BOOK REVIEW

Sample Preparation in Biological Mass Spectrometry

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Editors

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The past two decades have witnessed amazing technological developments that have brought mass spectrometry of biomolecules in general, and proteins in particular, to center stage in the biological sciences driving the generation of new or renewed fields such as proteomic and metabolomics. Remarkable discoveries have resulted from biological mass spectrometry, and mass spectrometers can be found in virtually all well-equipped research institutions. However, it is fair to say that instrumentation notwithstanding, not all mass spectrometers are optimally utilized, in part because of less than adequate training on the part of the scientists and technicians who operate them and in part because of poor experimental design and sample preparation. It is the latter point that the text edited by A. R. Ivanov (Harvard University) and A. V. Lazarev (Pressure BioSciences, Inc.) addresses. All practitioners in the field who conduct research using mass spectrometry are well aware of the phrase “X in, X out,” which the editors more eloquently address in an opening quote in the text by Charles Babbage. Although there are hundreds of books written on mass spectrometry and perhaps dozens on mass spectrometry protocols, few have both the depth and breadth exhibited in this book. The editors have reached throughout the world of scientists who actively utilize mass spectrometry to bring together 186 authors who contributed 49 chapters, which by and large address all current sample preparation issues facing scientists who wish to conduct biological mass spectrometric experimentation. The fact that so many talented authors were recruited and the large number of chapters written attests to great diversity in experimental approaches and, thus, sample preparation needs facing scientists who wish to utilize mass spectrometry.

The book is divided into 16 parts, covering virtually all aspects of sample diversity and sample preparation associated with modern biological mass spectrometry. Embedded in the parts are chapters that drill down on the technical aspects associated with that part. Some chapters (Parts) go into greater experimental detail than others, which could be disappointing if one's personal area of interest is less fully detailed. Also, there is, occasionally, some overlap between the parts generally due to similarities in technique but applied to different sample sources. This is not a negative in that it is well known that different samples can behave differently, which is an important point to address. Regardless, all chapters are sufficiently referenced to allow for further study into detailed protocols for sample preparation.

The first part in the book, Part I, addresses general issues associated with sample preparation, whereas Part II provides information on several approaches for proteolytic digestion for bottom-up applications. The difficult realm of tissue, cell, and organelle preparation is the focus of Part III. Three chapters reside in that part, all of which are interesting, but perhaps not exhaustive, given the complexity of this problem. The authors recognize this by virtue of several other parts, which discuss such specific issues associated with sample preparation for plant proteomics (Part VI), membrane proteomics (Part X), and rare samples (Parts XIV and XV). Part XII presents two chapters on clinical research applications and although those chapters are quite informative given the general direction of biomedical research, perhaps this is one part which could have benefited from additional chapters covering more specific topics in this field.

What became apparent to this reader while going through the book is that we in the field all have our favorite preparation methods, likely those being the ones that happen to work best in our hands. However, by reading through the text, I also gained a renewed appreciation for techniques in which I am less familiar and gained a certain sense that perhaps I should expand beyond my current sample preparation comfort zone into other approaches found in the book, which are well described and annotated. To me that is the real strength of this work and value to the reader.

If any criticism is to be leveled at this fine effort by Ivanov and Lazarev, it is that they perhaps could have encouraged greater focus by the authors on experimental design, which goes hand in glove with sample preparation. Perhaps it could be argued that the topic is beyond the scope of this book, which is lengthy as it is (1089 pages), and perhaps these adept editors may have this topic in mind for further undertakings.