Carbohydrate Research, 118 (1983) c13–c15
Elsevier Science Publishers B.V., Amsterdam – Printed in The Netherlands

Book review

Advances in Carbohydrate Chemistry and Biochemistry: Volume 40, edited by R. STUART TIPSON AND DEREK HORTON, Academic Press, New York and London, 1982, x + 399 pages + Author and Subject Indexes, and Cumulative Author and Subject Indexes (Vols. 36–40), $65.00

As in previous volumes of this series, *Advances,* Vol. 40, presents a set of timely articles on a variety of subjects of intense interest to teachers, students, research scientists, and anyone else concerned with carbohydrates.

The first Chapter, a complete review of the synthesis of sugars from non-carbohydrate substrates, is by Aleksander Zamojski, Anna Banaszek, and Grzegorz Grynkiewicz. These authors, as pioneers in this branch of organic chemistry, are eminently qualified to cover this topic, and have admirably performed the mammoth task of surveying all of the major synthetic efforts during the period from the 1950's through the early part of 1980. Only aldol-type reactions of formaldehyde and of two- or three-carbon hydroxy aldehydes and ketones, reviewed in Vol. 29 of this Series, and reactions leading from dialkenes to hexitols, reviewed in Vol. 2, are omitted. The article is organized in such a way that syntheses are grouped together according to the type of starting material, *e.g.*, alkenes and dihydro-2*H*-pyrans, so that there is some intentional overlap between sections. For most syntheses, a Scheme is provided, outlining the reactions involved, and these are usually on the same or facing page, which helps the reader. This is important, because, owing to the nature of the contents, this chapter demands attentive reading. Most of the syntheses described are of racemic mixtures, but the last seventeen pages describe optically active products, obtained by resolution of racemates, from chiral precursors, or by stereo-differentiating methods. Because of the timing of this article, the recent papers by Sharpless and coworkers on titanium-catalyzed, asymmetric epoxidation with diethyl (+)- or (−)-tartrate are not included. There is no attempt to evaluate procedures for practical applications. As is true of the other chapters, this one is extremely well documented (364 literature references), and the Figures and formulas are of the highest quality.

In the second Chapter, Roland Schauer has written what must be the definitive review of the sialic acids. After an introductory Section, the occurrence, isolation, analysis, biosynthesis, enzymic release, and biological significance are covered, and all of the topics are exhaustively documented (555 references). The coverage of the sialidases is especially noteworthy, with a very useful Table of substrate specificities for enzymes from eleven different sources. Included in the references, throughout, are many citations of the author's own work, including unpub-

lished results. (Some of these are as recent as 1981, while most of the others are up to early 1980.) In each Section, other relevant reviews are invariably cited, and the author makes a point of not duplicating material already adequately covered, especially in the sections on sialyltransferases and sialidases. In spite of the length of this article (103 pages), it is very easy to read. In some Sections, especially those on analytical methods, there is a welcome emphasis on practical applications, and the Chapter gives a general impression of being particularly aimed toward the working scientist.

An article by Yu-Teh Li and Su-Chen Li on the biosynthesis and catabolism of glycosphingolipids is a very useful survey of the current state of knowledge in these areas. In contrast to the preceding chapter, there is no attempt to review the whole literature on glycosphingolipids comprehensively. Instead, the authors orient the reader by a useful set of Tables and Schemes that correlate the names, abbreviations, and structures of these compounds, which are otherwise a source of some confusion for the non-expert. In their treatment of both biosynthesis and degradation, the authors emphasize the advantages and the potential pitfalls associated with the use of exogenous substrates, and such factors as detergents that affect assay conditions. They also point out the caution with which the results of *in vitro* experiments must be interpreted. These considerations are exemplified in the Sections on β-D-galactosidase and β-D-hexosaminidases A and B, and the associated storage diseases.

The fourth Chapter is on the lipid pathway of protein glycosylation and its inhibitors: the biological significance of protein-bound carbohydrates, by Ralph T. Schwartz and Roelf Datema. The rapid progress made in the studies by which the intricacies of this pathway have been revealed during the past thirteen years is a testament to the combined efforts of chemists, biochemists, cell biologists, and virologists. Several reviews of this subject have already appeared (and are cited in the article), but the authors have taken a refreshingly original approach that reflects their own expertise, based on the mechanism of action of glycosylation inhibitors. The authors carefully review, with very extensive documentation (562 references, up to 1980), both "halves" of the pathway, *i.e.*, assembly of an oligosaccharide "lipid intermediate", and "processing" after transfer to protein. They tend to avoid aspects covered in depth by previous reviewers, and concentrate instead on some of the unanswered questions, such as: what is the biological role of the "alternative" or heptasaccharide "lipid intermediate" pathway, observed in a mouse lymphoma cell-line, or virus-infected cells fed with 2-deoxy-2-fluoro-D-glucose? What stands out as regards this Chapter is the way in which the authors base their discussion on a careful evaluation of results from different laboratories, and never resort to an uncritical listing of facts and references. Work with cell-free systems and with intact cells is compared and contrasted, and it is not surprising to find an emphasis on the use of virus-infected cells for discussions of biosynthesis and processing. After dealing with glycosylation inhibitors, such as sugar analogs (*e.g.*, 2-deoxy-D-*arabino*-hexose) and antibiotics (particularly tunicamycin), there is a logical prog-

ression to a consideration of the functional role of sugars in glycoproteins; this includes important sections on "routing", secretion, recognition, and uptake, and the influence of glycosylation on virus formation and infectivity.

The last Chapter, by Pudupadi R. Sundararajan and Robert H. Marchessault, is a continuation of the important series "Bibliography of Crystal Structures of Polysaccharides". This, the fourth such article, covers the period 1977–1979; it contains sections on amylose, cellulose, glycosaminoglycans (including chitins), bacterial polysaccharides, and a peptidoglycan.

Advances, Vol. 40, contains very few errors. In each Chapter, the Figures, Schemes, and references have been arranged to complement the text, in such a way that page-turning is minimized. This is a superb addition to a series that has established an enviable reputation for a consistently high quality of content and production, and that is of outstanding value.

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