

Book review

*Glycopeptides and Related Compounds:
Synthesis, Analysis, and Applications*

Edited by David G. Large and Christopher D. Warren.
Marcel Dekker, New York, 1997. ISBN 0-8247-9531-8, 784 pp, \$195

The presence of sugar moieties in proteins has been the subject of both speculation and experiment for over 100 years. However, the existence of carbohydrate in covalent linkage to protein was not demonstrated until 1958 when Albert Neuberger and coworkers in a paper in *Nature* demonstrated that asparagine was the linking compound. The N-(L- β -aspartyl)- β -D-glucopyranosylamine was synthesised in 1962 and the complete identification of synthetic material with the natural glycopeptide finally clinched the structure. In the intervening 35 years, there has been increasing interplay between structural and synthetic carbohydrate chemists and biologists and, as the title suggests, these are the areas covered by this timely book. The volume opens with a chapter by Christopher Warren and Hari Garg entitled "Glycopeptides and Glycoproteins: Their Past, Present, and Future" which surveys the current challenge of glycopeptide synthesis along with biomedical applications of glycopeptides and glycoproteins while speculating on future trends in synthesis and analysis. Of the remaining 14 chapters eight cover synthetic aspects, five are devoted to analysis and the final chapter looks at some applications from the preceding chapters. As regards chemical synthesis, Horst Kunz and Michael Schultz look at recent advances in the synthesis of glycopeptides, Sabine Flitsch and Gregory Watt turn to the synthesis of glycoprotein glycans, Samuel Danishefsky and Jacques Roberge describe the syntheses of oligosaccharides and glycopeptides on insoluble and soluble supports and this is followed by a chapter on the synthesis of the peptide moiety of glycopeptides by David Large and Ian Bradshaw.

Moving from the area of glycopeptides, Roy and Jill Gigg look at the synthesis of glycosylphosphatidylinositol anchors, Vladimir Shibaev and Leonid Danilov cover the synthesis of intermediates in the Dolichol pathway and the final synthesis chapter by Michael Williams surveys the synthesis of substrates and inhibitors of glycosyltransferases and glycosidases. All seven chapters are both comprehensive and clearly written, are illustrated with well-drawn reaction schemes, contain extensive bibliographies and have welcome lists of abbreviations used.

The enzymatic synthesis of oligosaccharides and glycopeptides is examined in a major chapter with over 350 references by Yoshitaka Ichikawa which surveys the glycosyltransferases available and methods for large-scale enzymatic synthesis of oligosaccharides. Glycosidase reactions are also covered with a subsection on glycopeptide preparation by glycosurgery; a clever term to describe the attainment of defined structures by treatment of larger glycopeptides with exoglycosidases.

The chapter by Malcolm McConville and Julie Ralton on the analysis of GPI protein anchors and related glycoproteins is introduced with a summary of the more than 20 GPI protein anchors and 10 protein-free GPI glycolipids, or GPILs, determined since 1985. Both chemical and enzymatic methods for releasing and sequencing the various moieties together with instrumental methods for structure determination are described.

In the following chapters, Steven Levery gives us a historical survey of the use of permethylation with GC-MS and surveys some recent developments, while David Harvey looks at the use of

mass spectrometry, a technique which is playing an ever-more-prominent role in the structural determination of glycoproteins and oligosaccharides. NMR spectroscopy holds a unique position in the analysis of oligosaccharides, proteoglycans and lower molecular weight glycoconjugates and this is amply demonstrated in the chapter by Elizabeth Hounsell and David Bailey. Their introduction contains a succinct account of the various experiments currently employed and is followed by a survey of representative structures; proteoglycans, oligosaccharides and glycopeptides, determined using these experiments. Trevor Rutherford's chapter on the use of NMR and molecular dynamics for conformational studies of glycoprotein glycans is a comprehensive and clearly written account of this important field.

The final chapter by Rao Koganty, Mark Reddish and Michale Longenecker on glycopeptides in

the immunotherapy of cancer pulls together some of the strands of the previous chapters, for example by looking at the use of synthetic glycopeptides as antigens against cancer. There are interesting subsections on the design and analysis of vaccines against cancer and the binding of monoclonal antibodies generated against synthetic mucin mimics.

Congratulations are in order for the editors of this excellent book for selecting such a distinguished set of authors from around the world and editing to a high standard a volume which should be on the bookshelf of every serious carbohydrate chemist and biochemist.

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