Supporting Information

Scheme

3 \[\rightarrow\] 11 \[\rightarrow\] 12

4 \[\rightarrow\] 5

13 \[\rightarrow\] 14 \[\rightarrow\] 15

6 \[\rightarrow\] 7

\[\text{Scheme}\]
**General Techniques.** All reactions were carried out under an atmosphere dry nitrogen. Yields refer to chromatographically and spectroscopically homogeneous materials. Anhydrous solvents were purchased from Kanto Chemical Co., Inc.

Reagents were purchased at the highest commercial quality and used without further purification. All reactions except for polymerization were monitored by thin-layer chromatography (TLC) carried out on Merck aluminium roll silica gel 60-F$_{254}$ using UV light and ethanoic phosphomolybdic acid or $p$-anisaldehyde solution for visualization. Merck silica gel (60, particle size 0.040-0.063 mm) was employed for flash column chromatography using toluene-ethyl acetate, hexane-ethyl acetate, and chloroform-methanol as eluting solvents.

$^1$H NMR (500 MHz) spectra were recorded with a Varian Inova 500 spectrometer equipped with Sun workstation. Unless otherwise stated $^1$H NMR spectra were recorded at 25°C in CDCl$_3$ using an internal tetramethylsilane (TMS) standard at 0 ppm. The following abbreviations were used to explain the multiplicities: $s =$ singlet, $d =$ doublet, $m =$ multiplet, $br =$ broad, $bs =$ broad singlet. IR spectra were recorded on a JASCO FT/IR-230 Fourier transform infrared spectrometer in the form of KBr disc for solid samples or film on KBr for liquid samples. Mass spectra were recorded on a Micromass LCT mass spectrometer under fast atom bombardment (FAB) conditions with NBA as the matrix. Elemental analyses were performed by PE2400 II CHNS/O Analyzer. Size exclusion chromatography was performed with a JASCO 800 high performance liquid chromatography on Shodex B804 + B805 columns using PBS as eluent. MM-2 calculations were carried out using Insight II/ Discover program and Amber force field.

4,6-$O$-Benzyldiene-$\alpha$-$D$-glucopyranosyl-(1-1)-6-$O$-TBDPS-$\alpha$-$D$-glucopyranoside (11). To a solution of 4,6-mono-$O$-benzyldiene-$D$-trehalose 3 (5.00 g, 11.6 mmol), 4-$N$,$N$-dimethylaminopyridine (142 mg, 1.16 mmol), and triethylamine (4.77 mL, 34.9 mmol) in pyridine (100 mL) was added tert-butylidiphenylsilyl chloride (4.46 mL, 17.4 mmol) gradually at 0°C, and the
reaction mixture was stirred for 12 h at room temperature. The reaction mixture was quenched by addition of 1N HCl and extracted with chloroform. The combined organic layer was washed with saturated aqueous solution of NaHCO$_3$ and brine, dried over MgSO$_4$, and concentrated in vacuo. The residue was purified by flash chromatography (silica gel, chloroform/methanol 10:1) to furnish the disaccharide 11 as a white powder (7.06 g, 91%): IR (disc, cm$^{-1}$) 3467 (OH), 1123 (acetal); $^1$H NMR (δ ppm, 500MHz, CDCl$_3$) 7.27-7.58 (m, 15H, ArH), 5.66 (s, 1H, ArCH(OR)$_2$), 5.16 (d, 1H, $J$ = 3.5 Hz, H-1), 5.11 (d, 1H, $J$ = 3.5 Hz, H-1’), 3.09-4.23 (m, 12H, sugar-H), 1.01 (s, 9H, TBDPS); Anal. calcd. for C$_{35}$H$_{44}$O$_{11}$Si: C, 62.85; H, 6.63; O, 26.31; Si, 4.20 %; found C, 62.81; H, 6.64 %.

2,3-Di-O-benzyl-4,6-O-benzylidene-α-D-glucopyranosyl-(1-1)-2,3,4-tri-O-benzyl-6-O-TBDPS-α-D-glucopyranoside (12). To a solution of disaccharide 11 (6.00 g, 8.97 mmol) in N,N-dimethylformamide (200 mL) was added sodium hydride (1.29 g, 53.8 mmol) and benzyl bromide (6.39 mL, 53.8 mmol) gradually at 0°C, and the reaction mixture was warmed to room temperature slowly and stirred for 12h. The reaction mixture was quenched by addition of methanol, brine and ethyl acetate was added, two phases were separated. The aqueous layer was extracted with ethyl acetate and the combined organic layer was washed with brine, dried over MgSO$_4$, and concentrated in vacuo. The residue was purified by flash chromatography (silica gel, hexane/ethyl acetate 10:1) to afford benzylated compound 12 as a colorless syrup (9.54 g, 95%): IR (film, cm$^{-1}$) 1338, 1220 (OBn), 1126 (acetal); $^1$H NMR (δ ppm, 500MHz, CDCl$_3$) 6.95-7.69 (m, 40H, ArH), 5.55 (s, 1H, ArCH(OR)$_2$), 5.20 (d, 1H, $J$ = 3.5 Hz, H-1), 5.12 (d, 1H, $J$ = 3.5 Hz, H-1’), 4.50-4.96 (m, 10H, ArCH$_2$O), 4.27 (ddd, 1H, H-5), 4.02-4.14 (m, 5H, sugar-H), 3.74 (dd, $J$ = 3.5, 10.5 Hz, H-2), 3.59-3.69 (m, 4H, sugar-H), 3.48 (dd, $J$ = 3.5, 9.8 Hz, H-2’), 1.09 (s, 9H, TBDPS); FABMS 1120 [M+1]$^+$. 

2,3,6-Tri-O-benzyl-α-D-glucopyranosyl-(1-1)-2,3,4-tri-O-benzyl-6-O-TBDPS-α-D-glucopyranoside (4). To a suspension of benzylated compound 12 (2.00 g, 1.78 mmol) and aluminium (III) chloride (1.17 g, 8.90 mmol) in dry tetrahydrofuran (100 mL) was added borane-
dimethylamine complex (435 mg, 8.90 mmol) gradually at 0°C, and the reaction mixture was stirred for 2 h at room temperature. The reaction mixture was filtered through a pad of Celite, and the filtrate was concentrated in vacuo. The residue was dissolved in chloroform, and the organic layer was washed with brine, dried over MgSO₄, and concentrated in vacuo. The residue was purified by flash chromatography (silica gel, hexane/ethyl acetate 5:1) to give alcohol 4 as a colorless syrup (1.88 g, 94%): IR (film, cm⁻¹) 3528 (OH), 1333, 1230 (OBn), 1135 (acetal); ¹H NMR (δ ppm, 500MHz, CDCl₃) 6.95-7.68 (m, 40H, ArH), 5.26 (d, 1H, J = 3.5 Hz, H-1), 5.18 (d, 1H, J = 3.5 Hz, H-1’), 4.46-5.00 (m, 12H, ArCH₂O), 4.00-4.15 (m, 3H, sugar-H), 3.85 (ddd, 2H, H-6), 3.73 (dd, J = 3.2, 10.3 Hz, H-2), 3.66 (ddd, 1H, H-5), 3.45-3.62 (m, 4H, sugar-H), 3.48 (dd, J = 3.4, 9.8 Hz, H-2’), 1.11 (s, 9H, TBDPS); FABMS 1122 [M+1]+.

4-O-Acetyl-2,3,6-tri-O-benzyl-α-d-galactopyranosyl-(1-1)-2,3,4-tri-O-benzyl-6-O-TBDPS-α-d-glucopyranoside (5). To a solution of alcohol 4 (1.50 g, 1.34 mmol) in pyridine (50 mL) was added trifluoromethanesulfonic anhydride (673 mL, 4.01 mmol) at 0°C, and the reaction mixture was stirred for 45 min at the same temperature. The reaction mixture was azeotroped repeatedly with toluene. The residue was purified by chromatography (silica gel, hexane/ethyl acetate 20:1) to furnish triflated disaccharide (1.68 g, quantitative yield) as a yellow syrup, which was processed without delay. A solution of the triflated disaccharide (1.60 g, 1.28 mmol), cesium acetate (2.46 g, 12.8 mmol) and 18-Crown-6 (3.38 g, 12.8 mmol) in dry toluene (20 mL) was placed in an ultrasound cleaning bath for 2 h at 40°C. Evaporation of the solvent followed by flash chromatography (silica gel, hexane/ethyl acetate 5:1) to give acetate 5 as a colorless syrup (1.44 g, 97%): IR (film, cm⁻¹): 3528 (OH), 1722, 1216 (acetyl), 1333, 1230 (OBn); ¹H NMR (δ ppm, 500MHz, CDCl₃) 7.20-7.39 (m, 40H, ArH), 5.65 (dd, 1H, J = 1.5, 3.2 Hz, GalH-4), 5.25 (d, 1H, J = 3.5 Hz, GalH-1), 5.23 (d, 1H, J = 3.5 Hz, GlcH-1), 4.32-4.90 (m, 12H, ArCH₂O), 4.48 (ddd, 1H, GalH-5), 3.34-4.14 (m, 10H,
sugar-H), 1.07 (s, 9H, TBDPS); FABMS 1163 [M]+.

2,3,6-Tri-O-benzyl-α-D-galactopyranosyl-(1-1)-2,3,4-tri-O-benzyl-6-O-TBDPS-α-D-glucopyranoside (13). A mixture of acetate 5 (1.00 g, 0.859 mmol) and sodium methoxide (50 mg) in methanol (10 mL) and tetrahydrofuran (10 mL) was stirred for 12 h at room temperature. The reaction mixture was concentrated in vacuo and the residue was dissolved with dichloromethane. The organic layer was washed with brine, dried over MgSO₄, and concentrated in vacuo. The residue was purified by chromatography (silica gel, hexane/ethyl acetate 3:1) to afford alcohol 13 as a colorless syrup (971 mg, quantitative yield): IR (film, cm⁻¹) 3498 (OH), 1350, 1226 (OBn); ¹H NMR (δ ppm, 500MHz, CDCl₃): 7.20-7.41 (m, 40H, ArH), 5.27 (d, 1H, J = 3.5 Hz, GalH-1), 5.24 (d, 1H, J = 3.5 Hz, GlcH-1), 4.38-4.91 (m, 12H, ArCH₂O), 4.31 (ddd, 1H, GalH-5), 4.15 (s, 1H, GalH-4), 3.99 (dd, 1H, J = 3.0, 10.0 Hz, GalH-3), 3.94 (dd, 1H, J = 3.5, 10.0 Hz, GalH-2), 3.87 (dd, 1H, J = 9.0 Hz, GlcH-3), 3.34-3.75 (m, 7H, sugar-H), 1.10 (s, 9H, TBDPS); FABMS 1122 [M+1]+.

2,3,6-Tri-O-benzyl-α-D-galactopyranosyl-(1-1)-2,3,4-tri-O-benzyl-α-D-glucopyranoside (14). To a solution of alcohol 13 (800 mg, 0.713 mmol) in tetrahydrofuran (20 mL) was added tetrabutylammonium fluoride (856 µL, 0.856 mmol, 1.0 M in tetrahydrofuran) and stirred for 24 h at room temperature. The reaction mixture was concentrated and the residue was dissolved in chloroform. The organic layer was washed with brine, dried over MgSO₄, and concentrated in vacuo. The residue was purified by chromatography (silica gel, toluene/ethyl acetate 10:1) to furnish diol 14 (598 mg, 95%) as a colorless syrup: IR (film, cm⁻¹) 3422 (OH), 1349, 1230 (OBn); ¹H NMR (δ ppm, 500MHz, CDCl₃) 7.20-7.40 (m, 30H, ArH), 5.20 (d×2, 2H, GlcH-1 and GalH-1), 4.30-4.95 (m, 12H, ArCH₂O), 4.33 (ddd, 1H, GalH-5), 3.98-4.15 (m, 5H, sugar-H), 3.34-3.75 (m, 6H, sugar-H); FABMS 883 [M]+.

2,3,6-Tri-O-benzyl-α-D-galactopyranosyl-(1-1)-2,3,4-tri-O-benzyl-6-O-(6-azidohexyl)-α-D-glucopyranoside (15). To a solution of diol 14 (500 mg, 0.567 mmol) in N, N-
dimethylformamide (20 mL) was added sodium hydride (16 mg, 0.680 mmol), 6-azido-1-bromohexane (149 µL, 0.680 mmol), and tetrabutylammonium iodide (22 mg, 0.06 mmol) at 0°C and the reaction mixture was stirred for 12 h at the same temperature. The reaction mixture was quenched by addition of methanol, added brine and ethyl acetate, and two phases were separated. The aqueous layer was extracted with ethyl acetate and the combined organic layer was washed with brine, dried over MgSO₄, and concentrated in vacuo. The residue was purified by chromatography (silica gel, hexane/ethyl acetate 3:1) to furnish azide 15 (519 mg, 92%) as a colorless syrup: IR (film, cm⁻¹) 3425 (OH), 1349, 1223 (OBn), 1249 (azide); ¹H NMR (δ ppm, 500MHz, CDCl₃) 7.18-7.40 (m, 30H, ArH), 5.27 (d, 1H, J = 3.5 Hz, GalH-1), 5.24 (d, 1H, J = 3.5 Hz, GlcH-1), 4.39-4.91 (m, 12H, ArCH₂O), 4.31 (ddd, 1H, GalH-5), 4.15 (bs, 1H, GalH-4), 4.06 (br, 1H, alkyl), 3.98 (dd, 1H, J = 3.0, 10.0 Hz, GalH-3), 3.93 (dd, 1H, J = 3.5, 9.5 Hz, GalH-2), 3.87 (dd, J = 9.5 Hz, GlcH-3), 3.34-3.74 (m, 7H, sugar-H), 3.17 (m, 1H, alkyl), 1.10-1.54 (m, 10H, alkyl); FABMS 1009 [M+1]⁺.

α-D-Galactopyranosyl-(1-1)-6-O-(6-N-acryloylamidohexyl)-α-D-glucopyranoside (6). To a solution of azide 15 (300 mg, 0.302 mmol) in tetrahydrofuran (5 mL) and methanol (5 mL) was added 10% Pd(OH)₂ on carbon (30 mg) and the mixture was hydrogenated for 1.5 h at room temperature. The reaction mixture was filtered through a pad of Celite and the filtrate was concentrated in vacuo. The residue was dissolved in methanol (5 mL), and triethylamine (125 µL, 0.905 mmol) was added. The mixture was cooled at 0°C and added acryloyl chloride (31 µL, 0.362 µmol) in CH₂Cl₂ (500 µL) gradually, and the reaction mixture was stirred for 2 h at room temperature. The reaction mixture was concentrated in vacuo and the residue was purified by chromatography (TSKgel HW-40S, water) to give monomer 6 (136 mg, 91%) as a white powder: IR (disc, cm⁻¹) 3298 (OH), 1660 1273 (amide), 1033, 827 (olefin); ¹H NMR (δ ppm, 500MHz, CDCl₃): 6.23, 6.21 (m×2, 1H×2, H-olefin and H-trans of olefin), 5.65 (dd, 1H, J = 3.5, 9.2 Hz, H-cis of olefin)
5.14 (d×2, 1H×2, J = 3.5 Hz, GalH-1 and GlcH-1), 4.05 (ddd, 1H, GalH-5), 3.32-3.74 (m, 11H, sugar-H), 1.10-1.54, 3.26, 3.50, 3.80 (m, 12H, alkyl) ; Anal. calcd. for C_{21}H_{37}NO_{12}: C, 50.90; H, 7.53; N, 2.83; O, 38.75 %; found C, 50.85; H, 7.58; N 2.80%.

**Glycoconjugate polymer (7).** To a solution of monomer 6 (30 mg, 0.064 mmol) and acrylamide (19 mg, 0.256 mmol) in degassed water (100 µL) and dimethylsulfoxide (50 µL) was added 2,2-azobis (2-amidinopropane) dihydrochloride (0.003 mmol in degassed water). The reaction mixture was frozen and degassed repeatedly under reduced pressure. The polymerization tube was sealed under reduced pressure and heated for 12 h at 60°C. The reaction mixture was dialyzed for 3 days in water (Mw 8000 cut off) and lyophilized to furnish polymer 7 as a white powder (35mg, 72%): \(M_n= 3.5 \times 10^5\) (SEC analysis, pullulan standard). Mol fraction of sugar unit = 0.17 ; IR (disc, cm\(^{-1}\)): 3248 (OH), 1662 (amide); \(^1\)H NMR (δ ppm, 500MHz, D\(_2\)O, 50°C) 5.62 (d, 2H, GalH-1 and GlcH-1), 3.85-4.53 (m, 12H, sugar-H), 1.58, 1.92-2.05, and 3.60 (br, H of alkyl), 2.55-2.80 (br, methyne of main chain), 2.10-2.42 (br, methylene of main chain).

**Hemagglutination inhibition assay.** Erythrocyte suspension (20 µL, 1%vol) was added to two-fold dilutions (20 µL) of Stxs in 96-well microtiter U-plates and incubated for 1 h. The minimum concentration of Stxs required for agglutination of erythrocytes was determined, and a 4-fold greater concentration was used for the following inhibition assay. Two-fold dilutions (20 µL) of oligosaccharides and glycopolymers were prepared in 96-well plates. An aliquot (20 µL) of the Stx solution was added to each well and the plates were incubated at 30°C for 1 h. An erythrocyte suspension (40 µL) was added to the hole and incubation was continued at 30°C for 1 h. Agglutination of erythrocytes was carefully observed and the minimum concentrations of oligosaccharides and glycopolymers required to inhibit erythrocyte agglutination (MIC) were determined.
Neutralization activity of glycoconjugate polymers against Stx-I. Wells of 96-well Nunclon tissue culture plate (A/S Nunc) were seeded with $5 \times 10^3$ HeLa cells in 180 µL of D-MEM supplemented with 10% FCS, 100 U mL$^{-1}$ penicillin and 0.1 mg mL$^{-1}$ streptomycin, and the cells were cultivated for 24 h. The mixture of Stx-I (0.05 unit) and the diluted each polymer solution (50 µM, per sugar unit) was pre-incubated for 1 h at 37°C. To the well were added the pre-incubated mixture and incubated in 5% CO$_2$ at 37 °C for a further 48 h. Then, the wells were washed and added 180 µL Hanks’ solution (Nissui Pharmaceutical Co., LTD, Tokyo, Japan) and 20 µL AlamarBlue solution (Trek Diagnostic Systems, LTD, West Sussex, UK). Fluorescence at 2-h incubation was determined at 530 nm excitation and 590 nm emission. The neutralization activities of each polymer were evaluated as the relative fluorescence intensity to that of Gb$_3$ copolymer.