Proc. KMB Annual Meeting
June 24-26, 2003, Muju, Korea

Sugar-Nucleotide Production for Glycosyltransferase(GT) Reaction and Its Application

Byung-Gee Kim

School of Chemical Engineering, Seoul National University

As, recently, the function and role of glyco moiety of glycoproteins, antibiotics and antibodies or oligosaccharides produced from body are revealed, the technology of large scale production of the defined oligosaccharides draws a great attention. To synthesize the oligosaccharides in large scale, owing to no need of the prior modification of monomer hexose units, enzymatic methods using glucosidase and glycosyltransferase have great advantages over the chemical methods. Although glucosidase(GS) can be used to synthesize various homo carbohydrate polymers, as it produces many side products during the reaction, glycosyltransferase(GT) is much preferred, especially for the synthesis of hetero carbohydrate oligomers. As GT usually show very narrow substrate specificity, efficient synthesis of oligosaccharides requires cloning of many GTs to meet such variation of the sequences.

To proceed large scale production of the oligosaccharides, although the cloning of various GTs is essential, another pre-requisite condition for the economic synthesis is hexose-NDP conjugates, which become the substrates for the GTs. For the economic synthesis of various corresponding hexose-NDP conjugates (UDP-Glc, UDP-Gal, CMP-NeuAc, GDP-Fuc, GDP-Man, UDP-GalNAc, UDP-GlcNAc, dTDP- Glc and etc.), E.coli cell based systems were successfully developed utilizing cell's nucleic acid synthesis machineries. In this talk, through the model studies of the synthesis of UDP-Gal, CMP-NeuAc, and dTDP-Glc, we will discuss about the strategies and problems in the sugar-nucleotide synthesis, and show the examples of such special oligosaccharide synthesis, i.e. sialyl oligosaccharides synthesis, remodeling of carbohydrate moieties of Ab, and synthesis of glycone unit of antibiotis, and their applications.