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# Preface

DOI: 10.1039/9781782626657-FP007

This volume is dedicated to the memory of Derek Horton, a scientist that has shown to the world the importance of the glycosciences for societal and industrial innovation. With more than 500 publications and numerous patents, he was also well known in the carbohydrate community for his editorial activities: he was a founder and editor of the leading journal *Carbohydrate Research*, and the editor of *Advances in Carbohydrate Chemistry and Biochemistry*, formerly known as *Advances in Carbohydrate Chemistry*, a book series containing peer reviewed contributions covering all areas of glycosciences.

In our memory remains his enthusiasm to find new topics and new authors, encouraging researchers, including the younger ones, to submit their contributions to the *Advances*, in recognition of their excellence and novelty. He loved challenges, and another of his passions was the nomenclature of carbohydrates. Indeed, he was a reference in this domain, and nomenclature experts always wanted to hear his voice on the matter! He was always first when giving a compound name, and a more complex structure was a bigger challenge and a joy for him! He chaired the American Chemical Society Committee for Carbohydrate Nomenclature and belonged to the expert panel of the Recommendations 1996 for the Nomenclature of Carbohydrates. Since then, as a member of the IUPAC Joint Commission of Biochemical Nomenclature and as a task group member of the IUPAC project dedicated to the revision of the Nomenclature of Carbohydrates, he honored us with his outstanding contributions to carbohydrate nomenclature.

Derek Horton was a Fellow of both the American Society of Chemistry (ACS) and the Royal Society of Chemistry (RSC), and received numerous awards, to name the Haworth Medal from the RSC, the Wolfrom Award and the Claude S. Hudson Award from the ACS. He held the Isbell Chair of Carbohydrate and Natural Product Chemistry at American University (1993–2009) and his love for teaching and research can be demonstrated by the number of students that have learnt how to study and how to investigate with him. This book contains contributions of some of his friends, who wish to dedicate this work to him and to the friendship they chaired in life.

Glycoconjugation and glycoside chemistry are the major topics of this volume. Chapter 1, authored by Rob Field, provides a critical survey of glycoconjugation methodologies, relevant to access homogenous natural glycoproteins and analogues thereof, emphasizing recent progress in the area. In this chapter, chemical and chemo-enzymatic glycoconjugation methods are described, along with illustrations of typical applications. These methods are unique tools to access glycoproteins for understanding the role of each glycan in glycoprotein structure–function relationships.

In Chapter 2, the application of solution NMR to the study of conformation, dynamics of molecules embodying sugars in their structure

(oligo and polysaccharides, glycopeptides and glycomimetics) and to the investigation of glycan-related molecular recognition events is authored by Jesús Jiménez-Barbero and coworkers (Chapter 4). They present recent selected examples for analysing saccharide conformation, and for describing key structural features of glycan molecular recognition events with different natural and synthetic receptors.

In Chapter 3 the evolution of methodologies for the conjugation of single amino group-containing carbohydrates to protein carriers is described by Pavol Kováč and his coworker. They present the squaric acid-based method as the most efficient one for converting proteins to glycoconjugates with predictable carbohydrate-carrier ratios, and give examples of proven protocols for the conjugation of low- and high-molecular-weight carbohydrates.

Paul Kosma contribution describes the latest findings in Kdo glycosidation, a demanding research area for the development of glycoarrays, immunoreagents and vaccines that can be accessed by reading Chapter 4.

Cyclic oligosaccharides have attracted the interest of glycochemists as a result of their immense industrial importance arising from their molecular and supramolecular properties. As opposed to the production of cyclic oligosaccharides biosynthetically, their chemical synthesis remains a challenge. In this Chapter 5, authored by N. Jarayaman and coworkers, advances in cyclic oligosaccharide synthesis are compiled, particularly those described over the last decade, with emphasis on modifications of glycosidic bonds or individual sugar moieties.

The developments in the Ferrier rearrangement reported in the last three years are the subject of the critical review authored by Ana Gómez and Cristobal López (Chapter 6), who demonstrate the usefulness of glycals to the synthesis of glycosides bearing a 2,3-unsaturated glycosyl group and the various reaction conditions described for stereoselectivity control. In addition, *S*-, *N*- and *C*-glycosylation starting from glycals is also presented and discussed.

In Chapter 7, authored by Beat Ernst and coworker, they report their original work on how to improve solubility, metabolic stability as well as passive permeability of mannoside antagonists of the mannose-binding adhesin FimH, by modifying the substitution pattern and by introducing heteroatoms at the aglycone. These molecules may give an important contribution to an efficient non-antibiotic strategy to overcome antibiotic resistance in urinary tract infections.

An overview of steroid glycoside synthetic methodologies is given in Chapter 8, authored by Yves Queneau and coworkers, who highlight their nature as amphiphilic systems and their ability to interact with other biomolecules within cell membranes and to contribute to organized molecular and supramolecular systems.

Recent advances in the synthesis of imino sugars, comprising the preparation of five- and six-membered heterocycles containing an endocyclic nitrogen atom, authored by Slawomir Jarosz and coworker (Chapter 9) and amino sugar synthesis, with emphasis on diastereo- and enantioselectivity (Chapter 10) authored by Zbigniew Witczak and Roman

Bielski complete this volume 42 of the Specialist Periodical Reports – Carbohydrate Chemistry: Chemical and Biological Approaches.

We hope the readers enjoy this selection of contributions that focus on the progress of synthetic methodologies for small molecule amino and imino sugars, glycoconjugation and glycosylation of a variety of acceptors leading to molecules with a diversity of medicinal properties. Insights onto molecular recognition studies by NMR also enrich the content and multidisciplinary of this volume.

Amelia P. Rauter  
Thisbe K. Lindhorst  
Yves Queneau

