# Substrates promiscuities of bacterial glycosyltransferases enable site-specific fucosylation

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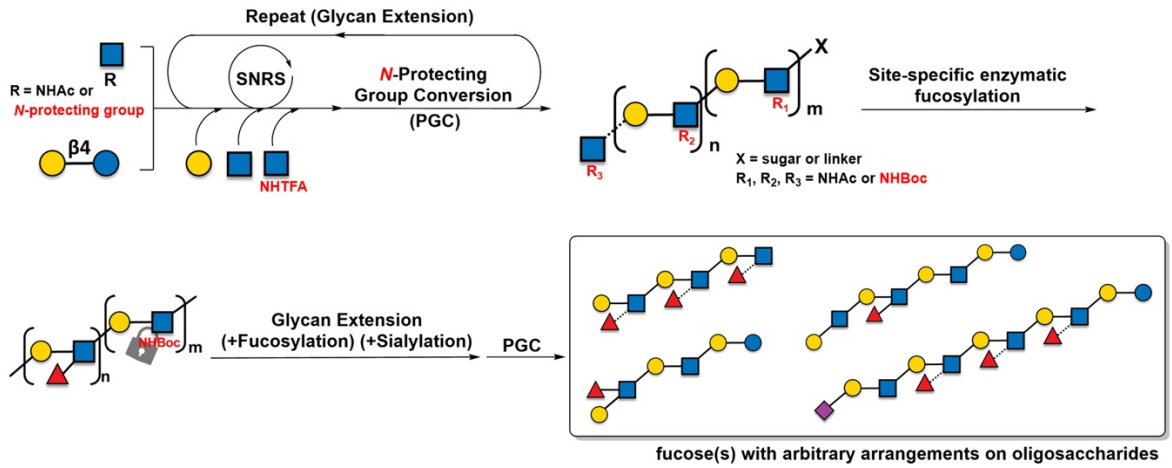
Fucosylated glycans are frequently existing in the *N*-glycans, *O*-glycans, glycosphingolipids (GSLs) and human milk oligosaccharides (HMOs), and involved in unique biological activities of organisms. Fucoses are assembled at multiple sites of *N*-acetyllactosamine (LN) and/or lacto-*N*-biose (LNB) which are also known as Lewis antigen. The diversity of Lewis antigens on the complex glycans causes their chemical synthesis difficulty due to the lower stereoselectivity and regioselectivity. The enzymatic fucosylation of oligosaccharide backbones is a prosperous strategy owing to its stereoselectivity and higher synthetic efficiency. However, it also leads to heterogeneous glycan determinants resulting in time-consuming and difficult purification steps. Herein, we developed a general strategy for site-specific fucosylation on poly LN or LN/LNB hybrid backbones. The promiscuous bacterial glycosyltransferases can assemble *N*-modified glucosamines into oligo-LN and LNB, respectively. The regioselectivity of fucosylation can be controlled by the amino protecting groups. Although various site-specific fucosylation strategies have been reported,[1]-[3] our strategy makes the purification and reaction monitoring easier. Importantly, the synthetic scale and efficiency can be raised by coupling with sugar nucleotide regeneration system (SNRS). The robust strategy was demonstrated by the facile synthesis of myeloglycans, dodecasaccharides, and internal/terminal fucosylated HMOs. Our method features the feasible applications on other complex carbohydrates.




Schematic illustration of site-specific fucosylation strategy in this work

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