

Preface

Sample Preparation Techniques for Soil, Plant and Animal Samples arrives to fill the unusual gap in the modern molecular biology lab practice collection of books. The editor of this book was surprised that, while the sample preparation for a variety of molecular biology analyses, especially from the difficult-to-process matrices, represents a major bottleneck in a modern molecular biology lab practices, there is no single comprehensive resource currently on the market covering its theory and practice. It is estimated that about 20% of the time spent by researchers in the molecular biology lab is actually spent on nonproductive tasks of nucleic acid sample preparation, so the editor felt compelled to assemble a comprehensive treatise on the theory and practice of sample preparation of difficult samples, to help researchers to break the lab productivity bottleneck. For readers' clarification, we qualify as difficult any samples of complex mechanical matrices, which are difficult to grind, homogenize, and lyse, or which are "dirty," i.e., contain other components or contaminants which may interfere with further nucleic acids purification or processing.

This book will cover both the theoretical foundations and practical recipes for successful sample preparation processes and tasks dealing with difficult samples, such as samples of plant and animal origin, and complex matrices such as food and feed, environmental samples, soils, water, and fecal matter. As such, this book appeals to a broad spectrum of practitioners doing research, diagnostics, or quality control work in broad areas, such as agro-biotech, food technology, plant science, plant breeding, environmental science, marine biology, soil microbiology, nutritional science, and animal breeding, up to and including law and customs enforcement agencies, forensics, industrial and agricultural hygiene, and many others. The book is equally appealing to anyone working at the bench, including students, graduate students, postdocs, industrial researchers, lab technicians, field scientists, diagnostics technicians, and other similar professionals or aspiring future professionals in the life science arena, as well as the professionals working for the life science companies who are developing, promoting, and doing customer service supports for the instruments, tools, and kits for DNA and RNA extraction.

In the first section of the book, authors have introduced readers to the physical chemistry properties of nucleic acids and basic concepts in sampling and have described in great detail the major mainstream methodologies for sample preparation processing of difficult and tough samples in general. Special emphasis is given to the front end of sample preparation, i.e., on sample homogenization, grinding, and lysing processes and technologies, following with techniques for nucleic acids purification. The editor is especially excited to see for the first time in history, in one place, a collection of chapters contributed by the authors with great expertise from the three major areas in the field of molecular biology sample preparation: (1) sample collection and homogenization, (2) lysis, and (3) purification. The chapter authors belong to the leading organizations in the field of sample preparation, including Bertin Technologies, Genos, MP Biomedicals, Promega, Rota Prep, Omni International, and Zymo Research, and from many leading academic institutions. Most emphasis in this portion of the book is given to the technologies of mechanical sample lysing, especially the bead beating as the one methodology which is gaining momentum with researchers due to its simplicity and high efficiency in lysis of broad spectrum of difficult samples. On the purification side, this section of the book covers in detail the two most common methods: magnetic beads-based and bind-wash-elute/solid phase extraction-based processes. The editor is especially proud of this section of the book, as he has been for the past 10+ years directly involved in the evolution of the bead beating sample homogenization technologies in the function of vice president for research and development at MP Biomedicals, where he launched a successful line of the FastPrep-24, FastPrep-96, and FastPrep-1 systems and plurality of associated kits. This is the first time in the industry that the leading experts, from all four major organizations that design, manufacture, and sell bead beating-based sample preparation systems, namely Bertin Technologies SAS, MP Biomedicals LLC, Omni International Inc., and RotaPrep, Inc., have contributed a lot of the tacit knowledge and expertise and unveil a lot of mysteries of bead beating-based sample preparation.

In the second portion of this book, the reader will find treatises on both theoretical aspects of sample preparation and practical recipes for successful nucleic acids sample preparation from a variety of difficult samples, providing valuable guidance and useful recipes and practical tips for any bench practitioners to apply them directly to their sample. The selection of difficult samples ranges from animal tissues and cells, variety of plant samples, microbiota samples, to complex environmental matrixes.

Finally, the third portion of the book presents sample preparation topics of other “omics,” i.e., non-nucleic acid sample preparation of components whose study may be of interest to the typical researchers dealing with difficult samples. In these chapters we have covered comprehensive methods for lignin extraction from plants, pri-
ons extraction and purification, and glycan purification, all of which represent the emerging areas for studies.

The editor of this book is grateful to all authors for dedicating a portion of their lives in writing the chapters for this book and making this piece come together. The editor acknowledges the management of all of the corporate entities that allowed its

employees to write the chapters and supported the project by generously granting the images and information, especially the management of Bertin Technologies, MP Biomedicals, Omni International, and Zymo Research. Finally, I would like to acknowledge one very special person, whose dedication has made this book happen, Ms. Mariah Gumpert, Developmental Editor of this book, for her great help with all of the editorial, managerial, and administrative items related to the completion of this project.

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Sample Preparation Techniques for Soil, Plant, and
Animal Samples

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2016, XXIII, 406 p. 96 illus., 65 illus. in color., Hardcover

ISBN: 978-1-4939-3184-2

A product of Humana Press