Supporting information for

Fast and Low-Cost Purification Strategy for Oligosaccharide Synthesis Based on a Hop-On/Off Carrier

Yingle Feng,a,b Jingjing Wu,a Guosong Chen,*b Yonghai Chai *a

aKey Laboratory of Applied Surface and Colloid Chemistry, Ministry of Education and School of Chemistry and Chemical Engineering, Shaanxi Normal University, Xi’an 710119 (China)
bThe State Key Laboratory of Molecular Engineering of Polymers, Department of Macromolecular Science, Fudan University, Shanghai 200433 (China)

Table of Contents

1. General Experimental Methods: ..................................................................................S2
2. Experimental Procedures .................................................................................................S3–S10
**General Experimental Methods:** Anhydrous dichloromethane (CH$_2$Cl$_2$), tetrahydrofuran (THF) were purified using a solvent purification system (PS-MD-3, Innovative Technology Inc., USA) before use. Toluene were obtained by refluxing with CaH$_2$ under argon for more than 5 h. For reactions that require heating, the oil (dimethyl silicon oil) bath was used as heat source. Solvents used for column chromatography were analytical grade. Detection of compounds was achieved by UV absorption (254 nm) and/or by staining with sulfuric acid/ethanol (1/9, v/v). Column chromatography was performed using 300–400 mesh silica gel. Nuclear magnetic resonance spectra were afforded with Bruker 400 MHz for $^1$H NMR and 100MHz for $^{13}$C NMR. Chemical shifts (δ) were reported in parts per million (ppm). Coupling constants (J) were reported in Hertz. Multiplicity reported using the following abbreviations: s (singlet), d (doublet), t (triplet), q (quartet), m (multiplet), dd (doublet of doublet), dt (doublet of triplet). The matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS) measurement was performed using AB SCIEX MALDI-TOF/TOF MS 5800 system in reflection mode. High resolution mass spectra were measured by ESI ionization sources using Bruker mass spectrometer. $^1$H NMR spectra were referenced to 0 (TMS), 4.79 (D$_2$O). $^{13}$C NMR spectra were referenced to 77.00 (CDCl$_3$) ppm.
Experimental Procedures:

**p-Tolyl 3-O-acetyl-2,4,6-tri-O-benzyl-β-D-galactopyranoside**

To a solution of compound S-1 (1.18 g, 2.12 mmol) in pyridine (4 mL) was added Ac₂O (0.4 mL), the mixture was allowed to stirred at room temperature overnight. After TLC showed the reaction was complete, the reaction mixture was concentrated in vacuo, the residue was dissolved in CH₂Cl₂ and washed with 1 M HCl and saturated NaHCO₃ aqueous respectively. The organic phase was dried over Na₂SO₄, filtered and concentrated, the residue was purified by column chromatography (EtOAc/petroleum, v/v, 1/3) to give compound 11 (1.18 g, 1.97 mmol, 93%) as syrup.

**IR (KBr, cm⁻¹)** ν 3063, 3030, 2920, 2866, 1744, 1494, 1152; **¹H NMR** (400 MHz, Chloroform-d) δ 7.50 – 7.44 (m, 2H), 7.37 – 7.25 (m, 15H), 7.04 – 6.99 (m, 2H), 4.95 (dd, J = 9.7, 3.0 Hz, 1H), 4.84 (d, J = 11.0 Hz, 1H), 4.63 (d, J = 9.6 Hz, 1H), 4.61 (d, J = 11.6 Hz, 1H), 4.55 (d, J = 11.0 Hz, 1H), 4.52 (d, J = 11.6 Hz, 1H), 4.49 (d, J = 11.8 Hz, 1H), 4.42 (d, J = 11.8 Hz, 1H), 4.02 (dd, J = 3.1, 1.0 Hz, 1H), 3.90 (t, J = 9.7 Hz, 1H), 3.72 (ddd, J = 7.7, 5.5, 1.0 Hz, 1H), 3.69 – 3.60 (m, 2H), 2.30 (s, 3H), 1.88 (s, 3H); **¹³C NMR** (100 MHz, CDCl₃) δ 170.2, 138.2, 138.1, 137.7, 137.4, 132.2, 129.9, 129.6, 128.4, 128.3, 128.2, 128.0, 127.81, 127.77, 127.74, 127.70, 127.6, 88.0, 76.9, 76.8, 75.5, 75.3, 74.8, 74.5, 73.4, 68.2, 21.1, 20.9; **HRMS (ESI)** calcd for C₃₆H₃₈NaO₆S [M + Na]⁺: 621.2281, found: 621.2282.

**p-Tolyl 2-O-acetyl-3,4,6-tri-O-benzyl-β-D-galactopyranosyl-(1→3)-4,6-benzylidene-2-azido-2-deoxy-1-thio-β-D-galactopyranoside**

To a solution of compound 12-n (337 mg, 0.84 mmol) in dichloromethane (4 mL) was added TIOH (8 μL) at -30 °C. Then, a solution of compound 13 (0.90 g, 1.42 mmol) in dichloromethane was added dropwise for ~40 minutes. 1 hour later, TLC showed that the reaction was complete, excess Et₃N (0.1 mL) was added to quench the reaction. The solution was removed under reduced pressure, the residue was purified by column chromatography (EtOAc/toluene, v/v, 1/8) to give compound 7-n (500 mg, 0.57 mmol, 68%). **IR (KBr, cm⁻¹)** ν 3064, 3031, 2914, 2863,
To a solution of compound 7-n (1.22 g, 1.40 mmol) in anhydrous THF (6 mL) was added fresh prepared MeONa solution (0.38 mol/L, 3.6 mL, 1.40 mmol) dropwise. 8 h later, TLC showed that the reaction was complete. The reaction mixture was neutralized with saturated NH₄Cl and the aqueous layer was extracted with EtOAc for 3 times. The combined organic layers was dried over MgSO₄, filtered and concentrated to give compound 14 (1.17 g, 1.40 mmol, 100%), the crude product can be used immediately without further purification.

To the crude product of compound 14 (856 mg, 1.03 mmol), 9 (720 mg, 1.33 mmol) and 4 Å MS (1.64 g) in anhydrous toluene (9 mL) was added NIS (300 mg, 1.33 mmol). The mixture was cooled to -35 °C, and then TfOH (12 μL) was added. After 1 h, the reaction was quenched with Et₃N (50 μL). Filtered and concentrated, the filtration was washed with saturated aqueous Na₂S₂O₃ and NaHCO₃. The organic layer was dried over Na₂SO₄, filtered and concentrated. The resulting residue was purified by silica gel chromatography (EtOAc/petroleum, v/v, 1/3) to afford α-anomer of 15 (696 mg, 0.56 mmol, 54%) and β anomer of 15 (197 mg, 0.16 mmol, 15%). α-anomer: IR (KBr, cm⁻¹) ν 3032, 2920, 2863, 1511, 1099; ¹H NMR (400 MHz, CDCl₃) δ 7.61 (d, J = 8.1 Hz, 2H), 7.44 – 7.39 (m, 2H), 7.37 – 7.16 (m, 28H), 7.06 – 6.99 (m, 2H), 6.95 – 6.90 (m, 4H), 5.53 (d, J = 3.3 Hz, 1H), 5.50 (s, 1H), 4.82 (d, J = 11.4 Hz, 1H), 4.78 (d, J = 11.5 Hz, 1H), 6.74 – 6.68 (m, 3H), 4.63 (d, J = 11.7 Hz, 2H), 4.47
the solvent was removed under reduced pressure, mixture solvent of THF (10 mL) and H$_2$O (1.6 mL). After heating at 60 °C in oil bath for 22 h, the solvent was removed under reduced pressure, the residue was dissolved with CH$_2$Cl$_2$ and 

IR (KBr, cm$^{-1}$) ν 3062, 3029, 2920, 2868, 2116, 1454, 1101; $^1$H NMR (400 MHz, CDCl$_3$) δ 7.53 (d, J = 8.1 Hz, 2H), 7.42 – 7.15 (m, 35H), 6.86 (d, J = 8.0 Hz, 2H), 5.31 (s, 1H), 5.00 (d, J = 11.7 Hz, 1H), 4.94 (d, J = 11.8 Hz, 1H), 4.96 (d, J = 11.4 Hz, 1H), 4.86 (d, J = 8.0 Hz, 1H), 4.82 – 4.76 (m, 3H), 4.72 (d, J = 11.9 Hz, 1H), 4.65 (d, J = 11.7 Hz, 1H), 4.61 (d, J = 11.7 Hz, 1H), 4.54 (d, J = 11.8 Hz, 1H), 4.47 (d, J = 7.3 Hz, 1H), 4.33 – 4.27 (m, 3H), 4.20 (dd, J = 1.4, 12.3 Hz, 1H), 4.19 (d, J = 9.8 Hz, 1H), 4.07 (d, J = 3.0 Hz, 1H), 3.80 (d, J = 2.7 Hz, 1H), 3.76 – 3.63 (m, 3H), 3.58 – 3.54 (m, 2H), 3.50 (dd, J = 3.0, 9.8 Hz, 1H), 3.49 – 3.46 (m, 2H), 3.43 (dd, J = 6.6, 2.4 Hz, 1H), 3.38 (dd, J = 10.1, 3.0 Hz, 1H), 3.32 – 3.25 (m, 1H), 2.94 (s, 1H), 2.20 (s, 3H), 1.12 (d, J = 6.3 Hz, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 139.6, 139.0, 138.3, 138.2, 138.0, 137.7, 134.3, 129.6, 128.5, 128.4, 128.3, 128.2, 128.01, 128.00, 127.97, 127.9, 127.83, 127.77, 127.75, 127.7, 127.6, 127.4, 127.3, 127.2, 127.1, 126.9, 126.4, 126.3, 126.2, 103.5, 101.8, 100.5, 85.7, 82.3, 80.8, 80.0, 79.8, 77.4, 75.7, 74.64, 74.59, 74.0, 73.8, 73.7, 73.6, 73.3, 73.14, 73.09, 70.1, 69.8, 69.7, 69.1, 59.4, 21.1, 16.7; HRMS (ESI) calcd for C$_{77}H$_{72}Na$_2$O$_{13}$S [M + Na]$^+$: 1270.5069, found: 1270.5071. $\beta$-anomer:

HRMS (ESI) calcd for C$_{77}H$_{72}Na$_2$O$_{13}$S [M + Na]$^+$: 1270.5069, found: 1270.5045.

p-Tolyl 2,3,4-tri-O-benzyl-α-L-fucosyl-(1→2)-3,4,6-tri-O-benzyl-β-D-galactopyranosyl-(1→3)-4,6-benzylidene-2-trichloroacetylamino-2-deoxy-1-thio-β-D-galactopyranoside

Compound 15-α (696 mg, 0.56 mmol) and PPh$_3$ (440 mg, 1.68 mmol) were dissolved in a mixture solvent of THF (10 mL) and H$_2$O (1.6 mL). After heating at 60 °C in oil bath for 22 h, the solvent was removed under reduced pressure, the residue was dissolved with CH$_2$Cl$_2$, and
then poured into a separatory funnel with about 8 mL H$_2$O. The organic layer was separated and the aqueous phase was extracted with CH$_2$Cl$_2$ for additional two times, the combined organic phase was dried over Na$_2$SO$_4$, filtered and concentrated, the residue was purified by silica gel flash chromatography (EtOAc/petroleum, v/v, 1/2) to remove PPh$_3$, compound 16 and PPh$_3$O which have similar Rf values were eluted with EtOAc and the afforded white solid (16 and PPh$_3$O) was used in next step without further purification. IR (KBr, cm$^{-1}$) ν 3341, 3375, 3088, 3062, 3030, 2974, 2916, 2868, 1101; $^1$H NMR (400 MHz, Chloroform-d) δ 7.49 – 7.43 (m, 2H), 7.40 – 7.21 (m, 27H), 7.20 – 7.08 (m, 6H), 7.05 – 6.98 (m, 2H), 6.93 (d, $J$ = 7.8 Hz, 2H), 5.61 (d, $J$ = 3.8 Hz, 1H), 4.51 (d, $J$ = 5.57 Hz, 1H), 4.38 (m, 8H), 4.31 (d, $J$ = 11.2 Hz, 1H), 4.23 (d, $J$ = 3.1 Hz, 1H), 4.13 (dd, $J$ = 9.6, 7.8 Hz, 1H), 4.00 – 3.92 (m, 2H), 3.89 (dd, $J$ = 10.1, 3.8 Hz, 1H), 3.86 (d, $J$ = 2.3 Hz, 1H), 3.82 – 3.70 (m, 2H), 3.58 – 3.53 (m, 2H), 3.51 – 3.41 (m, 3H), 3.25 (d, $J$ = 1.9 Hz, 1H), 2.29 (s, 3H).

To the crude product of 16 in CH$_2$Cl$_2$ (5 mL) was added Et$_3$N (0.2 mL), followed by the addition of trichloroacetic chloride (78 μL) at 0 °C. After the mixture was stirred at the room temperature for 2 h, TLC analysis indicated that the reaction was complete. The reaction mixture was poured into saturated aqueous NaHCO$_3$, and extracted with CH$_2$Cl$_2$, the organic layer was dried over MgSO$_4$, filtered and concentrated, the residue was purified by column chromatography (EtOAc/petroleum, 1/2) to give compound 17 (561 mg, 0.41 mmol, 73% in two steps) as a white solid. IR (KBr, cm$^{-1}$) ν 3280, 3030, 2914, 2868, 1718, 1454, 1099; $^1$H NMR (400 MHz, CDCl$_3$) δ 7.55 (d, $J$ = 8.1 Hz, 2H), 7.44 (d, $J$ = 7.4 Hz, 1H), 7.43 (d, $J$ = 7.9 Hz, 1H), 7.38 – 7.18 (m, 25H), 7.16 – 7.10 (m, 5H), 7.04 (d, $J$ = 8.0 Hz, 2H), 7.01 (dd, $J$ = 7.6, 1.6 Hz, 2H), 6.92 (d, $J$ = 7.3 Hz, 1H), 5.57 (d, $J$ = 3.8 Hz, 1H), 5.45 (s, 1H), 5.29 (d, $J$ = 10.0 Hz, 1H), 4.83 (d, $J$ = 11.4 Hz, 1H), 4.79 (d, $J$ = 11.4 Hz, 1H), 4.76 (d, $J$ = 11.8 Hz, 1H), 4.62 (d, $J$ = 11.8 Hz, 2H), 4.53 (d, $J$ = 7.8 Hz, 1H), 4.51 – 4.36 (m, 8H), 4.31 (d, $J$ = 11.2 Hz, 1H), 4.23 (d, $J$ = 3.1 Hz, 1H), 4.13 (dd, $J$ = 9.6, 7.8 Hz, 1H), 4.00 – 3.92 (m, 2H), 3.89 (dd, $J$ = 10.1, 3.8 Hz, 1H), 3.86 (d, $J$ = 2.3 Hz, 1H), 3.82 – 3.70 (m, 2H), 3.58 – 3.53 (m, 2H), 3.51 – 3.41 (m, 3H), 3.25 (d, $J$ = 1.9 Hz, 1H), 2.29 (s, 3H).
0.53 (d, J = 6.4 Hz, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 161.7, 139.1, 138.9, 138.6, 138.29, 138.28, 138.0, 137.78, 137.77, 134.1, 129.7, 129.1, 128.5, 128.31, 128.28, 128.23, 128.21, 128.1, 128.0, 127.92, 127.91, 127.88, 127.84, 127.82, 127.6, 127.34, 127.32, 127.27, 127.2, 127.03, 127.00, 126.8, 126.4, 102.0, 101.2, 96.9, 92.3, 84.0, 83.5, 79.6, 78.4, 76.0, 75.9, 74.9, 74.6, 73.6, 73.5, 72.94, 72.88, 72.4, 72.3, 72.1, 71.5, 70.2, 69.1, 68.3, 66.4, 53.7, 21.3, 15.9; HRMS (ESI) calcd for C$_{76}$H$_{78}$Cl$_2$NNaO$_{14}$S [M + Na]$^+$: 1388.4101, found: 1388.4152.

(4-(1,3-bis(3,4,4,5,5,6,6,7,8,8,8-tridecafluoroctyloxy)propan-2-yloxy)-phenyl) methyl 2,3,4-tri-O-benzyl-α-L-fucosyl-(1→2)-3,4,6-tri-O-benzyl-β-D-galactopyranosyl-(1→3)-4,6-benzylidene-2-trichloroacetamido-2-deoxy-6-O-benzy-β-D-galactopyranosyl-(1→3)-2,4,6-tri-O-benzyl-α-glactopyranosyl-(1→4)-2,3,6-tri-O-benzyl-β-D-glucopyranoside

To the mixture of 17 (120 mg, 0.088 mmol), 6 (140 mg, 0.064 mmol) and 4 Å MS (256 mg) in anhydrous CH$_2$Cl$_2$ (2 mL) was added N-iodosuccinimide (23 mg, 0.102 mmol) at -30 °C. Then a solution of TfOH in anhydrous CH$_2$Cl$_2$ (10 µL TfOH in 2.5 mL CH$_2$Cl$_2$, 0.2 mL) was added. After 1 h, the reaction was quenched with Et$_3$N. Filtered and concentrated, the filtration was washed with saturated aqueous Na$_2$S$_2$O$_3$ (3 mL) and NaHCO$_3$ (6 mL). The organic layer was dried over Na$_2$SO$_4$, filtered and concentrated. The resulting residue was purified by silica gel chromatography (EtOAc/ petroleum, 1/3) to afford 4 (199 mg, 0.058 mmol, 91%). IR (KBr, cm$^{-1}$) ν 3064, 3029, 2923, 2873, 1719, 1454, 1364, 1242; $^1$H NMR (400 MHz, CDCl$_3$) δ 7.35 – 7.40 (m, 4H), 7.36 – 7.16 (m, 60H), 7.16 – 7.06 (m, 16H), 7.03 – 6.96 (m, 2H), 6.91 – 6.86 (m, 2H), 6.54 (d, J = 9.5 Hz, 1H), 5.51 (d, J = 3.8 Hz, 1H), 5.41 (s, 1H), 5.17 (d, J = 11.2 Hz, 1H), 4.99 (d, J = 10.9 Hz, 1H), 4.89 – 4.85 (m, 2H), 4.84 (d, J = 11.4 Hz, 1H), 4.83 (d, J = 11.0 Hz, 1H), 4.82 (d, J = 11.4 Hz, 1H), 4.82 (d, J = 11.8 Hz, 1H), 4.76 (d, J = 11.4 Hz, 1H), 4.75 (d, J = 11.0 Hz, 1H), 4.73 – 4.65 (m, 4H), 4.64 – 4.59 (m, 2H), 4.57 – 4.49 (m, 6H), 4.49 – 4.43 (m, 7H), 4.42 (d, J = 5.1 Hz, 1H), 4.40 – 4.30 (m, 5H), 4.30 – 4.27 (m, 1H), 4.22 – 4.18 (m, 2H), 4.16 (dd, J = 2.9, 11.7 Hz, 1H), 4.13 – 4.03 (m, 6H), 4.03 – 3.97 (m, 2H), 3.97 – 3.93 (m, 2H), 3.88 – 3.81 (m, 3H), 3.81 – 3.71 (m, 7H), 3.71 – 3.66 (m, 4H), 3.66 – 3.59 (m, 2H), 3.56 (d, J = 6.3 Hz, 1H), 3.55 – 3.47 (m, 5H), 3.47 – 3.37 (m, 3H), 3.35 – 3.23 (m, 3H), 3.19 (dd, J = 8.4, 4.7 Hz, 1H), 2.48 – 2.31 (m, 4H), 0.38 (d, J = 6.4 Hz, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 161.4, 157.4, 139.7, 139.4, 139.3, 139.1, 138.7, 138.6, 138.5, 138.34, 138.29, 138.24, 138.20, 138.04,
PTFE assisted syntheses of Globo-H:

Step 1 (synthesis of disaccharide 3): To a mixture of lactose building block 2 (384 mg, 0.38 mmol), fluorous tag 1 (264 mg, 0.29 mmol) and 4 Å MS (700 mg) in anhydrous CH₂Cl₂ (4 mL) was added N-Iodosuccinimide (91 mg, 0.40 mmol). The mixture was cooled to -30 °C, and then TMSOTf (8 µL) was added. 1 h later, the reaction was quenched with Et₃N (20 µL). After filtration of 4 Å MS, PTFE (5.3 g) was added to the resulting mixture, the volatile solvent was removed under reduced pressure. Then, a mixture solvent of acetone and H₂O (acetone/H₂O = 7/3, v/v, 20 mL) was added. After stirring at room temperature for 10~20 minutes, the suspension was filtered through sand core funnel and washed with additional acetone/H₂O (7/3, v/v, 20 mL× 3). At last, the crude product was detached by washing with acetone (20 mL× 3), the afforded solution was concentrated under reduced pressure followed by co-evaporation with toluene for several times to give the crude product 3 (451 mg, 0.25 mmol). The crude product was used immediately in the next step without further purification. (Note: The mass of the PTFE powder refers to the loading capacity of FSPE. The more PTFE used, the higher
sample loading capacity. According to our experience, PTFE powder of 5-10 times the mass of the sample's weight provides efficient separation. Much more addition of PTFE powder is not necessary.)

**Step 2 (deprotection of 3):** To a solution of crude product 3 in anhydrous THF (3 mL) was added MeONa/MeOH (0.32 mol/L, 0.45 mL). After stirring at room temperature overnight, the solution was neutralized with Dowex 50WX8 ion-exchange resin, filtered and concentrated to give disaccharide 10. (Alternatively, the reaction mixture could be washed with acetone/H$_2$O (1/1, v/v, 20 mL x 3) in the presence of PTFE to thoroughly remove the base remain in the solution)

**Step 3 (synthesis of trisaccharide 5):** To a solution of deprotected disaccharide and building block 11 (251 mg, 0.42 mmol) in anhydrous CH$_2$Cl$_2$ (3 mL) was added N-iodosuccinimide (83 mg, 0.34 mmol). The mixture was cooled to -30 °C, and then TMSOTf (9 μL) was added. 1 h later, the reaction was quenched with Et$_3$N (20 μL). After filtration of 4 Å MS, PTFE (5.24 g) was added to the resulting mixture, the volatile solvent was removed under reduced pressure. Then, a mixture solvent of acetone and H$_2$O (acetone/H$_2$O = 7/3, v/v, 20 mL) was added. After stirring at room temperature for 10-20 minutes, the suspension was filtered through sand core funnel and washed with additional acetone/H$_2$O (7/3, v/v, 20 mL x 3). At last, the crude product was released by washing with acetone (20 mL x 3), the afforded solution was concentrated under reduced pressure followed by co-evaporation with toluene for several times to give the crude product 5 (542 mg, 0.24 mmol). The crude product was used immediately in the next step without further purification.

**Step 4 (deprotection of 5):** To a solution of crude product 5 in anhydrous THF (3 mL) was added MeONa/MeOH (0.16 mol/L, 1 mL). After stirring at room temperature for 12 h, the solution was neutralized with Dowex 50WX8 ion-exchange resin, filtered and concentrated to give crude trisaccharide 6. (Alternatively, the reaction mixture could be washed with acetone/H$_2$O (1/1, v/v, 20 mL x 3) in the presence of PTFE to thoroughly remove the base remain in the solution)

**Step 5 (synthesis of hexasaccharide 4):** The mixture of crude product 6 and 17 (400 mg, 0.29 mmol) was coevaporated with toluene for 3 times. 4 Å MS (1.1 g) and anhydrous CH$_2$Cl$_2$ (4 mL) was added and the mixture was allowed to stir at room temperature for 0.5 h. Then N-iodosuccinimide (69 mg, 0.31 mmol) was added, followed by addition of a solution of TIOH in anhydrous CH$_2$Cl$_2$ (10 μL TIOH in 1 mL CH$_2$Cl$_2$, 0.3 mL) at -30 °C. 1 h later, the reaction was quenched with Et$_3$N (20 μL). After filtration of 4 Å MS, PTFE (5.1 g) was added to the resulting mixture, the volatile solvent was removed under reduced pressure. Then, a mixture solvent of
acetone and H₂O (acetone/H₂O = 7/3, v/v, 20 mL) was added. After stirring at room temperature for 10~20 minutes, the suspension was filtered through sand core funnel and washed with additional acetone/H₂O (7/3, v/v, 20 mL× 3). At last, the crude product was released by washing with acetone (20 mL× 3), the afforded solution was concentrated under reduced pressure followed by co-evaporation with toluene for several times to give the crude product 4 (818 mg, 0.24 mmol). The resulting residue was purified by silica gel chromatography (EtOAc/ petroleum, 1/3) to afford 4 (477 mg, 0.14 mmol, 48% in 5 steps).

**Step 6 (global deprotection):** A solution of compound 4 (165 mg, 0.048 mmol) in EtOAc/MeOH/CH₂Cl₂/H₂O (2/3/0.24/0.16, 7 mL) was kept stirring in the presence of 10% Pd/C (107 mg, 0.10 mmol) under 4 MPa hydrogen atmosphere for 5 days. The mixture was filtered through qualitative filter paper and washed with additional MeOH, H₂O and CH₂Cl₂. The filtration was concentrated under reduced pressure and then diluted with H₂O, the fluorous tag (30 mg, 0.033 mmol, 69%) removed from 4 was recovered by extracted with CH₂Cl₂. The water phase was collected and concentrated. The residue was purified by reverse phase silica gel (MeOH/H₂O, 1/1, v/v) to give Globo-H (36 mg, 0.035 mmol, 74%). IR (KBr, cm⁻¹) ν 3364, 2956, 2922, 2853, 1660, 1633, 1469, 1081; ¹H NMR (400 MHz, D₂O) δ 5.23 (m, d, J = 4.28 Hz, 1H), 4.89 (d, J = 4.0 Hz, 1H), 4.66 (d, J = 8.0 Hz, 1H), 4.62 (d, J = 7.7 Hz, 1H), 4.58 – 4.49 (m, 2H), 4.42 – 4.36 (m, 1H), 4.28 – 4.18 (m, 2H), 4.13 – 4.09 (m, 1H), 4.03 (d, J = 3.3 Hz, 1H), 3.99 – 3.54 (m, 30H), 2.04 (s, 3H), 1.21 (d, J = 6.6 Hz, 3H); ¹³C NMR (100 MHz, D₂O) δ 174.9, 104.6, 103.9, 102.6, 101.0, 99.9, 96.3, 92.4, 79.5, 79.3, 79.0, 77.7, 77.0, 76.7, 76.1, 75.7, 75.4, 75.2, 75.0, 74.5, 74.2, 72.7, 72.5, 72.1, 71.8, 71.5, 70.7, 70.1, 69.8, 69.7, 69.5, 69.2, 68.7, 68.6, 68.4, 67.4, 61.6, 61.0, 60.9, 60.7, 60.5, 52.2, 43.0, 22.9, 15.9; HRMS (ESI) calcd for C₃₈H₆₅NNaO₃₀ [M + Na]⁺ calculated: 1038.3484; found: 1038.3492.
Spectral Data:

Figure S1. $^1$H NMR spectrum of compound 11 (CDCl$_3$, 400 MHz)

Figure S2. $^{13}$C NMR spectrum of compound 11 (CDCl$_3$, 100 MHz)
Figure S3. $^1$H NMR spectrum of compound 7-n (CDCl$_3$, 400 MHz)

Figure S4. $^{13}$C NMR spectrum of compound 7-n (CDCl$_3$, 100 MHz)
Figure S5. $^1$H NMR spectrum of compound 15-α (CDCl$_3$, 400 MHz)

Figure S6. $^{13}$C NMR spectrum of compound 15-α (CDCl$_3$, 100 MHz)
Figure S7. $^1$H NMR spectrum of compound 15-β (CDCl$_3$, 400 MHz)

Figure S8. $^{13}$C NMR spectrum of compound 15-β (CDCl$_3$, 100 MHz)
Figure S9. $^1$H NMR spectrum of compound 16 (CDCl$_3$, 400 MHz)

Figure S10. $^{13}$C NMR spectrum of compound 16 (CDCl$_3$, 100 MHz)
Figure S11. $^1$H NMR spectrum of compound 17 (CDCl$_3$, 400 MHz)

Figure S12. $^{13}$C NMR spectrum of compound 17 (CDCl$_3$, 100 MHz)
Figure S13. $^1$H NMR spectrum of compound 4 (CDCl$_3$, 400 MHz)

Figure S14. $^{13}$C NMR spectrum of compound 4 (CDCl$_3$, 100 MHz)
Figure S15. Heteronuclear J-resolved spectroscopy (JRES) of compound 4 (CDCl₃)
Figure S16. HSQC spectrum of compound 4

Figure S17. The $^1$H NMR spectrum of nonfluorous phase and fluorous phase components separated by PTFE during the synthesis of compound 5.
Figure S18. The $^1$H NMR spectrum of nonfluorous phase and fluorous phase components separated by PTFE during the synthesis of compound 4.

Figure S19. MALDI-TOF mass spectrometry of crude product 4 (fluorous phase) and nonfluorous phase purified by PTFE.
Figure S20. Comparative $^1$H NMR spectrum of 4 (β pure to α & β anomer mixture, CDCl$_3$, 400 MHz)

Figure S21. Comparative $^{13}$C NMR spectrum of 4 (β pure to α & β anomer mixture, CDCl$_3$, 100 MHz)
Figure S22. $^1\text{H}$ NMR spectrum of Globo-H (D$_2$O, 400 MHz)

Figure S23. $^{13}\text{C}$ NMR spectrum of Globo-H (D$_2$O, 100 MHz)