ENVIRONMENTAL MICROBIAL FORENSICS

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Preface

The title of this book, *Environmental Microbial Forensics*, is quite a mouthful, so right off the bat one may wonder what this book covers. Most lay people will think of cadavers and crime scene investigations when they see the term *forensics*, but the term covers a lot of ground, including possible environmental crimes, which can be solved using microbial forensics and microbial source tracking (MST) approaches. This is now possible because of the molecular methods recently applied to microbiology, environmental sciences, and yes, forensics. As an example, a forensics approach can be used to study how microorganisms possibly evolved from free-living saprophytes into pathogens.

All data obtained by molecular approaches must be analyzed in a systematic manner. DNA sequences are just that, sequences, and even if we can attach some of these sequences to phyla, or even genera, we need to make biological sense from the information in the sequences. Current algorithms allow us to draw incredible conclusions from the data analyses, and statistical analyses are key to unraveling the clues the data offer. We were very fortunate to include a chapter on statistical analyses (Chapter 2) and to also have authors who have shared their expertise on MST (Chapter 6), host-microbe interactions (Chapter 3), food microbiology (Chapter 5), soil contamination (Chapter 7), and more, in a book that is no doubt incomplete, because there is so much more to cover in terms of microbial environmental forensics.

Antibiotic resistance in bacteria has been called *the next tsunami*—and with good reason, as it is rapidly and inexorably gaining more importance in terms of public health. Horizontal gene transfer has been shown to be one of the culprits in the tremendous prevalence of antibiotic resistance, of course pushed by the use and abuse of antibiotics and, possibly, all antimicrobials. The forensic approach may be one way to better understand what is going on in many of these important studies.
Those who have published a book understand, better than anybody, the joy of seeing the final product. Those same people will repeatedly ask themselves why they started the project in the first place. This book has been in the making for several years, starting out full of energy, losing some of it, and then regaining it again. So much more information could have been included, as every time one reads a new publication or report, more ideas come to mind. However, there has to be a limit, and deadlines must be met.

We have thoroughly enjoyed this endeavor, and we thank each and every one of the authors for their commitment and for sharing their expertise. We certainly hope that the reader will find this book useful in many different areas of microbiology and will perhaps also suggest new areas of research for the current and next generations of microbiologists.

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Raúl J. Cano is the Chief Scientific Officer at The BioCollective and previously served as Executive Director of Research at the ATCC Center for Translational Microbiology at ILSE. He is also Professor Emeritus at the Biological Sciences Department, California Polytechnic State University, San Luis Obispo. He is founder and former Director of the Environmental Biotechnology Institute (EBI) and Managing Partner of the Environmental Diagnostic Consultants as well as founding Scientist and Vice President of Ambergene Corporation. Dr. Cano is best known for his groundbreaking work in paleomicrobiology. An elected Fellow of the American Academy of Microbiology, Dr. Cano has been involved in different committees of the American Society for Microbiology over the years. His current research interests focus on the microbiome and resistome of ancient human populations, including pre-Colombian cultures and ancient European and African cultures.

Gary A. Toranzos has been involved in environmental microbiology research for several decades. Focusing his efforts on the ecology of water saprophytes and waterborne pathogens, he has published extensively in this area, but in the last few years has dedicated some of his research time to studying paleomicrobiology and conducting ancient microbial DNA studies. Dr. Toranzos is an elected Fellow of the American Association for the Advancement of Science and the American Academy of Microbiology. He has also served on numerous committees of the American Society for Microbiology and is currently Professor of Microbiology at the University of Puerto Rico, where he has been teaching for the last three decades. Although born in Bolivia, he has lived on three continents and has made Puerto Rico his home for the last 32 years.