudhsagar Dairy, Mehsana, Gujarat. ignaling infectious diseases and the effect of probiotics in the treatment of these diseases.

Abstract

Introduction: Obesity is a metabolic disorder and reports say that the human gut microbiota has a key role in obesity development. The makeup of the gut microbiota differs between obese and lean people. Hence, changing the gut microbiota through a probiotic-rich diet could become a valuable treatment and management option for obesity. There is no report on the concomitant use of fecal microbiota and these poorly soluble drugs.

Objectives: To investigate the role of Probiotic Composite Fermented Food (PCFF) in alleviating the obesity complications in High Fat Diet (HFD) fed Wistar rats.

Methodology: Probiotic strains used in the study were *Streptococcus thermophilus* MTCC5460, *Lactobacillus helveticus* MTCC5463, *L. rhamnosus* MTCC5945 and *L. rhamnosus* MTCC5946. Milk added with finger millet was fermented using the above strains. Study comprised of 4 groups of Wistar rats viz., normal pellet diet fed (NC), HFD fed (DC), DC treated with PCFF (PCFF), DC treated with control probiotic food
without finger millet (C), each group having n=6. Products [1ml (10^9log cfu)/day] were administered orally for 8 weeks and indicators involved in obesity disorder were studied.

Results and Discussions: Feeding HFD caused significant($p<0.05$) increase in body weight, organ weights, activity of liver enzymes [alaninetransferase (ALT), aspartatetransferase (AST), alkalinephosphatase (ALP)], Triglyceride, total cholesterol (TC), LDL, leptin and decrease in HDL. Administration of PCFF and C caused significant ($p<0.05$) decrease in body weight, organ weights, abdominal fat, activity of ALT, AST, ALP, Triglyceride, TC, LDL of obese rats. Decreased level of HDL in DC group was brought back to near normal in PCFF and C groups. Liver from DC group showed widespread lipid vacuoles deposited inside the parenchyma cells whereas PCFF and C groups showed lesser micro-vesicular fatty changes.

Conclusion: Probiotic composite fermented food is found to possess promising antiobesity effect.

Key Message: In a probiotic food, along with probiotics, its delivery matrix play crucial role in providing health benefits.

Prevalence and Carriage of Drug Resistant *Enterobacteriaceae* in the Infant Gut Microbiome – Study from Coastal Karnataka, India

Saahithya Mahesh

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Saahithya Mahesh is PhD student working on the characterization of the antimicrobial resistance in the gut microbiome of infants. I work under the guidance of Dr Mamatha Ballal at Kasturba Medical College, Manipal.

Abstract

Introduction: The intestinal microbiome of infants progressively evolves with the influence of various intrinsic and extrinsic factors. The gut harbours a plethora of bacteria including opportunistic pathogens. Colonization and harbouring of drug-resistant strains of such bacteria in the gut can pose a threat to the host, and acts as a potential source of transmission of resistance to other bacteria and the environment.

Objectives: This study investigates the prevalence of drug resistant strains of opportunistic pathogens from the family *Enterobacteriaceae* in the gut of healthy infants.

Methods: Stool samples from sixteen healthy infants were collected at three time points viz., at birth, six weeks, and 14 weeks. Stool samples were cultured on MacConkey Agar and bacteria were identified by routine biochemical tests. The Antimicrobial susceptibility of the organism was tested using Kirby Bauer's disc diffusion technique.

Results: Overall, the *Enterobacteriaceae* in the gut of infants contained *Escherichia coli* (39.8%), *Klebsiella pneumoniae* (33%) and *Enterobacter spp.* (12.6%). At birth, *K. pneumoniae* (27%) and *Enterobacter spp.* (24.2%) were higher. They were dominated over by *E. coli* at six weeks (38%) and 14 weeks (61%). All isolates showed the highest resistance to ampicillin at birth (68%), at 6 weeks (63%), and at 14 weeks (63%); followed by tetracycline (9%, 17%, 22%) and cotrimoxazole (9%, 17%, 27%). The isolates at birth also showed resistance to third and fourth generation cephalosporins like ceftriaxone (13%), Cefepime (9%) and carbapenems (4%).

Discussion and Conclusion: The provisional result from this ongoing study gives an interesting observation about the prevalence and carriage of drug resistant Enterobacteriaceae in the gut of infants. These opportunistic pathogens can get selected under an antibiotic exposure and persist in the intestine with the potential to transform into pathogens provided with a suitable route of infection.

Key Message: The gut microbiome is a potential reservoir of antimicrobial resistance from the early days of life.

The Probiotic Potential Of Human Breastmilk- An Exploratory Study In Infants From Rural Areas Of Karnataka

Vidya Rajesh

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I am currently working as a Clinical Nutritionist, at Dr. TMA Pai Rotary Hospital, Rural Training center, Manipal Academy of Higher Education -MAHE *(An Institute of Eminence Accorded by MHRD)*, Karnataka, India, since the past 5 years after earning my MSc in Dietetics and applied Nutrition from WGSHA, MAHE.
I am also pursing my PhD degree focused on **Infant Nutrition and gut microbiome.** It is a multidisciplinary study with inputs from Dr. Ankur Mutreja, Senior Scientist, Cambridge University, UK.
I have 3 research Publications, focusing on the radical effect of nutrients on adolescent health, COVID-19 and traditional medicine.

Abstract

Introduction: Probiotics furnish immunological benefits to their hosts. A similar phenomenon is observed in exclusively breastfed infants. Exclusive breastfeeding are modifiable factors that may impact the diversity and functional capacity of the gut microbiome.

Objectives: The aim of this research was to explore the probiotic properties of human breastmilk by studying the associations of type of breastfeeding and complementary feeding with gastrointestinal infections and antibiotic exposure in infancy in a rural setting.

Methods: A prospective cohort (pilot) study was conducted with a sample size of 200 mothers of 6-12 months old healthy infants in Udupi, Karnataka. Data collection was done using In-depth interview using a structured questionnaire to collect information on duration and exclusivity of Breast Feeding (Exclusive-EBF, Formula-FF and Partial -PBF), given, episodes of vomiting, diarrhoea and antibiotic exposure.

Results: EBF was observed in 50.5% of infants, PBF in 49% and FF in 0.5%. On EBF for 6 months, 3% of infants had vomiting and 1% had diarrhoea, whereas on PBF, 5.2 and 3% (p=0.6) of infants had vomiting and diarrhoea, respectively.

Discussion: LAB isolates from the breast-fed infants showed lower levels of β-glucuronidase. But in case PBF because of the missing prebiotics, functional ingredients like HMO, DHA, lactoferrin, probiotics and microbes in formula milk leading to improper control of inflammation and inadequate immune training of the GI tract. Therefore, an increase in GI infections is observed.

Conclusion: Bioprospecting of novel probiotics strains from unexplored ecological niches like human breastmilk could prove beneficial in targeting novel strains with potential functional characteristics for future applications in pharmaceutical industries.

Key Message: Targeting of probiotics particularly for infants/children has been highlighted and probiotic strains with optimal effects may be determined for prospective infant applications.

Screening and Selection of Prebiotics for Electrospinning of Lactiplantibacillus plantarum CRD7

Divya Pannerselvam

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Er. Divya Panneerselvam currently working as SRF under DST funded project entitled Electro-hydrodynamic encapsulation of Probiotics using Prebiotic nanofibres in food applications in Dairy engineering section, ICAR National Dairy Research Centre, Bangalore. I am M.TECH - FOOD TECHNOLOGY graduate from IIFPT, Thanjavur. Having 3 years experience in R&D Central government research stations.

Abstract

Introduction: Probiotics are defined as "live microorganisms that when administered in adequate amounts confer a health benefit on the host" (FAO/WHO, 2006). Encapsulation is a method to improve the viability of probiotics and protect them in the GI transit for selective release at the targeted area (colon). Freeze- and spray drying are commercially used for production of dried probiotics. Electrospinning is used as an alternative drying and encapsulation technique to conventional spray- and freeze drying to improve the survival of probiotics. The main advantage of electrospinning is that it is ambient temperature process.

Objectives: Screening and selection of prebiotics for encapsulation of *Lactiplantibacillus plantarum* CRD7 by electrospinning.

Methods: The selection of biopolymers for electrospinning is a difficult task since all the biopolymers do not have electrospinning ability. Their properties such as electrical conductivity, viscosity, surface tension and structure affect electrospinnability. In this study, the feed solutions were prepared using 14% (w/w) pullulan and prebiotics such as inulin, polydextrose, sorbitol and isomalto-oligosaccharides at 20, 30 and 40% (w/w) concentrations. The viscosity, surface tension, density and electrical conductivity of the feed solutions were estimated. The dimensionless numbers such as Deborah (De), Ohnesorge (Oh) and Berry (Be) numbers influencing electrospinning were computed and validated.

Results and Discussion: The viscosity and surface tension of feed solution ranged from 204.13 to 280.20 m.Pa.s and 44.89 to 68.82 mN/m, respectively. The viscosity the feed solution increased with increase in concentration of prebiotics. The 'De' and 'Oh' of the solutions lied in the range of 20.54 to 24.19 and 0.80 to 1.28, respectively. The 'Oh' of pullulan solution with inulin (20 and 30%), sorbitol (20 and 30%) and polydextrose (20%) was less than 1. The electrical conductivity of the solution ranged from 0.03 to 0.08 mS/cm. The 'Be' of pullulan solution with different prebiotics were greater than 1. The feed solutions that satisfied the condition of Oh≥1, De≥1 and De≥Oh≥ were electrospun and characterized using SEM.

Conclusion: The electrospun fibres of pullulan with sorbitol disappeared within a few days due to their hygroscopic nature, while the fibres formed from inulin were beaded due to its lower electrical conductivity. In contrast, smooth beadfree fibres were obtained from pullulan with polydextrose and isomalto-oligosaccharides (IMO). Between polydextrose and IMO, the latter was found to be better in producing clean, thin and uniform electrospun fibres. Also, between 14 and 18 kV, the latter voltage was found to form relatively better fibres.

Key Message: Encapsulation, Electrospinning, *Lactiplantibacillus plantarum* CRD7, Nanofibres, Prebiotics

Studies on Antidiarrheal and Antioxidative Nature of Synbiotic Sesame Yogurt in Balb/c Mice

Samadrita Sengupta

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Dr. Samadrita Sengupta is currently working as an assistant professor in the Department of Food and Nutrition, West Bengal State University, Barasat, Kolkata. Originally a nutritionist by training, she obtained her M.Sc. degree and Ph.D degree from IIEST, Shibpur. She has made a remarkable contribution in the field of food processing and nutrition science. She has been working extensively in the areas of formulation of probiotic non-dairy food products from non-conventional edible seed flours. This study has been published in the form of patent (WO2020/234896-A1) on 2020. She has published several research papers in National and International peer reviewed journals. Her current research focused in the field of fortification of non-dairy food products by nano micronutrient in health and disease control.

Abstract

Introduction: Diarrheal disease is a major cause of morbidity and mortality throughout the world, particularly in India. There is a growing interest in the dietary management of diarrhea. Trends towards the use of non-dairy food products especially synbiotic food (prepared from soy, sesame, flaxseed etc.) are growing due to their potential implications in health maintenance and prevention of diverse diseases. While sesame seed is an excellent food that contains not only abundant nutrients but also natural antioxidants, synbiotic sesame yogurt (SSY) may be expected to have preventive and therapeutic effects on diarrhea.

Objectives: Considering this perspective, the present research was conducted to assess the antidiarrheal and antioxidant efficacy of SSY.

Methods: The SSY was prepared with the incorporation of fructo oligosaccharides as a prebiotic and *Lactobacillus acidophilus* and *Bifidobacterium bifidum* as probiotic strains in sesame milk and SSY was assessed by both *in vitro* and *in vivo* antidiarrheal studies on mice models. The antioxidative parameter was measured by superoxide dismutase (SOD) and catalase (CAT) content in liver tissues.

Results: SSY significantly prolonged the onset of diarrhea and reduced the weight of wet and total feces in the castor oil-induced diarrheal model. *Vibrio cholerae* infected mice, which were not treated by the SSY, diarrheal feces were shown. Significant increases in viable probiotics numbers were detected in feces of mice treated with SSY. For 3 days treatment with SSY, the SOD and CAT content increased, 17.72% and 24.96% respectively.

Discussion: Antidiarrhoeal potential of the SSY was evidenced by a significant reduction in the total defecation and diarrheal drops in comparison of conventional sesame yogurt. Oral administration of SSY reduced intestinal *V. cholerae* burden.

Conclusion: Dietary interventions with SSY containing prebiotic fructo oligosaccharides and probiotic *Lactobacillus acidophilus* and *Bifidobacterium bifidum* showed promising antidiarrheal activity. Hence, this study supports its antidiarrheal use in Indian folklore medicine.

Key Messages:

- Process technology for making SSY has been developed.
- Synbiotic may offer a safe intervention for diarrheal diseases.
- SSY could be used as a potential antidiarrheal agent along with its antioxidant and therapeutic potentiality.
- Therefore, our synbiotic soy yogurt could be an effective alternative to standard drugs.

A Combination of Probiotic *Lactobacillus fermentum* & *Phytochemical Epigallocatechin* Gallate Confers Second Generation Synbiotic Effects by Modulating Cellular Immune Responses & Antioxidant capacity in Aging Mice

Rohit Sharma

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Dr Rohit Sharma is actively engaged in the identification and development of novel functional foods that improve the deleterious aspects of aging including immunosenescence and cellular senescence. Dr Sharma has already identified a novel synbiotic combination of tea phenols and probiotic bacteria that enhance aging immune functions and his study was the first to identify that secretory metabolites of probiotic bacteria can attenuate cellular aging. He has been awarded the prestigious Young Scientist Award by National Academy of Sciences India in 2020 in addition to fellowships and extramural grants.

Abstract

Introduction: Traditional oligosaccharide-based prebiotics have major drawbacks including the liability to encourage the growth of non-probiotic bacteria, inconsistency in observed clinical end-points, and lack of inherent bioactivity. A novel concept called 'second generation synbiotics' has been advocated recently which argues that prebiotics could be best defined based on their physiological effects in the host rather than their specific microbial targets.

Objectives: In the present study, we systematically identified and evaluated a second-generation synbiotic combination of tea phytochemical epigallocatechin gallate (EGCG) and probiotic bacteria in amelioration of immunosenescence and oxidative stress in aged mice.

Methods: The study was divided into three phases:
i. Firstly, we assessed how the growth of probiotic and pathogenic bacteria is influenced by the presence of EGCG. For this, a 5% bacterial inoculum (pathogens and probiotics) was transferred to a broth containing 0.1% EGCG (w/v) followed by absorbance analysis at 600 nm.
ii. Next, a functional combination of EGCG and probiotic bacteria with potential synergistic cytoprotective effects against oxidative and inflammatory stress was identified *ex vivo* using murine peripheral blood mononuclear cells.
iii. Finally, the best synbiotic combination, vis-à-vis prebiotic and probiotic supplementation alone, was evaluated in aged Swiss albino mice for analyses of various immunological and antioxidative parameters.

Results: EGCG strongly inhibited the growth of all pathogenic microbes as compared to probiotic bacteria. A combination of EGCG with probiotic *Lactobacillus fermentum* (LF) provided evidence of additive effects in the amelioration of oxidative and inflammatory stress-induced cell death. *In vivo* study revealed that combined supplementation of LF and EGCG significantly enhanced neutrophil oxidative index, splenic CD3+ T cell numbers and activation status (CD69+), Th1/Th2 cytokines in splenic supernatants, and liver Nrf-2 expression in comparison to treatments with LF or EGCG alone. .

Discussion: Tea polyphenols differentially inhibit bacterial growth and their combination with specific probiotics can impart superior physiological health beneficial effects in improving aging immune functions and attenuating systemic oxidative stress.

Conclusion: These observations are the first to suggest that EGCG could be considered as a prebiotic that can offer second-generation synbiotic health beneficial effects during aging.

Key Messages:

• Amalgamation of probiotic bacteria and tea polyphenols can impart superior functional benefits to the host.

• This highlights a novel category of polyphenols and specific probiotics-based second-generation synbiotic functional foods.

Effect of resistant starch supplements on fecal short-chain fatty acids and enteropathogens in a cohort of infants in rural Odisha

Rojalin Biswal

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I am Rojalin Biswal. I was completed my MSc. in Bioinformatics from Orissa University of Agriculture and Technology, Bhubaneswar in 2020. My Master's thesis focused on Analysis of transcriptome data for the identification of putative sheath blight resistance gene (s) in rice" at ICAR- NRRI, Cuttack. Currently working as Project Technician in ICMR-funded project entitled : "Pattern of microbial dysbiosis in gastric cancer - A multicentric study'' at AIIMS, Bhubaneswar since 2021. Also I am working on metagenomics and metatranscriptomics study in the various research projects

Abstract

Hypothesis: We hypothesized that high amylose maize starch (RS) would increase fecal short-chain fatty acids (SCFAs) and reduce enteropathogens carriage in infants.

Objectives: To study the effect of RS on fecal SCFA and microbial enteropathogens in a cohort of infants in rural Odisha.

Methods: In total, 64 infants-age (6 months) were weaned with 10 g of RS once a day for 6 weeks. Stool samples were obtained at Baseline 3, 6, 12, and 26 weeks after the start of the intervention. Fecal SCFAs were measured and quantitated against internal standards by gas chromatography coupled to mass spectrometry. Fecal DNA was extracted, and real-time PCR was used to detect and quantitate DNA of 9 bacterial enteropathogens and 5 gut parasites.

Results: The infants have tolerated the RS without any adverse effects. Fecal total SCFAs and acetate were significantly ($P<0.05$) increased after the intervention compared to the baseline. Fecal enteropathogens carriage was not statistically significantly different between RS and control group.

Conclusion: RS increased fecal SCFAs concentrations but did not significantly reduce enteropathogens carriage in this cohort of infants.

Key Message: RS increased fecal SCFAs in infants, which may be expected to affect the colonic milieu and offer associated health benefits positively.

Rapid Detection of Lactobacilli and non-Lactobacillus bacteria associated with Term and Preterm Birth

Taruna

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A Ph.D. pursuing scholar having deep theoretical and practical knowledge about the course work. Seeking project recruitment to further develop her skill along with the contribution to organization development by imparting her knowledge.

Abstract

Introduction: Pre-term birth (PTB) defined as birth before 37 completed weeks of gestation is a primary cause of infant death and morbidity in the developing nations (WHO, 2018). Several evidences indicate that the vaginal microbial communities play important role in the pathophysiology of PTB. The healthy vaginal microbiota is less diverse, generally shows a predominance of *Lactobacillus* genus supposed to play protective role in term birth (TB). In general, PTB has been associated with increased microbial diversity, a decrease in anti-inflammatory compounds, and an increase in pro-inflammatory bacteria in the vaginal environment, having members including *Gardnerella, Sneathia, Megasphera* and *Lactobacillus iners*. Development of a rapid detection assay based on the presence of the bacterial species in vaginal milieu would be valuable in determining possible birth outcomes.

Objectives: Development of specific nucleic acid detection in the high vaginal swab (HVS) samples using dipstick-based sensors.

Methodology: Bacterial strains were isolated from HVS samples of study participants enrolled in the GARBH-Ini cohort. Specific nucleic acid sequences representing identity of the different bacterial species were identified from our whole genome sequencing data and used for the development of the assay. Genomic DNA was isolated and direct multiplex PCR was optimized using tagged species-specific primers. Immobilizing four complementary oligonucleotides that were hybridized with 5' end of the precise PCR amplicons developed dipstick strips.

Results: Our uniplex and multiplex PCR assays followed by the dipstick-based detection precisely identified the presence of *Gardnerella, Sneathia, Megasphera, L. iners. L. crispatus, L. gasseri and L. jensenii* in the HVS samples of pregnant Indian women. The specificity (83.3%) and sensitivity (85.07% for n=90) of detection of term and preterm birth associated bacteria are high. In addition, the assay is very rapid, cost effective, need minimal resources and technical expertise to conduct the test and interpret the results.

Discussion: Nucleic acid detection-based approaches eliminate the necessity for in-vitro culture and reduce the time required to detect bacterial species. DNA biosensors provide a way to simplifying post-PCR analysis, with much improved detectability, specificity, and reproducibility. This assay has potential to screen women at the community level and provide early indication of risk of preterm birth.

Conclusion: The rapid detection of PTB associated bacteria in low resource settings is very promising to avoid PTB associated complications and reduce the burden to the society.

Key Message: The identification of bacterial species linked with any disease allows for quick and early detection and should be utilized extensively in diagnostics.

Studies on suitability to incorporate millets and moringa oleifera (lin.) pod powder in selected fermented probiotic dairy products

Aakash Rathod

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Abstract

Introduction: The innovation is critically important because of the change. Forcing food industry to change to fulfill growing demand of value-added innovative products for health conscious consumers. Fermented foods are of great significance since they provide and preserve vast quantities of nutritious foods in a wide diversity of sensory attributes enriching the human diet. The fermentation process is used as a method of value addition and transformation of raw materials by microbes and their enzymes into a variety of products with different nutritional and sensory characteristics.

Objectives: To study the growth pattern of probiotic organisms in such products as well antimicrobial properties of such products and to study the economic feasibility vis-à-vis nutritional and therapeutic benefits of the standardized products.

Methodology: The two proven and patented, human origin probiotic strains Viz. *L. rhamnosus* and *L. helveticus* and three strains of the LAB, namely *L. casei*, a mixed yoghurt culture and *L. acidophilus* were used during the course of the investigation. The processes have been optimized to prepare three (Foxtail, Barnyard and Oat) millet-based probiotic fermented dairy products containing moringa pod powder.

Results: The optimized method for barnyard millet-based moringa-fortified probiotic fermented product was most acceptable followed by its foxtail millet-based and the oat-based counterparts. Barnyard millet based product contains enhanced amount of invaluable nutrients like protein and dietary fibre which makes it an innovative value-added product with added benefit of huge number of viable cells of probiotics. It is further that the antimicrobial properties against the test pathogens, namely *B. cerus, Staph. aureus, Alc. viscolactis* and *E. coli* exhibited by these innovative products have added value in these products. Our findings highlighted the possibility of production of value-added products in an affordable cost of production.

Conclusion: The supplementing with the test millets have practically demonstrated as the promising growth promoters due to its prebiotic effect as well prepared novel products exhibited the significant zone of inhibition for the antimicrobial test against selected pathogens and spoilage organisms. It is proposed to conduct further research on a large scale so as to ascertain the exact mechanism of action of the millets and moringa to promote the growth and survivability of the probiotics. It is also suggested to explore the possibility of commercialization of these novel products.

Key Message: Millets, *Moringa oleifera* (Lin.) leaf and pod powder, Fermented probiotic dairy products, Prebiotics, Antimicrobial properties.

Probiotic based induction of Fetal Hemoglobin and Anti-sickling effect in Sickle Cell Erythroctyes

Ms. Firdosh Shah

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I am presently pursuing a Ph.D. in Biotechnology from C.G. Bhakta Institute of Biotechnology, Uka Tarsadia University, Surat, Gujarat where I am currently working on determining the potential role of probiotics in the treatment aspects of sickle cell patients in the South Gujarat area. With the help of immense support and guidance from my guide and my labmates, I was able to publish 5 research articles and 4 book chapters on probiotics. I have a keen interest in exploring the role of probiotics in Hematological and immunological disorders.

Abstract

Introduction: Sickle cell disease (SCD) is a genetic blood disorder that affects the shape and transportation of red blood cells in blood vessels, leading to various clinical complications. Many drugs which are available for treating the disease are insufficiently effective, toxic, or too expensive. Therefore, there is a pressing need for safe, effective, and inexpensive therapeutic agents apart from the pre-existing treatments such as probiotics. Probiotic strain like *Lactobacillus plantarum* is associated with short chain fatty acids expression on LepR+ (leptin receptor-expressing) MSCs (mesenchymal stromal cells), subsequently controls hematopoiesis and erythropoiesis in the bone marrow.

Objectives: Henceforth, the aim of our present study was to assess the potential of probiotic *Lactobacillus plantarum* for its in vitro antisickling and Fetal Hemoglobin inducing activity within sickle erythrocytes obtained from SCD patients.

Methods: Total 10 SCD patients and 5 control blood samples were collected, followed by erythrocytes isolation, which then was subjected to microscopic observation for Emmel test after different doses and time dependent treatments of the *L plantarum* culture supernatant. Hydroxyurea and normal saline were used as drug control and negative controls respectively.

Results: The percentage of sickling was evaluated which suggests that the L *plantarum* culture supernatant dose 30 mg/ml and incubation time 60 min. exerts significant anti-sickling effect on SCD erythrocytes.

Moreover, *L plantarum* culture supernatant showed significant increased HbF% in SCD patients' erythrocytes at 30 mg/mL concentration for 120 min compared to negative control.

Conclusion: Overall, our results suggest that the *L. Plantarum* may have potential anti-sickling activity and may be employed as alternative therapy to hydroxyurea in SCD management. However, our results must be confirmed with increased sample size and further in vivo effects of the *L plantarum* supernatant must be assessed using SCD animal model.

Key Message: Sickle cell disease; Probiotics; *Lactobacillus plantarum*; Hydroxyurea; Anti-sickling activity; Fetal haemoglobin

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