Supporting Information (13 pages)

Materials and General Methods. ^{1}H NMR and ^{13}C NMR spectra were recorded on Varian VXR 500 MHz or Varian Unity 300 MHz instruments. Mass spectrometric data were obtained on a JEOL SX 102A spectrometer. THF was refluxed with sodium/benzophenone ketyl and freshly distilled. Dichloromethane was distilled immediately prior to use from CaH_2 under nitrogen. The carboxypolystyrene resin was purchased from Novalbiochem company.

Preparation of 4: A mixture of **3** (5.06 g, 12.8 mmol), Ac_2O (4.18 g, 40.9 mmol), DMAP (156 mg, 1.27 mmol) and triethylamine (4.32 g, 42.6 mmol) in CH_2Cl_2 (150 mL) was stirred at room temperature for 24 h. The solution was concentrated, and the product was isolated by chromatography (silica gel, EtOAc / Hexane 1 / 2) to give white solid (5.79 g, 87 % yield). Data for **2:** NMR (^{1}H, $CDCl_3$) δ 4.90 (br, 1 H), 4.58 (br, 1 H), 4.01 (m, 3 H), 2.07 (s, 3 H), 2.05 (s, 3 H), 2.03 (s, 3 H), 1.01 – 2.01 (m, 24 H), 0.99 (d, *J* = 6.6 Hz, 3 H), 0.93 (s, 3 H), 0.69 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 171.46, 170.90, 170.76, 74.30, 72.99, 71.07, 65.16, 47.58, 46.75, 42.30, 41.13, 38.28, 35.23, 34.96, 34.72, 34.54, 31.99, 31.50, 28.72, 28.35, 27.56, 26.88, 25.32, 23.17, 22.75, 21.88, 21.69, 21.13, 17.84, 12.73; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ([M + $Na]^+$) 543.3292 (100%), calcd 543.3298.

Preparation of 5: A mixture of **3** (6.30 g, 0.012 mol), PDC (9.10 g, 0.024 mol) and 4 Å molecular sieves (2.9 g) in 220 mL of CH_2Cl_2 was stirred at room temperature for 20 h. the solvent was removed in vacuo, and the residue was purified by chromatorgraphy (EtOAc / Hexane 1 / 2) giving a white solid (6.15 g, 99% yield). NMR (^{1}H, $CDCl_3$) δ 4.99 (br, 1 H), 4.57 (m, 1 H), 4.03 (m, 2 H), 2.51 (m, 1 H), 2.33 (m, 1 H), 2.04 (s, 3 H), 2.03 (s, 3 H), 2.02 (s, 3 H), 1.14 – 2.14 (m, 22 H), 1.04 (s, 3 H), 1.03 (s, 3 H), 0. 86 (d, *J* = 6.0 Hz, 3 H); NMR (^{13}C, $CDCl_3$) δ 214.24, 171.49, 170.91, 170.43, 73.74, 70.71, 65.15, 57.28, 53.35, 46.63, 40.67, 38.05, 37.80, 35.85, 35.73, 35.08, 43.73, 31.63, 31.53, 29.96, 27.68, 26.73, 25.70, 23.99, 22.29, 21.64, 21.61, 21.20, 18.97,11.68; HRFAB-MS (thioglycerol + H^+ matrix) *m/e* ([M + $H]^+$) 519.3322 (83%), calcd 519.3322. To a 500 mL flask was added the ketone from the first step (4.94 g, 9.53 mmol), hydroxylamine hydrochloride (0.796 g, 11.45 mmol), NaOAc (1.56 g, 18.88 mmol) in 260 mL of 95% EtOH. The mixture was refluxed for 15 h, cooled to room temperature, and saturated aqueous Na_2CO_3 (50 mL) was added. The solution was extracted with CH_2Cl_2 (3 x 50 mL) and concentrated. The product was purified via column chromatography (silica gel, EtOAc / Hexane 1 / 2) giving a white solid (5.08 g, ~100% yield). NMR (^{1}H, $CDCl_3$) δ 8.88 (br, OH), 4.95 (m, 1 H), 4.59 (m, 1 H), 4.03 (m, 2 H), 3.38 (m, 1 H), 2.05 (s, 3 H), 2.04 (s, 3 H), 2.02 (s, 3 H), 1.05 – 2.09 (m, 23 H), 1.02 (s, 3 H), 0.94 (d, *J* = 6.0 Hz, 3 H), 0.93 (s, 3H); NMR (^{13}C, $CDCl_3$) δ 171.20, 170.62, 170.30, 164.82, 73.85, 70.82, 65.04, 64.96, 53.35, 49.50, 47.11, 40.77, 38.05, 36.00, 35.49, 35.45, 35.08, 34.51, 31.62, 31.35, 28.02, 26.62, 25.80, 23.59, 22.14, 21.55, 21.42, 21.01, 19.56, 19.34, 12.06; HRFAB-MS (thioglycerol + H^+ matrix) *m/e* ([M + $H]^+$) 534.3442 (100%), calcd 534.3431. Sodium (7.33 g) was added portion wise during 4 h to a solution of the oxime (1.0 g, 1.87 mmol) in boiling *n*-propanol (80 mL) under an atmosphere of nitrogen. The mixture was kept at reflux for 20 h. The cooled mixture was poured into brine (80 mL), and the aqueous layer was extracted with ether (2 x 50 mL). The combined organic extract was evaporated to dryness under reduced pressure, and the residue was dissolved in ether, washed

with brine, and dried ($MgSO_4$). After removal of solvent, flash column chromatography of residue (silica gel, CH_2Cl_2 / MeOH / NH_3•H_2O10 / 1.5 / 0.2) to afford white solid (0.71 g, 96% yield). NMR (^1H, 5% CD_3OD in $CDCl_3$) δ 4.16 (br, 5 H), 3.96 (br, 1 H), 3.83 (br, 1 H), 3.55 (m, 2 H), 3.39 (m, 1 H), 0.97 – 2.10 (m, 24 H), 1.00 (d, *J* = 7.0 Hz, 3 H)), 0.90 (s, 3 H), 0.69 (s, 3 H); NMR (^{13}C ,$CDCl_3$) δ 72.96, 71.50, 68.21, 62.83, 47.18, 46.27, 41.56, 41.44, 39.38, 39.17, 35.55, 35.22, 34.66, 34.44, 31.80, 29.84, 29.16, 28.00, 27.48, 26.33, 23.09, 22.30, 17.35, 12.30; HRFAB-MS (thioglycerol + H^+ matrix) *m/e* ($[M + H]^+$) 394.3326 (100%), calcd 394.3321.

Preparation of 6: $(Boc)_2O$ (1.46 g, 6.61 mmol) was added to a solution containing **5** (2.39 g, 6.08 mmol) and Et_3N (0.95 mL) in CH_2Cl_2 (180 mL). The mixture was stirred at room temperature for 20 h. Solvent was evaporated under reduced pressure, the residue was isolated by chromatography (silica gel, CH_2Cl_2 / MeOH 10 / 1) to give white solid (2.78 g, 93% yield). NMR (^1H, $CDCl_3$) δ 4.95 (br, NH), 3.96 (br, 1 H), 3.86 (br, 1 H), 3.61 (m, 2 H), 3.34 (m, 1 H), 1.45 (s, 9 H), 0.95 – 2.20 (m, 24 H), 0.92 (d, *J* = 6.5 Hz, 3 H), 0.89 (s, 3 H), 0.79 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 155.59, 79.05, 72.10, 68.36, 66.02, 63.59, 53.30, 44.84, 44.24, 41.60, 41.53, 39.88, 39.58, 35.51, 35.31, 35.18, 34.88, 31.94, 30.54, 29.69, 28.89, 27.77, 27.59, 26.78, 23.50, 22.88, 17.95, 15.42, 13.79; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 516.3670 (100%), calcd 516.3665. A solution of the trialcohol (2.8 g, 5.68 mmol), triphenylmethyl chloride (1.90 g, 6.83 mmol), DMAP (67 mg, 0.55 mmol), and Et_3N (7.18 mmol) in CH_2Cl_2 (100 mL) was stirred at room temperature for 20 h. The solvent was evaporated and the residue was purified by column chromatography (silica gel, CH_2Cl_2 / MeOH 5 / 1) to furnish a white solid (3.26 g, 78% yield). NMR (^1H, $CDCl_3$) δ 7.18 – 7.44 (m, 15 H), 5.38 (br, NH), 3.96 (br, 1 H), 3.83 (br, 1 H), 3.44 (br, 1 H), 3.01 (m, 2 H), 2.81 (br, 1 H), 1.01 – 2.25 (m, 23 H), 1.45 (s, 9 H), 0.91 (d, *J* = 6.0 Hz, 3 H), 0.87 (s, 3 H), 0.75 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 155.57, 144.64, 128.78, 128.58, 128.53, 127.87, 127.71, 127.53, 127.00, 126.85, 86.38, 78.85, 71.97, 68.25, 64.20, 53.23, 48.45, 44.78, 44.05, 41.62, 39.81, 39.54, 35.28, 35.17, 34.83, 32.30, 30.44, 28.67, 27.67, 27.50, 26.74, 23.44, 22.82, 17.88, 13.68; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 758.4762 (100%), calcd 758.4760.

Preparation of 7a and 7b: A mixture of **6** (3.2 g, 4.34 mmol)), PDC (6.5 g, 17.27 mmol), and 4 Å molecular sieves (0.79 g) in CH_2Cl_2 (100 mL) was stirred at room temperature for 20 h. The reaction mixture was filtered through silica gel and concentrated. The residue was purified by column chromatography (silica gel, EtOAc / Hexanes 1 / 2) to a white solid (3.08 g, 97% yield). NMR (^1H, $CDCl_3$) δ 7.21 – 7.44 (m, 15 H), 4.78 (br, NH), 3.97 (br, 1 H), 3.02 (m, 2 H), 2.86 (m, 1 H), 2.52 (m, 1 H), 0.98 – 2.05 (m, 22 H), 1.28 (s, 9 H), 1.26 (s, 3 H), 0.89 (d, *J* = 6.5 Hz, 3 H), 0.80 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 210.62, 209.88, 155.30, 144.69, 128.87, 127.98, 127.82, 127.63, 127.11, 126.96, 86.51, 79.52, 64.17, 60.47, 53.11, 49.66, 48.01, 47.76, 45.02, 44.68, 43.02, 42.87, 37.28, 36.52, 35.33, 35.10, 35.08, 32.40, 28.57, 27.66, 27.61, 26.82, 24.53, 22.49, 17.66, 14.34, 14.23; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 754.4450(45.5%), calcd 754.4447. A mixture of the diketone (3.09 g, 4.22 mmol), hydroxylamine hydrochloride (1.36 g, 10.08 mmol), and NaOAc (1.36 g, 16.64 mmol) in 95% EtOH (200 mL) was reflux for 22 h. The reaction mixture was concentrated, and the residue was purified by column chromatography (silica gel, EtOAc / Hexanes 1 / 1) to afford a white solid

(3.12 g, 97% yield). NMR (^{1}H, $CDCl_3$) δ 8.80 (br, OH), 8.66 (br, OH), 7.20 – 7.44 (m, 15 H), 4.96 (br, NH), 3.92 (br, 1 H), 3.17 (m, 2 H), 3.02 (m, 2 H), 1.35 – 2.35 (m, 22 H), 1.24 (s, 9 H), 1.03 (s, 3 H), 0.90 (d, *J* = 5.5 Hz, 3 H), 0.78 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 160.10, 159.90, 155.39, 144.67, 128.84, 128.64, 127.94, 127.78, 127.06, 126.91, 86.47, 79.43, 64.22, 60.51, 53.09, 47.94, 46.32, 44.96, 44.87, 43.14, 42.92, 42.29, 42.23, 37.42, 35.99, 35.85, 35.08, 32.56, 32.40, 28.61, 27.51, 27.03, 26.88, 26.40, 25.49, 25.06, 23.06, 22.98, 21.11, 19.37, 17.93, 17.78, 14.31, 14.18; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 784.4651 (100%), calcd 784.4637. A mixture of the dioxime (3.2 g, 4.20 mmol) in AcOH (44 mL) was hydrogenated in the presence of PtO_2 (190 mg) under 900 psi H_2 pressure. After the mixture was stirred at room temperature for 6 days, the catalyst was filtered off. The filtrate was concentrated under vacuum, the residue was made basic with 20% aqueous NaOH, and extracted with CH_2Cl_2 (3 x 30 mL). The combined layers were dried with Na_2SO_4, and the solvent was removed in vacuo. The resulting residue was purified by column chromatography (silica gel, CH_2Cl_2 / MeOH / NH_3•H_2O 10 / 2 / 0.2) to afford **7a** as white solid (1.17 g, 38% yield). In this solvent system, **7a** had an R_f of ~0.7 on TLC (silica gel, CH_2Cl_2 / MeOH / NH_3•H_2O 10 / 2 / 0.2). The only other major product observed with TLC using this solvent system was a material with an R_f of ~0.3. This latter compound proved to be **7b** which was isolated at a white solid (0.62 g, 30% yield). **7a:** NMR (^{1}H, $CDCl_3$) δ 7.21 – 7.44 (m, 15 H), 5.14 (br, NH), 3.95 (br, 1 H), 3.09 (br, 1 H), 3.02 (m, 2 H), 2.60 (br, 1 H), 0.88 – 2.05 (m, 24 H), 1.45 (s, 9 H), 0.89 (m, 6 H), 0.75 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 155.59, 144.75, 129.68, 128.91, 127.87, 127.16, 126.98, 86.45, 78.98, 66.03, 64.28, 53.26, 52.00, 48.50, 48.04, 44.96, 44.58, 42.35, 39.11, 36.05, 35.28, 35.15, 32.39, 28.71, 27.54, 27.41, 27.00, 26.83, 23.83, 23.20, 17.98, 15.45, 13.85; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 756.5080 (100%), calcd 756.5080. **7b:** NMR (^{1}H, $CDCl_3$) δ 5.17 (br, 1 H), 3.96 (br, 1 H), 3.60 (m, 2 H), 3.08 (br, 1 H), 2.52 (br, 1 H), 1.02 – 2.10 (m, 24 H), 1.45 (s, 9 H), 0.92 (d, *J* = 7.0 Hz, 3 H), 0.91 (s, 3 H), 0.78 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 155.59, 78.95, 63.19, 53.29, 52.06, 48.66, 47.76, 44.86, 44.65, 42.50, 41.49, 39.31, 36.14, 35.34, 35.22, 35.18, 32.05, 31.54, 29.83, 28.67, 27.54, 27.25, 26.74, 23.83, 23.26, 17.95, 13.83; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 514.3986 (25.2%), calcd 514.3985.

Preparation of 8: To a solution of **7** (105 mg, 0.14 mmol) and pyridine (14 mg, 0.18 mmol) in THF (5 mL) was added allyl chloroformate (21.6 mg, 0.18 mmol). The mixture was stirred at room temperature overnight. The solvent was removed in vacuo and the residue was purified by column chromatography (silica gel, CH_2Cl_2 / MeOH / NH_3•H_2O 10 / 1.5 / 0.2) to give white solid (102 mg, 89% yield). NMR (^{1}H, $CDCl_3$) δ 7.21 – 7.44 (m, 15 H), 5.90 (br, NH), 5.28 (d, *J* = 10.5 Hz, 1 H), 5.18 (d, *J* = 10.5 Hz, 1 H), 5.08 (br, NH), 4.60 (m, 1 H), 4.52 (br, 2 H), 3.97 (br, 1 H), 3.36 (br, 1 H), 3.17 (br, 1 H), 2.97 (m, 2 H), 1.45 (s, 9 H), 0.95 – 2.1 0 (m, 24 H), 0.89 – 0.91 (m, 6 H), 0.75 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 155.58, 155.31, 144.61, 133.25, 129.50, 128.75, 127.86, 127.69, 127.00, 126.83, 117.28, 86.37, 78.96, 65.20, 64.11, 62.38, 53.24, 51.39, 48.52, 47.45, 44.76, 44.57, 42.34, 39.26, 37.82, 35.94, 35.12, 35.08, 34.86, 32.31, 28.60, 28.16, 27.43, 27.37, 27.06, 26.89, 26.74, 26.61, 23.70, 23.12, 17.75, 13.72; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 840.5300 (100%), calcd 840.5291.

Preparation of 1: To a solution of **8** (101 mg, 0.12 mmol) and diisopropylethylamine (20.70 mg, 0.16 mmol) in CH_2Cl_2 (8 mL) was added 9-fluorenylmethyl chloroformate (35 mg, 0.13 mmol). The reaction was stirred at room temperature overnight. The solvent was removed in vacuo and the residue was purified by column chromatography (silica gel, CH_2Cl_2 / MeOH / 30 / 1) to give a white solid (117 mg, 94% yield). NMR (^{1}H, $CDCl_3$) δ 7.19 – 7.72 (m, 23 H), 5.92 (br, 1 H), 5.20 – 5.31 (m, 3 H), 4.48 – 4.56 (m, 5 H), 4.19 (br, 1 H), 3.92 (br, 1 H), 3.64 (br, 1 H), 3.20 (br, 1 H), 3.04 (m, 2 H), 1.24 (s, 9 H), 0.71 – 2.05 (m, 33 H); NMR (^{13}C, $CDCl_3$) δ 155.80, 144.58, 144.23, 143.87, 141.43, 132.99, 128.74, 128.49, 127.70, 127.49, 127.08, 126.84, 124.92, 124.87, 119.97, 117.74, 86.37, 78.89, 65.33, 64.09, 53.47, 51.78, 51.26, 48.49, 47.83, 47.70, 47.37, 44.67, 44.41, 43.99, 41.99, 36.74, 36.21, 35.78, 35.06, 34.44, 32.31, 32.01, 28.70, 27.29, 26.85, 26.67, 23.14, 22.81, 17.79, 13.62; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ([M + Na]$^+$) 1062.5970 (100%), calcd 1062.5972. The trityl ether (607 mg, 0.58 mmol) and *p*-toluenesulfonic acid (22 mg) were dissolved in CH_2Cl_2 (5 mL) and stirred at room temperature for 1 h. The solvent was removed in vacuo, and the residue was purified by column chromatography (silica gel, CH_2Cl_2 / MeOH 20 / 1) to afford white solid (392 mg, 84% yield). NMR (^{1}H, 5% CD_3OD in $CDCl_3$) δ 7.28 – 7.75 (m, 8 H), 6.52 (br, NH), 5.90 – 6.15 (m, 3 H), 5.45 (br, NH), 5.31 (d, *J* = 10.0 Hz, 1 H), 5.21 (d, *J* = 10.0 Hz, 1 H), 4.56 (br, OH), 4.47 – 4.53 (m, 2 H), 4.22 (m, 1H), 3.92 (br, 1 H), 3.62, (br, 1H), 3.55 (m, 2 H), 3.23 (br, 1 H), 0.93 – 1.95 (m, 24 H), 1.42 (s, 9 H), 0.91 (d, *J* = 6.5 Hz, 3 H), 0.88 (s, 3 H), 0.74 (s, 3 H); NMR (^{13}C, 5% CD_3OD in $CDCl_3$) δ 156.08, 155.87, 144.20, 143.79, 141.35, 132.92, 127.62, 127.02, 126.99, 124.82, 119.88, 117.57, 117.27, 78.59, 66.57, 65.36, 62.94, 51.63, 48.59, 47.80, 47.59, 47.40, 44.65, 44.06, 41.93, 36.75, 36.57, 35.79, 35.59, 35.08, 34.27, 31.82, 31.74, 29.37, 28.54, 28.39, 28.22, 28.14, 27.17, 26.84, 23.01, 22.75, 22.62, 17.79, 13.46; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ([M + Na]$^+$) 820.4869 (100%), calcd 820.4876.

Preparation of 9: To a solution of **1** (361 mg, 0.45 mmol), Et_3N (0.07 mL) and DMAP (6.3 mg) in CH_2Cl_2 (25 mL) was added benzoyl chloride (70 mg, 0.49 mmol). The mixture was stirred at room temperature for 6 h. The solvent was removed in vacuo, and the residue was purified by column chromatography (silica gel, CH_2Cl_2 / MeOH 30 / 1) to give **9** (403 mg, 98% yield) as white solid. NMR (^{1}H, $CDCl_3$) δ 8.02 (d, *J* = 8.0 Hz, 2 H), 7.27 – 7.73 (m, 11 H), 6.15 (br, NH), 5.92 (br, NH), 5.30 (d, *J* = 13.0 Hz, 1 H), 5.21 (d, *J* = 13.0 Hz, 1 H), 4.48 – 4.55 (m, 5 H), 4.28 (br, 1H), 4.18 (br, 1 H), 3.95 (br, 1 H), 3.68 (br, 1 H), 3.23 (br, 1 H), 1.43 (s, 9 H), 0.95 – 1.95 (m, 27 H), 0.89 (s, 3 H), 0.77 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 166.96, 155.72, 144.29, 143.93, 141.49, 133.67, 132.97, 130.60, 130.50, 129.59, 128.64, 128.46, 127.75, 127.13, 124.98, 124.92, 120.04, 117.77, 78.59, 65.63, 53.32, 51.77, 51.28, 48.54, 47.91, 47.73, 44.82, 44.65, 42.08, 36.90, 35.86, 35.14, 34.60, 32.08, 28.71, 28.56, 27.43, 26.97, 25.61, 23.24, 22.95, 17.87, 13.73; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ([M + Na]$^+$) 924.5143(100%), calcd 924.5138.

Preparation of 10: Compound **9** (403 mg, 0.44 mmol) was dissolved in trifluoroacetic acid (8mL), and the mixture was stirred at room temperature for 2 h. The trifluoroacetic acid was removed in vacuo. To the residue was added saturated aqueous Na_2CO_3 (5 mL), extracted with CH_2Cl_2 (3 x 10 mL) and the combined extracts were dried with Na_2SO_4. The solvent was removed in vacuo, and the residue was purified by column chromatography (silica gel, CH_2Cl_2 /

MeOH 20 / 1) to give a white solid (357 mg, 99% yield). NMR (^{1}H, $CDCl_3$) δ 7.99 (d, *J* = 7.50 Hz, 2 H), 7.24 – 7.69 (m, 11 H), 6.93 (br, NH), 6.49 (br, NH), 6.28 (br, NH), 5.14 – 5.31 (m, 2 H), 4.22 – 4.54 (m, 8 H), 3.78 (br, 1H), 3.61 (br, 1 H), 3.39 (br, 1 H), 0.76 – 2.42 (m, 33 H); NMR (^{13}C, $CDCl_3$) δ 166.78, 156.15, 144.24, 144.10, 141.40, 133.21, 132.95, 130.40, 129.52, 129.49, 128.40, 127.87, 127.56, 127.01, 125.05, 124.97, 119.84, 117.30, 65.58, 65.33, 54.23, 50.95, 48.41, 48.10, 47.60, 45.33, 42.00, 37.08, 36.08, 35.86, 35.11, 34.48, 31.96, 27.99, 27.62, 27.43, 27.31, 25.42, 23.03, 22.24, 17.47, 13.23; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 824.4609 (100%), calcd 824.4614. Boc-phenylalanine (127.2 mg, 0.48 mmol) was activated with diisopropylcarbodiimide (60.48 mg, 0.48 mmol) and 1-hydroxy-7-azabenzotriazole (65.28 mg, 0.48 mmol) in CH_2Cl_2 (5 mL) and added to a solution of the amine (350 mg, 0.44 mmol) in CH_2Cl_2 (20 mL). After stirring for 3 h, the solvent was removed in vacuo, and the residue was purified by column chromatography (silica gel, CH_2Cl_2 / MeOH 30 / 1) to give **10** (425 mg, 93% yield) as white solid. NMR (^{1}H, $CDCl_3$) δ 7.99 (d, *J* = 7.5 Hz, 2 H), 7.20 – 7.73 (m, 16 H), 6.35 (br, NH), 6.08 (br, NH), 5.90 (m, NH), 5.68 (br, NH), 5.29 (d, *J* = 12.7 Hz, 1 H), 5.19 (d, *J* = 12.7 Hz, 1 H), 4.54 – 4.65 (m, 4 H), 4.23 – 4.31 (m, 5 H), 3.64 (br, 1 H), 3.59 (br, 1 H), 3.33 (br, 1 H), 2.85 – 3.01 (m, 2 H), 1.32 (s, 9 H), 0.88 – 1.95 (m, 30 H), 0.79 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 166.92, 156.55, 156.04, 155.84, 144.09, 143.94, 141.50, 136.86, 133.09, 132.92, 130.36, 129.45, 128.92, 128.68, 128.54, 128.38, 127.63, 127.07, 126.92, 124.84, 124.77, 119.91, 117.37, 80.66, 65.46, 65.32, 52.14, 50.74, 48.84, 47.93, 47.71, 47.54, 44.40, 44.30, 41.88, 41.73, 39.29, 36.75, 36.51, 36.19, 35.68, 35.04, 34.15, 32.03, 31.71, 28.82, 28.16, 27.86, 27.56, 26.83, 25.40, 22.94, 22.57, 17.68, 55.80, 13.27; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 1071.5811 (14.3%), calcd 1071.5823.

Preparation of 11: To a flask containing **10** (344 mg, 0.32 mmol) was added dicycyclohexamine (5 mL) and DMF (5 mL). The mixture was stirred at room temperature overnight. After removal of solvent in vacuo, the residue was purified by column chromatography (silica gel, CH_2Cl_2 / MeOH 20 / 1) to give a white solid (258 mg, 95% yield). NMR (^{1}H, $CDCl_3$) δ 7.20 – 8.02 (m, 10 H), 5.89 (br, NH), 5.17 – 5.28 (m, 2 H), 4.51 (br, 3 H), 4.35 (br, 1 H), 4.26 (br, 2 H), 3.33 (br, 1 H), 3.15 (br, 2 H), 2.87 – 2.89 (m, 2 H), 1.32 (s, 9 H), 0.90 – 2.05 (m, 30 H), 0.80 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 166.83, 156.01, 155.71, 137.29, 133.31, 132.86, 130.57, 129.56, 129.31, 128.50, 128.39, 126.69, 117.14, 79.80, 65.55, 65.19, 55.58, 52.10, 50.88, 48.70, 47.60, 44.47, 44.05, 41.79, 39.52, 38.94, 37.12, 36.02, 35.12, 34.75, 32.08, 28.35, 27.64, 27.28, 27.00, 26.67, 25.61, 23.89, 22.57, 17.79, 17.77, 13.39; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 849.5135 (100%), calcd 849.5142. Boc-glycine (60.0 mg, 0.34 mmol) was preactivated with diisopropylcarbodiimide (42.8 mg, 0.34 mmol) and 1-hydroxy-7-azabenzotriazole (46.2 mg, 0.34 mmol) in CH_2Cl_2 (5 mL) and added to a solution of the amine (258 mg, 0.31 mmol) in CH_2Cl_2 (15 mL). After stirring for 3 h, the solvent was removed in vacuo, and the residue was purified by column chromatography (silica gel CH_2Cl_2 / MeOH 20 / 1) to give **11** (287 mg, 93% yield) as white solid. NMR (^{1}H, $CDCl_3$) δ 7.30 – 7.99 (m, 10 H), 5.87 (br, NH), 5.17 – 5.30 (m, 2 H), 4.48 – 4.51 (m, 2 H), 4.27 – 4.36 (m, 4 H), 3.68 – 3.92 (m, 5 H), 2.91 – 3.07 (m, 2 H), 1.46 (s, 9 H), 1.43 (s, 9 H), 0.83 – 2.01 (m, 33 H); NMR (^{13}C, $CDCl_3$) δ 168.20, 166.70, 156.33, 155.73, 136.90, 133.19, 132.88, 130.55, 129.54, 129.49, 129.09, 128.61, 128.38, 126.89, 117.41, 117.21, 80.50, 80.19, 65.40, 65.24, 56.08, 52.08, 51.06, 48.95, 46.63, 44.48, 41.90, 39.37, 36.56, 36.43, 35.80, 35.11, 34.60, 34.35, 32.09, 31.62, 31.32,

28.96, 28.47, 28.39, 27.53, 27.22, 26.70, 25.53, 23.57, 23.41, 23.06, 22.87, 17.75, 13.53, 13.37; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 1006.5866 (54.1%), calcd 1006.5881.

Preparation of 12: To a solution of **11** (285 mg, 0.29 mmol) in AcOH (20 mL) was added $Pd(PPh_3)_4$ (16.7 mg, 0.014 mmol) and Bu_3SnH (183 mg, 0.63 mmol). After stirring for 3 h, the solvent was removed in vacuo, and the residue was purified by column chromatography (silica gel, CH_2Cl_2 / MeOH 10 / 1) giving a white solid (237 mg, 91% yield). NMR (^1H, $CDCl_3$) δ 7.15 – 7.96 (m, 10 H), 6.15 (br, NH), 5.74 (br, NH), 4.77 (br, NH), 4.48 (br, NH), 4.37 (br, NH), 4.23 (br, 2 H), 3.91 – 4.04 (m, 3 H), 3.54 (br, 1 H), 3.18 (br, 1 H), 3.18 (br, 1 H), 2.54 – 2.74 (m, 2 H), 2.31 (br, 1 H), 1.41 (s, 9 H), 1.14 (s, 9 H), 0.83 – 1.99 (m, 32 H); NMR (^{13}C, $CDCl_3$) δ 171.59, 166.92, 156.41, 155.63, 137.88, 132.81, 130.42, 129.84, 129.47, 128.35, 128.12, 126.40, 79.93, 79.42, 58.75, 55.47, 49.19, 48.68, 46.49, 46.12, 45.12, 44.65, 43.99, 41.11, 40.65, 39.68, 36.76, 35.08, 34.71, 34.57, 34.37, 32.37, 32.15, 31.94, 31.37, 29.50, 28.33, 28.16, 28.03, 27.42, 27.15, 26.97, 26.72, 25.55, 24.82, 23.17, 23.00, 22.12, 18.04, 13.72, 13.49; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 922.5685 (100%), calcd 922.5670. Boc-alanine (22.7 mg, 0.12 mmol) was activated with diisopropylcarbodiimide (15.1 mg, 0.12 mmol) and 1-hydroxy-7-azabenzotriazole (16.3 mg, 0.12 mmol) in CH_2Cl_2 (5 mL) and added to a solution of the amine (98.4 mg, 0.11 mmol) in CH_2Cl_2 (10 mL). After stirring for 3 h, the solvent was removed in vacuo, and the residue was purified by column chromatography (silica gel, CH_2Cl_2 / MeOH 20 / 1) to give **12** (102 mg, 88% yield) as white solid. NMR (^1H, $CDCl_3$) δ 7.99 (d, *J* = 7.0 Hz, 2 H), 7.21 – 7.53 (m, 8 H), 6.97 (br, NH), 6.81 (br, NH), 6.48 (br, NH), 5.50 (br, NH), 5.08 (br, NH), 4.21 – 4.41 (m, 5 H), 3.97 – 4.03 (m, 2 H), 3.64 – 3.74 (m, 2 H), 3.11 (br, 2 H), 1.44 (s, 9 H), 1.42 (s, 9 H), 1.36 (s, 9 H), 0.91 – 1.95 (m, 30 H), 0.95 (s, 3 H), 0.82 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 171.64, 171.50, 168.63, 166.77, 156.37, 156.19, 155.77, 137.45, 132.98, 130.68, 129.65, 129.29, 128.75, 128.50, 126.97, 80.73, 80.30, 80.01, 70.79, 65.46, 52.19, 50.57, 49.13, 46.27, 45.65, 45.15, 44.73, 41.82, 38.41, 37.12, 35.81, 35.18, 34.69, 32.17, 31.94, 31.83, 31.68, 29.86, 29.02, 28.65, 28.53, 28.51, 27.57, 26.07, 25.79, 25.05, 23.40, 22.93, 17.86, 13.75; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 1093.6584 (100%), calcd 1093.6565.

Preparation of 2: Compound **12** (89 mg, 0.083 mmol) was dissolved in trifluoracetic acid (6 mL), and the mixture was stirred at room temperature for 1 h. After removal of trifluoroacetic acid in vacuo, saturated aqueous Na_2CO_3 (5 mL) was added, and the mixture was extracted with CH_2Cl_2 (3 x 10 mL). The combined extracts were dried with Na_2SO_4, and the solvent was removed in vacuo. The residue was purified by column chromatography (silica gel, CH_2Cl_2 / MeOH / $NH_3•H_2O$ 10 / 2 / 0.2) giving a white solid (62.7 mg, 98% yield). NMR (^1H, $CDCl_3$) δ 8.00 (d, *J* = 7.5 Hz, 2 H), 7.90 (m, 2 H), 7.48 (m, 1 H), 7.26 – 7.43 (m, 5 H), 4.24 – 4.30 (m, 3 H), 4.04 (br, 1 H), 3.68 (m, 1 H), 3.37 – 3.40 (m, 5 H), 2.60 (dd, *J* = 14.0, 10.5 Hz, 1 H), 1.02 – 2.08 (m, 27 H), 0.98 (s, 3 H), 0.92 (d, *J* = 5.0 Hz, 3 H), 0.84 (s, 3 H); NMR (^{13}C, $CDCl_3$) δ 174.82, 172.95, 170.95, 166.79, 138.31, 132.98, 130.64, 129.60, 129.41, 128.88, 128.49, 127.07, 65.53, 57.07, 51.68, 50.91, 50.26, 49.00, 45.63, 45.26, 44.94, 44.67, 42.12, 41.61, 37.25, 35.99, 35.06, 34.80, 32.13, 31.94, 29.09, 27.52, 27.47, 26.06, 25.48, 23.42, 23.14, 21.89, 17.90, 13.67; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 793.5005 (15.4%), calcd 793.4992. The triamine (58 mg, 0.075 mmol) was dissolved in a solution of MeONa in MeOH (1.5 M, 6 mL), and the mixture was stirred at room temperature for 1 h. After removal of MeOH in vacuo,

the residue was purified by column chromatography (silic gel, CH_2Cl_2 / MeOH / $NH_3.H_2O$ = 10 / 2 / 0.3) to give **2** (49 mg, 98% yield) as white solid. NMR (^1H, 5% CD_3OD in $CDCl_3$) δ 7.25 – 7.32 (m, 5 H), 4.29 (br, 1 H), 4.00 (br, 1 H), 3.66 (dd, *J* = 10.0, 4.0 Hz, 1 H), 3.51 – 3.67 (m, 2 H), 3.42 (m, 1 H), 3.33 – 3.35 (m, 2 H), 3.27 (dd, *J* = 13.0, 4.0 Hz, 1 H), 2.77 (br, 11 H), 2.62 (dd, *J* = 13.5, 9,5 Hz, 1 H), 1.05 – 2.02 (m, 27 H), 0.97 (s, 3 H), 0.84 (d, *J* = 6.5 Hz, 3 H), 0.83 (s, 3 H); NMR (^{13}C, 5% CD_3OD in $CDCl_3$) δ 175.23, 173.21, 171.55, 137.83, 129.29, 128.93, 127.14, 63.09, 56.82, 51.96, 51.87, 50.69, 50.18, 50.08, 48.99, 46.03, 45.91, 45.00, 44.62, 42.00, 41.67, 36.93, 35.78, 35.68, 35.14, 34.71, 31.83, 31.77, 29.25, 29.18, 27.44, 27.31, 26.22, 23.23, 23.00, 21.58, 17.70, 13.55; HRFAB-MS (thioglycerol + Na^+ matrix) *m/e* ($[M + Na]^+$) 689.4738 (100%), calcd 689.4730.

Attachment of 1 to resin and preparation of 2: 3.14 g of benzoic acid polymer (1.18 mmol of acid/g), 6.28 mL of freshly distilled thionyl chloride and 60 mL of dry benzene were stirred at reflux under nitrogen overnight. The mixture was filtered, washed with dry benzene (50 mL), twice with dry ether (50 mL), and immediately pumped dry under vacuum. Compound **1** (419 mg, 0.52 mmol) was shaken with the acid chloride resin (446 mg), DMAP (6.3 mg, 0.052 mmol) and triethylamine (52.5 mg, 0.52 mmol) in DMF (5 mL) for 6 h. The resin was filtered and washed with DMF (3 x 25 mL), MeOH (3 x 25 mL) and CH_2Cl_2 (3 x 25 mL), a solution of CH_2N_2 (1.56 mmol) in ether was added to a suspension of the resin in ether (15 mL) and shaking was continued for 3h in order to block any unreacted free acid. The resin was filtered and washed with DMF (3 x 25 ML), MeOH (3 x 25 mL) and CH_2Cl_2 (3 x 25 mL). Boc deprotection was achieved by treatment of the beads (508 mg) with trifluoroacetic acid (8 mL) for 2 h. The beads were then washed with CH_2Cl_2 (3 x 25 mL), 5% *N, N*-diisopropylethylamine in CH_2Cl_2 (3 x 25 mL), DMF (3 x 25 mL), MeOH (3 x 25 mL) and CH_2Cl_2 (3 x 25 mL). The resin was coupled with Boc-phenylalanine (3 eq) which was preactivated with diisopropylcarbodiimide and 1-hydroxy-7-azabenzotriazole. The Fmoc group was removed by adding dicyclohexylamine (5 mL) to the suspension of the resin (416 mg) in DMF (5 mL). The mixture was shaken overnight followed by filtration and rinsing of the resin with MeOH (3 x 25 mL) and CH_2Cl_2 (3 x 25 mL) giving free amine group at C-7. Boc–glycine was preactived with the aid of diisopropylcarbodiimide and 1-hydroxy-7-azabenzotriazole and added to the resin. After shaking for 3 h, filtering, and washing with DMF (3 x 25 mL), MeOH (3 x 25 mL) and CH_2Cl_2 (3 x 25 mL), the beads were dried under vacuum. The alloc – group was removed by adding Bu_3SnH (0.86 mL) and $Pd(PPh_3)_4$ (100 mg) to the suspension of the resin (280 mg) in AcOH (8 mL). The mixture was shaken for 24 h then filtered and washed with DMF (3 x 25 mL), MeOH (3 x 25 mL) and CH_2Cl_2 (3 x 25 mL). The free amine group at C-3 was coupled with Boc–alanine using diisopropylcarbodiimide and 1-hydroxy-7-azabenzotriazole. The resin was filtered and washed under the same conditions as described above. The Boc groups on amino acid were removed by treatment of resin (250 mg) with trifluoroacetic acid (5 mL). Finally the resin was washed with CH_2Cl_2 (3 x 25 mL), 5% *N, N*-diisopropylethylamine in CH_2Cl_2 (3 x 25 mL), DMF (3 x 25 mL), MeOH (3 x 25 mL) and CH_2Cl_2 (3 x 25 mL) and the beads were dried in vacuo.

Capillary electrophoresis: Capillary electrophoresis was performed on a Crystal CE 300 system (ATI, Madison, WI, USA) equipped with UV absorbance detector. Absorbance wavelength used was 215 nm. A fused-silica separation capillary (Polymicro Technologies, Phoenix, AZ, USA) of

50 µm I.D. (360 µm O.D.) x 72 cm was used with an effective length of 60 cm. An applied voltage of 20 kV was used at ambient temperature. The fused silica capillary was rinsed with 1 M NaOH for 30 min, water for 30 min, and run buffer for 30 min prior to analysis and for 5 min with run buffer between each run. The buffer solution was prepared from Millli-Q system water and was filtered and degassed thoroughly prior to use. All experiments were performed at pH 4 using a 20 m*M* ionic strength phosphate buffer.

^{1}H NMR Spectra of Compounds **1**, **2**, **6** and **12** after deprotection of the Boc groups.