

Dr Gianfranco Grompone BioGaia CSO about NLSDays' Microbiome super session



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You have a very exciting title on your talk “From Michelangelo to Leonardo – Translational Challenges for Probiotics in the Microbiome Era”. What insights will you be sharing during the session?

– Leonardo Da Vinci, Michelangelo (and Raphael) are considered the most representative geniuses of the 15th century Florentine Renaissance Art. The idea behind the title of my talk is illustrating transversal approaches and pluridisciplinarity by comparing how multiple talents need to be integrated to solve complex scientific issues. I'd like to share my passion for art and science by reflecting together with the audience on the main opportunities and translational challenges that human microbiome science brings into the probiotic field. During the session I will elaborate on how we could potentiate the new findings obtained from complete genome sequencing and new cultivation methods into insights for classic and next generation probiotics. Moreover, I will stress the need for a continuous translational exchange between clinical evaluation of probiotics and basic mechanistic data of the strains. I strongly believe a precise molecular basic understanding of the probiotic strains' properties should support our clinical work and methodology. The microbiome era has established new tools that will reshape the way we think about probiotics in the future, as single strains, as bacterial consortia or as synbiotics.

Research in the field of microbiome is increasing, what opportunities and benefits do you see with that?

– We live now an extremely exciting transitional phase in the microbiome field where most of the correlations and descriptive data have been consolidated towards stronger causalities and functional insights. I see a clear impact in the way we understand how the microbial ecosystems in the human holobiont (human-microbes symbiosis) interact with our body. For instance, ecological approaches to understand trophic and cross-feeding interactions within diverse members of the microbiome could help us to understand which functions are important to provide the right metabolites at the right time. We are now moving from “who” are living in the microbiome to “what are they doing”, especially by applying more and more metabolomics approaches that are giving us functional information of what is happening in a healthy person or in the context of specific diseases. Another important benefit I see from this is the progression towards a deeper personalization of the approaches thanks to the microbiome science. Preventive strategies for infectious diseases or chronic diseases through Nutrition have been transformed by the level of personalized data we have at our disposal today. We are just starting to process this information and I foresee huge innovation opportunities by translating this science into new probiotic products.

Biogaia experience that there is a growing interest in probiotics among consumers and that doctors are increasingly recommending probiotics to their patients. Despite this, knowledge is generally low and the need for education is high. What is your take on this? What are the challenges?

– Probiotic science is still young from a historical perspective, and despite all the work already performed, there is a lot to still be discovered in this field. Communication to consumers and non-scientists in general is crucial to make scientific information and new findings about probiotics available to a big number of people. I am a strong supporter of science communication in simple terms that could reach a largest audience. It is a demanding role and quite empirical, where we connect with communication professionals to translate the most important scientific messages. It's a little bit like speaking other's people language and a lot about learning by doing. At BioGaia we are deeply committed in educational

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programs for health care professionals, scientific presentation of our results in international congresses, webinars and large public communication. One of the main challenges here is translating the probiotic science and clinical evidence into accurate messages for the right audiences. This again is a pluridisciplinary teamwork where scientists and communicators work together.

What scientific advances have you seen lately within the field? Anything in particular that has been surprising?

– The probiotic field is extremely dynamic. We are now living a period where the microbiome has not only been included as a parameter and endpoint to understand probiotics mechanisms and effects, but progressively became a driving engine for new discoveries. I can mention some areas where I've seen solid scientific advances: A recent study performed by Maria Jenmalm's team at Linköping University showed that maternal *Limosilactobacillus reuteri* supplementation during pregnancy may affect epigenetic modifications on immune cells and induce immune modulation for infants at birth, potentially benefiting immune maturation and allergy prevention, which brings new insights into the role of probiotics in the perinatal period from the mother to the child. Another fascinating study published last year by Dr Schlagenhauf from the University Hospital of Wuerzburg in Germany, showed that probiotics can have strong effects in oral health. A randomized, double-blind, placebo-controlled trial in healthy sailors showed that supplementation of *Limosilactobacillus reuteri* DSM 17938 and *Limosilactobacillus reuteri* ATCC PTA 5289 significantly reduced bleeding on probing compared to placebo, showing that probiotic supplementation is an efficacious way to improve and maintain periodontal health in a context of poor oral hygiene. There are as well scientific advances in the understanding of how probiotics could act via secreted compounds and impact human immune system and the microbiome. Recent publications have shown that extracellular membrane vesicles from *L. reuteri* DSM 17938 are able to induce anti-inflammatory effects in human immune cells and reproduce the gut motility patterns of the whole bacteria in preclinical laboratory models. These advances show how important is the translational approach where combination of basic research and modelization with clinical research is key to understand how probiotics work.

Biogaia gathers a large international research network, could you tell us more about that?

– BioGaia has created a unique international network of researchers and collaborators all over the world in the last 30 years. I am deeply honoured to continue this work with our Discovery and Research team, where we

develop long-term relationships with scientists and medical doctors worldwide. We work today with a network of over 50 research institutes and clinics which has become a great cross-innovation asset to study the effectiveness of our probiotics in various indications as well as the mechanisms of action involved, with the highest possible scientific and ethical standards. I can mention the University of Gothenburg and the Sahlgrenska University Hospital, the Baylor College of Medicine in Houston, Texas, the National University of Singapore, the Università degli studi di Bari Aldo Moro in Italy, among many others. I think one of the key aspects of the trust and confidence built over the years is supported by the fact that BioGaia always encourages publication of studies in international high quality journals regardless of results.

What are you hoping for to happen during 2021 and what is your vision for the future?

– After 2020 pandemic outbreak, many aspects of our life have changed. Science is not an exception. The role of science will never be the same and I hope 2021 will be the year where science will consolidate its help to the society, in terms of progress but also in the way we communicate our discoveries to a large public. My vision for the future includes a major involvement of our probiotic community in prevention of diseases which should become a key driver in our life. Probiotics and nutrition in general have determinant roles in preparing our immune system for future challenges but also in preventing chronic and non-communicable diseases which unfortunately are becoming one of the biggest public health threats in the coming years. I believe probiotics and microbiome science have a huge potential to innovate in new and existing areas of development, such as gut-brain axis, neurological diseases, stress related diseases, as well as metabolic syndrome and aging-related disorders. Synbiotics research, where probiotics are studied in association with dietary fibers and prebiotics, will become crucial in the future and combining precision microbiome and probiotic strains data with people-centered clinical research should pave the way.

– But science is not enough, we need to be able to transform our microbiome and probiotic research field into innovative, clinically effective, safe and sustainable probiotic products in the market to improve people's life. Let's then get inspired by Michelangelo and Leonardo to create the future of probiotics!

