

International Conference on

PROBIOTICS AND  
PREBIOTICS



JUNE 2022

15-16

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**BOOK OF  
ABSTRACTS**

**INTERNATIONAL CONFERENCE ON  
PROBIOTICS AND  
PREBIOTICS**

**15-16** JUNE

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## ABOUT MAGNUS GROUP

**Magnus Group (MG)** is initiated to meet a need and to pursue collective goals of the scientific community specifically focusing in the field of Sciences, Engineering and technology to endorse exchanging of the ideas & knowledge which facilitate the collaboration between the scientists, academicians and researchers of same field or interdisciplinary research. Magnus group is proficient in organizing conferences, meetings, seminars and workshops with the ingenious and peerless speakers throughout the world providing you and your organization with broad range of networking opportunities to globalize your research and create your own identity. Our conference and workshops can be well titled as 'ocean of knowledge' where you can sail your boat and pick the pearls, leading the way for innovative research and strategies empowering the strength by overwhelming the complications associated with in the respective fields.

Participation from 90 different countries and 1090 different Universities have contributed to the success of our conferences. Our first International Conference was organized on Oncology and Radiology (ICOR) in Dubai, UAE. Our conferences usually run for 2-3 days completely covering Keynote & Oral sessions along with workshops and poster presentations. Our organization runs promptly with dedicated and proficient employees' managing different conferences throughout the world, without compromising service and quality.



## ABOUT PROBIOTICS 2022

Magnus Group cordially invites you to its “International Conference on Probiotics and Prebiotics” (PROBIOTICS 2022) slated Virtually during June 15-16, 2022.

The congress will be focused on its meaningful theme “Deciphering the Scientific Landscape on Probiotics and Prebiotics” and will emphasize on recent advancements in probiotic and prebiotic science and research, and their current and future roles in sustaining health and preventing diseases. Current technological and methodological advancements open up exciting new avenues for probiotics and prebiotics research and application. Modification of strains and genetic characterization, state-of-the-art in vivo, in vitro, and in silico techniques to uncover the effects of probiotics and prebiotics on their targets, and metabolomic tools to identify key molecules that mediate benefits on the host are driving probiotic and prebiotic research. This discipline will be propelled forward by new techniques that allow real-time investigations in humans and follow a microbe as it integrates into an existing microbiome, as well as systems that can quantify health levels. Probiotic strains and prebiotic products can make a significant difference in the treatment of global threats facing society.

The goal of this congress is to provide a panoramic perspective on the greatest opportunities for advancing science and impacting human health.

Join us for an enlightening conference focused on the role of prebiotics and probiotics in maintaining health and preventing disease.



# KEYNOTE FORUM

**DAY 01**

**INTERNATIONAL CONFERENCE ON**  
**PROBIOTICS AND**  
**PREBIOTICS**

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## Thi Thu Hao Van\*<sup>1</sup>, Mian Chee Gor<sup>1</sup>, Joshua Fraser<sup>1</sup>, Van Canh Phung<sup>1</sup>, Priscilla F. Gerber<sup>2</sup> and Robert J. Moore<sup>1</sup>

<sup>1</sup>School of Science, RMIT University, Bundoora West Campus, Plenty Rd, Bundoora, Victoria 3083, Australia

<sup>2</sup>Animal Science, School of Environmental and Rural Science, University of New England, Armidale, NSW 2351, Australia

### Lack of correlation between in vitro and in vivo assays when assessing colonization characteristics of potentially probiotic bacteria

The survival and colonization stability of probiotic bacteria within the gastrointestinal tract of a host are important to ensure that the host receives constant benefits from the probiotic bacteria. Probiotics strains have generally been preselected based on a series of in vitro assays, such as tests of ability to adhere to cultured host cells, ability to withstand the low pH of the stomach and bile acids in the intestines. This study aimed to compare the performance of potential probiotics isolates in vitro and in vivo. Lactic acid bacteria were isolated from chicken guts and 67 strains from 24 species were examined in vitro, using resistance to acid and bile, and adherence to tissue culture cells assays. A chicken trial was carried out to assess their colonization and persistence characteristics in vivo. The birds were orally dosed with a mixture of LAB isolates. They were euthanised four weeks after the administration and caecal content was collected to analyse the presence of the input probiotic strains. The results showed that there was no clear correlation between in vivo colonization and persistence of isolates and their resistance to acid and bile, or adherence to tissue culture cells. Therefore the in vitro screening steps for probiotic strain selection should be considered carefully, as they may be a very poor indicator of a strains ability to survive passage through the harsh environment of the gastrointestinal tract and subsequent activity within the gut.

#### Audience Take Away:

- There are discrepancies between in vivo and in vitro assays in the probiotic selection process.
- This research will help other researchers in designing and adapting assays to better represent in vivo conditions.
- We describe a robust method to screen for isolates that are able to colonize and persist in the gut.

#### Biography

Dr Thi Thu Hao Van completed her PhD at RMIT University, Australia. She is currently a Vice Chancellor Senior Fellow at RMIT University. Her areas of expertise include the manipulation of gut microbiota for animal and humans health, identifying and understanding the cause and biology of the pathogens causing diseases in farm animals and humans, developing intervention strategies to combat these diseases, including development of probiotics, antimicrobial compounds and vaccines. She has published more than 70 peer-reviewed articles.



## Oktay Yerlikaya

Department of Dairy Technology, Faculty of Agriculture, Ege University,  
35100, Bornova-Izmir, Turkey

## Enterococci: A review of potential technological and functional properties

**E**nterococci, the most controversial group of lactic acid bacteria are human and animal intestinal commensals that can be found in almost every environment and place (water, plant, soil, and foods). With the development of modern classification techniques, some of the genera that were previously included in Lancefield's group D streptococci have been transferred to the new *Enterococcus* genus. Enterococci are neither GRAS (Generally Recognized As Safe) nor included in the QPS (Qualified Presumption of Safety) list. Although there are a significant number of strains belonging to different *Enterococcus* species, they are highly competitive due to their resistance to a wide pH and temperature range. Although enterococci are present in high numbers in some types of fermented cheese and sausages, they are not added intentionally as starter cultures. Some strains of *Enterococcus faecium* and *Enterococcus faecalis* are used as probiotics and are often administered in the form of pharmaceutical preparations to treat diarrhea, antibiotic-associated diarrhea or irritable bowel syndrome, lower cholesterol levels, or improve host immunity. It is desired that the strains planned to be used in foods should not have any virulence factors and should be clinically sensitive to some antibiotics. As a result of the studies, they are used as starters in fermented food production due to their biotechnological properties (enzymatic, proteolytic and lipolytic activities, citrate metabolism etc.) or as preservative cultures or probiotics in food biopreservation due to the antimicrobial bacteriocins called enterocins they produce, as well as they have different beneficial properties such as stimulating immunity. Enterocins can be used in different food products to increase their shelf life as they are heat stable and show activity in a wide pH range. Enterocins are as effective as they are safe for use in the food system because they are GRAS. *E. faecium* and *E. faecalis* are the predominant bacteriocin-producing *Enterococcus* species in food products. Living cells also provide anti-inflammatory activity, hypocholesterolemic effect, and use in the prevention/treatment of some diseases. These microorganisms are also important for the formation of bioactive peptides, especially from milk components, which provide new opportunities for the development of functional foods and nutraceuticals for human nutrition and health. Although there are many biotechnological advantages (eg. bacteriocin production, probiotic properties, usability in dairy technology), there is currently no consensus on whether enterococci pose a threat as foodborne pathogens.

**Keywords:** Lactic acid bacteria, Enterococci, *Enterococcus*, Probiotics, Enterocin

### Biography

Assoc. Prof. Dr. Oktay YERLIKAYA was born on 03.06.1982 in Izmir-Turkey. He graduated from Ege University, Faculty of Agriculture, Animal Production Program, Dairy Technology Sub-Program in 2005. He completed his master's thesis on "A Research on Caper White Cheese Production and Quality Characteristics" in 2008, and he completed his doctorate degree with a thesis on "Isolation and Identification of *Enterococcus* Species with Probiotic Properties from Raw Milk and Traditional Dairy Products and Investigation of Use as Adjunct Cultures in İzmir Tulum Cheese Production" in 2013. Oktay Yerlikaya, who is still working as an Associate Professor at Ege University, Dairy Technology Department studies dairy science and technology, probiotic dairy products, dairy microbiology, and pure culture production technology. He published more than 60 research articles in SCI (E) and international journals.





## David Pineda Ereno

DPE International Consulting, Belgium

### Global regulatory trends on the use of probiotics in foods and food supplements

David's presentation will address the regulatory state of play and trends for probiotics focusing on the following core issues: The opportunities for probiotics in functional food, fortified food and supplements. Possible claims and the scientific evidence needed to make them.

Market entry - what's required to bring your product to market?

#### Biography

With a Law degree by the University of Deusto, Bilbao, Spain and a Master's degree in European Community Law and Comparative Law by the University of Maastricht, The Netherlands, David has over 20 years of experience providing strategic and regulatory advice to companies, trade associations and government bodies in the food, nutrition and health arena at national, regional and international level in Asia, Europe, Latin America and the Caribbean and the United States. This also includes his expertise in regulatory harmonisation processes in international organisations such as the Codex Alimentarius Commission, in the notification processes of regulations to the World Trade Organisation and in the development of international policies on health and nutrition such as the World Health Organisation and the Pan American Health Organisation. David has vast expertise leading regulatory projects consisting of the analysis of regulations applying to foods, beverages and other nutritional products, advising in regulatory harmonisation processes, creating, expanding and consolidating international and regional trade associations, and developing, coordinating and implementing strategic plans contributing to the removal of trade barriers and the access of products and ingredients to markets worldwide. David has organised, participated and spoken in events, conferences and training workshops for industry, academia and government bodies representatives in the foods, beverages, food supplements and medicines areas across the globe. Moreover, David has written articles and publications and given interviews for media magazines, newsletters and blogs internationally on trending topics on food, beverage and food supplement regulations and market entry.



## Suriyavathana Muthukrishnan

Department of Biochemistry, Periyar University, India

### Biochemical profile of guar (*Cyamopsis tetragonoloba*) as - a potential natural prebiotic

Prebiotics are special plant fibers that help healthy bacteria grow in your gut. This makes your digestive system work better. Both prebiotics and probiotics are good for your gut, but they help in different ways. Prebiotics are a source of food for your gut's healthy bacteria. They are carbs your body can't digest. So they go to your lower digestive tract, where they act like food to help the healthy bacteria grow. The term medicinal plants comprise a variety of plants that are used in herbals and many others having medicinal activities, Medicinal plants are the factories for the natural templates and a variety of phytochemicals, which confers biological activities. The significance of these natural products is highlighted by biological screening, Guar (*Cyamopsis tetragonoloba* L.) as a legume crop of the warm season with a deep and well-developed root system is drought tolerant and is cultivated mainly as a rain-fed crop in arid and semi-arid areas, The natural products obtained from guar plants are recognized as a plentiful source of biologically active compounds. The compounds obtained from these plants have more capacity to succeed in toxicological screening than the synthetic chemical compounds, The use of plants to cure several kinds of human diseases has a long history. Various parts of plants such as a leaf, stem, bark, root, etc. are being used to prevent, allay symptoms of abnormalities to normal. The search for, and use of drugs and dietary supplements obtained from plants have increased in recent years. Guar has been traditionally used as a vegetable, livestock feed, and green manure crop in agriculture, Guar gum is a natural polysaccharide with high molecular weight, which easily hydrates in cold water, CT supplies fibreless green pods for vegetables, nutritious fodder, and guar meal to the livestock by fixing a large amount of atmospheric nitrogen and adding organic matter it adds fertility to soil. the biochemical properties of guar gum, it is widely used in industries from paper to cosmetics, due to its high availability, low cost, biodegradability, and different physiochemical properties, guar gum is an important thickener found in many food applications. Carbohydrates class of naturally occurring compounds which means "watered carbon". Since the Carbohydrates play a crucial role in the metabolic process of living organisms, the high content of carbohydrates quantified upholds that *Cyamopsis tetragonoloba* contains a very good store of this vital nutrient namely glucose followed by notable content of the protein serves as a major macronutrient and acts as an important component for growth and development. Biochemical constituents that produce definite biological actions which is proved by the good quantum of antioxidant vitamins (A, C, E) and minerals (Calcium, Phosphorus, Iron) were by provided that CT encompasses the high quality of prebiotic potential.

#### Biography

Dr. (Mrs.) M. Suriyavathana, M.Sc., M.Phil., Ph.D graduated at Bharathiar University in 1991. She received her Doctoral degree in 2007 at the Bharathiar University. She obtained the position of Associate Professor at Periyar University, Salem, Tamilnadu. To her credentials she has published more than 70 research articles and 3 books (national & international). To her research expertise she has guided 32 M.Phil and 19 Ph.D candidates. She has delivered plenary lectures in International conferences at USA and UAE. She has organized 7 national and international conferences and seminars and she has received her patent, to her credit she has been awarded as best Researcher /Women scientist in 2015.

**SPEAKERS**

**DAY 01**

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## Jian-Yong Wu

Research Institute for Future Food, Department of Applied Biology & Chemical Technology, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong

### Prebiotic functions and health benefits of bioactive natural polysaccharides

The human gut is populated by a huge number of microbial organisms, generally known as the gut microbiota. The gut microbiota plays an important role in human health, affecting the digestive, immune and other host functions. Conversely, the dysbiosis of gut microbiota is implicated in the development and outcomes of human diseases and disorders. Prebiotic is a term for a class of carbohydrate fibers that are selectively metabolized by certain bacteria in the gut microbiota, conferring a health benefit to the host. In other words, the health benefits of prebiotics are the results from their fermentative metabolism in the gut microbiota and modulation of the gut microbial composition. Polysaccharides represent one of the most abundant components of many food and medicinal materials originated from plants, fungi, algae and other living organisms. Many polysaccharides have special health benefits and notable bioactivities such as antitumor, immunomodulation, antioxidant, and anti-inflammation. Most of the bioactive polysaccharides are non-digestible like the dietary fibres and can reach the large intestine to be metabolised by bacteria in the gut microbiota, so that the various health benefits of bioactive polysaccharides may be associated with their “prebiotic” functions in the gut microbiota. This presentation will give a brief review on the health benefits of bioactive polysaccharides associated with the gut microbiota and then a summary of the results and findings from our recent studies on the prebiotic functions and anti-inflammatory activities of exopolysaccharides (EPS) produced by a medicinal fungus *Cordyceps sinensis* Cs-HK1.

#### Audience Take Away:

- To gain better knowledge and useful information about the health benefits of natural polysaccharides and mechanistic connection with the gut microbiota.
- To recognize the significance of bioactive polysaccharides as abundant and attractive resource for development of new dietary supplements and therapeutic ingredients.
- To inspire the research interests and ideas on the valuable functions of polysaccharides.
- To identify the most promising areas and valuable opportunities of polysaccharides for academic research and health product development.

#### Biography

Dr. JY Wu is a full professor at the Hong Kong Polytechnic University. He received his PhD in Biochemical Engineering in 1994 at Queen's University in Canada. He has published more than 190 peer-reviewed papers, 145 as the first/corresponding author in SCI journals and attained over 7300 citations and an H-index 56 on Scopus. He is an editorial board member for *Carbohydrate Polymers*, *International Journal of Biological Macromolecules* and *Biotechnology and Applied Biochemistry*. Major areas of research interest: Bioprocesses for medicinal fungi; bioactive polysaccharides; Functional foods, prebiotics and gut microbiota; Ultrasound processing natural products.



**Yifan Zhong<sup>1\*</sup>, Tao Zhu<sup>1</sup>, Jiangdi Mao<sup>1</sup>, Congxiang Huang<sup>2</sup>,  
Zhaoxi Deng<sup>1</sup>, Yanjun Cui<sup>1</sup>, Jianxin Liu<sup>1</sup>, and Haifeng Wang<sup>1</sup>**

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<sup>2</sup>Xixi Hospital of Hangzhou, Hangzhou, China, 310023

## **L. reuteri ZJ617 inhibits inflammatory and autophagy signaling pathways in gut-liver axis in piglet induced by lipopolysaccharide**

**O**ur previous study has isolated a probiotic strain *Lactobacillus reuteri* ZJ617 (ZJ617) from pig intestine with high adhesive ability and showed inhibition ability against pathogens potentially via S-layer proteins both in vitro and in mice study. In this study, the protective effects of ZJ617 on intestinal and liver injury and the underlying mechanisms in modulating inflammatory, autophagy, and apoptosis signaling pathways in a piglet challenged with lipopolysaccharide (LPS) were investigated. A total of 18 Duroc × Landrace × Large White piglets were assigned to 3 groups (n = 6/group), including control (CON), LPS, and ZJ617 + LPS group. The CON and LPS group received oral phosphate-buffered saline for 2 weeks and intraperitoneal injected (IP) with physiological saline or LPS, respectively. Piglets in ZJ617 + LPS group were orally inoculated with ZJ617 for 2 weeks before IP of LPS. Compared with CON, LPS stimulation significantly increased intestinal phosphorylated-p38 MAPK, phosphorylated-ERK and JNK protein levels and decreased  $\kappa\text{B}\alpha$  protein expression, while LPS, TNF- $\alpha$ , and IL-6 levels in serum were increased (P < 0.05). Compared with CON, LPS stimulation significantly increased LC3, Atg5, and Beclin-1 protein expression (P < 0.05) but decreased ZO-1, claudin-3, and occludin protein expression (P < 0.05) and increased serum DAO and D-xylose levels, effects that were all countered by ZJ617 pretreatment. LPS induced significantly higher hepatic LC3, Atg5, Beclin-1, SOD-2, and Bax protein expression (P < 0.05) and lower hepatic total bile acid (TBA) levels (P < 0.05) compared with CON. ZJ617 pre-treatment significantly decreased hepatic Beclin-1, SOD2, and Bax protein expression (P < 0.05) and showed a tendency to decrease hepatic TBA (P = 0.07) induced by LPS treatment. Pretreatment of ZJ617 before LPS injection induced the production of 5 significant metabolites in the intestinal contents: capric acid, isoleucine 1TMS, glycerol-1-phosphate by-product, linoleic acid, alanine-alanine (P < 0.05). In conclusion, our results demonstrated that probiotic strain ZJ617 could alleviate LPS-induced intestinal tight junction protein destruction, and intestinal and hepatic inflammatory and autophagy signal activation in the piglets.

### **Audience Take Away:**

- The presentation highlighted the importance of probiotics in gut and hepatic health.
- Probiotic strain *L. reuteri* ZJ617 was isolated and studied by our lab, which could provide experience to the audience or faculty who are interested in the discovery of probiotics.
- The presentation demonstrated the beneficial effects of probiotic strain *L. reuteri* ZJ617 in piglets, which contributes to the application of probiotics in animal production.

### **Biography**

Dr. Zhong studied Animal Nutrition and Feed Science at College of Animal Science, Zhejiang University, Hangzhou and received his PhD degree in 2020. He is a post doctor majored in gut microbiota supervised by Prof. Haifeng Wang at the same institution. He has published more than 10 articles in SCI journals.

**Yuying Bai\*, Naoyuki Yamamoto**

School of Life Science and Technology, Tokyo Institute of Technology,  
Yokohama, Kanagawa, Japan

**Gut associated *Lactobacillus johnsonii* enhanced barrier function in colitis model mouse**

**B**acteria interact and communicate with the host intestinal epithelium by binding to specific host receptors. However, the host intestinal receptors for bacterial binding and the role in host health are not well understood. In the present study, *Lactobacillus johnsonii* MG (MG) with interaction with mouse intestinal tract was screened from mouse feces and analyzed its role in the intestinal tract. To identify the intestinal receptors involved in the bacterial binding, surface layer proteins isolated from MG were bound with affinity resin and intestinal proteins with affinity to MG were purified. The purified gut protein was identified as a member of tight junction protein, JAM-2.  $H_2O_2$  damaged tight junction of Caco-2 cells were improved by the treatment with MG throughout activations of various genes involved in tight junction, inflammation, transcriptional regulator, and apoptosis. Then, tight junction associating MG was challenged on dextran sulfate sodium (DSS)-induced colitis model mouse to confirm the anti-inflammatory effect. After the DSS treatment for 9 days, mice reduced body weight for 4 days, then naturally recovered it. After 3 days of washout period, the following MG treatment showed faster recovery of body weight than that of not-treated mice. MG treated mice also showed improvement of inflammatory damage in gut on DSS treated mice. By the treatment with MG, genes for ZO-1, LAMA3 and ITGA2 in matrix of tight junction and MMP1 in apoptosis were mainly upregulated. Additionally, MG affected on the DSS-induced gut microbiota by regulation of Ruminococcaceae, Bacteroides and Lachnospiraceae. We report here the potential of gut associating *L. johnsonii* MG on gut barrier function and intestinal microbiota in colitis model mice.

**Audience Take Away:**

- To develop now probiotic bacteria and understand probiotic effect in host and interaction with host components, and impact on intestinal bacteria, our study provides some approaches for them.
- To understand the role of intestinal bacteria, we will present a unique approach from mouse study. This study also shows some methods to identify receptor molecule and way to understand the functions of intestinal bacteria and key molecules involved in the interaction. The experimental steps include screening of bacteria, purification and identification of receptor, prediction and confirmation of function (culture cell), in vivo study.
- This research introduced a promising approach to find novel gut receptor molecule based on commensal bacterial interaction and understand host-bacterial communication from mouse model study.
- This study is based on novel approach and may need flexible idea depend on the target. So, to simplify the process may be not easy at this stage.
- For the improvement of accuracy, we need more time, but for NGS based data analysis, this study provides new idea for deep understanding of functions of intestinal bacteria.

**Biography**

Yuying Bai studied Food science and engineering (BS) at the Harbin Institute of Technology (China) where she graduated in 2017, then received her MS degree in 2019 at the same university. In 2019 she joined the research group of Prof. Yamamoto at Tokyo Institute of Technology (Japan), for a Ph.D. project in "interaction of gut microbiota and gut surface proteins".



## Nasim Tabrizi

Mazandaran University of Medical Sciences, Sari, Iran

### The role of gut-brain axis in epilepsy

Epilepsy is a common neurological disorder with negative effects on quality of life. In about one third of patients, epilepsy is resistant to common antiseizure medications. The low possibility of response to medical therapy in this group of patients demonstrates the urgent need to find and use other alternative therapeutic methods. Few recent studies have suggested the role of gut microbiota in epilepsy. In this review, I aimed to investigate the possible role of these microorganisms in the development and treatment of epilepsy.

Changes in gut microbiota may influence seizure pathogenesis by different mechanisms. Recent studies have shown that alteration in intestinal microbiota is necessary to achieve protection against seizure in both human and animal models. Moreover, treatment of animal models by probiotics similar to the intestinal flora which are enhanced by ketogenic diet, has led to seizure protection. There are reports of temporary seizure control in children and adults with refractory epilepsy who received antibiotic therapy. Partial improvement in patients with epilepsy who received probiotics as supplementary treatment is reported in a recent study as well. In addition, fecal microbiota transplantation has led to cure of epilepsy in a patient with epilepsy and Crohn's disease. The results of these studies suggest the possible role of gut bacteria in pathogenesis and treatment of epilepsy. However, well-designed placebo-controlled clinical trials with larger sample sizes and fecal microbiota analysis are necessary to clarify this issue and resolve the contradictions.

### Biography

Dr. Tabrizi has obtained her M.D. degree from Shahid Beheshti University of medical sciences, Iran in 2005. She has been educated as Neurology assistant at Isfahan University of medical sciences (2008-2012) and has achieved first degree of Iranian Medical Board registration in Neurology (2012). She has passed her fellowship course in Epilepsy at Isfahan University of Medical Sciences (2016-2017). Now she is an Associate Professor of Neurology and head of Neurology Department and Epilepsy Monitoring Unit at Mazandaran University of medical sciences, Iran. She has published more than 40 research articles in PubMed and Scopus indexed journals.



## Hebe T. Fernandez

Departamento de Agronomía, Universidad Nacional del Sur, Bahía Blanca, Buenos Aires, Argentina.

### Use of probiotic *Bacillus Subtilis* and chia meal in broiler. Impact on gut histomorphometry and productive performance

In poultry production, there is a growing interest in researching possible alternatives in the diet that are translated into animal growth and health benefits. In this sense, the use of probiotics has attracted great interest as a viable alternative to the use of antibiotic growth promoters. In addition, enriched broiler diet with omega n-3 polyunsaturated fatty acids (n-3 PUFA) has a beneficial effect on the immune system, increasing performance and resistance to poultry diseases. The addition of a probiotic combined with a source of n-3 PUFA in the diet could exert a complementary action. Probiotics promote the absorption of n-3 PUFA and these fatty acids improve the adhesion of probiotics to intestinal mucosa. The purpose of this research was to evaluate the effect of the addition in the diet of a probiotic (*Bacillus subtilis*; Laboratorios Biotay, Argentina) and/or a by-product of the agroindustry, chia meal (*Salvia hispánica* L.; DESUS S.A, Argentina) on gut weight, intestinal histomorphometry and productive performance of broiler. The results obtained in this work suggest that the addition of 250 g/ton  $1 \times 10^9$  UFC of *Bacillus subtilis* or 15% chia meal in broiler diet had no effect on productive parameters and commercial cuts. Furthermore, a synergistic effect between n-3 PUFA and the probiotic was expected to be evidenced. The mucilage (soluble fiber) present in chia meal would increase digestive passage speed, thereby affecting absorption of nutrients and adhesion of *Bacillus subtilis* to intestinal mucosa through biofilm formation. Moreover, n-3 fatty acids could decrease probiotic growth capacity by inducing changes in the fluidity of the microorganism's membrane (Gram +). In addition, there is evidence that bacteria can capture PUFA, decreasing their availability for metabolic purposes. In the interpretation of productive results, it is also important to take into consideration the effect of n-3 PUFA and mucilage of chia meal on gut weight and mucosal structure. Chia meal diet enhanced small intestinal weight and crypt depth, leading to increased development of intestinal villi. However, the higher absorptive surface area was not reflected by an enhancement of productive parameters. Maintenance energy is largely related to the intense metabolic activity of the digestive organs. Increased small intestine weight results in higher maintenance requirements and lower energy for production. The lack of differences observed in performance parameters in chia meal diet could be attributed to a trade-off between the promotion of intestinal mucosal development and increased maintenance energy. Further research is needed to determine the effect of removing chia mucilage or using enzymes as carbohydrases to reduce intestinal viscosity, as well as to study the possible effect of higher doses of *Bacillus subtilis* and time of exposition on broiler diet.

#### Audience Take Away:

- The research presented in this work will lay the groundwork for future research allowing the use of new additives or deepening into the compounds presented. Currently, there is a growing interest in investigating possible alternatives in the diet of broilers that result in obtaining heavier, healthier and cost-effective animals.
- The knowledge of the effects of the addition of a dietary by-product of the agroindustry, chia meal combined with *Bacillus Subtilis* appears as being limited. In our current study, diets containing 250 g/tn  $1 \times 10^9$  UFC of *Bacillus subtilis* with 15% chia meal were novel. Further research is needed to determine other exposure times and probiotic doses as well as methods for mucilage extraction of chia meal
- Actually, all concepts imparted in this talk are used in several signatures dictated at the Department of Agronomy with the objective to promote student interest.
- The information imparted in this presentation will allow understanding of the importance of the addition of probiotics to the diet and their effect on intestinal health and broiler production as possible growth promoters reducing or replacing the use of antibiotics.



- On the other hand, it will raise awareness about the importance of using agro-industrial by-products as an ingredient in animal diets, as a way of adding value to the production system.
- It provides new information for professionals since the use of low-cost agroindustrial by-products is expected to improve animal performance and reduce costs by replacing part of cereals. Moreover, probiotics allows replace the use of antibiotic growth promoters with natural additives in order to obtain high-protein feed, optimize intestinal health, immune status and production parameters in broiler chickens.
- This presentation transfers promissory experiences on the importance of the use of these by-products encouraging the development of new trials, as well as, their diet incorporation to provide greater health benefits.

### **Biography**

Dr. Hebe T. Fernández graduated as Veterinary at the National University of La Plata, Argentina. She then joined as a professional teaching research assistant at the Department of Agronomy of the National University of the South (UNS), Bahía Blanca. She received the M.Sc postgraduate degree in 2001 at the same institution, later obtained the position of an Associate Professor. Since 2013 she is the Director of the Poultry Broiler Experimental Unit (UEA) of the Department of Agronomy directing grade and posgrade students. The main line of research focuses on the production of sustainable broiler, investigating alternatives in the management of the diet that lead to direct benefits on performance and animal health, as well as meat with higher nutritional value and hygienically safe for public health.



## Anju Kala\*, Shubham Waghe, L.C. Chaudhary

Animal Nutrition Division, Indian Veterinary Research Institute, Izatnagar,  
India

### Calf-gut multi species probiotic shows enhanced anti-microbial potential against different *E. coli* isolates from field

Multi strain probiotics are considered to have a wide range of possible advantages due to greater variety of microbes and hence broader efficacy spectrum against gut pathogens. This study explores the comparative assessment of autochthonous probiotic strains individually or in combination for their anti-microbial ability against common enteric pathogens using battery of in vitro tests. Ten autochthonous lactic acid bacteria belonging to *Lactobacillus* and *Pediococcus* genus (RM 139, RM 144, RM 146, RM 148, RM 149, RM 150, RM 151, RM 125, RM 119 and RM 122) from calf-gut were assessed for their probiotic attributes.

All the isolates were able to tolerate gastric pH 2, 3 and intestinal pH 7, 8 up to 6 hours of incubation. The isolates flourished very well under different bile salt concentrations (0, 0.3 and 1 %) up to 6 hours of incubation with decrease of only about 2% and 11% for 0.3 and 1 % bile salt, at end of 6h of incubation. The isolates had high Cell surface hydrophobicity, strong (RM 149, RM 125 and RM 119) to moderate biofilm formation. Isolates RM 144 (135.63 $\mu$ l/ml), RM 148(133.14 $\mu$ l/ml) and RM 149(130.56 $\mu$ l/ml) showed the maximum lactic acid production, whereas for other isolates lactic acid production ranged from 86-127 $\mu$ l/ml. All the isolates were positive for presence of bacteriocin gene. The antibiotic susceptibility against 8 antibiotics showed that all the isolates were resistant to vancomycin, oxytetracycline, clindamycin and erythromycin, with variable susceptibility to Ampicillin, Levofloxacin, Cephalolhin and Gentamycin.

*E.coli* has been reported as primary or secondary infection in every kind of neonatal diarrhoea as bacterial infection. In order to assess the antimicrobial activity against *E. coli*, all the isolates were initially tested against *E. coli* ATCC strain and produced zone of inhibition (ZOI) ranging from 13-19 mm with maximum inhibition shown by RM 149, RM 150, RM 125 and RM 119. Based on this, these four isolates with highest ZOI were shortlisted to assess the antimicrobial potential of the selected four isolates in combination. To study the possible antagonism among the shortlisted four isolates, cross streak assay was performed, which showed that there was no antagonism amongst the selected strains. Further, 11 combinations (6 binary, 4 tertiary and 1 quaternary) of the selected isolates were assessed for their anti microbial activity against different *E. coli* isolates with 7 different serotypes and 5 field strains from neonatal calf diarrhoea samples. Interestingly, it was observed that some combinations showed higher ZOI than individual isolates and other combinations. Combination of RM149+RM150+RM125+RM119 showed the highest inhibition followed by RM149+RM150 and RM149+RM150+RM119 than individual or other probiotic combinations for most of the *E. coli* strains tested.

It was clear from the study that multi strain probiotics have higher anti microbial activity than the single strains. However, only specific combinations of probiotics can provide high anti microbial activity, and thus should be assessed critically in laboratory before preparation of a multistrain probiotic. In our study, multistrain probiotic having four probiotic cultures showed highest antimicrobial activity against various *E. coli* strains from calf diarrhoea samples.

#### Audience Take Away:

- Probiotics have potent antimicrobial property, which is enhanced with a multi strain combination than individual strains.
- However, the antimicrobial activity differs for various probiotics, and hence a systematic assessment of probiotics should be strictly followed while formulating a multi strain probiotic combination.
- The audience will learn how to approach systematically for formulation of a multistrain probiotic combination.
- The study provides a probable solution to address the increasing anti microbial resistance (AMR) in livestock.

**Biography**

Dr Anju has studied veterinary science and animal husbandry and graduated from GB Pant University of agriculture and technology, UK, India. She has done her Masters in veterinary science in Animal nutrition from Indian veterinary research institute, UP, India. She has also completed her PhD from same institute in 2017 in Animal nutrition. She joined Agricultural research system as scientist in Animal nutrition in 2015, and is currently working in field of probiotics, synbiotics for neonatal calves, rumen microbiology, rumen metagenomics, and methane mitigation. She has 21 research articles in peer reviewed journals, 46 invited lectures, and 20 other publications. She is also recipient of many national and societal awards.



## Kavita Pandey

Dept of Bioanalytical Sciences, GN Khalsa College (Autonomous), Mumbai  
India

### Role of functional foods to combat lifestyle disorders

The human gastrointestinal tract (GIT) harbours the most abundant number and varieties of microbes called the microbiome. It consists of good and bad bacteria in balanced ratios (eubiosis). However, in today's fast-paced life, several factors like lack of sleep and exercise, consumption of processed and sugary foods, stress, and most importantly bad food choices leads to imbalanced flora, called dysbiosis. Dysbiosis has been associated with several life-style related disorders like diabetes, hypertension, cancer, etc. To combat these lifestyle disorders functional foods like probiotics, prebiotics have been very crucial. They are known to selectively promote the probiotics. This presentation throws light on the mechanisms involved in the different health benefits imparted by functional foods consumption on human health.

#### Audience Take Away:

- Causes of dysbiosis.
- Types of foods to consumed to promote gut health.
- Functional foods in India and more.

#### Biography

Dr. Kavita Pandey is presently heading the department of Bioanalytical Sciences at GN Khalsa College, Mumbai, India and also offers consultancy services to various nutraceutical industries. In 2012, she pursued her Masters by research, (working on an industrial problem related to probiotics fermentation) and later in 2016 earned her doctoral degree from the University of Mumbai. Some of her areas of research interests include functional foods, probiotic bioprocess, human microbiome, and nutraceuticals. Dr. Kavita has delivered invited talks across India and USA at multiple scientific events. She has published more than 22 research articles in national and international peer-reviewed journals and 3 book chapters so far.

**Manisha Mandal**

Department of Physiology, MGM Medical College, India

## Metagenomic analysis of non-dairy fermented foods reveals food source associated differences in taxonomy, biosynthesis of secondary metabolites and xenobiotic degradation

**Background and objectives:** Recent studies have suggested that healthy diets should include fermented foods to enhance probiotics as live beneficial microorganisms in our gut. The need for non-milk based fermented foods has arisen in lactose intolerants, those allergic to milk proteins, vegans, due to high fat and cholesterol content in dairy products. However, the mechanisms underlying the health benefits accruing from the non-milk fermented food microbiome are not clearly understood. The present study aims to attain a comprehensive insight into the structural and functional composition of microbiomes by metagenomic analysis of a diverse range of non-dairy based fermented products traditionally used across a number of countries.

**Methods:** MiSeq single-end fastq sequences of 16S rRNA bacterial genes were fetched using SRA, pertaining to 23 non-dairy fermented food samples (9 datasets) including pickles (n=3), sauerkraut (n=3), whole wheat (n=2), sourdough (fermented spontaneously or by inoculation, n=3, each), Arabian foods (n=2), olives (n=2), carrot juice (n=3), and pozol (n=2). The sequences were imported to QIIME2 in Miniconda-3, and subjected to demultiplexing, quality control with Dada2 algorithm, phylogenetic analysis, and taxonomic classification using GREENGENES. Statistical analysis for community profiling was achieved with alpha-, beta diversity, and core microbiome analysis; clustering analysis with heatmap to compare abundance of different taxonomic levels, dendrogram, correlation analysis, pattern search; differential abundance analysis with univariate statistics, and marker-gene survey with metagenomeSeq (<https://www.microbiomeanalyst.ca>). The PICRUSt was used for prediction of the functional potential and pathway analysis of the microbiota from 16S output.

**Results:** The study revealed that the fermentation source and food types were the major drivers of microbial composition, with pozol and whole wheats demonstrating respectively the highest and lowest effect on microbial diversity, while inoculated sourdough exhibited highest species richness. Functionally, pickles and dough were more diverse and rich respectively, while sauerkraut displayed no effect on microbial community function. Genes related to ATP-binding cassette type transport system were dominant, essential in nutrient uptake, cell viability, protein secretion, signal transduction, drug and antibiotic resistance. *Lactobacillus* was consistently abundant in carrot juice, spontaneous sourdough, pozol, and whole wheat while *Lactococcus*, *Leuconostoc*, and *Weisella* were abundant in carrot juice only, the four beneficial lactic acid bacteria with established probiotic potentiality. Bacterial strains of the genus *Sphingomonas* with projected bioremediation capacity, was predominant in spontaneously fermented sourdough. The presence of genes related to the degradation of atrazine, styrene, geraniol, caprolactam, limonene, pinene, toluene, ethyl benzene, polycyclic aromatic hydrocarbon, and fluorobenzoate might be useful in restoring environmental quality. This study revealed the abundance of genes related to the biosynthesis of penicillin, cephalosporin, stilbenoid, diarylheptanoid, gingerol, flavonoid, carotenoid, and ansamycins with possible industrial application. On the other hand, involvement of pathogenic bacterial genera such as *Clostridium*, *Corynebacterium*, *Pseudomonas*, *Escherichia*, *Rhodococcus* and *Streptococcus* in pickles cannot be ruled out for major health concern to the consuming population.

**Conclusions:** Non-dairy genomics may be applied for monitoring the microbial composition and functionality to obtain candidate non-dairy starter strains, towards development of functional food with desirable gene traits, and assessing the safety of the traditional non-milk fermented foods.

**Audience Take Away:**

- The information gained is important for evaluation of alternatives to fermented dairy foods with respect to their suitability, safety, and benefits.
- The study will help in the development of functional food with probiotic potentiality for certain population who are lactose intolerant, allergic to milkproteins and strict vegeterians.

**Biography**

Dr. Manisha Mandal has her expertise in the field of molecular epidemiology of infectious diseases, data analysis using bioinformatic approaches towards drug development, disease modelling, next generation sequencing, bioremediation of pesticide using bacterial system, and pollution abatement. She has published more than 70 research articles in her research field in different journals, one book, and presented several papers in different conferences.



**Kouadio Natia Joseph<sup>1\*</sup>, Allalet Zady Luc Olivier<sup>1</sup>, Kra Kouassi Aboutou Severin<sup>1</sup>, Digut, A Camelia Filofteia<sup>2</sup>, Niamke Sebastien<sup>1</sup> And Matei Florentina<sup>2</sup>**

<sup>1</sup>Laboratory of Biotechnology Agriculture and Valorisation of Biological Ressources, UFR Biosciences, Felix Houphouet-Boigny University, Abidjan, 22 BP 582 Abidjan, Cote d'Ivoire

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## **Probiotic Potential of *Lactobacillus plantarum* strains Isolated from Fermented Paste of Plantain Dockounou Enriched with Soybean and Fish**

**B**acteria isolated from fermented foods plays an importance role in intestinal flora and can be used as probiotics in human and animal nutrition. The goal of this study was to select, to sequence and to assess the probiotic potential of 10 (ten) lactic acid bacteria isolated from fermented dockounou dough plantain enriched with soybean and fish. To do so, 10 lactic acid bacteria were isolated from fermented dockounou pastes enriched with soybean and fish. Selected isolates were identified on the basis of morphological, physiological and biochemical characterizations and by 16S rRNA gene sequencing. Their resistance to environmental conditions (pH 1.5, 0.3 % of bile salt, pepsin-pH 2, 0.4 % of phenol), safety conditions with respect to the host (hemolytic activity, antimicrobial activity and antibiotic sensibility) and their functional properties (hydrophobicity, self-aggregation and co-aggregation tests) were studied in order to evaluate their potentialities probiotics. Sequencing reveals that 10 isolates of lactic acid bacteria are different strains of *Lactobacillus plantarum*. Regarding the resistance to environmental conditions, the results show a strong resistance of the strains to pH 1.5 (81.18 % - 98.16 %); to phenol (40.59 % - 128.24 %), to bile salt (68.64 % - 100.65 %) and to pepsin pH2 (99.77 % - 88.54 %). All isolates showed non-hemolytic activity and very high anti-microbial activity against *S. aureus*, *Listeria monocytogenes*, *Escherichia coli* and *Salmonella tiphy*. All the strains showed sensitivity to antibiotics of protein synthesis inhibitors and cell wall synthesis inhibitors. Concerning the functional properties, the strains showed good capacity of self-aggregation (63.20 % - 99.60 %), hydrophobicity (35.23 % - 69.43 %) and co-aggregation (56.67 % - 71.78 %) against *S. Tiphy*. *S. Tiphy*. The findings of this study suggest that *Lactobacillus plantarum* strains with interesting probiotic properties could be used to develop functional products in the future.

**Key words:** Lactic bacteria, potential probiotic, senescent plantain, dockounou paste, *Lactobacillus plantarum*, antimicrobial activity, hydrophobicity.

### **Audience Take Away:**

- From this presentation, the public will learn that different species of *Lactobacillus plantarum* have been isolated from the fermented dockounou paste of plantain enriched with soybean and fish.
- This result could comfort other researchers in their studies because usually, it is a diversity of lactic bacteria that are isolated in fermented foods. Moreover, the isolated *Lactobacillus* presents a great ability to resist to gastrointestinal stress conditions and does not constitute a threat for the living organism.
- The results of this study can be used by the scientific community after its publication and the drafting of technical data sheets. The methodology and the results of this study can be used for teaching purposes because they reflect the behavior of *Lactobacilli* as probiotics.
- The high resistance capacity to stress conditions of the gastrointestinal tract, the absence of harm to the host as well as interesting technological properties are qualities that are sought by industrialists for the use of microorganisms as probiotics. However, this study can serve as a basis for other researchers to improve their probiotic research strategies.

### **Biography**

Dr. KOUADIO Natia Joseph studied biochemistry-microbiology at the University Félix Houphouet-Boigny in Abidjan, Ivory Coast, where he obtained a PhD in food biotechnology. I was recruited as a researcher at the same university in February 2017. I am working on valorization of the senescent plantain through its transformation into a food called dockounou. Currently, we are planning to enrich it with soybean and fish and then transform it into flour in order to make it a food to fight against malnutrition. These research projects have received funding from PASRES and from the Romanian government under the Eugen Ionesco scholarship.



## Amir Salari and Zeinab Rezaei\*

Department of Food Hygiene and Aquaculture, Ferdowsi University of Mashhad, Iran

### Metamorphosis of probiotics from the first generation to the fourth generation in the food industry

A recent review of statistics shows that out of the amount of money that is happening in the world for probiotics, in 2023 it is estimated that we will have a turnover of about twenty billion dollars for probiotic products. We see the same phenomenon in scientific discussions. Research from 1995 onwards reveals the fact that probiotics have emerged as a new phenomenon in scientific research and are increasing day by day. This shows that both in research and in operational and financial aspects, the phenomenon of probiotics has occupied a wide space of food science and health and is predicted to be one of the most important issues in the food industry in the next few years. On the other hand, there are various challenges in the development of these microorganisms. If we want to draw the metamorphosis of probiotics from birth to today, we come to the following timeline.

In the 1900s and 1965s, efforts began to produce probiotic products, leading to the emergence of the first generation of probiotics. Lyophilized planktonic bacteria were the first generation of probiotics to be used to produce probiotic products. Later, declining probiotic populations in processing and storage, gastrointestinal conditions, and the presence of antibiotics led to the second generation of probiotics. Lyophilized bacteria were coated with natural or synthetic polymers. But this method also could not solve the problem of sensitivity and vulnerability in the gastrointestinal tract. In order to solve the problems of the second generation, encapsulation emerged as the third generation. This generation included bacteria that were trapped in the polymer by a mechanical or physicochemical process such as extrusion, emulsion, trapping, and spray drying. Despite the numerous studies that have been done on the encapsulation of probiotics, the problem of the survival and complete arrival of the bacteria to the desired location has not yet been understood. Therefore, many efforts are being made today to commercialize the fourth generation of probiotics. Biofilm is the fourth generation of probiotic bacteria, which is known as an innovative protection technique and is only a few years old.

#### Audience Take Away:

- The audience can find new ideas for the use of probiotics in the food, medicine and medical industries.
- Yes, familiarity with the fourth generation of probiotics can be of scientific and research interest and can be helpful in the commercialization of probiotic products.
- One of the major problems that the probiotic industry is currently facing is the persistence of these beneficial microorganisms during the processing and consumption process. With the fourth generation of probiotics, not only will the problem of survival be solved, but also the commercialization of this generation in the food and pharmaceutical industries can create a great change that can lead to the introduction of new and useful products.
- Yes, Probiotic biofilm method is a new and innovative method that can eliminate the disadvantages of previous generations and offer a great change in the production and delivery of probiotics.
- The fourth generation of probiotics is inexpensive.
- It is easy, simple and low cost to implement.
- A natural and innate method is bacteria itself. The survival of probiotics is increased by this method.

#### Biography

Dr. Zeinab Rezaei studied Food safety and hygiene at the Ferdowsi University, Iran and graduated as PhD in 2020. After one year postdoctoral fellowship supervised by Dr Haddad khodaparast at the Department of Food Science and Technology, Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad, Iran. For the first time, she studied probiotic biofilms in the food environment and she has published more than 5 research articles in biofilm of probiotics.





**Diletta Francesca Squarzanti<sup>1\*</sup>, Paola Zanetta<sup>1</sup>, Margherita Ormelli<sup>1</sup>, Marcello Manfredi<sup>2</sup>, Elettra Barberis<sup>2</sup>, Virginia Vita Vanella<sup>2</sup>, Angela Amoroso<sup>3</sup>, Marco Pane<sup>3</sup> and Barbara Azzimonti<sup>1</sup>**

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## Cell-free supernatants of *Lactobacillus johnsonii* LJO02 inhibit the growth and virulence of pathogenic methicillin (oxacillin)-resistant *Staphylococcus aureus*

The rapid spread of multidrug-resistant (MDR) bacteria, such as the skin commensal *Staphylococcus aureus* which could behave as an opportunistic pathogen, is a global health challenge. Therefore, new methods to limit the over-colonization and virulence of opportunistic pathogenic biotypes are highly urgent. Recently, cell-free supernatants (CFSs) from lactic acid bacteria (LAB) cultures have been exhibiting the ability to reduce the virulence of different pathogenic species, including *S. aureus*.

We characterized and compared the activity of *Lacticaseibacillus rhamnosus* LR06 and *Lactobacillus johnsonii* LJO02 (DSM 21981 and DSM 33828, respectively; Probiotal Research Srl) CFSs, produced in the conventional animal-based De man, Rogosa and Sharpe (MRS) medium and in an innovative totally animal-free broth (TIL) versus the methicillin (oxacillin)-resistant *S. aureus* strain (MRSA; ATCC 43300). CFSs were analysed via high-resolution mass spectrometry and gas-chromatography for short chain fatty acids (SCFAs), lactic acid and protein composition, while their activity was assessed towards i) the viability and metabolic activity of the MRSA strain through optical density and alamarBlue assay, and ii) the capability to inhibit/disaggregate the pathogenic biofilm, via crystal violet staining.

All the CFSs reduce the viability and metabolic activity of *S. aureus*. The animal-free TIL medium demonstrates to be more efficient respect to MRS in stimulating LAB metabolism and in reducing the biofilm form, a virulent feature of the pathogen. CFSs from LJO02 produced in TIL are the best, thanks to their specific SCFAs and protein metabolites composition.

In conclusion, antagonistic non-pathogenic CFSs represent a promising and strategic approach, with potential applications as bacteriotherapy and bioremediation of hospital equipment surfaces. The deeper elucidation of the molecular basis associated with their anti-pathogenic potential could represent a novel and effective prevention and treatment measure for MRSA.

This is the first investigation showing that an animal-free medium can stimulate, to a greater extent than a conventional animal-based medium, the production of CFSs able to counteract opportunistic *S. aureus* over-colonization and virulence, through specific SCFAs, lactic acid and protein regulators.

### Audience Take Away:

- This work wants to highlight how it is crucial the balance among the microorganisms that colonize our skin, forming the cutaneous microbiota.
- *S. aureus*, normal harmless skin resident, finds the right way to express its opportunistic pathogenic potential under diverse and selective environmental pressure, for example the indiscriminate use of antibiotics.
- MDR *S. aureus* infections are often acquired in the hospitals but are also more and more frequently in the general community.
- Unfortunately, such conditions favor *S. aureus* numerical prevarication and virulence, leading to dysbiosis and several clinical disorders.
- CFSs from LAB could represent a non-invasive treatment to counteract MDR *S. aureus* spread.

**Biography**

Dr. Diletta F. Squarzanti graduated in Medical and Pharmaceutical Biotechnology in 2010 at University of Piemonte Orientale (UPO) in Italy. She obtained her PhD in 2016 in UPO, after a period as a Pharmacovigilance Associate in Phidea Spa in Milan, Italy. She then joined the laboratory of Applied Microbiology at CAAD directed by Prof. Azzimonti in 2017, where she is currently a Post-Doctoral fellow (UPObook). She published several papers in international peer reviewed journals (h-index 6; Publons).



## **Diana Catalina Castro Rodriguez**

Cátedras, CONACYT. Instituto Nacional de Ciencias Médicas y Nutrición  
Salvador Zubirán, Mexico City, Mexico

### **Benefits of consuming probiotics during pregnancy and lactation**

**I**t consists of basic concepts about the origin of the microbiota, how it is modified by maternal nutrition, the effects on offspring development, and possible interventions using functional foods, mainly probiotics as alternatives to prevent or improve the negative effects of poor maternal programming and its effect on the microbiota.

#### **Audience Take Away:**

- Importance of adequate nutrition in early stages of development such as pregnancy and lactation.
- Beneficial effects of the use of probiotics in fat reduction.
- Characterization of bacteria with probiotic potential.

#### **Biography**

Diana C. Castro Rodríguez has PhD in Science in Bioprocesses. She is currently a young researcher from CONACYT. She has carried out two research stays, one at the Institute of Agrochemistry and Food Technology, Valencia, Spain and another at Texas Biomedical Research Institute and Southwest National Primate Research Center, San Antonio, United States. She has three patent application records. She has been awarded honorable mentions for her work in both the Master's and PhD. Her line of research is aimed at the bio-synthesis of the secondary metabolites of probiotic and their effects in chronic degenerative diseases.

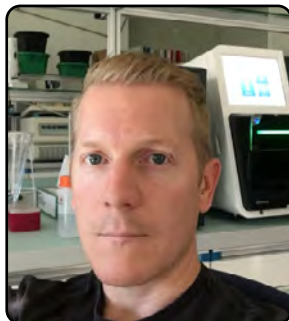
# POSTERS

## DAY 01

INTERNATIONAL CONFERENCE ON

# PROBIOTICS AND PREBIOTICS

**15-16** JUNE



## Bergman Jensen Karl<sup>1</sup>, Gerard François<sup>2</sup>, Lefort François<sup>3</sup> and Crovadore Julien<sup>3\*</sup>

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<sup>2</sup>BOSWELLIA SARL, 7 rue de la Bretonnière, 26330 Chateauneuf de Galaure

<sup>3</sup>HEPIA, Plants and Pathogens group, HES-SO//Geneva, University of Applied Sciences and Arts Western Switzerland, Jussy, Switzerland

### Uncovering the probiotics diversity of beehive products and flowers microbiotas with metagenomic analysis

New Nordic is a Swedish based company with a unique know-how in the field of medicinal plants. It develops and markets effective herbal food supplements that meet specific health and beauty needs. For many years, New Nordic has been particularly interested in wild microorganisms, resulting in the isolation and whole genome sequencing of interesting strains as natural probiotics, or allowing increased bioavailability of plants active ingredients through fermentation.

Thus, with one of its research partners specialized in plants, microbiology and sequencing, the Plants and Pathogens laboratory of HEPIA (Switzerland), several microbiotas analysis by metagenomics have been carried out in the last few years on different bees' gut, beehive products (such as honey, honeydew, pollen, bee bread, royal jelly) and flowers.

The proposed study consisted in a metagenomic profiling of six beehive related products microbiotas (one sample of fresh pollen, three of different honeys, one of honeydew and one of royal jelly) and two internal and external flowers microbiotas (from rose and lavender) which would provide a detailed profile of all microbial prokaryotic and eukaryotic microorganisms present in these samples as well as their relative proportions. It has also been planned to isolate and genetically identified some putative probiotic strains from the different samples, and to use them for further specific experiments of plants fermentation.

*Apilactobacillus kunkeei* species was found dominant in bee's gut, honeys and in other royal jelly and pollen samples too.

New Nordic has been able to develop and market a dietary supplement called « Wild Biotic », composed of recognized probiotic strains and supplemented by various wild strains found in beehive's products, honey being for example scientifically recognized to boost the immune system in the intestine by providing alive or even dead strains of *Apilactobacillus kunkeei*.

Two strains of *A. kunkeei* as well as several yeasts from honey such as *Zygosaccharomyces rouxii* or *Zygosaccharomyces mellis* are being studied alone or in co-culture to increase the antioxidant potential and the bioavailability of plant extract bioactive compounds by fermentation.

#### Audience Take Away:

- Metagenomics analysis of wild and raw materials
- Naturally Occurring Probiotics
- Genomics of Probiotics
- Fermentation Process

#### Biography

M. Crovadore studied Agronomy at the Agropolis institute of Montpellier (France) and graduated as Agronomy engineer at the Engineer school of Lullier in Geneva – Switzerland plus a certificate of advanced studies as Biomedical Engineer. He joined the research group of Prof. Lefort in the University of applied Sciences of HEPIA (Geneva – Switzerland) as Scientific adjoint and Phytopathology teacher. In charge of the genomic platform of the laboratory and of the sequencing data bioinformatic analysis, he is specialized in the study of various microbiota by metagenomic (soil, wastewater, plants, beehive products, birch sap, etc.), in the analysis of environmental DNA, in metabarcoding, in transcriptomic, in in vitro culture of plants, or in microbiological control. He has published more than 61 research articles in SCI(E) journals. He also now works part-time as an agronomy engineer and scientific advisor in the creation of new products for the privately owned nutritional supplement company New Nordic (Sweden-Danemark).



**Andrea Polo<sup>1</sup>, Claudia Cappello<sup>1\*</sup>, Ilaria Carafa<sup>1</sup>, Alessio Da Ros<sup>1</sup>, Francesca Baccilieri<sup>2</sup>, Raffaella Di Cagno<sup>1</sup>, Marco Gobbetti<sup>1</sup>**

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<sup>2</sup>Bonomelli SRL, Via Mattei, 6 – 40069 Zola Predosa (BO) Italy

## **A novel functional herbal tea containing probiotic *Bacillus coagulans* GanedenBC30: An in vitro study using the Simulator of the Human Intestinal Microbial Ecosystem (SHIME)**

**B**acillus coagulans is a spore-forming, Gram-positive, facultative anaerobic, nonpathogenic, lactic acidproducing bacterium with well-known probiotic properties. Currently, various strains of *B. coagulans* are used as probiotics with the overall potential claim of improving and/or preserving the ecological balance within the human intestinal microbiota, together with other health promoting effects. Nowadays, probiotics and functional foods are, probably, the binomial with the greatest potential. Fortification of the traditional beverages to make them suitable as carriers for probiotics is the most reliable way for functionalization. This study aimed at investigating the potential of a novel functional herbal tea to act as the carrier for the probiotic *Bacillus coagulans* GanedenBC30. Preliminarily, the optimal survival conditions of probiotic cells to infusion temperatures and GIT transit were assessed. Subsequently, the capabilities of *B. coagulans* GanedenBC30 to colonize mucus layers and persist in colon tracts were investigated using the SHIME model. Spores markedly survived to infusion treatments and the simulation of the gastrointestinal transit only slightly affected the survival, which was  $94.8 \pm 2.8\%$ . An in-depth investigation using the Simulator of the Human Intestinal Microbial Ecosystem (SHIME) which incorporated mucin-covered microcosms was performed. Q-PCR with targeted primers demonstrated that the probiotic quickly colonized mucosal compartments and persisted after 4 days of wash out. As estimated by plate count combined with 16S rRNA sequencing, *B. coagulans* GanedenBC30 showed almost the same behavior in luminal compartments both during herbal tea intake and wash out. By summing the luminal and mucosal values and referring to whole volume of colon bioreactors, the content of viable cells of *B. coagulans* GanedenBC30 was largely above the probiotic threshold.

### **Audience Take Away:**

- The audience will have the chance to learn more about a probiotic product definition using the Simulator of the Human Intestinal Microbial Ecosystem (SHIME) which is a unique tool to get scientifically validated insights about the potential behavior of functional probiotics during gastrointestinal transit.
- The audience will have the chance to hear about novel functional food (herbal tea) able to deliver probiotic *B. coagulans* GanedenBC30.
- This solution will help in finding alternatives in activities aiming at defining probiotic products, simplifying the design of the projects.
- This research could be used as reference from other faculties working on probiotics and their survival in the gastrointestinal tract.

### **Biography**

Claudia Cappello, studied Biotechnology (BS) at the University of Bologna where she graduated in 2015, then moved to Padova for the MSc. in Food Biotechnology and graduated in 2017. In 2019 she joined the research group of Prof. Di Cagno and Prof. Gobbetti in the Faculty of Science and Technology at the Free University of Bolzano (Italy), for a Ph.D. project in “Brain-Gut-Microbiome axis: psychobiotics, probiotics and food functionality”.

# KEYNOTE FORUM

**DAY 02**

**INTERNATIONAL CONFERENCE ON**  
**PROBIOTICS AND**  
**PREBIOTICS**

**15-16** JUNE



## Yasin Ozdemir<sup>1\*</sup>, Zehra Erigdeci<sup>2</sup>

<sup>1</sup>Department Food Technologies, Ataturk Horticultural Central Research Institute, Yalova, Turkey

<sup>2</sup>Akyuz Milk Products Food Industry and Trade, Kutahya, Turkey

### Possible Advantages of Using Reishi in Cheese Brine for The Production of Probiotics and/or Prebiotics Cheese

In this study, the use of reishi mushroom (*Ganoderma lucidium*) powder or extract in process brine or ripening brine in the cheese production and the possibilities of probiotic and/or prebiotic cheese production were evaluated in the light of literature reports. Studies on this subject support the idea that reishi mushroom powder or extract can be used in cheese brine to support the viability of probiotic bacteria without making any sensory difference.

Dairy products have been evaluated as a good probiotic and prebiotic carrier vehicle from past to present. Cheese producers have been working on alternative and new production methods to produce healthier products in recent years. For this reason, it is thought that these properties of cheese, which is a good probiotic and/or prebiotic food, can be supported by adding reishi mushroom powder in brine and this potential may increase. Reishi mushroom has water-soluble and prebiotic components, especially beta glucans and some polysaccharides. Thanks to these components, it has the potential to increase the growth of probiotic bacteria. In this way, it has the potential to provide beneficial effects both during the cheese process and after cheese is consumed in the gut of the consumer. In the production of probiotic foods, probiotic bacteria must be present in sufficient numbers and alive until the end of their shelf life. It is thought that the addition of reishi mushroom powder in the production brine and ripening brine will activate the growth of live probiotic bacteria. This is a situation that will increase the current probiotic cheese production potential. Manufacturers or researchers will be able to strengthen their processes with different natural prebiotics such as reishi mushroom

Thanks to the information gathered in this study, cheese producers or scientists doing research on this subject will have information about the possible beneficial effects of reishi mushrooms during cheese processing and ripening and will be able to use this data in future research designs. This study will provide new information to assist in a process design problem. The number of live probiotic bacteria cannot always be reached as desired. For this reason, adding prebiotic components that will encourage live bacteria to the brine will provide an advantage in the production of probiotic cheese. It is thought that cheeses containing both probiotics and reishi prebiotics may be attractive to consumers who want to eat healthier in the market. However, clearer results can be obtained with comparative studies on this subject.

#### Audience Take Away:

- Reishi mushroom has water-soluble and prebiotic components, especially beta glucan and some polysaccharides. Thanks to these components, it has the potential to increase the growth of probiotic bacteria. In this way, it has the potential to provide beneficial effects both during the cheese process and after cheese is consumed in the gut of the consumer.
- Dairy products have been evaluated as a good probiotic and prebiotic carrier vehicle from past to present. Cheese producers have been working on alternative and new production methods to produce healthier products in recent years. For this reason, it is thought that these properties of cheese, which is a good probiotic and/or prebiotic food, can be supported by adding Reishi mushroom powder in brine and this potential may increase.
- Thanks to the information gathered in this study, cheese producers or scientists doing research on this subject will have information about the possible beneficial effects of reishi mushrooms during cheese processing and ripening and will be able to use this data in future research designs.



- In the production of probiotic foods, probiotic bacteria must be present in sufficient numbers and alive until the end of their shelf life. It is thought that the addition of reishi mushroom powder in the production brine and ripening brine will activate the growth of live probiotic bacteria. This is a situation that will increase the current probiotic cheese production potential. Manufacturers or researchers will be able to strengthen their processes with different natural prebiotics such as reishi mushroom.
- This study will provide new information to assist in a design problem. The number of live probiotic bacteria cannot always be reached as desired. For this reason, adding prebiotic components that will encourage live bacteria to the brine will provide an advantage in the production of probiotic cheese.

### Biography

Dr. Ozdemir studied Food Engineering at the Ege University, Turkey and graduated as MS in 2004. He then joined the research group of Prof. Kurultay at the Trakya University. She received her PhD degree in 2011 at the Namık Kemal University. During PhD studies he started to work in Ataturk Horticultural Central Research Institute. He has 3 process patent and 2 national awards in scientific study area. He published more than 10 research articles in SCI (E) journals and more than 80 articles in international journals.



## Nurinisa Esenbuga\*, Muhlis Macit

Department of Animal Sciences, Faculty of Agriculture, Erzurum, Turkey

### Effects of supplementation of dietary probiotic at different levels on laying performance, egg quality and yolk fatty acid profile of laying hens

This study was carried out to determine the effects of different levels of dietary probiotics (Control, 0.3, 0.6) supplementation on laying performance, egg quality characteristics and yolk fatty acid compositions of Lohmann laying hens. A total of 72 Lohmann layers at age of 28 weeks were used in three groups, and the research was lasted for 16 weeks. Except for egg production and egg weight, probiotic levels did not affect laying performance parameters. As probiotic level increased, egg production and egg weight also increased linearly. Except for cracked egg, time significantly affected all of the performance parameters ( $P < 0.01$ ). The effect of probiotic level by time interaction had significant effect on feed consumption from performance parameters ( $P < 0.01$ ). Egg quality characteristics were not affected by the probiotic level except for shell thickness and yolk color. In addition, the effect of time on egg quality parameters except shape index, shell thickness and yolk color was very significant ( $P < 0.01$ ). Groups fed diets containing probiotics produced darker egg yolk color than the control group. Probiotic level by time interaction on other egg quality parameters was found to be insignificant except for the shell strength and shell thickness. As for the fatty acid compositions of yolk were examined, while stearic and oleic acids decreased in the groups supplemented with probiotics compared to the control group, myristoleic acid, palmitoleic acid, heptadecaenoic acid and elaidic acid increased. In conclusion, it was determined that egg production and egg weight increased in groups fed with diets containing probiotics at different level. Adding probiotics to the laying hen diet increased some unsaturated fatty acids and decreased saturated fatty acids such as stearic and oleic acid compared to control group.

Keywords: Laying hen, Probiotic, Performance and egg quality, Fatty acid composition

#### Biography

Prof. Dr. Nurinisa Esenbuga is a Professor at the Department of Animal Science of Ataturk University in Turkey. She has M.Sc. (1995) and Ph.D. (2000) degrees from the Department of Animal Science. Since 1992 she has continued her research and teaching activities. She is the author of more than 106 scientific papers. She had studied at the Department of Animal Science of Ohio State University as post-doctorate. She has contributed different project and had some grants from National Institutions. Prof. Dr. Esenbuga has gained major experience in project development; implementation and management by means of the various roles. She has undertaken in several national (e.g. TÜBİTAK, KUDAKA and BAP) research projects throughout her research career.



## Esperanza Martínez-Romero\*, Rafael Bustamante-Brito, Pilar Gonzalez-Roman, Diana Hernandez-Oaxaca, Monica Rosenblueth, Marco A. Rogel, Julio Martinez

Genomic Science Center, UNAM, Cuernavaca, Mexico

### Can endophytes become human probiotics?

We proposed an endophytic-enteric cycle to account for the flow of bacteria from plants to animal guts (Martínez-Romero et al 2021). From plants, valuable bacteria to be used as probiotics have been and will be obtained. Notably, plant and gut bacteria are intermingled in their phylogenies indicating that there is a common pool of bacteria that may inhabit both guts and roots. We found however that there may be a differential gene expression of these bacteria in these distinct habitats. On the other hand, human pathogens may be found as natural endophytes in food products. Pathogenic endophytes are not removed by surface disinfection procedures. To avoid plant colonization by pathogens, plant inoculation with probiotics may help. Thus, probiotics could be ingested directly from raw fruits and vegetables.

Martínez-Romero et al 2021. We and herbivores eat endophytes. *Microbial biotechnology*, 14: 1282-1299.

Support from PAPIIT (UNAM) 210021.

#### Audience Take Away:

- Audience will recognize new sources for probiotics.
- New ideas and resources for teaching.
- New concept of endophytes as a source of probiotics.

#### Biography

Esperanza Martínez-Romero is professor at the Genomic Sciences Center at UNAM Mexico. She studies the mutualistic symbioses of bacteria with plants and animals using metagenomics. She described new species of bacteria from plants and insects, some of them nitrogen-fixing bacteria. Some of the species she described are used as inoculants or biofertilizers in agriculture. She has received awards and prizes such the National Science Award of Mexico in December of 2019 and the UNESCO Prize for Women in Science in March 2020. She is a highly cited Mexican scientist. She has published 216 articles in international journals.



## Shyamapada Mandal

Department of Zoology, University of Gour Banga, India

### Omega-3 fatty acids in the management of FTO-mediated obesity: Molecular docking and ADMET profiling

Probiotics are small molecules found in food that benefit our health through gut homeostasis. Around the globe there is ample research on prebiotics, including omega-3 fatty acids, for their potential health promotion and diseases prevention. The current study has been designed to explore the inhibitory capacity of three omega-3 fatty acids: alpha-linolenic acid (ALA), docosahexaenoic acid (DHA), eicosapentaenoic acid (EPA) against fat mass and obesity-associated protein (FTO) as the obesity-target through molecular docking *in silico*. Displaying different interactions with several amino acid residues of FTO, the omega-3 fatty acids ALA, DHA and EPA had good binding affinity towards the protein with binding energy -6.0, -6.5 and -6.1 kcal/mol, respectively. All the three omega-3 fatty acid molecules obeyed Lipinski's rule of five with one violation ( $\log P > 5$ ) and showed high gastro-intestinal absorption property, while ALA and EPA showed blood-brain-barrier permeability. Overall, this study signifies the usefulness of omega-3 fatty acids (ALA, DHA and EPA), particularly the DHA with lowest binding energy (-6.5 kcal/mol), in the management of obesity and associated disorders.

#### Biography

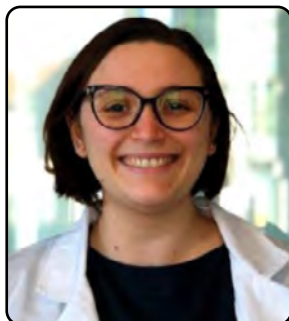
Dr. Shyamapada Mandal is Professor and Head of the Department of Zoology, and Dean (Science), University of Gour Banga, India. He is interested on infectious diseases, probiotics, and genomics and bioinformatics research. He did pre-PhD, PhD, and post-PhD research under the guidance of Professor Nishith Kumar Pal at Calcutta School of Tropical Medicine, India. He has published 118 articles with eight book chapters. He is life member of IAMM and IASR, India, and fellow member of SASS, India. Eight national academic and research awards have been conferred to him. He has guided 52 post graduate students; supervised three MPhil and three PhD students, and supervising 6 PhD and one MPhil students. Professor Mandal is among the world's top 2% scientists as per the survey of the Stanford University, published in PLOS (Public Library of Science) Biology (October, 2020). He is featured in the top 2% world scientists list for second consecutive time as published by the Stanford University-Elsevier BV (October, 2021).

**SPEAKERS**

**DAY 02**

**INTERNATIONAL CONFERENCE ON  
PROBIOTICS AND  
PREBIOTICS**

**15-16** JUNE



**Paola Zanetta<sup>1,2\*</sup>, Diletta Francesca Squarzanti<sup>1,2</sup>,  
Marta Ferrier<sup>1,2</sup>, Angela Amoruso<sup>3</sup>, Marco Pane<sup>3</sup>,  
Mario Migliario<sup>4,5</sup>, Barbara Azzimonti<sup>1,2</sup>**

<sup>1</sup>Department of Health Sciences, UPO, Novara, Italy

<sup>2</sup>CAAD, UPO, Novara, Italy

<sup>3</sup>Probiotal Research Srl, Novara, Italy

<sup>4</sup>Department of Translational Medicine, UPO, Novara, Italy

<sup>5</sup>Odontostomatology Unit, AOU Maggiore della Carita, Novara, Italy

## Roles of Probiotics in Oral Health

Oral Lichen Planus (OLP) is an underestimated autoimmune inflammatory disorder of mucous membranes, which involves 1-3% of the global population. It is still unknown why patients with the same predisposing factors can present more lesions with a faster progression into Oral Squamous Cell Carcinoma (OSCC), whose incidence can reach up to 12.5% of the total OLP cases.

Recent evidence is underlying the involvement of oral microbiota imbalances not only in OLP development and tumour progression, but also in systemic infections and disorders in several distant body sites. Since the still late OSCC diagnosis causes high morbidity/mortality rates, sanitary costs and social impact, novel prevention and treatment measures are urgently needed.

In order to respond to this demand, in this study we focused on *Aggregatibacter actinomycetemcomitans* (DSM 11123), *Streptococcus mitis* (DSM 12643) and *S. mutans* (DSM 6178), three normal oral commensals, which, under selective pressure, can overgrow and behave as opportunistic pathogens, especially in OSCC affected patients. Recent studies found a similar dysbiotic pattern in pretumoral oral lesions, such as OLP. In particular, these pathogens can promote systemic infections and chronic inflammation that are major OSCC triggers.

We selected, after literature research, six specific Lactic Acid Bacteria (LAB; *Lactobacillus brevis* LBR01-DSM 23034, *L. salivarius* LS03-DSM 22776, *L. reuteri* LRE11-DSM 33827, *L. rhamnosus* LR04-DSM 16605, *L. casei* LC04-DSM 33400 and *L. fermentum* LF26-DSM 33402, from Probiotal Research Srl and deposited at DSMZ) and we investigated, by an Agar Spot assay, their capability to contain the overabundance of the oral opportunistic pathogens. Then, we analysed LAB cell free supernatants (CFS) to determine their ability to reduce pathogen viability, using the BacTiter-Glo™ Microbial Cell Viability Assay, and to prevent biofilm formation, via crystal violet staining.

The LAB and their CFS demonstrated to contain pathogen viability and virulence; in particular, CFS from LRE11, LR04, LC04 and LF26 strains are the best performers that we will further evaluate for their possible effects in reducing the inflammation, DNA damage and apoptosis induced by infections in human oral keratinocytes. Finally, an in vivo perspective clinical study will be conducted on a cohort of OLP cases with the aim to investigate the impact of the selected LAB on their salivary and serum metabolic and inflammatory profiles.

### Audience Take Away:

- This work wants to highlight how it is crucial to also educate patients' categories regarding the new pathology prevention measures.
- In particular, the audience will understand how CFS from LAB may contribute to maintain oral eubiosis and health, being powerful tools for prevention of oral and non-oral pathologies and a good help for treatments.

### Biography

Paola Zanetta graduated as MSc in 2019 at University of Milano Bicocca, Milan, (Italy). She then joined Prof. Barbara Azzimonti's Applied Microbiology Lab group at CAAD as a Research Fellow first, and then as a PhD Student (Food, Health and Longevity; XXXVI cycle) in 2020. She spent six months at Cardiff University, Cardiff (UK), in Dr Joachim Bugert's Medical Microbiology Lab (2015), and one year at the Institut für Mikrobiologie der Bundeswehr, Munich (Germany) (2018), in Dr Joachim Bugert's Virology Lab. Now, her research is focused on oral microbiota, oral pathogens and probiotics.



**Shahrzad Mirashrafi<sup>1</sup>, Seyedeh Zahra Hejazi Taghanaki<sup>1</sup>, Faezeh Sarlak<sup>1</sup>, Amir Reza Moravejolahkami<sup>1\*</sup>, Mohammad Ali Hojjati Kermani<sup>2</sup> and Mohsen Haratian<sup>3</sup>**

<sup>1</sup>Department of Clinical Nutrition, School of Nutrition & Food Science, Isfahan University of Medical Sciences, Isfahan, Iran

<sup>2</sup>Clinical Tuberculosis and Epidemiology Research Center, National Research Institute of Tuberculosis and Lung Diseases (NRITLD), Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>3</sup>Department of Nutrition, Vice Chancellor of Health, Hamadan University of medical Sciences, Hamedan, Iran

## **Effect of Probiotics Supplementation on Disease Progression, Depression, General Health and Anthropometric Measurements in Relapsing-Remitting Multiple Sclerosis Patients: A Systematic Review and Meta-analysis of Clinical Trials**

**Background:** Probiotics may have a promising role in chronic auto inflammatory diseases. The current systematic review and meta-analysis investigated the effects of probiotics on disease progression, depression, general health and anthropometric measurements in Relapsing-Remitting Multiple Sclerosis (RRMS) patients.

**Methods:** The English literature search was performed using PubMed, Scopus, Web of Science, and the Central Cochrane Library through January 2021. Random effect models were used to synthesize quantitative data by STATA14.

**Results:** From a total of 152 identified entries, four trials were included in quantitative synthesis (n=213; 106 as intervention, 107 as control). An additional six studies with the same structure and different markers were also systematically reviewed. The pooled effect size showed that Expanded Disability Status Scale (EDSS) (WMD=-0.43; 95% CI=-0.65, -0.20; P<0.001), Beck Depression Inventory-2 (BDI-2) (WMD=-3.22; 95% CI=-4.38, -2.06; P<0.001) and General Health Questionnaire (GHQ) (WMD=-4.37; 95% CI=-6.43, -2.31; P<0.001) were improved following probiotics supplementation. However, body weight and body mass index did not statistically change.

**Conclusion:** Our findings revealed that probiotics supplementation can improve disease progression, suppress depression, and general health in MS patients; although, further investigations may be needed.

**Keywords:** Probiotics, health, depression, multiple sclerosis, meta-analysis, systematic review.

### **Biography**

Dr. Amir Reza Moravejolahkami is a dietitian (Ph.D. Candidate of Nutrition), with a base of anesthesiology. He works in a specialized Multiple Sclerosis center (M.S. Isfahan Clinic). He likes to investigate the effects of nutrition on chronic auto-inflammatory disorders; from MS to Cancers. He is a big fan of synbiotics, probiotics, and prebiotics



## Mohammad Reza Shadmand Foumani Moghadam

Department of Nutrition Sciences (Med-Sci), Varastegan Institute for Medical Sciences, Mashhad, Iran

### The New Barriers to Using Synbiotic and Probiotic supplementations in hospitalized critically ill patients

**Introduction:** Critical ill patients, regardless of the effect and variety of diseases, are at higher risk of losing “health-promoting” gut microbiota as well as overgrowth of pathogenic bacteria. This condition can lead the critically ill patients to higher infections and inflammation, sepsis, multi-organ failure (MOF), muscle wasting, and cachexia. Currently, synbiotics and probiotics are considered immunomodulatory agents that can be considered effective supplements for patients.

**Method:** This study reviewed current findings and recent unpublished evidence of the impact of synbiotics and probiotics in critically ill patients.

**Result:** In practice, the results of clinical studies are heterogeneous which prevents giving a firm answer to the impact of synbiotics and probiotics on critical illness. However, the literature regarding the impact of symbiotics and probiotics in critically ill patients is still in the exploring phase. The findings show no harmful impact of using probiotics and synbiotics in critical illness. In theory, gut microbiota modulation using synbiotics and probiotics can be considered an effective method to control pathogenic bacteria to reduce the infection. In addition, these supplements have the potential to improve energy and macronutrient homeostasis, reduce muscle wasting and improve clinical outcomes. Despite the exact mechanism being still unclear, there is evidence that these improvements result from maintaining and nourishing gut epithelial barrier and cells as well as replacing the host metabolism, and enhancing immune function. Nevertheless, there are evidences that the energy balance of these supplements has no significant beneficial impact on feeding tolerance and energy homeostasis. However, it significantly controls the prevalence and duration of diarrhea in critically ill patients. The limited data on critical illness suggests fasting blood glucose (FBG), insulin, and lipid profile do not significantly change by synbiotic and probiotic. There are also reports that nitrogen balance (clinically) and inflammatory markers significantly improve. So, despite the use of synbiotics and probiotics can have no effect on biochemical factors, it may have the potential to reduce the systemic inflammatory, sepsis, wasting and MOF that are the important concerns in critical care. Although clinical endpoints such as ICU length of stay and mortality rate remain unchanged. The works on this subject are limited and heterogeneous which required research more.

**Conclusion:** Studies suggest probiotics and synbiotics are safe in critical care and probiotic administration has beneficial effects that could be considered an adjunct therapy for critically ill patients. However still more work is required.

**Keywords:** ICU, critically ill, Probiotic, Synbiotic

#### Audience Take Away:

- Probiotics and synbiotics are safe in the critical care patients.
- The balance of findings shows probiotics and synbiotics can have benefits in critically ill patients.
- Probiotics and synbiotics can have small or no impact on biochemical agents but significantly improve clinical and inflammatory agents of critically ill patients.

#### Biography

Mohammad Reza is an Iran Medical Council Registered Nutritionist and Dietitian (IRMC-RDN) and researcher with a concentration in critical illness, cachexia, sarcopenia, and cardiometabolic clinical and public health studies. Despite the young age, his current occupations are Full researcher at Varastegan Institute for Medical Sciences and Research Assistant and Lab Manager in “MetaNut (Metabolism and Nutrition) Lab” as well as the COO of a nutritional knowledge-based private company. He won several research grants and titles during his education and currently is an editorial board member of “Current Medicine” and an academic reviewer of several journals.





## Seyed-Amir Tabatabaeizadeh

Department of Nutrition Sciences, Varastegan Institute for Medical Sciences,  
Mashhad, Iran

### Does probiotic supplementation help with gestational diabetes mellitus?

**Background and aims:** Gestational diabetes mellitus (GDM) is one of the most common complications of pregnancy and related to many adverse events of pregnancy. There are previous evidences that probiotics can be regarded as a therapeutic option in GDM. In this systematic review article, the effect of probiotic supplementation in GDM has been evaluated.

**Methods:** A systematic search for literatures was done through PUBMED/Medline and Google Scholar up to June 2021. This systematic review followed Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) Guideline for evaluation of the effect of probiotic supplementation on gestational diabetes mellitus.

**Results:** The component of probiotic supplements varied in different studies. However, the most prevalent species in approximately all of studies was *Lactobacillus*. Probiotic supplementation can reduce the fasting plasma glucose. Furthermore, probiotics reduced risk of GDM. On the other hand there are previous RCTs that have shown no beneficial effect for probiotics supplementation on the FPG or GDM risk. The difference of result in these studies can be related to viable counts of bacteria or types of probiotic strains. Furthermore, the power of some trials is insufficient due to have a low number of participants.

**Conclusion:** This study suggests that probiotic supplementation is associated with the reduced risk of GDM and a significant reduction in FPG. These findings are promising that maybe probiotic supplementation is useful as a therapy in GDM. However, it looks like that more RCTs with different doses and more probiotic strains in probiotic supplements and its effects on GDM could be warranted.

#### Biography

Dr. Seyed-Amir Tabatabaeizadeh graduate with an MD, PhD degree. Currently he has an assistant professor position in clinical nutrition, visit patients in the clinic, hospital, and do medical nutrition counseling. As a researcher, he focuses on chronic diseases, vitamin D, gut microbiome and inflammation and has publications in peer-reviewed journals in these fields.



## Pogorelov Valeriy\*, Kryvenko Bogdan, Pogorelov Alexey

Department of Physics Kyiv National Taras Shevchenko University, Kyiv, Ukraine

### Cluster structure and unique water and alcohols properties

Intermolecular hydrogen bonding, which is formed between water and alcohol's molecules, causes a variety of liquid water' and alcohols unique properties. This report presents the experimental FT IR studies' results of water and methanol trapped in Ar matrix at temperatures from 10 to 50 K as well as condensed water and methanol at temperatures from 100 to 370 K. It is shown that temperature evolution for FTIR-spectra of water trapped in cryo Ar-matrices can be considered as an experimental model of the water structure transformation during the phase transition from gas phase to condensed confined water [1, 2]. The FTIR spectra comparison of water in Ar-matrices with the corresponding spectra of bulk water allows us to conclude that bulk water structure consist from clusters of different sizes. These clusters are elementary volume units of hydrogen bonded networks. The comparison of the water vibrational spectra change with temperature in Ar matrix and in condensed phase allows us to conclude that intermolecular H-bonding can be seen in the water intracluster vibrational spectra. And they are absent in the isolated water molecules spectra. These vibrational spectra contain information about peculiarities of water cluster structure in cryomatrices and in condensed phase. Water cluster structure in condensed phase is changing with temperature. Number of big size clusters (4 – 6 molecules per cluster) is increasing while cooling [3]. Thus water in condensed phase is a complex cluster structure, its' cluster composition is changing with temperature. Cluster compositions of different sizes are depicting themselves through unusual water properties with unusual behavior at different temperatures. Our investigation results allow us to consider condensed water as hydrogen bonded Continuous Molecular Networks, where molecular clusters are structural units. One must take into account that such networks are created from clusters as structural units, and for liquid water the number of molecules in each cluster is not bigger than four. Networks of super cooled water contain five-molecule clusters, what don't allow to build the crystalline structure and explain the water density increase at temperatures below 273 K (so-called low density water). The analogous results we fixed for bulk methanol.

1. V. Pogorelov, I. Doroshenko, Vibrational spectra of water clusters, trapped in low temperature matrices, *Low Temp. Phys.* 42 (12) (2016) 1163 - 1166.
2. V. Pogorelov, I. Doroshenko, G. Pitsevich, V. Balevicius, V. Sablinskas, B.Krivenko, L.G.M. Pettersson, From clusters to condensed phase - FTIR studies of water, *J. Mol. Liq.* 235 (2017) 7 - 10.
3. A. Vasylieva, I. Doroshenko, Ye. Vaskivskiy, Ye. Chernolevska, V. Pogorelov, FTIR study of condensed water structure, *Journal of Molecular Structure* 1167 (2018) 232 – 238

#### Audience Take Away:

- It is research that other faculty could use to expand their research and teaching.

#### Biography

Prof. Pogorelov Valeriy studied Physic (Molecular Spectroscopy) at the Kyiv National Taras Shevchenko University, Ukraine and graduated as PhD in 1966. He obtained the position Full Professor at same University in 1986. His scientific interests are Raman Spectroscopy, vibrational and orientational molecular relaxation, structure and spectroscopy partially ordered liquids, peculiarities of cluster structure of water and 10 first alcohols. He has published 6 books and more than 200 research articles in SCI(E) journals.



## Ramesh Kothari\*, Amishi Bhatt

Department of Biosciences, Saurashtra University, Rajkot, Gujarat, India

### Probiotics and Prebiotics: An Evolving Aspect for Better Human Health

The human body lives in close harmony with a complex ecosystem; diverse microbiota inhabits different areas of the human body, collectively known as microbiota. Especially, gut microbiota which lives with us in a mutually beneficial life-long relationship. Gut microbiota plays a crucial and constructive role in maintaining and improving the host's health through various metabolic activities. These benefits can be enhanced by consuming friendly (probiotic) microorganisms and food (prebiotics) to improve the gut microbiome. The interest in probiotics has emerged constantly due to fascinating scientific shreds of evidence of benefits on human health. Hence, probiotics have been explored to learn about their habitats, beneficial activities, side effects, etc. Probiotics as a treatment modality may restore normal microbiota and functioning of the gastro-intestinal (GI) tract. Strong scientific evidence is associating these bacteria with the prevention and therapy of various GI disorders such as inflammatory bowel diseases, Irritable Bowel Syndrome (IBS), lactose intolerance, etc. Recent studies have pointed the link between the gut microbiota and the nervous system, including the brain, which can support treating mental health issues such as anxiety, depression and neurological conditions. Recently, the research going on in our lab is to obtain antimicrobial peptides from Probiotic organisms with lesser or no side effects as an advanced approach for the post-antibiotic era.

In recent years there has been a rapid rise in interest in applying probiotic supplements to act as mediators in health and disease. Probiotics can emerge as an alternative to improve immunity in pandemic situations like COVID19. In light of the ongoing trend of probiotics, further research is needed to obtain potential applications for better health.

#### Audience Take Away:

- The research going on in our lab and its outcome can be helpful to the researcher working in this field.
- The emerging aspect of probiotics and their direct or indirect association with human health will be explained.
- The presentation might develop innovative ideas to use probiotics for advanced disease treatment approaches.

#### Biography

Prof. Ramesh Kothari post-graduated in microbiology at the Saurashtra University, Rajkot, Gujarat, India. He received his Ph.D. degree in 2002 at the same institution. After his postdoctoral research from the University of Medicine and Dentistry of New Jersey (UMDNJ-now Rutgers University) Newark, USA, he joined as a Direct Professor in Microbiology at the Department of Biosciences, Saurashtra University, Rajkot, India. He has 22 years of research and teaching experience. He has published 47 research publications and more than 12 research papers in conference proceedings. He has guided 13 Ph.D., 08 M.Phil. and more than 50 M.Sc. Dissertation research students.



## Ravidarshdeep Kaur<sup>1\*</sup>, R.M. Rawal<sup>1</sup>, D.P. Singh<sup>2</sup>

<sup>1</sup>Department of Biochemistry and Forensic Sciences, Gujarat University, Ahmedabad

<sup>2</sup>ICMR-NIOH, Ahmedabad, Gujarat

### **Arsenic exposure and cognitive health: Understanding the relationship between arsenic related neurotoxicity and role of gut microbiota**

**G**ut microbiota plays a crucial role in retaining the hemostasis of host body however under the exposure of various heavy metals the composition of gut biota is disturbed in terms of species diversity and richness. Ever since the increase of microbiome related studies during the last decade, many research studies have delivered the understanding of the causes and concerns of alteration in the gut microbiota. The factor that regulates the microbiome includes nutrition and environmental pollutants that lead to alteration in the gut microbiome significantly. During the past decade research related to influence of heavy metal in gut microbiota alteration has increased and it's been confirmed from various studies that heavy metals alters the microbial composition which result in change in gene expression, alterations in metabolism, immunity, and neurological dysfunction. Majority of the studies regarding heavy metal effects on gut microbiota has targeted the toxic metals such as lead, arsenic, cadmium and mercury and model organisms such as fish (Danio rerio and Pimephales promelas) and mice (mus musculus).

#### **Biography**

I have obtained my bachelor's degree in 'Pharmaceutical sciences' from the Department of pharmaceutical sciences and drug research, Punjabi University Patiala, Punjab, India and currently pursuing PhD (pharmaceutical sciences) from Gujarat University in collaboration with ICMRNIOH (Indian council of medical research - National institute of Occupational health), Ahmedabad, Gujarat. I have previously worked in life science healthcare sector and as guest lecturer in Gujarat University, India. I have received DHR-ICMR young scientist fellowship award for the ongoing project entitled 'Targeting gut-microbiota by non-carbohydrate prebiotic substances in inorganic arsenic induced-cognitive deficit in a rodent model'. My PhD research involves Pharmacological studies on gut microbial modulators in arsenic induced behavioral alterations. My area of interest is heavy metal toxicity, gut microbiome, gut brain axis, probiotics and prebiotics.



## Ramesh Nagarajappa<sup>1\*</sup>, Debasruti Naik<sup>1</sup>, Gayathri Ramesh<sup>2</sup>

<sup>1</sup>Department of Public Health Dentistry, Institute of Dental Sciences, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India

<sup>2</sup>Department of Dentistry, Chamarajanagar Institute of Medical Sciences, Chamarajanagar, Karnataka, India

### Essential role of prebiotics and probiotics in dental health

Probiotics are live microorganisms that are introduced to the human body and are intended to have health benefits. They are often the same or similar to the microorganisms that live naturally within humans. Prebiotics are not alive, but they are dietary substances that favor the growth of beneficial bacteria over harmful ones. Prebiotics and probiotics both support the body in building and maintaining a healthy colony of bacteria and other microorganisms, which supports the gut and aids digestion. These food components help promote beneficial bacteria by providing food and creating an environment where microorganisms can flourish.

Oral-probiotics are helpful, and dentists can prescribe them to: prevent plaque, fight bad breath, prevent oral cancer and decrease inflammation from gum disease. Though both have proven health benefits exclusively, they need not to be taken together, but it is believed that the two can be even more effective when working synergistically.

Since these supplements are now widely used in health settings a thorough understanding of their risks and benefits are essential.

#### Audience Take Away:

- Health benefits of using these supplements.
- These relatively new oral care supplements are quickly gaining traction with consumers looking for alternative, preventative-focused options to address dental health and hygiene issues.
- It is essential to understand the effects and risks associated with their use.

#### Biography

Dr. Ramesh Nagarajappa, graduated from the prestigious Bapuji Dental College and Hospital, Davangere, India in 1999. He is presently working as a Professor and Head, in the Department of Public Health Dentistry affiliated to Siksha 'O' Anusandhan (Deemed to be University) at Bhubaneswar in India. He has a post-graduation teaching experience of over 22 years and guiding both PhD and MDS students. He has also authored 132 publications in various international and national reputed journals. He has been a regular reviewer too in many journals. He does have an experience of delivering scientific presentations and chairing scientific sessions in various conferences.



## Debasruti Naik\* and Ramesh Nagarajappa

Department of Public Health Dentistry, Institute of Dental Sciences, Siksha O Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India

### THE MAGICAL BIOTHERAPY OF PROBIOTICS IN DENTISTRY

Probiotics are dietary supplements, which have been advocated for the prevention and the treatment of a wide range of diseases. These products consist of beneficial micro-organisms, which stimulate health promoting flora thus, suppressing the pathologic colonization and disease spread. Since, probiotics are now widely used in both medical (such as cancer risk reduction, gastrointestinal tract health, and urinary tract health) and dental specialties (reduction in caries development, in achieving periodontal health, reducing oral malodor, etc.), a thorough understanding of their risks and benefits are essential. This topic focuses on the recent trends in use of probiotics in dentistry as well as the potential risks associated with them.

**Keywords:** Micro-flora, micro-organisms, probiotics

#### Biography

Dr. Debasruti Naik studied dentistry at Siksha O Anusadhan University, Bhubaneswar in the year 2012 and done her MDS in Public Health Dentistry from the same reputed university in India. She was awarded as best scientific paper presenter in many national conferences held at India. She was also a receiver of Gold medal for her MDS career in the year 2019. She is an academician and is well known for her publications in many national and international journals. She is currently working as Assistant professor in Dept. of Public Health Dentistry at Siksha O Anusandhan University and is presently pursuing her PhD simultaneously.



## Usra Jamil\* and Sayyada Ghufrana Nadeem

Microbiology, Jinnah University for Women, Karachi, Pakistan

### Bioactive Potential of Probiotics of Lactic Acid Bacteria from *Bos Taurus* (cow) Milk

Milk is an essential for all as it contains high valuable nutrients which are an important for all age groups. It provides basic medium for microbial production. Variety of milk and milk products basically linked with probiotic which is beneficial for intestine and boost gut flora. Different variety of milk contains various probiotic loads whether it's raw, fermented or any other milk products. Such as yogurt & cheese formed by lactic acid bacteria (LAB), which depends upon its temperature, microbial combination, technologies involved reaction condition. Fresh or fermented milks are consumed in different regions of the world. The presence of high counts of LAB in cow milks as beneficial microbes indicates a source for explorations of biological materials of considerable public health importance and vast applications in the dairy industry. It is now well understood that some of the infections and disorders such as irritable bowel syndrome, inflammatory bowel disease, & antibiotic-induced diarrhea could be treated with the use of probiotics (Shokryazdan et al., 2014). Broad range of bacteria produces peptides or bacteriocin like substance and their classification based on their molecular size, killing mechanism & chemical properties. Bacteriocins are ribosomal proteins, antimicrobial product that eradicate the growth production of other closely related microbes (Cotter et al., 2005). They are Generally Recognized as Safe (GRAS) due to less toxic as compared to unnaturally synthesize antibiotics (Holzapfel et al., 1995). The emergence of non-curable infections increase death rate because of resistant to many antibiotics. The researchers are continuously searched for an alternative and the bacteriocin is an alternative to control & overcome the alarming issue of multi drug resistance.

In this study 100 milk samples were analyzed to screen the bacteriocinogenic organism. The 72 samples were meeting the criteria and were preceded for further analysis by performing the physical, chemical & microbiological standard procedures. The antimicrobial susceptibility testing used for screening potential probiotic isolates against clinical isolates. We observed 23 isolates showed activity against clinical isolates & the probiotic isolates of *Lactobacillus acidophilus* & *Lactobacillus lactis* strains showed increased bacteriocinogenic activity by producing a wide zone of inhibition against drugs resistance pathogens.

#### Audience Take Away:

- The alarming situation of Multidrug resistant pathogens increasing day by day and this may contribute to work on an alternative to antibiotics.
- It's a preliminary study of probiotic food and its potential effects on pathogens, and knows about the probiotic load in raw cow milk.

#### Biography

Ms. Usra Jamil studied Microbiology at the Jinnah University for women, Pakistan and graduated (BS) in 2013. Recently completed MS degree and joined the same institution as a cooperative lecturer. And also done internship in food industry, clinical laboratory and have some skills on molecular techniques.



**Tohoyessou Majoie Geroxie<sup>1\*</sup>, Mousse Wassiyath<sup>1</sup>,  
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<sup>2</sup>Laboratory of Applied Microbiology, Department of Biotechnology, Bucharest Romania; University of Agronomic Sciences and Veterinary Medicine of Bucharest, Benin.

## **Study of the antibiotic/probiotic potential of lactic acid bacteria isolated from artisanal fermented dairy products sold in Benin.**

The objective of the present work was to study the probiotic potential of lactic acid bacteria isolated from artisanal fermented dairy products sold in Benin. A total of 128 strains of lactic acid bacteria were isolated from yoghurt, degue-Couscous and degue-Mil samples. After macroscopic and microscopic examinations and biochemical characterization, 30 strains were selected for the actual study. The hemolysis test was performed and none of the strains were hemolysis producers. All lactic acid bacteria strains had antibacterial activity in varying proportions on five pathogenic strains tested; most strains produced bacteriocin and were sensitive to most antibiotics tested. The strains showed good rates in self-aggregation, coaggregation and hydrophobicity tests. Molecular identification revealed the presence of 3 species of lactic acid bacteria: *Lactobacillus Fermentum*, *Lactobacillus pentosus* and *Lactobacillus plantarum*.

Given all the potentialities of probiotics, it would be interesting to overcome the problem of resistance of microorganisms to synthetic antibiotics by promoting the use of probiotic strains or antimicrobial metabolites produced by these probiotics as a solution of choice to conventional antibiotic therapy in the treatment of infections and also in bio-preservation.

**Key words:** Fermented dairy products, lactic acid bacteria, Probiotics, Benin.

### **Biography**

Dr tohoyessou Majoie Geroxie is a researcher at the Laboratory of Biology and Molecular Typing in Microbiology at the Faculty of Science and Technology of the University of Abomey-Calavi in Benin. She joined this team to obtain her Master's degree in Nutrition and Food Security and then did her thesis work to obtain her PhD degree in Microbiology, Molecular Biology and Nutrition in 2020 with the highest honors plus congratulations of the Jury. As a young researcher, she has shown her qualities through several doctoral and post-doctoral fellowships and has participated in several international conferences where she has presented the results of her different research works which all deal with public health issues.





## Wahauwouele Hermann Coulibaly

Biotechnology and Food Microbiology Laboratory, Food Science and Technology, Formation and Research Unit, University Nangui Abrogoua, Abidjan, Cote d'Ivoire

### **In Vitro evaluation of antimicrobial activity, antibiotic susceptibility, capacity to form a biofilm isolated potential probiotic strains from Tilapia fish (*Oreochromis niloticus*)**

The probiotic potential of lactic acid bacteria isolated from the gut of Tilapia fish (*Oreochromis niloticus*) for use in aquaculture was tested. The selection tests focused on antibacterial activity, antibiotic susceptibility and biofilm forming ability. Thus, from a collection of 154 isolates of lactic acid bacteria, only 72 isolates were able to inhibit growth of 5 pathogens *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus*, *Proteus mirabilis*, *Klebsiella pneumoniae* with inhibition diameters between 7 and 23 mm. The antibiotic sensitivity test carried out on the 72 isolates which passed the antibacterial activity test showed that only 25 lactic acid bacteria isolates were sensitive to 9 of the 12 antibiotics tested. Regarding biofilm forming ability test, all isolates (25) exhibited important capacity to form biofilm ( $DO \geq 0.5$ ). On the hand over, others tests will be necessary before a definitive selection.

#### **Audience Take Away:**

- This research work is a first step in fish feed improvement and all person which works in aquaculture can use this result in practice.
- Also, this result can to be used by the lecturers, researchers, students or everybody working in aquaculture or human feed.
- This result if it is valuable will allow increasing the income of aquaculture workers, increasing the fish production, to provide good quality of fish to consumers.

#### **Biography**

Dr. COULIBALY Wahauwouele Hermann holds Ph.D in Biotechnology and Food Microbiology at the University Nangui Abrogoua, Abidjan, Ivory Coast. Since 2017, He is researcher at Biotechnology Biotechnology and Food Microbiology laboratory at Food Science and technology department University Nangui Abrogoua. During Ph.D researchs, he performed a training in INSA-Toulouse France and several African countries such as Benin, Cameroon, Tunisia. He has been the recipient of post-doctoral research award of Agence Universitaire de la Francophonie (AUF) and Romania goverment; Eugen Ionescu in 2021 for post-doctoral researchs at University of Agronomic Science and Medecine Veterinary of Bucarest, Romania.

**POSTER**  
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## Safronova L.A<sup>1</sup>, Iryna Skorochod O<sup>2\*</sup>, Spivak M.Ya<sup>3</sup>

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### Hepatoprotective effects of the probiotic strains *Bacillus amyloliquefaciens* ssp. *Plantarum* on the model of rat hepatocyte lesion by tetrachloromethane

Due to the wide range of biological activities and positive effects on the body preventive and therapeutic efficacy of probiotics *Bacillus amyloliquefaciens* ssp. *plantarum* are intensively studied in various diseases (gastrointestinal disorders, cancer, allergic and HIV diseases, diabetes). Of particular interest in this matter is the study of the effects of probiotics on stress-sensitizing cells of animals and humans, in particular on hepatocytes. Imbalance of hepatocyte redox-homeostasis plays an important role in the course of inflammatory, metabolic and proliferative liver diseases. Reactive oxygen species primarily influence on hepatocyte proteins, lipids and DNA. Therefore, inactivation and elimination of oxidants in hepatocytes is an important process. In our study, rat liver cell damage was initiated by carbon tetrachloride (CCl<sub>4</sub>). This is one of the most well-known hepatocarcinogen used to create experimental models of hepatopathies. The toxic effect of CCl<sub>4</sub> is realized both by direct action on cell membranes and by its metabolic transformation into hepatotropic free radicals with the participation of cytochrome P<sub>450</sub>. Based on this model of hepatocyte damage in animals, the study of hepatoprotective action of microorganisms has achieved some success. However, the presence of such effects for *Bacillus amyloliquefaciens* ssp. *plantarum* IMV B-7142 and *Bacillus amyloliquefaciens* ssp. *plantarum* IMV B-7143 remain unexplored to date.

It was found that catalase activity of rat hepatocytes decreased by 288.5 mM/min/mg of protein and antiradical activity (ARA) – by 21.54% at their treatment by CCl<sub>4</sub>, compared with the control sample. At the same time, the levels of lipid hydroperoxides (LOOHs) increased by 2.74 relative units and malonic dialdehyde (MDA) by 4.35 μM/L, respectively to control. However, at post-treatment of stress-induced hepatocytes by cell-free extracts (CFE) of the studied probiotic strains, the aggressive effect of CCl<sub>4</sub> was reduced. Thus, at post-treatment of hepatocytes by the CFE of strain IMV B-7142, the catalase activity of mammalian cells increased sharply and exceeded that in the control variant by 196.7 mM/min/mg of protein and by 485.2 mM/min/mg of protein in stress-induced sample. However, the CFE of strain IMV B-7143 did not affect this enzyme activity. The antiradical activity of CCl<sub>4</sub>-treated hepatocytes to 2,2-diphenyl-1-picrylhydrazyl radical at their post-treatment by CFE of IMV B-7143 increased by 21.04%, and the CFE of IMV B-7142 – by 38.74%, respectively, to the stress-induced sample.

At the influence of the CFE of probiotics on stress-induced hepatocytes a decrease in the levels of LOOHs and MDA was observed in them. Thus, at post-treatment by the CFE of the strain IMV B-7143 the concentration of LOOHs decreased by 2.88 relative units, MDA by 3.50 μM/L, compared with the stress variant. After post-treatment by the CFE of the strain IMV B-7142 the level of LOOHs decreased by 3.26 relative units, MDA by 6.06 μM/L, compared with the stress variant.

According to obtained results the CFE of *B. amyloliquefaciens* ssp. *plantarum* IMV B-7142 and *B. amyloliquefaciens* ssp. *plantarum* IMV B-7143 normalize the redox-status of CCl<sub>4</sub>-damaged rat hepatocytes. The obtained experimental data can be used in further preclinical studies of these probiotic strains for create new hepatoprotective preparations.

#### Audience Take Away:

- The relevance of the experimental work is to deepen the understanding of the role of the probiotic strains of *Bacillus amyloliquefaciens* ssp. *plantarum* IMV B-7142 and *Bacillus amyloliquefaciens* ssp. *plantarum* IMV B-7143 in stabilizing redox-homeostasis of rat hepatocytes.

- The obtained results could be a basis for expanding studies of the antioxidant properties of *Bacillus amyloliquefaciens* ssp. *plantarum*.
- Further preclinical studies of probiotic strains proposed in the work will create new hepatoprotective preparations.

### **Biography**

Dr. Iryna Skorochod studied Biology and Chemistry at the National Pedagogical Dragomanov University, Kyiv, Ukraine and graduated as MS in 2007. She then joined the research group of Prof. Kurdish at the Zabolotny Institute of Microbiology and Virology, National Academy of Sciences of Ukraine. She received her PhD degree in 2016 at the same institution. She obtained the position of Senior Researcher of the Department of Microbiological Processes on Solid Surfaces in 2022 year. She has published more than 50 scientific works.

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