SUPPORTING INFORMATION

A surprising dipolar cycloaddition provides ready access to aminoglycosides.

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Unless otherwise noted, reagents and solvents were commercially purchased and used without purification. All reactions were conducted in standard glassware without regards to atmosphere or moisture. ^1H NMR spectra were obtained on Varian HG-400 spectrometers. Chemical shifts are reported in parts per million relative to TMS. Multiplicities are given as: s (singlet), d (doublet), t (triplet), q (quartet), dd (doublet of doublet), and m (multiplet). Proton-decoupled ^{13}C NMR spectra were obtained on Varian HG-400 (100 MHz) spectrometers. ^{13}C chemical shifts are reported relative to CDCl_3 (t, 77.0). Mass spectra were obtained on a Perkin-Elmer API 150 MCA mass analyzer. Purities for all compounds were obtained by reverse phase LC/MS or NMR.

2a: Tri-O-acetyl-D-glucal (200mg, 0.73 mmol) and benzyl azide (126 mg, 0.95 mmol) were heated at 120°C in 1 mL trimethylorthoformate (sealed tube) for 30h. Evaporation and chromatography on silica (hexanes/ethyl acetate 2:1) gave **2a** (278 mg, 94%) as a colorless syrup which crystallized on standing. ^1H NMR (400 MHz, CDCl_3) δ 7.26-7.38 (m, 5H), 5.61 (s, 1H), 5.14 (d, $J = 13$ Hz, 1H), 5.10 (d, $J = 5.2$ Hz, 1H), 4.82 (d, $J = 12.8$ Hz, 1H), 4.63 (d, $J = 19$ Hz, 1H), 4.25 (d, $J = 10$ Hz, 1H), 3.80-4.10 (m, 2H), 2.95-3.01

(m, 1H), 2.10 (s, 3H), 2.09 (s, 3H), 2.08 (s, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 171.02, 169.11, 168.79, 129.05, 128.73, 128.38, 80.88, 75.44, 69.41, 69.01, 68.68, 63.57, 49.77, 21.24 (m). MS $[\text{M}+\text{H}]$ 406.4.

2b: Procedure as for **2a**. 87%. ^1H NMR (400 MHz, CDCl_3) δ 5.71 (d, $J = 2\text{ Hz}$, 1H), 5.45 (d, $J = 12\text{ Hz}$, 1H) 4.88 (d, $J = 12\text{ Hz}$, 1H), 4.22 (d, $J = 12\text{ Hz}$, 1H), 3.98-4.13 (m, 2H), 3.09-3.15 (m, 1H), 2.12 (s, 3H), 2.11 (s, 3H), 2.06 (s, 3H), 1.70-1.75 (m, 15H); ^{13}C NMR (75 MHz, CDCl_3) δ 170.55, 169.77, 169.37, 79.76, 74.08, 69.52, 69.012, 68.405, 64.165, 42.84, 36.50, 29.86, 21.40, 21.32, 21.14. MS $[\text{M}+\text{H}]$ 465.4.

2c: Procedure as for **2a**. 92%. ^1H NMR (400 MHz, CDCl_3) δ 6.51 (s, 2H), 6.42 (s, 1H), 5.67 (s, 1H), 5.20 (d, $J = 8\text{ Hz}$, 1H), 5.16 (d, $J = 16\text{ Hz}$, 1H), 4.90 (d, $J = 8\text{ Hz}$, 1H), 4.60 (d, $J = 12\text{ Hz}$, 1H), 4.32-4.35 (m, 1H), 3.79-4.08 (m, 2H), 3.78 (s, 6H), 3.05-3.09 (m, 1H), 2.11 (s, 3H), 2.10 (s, 3H), 2.09 (s, 3H). MS $[\text{M}+\text{H}]$ 449.5

5: Compound **2a** (100mg, 0.25 mmol) in 2mL acetone was placed in a closed quartz reaction vessel and irradiated at RT for 15h. The resulting solution is then immediately poured into a solution of methanol (0.50 mmol) in 1mL THF with catalytic $\text{Sc}(\text{OTf})_3$ (0.05 mmol) and stirred at RT for 2h. Evaporation and reverse-phase chromatography (ACN/ H_2O) yielded **5** (97.3 mg, 92%) as a yellow syrup. ^1H NMR (400 MHz, CDCl_3) δ 7.23-7.52 (m, 5H), 5.38 (t, $J = 10\text{ Hz}$, 1H), 4.99 (d, $J = 8\text{ Hz}$, 1H), 4.85 (t, $J = 8\text{ Hz}$, 1H), 4.41 (d, $J = 13\text{ Hz}$, 1H), 4.27-4.34 (m, 2H), 4.09 (d, $J = 12\text{ Hz}$, 1H), 3.97-4.01 (m, 1H), 3.66 (s, 3H), 3.02 (t, $J = 8\text{ Hz}$, 1H), 2.08 (s, 3H), 1.97 (s, 3H), 1.95 (s, 3H); ^{13}C NMR (75

MHz, CDCl₃) δ 170.89, 169.77, 170.64, 169.72, 130.98, 129.96, 129.38, 71.34, 69.27, 61.74, 57.65, 57.25, 51.49, 21.127, 21.067, 20.885. MS [M+H] 410.4.

6: Procedure as for **5**. 94%. ¹H NMR (400 MHz, CDCl₃) δ 7.42-7.51 (m, 5H), 5.38 (t, *J* = 9 Hz, 1H), 5.07 (d, *J* = 9 Hz, 1H), 4.85 (t, *J* = 9 Hz, 1H), 4.40 (q, *J* = 12 Hz, 2H), 4.29 (d, *J* = 12 Hz, 2H), 4.02-4.08 (m, 2H), 3.94-3.98 (m, 1H), 3.75 (dq, *J* = 7, 2 Hz, 2H), 3.05 (t, *J* = 8 Hz, 1H), 2.052 (s, 3H), 1.957 (s, 3H), 1.953 (s, 3H), 1.39 (t, *J* = 7 Hz, 3H); ¹³C NMR (75 MHz, CDCl₃) δ 171.00, 170.77, 169.86, 130.97, 130.04, 129.93, 129.47, 99.68, 71.31, 69.20, 66.70, 61.79, 57.18, 51.49, 21.10, 20.89, 15.34. MS [M+H] 424.4.

7: Procedure as for **5**. 96%. ¹H NMR (400 MHz, CDCl₃) δ 7.39-7.57 (m, 5H), 5.35 (t, *J* = 10 Hz, 1H), 5.19 (d, *J* = 8 Hz, 1H), 4.85 (t, *J* = 9 Hz, 1H), 4.44 (d, *J* = 13 Hz, 1H), 4.34 (d, *J* = 13 Hz, 1H), 4.26 (q, *J* = 5 Hz, 1H), 4.17 (m, 1H), 4.05 (d, *J* = 12 Hz, 1H), 3.89 (m, 1H), 3.05 (t, *J* = 8 Hz, 1H), 2.01 (s, 3H), 1.94 (s, 3H), 1.93 (s, 3H), 1.35 (d, 6H); ¹³C NMR (75 MHz, CDCl₃) δ 170.99, 170.65, 168.78, 131.05, 130.46, 129.7, 129.51, 129.58, 98.66, 74.25, 71.49, 70.98, 69.62, 67.72, 67.54, 62.12, 56.75, 51.051, 23.952, 22.24, 21.44, 21.30, 21.18, 21.11. MS [M+H] 438.4.

8: Procedure as for **5**. 98%. ¹H NMR (400 MHz, CDCl₃) δ 7.43-7.55 (m, 5H), 6.02-6.11 (m, 2H), 5.37-5.44 (m, 2H), 5.30 (d, *J* = 10 Hz, 1H), 5.15 (d, *J* = 9 Hz, 1H), 4.84 (t, *J* = 9 Hz, 1H), 4.46 (q, *J* = 6 Hz, 1H), 4.38 (d, *J* = 12 Hz, 1H), 4.21-4.29 (m, 2H), 4.02-4.08 (m, *J* = 13 Hz, 2H), 3.03 (t, *J* = 8 Hz, 1H), 2.01 (s, 3H), 1.95 (s, 3H), 1.94 (s, 3H); ¹³C NMR (75 MHz, CDCl₃) δ 170.91, 170.65, 169.74, 133.02, 131.01, 130.06, 129.87, 129.35, 119.54, 99.15, 71.70, 71.32, 69.33, 61.82, 56.97, 51.33, 21.21, 21.12, 20.92. MS [M+H] 436.4.

9: Procedure as for **5**. 96%. ^1H NMR (400 MHz, CDCl_3) δ 7.28-7.45 (m, 10H), 5.33 (t, J = 8 Hz, 1H), 5.18 (d, J = 8 Hz, 1H), 4.91 (d, J = 11 Hz, 1H), 4.82 (t, J = 9 Hz, 1H), 4.66 (d, J = 10 Hz, 1H), 4.31 (d, J = 13 Hz, 1H), 4.23 (dd, J = 6, 4 Hz, 1H), 4.15 (d, J = 14 Hz, 1H), 4.04 (d, J = 10 Hz, 1H), 3.83-3.86 (m, 1H), 3.03 (t, J = 9 Hz, 1H), 2.10 (s, 3H), 1.94 (s, 3H), 1.90 (s, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 171.10, 170.84, 170.65, 169.79, 145.79, 130.70, 130.04, 129.43, 129.17, 128.86, 99.20, 74.19, 71.45, 69.05, 67.74, 67.43, 63.24, 61.69, 21.41, 21.25, 21.24. MS $[\text{M}+\text{H}]$ 486.4.

10: Procedure as for **5**. 88%. ^1H NMR (400 MHz, CDCl_3) δ 7.41-7.57 (m, 5H), 5.46 (t, J = 8 Hz, 1H), 4.81 (t, J = 8 Hz, 1H), 4.52 (d, J = 12 Hz, 2H), 4.24-4.31 (m, 2H), 4.06 (d, J = 9 Hz, 2H), 3.94 (s, 1H), 2.99 (t, J = 8 Hz, 1H), 2.01 (s, 3H), 2.00 (s, 3H), 1.97 (s, 3H), 1.56-1.90 (m, 8H). MS $[\text{M}+\text{H}]$ 464.4.

11: Procedure as for **5** except catalyst is omitted and the nucleophile (TMSN_3 , 2eq) is dissolved in acetonitrile. 98%. ^1H NMR (400 MHz, DMSO) δ 7.32-7.47 (m, 5H), 5.20 (d, J = 6 Hz, 1H), 4.8 (t, J = (Hz, 1H), 4.72 (t, J = 9 Hz, 1H), 4.27 (m, 2H), 4.12 (dd, J = 14, 5 Hz, 1H), 4.02 (m, 2H), 2.91 (m, 1H), 2.06 (s, 3H), 2.00 (s, 3H), 1.96 (3H). MS $[\text{M}+\text{H}]$ 421.5.

14: Procedure as for **5**. 74%. ^1H NMR (500 MHz, CDCl_3) δ 7.29-7.44 (m, 5H), 6.45 (d, J = 6 Hz, 1H), 6.34-6.38 (m, 2H), 5.44 (s, 1H), 5.30-5.31 (m, 1H), 4.86-5.03 (m, 2H), 4.74 (dd, J = 6, 2 Hz, 1H), 4.50-4.53 (m, 1H), 4.38 (d, J = 5 Hz, 1H), 4.19-4.29 (m, 2H), 4.12

(m, 1H), 3.83 (dd, $J = 10, 7$ Hz, 1H), 3.68 (m, 1H), 2.13 (s, 3H), 2.12 (s, 3H), 2.10. MS [M+H] 524.4.

15: Procedure as for **5**, with no added nucleophile. 74%. ^1H NMR (400 MHz, CDCl_3) δ 7.37-7.47 (m, 5H), 5.58 (t, $J = 8$ Hz, 1H), 5.54 (s, 1H), 4.90 (t, $J = 8$ Hz, 1H), 4.28-4.34 (m, 3H), 4.16 (d, $J = 11$ Hz, 1H), 4.03 (d, $J = 8$ Hz, 1H), 3.23-3.28 (m, 1H), 2.86 (m, 2H), 2.06 (s, 3H), 2.05 (s, 3H), 2.04 (s, 3H), 1.99 (s, 3H). MS [M+H] 436.5.

17: Procedure as for **2a**. 86%. ^1H NMR (500 MHz, CDCl_3) δ 7.07-7.39 (m, 5H), 5.42 (t, $J = 4$ Hz, 1H), 5.17 (dd, $J = 6.5, 3$ Hz, 1H), 5.02 (d, $J = 15$ Hz, 1H), 4.54 (d, $J = 15$ Hz, 1H), 4.13 (dd, $J = 15, 6.5$ Hz, 2H), 3.88 (q, $J = 5.5$ Hz, 2H), 2.66 (t, $J = 10$ Hz, 1H), 2.07 (s, 3H), 2.05 (s, 3H), 1.98 (s, 3H). MS [M+H] 406.5.

18: Procedure as for **5**. 94%. ^1H NMR (400 MHz, CDCl_3) δ 7.23-7.52 (m, 5H), 6.34 (m, 1H), 5.40 (s, 1H), 5.32 (t, $J = 5$ Hz, 1H), 4.36 (d, $J = 5.5$ Hz, 2H), 4.29 (m, 1H), 4.11 (m, 2H), 3.81 (s, 3H), 2.91 (d, $J = 5$ Hz, 1H), 2.11 (s, 3H), 2.07 (s, 3H), 2.02 (s, 3H). MS [M+H] 410.5.

^1H NMR spectrum for **2a**.

405 triazoline

Pulse Sequence: s2pu1

Solvent: CDCl3

Ambient temperature

Mercury-10000 "high"

PULSE SEQUENCE

PRG: s2pu1

Pulse 1: 1.000 sec

Pulse 2: 42.6 degrees

Acq. time 1.385 sec

Width 3888.0 Hz

18 repetitions

00.0535517 MHz

DATA ACQUISITION

FT 8124 32740

Total time 0 min., 50 sec

ppm

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405 triazoleline
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Solvent: CDCl3
Solute: CMC13
Ambient Temperature:
Mercury-4000B "hg10"
PULSE SEQUENCE
Relax - delay 1.000 sec
Pulse 1: 4.6 degrees
Pulse 2: 4.6 degrees
Pulse 3: 4.6 degrees
Width 1898.0 Hz
18 repetitions
OBSERVE H3, 400.055517 MHz
DATA PROCESSING
FT size 32768
Total time 0 min, 50 sec

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¹H NMR spectrum for 2c.

¹H NMR spectrum for **4a**.

¹H NMR spectrum for **5**.

^1H NMR spectrum for **6**.

^1H NMR spectrum for **8**.

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