# Preface

Since the existence of trillions of microbes in our body has been described, human microbiota research has become a recent trend in the field of medical science. In particular, the development of high-throughput sequencing techniques and bioinformatics has made a great contribution to understanding the dynamic relationship between these microbes and human health, such as in inflammatory bowel disease, type 2 diabetes and obesity. In fact, over 3500 articles were published in 2017 and deposited on PubMed. These studies reveal that microbiota may contribute to many different types of diseases, early development and ageing. Here, we provide a summary of recent human microbiota studies and describe the current understanding of healthy microbial diversity, its functional roles in development and the potential of probiotic therapy in future studies of human microbiota.

'Microbiota' refers to the microorganisms in a particular environment and also the microbial community inhabiting our bodies. The 'microbiome' is an ensemble of the genomic material of these microorganisms. This genomic information can be utilized to understand the existence of a microbial community, using current analytical approaches. The recent development of next-generation sequencing methods has greatly facilitated the study of the microbiota. In Chapter 1, Nuria Salazar *et al.* describe non-culture methods and high-throughput sequencing techniques for microbiome study and provide an overview of the association of microbiota with dietary patterns and lifestyle factors and evidence of its influence on health status in the elderly.

Alteration of the microbiota during early life is regarded as one of the factors that increases the risk of non-communicable diseases and metabolic disorders. In Chapters 2 and 3, Yuichiro Yamashiro *et al.* provide a comprehensive understanding of the aberrant bacterial community 'dysbiosis' in early life and its contribution to the development of the immune system and metabolic conditions and its influence on the developmental origins of health and disease. Furthermore, they describe the efficacy of probiotics in treating paediatric illnesses such as preterm low-birthweight, allergy associated with caesarean section delivery, mucositis and child obesity. They briefly summarise the beneficial effects of probiotic supplementation in promoting a more favorable microbiota composition and the progress of current probiotic applications.

There is a complex crosstalk between microbiota and the host cells. Metaproteomics is a novel omics approach that can be used for the large-scale characterization of the entire protein complement of the environmental microbiota. Both the human and the microbiota proteins can provide information on the functional aspects of the proteolytic events in the

gut environment. Together with evidence from the complementary approaches of metagenomics and metatranscriptomics, metaproteomics may provide new insights into the role of the microbiome. General knowledge of these processes and approaches are described in Chapter 4 by Bernardo Petriz *et al*.

Recently, it has been identified that the gut microbiota contributes to biochemical signalling from the gastrointestinal tract to the central nervous system as bidirectional communication between the central and the enteric nervous systems. In Chapter 5, Surajit Pathak *et al*. describe how this dynamic relationship plays an important role in normal brain development and dysfunction, leading to several diseases. Gaining a better understanding of this bidirectional pathway can provide an insight into innovative and therapeutic strategies for neurodevelopmental and behavioral disorders. Not only microbiota in the gut, but also microbiota in the oral cavity, have a key role to play in maintaining our health status. A diverse population of microorganisms exists in our oral cavity. In Chapter 6, Surajit Pathak *et al.* describe how recent studies have suggested that oral pathogens are involved in the production of chronic inflammatory responses and that these may contribute to the development of neurodegenerative diseases such as Parkinson's disease and Alzheimer's disease. There is a need to expand our knowledge of the composition and function of the oral microbiota, which contribute to our brain health.

Changes in the structure of the gut microbiota contribute to our health and to diseases. However, it is still unclear whether or not the ecological niche of a microbial community is associated with the onset of primary tumours in other organs. In Chapter 7, Vo Phuoc Tuan *et al*. describe the structure of the microbiota in the gastrointestinal tract, particularly in the esophagus, stomach and colon, providing a comprehensive summary of current studies in this area and how the composition of the microbiota changes as a result of diseases such as gastric cancer. In addition, they describe the potential application of therapeutic approaches targeting microbiota and discuss future trends in microbiota studies.

We hope that this book will help you to understand the current research and emerging trends in the study of microbiota.

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