The work embodied in this thesis have been carried out in the Division of Molecular Medicine, Bose institute, P-1/12, C.I.T. Scheme VII M, Kolkata-700054, India during the period 2009 to 2013. The thesis is broadly divided into four chapters. The objective of the work is to synthesize complex oligosaccharides corresponding to the bacterial polysaccharides as well as development of the novel methodologies for their application in the synthetic organic chemistry.

Chapter 1 covers a brief survey on the carbohydrate derived therapeutics and carbohydrate based antimicrobial vaccine candidates. An overview of various glycosylation techniques for the stereo- and regioselective synthesis of complex oligosaccharides using different glycosyl donors has also been presented. In addition, a brief coverage on the modern glycosylation techniques has also been discussed.

Chapter 2 deals with the chemical synthesis of the complex oligosaccharides found in the cell-wall O-antigens of Shigella boydii strains. This chapter is divided into three parts. In the first part of this chapter, synthesis of a tri-and a pentasaccharide repeating unit of the O-antigen of Shigella boydii type 6 is illustrated. The second part deals with the synthesis of a tetrasaccharide repeating unit of the O-antigen of Shigella boydii type 9 and the third part demonstrates the synthesis of a common tetrasaccharide repeating unit of the O-antigen of enteroinvasive Escherichia coli O143 and Shigella boydii type 8.

Chapter 3 focuses on the synthesis of oligosaccharides related to some pathogenic Escherichia coli strains. This chapter is divided into two parts. The first part deals with the synthesis of a pentasaccharide repeating unit of the O-antigen polysaccharide of enterohemorrhagic Escherichia coli O113 using a [3+2] block glycosylation strategy. The second part demonstrates the expedient synthesis of two structurally close tetrasaccharides corresponding to the O-antigens of Escherichia coli O127 and Salmonella enterica O13. Both tetrasaccharides have been synthesized using a “unichemo” approach and minimum number of reaction steps.

Chapter 4 describe the development of a series of novel reaction methodologies useful in the synthesis of oligosaccharides, which include (a) acylation and sulfation of carbohydrates using
sulfamic acid as catalyst and (b) deprotection of benzylidene acetal in carbohydrate derivatives by catalytic transfer hydrogenation using triethylsilane and 10% Pd-C.

Relevant references are given at the end of each chapter. Nomenclatures of the compounds through the series were given according to IUPAC as appeared in the *Pure and Applied Chemistry* 1996, 68, 1919. Parts of this dissertation have already been published and the list of publications is presented at the end of thesis.

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