Supporting Information for
Semi-synthesis of antiviral alkyl long-chain ether glycosides of sulfated oligosaccharides via dibutyldistannylene acetal intermediates

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3-O-Tetradecyl-β-D-galactopyranosyl-(1→4)-3,6-anhydro-L-galactitol (7)

125.7 MHz $^{13}$C NMR spectrum
500.1 MHz $^1$H NMR spectrum

β-D-Galactopyranosyl-(1→4)-3,6-anhydro-α-L-galactopyranosyl-(1→3)-β-D-galactopyranosyl-(1→4)-3,6-anhydro-1-O-tetradecyl-L-galactitol (8)

125.7 MHz $^{13}$C NMR spectrum
500.1 MHz $^1$H NMR spectrum

Sodium 3-O-Sulfonato-β-D-galactopyranosyl-(1→4)-3,6-anhydro-1-O-tetradecyl-L-galactitol (9)

125.7 MHz $^{13}$C NMR spectrum
500.1 MHz $^1$H NMR spectrum

The mixture of disulfates also produced on sulfonation of compound 3 (Scheme 5)

125.7 MHz $^{13}$C NMR spectrum
500.1 MHz $^1$H NMR spectrum

Spectra of the mixture of isomers resulting from sulfation of 4

125.7 MHz $^{13}$C NMR spectrum in DMSO-$d_6$
500.1 MHz $^1$H NMR spectrum in DMSO-$d_6$

Sodium 4-O-Sulfonato-β-D-galactopyranosyl-(1→4)-3,6-anhydro-1-O-tetradecyl-D-galactitol (11).

125.7 MHz $^{13}$C NMR spectrum
500.1 MHz $^1$H NMR spectrum
**General Methods.** Thin-layer chromatography (TLC) was performed on silica gel coated aluminium sheets 60 F254 using solvent mixtures measured on a v/v basis. After chromatography, products were visualized by spraying the plate with a solution of 0.5% orcinol in ethanol/conc H$_2$SO$_4$ (20/1) and heating on a hot plate until coloration was observed. Flash column chromatography was carried out using TLC grade silica gel 60 with fractions being analyzed by TLC. DEAE-Sephadex A-25 and BioGel P-2 columns eluents were analyzed for carbohydrates by phenol-sulfuric method.$^{71}$ $^1$H and $^{13}$C NMR spectra were recorded in 5 mm NMR tubes on an NMR spectrometer operating at 500.13 and 125.77 MHz, respectively. Chemical shifts were reported relative to an internal acetone standard at 30.20 ppm for $^{13}$C and 2.224 ppm for $^1$H nuclei, for samples recorded in D$_2$O. For samples recorded in acetone-$d_6$, chemical shifts were referenced to the central line of the deuterated solvent at 29.92 ppm for $^{13}$C and 2.050 ppm for $^1$H. For samples recorded in CDCl$_3$, spectra were calibrated through the central line of the deuterated solvent for $^{13}$C (77.16 ppm) and referenced to the internal TMS standard at 0.00 ppm for $^1$H. For samples in CD$_3$OD or in solvent mixtures (CDCl$_3$:CD$_3$OD 2:1 or CDCl$_3$:CD$_3$OD:D$_2$O 2:2:1), central line of CD$_3$OD was calibrated at 49.15 ppm ($^{13}$C) and 3.310 ppm ($^1$H). All assignments were performed with the aid of COSY, HSQC and/or HMBC experiments. Assignments and magnitudes of coupling constants were obtained for $^1$H NMR spectra by first-order analyses. The appearance of signals is indicated using the abbreviations b, s, d, t, q, p, and m for broad, singlet, doublet, triplet, quartet, pentet, and multiplet, respectively. High resolution electrospray mass spectra (HR ESI MS) were recorded with samples dissolved in methanol using trilysine KKK or rifampicin or the Tuning Mix from Agilent as reference. All solvents were dried and purified by standards methods and distilled before use.
Compound 2

Compound 2: $^{13}$C (methanol d4)

Compound 2: $^1$H methanol d4
Compound 3: $^{13}$C chloroform dimethanol d$_4$ (2:1)

Compound 3: $^1$H methanol d$_4$: chloroform d (2:1)
Compound 4

Compound 4: 13C chloroform d

Compound 4: H chloroform d
Compound 6

Compound 6: 13C acetone d6

Compound 6: 1H acetone d6
Compound 7

Compound 7: 13C chloroform d: methanol d4 (2:1)

Compound 7: 1H chloroform d: methanol d4 (2:1)
Compound 8

\[
\begin{align*}
\text{OH} & \quad \text{O} \\
\text{OH} & \quad \text{O} \\
\text{OH} & \quad \text{O} \\
\text{OH} & \quad \text{O} \\
\text{OH} & \quad \text{O(CH}_2\text{)}_{13}\text{CH}_3 \\
\text{OH} & \quad \text{O} \\
\text{OH} & \quad \text{O} \\
\text{OH} & \quad \text{O} \\
\text{OH} & \quad \text{O} \\
\text{OH} & \quad \text{O} \\
\end{align*}
\]
The unseparable mixture of disulfates:
Spectra of the mixture of isomers resulting from sulfation of 4:
Compound 11