

**Ball Milled Glyco-graphene oxide conjugates markedly disrupted *Pseudomonas aeruginosa* biofilm.**

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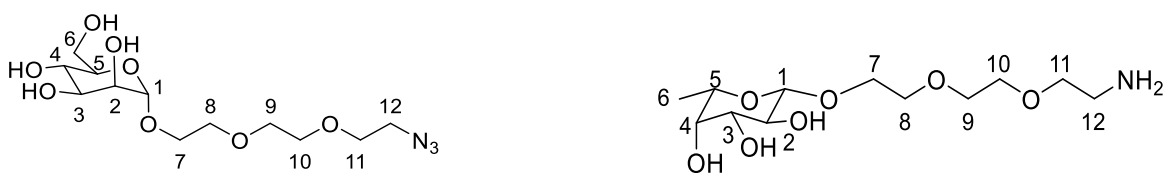
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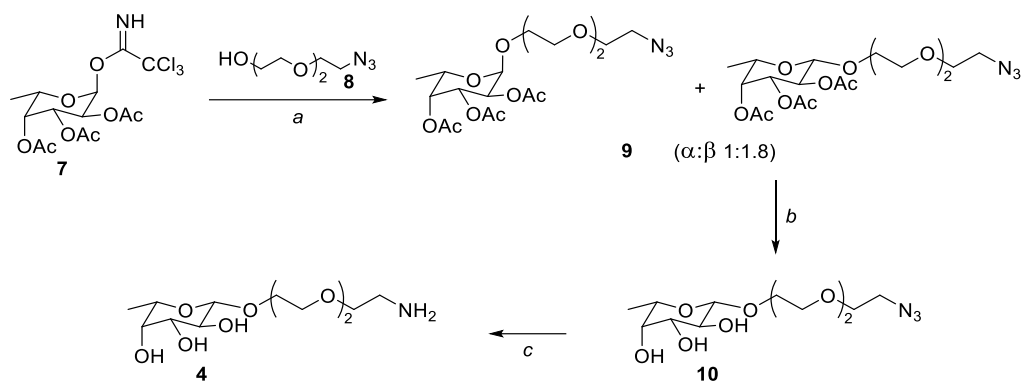
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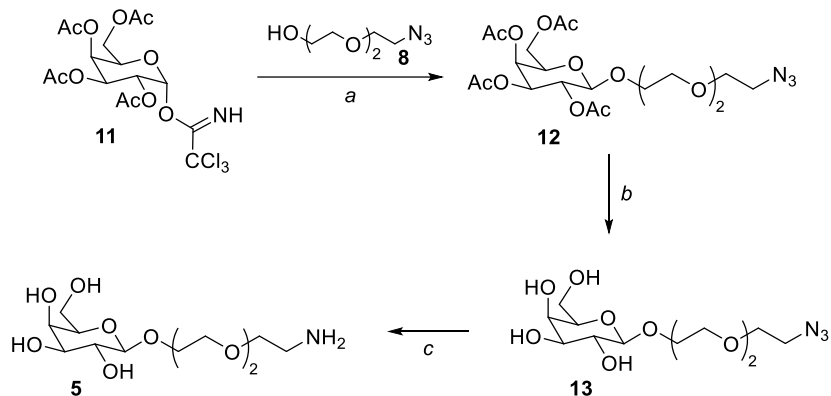
## Example of numeration



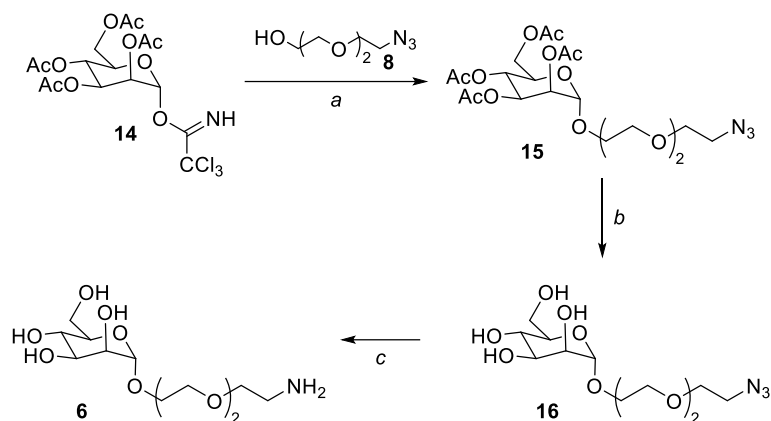
**Scheme S1.** a) TMSOTf, DCM, r.t., 1h, 82% yield (1:1.8  $\alpha$ : $\beta$  mixture); b)  $K_2CO_3$ , methanol, r.t., 1h, 90% yield; c)  $H_2$ , Pd(OH) $_2$  20% on carbon, MeOH:AcOEt 1:3, r.t., 1h, quantitative yield.



**Scheme S2.** a) TMSOTf, DCM, r.t., 1h, 40% yield; b)  $K_2CO_3$ , methanol, r.t., 1h, 94% yield; c)  $H_2$ , Pd(OH) $_2$  20% on carbon, MeOH:AcOEt 1:3, r.t., 1h, 97% yield.



**Scheme S3.** a) TMSOTf, DCM, r.t., 1h, 82% yield; b) K<sub>2</sub>CO<sub>3</sub>, methanol, r.t., 1h, 98% yield; c) H<sub>2</sub>, Pd(OH)<sub>2</sub> 20% on carbon, MeOH:AcOEt 1:3, r.t., 1h, 94% yield.



**Synthesis of 9.** To an ice-cooled solution of **7** (0.996 g, 2.02 mmol) and **8** (700 mg, 4.0 mmol) in dry dichloromethane (16 mL), trimethylsilyl trifluoromethanesulfonate (73  $\mu$ L, 0.40 mmol) was added. The reaction mixture was stirred at r.t. for 1 h, then it was neutralized with triethylamine (167  $\mu$ L, 1.2 mmol). Thus, pyridine (268  $\mu$ L, 3.33 mmol), anhydride acetic (340  $\mu$ L, 3.33 mmol) and 4-dimethylaminopyridine (82 mg, 0.2 mmol) were added. The reaction mixture was stirred at r.t. for 1h, then it was diluted with dichloromethane (150 mL) and washed with a saturated solution of NH<sub>4</sub>Cl (3 x 15 mL) and Brine (1 x 15mL). The organic phase was anhydricated with Na<sub>2</sub>SO<sub>4</sub>, filtered and concentrated under vacuum. The crude was purified by flash chromatography on silica gel to give **9** as  $\beta$ -anomer (523 mg, 64%) as yellow oil.  $[\alpha]_{25}^D = -54.6^\circ$  ( $c = 0.42$ , CHCl<sub>3</sub>); <sup>1</sup>H-NMR (400 MHz, CDCl<sub>3</sub>,  $\delta$ ): 5.21 (dd,  $J_{4,5} = 0.8$  Hz,  $J_{3,4} = 3.6$  Hz, 1H, H-4), 5.17 (dd,  $J_{1,2} = 8.0$  Hz,  $J_{2,3} = 10.4$  Hz, 1H, H-2), 5.50 (dd,  $J_{3,4} = 3.6$  Hz,  $J_{2,3} = 10.4$  Hz, 1H, H-3), 4.51 (d,  $J_{1,2} = 8.0$  Hz, 1H, H-1), 3.98 – 3.93 (m, 1H, H-7A), 3.81 – 3.77 (m, 1H, H-5), 3.73 – 3.69 (m, 1H, H-7B), 3.67 – 3.62 (m, 8H, H-8, H-9, H-10, H-11), 3.38 (at,  $J_{11-12} = 5.2$  Hz, 2H, H-12), 2.16 (s, 3H, CH<sub>3</sub>), 2.04 (s, 3H, CH<sub>3</sub>), 1.21 (s, 3H, CH<sub>3</sub>), 1.21 (d,  $J_{5-6} = 6.4$  Hz, 3H, H-6). <sup>13</sup>C-NMR (100 MHz, CDCl<sub>3</sub>,  $\delta$ ): 101.15, 71.32, 70.71, 70.68, 70.37, 70.28, 70.01, 69.12, 68.93, 68.90, 50.67, 20.77, 20.67, 20.61, 16.03; MS (ESI)  $m/z$ : [M+Na]<sup>+</sup> calcd for C<sub>18</sub>H<sub>29</sub>N<sub>3</sub>O<sub>10</sub>Na<sup>+</sup> 470.18; found 470.14; NMR data are in agreement with the literature.<sup>[1]</sup>

**Synthesis of 10.** To a dispersion of **9** (561 mg, 1.25 mmol) in methanol (5 mL), potassium carbonate (52 mg, 0.38 mmol) was added. The reaction mixture was stirred at r.t. for 1 h, then it was diluted with methanol and neutralized with a solution of HCl (1% in methanol). The crude was filtered on silica gel to give **10** (362 mg, 90%) as a yellow oil.  $[\alpha]_{25}^D = -28.2^\circ$  ( $c = 0.35$ , CD<sub>3</sub>OD); <sup>1</sup>H-NMR (400 MHz, CD<sub>3</sub>OD,  $\delta$ ): 4.23 (d,  $J_{1,2} = 7.2$  Hz, 1H, H-1), 3.99 – 3.93 (m, 1H, H-7A), 3.72 – 3.59 (m, 11H, H-4, H-5, H-7B, H-8, H-9, H-10, H-11), 3.48 – 3.47 (m, 2H, H-2, H-3), 3.39 (at,  $J_{11-12} = 5.2$  Hz, 2H, H-12), 1.25 (d,  $J_{5-6} = 6.4$  Hz, 3H, H-6). <sup>13</sup>C-NMR (50 MHz, CD<sub>3</sub>OD,  $\delta$ ): 103.44, 73.60, 71.58, 70.87,

70.54, 70.11, 69.99, 69.65, 68.11, 50.33, 15.24; MS (ESI)  $m/z$ :  $[M+Na]^+$  calcd for  $C_{12}H_{23}N_3O_7Na^+$  344.14; found 344.20. NMR data are in agreement with the literature.<sup>[1]</sup>

**Synthesis of 4.** To a solution of **10** (268 mg, 0.85 mmol) in methanol:ethyl acetate 1:3 (11 mL) in  $H_2$  atm,  $Pd(OH)_2$  20% on carbon (178 mg, 0.25 mmol) was added. The reaction mixture was stirred at r.t. in  $H_2$  atmosphere for 1 h, then it was filtered on Celite<sup>521</sup> and concentrated to give **4** (292 mg, quantitative yield) as a yellow oil.  $[\alpha]_{25}^D = +69^\circ$  ( $c = 0.5$ ,  $CH_3OH$ );  $^1H$ -NMR (400 MHz,  $CD_3OD$ ,  $\delta$ ): 4.26 (d,  $J_{1-2} = 7.5$  Hz, 1H, H-1), 3.74-3.72 (m, 1H, H-4), 3.70-3.67 (m, 10H, H-7, H-8, H-9, H-10, H-11), 3.62-3.60 (m, 1H, H-5), 3.49-3.46 (m, 1H, H-2), 3.31-3.29 (m, 2H, H-12), 1.26 (d,  $J_{6-5} = 6.6$  Hz, 3H, H-6).  $^{13}C$ -NMR (100 MHz,  $CD_3OD$ ,  $\delta$ ): 103.44, 74.45, 71.23, 70.81, 70.57, 69.95, 69.01, 68.67, 39.29, 15.61. MS (ESI)  $m/z$ :  $[M+H]^+$  calcd for  $C_{12}H_{26}NO_7^+$  296.17; found 296.15. NMR data agree with the literature.<sup>[1]</sup>

**Synthesis of 12.** To an ice-cooled solution of **11** (1.27 g, 2.6 mmol) and **8** (910 mg, 5.2 mmol) in dry dichloromethane (16 mL), trimethylsilyl trifluoromethanesulfonate (60  $\mu$ L, 0.39 mmol) was added. The reaction mixture was stirred at r.t. for 1 h, then it was neutralized with triethylamine (167  $\mu$ L, 1.2 mmol). Thus, pyridine (321  $\mu$ L, 3.99 mmol), anhydride acetic (373  $\mu$ L, 3.99 mmol) and 4-dimethylaminopyridine (115 mg, 0.52 mmol) were added. The reaction mixture was stirred at r.t. for 1h, then it was diluted with dichloromethane (150 mL) and washed with a saturated solution of  $NH_4Cl$  (3 x 15 mL) and Brine (1 x 15mL). The organic phase was anhydricated with  $Na_2SO_4$ , filtered and concentrated under vacuum. The crude was purified by flash chromatography on silica gel to give **12** as  $\beta$ -anomer (523 mg, 40%) as yellow oil.  $[\alpha]_{25}^D = +137^\circ$  ( $c = 0.30$ ,  $CHCl_3$ );  $^1H$ -NMR (400 MHz,  $CHCl_3$ ,  $\delta$ ): 5.37 (ad,  $J = 3.4$  Hz, 1H, H-4), 5.19 (dd,  $J_{2-3} = 10.5$  Hz,  $J_{2-1} = 8.0$  Hz, 1H, H-2), 5.00 (dd,  $J_{3-2} = 10.5$  Hz,  $J_{3-4} = 3.4$  Hz, 1H, H-3), 4.56 (d,  $J_{1-2} = 8.0$  Hz, 1H, H-1), 4.18-4.08 (m, 2H, H-6), 3.97-3.92 (m, 1H, H-7A), 3.90 (at,  $J = 6.7$  Hz, 1H, H-5), 3.76-3.71 (m, 1H, H-7B), 3.67-3.65 (m, 8H, H-8, H-9, H-10, H-11), 3.39-3.37 (m, 2H, H-12), 2.13 (s, 3H,  $CH_3$ ), 2.05 (s, 3H,  $CH_3$ ), 2.03 (s, 3H,  $CH_3$ ), 1.97 (s, 3H,  $CH_3$ ).  $^{13}C$ -NMR (100 MHz,  $CDCl_3$ ,  $\delta$ ): 170.41, 170.27, 170.17, 169.49, 101.00, 71.10 70.80, 69.70, 69.05, 67.30, 61.47, 50.75, 20.22, 20.18, 20.14; MS (ESI)  $m/z$ :  $[M+Na]^+$  calcd for  $C_{20}H_{31}N_3NaO_{12}^+$  528.18; found 528.24. NMR data are in agreement with the literature.<sup>[1]</sup>

**Synthesis of 13.** To a dispersion of **12** (545 mg, 1.08 mmol) in methanol (6 mL), potassium carbonate (45 mg, 0.32 mmol) was added. The reaction mixture was stirred at r.t. for 1 h, then it was diluted with methanol and neutralized with HCl solution (1% in methanol). The crude was filtered on silica gel to give **13** (340 mg, 94%) as a yellow oil.  $[\alpha]_{25}^D = +151^\circ$  ( $c = 0.46$ ,  $CH_3OH$ );  $^1H$ -NMR (400 MHz,  $CD_3OD$ ,  $\delta$ ): 4.25 (d,  $J_{1-2} = 7.4$  Hz, 1H, H-1), 4.03-3.99 (m, 1H, H-7A) 3.81 (ad,  $J = 3.2$  Hz, 1H, H-4), 3.74-3.64 (m, 8H, H-8, H-9, H-10, H-11), 3.52-3.44 (m, 3H, H-6, H-7B), 3.39 – 3.36 (m, 2H, H-12).  $^{13}C$ -NMR (100 MHz,  $CD_3OD$ ,  $\delta$ ): 103.71, 75.34, 73.56, 71.19, 70.19, 70.08, 69.70, 68.76, 68.25,

61.16, 50.22. MS (ESI)  $m/z$ :  $[M+Na]^+$  calcd for  $C_{12}H_{23}N_3NaO_8^+$  360.14; found 360.19. NMR data agree with the literature.<sup>[2]</sup>

**Synthesis of 5.** To a solution of **13** (113 mg, 0.33 mmol) in methanol:ethyl acetate 1:3 (6 mL) in  $H_2$  atm,  $Pd(OH)_2$  20% on carbon (70 mg, 0.1 mmol) was added. The reaction mixture was stirred at r.t. in  $H_2$  atmosphere for 1 h, then it was filtered on Celite 521 and concentrated to give **5** (101 mg, 97%) as a yellow oil.  $[\alpha]_{25}^D = +140^\circ$  ( $c = 0.38$ ,  $CH_3OH$ );  $^1H$ -NMR (400 MHz,  $CD_3OD$ ,  $\delta$ ): 4.25 (d,  $J_{1-2} = 7.4$  Hz, 1H, H-1), 4.05-4.00 (m, 1H, H-7A), 3.81 (ad,  $J = 3.2$  Hz, 1H, H-4), 3.74-3.62 (m, 11H, H-2, H-3, H-5, H-8, H-9, H-10, H-11), 3.56-3.44 (m, 3H, H-6, H-7B), 3.31-3.29 (m, 2H, H-12).  $^{13}C$ -NMR (100 MHz,  $CD_3OD$ ,  $\delta$ ): 103.72, 75.38, 73.57, 71.17, 70.12, 69.76, 68.99, 68.24, 61.20, 40.45; MS (ESI)  $m/z$ :  $[M+H]^+$  calcd for  $C_{12}H_{26}NO_8^+$  312.17; found 312.20. NMR data agree with the literature.<sup>[2]</sup>

**Synthesis of 15.** To an ice-cooled solution of **14** (1.00 g, 2.03 mmol) and **8** (533 mg, 3.04 mmol) in dry dichloromethane (10 mL), trimethylsilyl trifluoromethanesulfonate (37  $\mu$ L, 0.20 mmol) was added. The reaction mixture was stirred at r.t. for 1 h, then it was neutralized with triethylamine (85  $\mu$ L, 0.61 mmol). Thus, pyridine (245  $\mu$ L, 3.04 mmol), anhydride acetic (282  $\mu$ L, 3.04 mmol) and 4-dimethylaminopyridine (49 mg, 0.2 mmol) were added. The reaction mixture was stirred at r.t. for 1h, then it was diluted with dichloromethane (150 mL) and washed with saturated solutions of  $NH_4Cl$  (3 x 15 mL) and Brine (1 x 15 mL). The organic phase was anhydricated with  $Na_2SO_4$ , filtered and concentrated under vacuum. The crude was purified by flash chromatography on silica gel to give **15** (820 mg, 82%) as pure  $\alpha$ -anomer as yellow oil.  $[\alpha]_{25}^D = +21^\circ$  ( $c = 0.337$ ,  $CHCl_3$ );  $^1H$ -NMR (400 MHz,  $CDCl_3$ ,  $\delta$ ): 5.36 (dd,  $J_{2-3} = 3.6$  Hz,  $J_{3-4} = 10.0$  Hz, 1H, H-3), 5.28 (at,  $J_{4-3} = 9.6$  Hz, 1H, H-4), 5.26 (dd,  $J_{1-2} = 2.0$  Hz,  $J_{2-3} = 3.6$  Hz, 1H, H-2), 4.87 (d,  $J_{1-2} = 1.6$  Hz, 1H, H-1), 4.31 – 4.26 (m, 1H, H-6a), 4.14 – 4.03 (m, 2H, H-6b, H-5), 3.85 – 3.78 (m, 1H, H-7A,  $CH_2$ ), 3.70 – 3.64 (m, 9H, H-7B, H-8, H-9, H-10, H-11), 3.39 (at,  $J = 5.2$  Hz, 2H, H-12), 2.15 (s, 3H,  $CH_3$ ), 2.10 (s, 3H,  $CH_3$ ), 2.03 (s, 3H,  $CH_3$ ), 1.98 (s, 3H,  $CH_3$ ).  $^{13}C$ -NMR (100 MHz,  $CDCl_3$ ,  $\delta$ ): 97.68, 70.77, 70.67, 70.04, 69.58, 69.07, 68.43, 67.39, 66.20, 62.43, 50.67, 20.83, 20.64; MS (ESI)  $m/z$ :  $[M+Na]^+$  calcd for  $C_{20}H_{31}N_3NaO_{12}^+$  528.18; found 528.17. NMR data agree with the literature.<sup>[1]</sup>

**Synthesis of 16.** To a dispersion of **15** (530 mg, 1.04 mmol) in methanol (4.2 mL), potassium carbonate (43 mg, 0.31 mmol) was added. The reaction mixture was stirred at r.t. for 1 h, then it was diluted with methanol and neutralized with a HCl solution (1% in methanol). The crude was filtered on silica gel to give **16** (345 mg, 98%) as a yellow oil.  $[\alpha]_{25}^D = +27.3^\circ$  ( $c = 0.333$ ,  $CH_3OH$ );  $^1H$ -NMR (400 MHz,  $CD_3OD$ ,  $\delta$ ): 4.79 (d,  $J_{1-2} = 1.6$  Hz, 1H, H-1), 3.86 – 3.80 (m, 3H, H-2, H-6a, H-7A,  $CH_2$ ), 3.72 – 3.53 (m, 13H, H-3, H-4, H-5, H-6b, H-7b, H-8, H-9, H-10, H-11), 3.37 (at,  $J = 4.8$  Hz, 2H, H-12).  $^1H$ -NMR (400 MHz,  $DMSO-d_6$ ,  $\delta$ ): 4.6 (d,  $J_{1-2} = 1.6$  Hz, 1H, H-1), 3.68 – 3.26 (m, 18H, H-2, H-3, H-4, H-5, H-6, H-7, H-8, H-9, H-10, H-11, H-12).  $^{13}C$ -NMR (100 MHz,  $DMSO-d_6$ ,  $\delta$ ): 100.36,

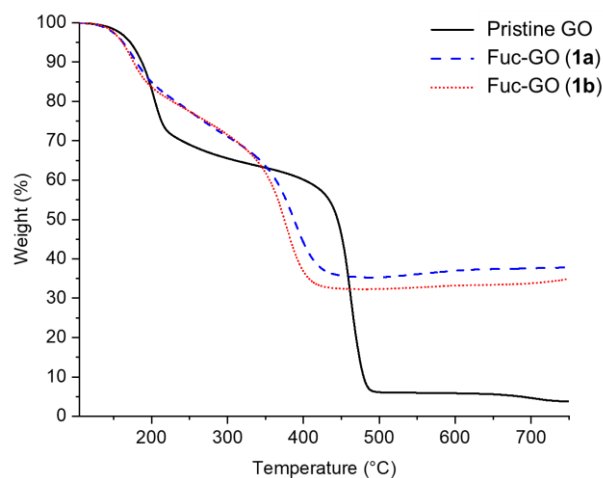
74.31, 71.32, 70.69, 70.27, 70.09, 69.94, 69.70, 67.35, 66.12, 61.66, 50.50; MS (ESI)  $m/z$ :  $[M+Na]^+$  calcd for  $C_{12}H_{23}N_3NaO_8^+$  360.14; found 360.07. NMR data agree with the literature.<sup>[2]</sup>

**Synthesis of 6.** To a solution of **16** (95 mg, 0.28 mmol) in methanol:ethyl acetate 1:3 (4 mL) in  $H_2$  atm,  $Pd(OH)_2$  20% on carbon (59 mg, 0.08 mmol) was added. The reaction mixture was stirred at r.t. in  $H_2$  atmosphere for 1 h, then it was filtered on Celite<sup>521</sup> and concentrated to give **6** (82 mg, 94%) as a yellow oil.  $[\alpha]_{25}^D = +41.2^\circ$  ( $c = 0.412$ ,  $CH_3OH$ );  $^1H$ -NMR (400 MHz,  $CD_3OD$ ,  $\delta$ ): 4.79 (d,  $J_{1-2} = 1.6$  Hz, 1H, H-1), 3.86-3.80 (m, 3H, H-3, H-4, H-7A), 3.70-3.62 (m, 9H, H-2, H-5, H-7B, H-8, H-9, H-10), 3.57-3.52 (m, 4H, H-6, H-11), 2.82 (at,  $J = 4.8$  Hz, 2H, H-12).  $^{13}C$ -NMR (100 MHz,  $CD_3OD$ ,  $\delta$ ): 100.28, 73.19, 71.12, 70.98, 70.66, 70.12, 69.99, 69.85, 67.17, 66.24, 61.48, 40.41; MS (ESI)  $m/z$ :  $[M+H]^+$  calcd for  $C_{12}H_{26}NO_8^+$  312.17; found 312.15. NMR data agree with literature.<sup>[2]</sup>

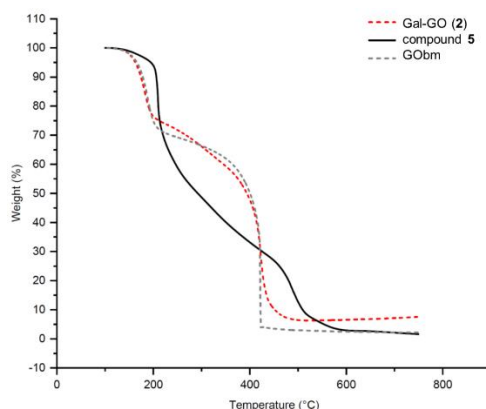
### Thermogravimetric analysis (TGA).

Thermogravimetric analysis (TGA) was run in air on a ~2 mg sample using a Q5000 IR model TA instrument (New Castle, UK) starting at 100 °C. The sample was kept isothermal for 60 min, then ramped up by 10 °C  $min^{-1}$ . Weight losses in the range 230-330 °C: Fuc-GO **1** (9.4%), Gal-GO **2** (11.4%), Man-GO **3** (9.6%), GO<sub>bm</sub> (6.3%).

**Figure S1** Thermogravimetric analysis (TGA) under air atmosphere of glyco-GO conjugates **1a-b** prepared in a 10 mL stainless-steel mixer mill and using two stainless-steel balls ( $\varnothing = 1.0$  cm) in wet grinding conditions (Fuc-GO **1a**) and in presence of an inert milling auxiliary (NaCl) in liquid-assisted grinding conditions (Fuc-GO **1b**).



**Figure S2** Thermogravimetric analysis (TGA) under air atmosphere of Gal compound **5**, Gal-GO **2** and **GO<sub>bm</sub>** (pristine GO milled without monosaccharide derivatives).



### Inductively coupled plasma atomic emission spectroscopy (ICP-AES).

Inductively coupled plasma atomic emission spectroscopy (ICP-AES) was used to determine the concentrations of iron (Fe), chromium (Cr), sulfur (S) and was performed in triplicate using a Varian 720-ES Inductively Coupled Plasma Atomic Emission Spectrometer (ICP-AES). An accurately weighted amount of each sample was treated with a microwave-assisted digestion (CEM MARS Xpress) using 1.0 mL of suprapure HNO<sub>3</sub> obtained by sub-boiling distillation and 1.0 mL of suprapure H<sub>2</sub>O<sub>2</sub>. Each sample was thus diluted to 10 mL with Ultrapure water (UHQ), spiked with 0.5 ppm of Ge used as an internal standard, and analyzed. Calibration standards were prepared by gravimetric serial dilution from commercial stock standard solutions of each element at 1000 mg L<sup>-1</sup>. The wavelengths used for elements determination were: 238.204 nm for Fe, 267.716 nm for Cr, 182.562 nm for S whereas for Ge the line at 209.426 nm was used. The operating conditions were optimized to obtain maximum signal intensity, and between each sample, a rinse solution constituted of 2% v/v HNO<sub>3</sub> was used to avoid memory effects.

**Table S1.** Inductively coupled plasma atomic emission spectroscopy (ICP-AES) analyses of glyco-GO conjugates **1-3**.

glyco-GO	% Fe	% Cr
Fuc-GO <b>1a</b>	16.11	3.70
Fuc-GO <b>1b</b>	13.11	2.04
Fuc-GO <b>1</b>	0.21	0.013
Gal-GO <b>2</b>	0.05	0.007
Man-GO <b>3</b>	0.03	0.004



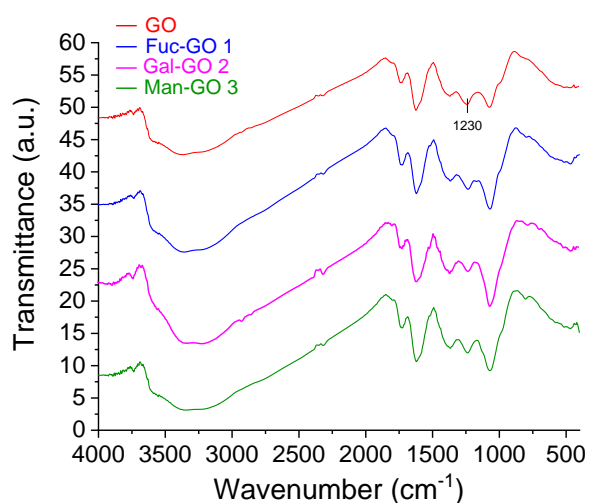
**Table S2.** Elemental analysis of glyco-GO conjugates **1-3**.

glyco-GO	C%	H%	N%	S%
Fuc-GO <b>1</b>	49.35	2.91	0.26	0.33
Gal-GO <b>2</b>	46.25	3.03	0.33	0.23
Man-GO <b>3</b>	47.87	3.10	0.21	0.13

### Infrared spectroscopy

The FT-IR measurements were carried out with the Shimadzu IRAffinity-1S instrument. Potassium bromide (KBr) pellets were prepared using 100 mg of potassium bromide and 1.0 mg of sample. The spectra were recorded under inert atmosphere and a pure potassium bromide pellet was used as background.

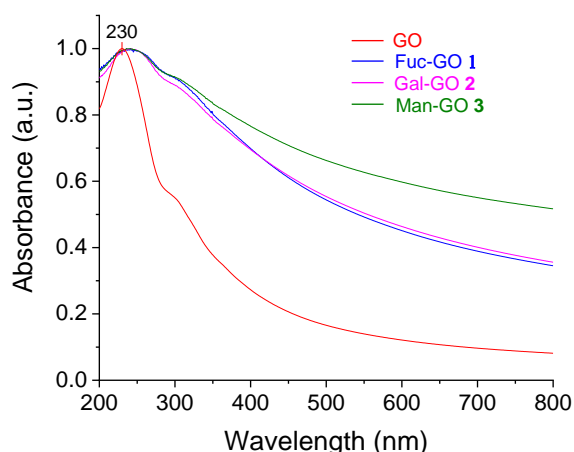
**Figure S3.** Infrared spectra of glyco-GO conjugates **1-3**.



### UV-vis spectroscopy

The UV-Vis absorption measurements were carried out with the Varian Cary 4000 instrument. The samples were dispersed in water at a concentration of 0.5 mg/mL. Before the measurement, the dispersions were placed in an ultrasonic bath for 30 min.

**Figure S4.** UV-vis spectra of glyco-GO conjugates **1-3**.



### Raman Spectroscopy

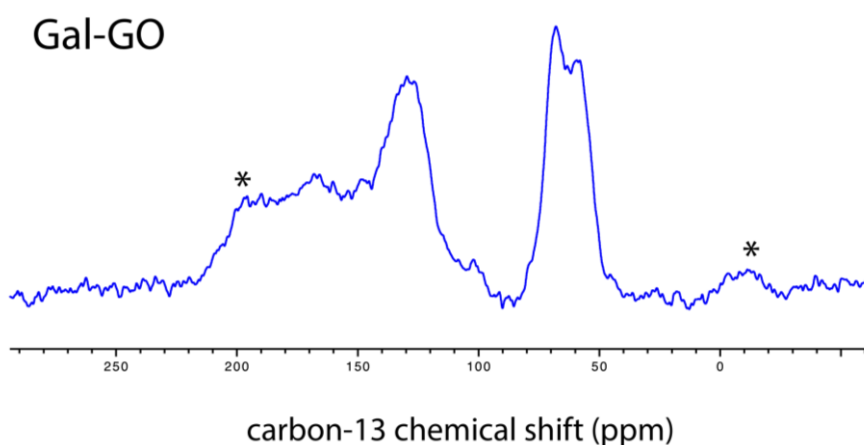
Raman spectra were collected using an inVia Qontor confocal Raman microscope (Renishaw). The 532 nm laser line was used, in combination with an 1800 L/mm grating. The selected objective was  $\times 50L$  (Leica). Spectra were acquired in the frequency range  $700\text{--}2850\text{ cm}^{-1}$ , with an exposure time of 10s and 10% laser power.

### NMR experiments

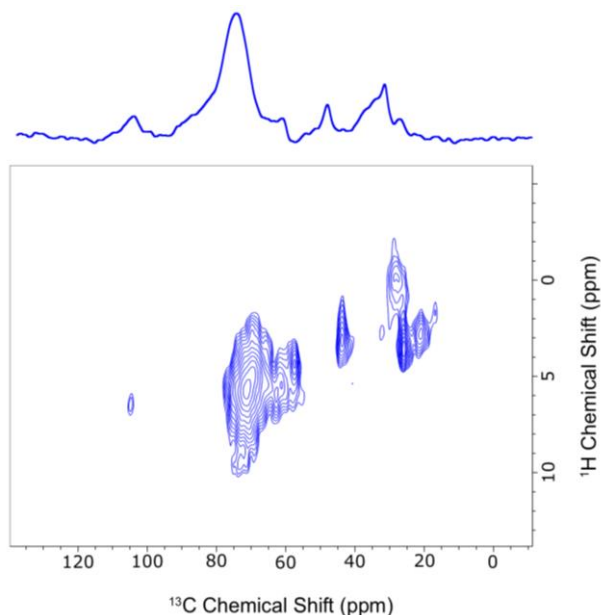
The solid-state NMR spectra were acquired in the CERM laboratory of the University of Firenze with a 16.47 T (700 MHz of proton Larmor frequency) Avance II Bruker instrument and a 20.0 T (850 MHz of proton Larmor frequency) Avance III Bruker instrument equipped, in both cases, with a 3.2 mm double resonance CP MAS probe. The MAS frequency was set to 20.0 kHz and temperature was set to 260 K to ensure an effective sample temperature around 298 K. In all the experiments 3.2 mm zirconia rotors with vespel caps were used. The reported 1D and 2D experiments were acquired at 20.0 T. In the 1D CP MAS experiment the  $^1\text{H}$   $\pi/2$  pulse was set to 2.5  $\mu\text{s}$ , the CP contact time was 100  $\mu\text{s}$ , with a CP power level of 50 kHz on  $^{13}\text{C}$  and 78 kHz on  $^1\text{H}$ . On  $^1\text{H}$  a 70 to 100% linear ramp was used, and the power level refers to 100% of power. The  $^1\text{H}$  decoupling was performed during the acquisition time with a  $\text{SW}_f\text{TPPM}$  decoupling sequence at 78 kHz of power. The recycle delay was set to 1.0 s and the acquisition time was 17.20 ms. The final spectrum was obtained summing up 40960 scans. The spectra were recorded with 1024 complex points and processed with 32768 complex points. Spectra were processed with an exponential widow function with 300 Hz of line broadening. For the 2D  $^1\text{H}\text{-}^{13}\text{C}$  FSLG CP experiments (reported in figure S4) a standard Frequency-Switched Lee-Goldberg sequence was used. The  $\pi/2$  proton pulse length and CP conditions were the same as

reported above for 1D experiments. Same power and decoupling sequence were used also for the  $^1\text{H}$  decoupling during the  $^{13}\text{C}$  acquisition. For the FSLG  $^1\text{H}$  homodecoupling, in the indirect dimension, a radiofrequency power of 100 kHz was used. The recycle delay was 1.0 s, the acquisition times were 17.07 ms for the  $^{13}\text{C}$  (direct) dimension and 1.176 ms for the  $^1\text{H}$  indirect dimension. Up to 13312 scans were added, acquiring 1280 and 18 complex points in the direct and indirect dimension, respectively. The spectra were processed with a 2048x256 matrix of complex points using exponential widow function with 300 Hz of line broadening in both dimensions.

**Figure S5.**  $^{13}\text{C}$  MAS direct excitation solid-state NMR spectrum of the glyco-GO Gal-GO **2**. Spectra is acquired at 16.4 T (701.1 MHz of  $^1\text{H}$  Larmor Frequency, 176.3 MHz of  $^{13}\text{C}$  Larmor frequency) and 12.0 kHz of MAS frequency. The resonance of the epoxide (C-O-C) and hydroxyl (C-OH) groups are clearly observed at about 60 and 70 ppm, respectively. Aromatic resonances of the C=C atoms are observed at about 129 ppm. An additional band around 160 ppm (that overlaps with a sideband around 190 ppm, denoted by \*) can be attribute to carbonyl groups (C=O). The  $^{13}\text{C}$   $\pi/2$  pulse was set to 3.3  $\mu\text{s}$ . The  $^1\text{H}$  decoupling was performed during the acquisition time with a  $\text{SW}_f\text{TPPM}$  decoupling sequence at 78 kHz of power. The recycle delay was set to 10 s and the acquisition time was 15.36 ms. The final spectrum was obtained summing up 40960 scans. The spectra were recorded with 1536 complex points and processed with 4096 complex points. Spectra were processed with an exponential widow function with 200 Hz of line broadening. Spectra were acquired with 1024.



**Figure S6.**  $^1\text{H}$ - $^{13}\text{C}$  FSLG CP 2D spectrum of Gal-GO **2**. The spectrum is acquired at 20.0 T (850 MHz of proton Larmor Frequency, 213.8 MHz of  $^{13}\text{C}$  Larmor frequency) and 20.0 kHz of MAS frequency. The  $^{13}\text{C}$  1D spectrum of Gal-GO **2** is reported above the 2D map to help the analysis of correlations. Notably, the resonances of the galactose and the saccharide linker are easily recognized. The experimental details are reported above.



**Table S3.** Minimal bactericidal concentrations (MBC, lowest concentration of drug that kills more than 99% of the bacterial population) of glyco-GO conjugates **1-3**, pristine GO and GO<sub>bm</sub>.

MBC $\mu\text{g/mL}$					
	Fuc-GO <b>1</b>	Gal-GO <b>2</b>	Man-GO <b>3</b>	Pristine GO	GO <sub>bm</sub>
<i>P.aeruginosa</i>	32	32	>128	64	32

**References:**

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- [2] A. K. Sanki, L. K. Mahal, *Synlett* **2006**, *2006*, 455.