Total Synthesis of Anachelin H

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Supporting Information

Abbreviations. CDI = Carbonyldiimidazole; DMAP = *N, N*-Dimethylaminopyridine; EDC = Ethyl-(*N, N*-dimethylaminopropyl)carbodiimide; ether refers to diethylether; RT = room temperature; TBS = *tert*-Butyl-dimethylsilyl; Z = Benzyloxycarbonyl.

General. Unless otherwise stated, chemicals were purchased from Fluka, ABCR or Acros and used without further purification. H-Ser(OBn)-OH was purchased from Senn Chemicals, Switzerland. Commercially available TBSOTf was distilled and stored at 4 °C. 2,6-Lutidine was distilled from CaH₂ and stored at 4 °C. CDI was recrystallized from THF. Solvents for work-up and chromatography were distilled from technical quality. Solvents used for chemical transformations were either puriss quality or dried over columns of dried aluminium oxide. Z-Ser(OBn)-OH was prepared according to reference [1]. 2-O-Bn-salicylic acid was prepared according to reference [2]. (S)-[2-(3,4-Dihydroxy-phenyl)-1-dimethylcarbamoyl-ethyl]-carbamic acid *tert*-butyl ester was prepared according to [3]. 7-Benzyloxy-(6S)-6-benzyloxycarbonylamino-(5R)-5-hydroxy-3-oxo-heptanoic acid methyl ester was prepared according to [3]. MgCl₂ was stored and weighed in a glove box under inert atmosphere.

Reactions were run under an atmosphere of Ar in dry glassware (at least 24 h in an oven at 140 °C, followed by heating with a heat gun under high vacuum). Analytical thin layer chromatography (TLC) was performed on Merck silica gel 60 F254 plates (0.25 mm thickness) precoated with a fluorescent indicator. The developed plates were examined under UV light and stained with ceric ammonium phosphate (CAM) stain or KMnO₄ stain followed by heating. Flash chromatography was performed using silica gel 60 (230-400 mesh) from Fluka. All ¹H and ¹³C NMR spectra were recorded using either Varian Gemini (300 MHz (¹H) or 75 MHz (¹³C)), Varian Mercury (300 MHz (¹H) or 75 MHz (¹³C)), Bruker AMX (500 MHz (¹H) or 125 MHz (¹³C)) or Bruker DMX 500 MHz

(^1H) or 125 MHz (^{13}C) FT spectrometers at ambient temperature, chemical shifts δ are given in ppm, coupling constants J are in Hz. IR spectra were recorded as CHCl_3 solution using a Perkin Elmer RX I FT-IR spectrometer, absorptions are given in cm^{-1} . Optical rotations were measured using a 1 mL cell with a 1 dm path length on a Jasco DIP 1000 digital polarimeter, the concentration c is given in g/100 mL. Elemental analyses were performed by the Mikroanalyse Labor of the Laboratorium für Organische Chemie der ETH Zürich. All mass spectra were recorded by the Massspectroscopy Service of the Laboratorium für Organische Chemie der ETH Zürich on a Ion spec Ultima 4.7 spectrometer in 2,5-DHB matrix using MALDI, and on TSQ 7000 using ESI. Fragment ions are given in m/z with relative intensities (%) in parentheses.

**(2S)-[2-(3,4-Bis-benzyloxy-phenyl)-1-dimethylcarbamoyl-ethyl]-carbamic acid
tert-butyl ester**

(S)-[2-(3,4-Dihydroxy-phenyl)-1-dimethylcarbamoyl-ethyl]-carbamic acid tert-butyl ester (6.48 g, 20 mmol) was dissolved in acetone (150 mL) and Cs_2CO_3 (19.55 g, 60 mmol, 3 eq) was added. The reaction mixture was stirred at this temperature for 15 minutes and the color turned red. Then benzyl bromide (7.13 mL, 60 mmol, 3 eq) was added and the reaction mixture was refluxed for 4 hours. The solvent was evaporated under reduced pressure and the residue taken up in AcOEt. It was washed 3x with citric acid, 3x with satd. NaHCO_3 soln., 2x with H_2O and 2x with brine. The organic phase was dried over MgSO_4 , filtered and evaporated under reduced pressure. The obtained solid was recrystallised from AcOEt/hexane 1:5 to give the title compound. FC (Hexane / AcOEt 1:1) of the evaporated mother liquor gave another 2 g to finally yield **15** (9.6 g, 19 mmol, 95%). White solid. M_p = 85-88 °C. R_f = 0.3 (AcOEt/Hexane 1:1). $[\alpha]_D^{25} = +27.5$ (C = 1.05, CHCl_3 , T = 28.5 °C). $^1\text{H-NMR}$ (CDCl_3 , 300 MHz) δ 1.42 (s, 9H), 2.46 (s, 3H), 2.76 (s, 3H), 2.81 (dd, 1H, $J_1 = 9.33$, $J_2 = 13.07$), 2.91 (dd, 1H, $J_1 = 5.6$, $J_2 = 13.07$), 4.69-4.79 (m, 1H), 5.11 (s, 4H), 5.52 (d, 1H, $J = 8.4$), 6.68 (dd, 1H, $J_1 = 1.56$, $J_2 = 8.41$), 6.82 (m, 2H), 7.24-7.48 (m, 10H). $^{13}\text{C-NMR}$ (CDCl_3 , 75 MHz) 28.5, 35.5, 36.8, 40.0, 51.4, 71.2, 71.3, 76.8, 79.5, 115.2, 116.0, 122.2, 127.3, 127.69, 127.75, 128.3, 128.4, 129.9, 137.1, 137.2, 147.6, 148.7, 155.0, 171.4. IR 3293w, 1704s, 1641s, 1509s. MS 527 (100, $[\text{M}+\text{Na}]^+$).

(2S)-[2-(3,4-Bis-benzyloxy-phenyl)-1-dimethylaminomethyl-ethyl]-carbamic acid *tert*-butyl ester

(2S)-[2-(3,4-Bis-benzyloxy-phenyl)-1-dimethylcarbamoyl-ethyl]-carbamic acid *tert*-butyl ester (7.6 g, 14.8 mmol) was dissolved in CH₂Cl₂ (60 mL) and cooled to 0 °C. Then TFA (60 mL) was added and the reaction mixture was stirred for 1 hour at this temperature and for 1 hour at RT. It was then neutralized by the addition of NaOH (1M) and extracted 3x with AcOEt. The combined organic phases were dried over MgSO₄, filtered and evaporated under reduced pressure. It was directly used without further purification in the next step.

The deprotected amine was dissolved in THF (40 mL) and cooled to 0 °C. Then BH₃·THF (1M) (44.4 mL, 44.4 mmol, 3 eq) was added dropwise and the reaction mixture was refluxed over night. It was cooled to 0 °C and HCl (12N) was added until pH reached 2-3. THF was evaporated under reduced pressure and NaOH (6N) was added until pH = 14. It was extracted 3x with AcOEt and the combined organic phases were dried over MgSO₄, filtered and evaporated under reduced pressure. It was used in the next step without further purification.

The diamine was dissolved in a mixture of dioxane/water 20 mL:20 mL and NaOH (1M, 15.54 mmol, 15.54 mL, 1.05 eq) was added. Boc₂O (3.88 g, 17.76 mmol, 1.2 eq) were added and the reaction mixture was stirred at RT over night. Dioxane was removed and the residual water extracted with 3x AcOEt. The combined organic phases were dried over MgSO₄, filtered and evaporated under reduced pressure. FC (AcOEt/Hexane 8:2) gave **16** (3.8 g, 7.8 mmol, 53%). Colorless oil. R_f = 0.4 (CH₂Cl₂ /

MeOH 9:1). $[\alpha]_D = +19.95$ ($C = 2.05$, CHCl_3 , $T = 27.1\text{ }^\circ\text{C}$). $^1\text{H-NMR}$ (CDCl_3 , 300 MHz) δ 1.44 (s, 9H), 2.06-2.16 (m, 2H), 2.18 (s, 6H), 2.71 (dd, 1H, $J_1 = 6.54$, $J_2 = 13.7$), 2.84 (dd, 1H, $J_1 = 4.05$, $J_2 = 13.7$), 3.78-3.81 (m, 1H), 4.61-4.69 (m, 1H), 5.13 (s, 2H), 5.15 (s, 2H), 6.69 (dd, 1H, $J_1 = 1.86$, $J_2 = 8.09$), 6.82 (d, 1H, $J = 1.86$), 6.87 (d, 1H, $J = 8.4$), 7.23-7.5 (m, 10H). $^{13}\text{C-NMR}$ (CDCl_3 , 75 MHz) 28.5, 38.4, 45.6, 61.7, 71.3, 71.4, 79.1, 115, 116.6, 122.5, 127.2, 127.3, 127.6, 127.7, 128.3, 131.1, 137.2, 137.3, 147.4, 148.5, 155.6. IR 3365w, 2971w, 2768w, 1682s, 1523s. MS 391.2 (48, $[\text{M-Boc}]^+$). HRMS calcd. for $\text{C}_{25}\text{H}_{31}\text{N}_2\text{O}_2$ (M-Boc^+): 391.2380, found: 391.2377.

(3S)-6,7-Bis-benzyloxy-3-*tert*-butoxycarbonylamino-1,1-dimethyl-1,2,3,4-tetrahydro-quinolinium; chloride

(2S)-[2-(3,4-Bis-benzyloxy-phenyl)-1-dimethylaminomethyl-ethyl]-carbamic acid *tert*-butyl ester (1.6 g, 3.26 mmol) was dissolved in MeOH (30 mL), and AcOH (300 μl). The reaction mixture was flushed 3x with argon and Pd/C (10%, 350 mg) was added. Then it was flushed with H_2 and stirred at RT for 4 hours. Pd/C was filtered over Celite and the solvent evaporated under reduced pressure.

17 was dissolved in CH_2Cl_2 (33 mL) and dianisyltelluriumoxide (1.28 g, 3.59 mmol, 1.1 eq) was added. After 20 minutes the color turned red, and the reaction mixture was stirred for another 3 hours at RT. The organic phase was extracted 3x with water and the water phases washed 5x with CH_2Cl_2 . Lyophilization gave **18** that was directly introduced in the next step.

The compound was dissolved in dry aceton (30 mL) and Cs_2CO_3 (3.19 g, 9.78 mmol, 3 eq) was added. After addition of BnBr (3.27 mL, 9.78 mmol, 3 eq), the reaction mixture was refluxed for 4 hours and the solvent then evaporated under reduced pressure. The residue was taken up in AcOEt and washed 3x with H_2O . The organic phase was dried over Na_2SO_4 , filtered and evaporated under reduced pressure. FC ($\text{CH}_2\text{Cl}_2/\text{MeOH}$ 9:1) gave **19** (630 mg, 1.3 mmol, 40%). Off-white solid. $R_f = 0.5$ (CH_2Cl_2 / MeOH 9:1). $[\alpha]_D = +8.16$ ($C = 1$, CHCl_3 , $T = 25.6$ °C). $^1\text{H-NMR}$ (CDCl_3 , 300 MHz) δ 1.39 (s, 9H), 2.1-2.16 (m, 2H), 3.0 (br. d, 1H), 3.15 (br. dd, 1H), 3.73 (s, 3H), 3.95-4.05 (m, 1H), 4.1-4.3 (m, 2H), 5.1 (s, 2H), 5.35 (s, 2H), 6.6 (br. s, 2H), 7.25-7.38 (m, 7H), 7.49 (d, 1H, $J = 7.16$), 7.61 (s, 1H). $^{13}\text{C-NMR}$ (CDCl_3 , 75 MHz) 28.4, 33.1, 41.2, 58.7, 66.4, 71.0, 72.1, 107.8, 114.5, 127.0, 127.7, 127.9, 128.1, 128.4, 128.6, 135.9, 136.3, 148.5, 149.9, 194.1. IR 3686-3107w, 1700m, 1518m. MS 433.2 (100, $[\text{M-tBu}]^+$), 489.3 (46, M^+). HRMS calcd. for $\text{C}_{30}\text{H}_{37}\text{N}_2\text{O}_4$ (M^+): 489.2748, found: 489.2742.

Boc-L-Thr(OBn)-D-Ser(OBn)-L-Ser(OBn)-(3S)-THQ(OBn); chloride

(3S)-6,7-Bis-benzyloxy-3-*tert*-butoxycarbonylamino-1,1-dimethyl-1,2,3,4-tetrahydroquinolinium chloride (50 mg, 95.3 μmol) was dissolved in dioxane (1 mL), cooled to 0 °C and $\text{HCl.dioxane}(4\text{M})$ (0.48 mmol, 480 μl , 5 eq) was added. The reaction mixture was stirred at 0 °C for 1 hour and 3 hours at RT. Then the solvent was removed under reduced pressure and the product dried under high vacuum overnight.

Boc-L-Ser(OBn) (1.2 eq) was dissolved in DMF (1 mL) with *i*BuOCOCl (15 μ l, 150 μ mol 1.2 eq) and NMM (21 μ l, 191 μ mol, 2 eq) and cooled to $-18\text{ }^{\circ}\text{C}$. The reaction mixture was stirred for 30 min and the amine salt dissolved in DMF (0.5 mL), NMM (21 μ l, 191 μ mol, 2 eq) was added dropwise. It was allowed to reach RT gradually overnight. Then the solvent was evaporated under reduced pressure and the residue taken up in AcOEt. It was washed 3x with H_2O and the combined water phases 3x extracted with AcOEt. The combined organic phases were dried over Na_2SO_4 , filtered and evaporated under reduced pressure. FC ($\text{CH}_2\text{Cl}_2/\text{MeOH}$ 90:10) gave the expected product (47.4 mg, 67.7 μ mol, 71%).

It was dissolved in dioxane (1 mL), cooled to $0\text{ }^{\circ}\text{C}$ and HCl.dioxane (4M, 85 μ l, 338 μ mol, 5 eq) was added. The reaction mixture was stirred for 1 hour at $0\text{ }^{\circ}\text{C}$ and 3 hours at RT. Then the solvent was evaporated under reduced pressure and the product dried under high vacuum overnight.

Boc-L-Thr(OBn)-D-Ser(OBn) (40 mg, 81.2 μ mol, 1.2 eq) was dissolved in DMF (1 mL) with *i*BuOCOCl (10.6 μ l, 81.2 μ mol, 1.2 eq) and NMM (15 μ l, 135 μ mol, 2 eq) and cooled to $-18\text{ }^{\circ}\text{C}$. The reaction mixture was stirred for 30 min and the amine salt dissolved in DMF (0.5 mL), NMM (15 μ l, 135 μ mol, 2 eq) was added dropwise. It was allowed to reach RT gradually over night. Then the solvent was evaporated under reduced pressure and the residue taken up in AcOEt. It was washed 3 times with H_2O and the combined water phases 3x extracted with AcOEt. The combined organic phases were dried over Na_2SO_4 , filtered and evaporated under reduced pressure. FC ($\text{CH}_2\text{Cl}_2/\text{MeOH}$ 90:10) gave the title compound (34 mg, 33.1 μ mol, 49%). Colorless oil. $R_f = 0.33$ ($\text{CH}_2\text{Cl}_2/\text{MeOH}$ 90:10). $[\alpha]_D = +4.36$ ($C = 1.825$, CHCl_3 , $T = 25.1\text{ }^{\circ}\text{C}$). $^1\text{H-NMR}$ (CDCl_3 , 300 MHz) δ 1.19 (d, 3H, $J = 6.23$), 1.33 (s, 9H), 2.80-2.90 (m, 2H), 3.15-3.3 (m,

1H), 3.45 (s, 6H), 3.6-3.75 (m, 4H), 3.9-4.0 (m, 2H), 4.05-4.2 (m, 1H), 4.3-4.45 (m, 1H), 4.43 (s, 2H), 4.47 (s, 2H), 4.48 (s, 2H), 4.6-4.7 (m, 1H), 4.75-4.82 (m, 1H), 5.1 (d, 2H, $J = 3.11$), 5.31 (s, 2H), 5.63 (d, 1H, $J = 7.47$), 6.55 (s, 1H), 7.02-7.41 (m, 25H), 7.82 (d, 1H, $J = 7.78$), 8.51 (d, 1H, $J = 5.92$), 8.68 (d, 1H, $J = 6.53$). IR 3317 w , 1705 w , 1664 m , 1518 m . MS 1034.5 (100, $[M]^+$). HRMS calcd. for $C_{61}H_{72}N_5O_{10}$ (M) $^+$: 1034.5274, found: 1034.5264.

(2,2-dimethyl-6-methylene-6H-[1,3]dioxin-4-yloxy)-trimethyl-silane

As a slight modification of a literature procedure [4], to a solution of iPr_2NH (1.29 mL, 9.18 mmol, 1.2 eq) in anhydrous THF (5 mL) at 0 °C was added $nBuLi$ (1.32M in hexane, 5.21 mL, 9.18 mmol, 1.2 eq) over 15 minutes. The clear solution was stirred at 0 °C for 20 min and then cooled to -78 °C. 2,2,6-Trimethyl-[1,3]dioxinone (1 mL, 7.65 mmol) was added neat over 10 minutes and the light yellow solution was stirred at -78 °C for 1 hour. $TMSCl$ (1.36 mL, 10.7 mmol, 1.4 eq) was added dropwise over 15 min and the reaction mixture was stirred for an additional 30 min at -78 °C. The suspension was then allowed to warm to ambient temperature over 90 min. It was filtered over anhydrous Na_2SO_4 under argon. The orange filtrate was concentrated under reduced pressure and the remaining oil distilled under reduced pressure (0.5 mbar, $T < 50$ °C) to give (2,2-dimethyl-6-methylene-6H-[1,3]dioxin-4-yloxy)-trimethyl-silane (1.31 g, 6.1 mmol, 80%). Colorless oil. 1H -NMR ($CDCl_3$, 300 MHz) δ 0.27 (s, 9H), 1.55 (s, 6H), 3.88 (s, 1H), 4.07 (s, 1H), 4.65 (s, 1H).

[1-(tert-Butyl-dimethyl-silanyloxymethyl)-3-(2,2-dimethyl-6-oxo-6H-[1,3]dioxin-4-yl)-((3S)-2-hydroxy-propyl)-(2S)carbamic acid benzyl ester

Following a modified literature procedure [5], a solution of [1-(tert-Butyl-dimethyl-silanyloxymethyl)-(2S)-2-oxo-ethyl]-carbamic acid benzyl ester (298 mg, 0.89 mmol) in dry CH_2Cl_2 (1 mL) was cooled to 0 °C and $\text{Eu}(\text{fod})_3$ (185 mg, 0.178 mmol, 0.2 eq) was added. After 10 minutes (2,2-dimethyl-6-methylene-6H-[1,3]dioxin-4-yloxy)-trimethylsilane (190 mg, 0.89 mmol, 1 eq) dissolved in CH_2Cl_2 (1 mL) was added dropwise. The reaction mixture was then stirred overnight reaching RT gradually. CH_2Cl_2 was removed under reduced pressure and the residue was taken up with AcOEt. It was washed 3x with citric acid (10%) and 3x with satd. NaHCO_3 . The organic phase was dried over Na_2SO_4 , filtered and evaporated under reduced pressure. FC (AcOEt/Hexane 3:7) gave the title compound (199 mg, 0.41 mmol, 47 %). White solid. $M_p = 60\text{--}63$ °C . $R_f = 0.21$ (AcOEt/Hexane 3:7). $[\alpha]_D = -1.07$ (C = 3.2, CHCl_3 , T = 26 °C). $^1\text{H-NMR}$ (CDCl_3 , 300 MHz) δ 0.056 (s, 3H), 0.071 (s, 3H), 0.88 (s, 9H), 2.34 (dd, 1H, $J_1 = 4.67$, $J_2 = 14.95$), 2.44 (dd, 1H, $J_1 = 8.5$, $J_2 = 14.95$), 3.33 (s, 1H), 3.63–3.66 (m, 1H), 3.86 (d, 2H, $J = 3.42$), 4.26–4.29 (m, 1H), 5.12 (s, 2H), 5.33 (s, 1H), 5.41 (br . d, 1H, $J = 9.03$), 7.32–7.37 (m, 5H). $^{13}\text{C-NMR}$ (CDCl_3 , 75 MHz) –5.5, 18.2, 24.8, 25.4, 25.8, 38.6, 54.1, 66.0, 67.0, 69.9, 95.3, 106.2, 128.0, 128.2, 128.5, 136.1, 156.2, 160.8, 168.1.

(6S)-6-Benzoyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(5S)-5-hydroxy-3-oxo-heptanoic acid methyl ester

To a solution of [1-(tert-Butyl-dimethyl-silanyloxymethyl)-3-(2,2-dimethyl-6-oxo-6H-[1,3]dioxin-4-yl)-((3S)-2-hydroxy-propyl)-(2S)carbamic acid benzyl ester (175 mg, 0.36 mmol) in toluene (3 mL) was added MeOH (58 μ l, 1.44 mmol, 4 eq) and the reaction mixture was refluxed for 4 hours. Then it was cooled until RT and the solvents were removed under reduced pressure. FC (AcOEt/Hexane 2.5:7.5) gave the title compound **5** (141 mg, 0.31 mmol, 85 %). R_f = 0.5 (AcOEt/Hexane 4:6). $[\alpha]_D = +0.65$ (C = 2, CHCl₃, T = 27.2 °C). ¹H-NMR (CDCl₃, 300 MHz) δ 0.051 (s, 3H), 0.06 (s, 3H), 0.87 (s, 9H), 2.65 (dd, 1H, $J_1 = 4.35$, $J_2 = 17.44$), 2.79 (dd, 1H, $J_1 = 8.4$, $J_2 = 17.43$), 3.34 (s, 1H), 3.47 (s, 2H), 3.62-3.63 (m, 1H), 3.72 (s, 3H), 3.8 (d, 2H, $J = 4.35$), 4.44-4.49 (m, 1H), 5.1 (s, 2H), 5.32 (br. d, $J = 9.34$), 7.31-7.37 (m, 5H). ¹³C-NMR (CDCl₃, 75 MHz) -5.4, 18.4, 26.0, 47.0, 49.8, 52.6, 54.5, 65.0, 67.1, 68.1, 128.4, 128.4, 128.8, 136.6, 156.7, 167.5, 202.5. IR 3647-3170m, 1744m, 1716s. MS 476.2 (100, [M+Na]⁺), 444.2 (79, [M-MeOH+Na]⁺). HRMS calcd. for C₂₂H₃₅NO₇SiNa (M+Na)⁺: 476.2075, found: 476.2069.

(6S)-6-Benzoyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(3S,5S)-4,5-hydroxy-3-oxo-heptanoic acid methyl ester

A solution of (6S)-6-Benzoyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(5S)-5-hydroxy-3-oxo-heptanoic acid methyl ester (80 mg, 0.18 mmol) in CH₃CN (0.5 mL) was cooled to -35 °C and Me₄N(OAc)₃BH (331 mg, 1.26 mmol, 7 eq) dissolved in CH₃CN/AcOH (0.5 mL/0.5 mL) was added. The reaction mixture was stirred at this temperature for 62 hours. It was then allowed to reach 0 °C and a saturated solution of Na-K-tartrate was added. The solution was stirred at this temperature for 4 hours. The phases were separated and the aqueous phase extracted 3x with AcOEt. The combined organic layers were washed with brine, dried over Na₂SO₄, filtered and evaporated under reduced pressure. The NMR of this compound showed a pure compound (d.r. = 97 : 3) which was directly used in the next step.

(6S)-6-Benzoyloxycarbonylamino-(3S,5S)-3,5,7-tris-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid methyl ester

A solution of (6S)-6-Benzoyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(3S,5S)-4,5-hydroxy-3-oxo-heptanoic acid methyl ester (80.0 mg, 0.18 mmol) was dissolved in dry CH₂Cl₂ (0.8 mL) and cooled to -20 °C. 2,6 lutidine (84 µl, 0.72 mmol, 4 eq) was added dropwise followed by the dropwise addition of TBSOTf (124 µl, 0.54 mmol, 3 eq). The reaction mixture was stirred at -20 °C for 1 h 30. It was diluted with CH₂Cl₂ (3

mL), washed 3x with citric acid (10%) and 2x with H₂O. It was dried over MgSO₄, filtered and evaporated under reduced pressure. FC (AcOEt/hexane 5/95) gave **8** (62.0 mg, 0.09 mmol, 52 % over 2 steps). R_f = 0.53 (AcOEt/hexane 1:9). $[\alpha]_D^{25} = +8.3$ (C = 3.1, CHCl₃, T = 24.7 °C). ¹H-NMR (CDCl₃, 300 MHz) δ 0.024 (s, 3H), 0.033 (s, 3H), 0.054 (s, 3H), 0.066 (s, 3H), 0.077 (s, 3H), 0.089 (s, 3H), 0.102 (s, 3H), 0.84 (s, 9H), 0.88 (s, 18H), 1.58-1.68 (m, 1H), 1.85 (ddd, 1H, $J_1 = 4.98$, $J_2 = 9.34$, $J_3 = 13.39$), 2.37 (dd, 1H, $J_1 = 7.78$, $J_2 = 14$), 2.49 (dd, 1H, $J_1 = 4.36$, $J_2 = 14$), 3.45-3.48 (m, 1H), 3.59-3.62 (m, 1H), 3.65 (s, 3H), 4.02-4.09 (m, 1H), 4.10-4.16 (m, 1H), 5.02 (br. d, 1H, J = 8.09), 5.09 (s, 2H), 7.31-7.39 (m, 5H). ¹³C-NMR (CDCl₃, 75 MHz) -5.3, -5.2, -4.8, -4.7, -4.4, -4.1, 18.0, 18.1, 25.8, 25.9, 26.0, 128.1, 128.2, 128.4, 155.9, 171.2. IR 2254m, 1719s. MS 706 (100, [M+Na]⁺). HRMS calcd. for C₃₄H₆₅NO₇Si₃Na (M+Na)⁺: 706.3961, found: 706.3954.

(6S)-6-Benzoyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(3R,5S)-4,5-hydroxy-3-oxo-heptanoic acid methyl ester

A solution of Et_3B (750 μl , 0.75 mmol, 1.5 eq, 1M sol. in hexane) and pivalic acid (2.5 mg, 25 μmol , 0.05 eq) dissolved in dry THF (0.5 mL) and MeOH (1 mL) was stirred at RT for 1 hour and was then cooled to $-70\text{ }^\circ\text{C}$. (6S)-6-Benzoyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(5S)-5-hydroxy-3-oxo-heptanoic acid methyl ester (0.225 g, 0.50 mmol) in dry THF (1 mL) was added dropwise followed by NaBH_4 (57 mg, 1.5 mmol, 3 eq) and it was stirred at $-70\text{ }^\circ\text{C}$ for 4 hours. H_2O_2 (3 mL) and H_2O (5 mL) were then added at $-70\text{ }^\circ\text{C}$ and the reaction allowed to warm until RT. Then CHCl_3 and H_2O were added and the aqueous phase extracted with chloroform. The combined organic layers were washed with 5x H_2O , dried over Na_2SO_4 , filtered and evaporated under reduced pressure. FC (Hexane/AcOEt 5.5:4.5) gave the title compound (155.8 mg, 0.34 μmol , 69%). $R_f = 0.31$ (AcOEt/Hexane 3.5:6.5). $[\alpha]_D = +10.6$ ($C = 0.95$, CHCl_3 , $T = 30.7\text{ }^\circ\text{C}$). $^1\text{H-NMR}$ (CDCl_3 , 300 MHz) δ 0.055 (s, 3H), 0.063 (s, 3H), 0.88 (s, 9H), 1.5-1.6 (m, 1H), 1.67-1.82 (m, 1H), 2.44-2.51 (m, 2H), 3.57-3.65 (m, 1H), 3.7 (s, 3H), 3.72-3.77 (br. s, 1H), 3.78-3.82 (m, 1H), 3.87-3.92 (br. s, 1H), 5.1 (s, 2H), 5.38 (d, 1H, $J = 9.03$), 7.31-7.37 (m, 5H). $^{13}\text{C-NMR}$ (CDCl_3 , 75 MHz) δ -5.4, 18.3, 25.9, 39.4, 41.5, 51.9, 55.0, 65.2, 66.9, 68.2, 72.0, 128.0, 128.1, 128.4, 136.3, 156.3, 172.6. IR 3611-3144 m , 1721 s , 1510 m . MS 478.2 (100, $[\text{M}+\text{Na}]^+$). HRMS calcd. for $\text{C}_{22}\text{H}_{37}\text{NO}_7\text{SiNa}$ ($\text{M}+\text{Na}$) $^+$: 478.2232, found: 478.2224.

(6S)-6-Benzoyloxycarbonylamino-(3R,5S)-3,5,7-tris-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid methyl ester

A solution of (6S)-6-Benzoyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(3R,5S)-4,5-hydroxy-3-oxo-heptanoic acid methyl ester (19.0 mg, 41.7 μmol) in dry CH_2Cl_2 was cooled to $-20\text{ }^\circ\text{C}$ and 2,6 lutidine (19.4 μl , 0.17 mmol, 4 eq) was added dropwise followed by TBSOTf (29 μl , 0.125 mmol, 3 eq). The reaction mixture was stirred at $-20\text{ }^\circ\text{C}$ for 1h15. Then CH_2Cl_2 was added and the organic phase was washed 3x with citric acid (10%) and 2x with H_2O , dried over Na_2SO_4 , filtered and evaporated under reduced pressure. FC (AcOEt/hexane 1:9) gave **9** (21.0 mg, 30.7 μmol , 75 %). R_f = 0.68 (AcOEt/hexane 2:8). $[\alpha]_D = -1.3$ ($C = 1.05$, CHCl_3 , $T = 25.5\text{ }^\circ\text{C}$). $^1\text{H-NMR}$ (CDCl_3 , 300 MHz) δ 0.056 (s, 6H), 0.062 (s, 3H), 0.07 , 0.083(s, 6H), 0.098 (s, 3H), 0.86(s, 9H), 0.88 (s, 9H), 0.89 (s, 9H), 1.63-1.84 (m, 2H), 2.43 (d, 2H, $J = 6.22$), 3.52 (dd, 1H, $J_1 = 7.79$, $J_2 = 9.03$), 3.62 (s, 3H), 3.66 (d, 1H, $J = 5$), 3.69 (s, 1H), 3.73 (m, 1H), 4.99 (br.d, 1H, $J = 8.7$), 5.1 (s, 2H), 7.3-7.39 (m, 5H). $^{13}\text{C-NMR}$ (CDCl_3 , 75 MHz) δ -5.1, -4.5, -4.0, 18.0, 18.2, 18.6, 26.0, 26.1, 26.2, 42.1, 43.1, 51.6, 55.1, 62.0, 66.7, 66.9, 67.4, 128.3, 128.4, 128.7, 156.4, 171.6. IR 1727 m . MS 706.3 (100). HRMS calcd. for $\text{C}_{34}\text{H}_{65}\text{NO}_7\text{Si}_3\text{Na}$ ($\text{M}+\text{Na}$) $^+$: 706.3961, found: 706.3960.

7-Benzyloxy-(6S)-6-benzyloxycarbonylamino-(3S, 5R)-3,5-bis-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid methyl ester

A solution of Et_3B (1.08 mL, 1.08 mmol, 1.5 eq, 1M sol. in hexane) and pivalic acid (3.7 mg, 36 μmol , 0.05 eq) dissolved in dry THF (0.5 mL) and MeOH (1.5 mL) was stirred at RT for 1 hour and was then cooled to $-70\text{ }^\circ\text{C}$. 7-Benzyloxy-(6S)-6-benzyloxycarbonylamino-(5R)-5-hydroxy-3-oxo-heptanoic acid methyl ester (300 mg, 0.72 mmol) in dry THF (2.2 mL) was added dropwise followed by NaBH_4 (82 mg, 2.16 mmol, 3 eq) and it was stirred at $-70\text{ }^\circ\text{C}$ for 4 hours. H_2O_2 (3 mL) and H_2O (5 mL) were then added at $-70\text{ }^\circ\text{C}$ and the reaction was allowed to warm to RT. Then CHCl_3 and H_2O were added and the aqueous phase extracted with chloroform. The combined organic layers were washed with 5x H_2O , dried over Na_2SO_4 , filtered and evaporated under reduced pressure. It was directly introduced in the next step.

It was dissolved in dry CH_2Cl_2 (1.5 mL) and cooled to $-20\text{ }^\circ\text{C}$. Then 2,6-lutidine (0.335 mL, 2.88 mmol, 4 eq) and TBSOTf (496 μL , 2.16 mmol, 3 eq) were added dropwise and the reaction mixture stirred at this temperature for 3 hours. It was washed 3x with citric acid (10%), 2x with H_2O , filtered and evaporated under reduced pressure. FC (hexane/ AcOEt 9:1) gave the title compound **7** (395 mg, 0.6 mmol, 85%). $R_f = 0.64$ (AcOEt /hexane 2:8). $[\alpha]_D = -24.9$ ($C = 0.9$, CHCl_3 , $T = 30.1\text{ }^\circ\text{C}$). $^1\text{H-NMR}$ (CDCl_3 , 300 MHz) δ 0.015 (s, 3H), 0.03 (s, 3H), 0.07 (s, 3H), 0.099 (s, 3H), 0.84 (s, 9H), 0.86 (s, 9H), 1.67-1.8 (m, 2H), 2.35-2.45 (m, 1H), 2.48-2.55 (m, 1H), 3.57 (d, 1H, $J = 5.2$), 3.63 (s, 3H), 3.9-4.01 (m, 2H), 4.2-4.28 (m, 1H), 4.5 (s, 2H), 4.92-5 (m, 1H), 5.1 (s, 2H), 7.2-7.4

(m, 10 H). IR 1735 m , 1501 w . MS 682.4 (100, [M+Na]⁺). HRMS calcd. for C₃₅H₅₇NO₇Si₂Na (M+Na)⁺: 682.3566, found: 682.3558.

(6S)-6-(2-benzyloxy-benzoylamino)-(3R,5S)-3,5,7-tris-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid methyl ester

To a solution of (6S)-6-Benzyloxycarbonylamino-(3R,5S)-3,5,7-tris-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid methyl ester (70 mg, 102 μ mol) in MeOH (1 mL) previously 3x flushed with argon was added Pd/C. Then it was flushed with H₂ and it was stirred at RT for 4 hours. Pd/C was filtered over celite and the solvent was removed under reduced pressure. This product was added to a solution of O-Bn-salicylic acid (27.9 mg, 122 μ mol, 1.2 eq) dissolved in dry CHCl₃ (1.5 mL) with EDC.HCl (23.4 mg, 122 μ mol, 1.2 eq), HOBT (18.9 mg, 122 μ mol, 1.2 eq) and NMM (34 μ L, 306 μ mol, 3 eq). The reaction mixture was stirred at RT for 20 hours. The solvent was then removed under reduced pressure and the residue taken up with AcOEt. It was washed 3x with citric acid (10 %) and 3x with satd. NaHCO₃. The organic phase was dried over MgSO₄, filtered and evaporated under reduced pressure. FC (AcOEt/Hexane 1:9) gave **13** (45 mg, 59 μ mol, 58 %). R_f = 0.43 (AcOEt/Hexane 2:8). [α]_D = -4.2 (C = 2.235, CHCl₃, T = 26.5 °C). ¹H-NMR (CDCl₃, 300 MHz) δ 0.061 (s, 6H), 0.071 (s, 3H), 0.091 (s, 3H), 0.094 (s, 3H), 0.105 (s, 3H), 0.84 (s, 9H), 0.86 (s, 9H), 0.89 (s, 9H), 1.67-1.78 (m, 2H), 2.35-2.48 (m, 2H), 3.49 (s, 3H), 3.6 (dd, 1H, J₁ = 8.4, J₂ = 9.33), 3.71 (dd, 1H, J₁ = 5.6, J₂ = 9.6), 4.1-4.21 (m, 2H), 4.23-4.28 (m, 1H), 5.29 (s, 2H), 6.91 (dd, 1H, J₁ = 0.6, J₂ = 8.4), 7.0-7.1 (m, 1H), 7.28-7.37 (m, 6H), 8.0 (d, 1H, J = 8.4), 8.16 (dd, 1H, J₁ = 1.87, J₂ = 7.8).

^{13}C -NMR (CDCl_3 , 75 MHz) -5.1 , -4.5 , -4.2 , -4.0 , 17.9 , 18.1 , 18.5 , 25.9 , 26.0 , 26.1 , 42.1 , 43.2 , 51.4 , 53.8 , 61.2 , 66.5 , 67.1 , 70.7 , 113.2 , 121.3 , 122.3 , 126.7 , 128.1 , 128.7 , 132.2 , 132.3 , 135.9 , 156.3 , 164.9 , 171.3 . IR 2953m , 2928m , 2856m , 1740m , 1654m . MS 760 (100 , $[\text{M}+\text{H}]^+$). HRMS calcd. for $\text{C}_{40}\text{H}_{69}\text{NO}_7\text{Si}_3\text{Na}$ ($\text{M}+\text{Na}$) $^+$: 782.4274 , found: 782.4285 .

(6S)-6-(2-benzyloxy-benzoylamino)-(3S,5S)-3,5,7-tris-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid methyl ester

To a solution of (6S)-6-Benzyloxycarbonylamino-(3S,5S)-3,5,7-tris-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid methyl ester (59 mg , $86\text{ }\mu\text{mol}$) in MeOH (0.7 mL) previously 3x flushed with argon was added Pd/C (1 mg , $10\text{ }\%$). Then it was flushed with H_2 and it was stirred at RT for 4 hours. Pd/C was filtered over celite and the solvent was removed under reduced pressure. This product was added to a solution of $O\text{-Bn}$ -salicylic acid (19.6 mg , $86\text{ }\mu\text{mol}$, 1 eq) dissolved in dry CH_2Cl_2 (1 mL) with EDC.HCl (16.5 mg , $86\text{ }\mu\text{mol}$, 1 eq), HOBT (13 mg , $86\text{ }\mu\text{mol}$, 1 eq) and NMM ($28\text{ }\mu\text{L}$, $258\text{ }\mu\text{mol}$, 3 eq). The reaction mixture was stirred at RT for 20 hours. The solvent was then removed under reduced pressure and the residue taken up with AcOEt . It was washed 3x with citric acid ($10\text{ }\%$) and 3x with satd. NaHCO_3 . The organic phase was dried over MgSO_4 , filtered and evaporated under reduced pressure. FC ($\text{AcOEt/hexane } 1:9$) gave **12** (24 mg , $32\text{ }\mu\text{mol}$, $70\text{ }\%$). $R_f = 0.55$ ($\text{AcOEt/hexane } 2:8$). $[\alpha]_D = +26.3$ ($C = 0.9$, CHCl_3 , $T = 22.2\text{ }^\circ\text{C}$). ^1H -NMR (CDCl_3 , 300 MHz) δ -0.06 (s, 3H), -0.01 (s, 3H), 0.06 (s, 6H), 0.07 (s, 3H), 0.1 (s, 3H), 0.8 (s, 9H), 0.81 (s, 9H), 0.9 (s, 9H), 1.65 (ddd, 1H , $J_1 = 4.67$, $J_2 = 9.03$, $J_3 = 13.69$), 1.89 (ddd, 1H , $J_1 = 4.67$, $J_2 = 9.34$, $J_3 = 13.7$), 2.36 (dd, 1H , $J_1 = 8.09$, $J_2 =$

14.01), 2.52 (dd, 1H, $J_1 = 4.05$, $J_2 = 14.01$), 3.50 (t, 1H, $J = 9.34$), 3.64 (s, 3H), 3.67 (dd, $J_1 = 4.98$, $J_2 = 9.34$), 4.11-4.24 (m, 3H), 5.3 (s, 2H), 6.90 (dd, 1H, $J_1 = 0.62$, $J_2 = 8.4$), 7.03 (td, 1H, $J_1 = 0.93$, $J_2 = 7.78$), 7.29-7.36 (m, 5H), 8.0 (br. d, $J = 8.4$), 8.16 (dd, 1H, $J_1 = 1.87$, $J_2 = 7.78$). ^{13}C -NMR (CDCl_3 , 75 MHz) -5.2 , -5.0 , -4.8 , -4.6 , -4.3 , -4.1 , 18.0 , 18.2 , 18.3 , 25.9 , 26.1 , 42.4 , 42.5 , 51.6 , 53.6 , 60.7 , 66.8 , 67.0 , 71.0 , 113.5 , 121.6 , 122.7 , 126.9 , 128.4 , 129.0 , 132.7 , 136.4 , 156.7 , 165.4 , 171.7 . IR 3399s , 1735m , 1647m . MS 782 (100, $[\text{M}+\text{Na}]^+$). HRMS calcd. for $\text{C}_{40}\text{H}_{69}\text{NO}_7\text{Si}_3\text{Na}$ ($\text{M}+\text{Na}$) $^+$: 782.4274, found: 782.4285.

(6S)-6-(2-benzyloxy-benzoylamino)-(3S,5R)-3,5,7-tris-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid methyl ester

To a solution of 7-Benzyloxy-(6S)-6-benzyloxycarbonylamino-(3S, 5R)-3,5-bis-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid methyl ester (58 mg, 88 μmol) in MeOH (1 mL) previously 3x flushed with argon was added Pd/C. Then it was flushed with H_2 and it was stirred at RT for 4 hours. Pd/C was filtered over celite and the solvent was removed under reduced pressure. This product was added to a solution of O-Bn-salicylic acid (20 mg, 88 μmol , 1 eq) dissolved in dry CH_2Cl_2 (1 mL) with EDC.HCl (17 mg, 88 μmol , 1 eq), HOBT (13.5 mg, 88 μmol , 1 eq) and NMM (29 μL , 264 μmol , 3 eq). The reaction mixture was stirred at RT for 20 hours. The solvent was then removed under reduced pressure and the residue taken up with AcOEt. It was washed 3x with citric acid (10 %) and 3x with satd. NaHCO_3 . The organic phase was dried over MgSO_4 , filtered and the solvent evaporated under reduced pressure. It was dissolved in CH_2Cl_2

(1 mL) and cooled to $-20\text{ }^{\circ}\text{C}$. Then TBSOTf (44.5 μl , 194 μmol , 2.2 eq) and 2,6-lutidine (22.5 μl , 194 μmol , 2.2 eq) were added dropwise. The reaction mixture was stirred at $-20\text{ }^{\circ}\text{C}$ for 3 hours. It was washed 2x with citric acid, dried over Na_2SO_4 , filtered and evaporated under reduced pressure. FC (AcOEt/hexane 1:7) gave **11** (44 mg, 58 μmol , 66 %). $R_f = 0.33$ (AcOEt/hexane 1:7). $[\alpha]_D = -0.90$ ($C = 1.56$, CHCl_3 , $T = 25\text{ }^{\circ}\text{C}$). $^1\text{H-NMR}$ (CDCl_3 , 300 MHz) δ -0.042 (s, 3H), -0.037 (s, 3H), 0.001 (s, 6H), 0.024 (s, 3H), 0.05 (s, 3H), 0.80 (s, 9H), 0.83 (s, 9H), 0.84 (s, 9H), 1.55-1.61 (m, 2H), 2.29 (dd, 1H, $J_1 = 9.03$, $J_2 = 14.63$), 2.57 (dd, $J_1 = 3.11$, $J_2 = 14.63$), 3.5-3.6 (m, 1H), 3.64 (s, 3H), 3.64-3.73 (m, 1H), 3.84-3.91 (m, 1H), 5.18 (s, 2H), 7.0 (d, 1H, $J = 7.8$), 7.08 (td, $J_1 = 0.93$, $J_2 = 7.8$), 7.35-7.47 (m, 5H), 7.9 (d, 1H, $J = 8.09$), 8.23 (dd, 1H, $J_1 = 1.87$, $J_2 = 7.8$). $^{13}\text{C-NMR}$ (CDCl_3 , 75 MHz) -5.26, -5.14, -4.95, -4.35, -4.15, 18.0, 25.8, 26.0, 41.2, 42.9, 51.4, 55.3, 61.2, 67.0, 68.4, 71.2, 112.5, 121.451, 121.945, 127.7, 128.5, 128.8, 132.5, 135.5, 156.5, 164.6, 171.9. IR 3392w, 1739m, 1656m. MS 760 (100, $[\text{M}+\text{H}]^+$).

(6S)-6-(2-benzyloxy-benzoylamino)-(3R,5S)-3,5,7-tris-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid

To a solution of (6S)-6-(2-benzyloxy-benzoylamino)-(3R,5S)-3,5,7-tris-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid methyl ester (44 mg, 57.9 μmol) in MeOH (0.6 mL) cooled at $0\text{ }^{\circ}\text{C}$ was added NaOH (58 μl , 174 μmol , 1M, 3 eq). The reaction mixture was stirred 1 hour at RT and then one night at RT. As a TLC at this point showed no total conversion, THF (0.3 mL) and NaOH (1M, 39 μl , 116 μmol , 2 eq) were added and after 6 hours the reaction was completed. The solvent was evaporated down under reduced

pressure and the residue acidified to pH = 1 with HCl (1M). It was then extracted 3 times with AcOEt and the combined organic phases were dried over MgSO₄, filtered, and evaporated under reduced pressure. It was directly used without further purification in the next step.

(3R, 5S, 6S)-6-(Benzyloxy-benzoylamino)-3,5,7-tris-(*tert*-butyl-dimethyl-silanoxy)-heptanoic acid-L-Thr(OBn)-D-Ser(OBn)-L-Ser(OBn)-(3S)-THQ(OBn)

Boc-L-Thr(OBn)-L-Ser(OBn)-L-Ser(OBn)-(3S)-THQ(OBn) (36 mg, 33.6 μ mol) was dissolved in dioxane (0.6 mL) and HCl.dioxane (4M, 100 μ l, 400 μ mol) was added at 0 °C. It was stirred 1 hour at this temperature and 3 hours at RT. The solvent was then removed under reduced pressure and the product dried under high vacuum 2 hours. It was used without further purification.

To a solution of (6S)-6-(2-benzyloxy-benzoylamino)-(3R,5S)-3,5,7-tris-(*tert*-butyl-dimethyl-silanyloxy)-heptanoic acid (30 mg, 40.3 μ mol, 1.2 eq) in DMF (0.5 mL) at -18 °C was added *i*BuOCOC₂H₅ (5.3 μ l, 40.3 μ mol, 1.2 eq) and NMM (4.4 μ l, 40.3 μ mol, 2 eq). The reaction mixture was stirred at this temperature for 20 min. Then L-Thr(OBn)-L-

Ser(OBn)-L-Ser(OBn)-(3S)-THQ(OBn) (33.8 mg, 33.6 μ mol, 1 eq) dissolved in DMF (0.5 mL) and NMM (4.4 μ l, 40.3 μ mol, 2 eq) was added dropwise at $-18\text{ }^{\circ}\text{C}$ and it was allowed to warm over 4 hours. The solvent was evaporated under reduced pressure and the residue taken up in AcOEt. It was washed 3x with H_2O , and the resulting water extracted 3x with AcOEt. The combined organic phases were dried over Na_2SO_4 , filtered and evaporated under reduced pressure. FC ($\text{CH}_2\text{Cl}_2/\text{MeOH}$ 10:1) gave the title compound (31 mg, 18.3 μ mol, 54%). Colorless oil. $R_f = 0.18$ ($\text{CH}_2\text{Cl}_2/\text{MeOH}$ 10:1). $[\alpha]_D = +7.9$ ($C = 0.55$, CHCl_3 , $T = 26\text{ }^{\circ}\text{C}$). $^1\text{H-NMR}$ (CDCl_3 , 300 MHz) 0.013 (s, 3H), 0.032 (s, 6H), 0.061 (s, 6H), 0.079 (s, 3H), 0.80 (s, 9H), 0.83 (s, 9H), 0.86 (s, 9H), 1.15 (d, 3H, $J = 6.54$), 1.74-1.9 (m, 8H), 2.24 (dd, 1H, $J_1 = 6.54$, $J_2 = 14.6$), 2.35 (dd, 1H, $J_1 = 3.1$, $J_2 = 14.6$), 2.86 (dd, 1H, $J_1 = 5.0$, $J_2 = 16.2$), 3.18 (dd, 1H, $J_1 = 11.5$, $J_2 = 16.2$), 3.41 (s, 3H), 3.44 (s, 3H), 3.56-3.74 (m, 6H), 3.86-3.94 (m, 2H), 4.0-4.08 (m, 1H), 4.1-4.18 (m, 1H), 4.18-4.28 (m, 2H), 4.41 (s, 2H), 4.42 (s, 2H), 4.48 (s, 2H), 4.52-4.62 (m, 2H), 4.64-4.74 (m, 1H), 5.13 (d, 2H, $J = 2.5$), 5.21 (d, 2H, $J = 1.9$), 5.26 (s, 2H), 6.6 (s, 1H), 6.86-6.94 (m, 3H), 7.4-7.46 (m, 36H), 7.84 (d, 1H, $J = 7.5$), 7.97 (d, $J = 8.7$), 8.07 (dd, $J_1 = 1.9$, $J_2 = 7.5$), 8.38 (m, 2H). IR 1653m, 1520m, 1216s. MS 1662.8 (100, $[\text{M}+\text{H}]^+$). HRMS calcd. for $\text{C}_{95}\text{H}_{129}\text{N}_6\text{O}_{14}\text{Si}_3$ ($\text{M}+\text{H})^+$: 1661.8869, found: 1661.8897.

Anachelin H

(3R, 5S, 6S)-6-(Benzyloxy-benzoylamino)-3,5,7-tris-(*tert*-butyl-dimethyl-silanoxy)-heptanoic acid-L-Thr(OBn)-D-Ser(OBn)-L-Ser(OBn)-(3S)-THQ(OBn) (10 mg, 5.89 μ mol) was dissolved in CH_3OH (400 μ l) and glacial acetic acid (30 drops) was added. The reaction vessel was flushed three times with Ar, and then Pd/C (10 %, 8 mg) was added. The reaction vessel was three times flushed with H_2 and the reaction mixture was stirred 2.5 hours at RT. The reaction mixture was then filtered over celite and the solvent removed under reduced pressure. The residue was dissolved in cold MeOH (HCl 1%) (1 mL) and the solution stirred for 4 hours at 0 $^\circ\text{C}$. Then the solvent was evaporated under reduced pressure and the residual acid was coevaporated three times with chloroform. The residue was dissolved in water and lyophilized to give anachelin H (**1**) (3.3 mg, 70%). Light yellow fluffy powder. ^1H -NMR (D_2O , 300 MHz) 1.18 (d, 3H, $J = 6.2$), 1.6-1.64 (m, 1H), 1.65-1.74 (m, 1H), 1.99-2.08 (m, 1H), 2.27-2.35 (m, 1H), 2.89-3.04 (m, 1H), 3.05-3.15 (m, 1H), 3.36-3.44 (m, 1H), 3.53 (s, 6H), 3.66-4.1 (m, 7H), 4.1-4.17 (m, 2H), 4.2-4.33 (m, 2H), 4.38-4.45 (m, 3H), 4.53-4.7(m, 1H), 6.75 (s, 1H), 6.96-7.07 (m, 3H), 7.42-7.53 (m, 1H), 7.79 (d, 1H, $J = 7.5$). MS 779 (100, $[\text{M}]^+$), HRMS calcd. for $\text{C}_{35}\text{H}_{51}\text{N}_6\text{O}_{14}$ (M) $^+$: 779.3463, found: 779.3471.

[1-(*tert*-Butyl-dimethyl-silanyloxymethyl)-3-(2,2-dimethyl-6-oxo-6H-[1,3]dioxin-4-yl)-((3R)-2-hydroxy-propyl)-(2R)carbamic acid benzyl ester

A solution of [1-(*tert*-Butyl-dimethyl-silanyloxymethyl)-(2R)-2-oxo-ethyl]-carbamic acid benzyl ester (338 mg, 1.08 mmol) in dry CH₂Cl₂ (1.5 mL) was cooled to 0 °C and Eu(fod)₃ (224 mg, 216 μmol, 0.2 eq) was added. After 10 minutes (2,2-dimethyl-6-methylene-6H-[1,3]dioxin-4-yloxy)-trimethyl-silane (231 mg, 1.08 mmol, 1 eq) dissolved in CH₂Cl₂ (1.5 mL) was added dropwise. The reaction mixture was then stirred overnight reaching RT gradually. CH₂Cl₂ was removed under reduced pressure and the residue was taken up with AcOEt. It was washed 3x with citric acid (10 %) and 3x with satd. NaHCO₃. The organic phase was dried over Na₂SO₄, filtered and evaporated under reduced pressure. FC (AcOEt/hexane 3:7) gave the title compound (155 mg, 0.32 mmol, 30%). White solid. M_p = 61-63 °C . R_f = 0.2 (AcOEt/hexane 3:7). [α]_D = +5.2 (C = 0.2, CHCl₃, T = 27 °C). ¹H-NMR (CDCl₃, 300 MHz) δ 0.055 (s, 3H), 0.069 (s, 3H), 0.88 (s, 9H), 2.34 (dd, 1H, J₁ = 5.3, J₂ = 14.95), 2.44 (dd, 1H, J₁ = 8.5, J₂ = 14.63), 3.30 (s, 1H), 3.63-3.66 (m, 1H), 3.86 (d, 2H, J = 3.12), 4.26-4.29 (m, 1H), 5.12 (s, 2H), 5.33 (s, 1H), 5.41 (br . d, 1H, J = 8.7), 7.32-7.37 (m, 5H). ¹³C-NMR (CDCl₃, 75 MHz) -5.4, 18.3, 24.9, 25.5, 26.0, 38.7, 54.3, 66.1, 67.3, 70.1, 95.5, 106.8, 128.3, 128.5, 128.8, 136.5, 156.6, 161.2, 168.6. IR 3580-3165 m , 2360 m , 2355 m , 1728.2 s . MS 502.2 (8.6, [M+Na]⁺), 444.2 (100, [M-acetone+Na]⁺). HRMS calcd. for C₂₄H₃₇NO₇SiNa (M+Na)⁺: 502.2232, found: 502.2239.

(6R)-6-Benzoyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(5R)-5-hydroxy-3-oxo-heptanoic acid methyl ester

To a solution of [1-(*tert*-Butyl-dimethyl-silanyloxymethyl)-3-(2,2-dimethyl-6-oxo-6H-[1,3]dioxin-4-yl)-((3R)-2-hydroxy-propyl)-(2R)carbamoyl acid benzyl ester (28.0 mg, 58.4 μ mol) in Toluene (0.5 mL) was added MeOH (9.5 mL, 234 μ mol, 4 eq) and the reaction mixture was refluxed for 4 hours. Then it was cooled until RT and the solvents were removed under reduced pressure. FC (AcOEt/hexane 3:7) gave the title compound (23.2 mg, 48.5 μ mol, 83 %). R_f = 0.23 (AcOEt/hexane 3:7). $[\alpha]_D = -1.34$ (C = 0.75, CHCl₃, T = 24.9 °C). ¹H-NMR (CDCl₃, 300 MHz) δ 0.054 (s, 3H), 0.063 (s, 3H), 0.88 (s, 9H), 2.65 (dd, 1H, J_1 = 4.36, J_2 = 17.43), 2.79 (dd, 1H, J_1 = 8.4, J_2 = 17.43), 3.35 (s, 1H), 3.48 (s, 2H), 3.63-3.65 (m, 1H), 3.72 (s, 3H), 3.81 (d, 2H, J = 4.35), 4.44-4.49 (m, 1H), 5.1 (s, 2H), 5.32 (br. d, J = 9.34), 7.31-7.37 (m, 5H). ¹³C-NMR (CDCl₃, 75 MHz) -5.4, 18.3, 25.9, 46.8, 49.7, 52.5, 54.3, 65.0, 67.0, 68.0, 128.0, 128.1, 128.5, 136.2, 156.3, 167.1, 202.0. IR 3617-3213m, 1745m, 1717s. MS 476.2 (100, [M+Na]⁺), 444.2 (79, [M-MeOH+Na]⁺). HRMS calcd. for C₂₂H₃₅NO₇SiNa (M+Na)⁺: 476.2075, found: 476.2070.

(6R)-6-Benzoyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(3R,5R)-4,5-hydroxy-3-oxo-heptanoic acid methyl ester

A solution of (6R)-6-Benzoyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(5R)-5-hydroxy-3-oxo-heptanoic acid methyl ester (0.23 g, 0.51 mmol) in CH₃CN (2 mL) was cooled to -35 °C and Me₄N(OAc)₃BH (939 mg, 3.57 mmol, 7 eq) dissolved in CH₃CN/AcOH (1.5 mL/1.5 mL) was added. The reaction mixture was stirred at this temperature for 62 hours. It was then allowed to reach 0 °C and a saturated solution of Na-K-tartrate was added. The solution was stirred at this temperature for 4 hours. The phases were separated and the aqueous phase extracted 3x with AcOEt. The combined organic layers were washed with brine, dried over Na₂SO₄, filtered and evaporated under reduced pressure. The NMR spectrum showed a pure compound which was directly introduced in the next step.

This compound (0.51 mmol) was dissolved in dry CH₂Cl₂ (0.4 mL) and cooled to -20 °C. 2,6 lutidine (238 µl, 219 µmol, 4 eq) was added dropwise followed by the dropwise addition of TBSOTf (351 µl, 404 µmol, 3 eq). The reaction mixture was stirred at -20 °C for 1h30. It was diluted with CH₂Cl₂ (3 mL), washed 3x with citric acid (10%) and 2x with H₂O. It was dried over MgSO₄, filtered and evaporated under reduced pressure. FC (AcOEt/Hexane 5:95) gave the title compound (240.0 mg, 0.35 mmol, 69 % (2 steps)). R_f = 0.5 (AcOEt/Hexane 1:9). ¹H-NMR (CDCl₃, 300 MHz) δ 0.023 (s, 3H), 0.033 (s, 3H), 0.054 (s, 3H), 0.077 (s, 3H), 0.087 (s, 3H), 0.102 (s, 3H), 0.84 (s, 9H), 0.88 (s, 18H), 1.57-1.69 (m, 1H), 1.79-1.91 (ddd, 1H, J₁ = 4.67, J₂ = 9.03, J₃ = 13.69), 2.37 (dd, 1H, J₁ = 8.09, J₂ = 14.31), 2.49 (dd, 1H, J₁ = 4.36, J₂ = 14.31), 3.4-3.5 (m, 1H), 3.59-

3.64 (m, 2H), 3.66 (s, 3H), 4.04 (dd, 1H, $J_1 = 4.98$, $J_2 = 9.33$), 4.08-4.16 (m, 1H), 5.02 (d, 1H, $J = 8.42$), 5.1 (s, 2H), 7.32-7.38 (m, 5H). ^{13}C -NMR (CDCl_3 , 75 MHz) -5.3 , -4.8 , -4.7 , -4.4 , -4.1 , 18.0 , 18.1 , 25.8 , 25.9 , 26.0 , 42.0 , 42.3 , 51.5 , 54.5 , 61.1 , 66.6 , 66.8 , 128.1 , 128.2 , 128.4 , 136.3 , 156.0 , 171.2 . MS 706.4 (100, $[\text{M}+\text{Na}]^+$). HRMS calcd. for $\text{C}_{34}\text{H}_{65}\text{NO}_7\text{Si}_3\text{Na}$ ($\text{M}+\text{Na}$) $^+$: 706.3961 , found: 706.3953 .

(6R)-6-Benzyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(3S,5R)-4,5-hydroxy-3-oxo-heptanoic acid methyl ester

A solution of Et_3B (330 μl , 330 μmol , 1.5 eq, 1M sol. in hexane), pivalic acid (1.1 mg, 11 μmol , 0.05 eq) and MeOH (330 μl) was stirred at RT for 1 hour. Then it was cooled to -70°C . (6R)-6-Benzyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(5R)-5-hydroxy-3-oxo-heptanoic acid methyl ester (0.10 g, 0.22 mmol) in dry THF (500 μl) was added dropwise followed by NaBH_4 (33 mg, 0.88 mmol, 4 eq). The reaction mixture was stirred at -70°C for 4 hours. H_2O_2 (1 mL) and H_2O (1.5 mL) were then added at -70°C and the reaction allowed to warm until RT. Then CHCl_3 and H_2O were added and the aqueous phase extracted with chloroform. The combined organic layers were washed with 5x H_2O , dried over Na_2SO_4 , filtered and evaporated under reduced pressure. FC (Hexane/AcOEt 6:4) gave the cis title compound (70.0 mg, 15.4 μmol , 69%). $R_f = 0.18$ (AcOEt/Hexane 4:6). $[\alpha]_D = -11.68$ ($C = 2.22$, CHCl_3 , $T = 31.2^\circ\text{C}$). ^1H -NMR (CDCl_3 , 300 MHz) δ 0.052 (s, 3H), 0.061 (s, 3H), 0.88 (s, 9H), 1.5-1.6 (m, 1H), 1.67-1.81 (m, 1H), 2.44-2.51 (m, 2H), 3.56-3.65 (m, 1H), 3.69 (s, 3H), 3.75-3.82 (m, 2H), 3.89-3.93 (s, 1H), 4.19-4.35 (m, 2H), 5.1 (d, 1H, $J = 1.87$), 5.39 (br. d, 1H, $J = 9.02$), 7.3-7.36

(m, 5H). ^{13}C -NMR (CDCl_3 , 75 MHz) -5.4 , 18.2 , 25.9 , 39.4 , 41.5 , 51.8 , 55.0 , 65.0 , 66.8 , 68.1 , 71.8 , 127.95 , 128.0 , 128.4 , 136.3 , 156.3 , 172.5 . IR $3664\text{--}3143\text{m}$, 1722s , 1508.8m . MS 478.2 (100, $[\text{M}+\text{Na}]^+$). HRMS calcd. for $\text{C}_{22}\text{H}_{37}\text{NO}_7\text{SiNa}$ ($\text{M}+\text{Na}$) $^+$: 478.2232 , found: 478.2225 .

(6R)-6-Benzyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(3S,5R)-4,5-hydroxy-3-oxo-heptanoic acid methyl ester

A solution of (6R)-6-Benzyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(3S,5R)-4,5-hydroxy-3-oxo-heptanoic acid methyl ester (70.0 mg, 0.15 mmol) in dry CH_2Cl_2 (0.5 mL) was cooled to $-20\text{ }^\circ\text{C}$ and 2,6 lutidine (70 μL , 0.6 mmol, 4 eq) was added dropwise followed by TBSOTf (103 μL , 0.45 mmol, 3 eq). The reaction mixture was stirred at $-20\text{ }^\circ\text{C}$ for 2h. Then CH_2Cl_2 was added and the organic phase was washed 3x with citric acid (10%) and 2x with H_2O , dried over Na_2SO_4 , filtered and evaporated under reduced pressure. FC (AcOEt /hexane 1:9) gave the title compound (78.0 mg, 0.11 mmol, 74 %). $R_f = 0.68$ (AcOEt /hexane 1:4). $[\alpha]_D = +0.64$ ($C = 3.85$, CHCl_3 , $T = 28.1\text{ }^\circ\text{C}$). ^1H -NMR (CDCl_3 , 300 MHz) δ 0.063 (2*s, 9H), 0.086 (s, 6H), 0.103 (s, 3H), 0.87 (s, 9H), 0.89 (s, 9H), 0.90 (s, 9H), 1.65–1.83 (m, 2H), 2.43 (d, 2H, $J = 5.91$), 3.54 (dd, 1H, $J_1 = 7.78$, $J_2 = 9.02$), 3.6 (s, 3H), 3.65–3.8 (m, 2H), 4.08 (m, 1H), 4.12 (dd, 1H, $J_1 = 5.29$, $J_2 = 5.74$), 5.05 (d, 1H, $J = 8.7$), 5.1 (s, 2H), 7.03–7.39 (m, 5H). ^{13}C -NMR (CDCl_3 , 75 MHz) -5.2 , -4.6 , -4.1 , 17.9 , 18.1 , 18.5 , 25.8 , 26.0 , 26.1 , 41.9 , 42.9 , 51.4 , 54.8 , 61.8 , 66.4 , 66.7 , 67.1 , 128.0 , 128.1 , 128.4 , 136.5 , 156.0 , 171.2 . IR 2957m ,

2926m, 2884s, 2853m, 1725m. MS 706.4 (100, [M+Na]⁺). HRMS calcd. for C₃₄H₆₅NO₇Si₃Na (M+Na)⁺: 706.3961, found: 706.3953.

(6R)-6-(2-benzyloxy-benzoylamino)-(3R,5R)-3,5,7-tris-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid methyl ester

To a solution of (6R)-6-Benzyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(3R,5R)-4,5-hydroxy-3-oxo-heptanoic acid methyl ester (46 mg, 67 μ mol) in MeOH (1 mL) previously 3x flushed with argon was added Pd/C. Then it was flushed with H₂ and it was stirred at RT for 4 hours. Pd/C was filtered over celite and the solvent was removed under reduced pressure. This product was added to a solution of O-Bn-salicylic acid (18 mg, 80 μ mol, 1.2 eq) dissolved in dry CHCl₃ (1 mL) with EDC.HCl (15.3 mg, 80 μ mol, 1.2 eq), HOBT (12.2 mg, 80 μ mol, 1.2 eq) and NMM (26 μ L, 240 μ mol, 3 eq). The reaction mixture was stirred at RT for 20 hours. The solvent was then removed under reduced pressure and the residue taken up with AcOEt. It was washed 3x with citric acid (10 %) and 3x with satd. NaHCO₃. The organic phase was dried over MgSO₄, filtered and evaporated under reduced pressure. FC (AcOEt/hexane 1:9) gave the title compound (31.2 mg, 41 μ mol, 61%). R_f = 0.38 (AcOEt/Hexane 1:7). [α]_D = -26.7 (C = 0.81, CHCl₃, T = 24.2 °C). ¹H-NMR (CDCl₃, 300 MHz) δ -0.057 (s, 3H), -0.007 (s, 3H), 0.067 (s, 6H), 0.075 (s, 3H), 0.107 (s, 3H), 0.78 (s, 9H), 0.81 (s, 9H), 0.89 (s, 9H), 1.58-1.71 (m, 1H), 1.89 (ddd, J_1 = 4.67, J_2 = 9.34, J_3 = 13.7), 2.37 (dd, 1H, J_1 = 8.1, J_2 = 14.01), 2.52 (dd, 1H, J_1 = 4.05, J_2 = 14.01), 3.5 (m, 1H), 3.64 (s, 3H), 3.67 (dd, 1H, J_1 = 4.98, J_2 = 9.34), 4.13-4.2 (m, 2H), 5.3 (s, 2H), 6.9 (d, 1H, J = 8.4), 7.03 (td, J_1 = 0.93, J_2

= 7.78), 7.3-7.4 (m, 5H), 8.0 (d, 1H, $J = 8.72$), 8.15 (dd, 1H, $J_1 = 1.87$, $J_2 = 7.78$). ^{13}C -NMR (CDCl_3 , 75 MHz) -5.24, -5.13, -4.85, -4.67, -4.38, 17.9, 18.1, 25.8, 25.9, 42.2, 42.3, 51.4, 53.4, 60.6, 66.6, 66.8, 70.8, 113.2, 121.3, 122.4, 126.6, 128.0, 128.6, 132.3, 136.0, 156.3, 165.0, 171.3. IR 3401w, 1739m, 1656m. MS 760 (100, $[\text{M}+\text{H}]^+$).

(6R)-6-(2-benzyloxy-benzoylamino)-(3S,5R)-3,5,7-tris-(tert-butyl-dimethyl-silanyloxy)-heptanoic acid methyl ester

To a solution of (6R)-6-Benzyloxycarbonylamino-7-(tert-butyl-dimethyl-silanyloxy)-(3S,5R)-4,5-hydroxy-3-oxo-heptanoic acid methyl ester (47 mg, 68 μmol) in MeOH (1 mL) previously 3x flushed with argon was added Pd/C. Then it was flushed with H_2 and it was stirred at RT for 4 hours. Pd/C was filtered over celite and the solvent was removed under reduced pressure. This product was added to a solution of O-Bn-salicylic acid (19 mg, 82 μmol , 1.2 eq) dissolved in dry CHCl_3 (1 mL) with EDC.HCl (15.7 82 μmol , 1.2 eq), HOBT (12.5 mg, 82 μmol , 1.2 eq) and NMM (27 μl , 246 μmol , 3 eq). The reaction mixture was stirred at RT for 20 hours. The solvent was then removed under reduced pressure and the residue taken up with AcOEt. It was washed 3x with citric acid (10 %) and 3x with satd. NaHCO_3 . The organic phase was dried over MgSO_4 , filtered and evaporated under reduced pressure. FC (AcOEt/Hexane 1:9) gave the title compound (30 mg, 39.5 μmol , 58%). $R_f = 0.17$ (AcOEt/Hexane 1:9). Colorless oil. $[\alpha]_D = + 3.16$ ($C = 1.45$, CHCl_3 , $T = 28^\circ\text{C}$). ^1H -NMR (CDCl_3 , 300 MHz) δ 0.06 (s, 6H), 0.07 (s, 3H), 0.09 (s, 3H), 0.094 (s, 3H), 0.104 (s, 3H), 0.84 (s, 9H), 0.86 (s, 9H), 0.89 (s, 9H), 1.68-1.83 (m, 2H), 2.34-2.48 (m, 2H), 3.49 (s, 3H), 3.6 (dd, 1H, $J_1 = 8.41$, $J_2 = 9.65$),

1112 (dd, 1H, $J_1 = 5.3$, $J_2 = 9.65$), 4.13-4.22 (m, 2H), 4.22-4.32 (m, 1H), 5.29 (s, 2H), 6.91 (d, 1H, $J = 7.78$), 7.0-7.7 (td, 2H, $J_1 = 0.93$, $J_2 = 7.47$), 7.28-7.38 (m, 5H), 8.0 (d, 1H, $J = 8.41$), 8.16 (dd, 1H, $J_1 = 1.87$, $J_2 = 7.78$). ^{13}C -NMR (CDCl_3 , 75 MHz) -5.1, -4.5, -4.2, -4.0, 17.9, 18.1, 25.9, 26.0, 26.1, 42.1, 43.2, 51.4, 53.8, 61.2, 66.5, 67.1, 70.8, 111.2, 121.3, 122.3, 126.7, 128.1, 128.7, 132.2, 132.3, 135.9, 156.3, 165.0, 171.3. IR 3401w, 1739s, 1651s, 1596w, 1513m. MS 782 (100, $[\text{M}+\text{Na}]^+$). HRMS calcd. for $\text{C}_{40}\text{H}_{69}\text{NO}_7\text{Si}_3\text{Na}$ ($\text{M}+\text{Na}$) $^+$: 782.4274, found: 782.4283.

References

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STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem6oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

128 repetitions

OBSERVE H1, 300.2230602 MHz

DATA PROCESSING

FFT size 32768

Total time 7 min, 2 sec

STANDARD 1H OBSERVE

Sample directory: yb0319
File: /export/home/locnmr/vnmrSYS/exp2/text

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem5oc"

Relax. delay 1.000 sec

Pulse 45.0 degrees

Acq. time 1.998 sec

Width 4500.5 Hz

16 repetitions

OBSERVE H1, 299.7729185 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 49 sec

STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem6oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

16 repetitions

OBSERVE H1, 300.2230602 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 52 sec

STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem6oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

16 repetitions

OBSERVE H1, 300.2230602 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 52 sec

STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem4oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

16 repetitions

OBSERVE H1, 299.9012510 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 52 sec

STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem6oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

16 repetitions

OBSERVE H1, 300.2230602 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 52 sec

STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem4oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

16 repetitions

OBSERVE H1, 299.9012510 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 52 sec

STANDARD 1H OBSERVE

Sample directory: yb0256
File: /export/home/locnmr/vnmrsys/exp1/text

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem5oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

16 repetitions

OBSERVE H1, 299.7729185 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 52 sec

STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem6oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

16 repetitions

OBSERVE H1, 300.2230602 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 52 sec

STANDARD 1H OBSERVE

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

File: yb0367-2

Mercury-300BB "gem6oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

16 repetitions

OBSERVE H1, 300.2230602 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 52 sec

STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem6oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

16 repetitions

OBSERVE H1, 300.2230602 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 52 sec

STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl₃

Ambient temperature

User: ebethu

Mercury-300BB "gem40c"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

16 repetitions

OBSERVE H1, 299.9012510 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 52 sec

STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem6oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

16 repetitions

OBSERVE H1, 300.2230602 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 52 sec

Total Synthesis of Anachelin H

S-44

STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem6oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

48 repetitions

OBSERVE H1, 300.2230602 MHz

DATA PROCESSING

FT size 32768

Total time 14 min, 58 sec

STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BB "gem6oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

16 repetitions

OBSERVE H1, 300.2230602 MHz

DATA PROCESSING

FT size 32768

Total time 0 min, 52 sec

Total Synthesis of Anachelin H

S-46

STANDARD 1H OBSERVE

File: PROTON

Pulse Sequence: s2pul

Solvent: CDCl3

Ambient temperature

User: ebethu

Mercury-300BBB "gem6oc"

Pulse 30.0 degrees

Acq. time 3.138 sec

Width 5099.4 Hz

112 repetitions

OBSERVE H1, 300.2230602 MHz

DATA PROCESSING

FT size 32768

Total time 14 min, 58 sec

Total Synthesis of Anachelin H

¹H Chemical Shift Differences vs. the Natural Product

mixture of natural and
synthetic anachelin

synthetic anachelin

natural anachelin