Chemoenzymatic synthesis and applications of carbohydrates

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Carbohydrates are biologically and pathologically important molecules. Among different modern synthetic strategies, the application of glycosyltransferases and other related carbohydrate biosynthetic enzymes in producing these complex biomolecules has great advantages. We have developed several efficient one-pot multienzyme (OPME) systems for synthesizing complex carbohydrates including those containing naturally occurring[1] and non-natural carbohydrate modifications. These include one-pot multienzyme sialylation,[2-5] fucosylation,[6] galactosylation,[7, 8] *N*-acetylglucosaminylation, and glucuronylation processes.[9] Identifying carbohydrate biosynthetic enzymes and generating their mutants with good solubility, high expression level in *E. coli*, high activity and broad substrate specificity allow the activation and transfer of modified or unmodified monosaccharides to take place easily for preparative and large-scale synthesis of complex oligosaccharides, glycolipids, and glycopeptides. These compounds are essential probes for carbohydrate-binding proteins and potential prebiotics and therapeutics.

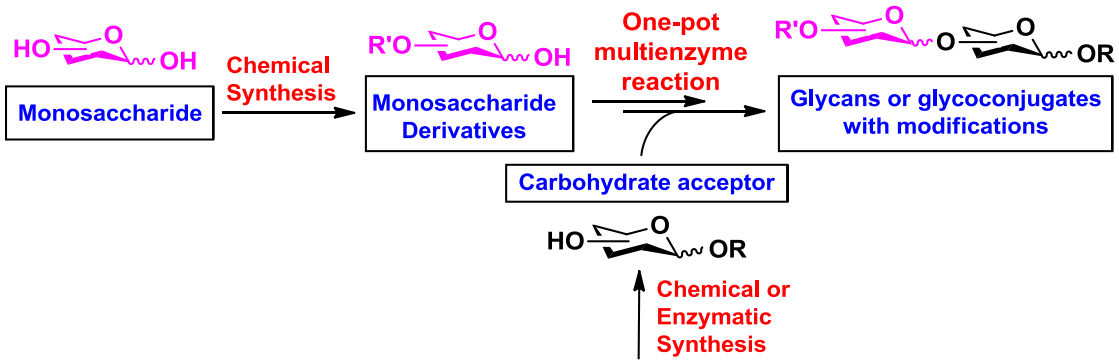

Figure 1. One-pot multienzyme (OPME) chemoenzymatic synthesis of glycosides.

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