Construction of Well-Defined Multifunctional Dendrimers
Using a Trifunctional Core

Cátia Ornelas and Marcus Weck*

Molecular Design Institute and Department of Chemistry, New York University,
New York, NY, 10003-6688

Supplementary Information

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**General data.**

Anhydrous DMF was purchased from Acros, PEG linker 5 from VWR, and dendrons aminetriester and nitrotriester from Frontier Scientific. All compounds were used as received. Compounds 1, 3, 4, 8 and 16 were synthesized according to literature procedures. Dialysis membranes were purchased from SpectrumLabs and used as received.

**NMR spectroscopy.** $^1$H NMR spectra were recorded at 25°C on a Bruker AC 400 (400 MHz) spectrometer. $^{13}$C NMR spectra were obtained at 100.0 MHz on a Bruker AC 400 spectrometer. All chemical shifts are reported in parts per million (ppm) with reference to solvent residual peaks.

**ESI Mass Spectrometry.** The ESI mass spectra were obtained in an Agilent 1100 Series Capillary LCMSD Trap XCT Spectrometer.

**MALDI-TOF Mass Spectrometry.** MALDI-TOF mass spectra were recorded with a Bruker OmniFLEX MALDI-TOF MS Spectrometer.

**Synthesis of 6**

Dendron 4 (0.460 g, 0.32 mmol), PEG linker 5 (0.200 g, 0.52 mmol) and HATU (0.150 g, 0.41 mmol) were dissolved in 8 mL of dry DMF. Triethylamine (0.1 mL, 0.72 mmol) was added with a syringe and the solution was stirred at room temperature for 16h. The solvent was removed under vacuum and

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the product was purified by column chromatography using silica gel and ethyl acetate as eluent. The final product was obtained as a white powder in 92% yield (0.532 g).

\[^1\text{H} \text{NMR (MeOD, 400 MHz, } \delta_{\text{ppm}} \text{ vs. TMS): } 7.80 \text{ (d, } J = 7.5 \text{ Hz, arom. } CH \text{ fmoc, 2H), 7.66 \text{ (d, } J = 7.4 \text{ Hz, arom. } CH \text{ fmoc, 2H), 7.36 \text{ (t, } J = 7.4 \text{ Hz, arom. } CH \text{ fmoc, 2H), 7.29 \text{ (t, } J = 7.4 \text{ Hz, arom. } CH \text{ fmoc, 2H), 7.33 \text{ (s, CONH, 5H), 4.36 \text{ (d, } J = 6.8 \text{ Hz, } CH_2OCONH, 2H), 4.22 \text{ (t, } J = 6.7 \text{ Hz, } CH_2CH_2CONH, 1H), 3.92 \text{ (s, OCH}_2\text{CONH, 2H), 3.68 \text{ (s, } OCH_2CH_2O, 4H), 3.60 \text{ (t, } J = 5.4 \text{ Hz, OCH}_2CH_2NHfmoc, 2H), 3.34 \text{ (s, OCH}_2CH_2NHfmoc, 2H), 2.17 \text{ (m, } CH_2CH_2COO, 24H), 1.93 \text{ (m, } CH_2CH_2COO, 24H), 1.43 \text{ (s, COOC(CH}_3)_3, 81H).} \]^13\text{C NMR (MeOD, 100 MHz, } \delta_{\text{ppm}} \text{ vs. TMS): 175.3 \text{ (CONH), 174.5 \text{ (COOtBu), 158.9 \text{ (NHCOOCH}_2), 145.5 \text{ and 142.7 (arom. } C_q, 128.9, 128.3, 126.4 \text{ and 121.1 (arom. } CH), 81.7 \text{ (COOC(CH}_3)_3), 72.3, 71.5, 71.2 \text{ and 71.1 (CH}_2CH_2OCH_2), 67.9 \text{ (NHCOOCH}_2), 58.9 \text{ (NHCOOCH}_2), 41.8 \text{ (OOCNHCH}_2\text{CH}_3OH), 32.4 \text{ (CH}_2CH_2CONH), 32.1 \text{ (CH}_2CH_2CONH), 30.8 \text{ (CH}_2CH_2COOtBu), 30.6 \text{ (CH}_2CH_2COOtBu), 28.6 \text{ (COOC(CH}_3)_3). MS-ESI [MNa}^+\text{ ] m/z calcld for C}_{97}H_{155}N_{5}O_{26}Na: 1829.1, \text{ found 1827.1. Anal. calcld. for C}_{97}H_{155}N_{5}O_{26}: C 64.46, H 8.64; found C 64.19, H 8.53.}

**Synthesis of 7**

Dendron 6 (0.174 g, 0.096 mmol) was dissolved in 20 mL of formic acid and 2 mL of water were added. The solution was stirred at room temperature for 16h. The solution was evaporated to dryness and the product was washed three times with ethyllic ether. The final product was obtained as a white solid in 97% yield (0.121 g).

\[^1\text{H} \text{NMR (MeOD, 400 MHz, } \delta_{\text{ppm}} \text{ vs. TMS): 8.09 \text{ (s, CONH, 5H), 7.79 \text{ (d, } J = 7.5 \text{ Hz, arom. } CH \text{ fmoc, 2H), 7.64 \text{ (d, } J = 7.4 \text{ Hz, arom. } CH \text{ fmoc, 2H), 7.38 \text{ (t, } J = 7.4 \text{ Hz, arom. } CH \text{ fmoc, 2H), 7.31 \text{ (t, } J = 7.4 \text{ Hz, arom. } CH \text{ fmoc, 2H), 4.38 \text{ (d, } J = 6.8 \text{ Hz, } CH_2OCONH, 2H), 4.21 \text{ (t, } J = 6.7 \text{ Hz, } CHCH_2OCONH, 1H), 3.93 \text{ (s, OCH}_2\text{CONH, 2H), 3.67 \text{ (s, } OCH_2CH_2O, 4H), 3.58 \text{ (t, } J = 5.4 \text{ Hz,}}\]
OCH₂CH₂NHfmoc, 2H), 3.33 (m, OCH₂CH₂NHfmoc, 2H), 2.27 (m, CH₂CH₂COO, 18H), 2.17 (m, CH₂CH₂CONH, 6H), 2.02 (m, CH₂CH₂COO, 24H). $^{13}$C NMR (MeOD, 100 MHz, δ ppm vs. TMS): 177.2 (COOH), 175.5 (CONH), 159.1 (NHCOOCH₂), 145.5 and 142.7 (arom. C₆), 128.9, 128.3, 126.3 and 121.1 (arom. CH), 72.3, 71.5, 71.2 and 71.1 (CH₂OCH₂), 67.8 (NHCOOCH₂), 58.7 (NHC₆), 41.7 (OOCNHC₆H₂O₂), 32.2 (CH₃CH₂CONH), 31.9 (CH₂CH₂CONH), 30.6 (CH₂CH₂COO), 29.4 (CH₂CH₂COO). MS-ESI [MNa⁺] m/z calcd for C₆₁H₈₃N₅O₂₆Na: 1324.5, found 1324.4. Anal. calcd. for C₆₁H₈₃N₅O₂₆: C 56.26, H 6.42; found C 55.87, H 6.33.

**Synthesis of 9**

Dendron 7 (0.058 g, 0.045 mmol) and HATU (0.187 g, 0.53 mmol) were dissolved in 6 mL of dry DMF. Triethylamine (0.15 mL, 1.1 mmol) and 3-aminopropyl azide 8 (0.080 g, 0.80 mmol) were successively added with a syringe and the solution was stirred at room temperature for 24h. The solvent was removed under vacuum and the product was purified by column chromatography using silica gel and CH₂Cl₂/methanol (90/10) as eluent. The final product was obtained as a colorless waxy product in 92% yield (0.083 g).

$^1$H NMR (MeOD, 400 MHz, δ ppm vs. TMS): 7.86 and 7.32 (s, CONH, 14H), 7.81 (d, J = 7.5 Hz, arom. CH fmoc, 2H), 7.67 (d, J = 7.4 Hz, arom. CH fmoc, 2H), 7.40 (t, J = 7.4 Hz, arom. CH fmoc, 2H), 7.33 (t, overlapped with singlet of CONH, arom. CH fmoc, 2H), 4.33 (d, J = 7.0 Hz, CH₂OCONH, 2H), 4.22 (t, J = 7.0 Hz, CHCH₂OCONH, 1H), 3.96 (s, OCH₂CONH, 2H), 3.70 and 3.68 (s, OCH₂CH₂O, 4H), 3.59 (t, J = 5.9 Hz, OCH₂CH₂NHfmoc, 2H), 3.34 (t, J = 6.7 Hz, OCH₂CH₂NHfmoc and CH₂N₃, 20H), 2.23 (t, J = 6.6 Hz, NHCH₂CH₂CH₂N₃, 18H), 2.17 (m, CH₂CH₂CONH, 24H), 1.99 (m, CH₂CH₂CONH, 24H), 1.74 (m, NHCH₂CH₂CH₂N₃, 18H). $^{13}$C NMR
(MeOD, 100 MHz, δppm vs. TMS): 175.5 (CONH), 159.2 (NHCOOCH₂), 145.5 and 142.7 (arom. C₂), 128.9, 128.3, 126.3 and 121.2 (arom. CH), 72.3, 71.6, 71.2 and 71.1 (CH₂OCH₂), 67.7 (NHCOOCH₂), 58.9 (NHC₃), 50.3 (CH₂N₃), 41.7 (OOCNHCH₂CH₂O), 38.1 (NHCH₂CH₂CH₂N₃), 31.7 (CH₂CH₂CONH), 31.4 (CH₂CH₂CONH), 29.8 (NHCH₂CH₂CH₂N₃). MS-ESI [MH⁺] m/z calcd for C₈₈H₁₃₈N₄₁O₁₇: 2041.1, found 2042.2. Anal. calcd. for C₈₈H₁₃₇N₄₁O₁₇6: C 51.78, H 6.76; found C 51.49, H 6.68.

**Synthesis of 10**

Dendron 9 (0.076 g, 0.037 mmol) was dissolved in 2 mL of DMF and 0.4 mL of piperidine was added. The solution was stirred at room temperature for 30 min. The solvent was removed and the product was purified by dialysis against water (3 x 1L) using a Spectra-Por MWCO 500-1000 dialysis membrane. The final product was obtained as a colorless waxy product in 98% yield (0.066 g).

¹H NMR (MeOD, 400 MHz, δppm vs. TMS): 3.95 (s, OC₂H₂CONH, 2H), 3.77 (t, J = 5.0 Hz, OCH₂CH₂NH₂, 2H) 3.64 (s, OCH₂CH₂O, 4H), 3.34 (t, J = 6.7 Hz, CH₂N₃, 18H), 3.23 (t, J = 6.8 Hz, NHCH₂CH₂CH₂N₃, 18H), 2.19 (m, CH₂CH₂CONH, 24H), 2.00 (m, CH₂CH₂CONH, 24H), 1.74 (m, NHCH₂CH₂CH₂N₃, 18H). ¹³C NMR (MeOD, 100 MHz, δppm vs. TMS): 175.6 (CONH), 72.1, 71.4, 71.2 and 70.3 (CH₂OCH₂), 59.3 (NHC₃), 50.2 (CH₂N₃), 41.6 (NH₂CH₂CH₂O), 38.0 (NHCH₂CH₂CH₂N₃), 31.7 (CH₂CH₂CONH), 31.4 (CH₂CH₂CONH), 29.8 (NHCH₂CH₂CH₂N₃). MS-ESI [MH⁺] m/z calcd for C₇₃H₁₂₈N₄₁O₁₅: 1819.0, found 1819.3. Anal. calcd. for C₇₃H₁₂₇N₄₁O₁₅: C 48.20, H 7.04; found C 47.92, H 6.96.
**Synthesis of 12:**

Dimethyl 5-aminoisophthalate (2.00 g, 9.56 mmol) was dissolved in 100 mL of dry methylene chloride. Triethylamine (3.05 mL, 28.7 mmol) and di-tert-butyl dicarbonate (4.39 mL, 19.1 mmol) were successively added and the solution was stirred at room temperature for 16h. Solvent was removed under vacuum giving a yellow solid. The product was purified by column chromatography using silica gel and hexane/ethyl acetate (80/20) as eluent. The final product was obtained as a white powder in 66% yield (1.95 g).

$^1$H NMR (MeOD, 400 MHz, $\delta_{ppm}$ vs. TMS): 8.30 (s, arom. CH, 2H), 8.23 (s, arom. CH, 1H), 3.93 (s, COOCH$_3$, 6H), 1.54 (s, C(CH$_3$)$_3$, 9H). $^{13}$C NMR (MeOD, 100 MHz, $\delta_{ppm}$ vs. TMS): 167.7 (COOCH$_3$), 155.1 (COOtBu), 141.9 (arom. CNH), 132.6 (arom. CCOOCH$_3$), 125.2 and 124.4 (arom. CH), 81.6 (C(CH$_3$)$_3$), 53.1 (COOCH$_3$), 28.8 (C(CH$_3$)$_3$). MS-ESI [M$^-$] $m/z$ calcd for C$_{15}$H$_{18}$NO$_6$: 308.1, found 308.4. Anal. calcd. for C$_{15}$H$_{18}$NO$_6$: C 58.25, H 6.19; found C 58.47, H 6.29.

**Synthesis of 13:**

Product 12 (1.21 g, 3.91 mmol) was dissolved in 90 mL of methanol and an aqueous solution of sodium hydroxide (0.156 g, 3.91 mmol in 10 mL of water) was added. The solution was stirred at room temperature for 24h and the solvent was removed under vacuum. The product was purified by column chromatography using silica gel and ethyl acetate/MeOH (96/4) as eluent. The final product was obtained as a white powder in 77% yield (0.89 g).

$^1$H NMR (MeOD, 400 MHz, $\delta_{ppm}$ vs. TMS): 8.32, 8.29 and 8.25 (s, arom. CH, 3H), 3.93 (s, COOCH$_3$, 3H), 1.53 (s, C(CH$_3$)$_3$, 9H). $^{13}$C NMR (MeOD, 100 MHz, $\delta_{ppm}$ vs. TMS): 168.8 (COOCH$_3$), 167.7
(COOH), 155.0 (COOtBu), 141.6 (arom. CNH), 133.2 (arom. CCOOH), 132.3 (arom. CCOOCH₃), 125.5, 124.8 and 124.3 (arom. CH), 81.6 (C(CH₃)₃), 53.0 (COOCH₃), 28.8 (C(CH₃)₃). MS-ESI [M'] m/z calcd for C₁₄H₁₆NO₆: 294.1, found 293.8. Anal. calcd. for C₁₄H₁₇NO₆: C 56.94, H 5.80; found C 57.16, H 5.69.

**Synthesis of 14:**

![Chemical structure of 14](image)

Product 13 (0.200 g, 0.68 mmol) and HATU (0.283 g, 0.75 mmol) were dissolved in 12 mL of dry DMF. Propargylamine (0.065 mL, 1.02 mmol) and diisopropylethylamine (0.24 mL, 1.35 mmol) were added with a syringe and the solution was stirred at room temperature for 16h. The solvent was removed under vacuum and the product was purified by column chromatography using silica gel and CH₂Cl₂/MeOH (98/2) as eluent. The final product was obtained as a white powder in 98% yield (0.22 g).

^1^H NMR (MeOD, 400 MHz, δ ppm vs. TMS): 8.27 (s, arom. CH, 1H), 8.08 (s, arom. CH, 2H), 4.15 (d, J = 2.5 Hz, NHCH₂C≡CH, 2H), 3.93 (s, COOCH₃, 3H), 2.61 (s, C≡CH, 1H), 1.54 (s, C(CH₃)₃, 9H).

^1^3^C NMR (MeOD, 100 MHz, δ ppm vs. TMS): 168.9 (COOCH₃), 167.8 (CONHCH₂), 155.2 (COOtBu), 141.8 (arom. CNH), 136.6 (arom. CCONH), 132.5 (arom. CCOOCH₃), 123.4, 123.2 and 122.9 (arom. CH), 81.7 (C(CH₃)₃), 80.7 (C≡CH), 72.3 (C≡CH), 53.0 (COOCH₃), 30.2 (NHCH₂), 28.8 (C(CH₃)₃). MS-ESI [M(H₂O)⁺] m/z calcd for C₁₇H₂₂N₂O₆: 350.1, found 349.3. Anal. calcd. for C₁₇H₂₀N₂O₅: C 61.44, H 6.01; found C 61.23, H 6.16.

**Synthesis of 15:**

![Chemical structure of 15](image)

Product 14 (0.200 g, 0.60 mmol) was dissolved in 20 mL of methanol and an aqueous solution of sodium hydroxide (0.036 g, 0.90 mmol, in 1 mL of water) was added. The solution was stirred at
room temperature for 48h and the solvent was removed under vacuum. The product was purified by column chromatography using silica gel and CH$_2$Cl$_2$/MeOH (80/20) as eluent. The final product was obtained as a beige powder in 87% yield (0.17 g).

$^1$H NMR (MeOD, 400 MHz, $\delta_{ppm}$ vs. TMS): 8.07 (s, arom. CH, 2H), 8.02 (s, arom. CH, 1H), 4.15 (d, $J = 2.2$ Hz, NHCH$_2$C=CH, 2H), 2.62 (s, C≡CH, 1H), 1.52 (s, C(CH$_3$)$_3$, 9H). $^{13}$C NMR (MeOD, 100 MHz, $\delta_{ppm}$ vs. TMS): 169.7 (COOH and CONHCH$_2$), 155.2 (COOtBu), 141.0 (arom. CNH), 135.9 (arom. CCONH), 130.5 (arom. CCOOH) 123.8, 123.2 and 120.8 (arom. CH), 81.2 (C(CH$_3$)$_3$), 81.0 (C≡CH), 72.3 (C≡CH), 30.1 (NHCH$_2$), 28.8 (C(CH$_3$)$_3$). MS-ESI [M$^+$] $m/z$ calcd for C$_{16}$H$_{17}$N$_2$O$_5$: 317.3, found 317.3. Anal. calcd. for C$_{16}$H$_{18}$N$_2$O$_5$: C 60.37, H 5.70; found C 60.07, H 5.61.

**Synthesis of 17**

Products 15 (0.088 g, 0.28 mmol) and 16 (0.085 g, 0.17 mmol) were dissolved in 200 mL of CH$_2$Cl$_2$/EtOH/H$_2$O (1:1:2) solvent mixture. Aqueous solutions of CuSO$_4$.5H$_2$O (0.050 g, 0.20 mmol) and sodium ascorbate (0.079 g, 0.40 mmol) were successively added and the solution was stirred at room temperature for 24h. The solvent was removed under vacuum and the product was purified by reverse-phase column using methanol as eluent. The product was obtained as a yellow solid in 62% yield (0.085 g).

$^1$H NMR (MeOD, 400 MHz, $\delta_{ppm}$ vs. TMS): 8.10 (s, arom. CH, 2H), 8.05 (s, arom. CH, 1H), 7.84 (s, triazole CH, 1H), 7.51 (m, arom. CH, 1H), 7.31 (m, arom. CH, 1H), 6.98 (m, arom. CH, 2H), 6.69 (s, arom. CH, 2H), 6.20 (m, arom. CH, 2H), 4.64 (s, triazole-CH$_2$CH$_2$, 2H), 4.53 (s, NHCH$_2$-triazole, 2H), 3.49 (m, NHCH$_2$CH$_2$CH$_2$-triazole, 2H), 1.92 (m, NHCH$_2$CH$_2$CH$_2$-triazole, 2H), 1.51 (s, C(CH$_3$)$_3$, 9H). $^{13}$C NMR (MeOD, 100 MHz, $\delta_{ppm}$ vs. TMS): 182.7 (NHC=S), 173.8 (COO), 169.7 (COOH and CONHCH$_2$), 158.5 (arom. C$_q$OH), 155.2 (COOtBu), 142.3 and 123.2 (CH of triazole), 141.1 (arom. CNH), 141.6, 139.5, 130.5, 126.8 and 124.4 (arom. C$_q$ of FITC), 135.9 (arom. CCONH),
132.4, 121.1 and 104.3 (arom. CH of FITC), 130.5 (arom. CCOOH), 123.7, 123.1 and 120.6 (arom. CH of core), 81.2 (C(CH₃)₃), 57.6 (NHCH₂-triazole), 51.0 (NHCH₂CH₂CH₂-triazole), 38.9 (NHCH₂CH₂CH₂), 29.0 (NHCH₂CH₂CH₂), 28.8 (C(CH₃)₃). MS MALDI-TOF [MH⁺] m/z calcd for C₄₀H₃₈N₇O₁₀S: 808.1, found: 808.6. Anal. calcd. for C₄₀H₃₇N₇O₁₀S: C 59.47, H 4.62; found C 59.49, H 4.69.

**Synthesis of 18**

Product 17 (0.016 g, 0.018 mmol), dendron 10 (0.040 g, 0.022 mmol) and HATU (0.0084 g, 0.024 mmol) were dissolved in 5 mL of dry DMF and diisopropylethylamine (0.007 mL, 0.040 mmol) was added. The solution was stirred at room temperature for 24h. The solvent was removed under vacuum and the product was purified by dialysis against methanol (3 x 1L), using a Spectra-Por MWCO 2000 dialysis membrane. The product was obtained as a yellow waxy product in 72% yield (0.039 g).

¹H NMR (MeOD, 400 MHz, δ ppm vs. TMS): 7.97 (s, arom. CH, 3H), 7.87 (s, triazole CH, 1H), 7.70 (s, CONH, 16H), 7.64 (d, J = 8.2 Hz, arom. CH, 1H), 7.43 (s, arom. CH, 1H), 7.29 (d, J = 8.2 Hz, arom. CH, 1H), 6.72 (s, arom. CH, 2H), 6.55 (d, J = 7.3 Hz, arom. CH, 2H), 4.64 (s, triazole-CH₂CH₂, 2H), 4.55 (s, NHCH₂-triazole, 2H), 3.97 (s, OCH₂CONH, 2H), 3.78 (t, J = 4.9 Hz, OCH₂CH₂NHCO, 2H), 3.66 (s, OCH₂CH₂O, 4H), 3.50 (t, J = 6.5 Hz, NHCH₂CH₂CH₂-triazole, 2H), 3.36 (t, J = 6.7 Hz, CH₂N₃, 18H), 3.25 (t, J = 6.8 Hz, NHCH₂CH₂CH₂N₃, 18H), 2.19 (m, CH₂CH₂CONH, 24H), 2.00 (m, CH₂CH₂CONH and NHCH₂CH₂CH₂-triazole, 26H), 1.76 (m, NHCH₂CH₂CH₂N₃, 18H), 1.52 (s, C(CH₃)₃, 9H). ¹³C NMR (MeOD, 100 MHz, δ ppm vs. TMS): 182.7 (NHC=S), 175.6 (CONH), 169.7 (CONHCH₂), 158.5 (arom. C₉OH), 155.1 (COOttBu), 142.3 and 123.2 (CH of triazole), 141.2 (arom. CNH), 141.6, 139.5, 130.4, 126.6 and 124.5 (arom. C₉ of FITC), 135.9 (arom. CCONH), 132.4, 121.1 and 104.3 (arom. CH of FITC), 123.7, 123.1 and 120.5 (arom. CH of core), 81.2 (C(CH₃)₃), 72.2, 71.5, 71.3 and 70.4 (CH₂OCH₂), 59.3 (NH₃C), 57.4 (NHCH₂-triazole), 51.0 (NHCH₂CH₂CH₂-
triazole), 50.3 (CH$_2$N$_3$), 41.6 (NH$_2$CH$_2$CH$_2$O), 38.8 (NHCH$_2$CH$_2$CH$_2$), 38.0 (NHCH$_2$CH$_2$CH$_2$N$_3$), 31.7 (CH$_2$CH$_2$CONH), 31.4 (CH$_2$CH$_2$CONH), 29.8 (NHCH$_2$CH$_2$CH$_2$N$_3$), 29.2 (NHCH$_2$CH$_2$CH$_2$), 28.8 (C(CH$_3$)$_3$). MS MALDI-TOF [MH$^+$] m/z calcd for C$_{113}$H$_{163}$N$_{48}$O$_{24}$S: 2608.3, found: 2609.6. Anal. calcd. for C$_{113}$H$_{162}$N$_{48}$O$_{24}$S: C 52.02, H 6.26; found C 51.83, H 6.15.

**Synthesis of 19**

Dendron 18 (0.030 g, 0.011 mmol) was dissolved in 20 mL of formic acid and 2 mL of water was added. The solution was stirred at room temperature for 16h. The solution was evaporated to dryness and the product was washed three times with ethylic ether. The final product was obtained as a yellow waxy product in 95% yield (0.027 g).

$^1$H NMR (MeOD, 400 MHz, $\delta_{ppm}$ vs. TMS): 7.97 (s, arom. CH, 1H), 7.87 (s, triazole CH, 1H), 7.70 (s, CONH, 16H), 7.64 (d, $J = 8.2$ Hz, arom. CH, 1H), 7.43 (s, arom. CH, 3H), 7.29 (d, $J = 8.1$ Hz, arom. CH, 1H), 6.72 (s, arom. CH, 2H), 6.55 (s, arom. CH, 2H), 4.64 (s, triazole-CH$_2$CH$_2$, 2H), 4.55 (s, NHCH$_2$triazole, 2H), 3.97 (s, OCH$_2$CONH, 2H), 3.78 (m, OCH$_2$CH$_2$NHCO, 2H), 3.66 (s, OCH$_2$CH$_2$O, 4H), 3.50 (m, NHCH$_2$CH$_2$CH$_2$-triazole, 2H), 3.36 (t, $J = 6.7$ Hz, CH$_2$N$_3$, 18H), 3.25 (t, $J = 6.8$ Hz, NHCH$_2$CH$_2$CH$_2$N$_3$, 18H), 2.19 (m, CH$_2$CH$_2$CONH, 24H), 2.00 (m, CH$_2$CH$_2$CONH and NHCH$_2$CH$_2$CH$_2$-triazole, 26H), 1.76 (m, NHCH$_2$CH$_2$CH$_2$N$_3$, 18H). $^{13}$C NMR (MeOD, 100 MHz, $\delta_{ppm}$ vs. TMS): 182.7 (NHC=S), 175.6 (CONH), 169.7 (CONHCH$_2$), 158.5 (arom. C$_4$OH), 148.2 (arom. CNH), 142.3 and 123.2 (CH of triazole), 141.6, 139.5, 130.4, 126.6 and 124.5 (arom. C$_4$ of FITC), 135.9 (arom. CCONH), 132.4, 121.1 and 104.3 (arom. CH of FITC), 116.0, 115.7 and 115.1 (arom. CH of core), 72.2, 71.5, 71.3 and 70.4 (CH$_2$OCH$_2$), 59.3 (NH$_2$N$_3$), 57.4 (NHCH$_2$-triazole), 51.0 (NHCH$_2$CH$_2$CH$_2$-triazole), 50.3 (CH$_2$N$_3$), 41.6 (NH$_2$CH$_2$CH$_2$O), 38.8 (NHCH$_2$CH$_2$CH$_2$), 38.0 (NHCH$_2$CH$_2$CH$_2$N$_3$), 31.7 (CH$_2$CH$_2$CONH), 31.4 (CH$_2$CH$_2$CONH), 29.8 (NHCH$_2$CH$_2$CH$_2$N$_3$), 29.2

Synthesis of 20

Dendron 4 (0.140 g, 0.097 mmol) was dissolved in 5 mL of pyridine and succinic anhydride (0.020 g, 0.194 mmol) was added. The solution was stirred at room temperature for 48h. The solvent was removed and the product was purified by column chromatography using silica gel and ethyl acetate as eluent. Dendron 20 was obtained as a white solid in 92% yield (0.138 g).

¹H NMR (MeOD, 400 MHz, δppm vs. TMS): 7.49 and 7.28 (s, CONH, 4H), 2.63 (t, J = 6.5 Hz, CH₂CH₂COOH, 2H), 2.46 (t, J = 6.5 Hz, CH₂CH₂COOH, 2H), 2.17 (m, C₉H₅CH₂CO, 24H), 1.94 (m, C₉H₅CH₂CO, 24H), 1.45 (s, COOC(CH₃)₃, 81H). ¹³C NMR (MeOD, 100 MHz, δppm vs. TMS): 175.3 (CONH), 174.5 (COOtBu), 173.8 (COOH), 81.5 (COOC(CH₃)₃), 58.8 (NHC₉), 32.5 (CH₂CH₂CONH), 32.2 (CH₂CH₂CONH), 30.6 (CH₂CH₂COOtBu), 30.4 (CH₂CH₂COOtBu), 30.0 (CH₂CH₂COOH), 29.6 (CH₂CH₂COOH), 28.3 (COOC(CH₃)₃). MS-ESI [M⁺] m/z calcd for C₈₀H₁₃₈N₄O₂₄: 1539.0, found 1538.3. Anal. calcd. for C₈₀H₁₃₈N₄O₂₄: C 62.39, H 9.03; found C 62.32, H 9.01.
Synthesis of 21

Product 19 (0.020 g, 0.0080 mmol) and dendron 20 (0.015 g, 0.010 mmol) were dissolved in 5 mL of dry DMF. HATU (0.0034 g, 0.010 mmol) and diisopropylethylamine (0.003 g, 0.020 mmol) were added, and the solution was stirred at room temperature for 24h. The solvent was removed under vacuum and the product was purified by dialysis against methanol (3 x 1L), using a Spectra-Por MWCO 2000 dialysis membrane. Dendrimer 21 was obtained as a yellow waxy product in 81% yield (0.026 g).

$^1$H NMR (MeOD, 400 MHz, $\delta_{ppm}$ vs. TMS): 8.01-6.41 (arom. CH and CONH, 20H), 4.61 (s, triazole-CH$_2$CH$_2$, 2H), 4.58 (s, NHCH$_2$-triazole, 2H), 4.58 (s, NHC$_2$H$_2$-triazole, 2H), 3.96 (s, COOCH$_2$CONH, 2H), 3.90 (s, OCH$_2$CHOCH$_2$NHCO, 2H), 3.66 and 3.64 (s, OCH$_2$CHO, 4H), 3.45 (m, NHCH$_2$CH$_2$-triazole, 2H), 3.36 (t, J = 6.6 Hz, CH$_2$N$_3$, 18H), 3.25 (t, J = 6.7 Hz, NHCH$_2$CH$_2$N$_3$, 18H), 2.64 (m, CH$_2$CHOCONH, 2H), 2.47 (m, CH$_2$CH$_2$CONH and CH$_2$CHOOtiBu, 48H), 2.00 (m, CH$_2$CHOCONH, CH$_2$CHOOtiBu and NHCH$_2$CH$_2$-triazole, 50H), 1.76 (m, NHCH$_2$CH$_2$CH$_2$N$_3$, 18H), 1.45 (s, COOC(CH$_3$)$_3$, 81H). $^{13}$C NMR (MeOD, 100 MHz, $\delta_{ppm}$ vs. TMS): 182.7 (NHCC=S), 175.5, 175.3, 174.4 and 169.6 (C=O), 158.5 (arom. C$_q$OH), 148.1 (arom. CNH), 142.2 and 123.2 (CH of triazole), 141.6, 139.5, 130.4, 126.5 and 124.4 (arom. C$_q$ of FITC), 135.9 (arom. CCONH), 132.5, 121.2 and 104.2 (arom. CH of FITC), 116.1, 115.8 and 115.7 (arom. CH of core), 81.4 (COOC(CH$_3$)$_3$), 72.2, 71.5, 71.2 and 70.2 (CH$_2$OCH$_2$), 59.3 (NH$_2$), 57.4 (NHCH$_2$-triazole), 51.0 (NHCH$_2$CH$_2$CH$_2$-triazole), 50.2 (CH$_2$N$_3$), 41.6 (NH$_2$CH$_2$CH$_2$O), 38.7 (NHCH$_2$CH$_2$CH$_2$), 37.9 (NHCH$_2$CH$_2$CH$_2$N$_3$), 31.7 (CH$_2$CHOCONH), 31.4 (CH$_2$CHOCONH), 30.5 (CH$_2$CHOOtiBu), 30.3 (CH$_2$CHOOtiBu), 29.7 (NHCH$_2$CH$_2$CH$_2$N$_3$), 29.2 (NHCH$_2$CH$_2$CH$_2$), 28.3 (COOC(CH$_3$)$_3$). MS MALDI-TOF [MH$^+$] $m/z$ calcd for C$_{188}$H$_{291}$N$_{52}$O$_{45}$S: 4029.2, found: 4030.1. Anal. calcd. for C$_{188}$H$_{290}$N$_{52}$O$_{45}$S: C 56.02, H 7.25; found C 55.74, H 7.16.
Synthesis of 22

Dendrimer 21 (0.020 g, 0.0050 mmol) was dissolved in 20 mL of formic acid and 2 mL of water were added. The solution was stirred at room temperature for 16h. The solution was evaporated to dryness and the product was washed three times with ethylic ether. Dendrimer 22 was obtained as a yellow waxy product in 96% yield (0.017 g).

$^1$H NMR (MeOD, 400 MHz, δ<sub>ppm</sub> vs. TMS): 8.01-6.41 (arom. CH and CONH, 20H), 4.61 (s, triazole-CH<sub>2</sub>CH<sub>2</sub>, 2H), 4.58 (s, NHCH<sub>2</sub>-triazole, 2H), 3.95 (s, OCH<sub>2</sub>CONH, 2H), 3.90 (s, OCH<sub>2</sub>CH<sub>2</sub>NHCO, 2H), 3.70-3.48 (m, OCH<sub>2</sub>CH<sub>2</sub>O and NHCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>-triazole, 6H), 3.35 (t, J = 5.5 Hz, CH<sub>2</sub>N<sub>3</sub>, 18H), 3.24 (t, J = 6.3 Hz, NHCH<sub>2</sub>CH<sub>2</sub>N<sub>3</sub>, 18H), 2.64 (m, CH<sub>2</sub>CH<sub>2</sub>CONH, 2H), 2.47 (m, CH<sub>2</sub>CH<sub>2</sub>CONH, 2H), 2.27 (m, CH<sub>2</sub>CH<sub>2</sub>COOH, 18H), 2.17 (m, CH<sub>2</sub>CH<sub>2</sub>CONH, 24H), 2.00 (m, CH<sub>2</sub>CH<sub>2</sub>CONH, CH<sub>2</sub>CH<sub>2</sub>COOH and NHCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>-triazole, 50H), 1.76 (m, NHCH<sub>2</sub>CH<sub>2</sub>N<sub>3</sub>, 18H). $^{13}$C NMR (MeOD, 100 MHz, δ<sub>ppm</sub> vs. TMS): 182.8 (NHC=S), 175.5, 175.3, 174.4, 173.2 and 169.6 (C=O), 158.4 (arom. C<sub>q</sub>OH), 148.0 (arom. CNH), 142.2 and 123.3 (CH of triazole), 141.6, 139.5, 130.5, 126.5 and 124.3 (arom. C<sub>q</sub> of FITC), 135.8 (arom. CCONH), 132.5, 121.2 and 104.2 (arom. CH of FITC), 116.1, 115.8 and 115.7 (arom. CH of core), 72.3, 71.6, 71.2 and 70.4 (CH<sub>2</sub>OCH<sub>2</sub>), 59.4 (NHC<sub>q</sub>), 57.4 (NHCH<sub>2</sub>-triazole), 51.0 (NHCH<sub>2</sub>CH<sub>2</sub>-triazole), 50.2 (CH<sub>2</sub>N<sub>3</sub>), 41.6 (NH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>O), 38.7 (NHCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>), 37.8 (NHCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>N<sub>3</sub>), 31.7 (CH<sub>2</sub>CH<sub>2</sub>CONH), 31.4 (CH<sub>2</sub>CH<sub>2</sub>CONH), 30.5 (CH<sub>2</sub>CH<sub>2</sub>COOH), 30.6 (CH<sub>2</sub>CH<sub>2</sub>COOH), 29.7 (NHCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>N<sub>3</sub>), 29.4 (CH<sub>2</sub>CH<sub>2</sub>COOH), 29.2 (NHCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>). MS MALDI-TOF [MH<sup>+</sup>] m/z calcd for C<sub>152</sub>H<sub>129</sub>N<sub>52</sub>O<sub>45</sub>S: 3524.6, found: 3524.2. Anal. calcd. for C<sub>152</sub>H<sub>128</sub>N<sub>52</sub>O<sub>45</sub>S: C 56.02, H 7.25; found C 55.81, H 7.12.
Mass Spectra

Exact Mass: 1806.10

\[ (M/2)H^+ \]

904.4

\[ MNa^+ \]

1827.1

Exact Mass: 1806.10

Background Subtracted, Baseline subtracted (0.80)
Exact Mass: 1301.53

Normal Mass: 1324.4

(M/2)Na+ 673.4

Exact Mass: 2040.11

(M/2)Na+ 1021.5
Exact Mass: 295.11

Exact Mass: 332.14
Exact Mass: 318.12

Exact Mass: 489.11
MALDI-TOF mass spectrum of 17

Exact Mass: 807.23

MALDI-TOF mass spectrum of 21

Exact Mass: 4028.17
MALDI-TOF mass spectrum of 22

3524.2

Exact Mass: 3523.61
\(^1\text{H NMR Spectra}\)

\(^1\text{H NMR spectrum of product 6}\)
$^1$H NMR spectrum of product 7

$^1$H NMR spectrum of product 9
$^1$H NMR spectrum of product 10

$^1$H NMR spectrum of product 12
\textbf{\textsuperscript{1}H NMR spectrum of product 19}

\begin{center}
\includegraphics[width=\textwidth]{1h_nmr_product_19}
\end{center}

\textbf{\textsuperscript{1}H NMR spectrum of product 20}

\begin{center}
\includegraphics[width=\textwidth]{1h_nmr_product_20}
\end{center}
1H NMR spectrum of product 21

1H NMR spectrum of product 22