

Bacterial Lipopolysaccharides: Structure, Synthesis, and Biological Activities, edited by LAURENS ANDERSON AND FRANK M. UNGER, American Chemical Society, Washington, DC, 1983, xi + 325 pages, \$44.95 (U.S. and Canada) and \$53.95 (elsewhere).

Bacterial Lipopolysaccharides, a 14-chapter volume, is based on a symposium sponsored by The Division of Carbohydrate Chemistry at the September, 1982, meeting of The American Chemical Society in Kansas City, Missouri. As the title indicates, the emphasis of the book is on the structure and synthesis of lipopolysaccharides (LPS) and their biological activities; such topics as membrane-fluidity dynamics (LPS is the major constituent of the outer membrane of Gram-negative bacteria), and protein-LPS interactions are not covered.

The first section, which consists of only one chapter, provides an overview of LPS structure, and the biological properties of synthetic, partial-LPS structures. This chapter, collaboratively authored by Lüderitz, Tanamoto, Galanos, Westphal, Zahringer, Rietschel, Kusumoto, and Shiba, is clearly and concisely written, and is an excellent introduction to the rest of the book.

The second section (four chapters) concerns the structure and immunochemistry of LPS O-antigens (the polysaccharide portions of the LPS molecules). Syntheses, as well as the linear and, to some extent, 3-dimensional, structures of several LPS molecules, are discussed in chapters by Horton *et al.* and by Bundle *et al.* Kochetkov, in the third chapter of the section, discusses several approaches to the synthesis of O-antigenic polysaccharides. The final chapter of this Section, by Alf Lindberg and co-workers, describes, in a clear and interesting manner, the immunology and immunochemistry of synthetic and semi-synthetic, *Salmonella* O-antigen-specific glycoconjugates. This entire section is well written.

The third section, which is entitled "3-Deoxy-D-manno-2-octulosonic Acid", is three chapters long. The first chapter (by Waldstatler, Christian, Schulz, Unger, Kosma, Kratky, and Paulsen) deals with the synthesis of oligosaccharides containing KDO residues. The second chapter (by Ray, Kelsey, Bigham, Benedict, and Miller) describes the synthesis, and use, of KDO in *E. coli*. The emphasis of this chapter is on potential sites in the synthetic pathway for inhibition and, thus, the finding of a general antibiotic. The final chapter of this section, written by Jann, describes several KDO-containing, capsular polysaccharides found in uropathogenic *E. coli*; it is the only chapter in the book that does not specifically deal with lipopolysaccharides; however, as KDO is such an important ingredient of the core region, the inclusion of this chapter is warranted.

The fourth section, presented in two chapters, describes the structures and biological activity of lipid A. It is regrettable that the "biological activity" described in this section was limited to that found in cancer immunotherapy. The first chapter (authored by Rietschel, Wollenweber, Sidorczyk, Zahringer, and Lüderitz) discusses the lipid A structure. Structural studies are described in greater detail

than in chapter 1. The chapter is well organized, and experiments and their results are clearly presented. Summaries, wherein key findings and conclusions are presented, are provided at convenient intervals. The chapter finishes with a set of concluding remarks that provide a capsule summary of the author's view of the status of lipid A structures and future goals. The second chapter of this fourth section (authored by Takayana, Qureshi, Ribí, Cantrell, and Amano) describes the use of endotoxins in cancer immunotherapy. The chapter briefly describes the history of tumor immunology, the role of LPS in tumor immunology, the toxicity problem, preparation of nontoxic lipid fragments, and their purification and analysis. The chapter is well written and informative.

The final section, consisting of four chapters, describes the synthesis and characterization of lipid A and its analogs. Such studies are designed to confirm the structure of lipid A and to provide insights into its functional mechanisms through chemical modification. The first chapter (by Kusumoto, Inage, Chaki, Imoto, Shimamoto, and Shiba) describes a synthetic route to the Salmonella-type lipid A, with or without phosphate groups. The next chapter, authored by Anderson and Nashed, describes a further synthesis of lipid A and its analogs; it is pointed out by these workers that, even if the pattern of *O*-acylation proves different from that proposed, the synthetic method should be capable of being modified to yield different *O*-acylated materials. The third synthetic approach to lipid A and analogs, by Kiso and Hasegawa, additionally describes monosaccharide derivatives of lipid A. The final chapter (authored by Charon, Diolez, Mondange, Sarfati, Szabo, Szabo, and Trigalo) is directed toward the synthesis of the two major LPS molecules present in *Bordetella pertussis*. The syntheses described in the four chapters are based on differing strategies, and provide nice intercomparisons.

Bacterial Lipopolysaccharides is, overall, of high quality. There is, in general, a good balance of topics, and each of the covered aspects of LPS chemistry and biology has been authored by leading investigators in the field. Purchase of this book is imperative for workers in the LPS field.

Division of Biochemistry and Biophysics, FDA
Bethesda, Maryland

WILLIAM EGAN