EMERGING INFECTIONS
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In memory of William A. Craig (1939-2015) and Robert C. Moellering, Jr. (1936-2014),
two highly esteemed colleagues, clinicians, educators, investigators, and mentors.
We thank them for their friendship, inspiration, and collective contributions to
the development of nearly every new antibacterial agent in the last four decades.
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The field of emerging and re-emerging infectious diseases has traveled from A (anthrax) to Z (Zika) in less than 15 years. Fortuitously, over that same interval, the insights, tools, and investments needed to address these challenges to medicine and public health have kept pace. The One Health Initiative has its roots in antiquity but only began to gather momentum with the appearance of West Nile virus in the Americas in 1999. Investigators now prospect wildlife and domesticated animals worldwide looking for novel agents and hints for origins of the next pandemic.

Molecular strategies for microbial surveillance, diagnosis and discovery have largely supplanted more laborious and expensive classical methods, resulting in an explosive expansion of genetic data that require increasingly complex and powerful resources for bioinformatic and biostatistical analysis. Discovery, an activity once focused in the West, is becoming decentralized as costs and expertise required for sequencing decrease. Governments and foundations invest in support of the United Nations International Health Regulations of 2005—a document signed by all member states “designed to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade.”

The importance of this document and of the commitment of the scientific and communities to transparency has been underscored by the emergence of pandemic strains of influenza, antibiotic-resistant bacteria, Nipah, SARS, chikungunya, MERS, Ebola, and most recently Zika, which threaten regional and global public health as well as economic security.

The U.S. Supreme Court decision in the Association for Molecular Pathology v. Myriad Genetics that challenged the patentability of sequences existing in nature had ramifications far beyond the field of diagnostic oncology that prompted the initial litigation. It effectively ended the race to simply recover, claim and license microbial sequences of emerging pathogens. The result has been to encourage more mechanistic science. The number of laboratories focused on work in high-level biocontainment has dramatically increased. This has enabled more investigators to contribute to research into the biology, pathogenesis, diagnosis, prevention and treatment of emerging infectious diseases. It has also driven concerns about gain-of-function and dual use research as well as inadvertent release of high threat agents. An appropriate balance will be essential if the needs of all stakeholders are to be met.

Emerging Infections 10 is the latest in an American Society for Microbiology series initiated in 1998. My dear friend and mentor, the late Josh Lederberg, who
wrote the foreword to *Emerging Infections* 1, would be pleased to see that the series is alive and well and that the authors include an international cast of veterinarians, physicians, basic scientists, and public health practitioners. He would have anticipated the emergence of novel agents and the re-emergence of old foes like measles. In channeling Josh and his propensity for driving the field with predictions, I expect that volume 11 will feature chapters on modeling and the role of social media in biosecurity.

W. Ian Lipkin  
New York, NY  
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Preface

Despite progress in the prevention and control of infectious diseases during the past several decades, the first 15 years of the 21st century continue to provide evidence of the persistence and tenacity of emerging microbial threats. The interplay of rapid globalization, demographic shifts, ecological changes, environmental degradation, climate change, and unprecedented movement of people, animals, and commodities yield unexpected risks to health, often with attendant social, economic, and political repercussions. The emergence and rapid global spread of diseases such as MERS, Ebola virus disease, chikungunya, and Zika virus disease provide dramatic evidence of the continued ability of microbes to emerge, spread, adapt, and challenge the global infectious diseases, microbiology, and public health communities. In addition, the resurgence of long recognized diseases such as measles and pertussis and the spread of diseases such as coccidioidomycosis beyond endemic areas pose additional challenges.

Since 1995, annual infectious diseases meetings including those organized by the Infectious Diseases Society of America and the American Society for Microbiology have included updates on emerging infectious diseases. The 22 chapters in *Emerging Infections 10* provide important updates on a broad range of emerging and re-emerging bacterial, viral, parasitic, and fungal infectious diseases in the United States and globally. Highlights include timely chapters on MERS, Ebola virus disease, chikungunya, and Zika virus disease which have recently been the focus of clinicians, researchers, and public health officials around the world and have received extensive media attention. The global threat of antimicrobial resistance is addressed in chapters on carbapenem-resistant *Enterobacteriaceae*, multiply-resistant gonococcal infections, non-typhoidal *Salmonella* infections in sub-Saharan Africa, and artemisinin-resistant *Plasmodium falciparum* malaria. Topics range from recently recognized diseases to long-recognized diseases posing current challenges to the clinical, laboratory, research, public health, and animal health communities.

Our experiences in responding to recent outbreaks, many of which are of vectorborne or zoonotic origin, provide important lessons for the future and highlight the relevance and importance of the One Health concept which emphasizes the importance of closer collaboration among the human, animal (both domestic and wildlife), and environmental and ecosystem health sectors. Recent experience emphasizes the importance of preparedness to respond to domestic and global threats with a co-ordinated, evidence-based, interdisciplinary response guided by strong, effective leadership at the national and global levels and accelerated implementation of a research agenda to provide tools to support diagnostic, therapeutic, and prevention strategies.
Because weak health systems in many areas of the world pose threats to all, investments in health system strengthening, national public health institutions, response capacity, and workforce development can yield substantial returns for the health and security of the global community. Recent experiences with and lessons learned from MERS, Ebola virus disease, chikungunya, and Zika virus disease have highlighted the importance of strengthening national capacities in support of the International Health Regulations and the Global Health Security Agenda. Fortunately, important scientific and prevention opportunities in the future are likely to result from advances in molecular diagnostics, next generation sequencing, utilization of big data, microbiome research, pathogen discovery, and epidemic modeling.

Future infectious disease challenges are difficult to predict but certainly include antimicrobial-resistant infections in healthcare and community settings, foodborne and waterborne diseases, influenza and other respiratory diseases, and vectorborne and zoonotic diseases, as well as new threats for immunocompromised and disadvantaged populations. Additional links between chronic diseases and infectious agents and between the microbiome and human health and disease will certainly be identified, providing new prevention and treatment opportunities. We hope the tenth volume in the *Emerging Infections* series will serve as a valuable resource for those currently working to address emerging infectious disease threats to national and global health and security as well as for the next generation of talented, committed professionals needed to confront these threats in the future.

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