

## The Expanding Role of Mass Spectrometry in Biotechnology

Gary Siuzdak

MCC Press

San Diego, CA, USA

2003, Paperback, \$49.00, 276 pages

ISBN 0-9742451-0-0

Reviewed by Christoph A. Schalley

Kekulé-Institut für Organische Chemie und Biochemie  
der Universität

Gerhard-Domagk-Str. 1

D-53121 Bonn, Germany

Comparable to the exciting development of nuclear magnetic resonance methods during the past three decades, mass spectrometry entered a phase of quick growth in the mid-eighties beginning with the introduction of soft ionization methods such as electrospray ionization (ESI) and matrix assisted laser desorption/ionization (MALDI). The speed with which mass spectrometry has extended into research areas in which it traditionally was of limited use is incredible. In particular, the area of biochemical, pharmaceutical, and medicinal research has profited to a great extent. As an example, one might just think of the quick and almost routine mass spectrometric protein sequencing strategies which to quite an extent can be automated nowadays.

For researchers in these fields who are not mass spectrometrists by training, it is of utmost importance to get an idea of the scope and limitations of mass spectrometry in general and of the different ionization methods and analyzers used. This information is a necessary prerequisite for the design of suitable experiments aiming at the solution of biochemical problems. Similarly, basic knowledge about the methodology needs to be conveyed to students starting their work in the area of mass spectrometry. Together, this defines the need for textbooks that simultaneously provide some practical knowledge and a sufficiently profound overview of the capabilities of modern mass spectrometers without confusing the (inexperienced) reader too much with technical details or unnecessary information on ongoing debates of the mechanisms of ionization and the like.

Gary Siuzdak has assembled such a book. *The Expanding Role of Mass Spectrometry in Biotechnology* is written from the viewpoint of the mass spectrometrist. Consequently, mass spectrometric methodology is the focus, but the book contains numerous applications to and examples from areas such as peptide and protein sequencing, the study of oligonucleotides and saccharides, and high throughput screening for drug development.

The book is divided into ten chapters. The first three of them introduce the reader to the most important

details of mass spectrometry, i.e., the capabilities of ionization methods and analyzers, and to practical questions. These chapters contain a wealth of information which too often is not included in textbooks and whose lack makes it difficult to apply the theory learnt from the textbooks to a real problem. That Gary Siuzdak's book explicitly deals with this kind of knowledge is a great plus. Chapters 4 to 6 are devoted to peptides and proteins and reach from the characterization of whole proteins and the analysis of digests including sequencing to protein profiling and the elucidation of structural features, e.g. by hydrogen/deuterium exchange processes. They deal with virtually all aspects in which mass spectrometry can be of use in protein chemistry, not excluding non-covalent interactions between proteins and the determination of the interaction surfaces. Chapter 7 summarizes mass spectrometric experiments with nucleic acids, sugars, and steroids and is followed by a detailed discussion of high throughput analysis and automation in Chapter 8 and pharmacokinetics in Chapter 9. While the first nine chapters stress methodological questions and problems, the last chapter vice versa identifies important biological and biochemical problems and provides insight into how mass spectrometry contributes to their solution. Among these, the reader even finds the determination of the mass of whole viruses, definitively one of highlights from the author's own research.

Each chapter starts with a section which puts its content briefly into perspective and thus sets the stage and prepares the reader for the main ideas of the following sections. At the end of each chapter, an overview summarizes the contents and some questions help the reader to test his or her understanding of the preceding chapter. For further reading, up-to-date references are provided through which the reader can get access to all the details. An appendix with a glossary of terms, a list of all natural isotopes of the elements, a table with the natural amino acids, and an index providing quick access to a particular desired piece of information provides useful data and makes the book a well-rounded piece of work.

The contents are clearly organized, well-written, and easy to understand even for the non-expert. Numerous straight-to-the-point illustrations make clear what is discussed in the text. I believe that Gary Siuzdak's book is an invaluable resource for a broad readership in biochemistry, biotechnology, medicine, and pharmaceutical research. On one hand, it gives an excellent introduction into mass spectrometry in biotechnological applications for those who are entering this field as newcomers. On the other hand, it will absolutely contribute a lot to experiment design for researchers in the biochemical field who want to use mass spectrometry as part of their research.

Published online February 6, 2004