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Protein Downstream Processing

**Design, Development, and Application of High
and Low-Resolution Methods**

Second Edition

Edited by

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Preface

Proteins are the most diverse group of biomolecules that are vital for cellular structure and function. The technological advances in the omics area and the efforts in proteomics research have increased the rate of discovering many new proteins with unknown structure and function. These newly discovered proteins present enormous opportunities for research and industrial application. The key factor for their commercial exploitation depends on the development of an efficient and effective purification procedure. However, with thousands of proteins—each displaying unique characteristics—the development of purification strategies that deliver the required purity needed for downstream applications is important. The challenge, therefore, is to separate the protein of interest from all of the other components in the cell, especially the unwanted contaminating proteins, with reasonable efficiency, speed, and yield, while retaining the biological activity and chemical integrity of the polypeptide. The increasing requirement for the production of pure proteins is forcing scientists to gain a thorough understanding of protein purification methods and gain abilities and knowledge to improve current and develop new and more effective purification methods and protocols.

This volume, which is the second edition of Vol. 1129 (2014), is designed to give the laboratory worker the information needed to design and implement a successful purification strategy. It presents reliable and robust protocols in a concise form, emphasizing the critical aspects on practical problems and questions encountered at the lab bench. Written in the highly successful *Methods in Molecular Biology* series format, each chapter provides introductory material with an overview of the topic of interest; a description of methods, materials, and reagents; readily reproducible step-by-step protocols, a Notes section for tips on troubleshooting; and a collection of published data with an extensive list of references for further details.

This volume consists of thirty chapters. It is divided in five parts (I–V), each of which dealing with different approaches and methods. Part I starts with an overview of screening and design of purification strategies and covers initial aspects on high-throughput screening, methods development, and media selection. Parts II and III of this volume concentrate on low- and high-resolution protein purification methods that currently enjoy frequent citation in the literature with the emphasis being on affinity chromatography. Information on scale-up considerations is given where appropriate. Aside from methods related directly to purification, this volume includes a description of analytical techniques of value in protein preparation. For example, much space has been allowed in Part IV on cutting-edge analytical techniques of purified proteins. The last section (Part V) presents a few selected examples and case studies.

It is impossible for a single book volume to cover all of the different methods, techniques, and applications of protein purification in which scientists have made significant progress. Thus, I have selected key examples covering a wide range of diverge scientific disciplines and state-of-the-art experimental approaches, in order to provide the reader with a representative sample of current status of the field.

The present book would definitely be an ideal source of scientific information to advanced students, junior researchers, and scientists involved in health sciences, cellular and molecular biology, biochemistry, biotechnology, and other related areas in both academia and industry.

I sincerely hope that the reader will enjoy the information provided in this book and find its contents interesting and scientifically stimulating. I also hope that I have established a successful compilation of chapters within the exciting area of protein purification. I would like to thank all contributing authors for their enthusiasm and for the time they spent preparing the chapters for this book. I would also like to thank Dr. John Walker, the series editor, for putting forward the idea of the book and for his help and encouragement, and everybody at Springer for their helpful advice, support, and professionalism. Without their cooperation, this volume would have not seen the light. Last but not least, I would especially like to thank my family for their understanding and patience during the editing and organization of the chapters.

Athens, Greece

Nikolaos E. Labrou

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