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Efficient chemo-enzymatic synthesis of (sialylated) galacto-N-biose derivatives

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Disaccharide galacto-N-biose (GNB, Gal β 1-3GalNAc) is a common glycan structure in nature. GNB with an α -configuration at the reducing end linked to the serine or threonine residue in glycoproteins (Gal β 1-3GalNAcSer/Thr) is named T-antigen and is one of the most common tumor-associated carbohydrate antigens (TATCs) found overexpressed on human carcinoma cells including those of lung cancer, prostate cancer, breast cancer etc. On the other hand, GNB with a β -configuration at the reducing end (Gal β 1-3GalNAc β) is an essential part of globo-series (e.g., Globo-H, Gb5, sialyl Gb5) and ganglio-series (e.g., GA1, GM1, GD1, GT1, GP1, GQ1, etc) glycosphingolipids. In this study, Galacto-N-biose (GNB) derivatives were efficiently synthesized from galactose derivatives via a one-pot two-enzyme system containing two promiscuous enzymes from *Bifidobacterium infantis*: a galactokinase (BiGalK) and a D-galactosyl- β 1-3-N-acetyl-D-hexosamine phosphorylase (BiGalHexNAcP). Mono-sialyl and di-sialyl galacto-N-biose derivatives were then prepared using a one-pot two-enzyme system containing a CMP-sialic acid synthetase and α 2-3-sialyltransferase or α 2-6-sialyltransferase.

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Effect of farnesol, a quorum sensing molecule on biofilm formation by *Candida* species

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Candida is a dimorphic fungus that can be either commensal or an opportunistic pathogen. *Candida* has various virulence traits that may cause diseases ranging from superficial mucosal infections to life-threatening systemic disorders. Biofilm is a highly organized community of cells that is regulated by the exchange of chemical signals among cells in a process known as quorum sensing (QS). Cells in the biofilm communicate via releasing chemical compounds, the quorum sensing molecules (QSM) that act in concert reaching threshold densities that signal the initiation of coordinated cellular differentiation events. Biofilms possess unique developmental characteristics that are in stark contrast to the characteristics of free-floating planktonic cells. Farnesol is an extracellular QSM released by *Candida* species that inhibit the yeast-to-mycelium conversion, disseminate, initiate infection and form biofilm. This strategy of cell-cell communication benefits the biofilm community by preventing and controlling unnecessary overpopulation and competition for nutrients and has important implications for the infectious process. The suppressive effect of farnesol on biofilm formation on polystyrene and its synergistic effect with fluconazole leading to the sensitization of resistant strains indicate a potential application for farnesol as therapeutic agent in the future for the treatment or prevention of biofilm related infections including device related infections and for promoting antimicrobial resistance reversal.

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