Understanding the Variable Responses of Gut Microbiome to Dietary Interventions

Biography

Dr. Meera Esvaran is Research Fellow at the School of Biological, Earth and Environmental Sciences at the University of New South Wales (UNSW), Sydney. She has also been actively involved in basic research in immunology and gut microbiology with positions held at the University of Sydney, both at the Centenary Institute as well as Westmead Childrens’ hospital, and in the School of Medicine at the University of New South Wales, St George Hospital in the Gut Microbiome Laboratory. Her doctoral research focused on the immune modulating capacity of probiotic strains and was extended in the post-doctoral position to include studies of the gut microbiota. In addition, she had industry experience in a biotechnology company developing probiotic products with immune benefits. Her current research is looking at gut microbiome in babies and adults and how they respond to pre- and probiotic intervention.

Abstract

Today the gut microbiome has been a central focus in the minds of many researchers from a huge range of diverse fields e.g. metabolic, neurological, immunological and inflammatory associated diseases and conditions. There is an emergence of studies correlating particular gut microbiome profiles and specific microbial populations with specific conditions. These findings are possible because of the tools available that allow us to understand the microbes and what they are doing or have the capacity to do. Furthermore, there is considerable evidence that diet can contribute to alterations in the gut microbiome and hence dietary intervention offers promise as a means to improve outcomes of diseases and conditions linked to the gut microbiome. It is widely accepted that a high fat, low fibre diet results in decreased bacterial diversity, with an increase in one particular population, namely the Firmicutes. Changes in the gut microbes also leads to a change in the metabolites such as the short chain fatty acids which play an essential role in health and well-being of the individual.

Unfortunately, there are numerous research publications which have failed to show significant benefits with dietary interventions that were expected to yield positive results. Even studies using similar intervention strategies had yielded very different outcomes. While the comment is often made that the study size was inadequate to show significance, and that the study groups differ in terms of physiological aspects, it is often noted that there are responders and non-responders. An important aspect often largely ignored is the variability of the gut microbiome within and across studies and the variable responses of the gut microbiome are most probably the single most important aspect to be considered.

The gut microbiome is not a stable uniform entity/organ. It is a very diverse complex microbial community which differs from individual to individual and is successively changing as the host develops and has multiple exposures to compounding factors, medications and life style choices. In fact, even at birth, the gut microbial populations are affected by gestational age, birthing methods...
and environmental exposures. It is well established that breast-fed babies have a very different gut microbiome to formula-fed babies, and infant formula compositions are being modified to address this. As the child develops, early life exposures influence the successive development of the gut microbiome since early colonizers can be more stable than invading populations. Studies show that individuals digest and metabolise identical foods differently depending on their gut microbe composition and that there is cross talk across the population and host-microbe cross talk, an understanding of which could be used to improve our understanding of using the gut microbiome for health benefits.

In summary, each individual has a unique microbiome and hence there is a need for tailored dietary intervention strategies.