Sampling for Biological Agents in the Environment
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This book is dedicated to those who lost their lives on September 11, 2001
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About the Editors

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As the biodefense team leader at the Edgewood Chemical Biological Center, Peter Emanuel is responsible for directing a multidisciplinary research team. His group is responsible for all of the biosafety level 3 high-containment laboratory operations on the Edgewood campus as well as efforts such as enzyme decontamination of chemical weapons and fundamental studies on biological pathogens.

Previously he served as the program manager for the Critical Reagents Program in the Joint Program Executive Office for Chemical and Biological Defense, where he was responsible for managing a network of secure repositories and the commercial production of millions of handheld immunoassays, freeze-dried immunoassays, PCR assays, and other products in support of the biological defense community. He also served as a scientific advisor at the Edgewood Chemical Biological Center, where he was part of a team that developed and patented a novel biological sampling device, developed over 100 highly specific and sensitive PCR assays for pathogen detection, isolated recombinant antibodies using combinatorial phage display, and oversaw bacterial fermentation production and tissue culture production of antibodies. With over 50 papers and presentations to his credit, Dr. Emanuel is currently focused on characterizing virulence factors in bacterial populations, validation of detection devices to national standards, developing systems to measure antigenic variability, and more effective biological sampling technologies.

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Jason W. Roos is the current director of the Critical Reagents Program in the Joint Program Executive Office for Chemical and Biological Defense.

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As director, Dr. Roos is responsible for coordinating and managing a network of government laboratories, repositories, and commercial vendors to research, develop, and manufacture standardized biological reagents and assays of the highest quality for use by the Department of Defense’s testing, fielding, and operational communities. Dr. Roos, together with the scientists, testers, and members of the armed forces in his network, determines current issues facing the United States, such as emerging biological threats, and develops novel techniques for their detection. He also coordinates with other government agencies to work towards multiagency consensuses and agreements on biological agent policies and procedures. In addition, he collaborates with international groups to coordinate and share ideas and resources for threats around the globe.

Previously, Dr. Roos served as a science advisor in the biological sciences for the chemical, biological, radiological, nuclear, and explosives team at Booz Allen Hamilton, Inc. He applied his technical expertise in molecular biology, biochemistry, cell biology, and virology to support several projects in the homeland defense arena for U.S. government clients. For these clients, Dr. Roos conducted chemical and biological detection technology evaluations, reviewed and developed procedures for homeland defense operations, prepared intelligence assessments, contributed to standardization efforts for chemical and biological sensors and environmental sampling for biological threats, and prepared research and development test plans.

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The need for this book was realized in 2001 during the aftermath of the intentional *Bacillus anthracis* contamination of the U.S. postal system. This need was not new, reaching back to the years before that event, when testing water supplies, determining levels of mold contamination, and everything in between were critical. The events of 2001, when the sampling community conquered sampling in the environment on a grander scale than ever before, allowed for the generation of a great deal of momentum and knowledge in the field and also illuminated the gaps that remained to be filled.

In January 2005, top scientists from around the United States and abroad gathered in Baltimore, Maryland, to attend the First National Conference on Environmental Sampling for Bio-Threat Agents and bring forward the many lessons learned from their extensive sampling experience. This book was born during that first gathering and gained momentum when scientists and first responders gathered again almost 2 years later in New York City at the Second National Conference on Environmental Sampling and Detection for Bio-Threat Agents. Scientists from almost every federal agency as well as state and local first responders reinforced the need to capture the knowledge we have learned, to determine future areas of study, and to pass the science of sampling to those in the field who keep us safe.

This book was intended to be different from other books on the subject. The authors and editors sought to create a format in which the current best practices could be presented in a straightforward manner for use by both the first responder community and the scientific community, with the understanding that the current best practices would be evolving with technology, policy, and world affairs. Technical discussions are accompanied by
text boxes which define terms or provide additional sources of information which can provide more detail on individual topics of interest. When contentious topics were encountered, the authors tried to present all sides of an argument so that readers can see that in science, there are no absolutes—only a hypothesis and data.

There is a common joke that when you place three scientists in a room, they will come out with four opinions. During the years since the *B. anthracis* attacks, there have been many interagency meetings which sought to achieve consensus on technical issues in the area of biological sampling. If those working groups have taught us anything, it is that three scientists are more likely to come out of a room with five opinions, not four. The science of sampling in the environment evolves as our understanding of the problems grows and as we develop tools and technologies to respond to multiple challenges. In the face of such change, seeking consensus when multiple opinions arise is advantageous for all involved. This book is part of the evolving body of sampling knowledge, and we hope it provides a useful tool.

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Important Notice

The field of sampling is constantly changing with every new method and technology that emerges. The editors and authors of this book believe that the procedures and guidelines suggested in this book are from reliable sources and are in line with the practices accepted at the time of publishing. Neither the editors, the authors, the publisher, nor any party who has been involved in the preparation of this work can guarantee that information contained herein is in every aspect accurate, complete, or current, and they disclaim all responsibility for any errors or omissions or for the results obtained from use of the information contained in this work. Furthermore, neither the editors, the authors, the publisher, nor any party who has been involved in the preparation of this text endorses any specific brands of products. The book is intended to serve not as an instructional manual but rather as a compilation of best practices; therefore, readers should confirm the information contained herein with other sources.
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