

Preface

If one was to ask whether a book dealing with the ability of the microbiota to influence the brain, and ultimately cognition and behavior, would have been possible just a few short years ago, the answer would most likely be no. A simple search of PubMed using the index words “microbiota AND gut AND brain” reveals only 134 publications as of 16th January 2014. However, this would not be an accurate reflection of the work that has been ongoing for many decades, but yet remained on the outer fringes of the disciplines that constitute the study of the mechanisms by which the microbiota and the brain communicate with each other. A comprehensive series of articles by Bested and colleagues [1] catalog the numerous studies going back over a century which amply demonstrate that the investigation of the role of the microbiota in brain function, and by extension mental health, has a long and varied (some may say checkered) scientific history. During this time it remained, for large measure, outside mainstream scientific inquiry following an initial burst of enthusiasm both in the scientific and public arenas at the turn of the twentieth century. That such scientific skepticism remained, and in many cases became entrenched, in the very scientific disciplines that form the basis of the microbiota–gut–brain axis is owed to a number of factors. One of these is surely the increasing specialization that occurred within each discipline over the years and the inherent lack of interdisciplinary thought that accompanied such specialization. With the advent of the concerted research into the microbiota and the microbiome, as best evidenced by the tremendous strides that the Human Microbiome Project has made over the last decade in cataloging the incredible diversity in the microbiota in health and disease, the realization that the microbiota has a role to play in the development and function of the nervous system and hence behavior and cognition, has once again entered into mainstream scientific and medical thought. However, old beliefs die hard. The recent experience of one of us (ML) as described in the prologue to Chap. 1 is but one example of the resistance that is still being encountered today for a role of the microbiota in the functioning of the brain. In many conservative Learned Societies the concept that the gut and indeed the gut microbiota can have such an influence on brain & behavior is still looked upon with incredulity. However, this is changing.

This book represents the realization that any attempt to understand the ability of the microbiota to interface with the brain (and by association any part of the host's neurophysiology) must attempt to address multiple disciplines, such as microbiology, anatomic neuropathology, and endocrinology to name but a few, that while on the first examination appear to be rather disparate from each other but on further examination are in fact highly interconnected as evidenced, for example, by the development of the field of microbial endocrinology itself. As described in Chap. 1, as well as detailed in a chapter in the first book of this series [2], the field of microbial endocrinology developed out of need to understand the paradox in which stress resulted in increased death from a bacterial challenge at the same time greatly increasing the phagocytic activity of the immune system. In considering the microbiota as an interactive player in the host that can both respond to signals from the host and influence the host through the provision of the very same host signaling molecules (i.e., neurochemicals) that are more commonly associated only with vertebrates, but in fact have a long evolutionary history involving the prokaryotes, the potential role of the microbiota in brain functioning and its potential for treatment of mental disorders becomes apparent.

As such, the book is organized along three thematic lines which will provide the reader not only a fuller understanding of the capabilities of the microbiota to interface with the brain and form the microbiota–gut–brain axis, but will also provide detailed examination of the consequences of the microbiota-driven gut-to-brain communication for both health and disease. The first four chapters cover the “Basic Concepts Underlying the Microbiota–Gut–Brain Axis”; the next eight chapters examine the “Mechanistic Factors Influencing the Microbiota–Gut–Brain Axis” and the concluding seven chapters address the “Microbiota–Gut–Brain Axis in Health and Disease”.

We have assembled a group of contributors who are recognized to be at the front of their respective fields to review the state of the art of this growing field. As the chapters in this book amply demonstrate, the field of microbiota–gut–brain axis is still in its infancy although its origins are now over a century old. With the advent of modern techniques ranging from deep pyrosequencing of the microbiota to brain imaging, the tools are in place to address those questions which were raised many decades ago. Given our evolving understanding of the complexity of the microbiota which when one couples that to the complexity of the brain and nervous system, this book represents only one more chapter in what promises to be a long and challenging story.

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References

1. Bested AC, Logan AC, Selhub EM (2013) Intestinal microbiota, probiotics and mental health: from Metchnikoff to modern advances: Part I – autointoxication revisited. *Gut Pathog* 5(1):5
2. Lyte M (2010) Microbial endocrinology: a personal journey. In: Lyte M, Freestone PPE (eds) *Microbial endocrinology: interkingdom signaling in infectious disease and health*. Springer, New York, pp 1–16

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in Health and Disease

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