Supplementary Information

Optimising Biomimetic Gelators Constructed from Amino-Acid Building Blocks

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General Experimental Methods

Reagents and solvents were commercially available and used as supplied without further purification unless otherwise stated. Boc protected L-lysine\(^1\) was synthesised according to literature methodologies. All other protected amino acids were bought from commercial sources. Compound 1-Lys was synthesised according to the previously published approach and all characterisation data were in agreement with those previously published by us.\(^2\) Column chromatography was performed on silica gel (35-70 µm), while TLC was performed on aluminium-backed plates coated with 0.25 mm silica gel 60. Spots were visualised by use of a UV lamp or an appropriate stain (ninhydrin solution 0.2 % (by mass) in ethanol or cerium molybdate stain: water (180 mL), conc. \(\text{H}_2\text{SO}_4\) (20 mL), ammonium dimolybdate 5 g, cerium sulfate 2 g). NMR chemical shifts (\(\delta\)) are reported in ppm downfield of tetramethylsilane using residual solvent as internal reference. All spectra were recorded on at 400 MHz (\(^1\text{H}\)) and 100 MHz (\(^{13}\text{C}\)). Mass spectra and high resolution mass spectra were recorded using electrospray and FAB methods respectively. All isotope peaks were in agreement with expected intensities. Infrared spectra are reported with peak intensities (s, m, w; strong, medium, weak).
Experimental Data for New Compounds

**Compound 2-Ala.** Synthesised using the general method. This crude product was purified by column chromatography (silica, CH₂Cl₂:MeOH 98:2 & 0.1% triethylamine) to give a white solid with a yield of 1.50 g (3.00 mmol, 59%). m.p. 118-120°C. \( R_f \) 0.65 (CH₂Cl₂:MeOH, 9:1). \(^1\)H NMR (400MHz, CDCl₃) \( \delta \) 6.22 (2H, br), 5.08 (2H, br), 4.12 (2H, br), 3.29-3.19 (4H, m), 1.48-1.42 (22H, m), 1.34 (6H, d, \( J=7 \) Hz), 1.30-1.24 (10H, m). \(^1^3\)C NMR (100MHz, CDCl₃) \( \delta \) 172.7, 156.0, 82.0, 50.5, 39.5, 29.5, 29.2, 29.0, 28.5, 26.7, 18.6. \( \nu_{\text{max}} \) 3337 m (N-H), 2974 m (C-H), 2928 m (C-H), 2854 m (C-H), 1682 s (C=O), 1654 s (C=O), 1519 s, 1365 m, 1319 s, 1246 s, 1165 s, 1050 m. \([\alpha]_D^{589} \) -11.9, (c = 1.0, MeOH). ESI MS C₂₅H₄₈N₄O₆ (Mr = 500.7) \( m/z \) 523 ([M+Na]+, 100%), 524 (25%), 423 ([M+Na+H-Boc]+, 18%), 301 ([M+2H-2Boc]+, 15%. HRMS-FAB, calcd for C₂₅H₄₈N₄O₆Na 523.3472, found 523.3470.

**Compound 3-Gln.** Synthesised using the general method. During the work-up, after washing with aqueous NaHSO₄, the product precipitated from solution. The product was then washed with diethyl ether and dried on a vacuum line to give a white powder with a yield of 1.40 g (72%). m.p. 163-164°C. \(^1\)H NMR (400MHz, CD₃OD) \( \delta \) 4.01-3.98 (2H, br m), 3.24-3.11 (4H, m), 2.29 (4H, t, \( J=7.6 \) Hz), 2.05-1.96 (1H, m), 1.89-1.79 (1H, m), 1.50-1.42 (22H, m), 1.34-1.31 (10H, m). \(^1^3\)C NMR (100MHz, CD₃OD) \( \delta \) 177.8, 174.5, 157.7, 82.7, 55.8, 40.4, 32.7, 30.3, 29.3, 28.7, 27.9. \( \nu_{\text{max}} \) 3410 m (N-H), 3291 m (N-H), 3213 m (N-H), 2970 m (C-H), 2928 m (C-H), 2855 m (C-H), 1686 s (C=O), 1651 s (C=O), 1550 m, 1520 s, 1454 m, 1393 m, 1366 m, 1319 s, 1277 m 1246 s, 1169 s, 1057 m. \([\alpha]_D^{589} \) -10.3 (c = 1.0, MeOH). ESI MS C₂⁹H₅₄N₆O₈ (Mr = 614.8) \( m/z \) 637 ([M+Na]+, 100%), 638
(27%), 537 ([M+Na+H-Boc]+, 22%). HRMS-FAB, calcd for C_{29}H_{54}N_{6}O_{8}Na 637.3901, found 637.3903.

**Compound 4-Phe.** Synthesised using the general method. The crude product was purified by sonicating the solid in a DCM/methanol mix then filtering the solid and finally washing with water. The white powder was then dried on a vacuum line to give a yield of 1.14 g (1.75 mmol, 35%). m.p. 161-163°C. \(^1\)H NMR (400MHz, CDCl\(_3\)) \(\delta\) 7.28-7.18 (10H, m), 5.85 (2H, br), 5.18 (2H, br), 4.28 (2H, br), 3.13-2.97 (8H, m), 1.42-1.18 (32H, m). \(^{13}\)C NMR (100MHz, CDCl\(_3\)) \(\delta\) 171.2, 155.6, 137.1, 129.5, 128.7, 127.0, 80.2, 56.2, 39.5, 39.0, 29.3, 29.2, 29.0, 28.4, 26.7. \(\nu_{\text{max}}\) 3337 m (N-H), 2974 m (C-H), 2928 s (C-H), 2854 m (C-H), 1682 s (C=O), 1654 s (C=O), 1520 s, 1365 m, 1319 s, 1296 m, 1238 s, 1167 s, 1045 m. \([\alpha]_D^{589}\) -1.6 (c = 1.0, MeOH:DCM, 2:1). ESI MS C\(_{37}\)H\(_{56}\)N\(_4\)O\(_6\) (Mr = 652.9) m/z 675 ([M+Na]+, 100%), 676 (36%), 575 ([M+Na+H-Boc]+, 12%). HRMS-FAB, calcd for C\(_{37}\)H\(_{56}\)N\(_4\)O\(_6\)Na 675.4098, found 675.4102.

**Compound 5-Cys.** Synthesised using the general method. This crude product was purified by column chromatography (silica, CH\(_2\)Cl\(_2\):MeOH 98:2 & 0.1% triethylamine) to give a white solid with a yield of 1.95 g (2.75 mmol, 55%). m.p. 71-73°C. R\(_f\) 0.46 (CH\(_2\)Cl\(_2\):MeOH, 9:1). \(^1\)H NMR (400MHz, CDCl\(_3\)) \(\delta\) 7.21 (2H, br t), 6.73 (2H, t, J=5.5 Hz), 5.72 (2H, br d), 4.57 (2H, dd, J=14.0, 7.0 Hz), 4.54 (2H, app q, J=6.1 Hz), 4.31 (2H, dd, J=13.7, 5.5 Hz), 3.33-3.15 (4H, m), 2.84 (4H, d, J=6.1 Hz), 2.00 (6H, s), 1.51-1.40 (22H, m), 1.32-1.24 (10H, m). \(^{13}\)C NMR (100MHz, CDCl\(_3\)) \(\delta\) 170.9, 170.7, 156.0, 80.5, 53.7, 41.1, 39.7, 34.5, 29.4, 29.0, 28.4, 26.7, 23.4. \(\nu_{\text{max}}\) 3282 m (N-H), 2974 m (C-H), 2928 m (C-H), 2854 m (C-H), 1647 s (C=O), 1519 s, 1365 m, 1246 m, 1161 s, 1087 m, 1045 m, 1018 m. \([\alpha]_D^{589}\) -36.4 (c = 1.0, acetone). ESI MS C\(_{31}\)H\(_{58}\)N\(_6\)O\(_8\)S\(_2\) (Mr = 707.0) m/z
729 ([M+Na]^+, 100%), 730 (30%), 629 ([M+Na+H-Boc]^+, 12%). HRMS-ESI, calcd for C_{31}H_{58}N_{6}O_{8}S_{2}Na 729.3650, found 729.3659.

References

Figure 1 $^1$H NMR of compound 2-Ala in CDCl$_3$.

Figure 2 $^{13}$C NMR of compound 2-Ala in CDCl$_3$. 
Figure 3 $^1$H NMR of compound 3-Phe in CDCl$_3$.

Figure 4 $^{13}$C NMR of compound 3-Phe in CDCl$_3$. 
Figure 5 $^1$H NMR of compound 4-Gln in CD$_3$OD.

Figure 6 $^{13}$C NMR of compound 4-Gln in CD$_3$OD.
Figure 7 $^1$H NMR of compound 5-Cys in CDCl$_3$.

Figure 8 $^{13}$C NMR of compound 5-Cys in CDCl$_3$. 
Figure 9 $^1$H NMR of compound 6-Trp in CDCl$_3$.

Figure 10 $^{13}$C NMR of compound 6-Trp in CDCl$_3$. 