Title: Structure/activity Relationship of Thapsigargin Inhibition on the Purified Golgi/secretory Pathway Ca^{2+}/Mn^{2+} Transport ATPase (SPCA1a)

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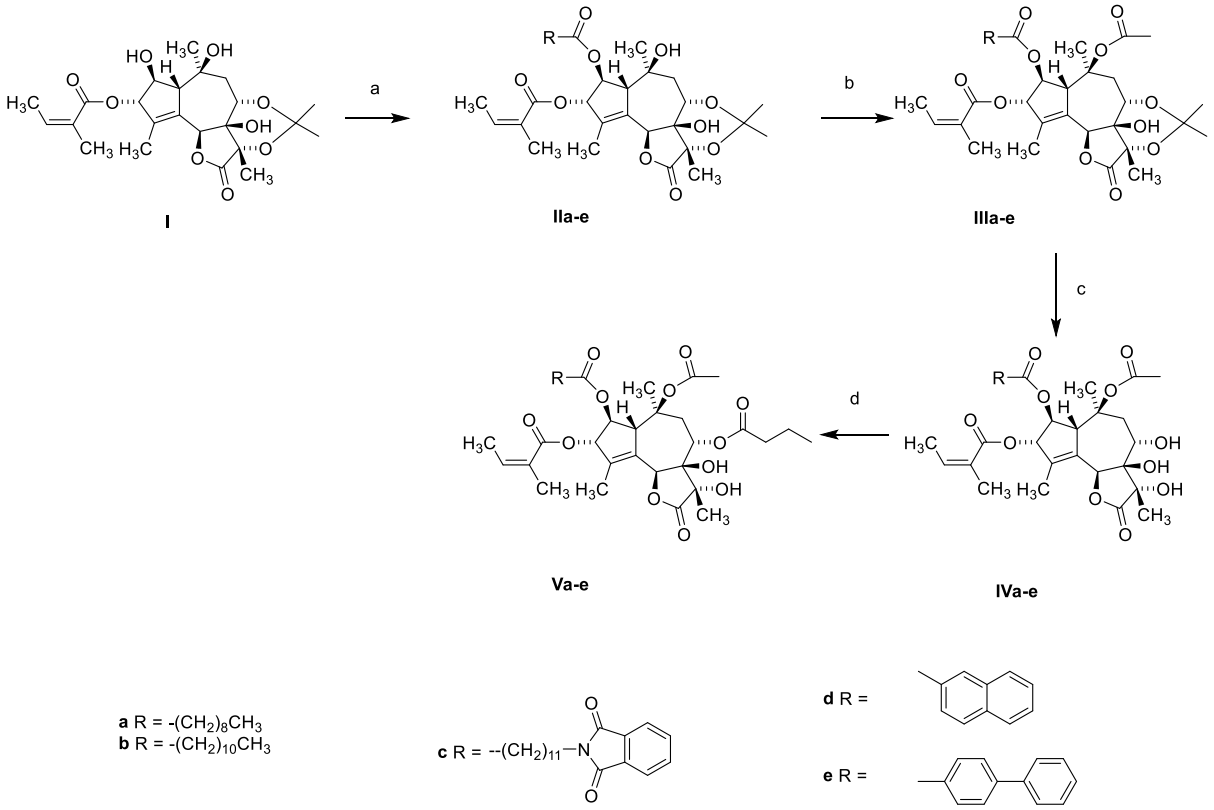
Supplementary Material and Methods

The substitution of the acyl group at O-2 was performed using the previous described protocol (1) starting with compound **I** as illustrated in Scheme S1:



Scheme S1. RCOOH, N,N'-dicyclohexylcarbodiimide (DCC), 4-dimethylaminopyridine (DMAP), dicholoromethane (DCM), b Acetic anhydride, toluenesufonic acid, DCM, c Methanol added hydrochloric acid, d Butanoic anhydride, DCC, DMAP, DCC.

Nortrilobolide (ΔO-2) was isolated as previously described (2). ΔO-3 (1), HzL09012012 (1), HzL170809 (1), ΔO-8 (3), Leu8ADT (4), ΔO-10 (5), HzL12012012 (1), HzL271009 (1), HzL20072015 (1) and Tg-epoxide (6) were synthesized as described previously.

Compound **IIa.** Compound **I** (100 mg, 0.22 mmol), decanoic acid (45.68 mg, 0.27 mmol), 4–dimethylaminopyridine (DMAP, 20 mg, 0.16 mmol) and N,N'–dicyclohexylcarbodiimide (DCC, 54.68 mg, 0.27 mmol) was dissolved in dichloromethane DCM (3 ml). The mixture was stirred at room temperature overnight. The mixture was filtrated and concentrated in vacuo. The residue was purified by column

chromatography using petroleum ether-EtOAc (2:1) as an eluent to give compound **IIa** (112 mg, 83.5%). ^{1}H NMR ($CDCl_3$) δ (ppm): 6.11 (q, J = 7.3 Hz, 1H, angeloyl H-3); 5.79 (s, 2H, H-3 and H-6); 5.36 (t, J = 4.6 Hz, 1H, H-2); 4.22 (s, 1H, H-8); 3.39 (s, 1H, H-1); 2.34 (m, 2H, decanoyl H-2); 2.24 (dd, J = 4.1 and 15.6 Hz, 1H, H-9); 2.04 (d, J = 15.6 Hz, 1H, H-9'); 1.97 (d, J = 7.3 Hz, 3H, angeloyl H-4); 1.89 (m, 6H, H-15 and angeloyl C-2 CH_3); 1.59 (m, 2H, decanoyl H-3); 1.53 (s, 6H, H-13 and Isopropylidene CH_3); 1.41 (s, 3H, isopropylidene CH_3'); 1.26 (m, 15H, H-14 and decanoyl H-4 to H-9); 0.87 (t, J = 6.7 Hz, 3H, decanoyl H-10). ^{13}C NMR ($CDCl_3$) δ (ppm): 174.7 (C=O, C-12); 172.8 (C=O, decanoyl C-1); 167.5 (C=O, angeloyl C-1); 139.1 (C=C, C-5); 137.5 (C=C, angeloyl C-3); 129.5 (C=C, C-4); 127.4 (C=C, angeloyl C-2); 100.9 ($C(CH_3)_2$); 83.5 (C-10); 79.2 (C-3); 78.8 (C-11); 77.9 (C-7); 76.0 (C-2); 72.9 (C-6); 65.8 (C-8); 59.8 (C-1); 44.3 (C-9); 34.5 (decanoyl C-2); 33.7 (decanoyl C-4); 31.9 (isopropylidene CH_3); 30.5 (decanoyl C-5); 29.4 (decanoyl C-6); 29.3 (decanoyl C-7); 29.3 (decanoyl C-8); 29.1 (decanoyl C-9); 24.7 (decanoyl C-3); 24.0 (isopropylidene CH_3'); 23.7 (C-14); 20.6 (angeloyl C-2 CH_3); 15.9 (angeloyl C-4); 15.9 (C-13); 14.1 (decanoyl C-10); 12.6 (C-15).

Compound **IIIa**. To a solution of **IIa** (91 mg, 0.15 mmol) in DCM (11 ml) was added acetic anhydride (0.35 ml, 3.75 mmol) and *p*–TsOH (77.49 mg, 0.41 mmol). The mixture was stirred at room temperature for 2 h and 15 min added saturated aqueous $NaHCO_3$ (50 ml) and the mixture extracted three times with EtOAc (50 ml). The organic layers were combined and washed with brine (50 ml), dried over Na_2SO_4, filtered and concentrated in vacuo. The residue was purified by column chromatography using heptane-EtOAc (2:1) as an eluent to give compound I**IIa** (83 mg, 85.3%). ^{1}H NMR ($CDCl_3$) δ (ppm): 6.09 (qq, J = 1.5 and 7.2 Hz, 1H, angeloyl H-3); 5.94 (br s, 1H, H-6); 5.80 (br s, 1H, H-3); 5.41 (t, J = 4.6 Hz, 1H, H-2); 5.13 (br s, 1H, H-8); 3.76 (br s, 1H, H-1); 2.74 (dd, J = 4.7 and 15.1 Hz, 1H, H-9); 2.58 (dd, J = 3.0 and 15.1 Hz, 1H, H-9'); 2.28 (m, 2H, decanoyl H-2); 2.16 (s, 3H, acetyl H-2); 1.99 (dq, J = 1.6 and 7.2 Hz, 3H, angeloyl H-4); 1.91 (m, 6H, H-15 and angeloyl C-2 CH_3); 1.57 (m, 8H, decanoyl H-3 and isopropylidene CH_3 and CH_3'); 1.46 (s, 3H, H-13); 1.43 (s, 3H, H-14); 1.26 (m, 12H, decanoyl H-4 to H-9); 0.88 (t, J = 6.8 Hz, 3H, decanoyl H-10). ^{13}C NMR ($CDCl_3$) δ (ppm): 173.1 (C=O, C-12); 172.6 (C=O, decanoyl C-1); 170.5 (C=O, acetyl C-1); 167.5 (C=O, angeloyl C-1); 138.7 (C=C, C-5); 138.5 (C=C, angeloyl C-3); 128.7 (C=C, C-4); 127.5 (C=C, angeloyl C-2); 101.1 ($C(CH_3)_2$); 84.9 (C-10); 84.1 (C-3); 79.4 (C-11); 78.0 (C-7); 77.8 (C-2); 75.9 (C-6); 65.8 (C-8); 57.2 (C-1); 38.1 (C-9); 38.0 (decanoyl C-2); 34.3 (decanoyl C-4); 31.9 (isopropylidene CH_3); 30. 5 (decanoyl C-5); 29.5 (decanoyl C-6); 29.3 (decanoyl C-7); 29.3 (decanoyl C-8); 29.2 (decanoyl C-9); 24.7 (decanoyl C-3); 23.6 (isopropylidene CH_3'); 22.6 (decanoyl C-11); 22.5 (C-14); 21.3 (acetyl C-2); 20.5 (angeloyl C-2 CH_3); 15.8 (angeloyl C-4); 15.8 (C-13); 14.1 (decanoyl C-10); 12.6 (C-15).

Compound **IVa**: To a solution of **IIIa** (103 mg, 0.16 mmol) in methanol (10 ml) was added 4N hydrochloric acid (0.14 ml). The mixture was stirred at room temperature for 3 h and 15 min. The reaction mixture was concentrated in vacuo and the residue dissolved in toluene (10 ml) and concentrated. The residue was concentrated in vacuo to give compound **IVa** (101 mg, 100%). ^{1}H NMR ($CDCl_3$) δ (ppm): 6.10 (qq, J = 1.6 and 7.2 Hz, 1H, angeloyl H-3); 5.80 (s, 1H, H-6); 5.69 (s, 1H, H-3); 5.46 (t, J = 3.5 Hz, 1H, H-2); 4.36 (s, 1H, H-8); 4.20 (s, 1H, H-1); 2.84 (dd, J = 1.9 and 14.1 Hz, 1H, H-9); 2.48 (dd, J = 3.3 and 14.5 Hz, 1H, H-9'); 2.29 (m, 2H, decanoyl H-2); 1.98 (dq, J = 1.6 and 7.3 Hz, 3H, angeloyl H-4); 1.91 (m, 6H, acetyl H-2 and H-15); 1.85 (s, 3H, angeloyl C-2 CH_3); 1.60 (m, 2H, decanoyl H-3); 1.50 (s, 3H, H-13); 1.44 (s, 3H, H-14); 1.30 (m, 12H, decanoyl H-4 to H-9); 0.87 (t, J = 6.7 Hz, 3H, decanoyl H-10). ^{13}C NMR ($CDCl_3$) δ (ppm): 175.9 (C=O, C-12); 172.7 (C=O, decanoyl C-1); 171.4 (C=O, acetyl C-1); 167.4 (C=O, angeloyl C-1); 140.7 (C=C, C-5); 138.9 (C=C, angeloyl C-3); 130.2 (C=C, C-4); 127.4 (C=C, angeloyl C-2); 85.6 (C-10); 84.2 (C-3); 79.6 (C-11); 79.3 (C-7); 78.0 (C-2); 77.2 (C-6); 68.6 (C-8); 57.4 (C-1); 39.1 (C-9); 34.3 (decanoyl C-2); 31.9 (decanoyl C-4); 29.4 (decanoyl C-5); 29. 3 (decanoyl C-6); 29.3 (decanoyl C-7); 29.1 (decanoyl C-8); 24.8 (decanoyl C-

9); 22.8 (decanoyl C-3); 22.7 (C-14); 22.6 (acetyl C-2); 20.5 (angeloyl C-2 CH_3); 16.1 (angeloyl C-4); 15.8 (C-13); 14.1 (decanoyl C-12); 12.8 (C-15).

Compound **Va (JBH04012016).** A solution of **IVa** (107 mg, 0.18 mmol), butyric anhydride (30.61 mg, 0.19 mmol) and DMAP (10 mg, 0.08 mmol) in dichloromethane (5 ml) was stirred at room temperature for 2 h and added saturated aqueous $NaHCO_3$ (10 ml). The reaction mixture was extracted three times with dichloromethane (10 ml). The organic layers was combined and dried over Na_2SO_4, filtered and concentrated in vacuo. The residue was purified by column chromatography using heptane-EtOAc (2:1) as an eluent to give compound **Va** (83 mg, 69.6%). ^{1}H NMR ($CDCl_3$) δ (ppm): 6.08 (qq, J = 1.5 and 7.2 Hz, 1H, angeloyl H-3); 5.65 (s, 1H, H-6); 5.64 (s, 1H, H-3); 5.62 (t, J = 3.8 Hz, 1H, H-2); 5.45 (t, J = 3.2 Hz, 1H, H-8); 4.32 (br s, 1H, H-1); 3.07 (dd, J = 3.6 and 14.8 Hz, 1H, H-9); 2.27 (m, 5H, decanoyl H-2 and butanoyl H-2 and H-9'); 1.97 (dq, J = 1.6 and 7.3 Hz, 3H, angeloyl H-4); 1.89 (br s, 3H, H-15); 1.87 (s, 3H, acetyl H-2); 1.84 (br s, 3H, angeloyl C-2 CH_3); 1.59 (m, 4H, decanoyl H-3 and butanoyl H-3); 1.44 (s, 3H, H-13); 1.37 (s, 3H, H-14); 1.25 (m, 12H, decanoyl H-4 to H-9); 0.92 (t, J = 7.4 Hz, 3H, butanoyl H-4); 0.85 (t, J = 7.0 Hz, 3H, decanoyl H-10). ^{13}C NMR ($CDCl_3$) δ (ppm): 175.9 (C=O, C-12); 172.9 (C=O, decanoyl C-1); 172.7 (C=O, butanoyl C-1); 171.1 (C=O, acetyl C-1); 167.1 (C=O, angeloyl C-1); 141.3 (C=C, C-5); 138.7 (C=C, angeloyl C-3); 130.5 (C=C, C-4); 127.5 (C=C, angeloyl C-2); 84.9 (C-10); 84.2 (C-3); 78.6 (C-11); 78.5 (C-7); 77.8 (C-2); 77.0 (C-6); 66.2 (C-8); 57.3 (C-1); 38.2 (C-9); 36.6 (butanoyl C-2); 34.2 (decanoyl C-2); 31.9 (decanoyl C-4); 29.4 (decanoyl C-5); 29.4 (decanoyl C-6); 29.3 (decanoyl C-7); 29.1 (decanoyl C-8); 24.8 (decanoyl C-9); 23.0 (decanoyl C-3); 22.6 (C-14); 22.6 (acetyl C-2); 20.6 (butanoyl C-3); 18.0 (angeloyl C-2 CH_3); 16.0 (angeloyl C-4); 15.8 (C-13); 14.0 (butanoyl C-4); 13.7 (decanoyl C-10); 12.9 (C-15). HRMS 701.35090, Calc. $(C_{36}H_{54}NaO_{12})^+$: 701.35075.

Compound **IIb.** Compound **IIb** was prepared in the same way as **IIa** using **I** (100 mg, 0.22 mmol) and dodecanoic acid (53.08 mg, 0.27 mmol) as starting materials. The crude reaction product was purified by column chromatography using petroleum ether:EtOAc (3:1) as an eluent to give compound **IIb** (133 mg, 94.8%). ^{1}H NMR ($CDCl_3$) δ (ppm): 6.11 (qq, J = 1.6 and 7.3 Hz, 1H, angeloyl H-3); 5.81 (s, 1H, H-6); 5.80 (s, 1H, H-3); 5.37 (t, J = 4.6 Hz, 1H, H-2); 4.24 (t, J = 3.7 Hz, 1H, H-8); 3.36 (br s, 1H, H-1); 2.33 (m, 2H, dodecanoyl H-2); 2.25 (dd, J = 4.4 and 15.4 Hz, 1H, H-9); 2.05 (dd, J = 2.9 and 15.0 Hz, 1H, H-9'); 1.98 (d, J = 7.5 Hz, 3H, angeloyl H-4); 1. 90 (m, 6H, H-15 and angeloyl C-2 CH_3); 1.56 (m, 8H, dodecanoyl H-3 and H-13 and isopropylidene CH_3); 1.42 (s, 3H, isopropylidene CH_3'); 1.25 (m, 19H, H-14 and dodecanoyl H-4 to H-11); 0.88 (t, J = 6.7 Hz, 3H, dodecanoyl H-12). ^{13}C NMR ($CDCl_3$) δ (ppm): 174.6 (C=O, C-12); 172.7 (C=O, dodecanoyl C-1); 167.4 (C=O, angeloyl C-1); 139.0 (C=C, C-5); 137.7 (C=C, angeloyl C-3); 129.3 (C=C, C-4); 127.4 (C=C, angeloyl C-2); 100.9 ($C(CH_3)_2$); 83.4 (C-10); 79.2 (C-3); 78.7 (C-11); 77.8 (C-7); 76.1 (C-2); 72.8 (C-6); 65.8 (C-8); 60.0 (C-1); 44.3 (C-9); 34.5 (dodecanoyl C-2); 33.8 (dodecanoyl C-4); 31.9 (isopropylidene CH_3); 30.5 (dodecanoyl C-5); 29.6 (dodecanoyl C-6); 29.5 (dodecanoyl C-7); 29.3 (dodecanoyl C-8); 29.3 (dodecanoyl C-9); 29.1 (dodecanoyl C-10); 24.8 (dodecanoyl C-3); 23.7 (isopropylidene CH_3'); 22.7 (dodecanoyl C-11); 22.7 (C-14); 20.6 (angeloyl C-2 CH_3); 15.9 (angeloyl C-4); 15.9 (C-13); 14.1 (dodecanoyl C-12); 12.6 (C-15).

Compound **IIIb**. Compound **IIIb** was prepared in the same way as compound **IiIa** using **IIb** (133 mg, 20.95 mmol) and acetic anhydride (0.49 ml, 5.24 mmol) as starting materials. The crude reaction product was purified by column chromatography using petroleum ether:EtOAc (3:1) as an eluent to give compound **IIIb** (71.3 mg, 50.3%). ^{1}H NMR ($CDCl_3$) δ (ppm): 6.10 (qq, J = 1.5 and 7.3 Hz, 1H, angeloyl H-3); 5.78 (br s, 1H, H-6); 5.73 (br s, 1H, H-3); 5.49 (t, J = 4.6 Hz, 1H, H-2); 4.26 (t, J = 3.5 Hz, 1H, H-8); 3.96 (br s, 1H, H-1); 2.79 (dd, J = 4.7 and 14.8 Hz, 1H, H-9); 2.64 (dd, J = 3.0 and 14.7 Hz, 1H, H-9'); 2.30 (m, 2H, dodecanoyl H-2); 1.98 (dq,

J = 1.5 and 7.2 Hz, 3H, angeloyl H-4); 1.91 (dq, J = 1.6 and 7.2 Hz, 3H, angeloyl C-2 CH_3); 1.87 (m, 6H, H-15 and acetyl H-2); 1.56 (m, 8H, dodecanoyl H-3 and isopropylidene CH_3 and CH_3'); 1.46 (s, 3H, H-13); 1.42 (s, 3H, H-14); 1.25 (m, 16H, dodecanoyl H-4 to H-11); 0.88 (t, J = 7.2 Hz, 3H, dodecanoyl H-12). ^{13}C NMR ($CDCl_3$) δ (ppm): 172.9 (C=O, C-12); 172.6 (C=O, dodecanoyl C-1); 170.4 (C=O, acetyl C-1); 167.4 (C=O, angeloyl C-1); 138.8 (C=C, C-5); 138.7 (C=C, angeloyl C-3); 128.5 (C=C, C-4); 127.5 (C=C, angeloyl C-2); 101.1 ($C(CH_3)_2$); 84.7 (C-10); 84.0 (C-3); 79.4 (C-11); 78.0 (C-7); 77.7 (C-2); 76.0 (C-6); 65.8 (C-8); 57.3 (C-1); 38.1 (C-9); 34.3 (dodecanoyl C-2); 31.9 (dodecanoyl C-4); 30.5 (isopropylidene CH_3); 29. 6(dodecanoyl C-5); 29.6 (dodecanoyl C-6); 29.5 (dodecanoyl C-7); 29.3 (dodecanoyl C-8); 29.3 (dodecanoyl C-9); 29.2 (dodecanoyl C-10); 24.8 (dodecanoyl C-3); 23.6 (isopropylidene CH_3'); 22.7 (dodecanoyl C-11); 22.5 (C-14); 21.2 (acetyl C-2); 20.5 (angeloyl C-2 CH_3); 15.8 (angeloyl C-4); 15.8 (C-13); 14.1 (dodecanoyl C-12); 12.6 (C-15).

Compound **IVb.** Compound **IVb** was prepared in the same way as compound **IVa** using **IIIb** (71.3 mg, 0.11 mmol) as starting material. The reaction mixture was concentrated in vacuo to give compound **IVb** (64 mg, 95.4%). ^{1}H NMR ($CDCl_3$) δ (ppm): 6.10 (qq, J = 1.3 and 7.3 Hz, 1H, angeloyl H-3); 5.79 (s, 1H, H-6); 5.68 (s, 1H, H-3); 5.44 (t, J = 3.6 Hz, 1H, H-2); 4.35 (s, 1H, H-8); 4.21 (s, 1H, H-1); 2.83 (d, J = 13.9 Hz, 1H, H-9); 2.45 (d, J = 13.9 Hz, 1H, H-9'); 2.27 (m, 2H, dodecanoyl H-2); 1.97 (m, 3H, angeloyl H-4); 1.89 (m, 6H, acetyl H-2 and H-15); 1.83 (br s, 3H, angeloyl C-2 CH_3); 1.58 (m, 2H, dodecanoyl H-3); 1.48 (s, 3H, H-13); 1.43 (s, 3H, H-14); 1.25 (m, 16H, dodecanoyl H-4 to H-1); 0.87 (t, J = 7.0 Hz, 3H, dodecanoyl H-12). ^{13}C NMR ($CDCl_3$) δ (ppm): 175.9 (C=O, C-12); 172.7 (C=O, dodecanoyl C-1); 171.4 (C=O, acetyl C-1); 167.4 (C=O, angeloyl C-1); 140.7 (C=C, C-5); 138.8 (C=C, angeloyl C-3); 130.2 (C=C, C-4); 127.4 (C=C, angeloyl C-2); 85.6 (C-10); 84.2 (C-3); 79.6 (C-11); 79.3 (C-7); 78.0 (C-2); 77.2 (C-6); 68.6 (C-8); 57.4 (C-1); 39.1 (C-9); 34.3 (dodecanoyl C-2); 31.9 (dodecanoyl C-4); 29.6 (dodecanoyl C-5); 29. 6(dodecanoyl C-6); 29.5 (dodecanoyl C-7); 29.3 (dodecanoyl C-8); 29.3 (dodecanoyl C-9); 29.2 (dodecanoyl C-10); 24.8 (dodecanoyl C-3); 22.8 (dodecanoyl C-11); 22.7 (C-14); 22.7 (acetyl C-2); 20.5 (angeloyl C-2 CH_3); 16.2 (angeloyl C-4); 15.8 (C-13); 14.1 (dodecanoyl C-12); 12.8 (C-15).

Compound **Vb (JBH09022016)**. Compound **Vb** was prepared the same way as compound **Va** using **IVb** (64 mg, 0.10 mmol) and butyric anhydride (25.46 mg, 0.16 mmol) as starting materials. The crude reation product was purified by column chromatography using heptane-EtOAc (3:1) as an eluent to give compound **Vb** (53 mg, 74.6%). ^{1}H NMR ($CDCl_3$) δ: 6.10 (qq, J = 1.5 and 7.2 Hz, 1H, angeloyl H-3); 5.68 (s, 1H, H-6); 5.65 (s, 1H, H-3); 5.62 (t, J = 3.7 Hz, 1H, H-2); 5.48 (t, J = 3.4 Hz, 1H, H-8); 4.27 (s, 1H, H-1); 3.03 (dd, J = 3.6 and 14.8 Hz, 1H, H-9); 2.29 (m, 5H, dodecanoyl H-2 and butanoyl H-2 and H-9'); 1.99 (dq, J = 1.5 and 7.1 Hz, 3H, angeloyl H-4); 1.91 (p, J = 1.6 Hz, 3H, H-15); 1.89 (s, 3H, acetyl H-2); 1.86 (br s, 3H, angeloyl C-2 CH_3); 1.61 (m, 4H, dodecanoyl H-3 and butanoyl H-3); 1.48 (s, 3H, H-13); 1.40 (s, 3H, H-14); 1.25 (m, 16H, dodecanoyl H-4 to H-11); 0.94 (t, J = 7.4 Hz, 3H, butanoyl H-4); 0.86 (t, J = 6.7 Hz, 3H, dodecanoyl H-12). ^{13}C NMR ($CDCl_3$) δ: 175.4 (C=O, C-12); 172.6 (C=O, dodecanoyl C-1); 172.6 (C=O, butanoyl C-1); 170.8 (C=O, acetyl C-1); 167.1 (C=O, angeloyl C-1); 141.8 (C=C, C-5); 138.7 (C=C, angeloyl C-3); 130.2 (C=C, C-4); 127.5 (C=C, angeloyl C-2); 84.6 (C-10); 84.1 (C-3); 78.6 (C-11); 78.6 (C-7); 77.8 (C-2); 76.9 (C-6); 66.2 (C-8); 57.5 (C-1); 38.3 (C-9); 36.7 (butanoyl C-2); 34.2 (dodecanoyl C-2); 31.9 (dodecanoyl C-4); 29.6 (dodecanoyl C-5); 29.6 (dodecanoyl C-6); 29.5 (dodecanoyl C-7); 29.4 (dodecanoyl C-8); 29.3 (dodecanoyl C-9); 29.1 (dodecanoyl C-10); 24.8 (dodecanoyl C-3); 22.9 (dodecanoyl C-11); 22.7 (C-14); 22.6 (acetyl C-2); 20.6 (butanoyl C-3); 18.0 (angeloyl C-2 CH_3); 16.2 (angeloyl C-4); 15.8 (C-13); 14.1 (butanoyl C-4); 13.7 (dodecanoyl C-12); 13.0 (C-15). HRMS 729.382250, Calc. $(C_{38}H_{58}NaO_{12})^+$: 729.38205.

Compound **IIc**. Compound **IIc** was prepared in the same way as **IIa** using **I** (70 mg, 0.15 mmol), phtalimid-dodecanoic acid (97 mg, 0.18 mmol), DCC (40 mg, 0.18 mmol), and 20 mg of DMAP as starting materials. After stirring for 18 h the crude reaction product was purified by column chromatography using toluene-EtOAc (3:1) as an eluent to give compound **IIc** (86 mg, 57%). ^{1}H NMR (600 MHz, $CDCl_3$) δ: 1.27 (s, 3 H, H-14), 1.21 - 1.37 (m, 14 H, dodecanoyl H-4 – H-10), 1.43 (s, 3 H, isopropylidene H-1), 1.55 (s, 3 H, H-13) 1.57 (s, 3 H, isopropylidene H-3), 1.58 - 1.64 (m, 2 H, dodecanoyl, H-3) 1.64 - 1.72 (m, 2 H, dodecanoyl, H-10) 1.89 (s, 3 H, H-15) 1.92 (s, 3 H, angeloyl H-5) 1.99 (d, *J*=6.97 Hz, 3 H, angeloyl H-4) 2.06 (dd, *J*=15.04, 2.57 Hz, 1 H, H-9b), 2.28 (dd, *J*=17.24, 4.77 Hz, 1 H, H-9a), 2.31 - 2.40 (m, 2 H, dodecanoyl H-2), 2.81 (s, 1 H, OH), 3.37 (s, 1 H, OH), 3.42 (br. s., 1 H, H-1) 3.68 (t, *J*=7.34 Hz, 2 H, dodecanoyl H-12), 4.27 (t, *J*=3.48 Hz, 1 H, H-8) 5.39 (t, *J*=4.59 Hz, 1 H, H-2) 5.81 (br. s, 1 H, H-6) 5.81 (br. s, 1 H, H-3), 6.12 (qq, *J*=7.10, 1.00 Hz, 1 H, angeloyl H-3) 7.68 - 7.76 (m, 2 H, phtalimid H-4 and 7) 7.81 - 7.88 (m, 2 H, phatalimid H-5 and 6). ^{13}C NMR (150 MHz, $CDCl_3$) δ: 12.56 (C-15), 15.90 (angeloyl C-5), 20.58 (angeloyl C-4), 23.68 (C-14), 24.05 (isopropylidene C-1), 24.72, 26.81, 28.54, 28.93, 29.09, 29.14, 29.29, 29.36, 29.37 (dodecanoyl C-3 – C-11), 30.50 (isopropylidene C-3), 34.43 (dodecanoyl C-2), 38.10 (C-9), 44.37 (dodecanoyl C-12), 59.85 (C-1), 65.83 (C-8), 72.89 (C-6), 76.02 (C-6), 77.95, 78.77 (C-7 and 10), 79.22 (C-10), 83.45 (C-3), 100.88 (isopropylidene C-2), 123.19 (phtalimide C-5, C-6), 127.40 (angeloyl C-2), 129.54 (C-4), 132.11 (phtalimide C-3, C-8), 133.91 (phtalimide C-4, C-7), 137.33 (angeloyl C-3), 138.96 (C-5), 167.42 (phtalimide C-2, C-9), 168.56 (angelolyl C-1), 172.88 (dodecanoyl C-1), 174.59 (C-12).

Compound **IIIc**: To a solution of compound **IIc** (86 mg, 0.11 mmol) in 5 mL of isopropenyl acetate was added 10 mg of p-TsOH and the mixture was stirred at room temperature for 2 h. The mixture was added 10 mL of aqueous $NaCO_3$ (saturated) and extracted three times with EtOAc (10 mL). The organic phases were combined and concentrated in vacuo. The residue was purified by reversed phase chromatography (Rp-18) chromatography using CH_3OH-H_2O (5:1) added 0.1 % acetic acid to give compound **IIIc** (56 mg, 62%). ^{1}H NMR (600 MHz, $CDCl_3$) δ 1.20 - 1.35 (m, 14 H, Dodecanoyl H-4 – Dodecanoyl H-10), 1.41 (s, 3 H, H-14), 1.47 (s, 3 H, Ket-3), 1.53 (br. s., 3 H, H-13), 1.56 (s, 3 H, Ket-1), 1.58 - 1.62 (m, 2 H, Dodecanoyl H-3) 1.62 – 1.68 (m, 2 H, Dodecanoyl H-10), 1.86 (br. s., 3 H, H-15) 1.87 (br. s., 3 H, Ac-2) 1.93 (m, 3 H, Angeloyl H-5), 1.97 (dq, *J*=5.20, 3.40 Hz, 3 H, Angeloyl H-4), 2.22 - 2.30 (m, 1 H, Dodecanoyl H-2b), 2.30 - 2.37 (m, 1 H, Dodecanoyl H-2a), 2.64 (dd, *J*=15.40, 2.00 Hz, 1 H, H-9b), 2.76 (dd, *J*=14.31, 3.67 Hz, 1 H, H-9a) 3.66 (m, 2 H, Dodecanoyl H-12), 4.00 (br. s., 1 H, H-1), 4.29 (br. s., 1 H, H-8), 5.49 (dd, *J*=7.40, 3.70 Hz, 1 H, H-2), 5.70 (br. s., 1 H, H-6), 5.78 (br. d, *J*=1.50 Hz, 1 H, H-3) 6.09 (br. q, *J*=7.10, 7.10, 7.10 Hz, 1 H, Angeloyl H-3), 7.69 - 7.73 (m, 2 H, Phtalimid-5 and 6), 7.83 (td, *J*=5.41, 3.12 Hz, 2 H, Phtalimid-4 and 7). ^{13}C NMR (150 MHz, $CDCl_3$) d ppm 12.59 (C-15), 15.80 (C-13), 20.53 (Angeloyl C-5), 21.20 (Angeloyl C-4), 22.54 (Ac-2), 23.61 (C-14), 24.71, 26.83, 28.56, 29.11, 29.14, 29.25, 29.39, 29.42, 29.47, (Dodecanoyl C-3 – 11), 34.27 (Dodecanoyl C-2), 38.06 (Dodecanoyl C-12), 57.24 (C-1), 65.84 (C-8), 75.89 (C-6), 77.83, 78.02 (C-7 and C-11), 79.44 (C-2), 84.07 (C-10), 84.86 (C-3), 101.06 (Ket-2), 123.16 (Phtalimid-4 and 7), 127.46 (Angeloyl C-2), 128.78 (C-4), 132.11 (Angeloyl C-3), 133.89 (Phtalimid-5 and 6), 138.21 (C-5), 138.64 (Phtalimid-3 and 8), 167.42 (Angeloyl C-1), 168.52 (Phtalimid-2 and 9), 170.45 (Ac-1), 172.60 (Dodecanoyl C-1), 172.12 (C-12).

Compound **IVc**: Compound **IVc** was prepared the same way as compound **IVa** using **IIIc** (56 mg, 0.06 mmol) as starting material. After workup the residue was purified by RP-18 chromatography using CH_3OH-H_2O (5:1, 0.1% AcOH) as eluent to give compound **IVc** (50 mg, 94%). ^{1}H NMR (600 MHz, $CDCl_3$) δ: 1.19 - 1.35 (m, 14 H, Dodecanoyl H-4 – Dodecanoyl H -10), 1.45 (s, 3 H, H-14), 1.50 (s, 3 H, H-13), 1.58 (sxt, *J*=8.10 Hz, 2 H, Dodecanoyl -3), 1.65 (quin, *J*=7.15 Hz, 2 H, Dodecanoyl H-10), 1.84 (s, 3 H, H-15), 1.91 (m, 3 H, Acetyl-2), 1.92 (m, 3 H, Angeloyl H-5), 1.98 (m, 3 H, Angeloyl H-5), 2.24 (dt, *J*=16.50, 6.60 Hz, 1 H, Dodecanoyl

H-2b), 2.31 (dt, *J*=16.50, 6.60 Hz, 1 H, Dodecanoyl H-2a), 2.49 (br. dd, *J*=11.40, 2.00 Hz, 1 H, H-9b), 2.83 (dd, *J*=12.50, 2.00 Hz, 1 H, H-9a) 3.66 (t, *J*=7.34 Hz, 2, Dodecanoyl H-12 H), 3.92 (s, 1 H, OH), 4.24 (br. s., 1 H, H-1) 4.32 (s, 1 H, OH) 4.38 (br. t, *J*=3.00, 3.00 Hz, 1 H, H-8) 5.40 (s, 1 H, OH) 5.46 (t, *J*=3.48 Hz, 1 H, H-3) 5.68 (br. s., 1 H, H-6) 5.81 (br. s., 1 H, H-3) 6.10 (qq, *J*=7.30, 1.30 Hz, 1 H, Angeloyl H-4) 7.69 - 7.73 (m, 2 H, Phtalimid-5 and 6) 7.81 - 7.85 (m, 2 H, Phtalimid-4 and 7). ^{13}C NMR (150 MHz, $CDCl_3$) δ: 12.83 (C-15), 15.83 (C-13), 16.16 (Angeloyl H-5), 20.56 (Angeloyl C-4), 22.69 (Ac-2), 22.73 (C-14), 42 24.77, 26.82, 28.53, 29.08, 29.22, 29.37, 29.39, 29.44 (Dodecanoyl C-3 -11), 34.26 (Dodecanoyl C-2), 38.10 (Dodecanoyl C-12), 39.15 (C-9), 57.51 (C-1), 68.67 (C-8), 77.04 (C-6), 78.01, C-2), 79.31, 79.54 (C-7 and 11), 84.20 (C-10), 85.55 (C-3), 123.21 (Phtalimid-7 and 4), 127.43 (Angeloyl C-2), 130.40 (C-4), 132.05 (Phtalimid-3 and 8), 133.95 (Phtalimid-5 and 6), 138.77 (Angeloyl C-3), 140.51 (C-5), 167.32 (Angeloyl C-1), 168.64 (Phtalimid-2 and 9), 171.26 (Acetyl-1), 172.66 (Dodecanoyl C-1), 175.73 (C-12).

Compound **Vc (HzL24042015)**: Compound **Vc** was prepared the same way as compound **Va** using **IVc** (50 mg, 0.06 mmol), 11mg of butyric anhydride and 10 mg of DMAP as starting materials. The mixture was stirred at RT for 2h. After workup the residue was purifed by chromatograpy using toluene-ethyl acetate (4:1) added 0.1 % acetic acid to give **Vc** (45mg, 84%). ^{1}H NMR (600 MHz, $CDCl_3$) δ ppm 0.94 (t, *J*=7.40 Hz, 3 H, Bu-4) 1.21 - 1.35 (m, 14 H, Dodecanoyl H-4 – Dodecanoyl H-9) 1.40 (s, 3 H, H-14) 1.48 (s, 3 H, H-13) 1.56 - 1.69 (m, 6 H, Bu-3, Dodecanoyl H-3, Dodecanoyl H-10) 1.86 (s, 3 H, H-15) 1.89 (s, 3 H, Angeloyl H-5) 1.92 (d, *J*=1.10 Hz, 3 H, Angeloyl H-5) 1.99 (dd, *J*=7.34, 1.47 Hz, 3 H, Angeloyl H-4) 2.23 - 2.37 (m, 5 H, Bu-2, Dodecanoyl H-2, H-9b), 3.05 (dd, *J*=14.49, 3.12 Hz, 1 H, H-9a) 3.30 - 3.41 (m, 1 H, OH) 3.67 (t, *J*=7.34 Hz, 2 H, Dodecanoyl H-12), 3.94 - 4.03 (m, 1 H, OH), 4.32 (br. s., 1 H, H-1) 5.49 (t, *J*=2.90 Hz, 1 H, H-2) 5.66 (t, *J*=4.00 Hz, 3 H, H-8), 5.64 - 5.70 (m, 2 H, H-3 and H-6) 6.10 (qq, *J*=7.00, 1.00 Hz, 1 H, Angeloyl H-3), 7.69 - 7.73 (m, 2 H, Pht-5 and 6), 7.81 - 7.86 (m, 2 H, Pht-4 and 7). ^{13}C NMR (150 MHz, $CDCl_3$) δ ppm 12.93 (C-15), 13.71 (Bu-4), 15.81 (C-13), 16.08 (Angeloyl C-5), 17.97 (Bu-3), 20.56 (Angeloyl C-4), 22.58 (Ac-2), 22.86 (C-14), 24.78, 26.83, 28.55, 29.05, 29.12, 29.23, 29.36, 29.39, 29.44 (Dodecanoyl C-3 to 11), 34.18 (Bu-2), 36.58 (Dodecanoyl C-2), 38.10 (Dodecanoyl C-12), 38.25 (C-9), 57.48 (C-1), 66.20 (C-8), 76.92 (C-6, 77.79 (C-2), 78.51, 78.60 (C-7 and 11), 84.20 (C-10), 84.74 (C-3), 123.18 (Pht-4 and 7), 127.46 (Angeloyl C-2), 130.47 (C-4), 132.11 (Pht-3 and 8), 133.89 (Pht-5 and 6), 138.61 (Angeloyl C-3), 141.40 (C-5), 167.11. (Angeloyl C-1), 168.56 (Pht-2 and 9), 170.85 (Ac-1), 172.60 (Bu-1), 172.66 (Dodecanoyl C-1), 175.70 (C-12). HRMS 874,39712, Calc. $(C_{48}H_{61}NaO_{14})^{+}$: 874,3984.

Compound **IId**: Compound **IId** was prepared in the same way as **IIa** using **I** (100 mg, 0.2 mmol), 2-naphtoic acid (42 mg, 0.24 mmol), DCC (50 mg, 0.24 mmol), and 20 mg of DMAP as starting materials. After stirring for 18 h the crude reaction product was purified by column chromatography using toluene-EtOAc (3:1) as an eluent to give compound **IId** (99 mg, 74%). ^{1}H NMR (600 MHz, $CDCl_3$) δ: 1.29 (s, 3 H, H-14) 1.40 (s, 3 H, isopropylidene H-3), 1.45 (br. s., 3 H, H-13) 1.51 (s, 3 H, isopropylidene H-1) 1.91 (s, 3 H, H-15) 1.94 (br. s., 3 H, angeloyl H-5) 1.96 (d, *J*=6.97 Hz, 3 H, angeloyl H-4), 2.00 (d, *J*=15.41 Hz, 1 H, H-9b), 2.17 (dd, *J*=15.41, 3.67 Hz, 1 H, H-9a) 3.67 (s, 1 H, H-1), 4.13 (br. s., 1 H, H-8), 5.64 (t, *J*=2.90 Hz, 1 H, H-2), 5.84 (br. s., 1 H, H-6), 6.04 (br. s., 1 H, H-3), 6.10 (qq, *J*=8.10, 1.10 Hz, 1 H, angeloyl H-3), 7.51 (t, *J*=6.60 Hz, 1 H, naphtoyl H-7), 7.58 (t, *J*=6.60 Hz, 1 H, naphtoyl H-6), 7.82 (d, *J*=7.50 Hz, 1 H, H-5), 7.83 (d, *J*=6.24 Hz, 1 H, H-8), 7.88 (d, *J*=7.70 Hz, 1 H, naphtoyl H-10), 8.03 (d, *J*=8.80 Hz, 1 H, naphtoyl H-11), 8.60 (s, 1 H, naphtoyl H-3). ^{13}C NMR (150 MHz, $CDCl_3$) δ: 12.64 (C-15), 15.80 (isopropylidene C-3), 15.89 (C-13), 20.58 (angeloyl C-4), 23.57 (isopropylidene C-3), 24.07 (C-14), 30.48 (isopropylidene C-1), 44.42 (C-9), 60.50 (C-1), 65.81 (C-8), 73.10 (C-6), 75.96 (C-2), 77.85, 79.27 (C-7/C-11), 79.95 (C-10), 83.61 (C-3), 100.90 (isopropylidene C-2), 125.30 (naphtoyl C-11), 126.73 (naphtoyl-C-2), 126.82 (naphtoyl C-6), 127.33 (naphtoyl C-3), 127.73 (naphtotyl C-10), 128.14 (naphtoyl C-7), 128.47 (naphtoyl C-8), 129.38 (naphtoyl C-5), 130.21 (angeloyl C-

2), 131.64 (naphtoyl C-4), 132.34 (C-4), 135.68 (naphtoyl C-9), 137.47 (angeloyl C-3), 139.18 (C-5), 167.44 (angeloyl C-1), 167.48 (naphtoyl C-1), 173.14 C-12).

Compound **IIId.** To a solution of compoud **IId** (99 mg, 0.16 mmol) in 10 mL of Isopropenyl acetate was added 5 mg of p-TsOH and the mixture was stirred at room temperature for 18h. The mixture was added 10 mL of aqueous $NaCO_3$ (saturated) and extracted three times with EtOAc (10 mL). The organic phases were combined and concentrated in vacuo. The residue was purified by reversed phase chromatography (Rp-18) chromatography using CH_3OH/H_2O (5:1) added 0.1 % acetic acid to give compound **IIId** (60 mg, 58%). ^{1}H NMR (600 MHz, $CDCl_3$) δ: 1.42 (s, 3 H, H-14), 1.51 (s, 3 H, isopropylidene H-3), 1.54 (s, 3 H, H-13), 1.55 (s, 3 H, isopropylidene H-1), 1.63 (s, 3 H, H-15), 1.92 (br. s., 1 H, angeloyl H-5), 1.95 (s, 3 H, acetyl H-2), 1.98 (d, *J*=7.34 Hz, 3 H, angeloyl H-4), 2.56 (d, *J*=14.67 Hz, 1 H, H-9b), 2.73 (dd, *J*=14.67, 4.03 Hz, 1 H, H-9a), 4.19 (br. s., 2 H, H-1 and H-8), 5.80 (t, *J*=3.50 Hz, 1 H, H-2), 5.82 (br. s, 1 H, H-6), 5.95 (br. s., 1 H, H-3), 6.11 (qq, *J*=7.30, 1.10 Hz, 1 H, angeloyl H-3), 7.50 (t, *J*=7.00 Hz, 1 H, naphtoyl H-7), 7.56 (t, *J*=7.34 Hz, 1 H, napthoyl H-6), 7.84 (d, *J*=8.07 Hz, 2 H, H-5 and 8), 7.90 (d, *J*=8.44 Hz, 1 H, naphtoyl H-10), 8.03 (d, *J*=8.44 Hz, 1 H, naphtoyl H-11), 8.59 (s, 1 H, H-3). ^{13}C NMR (150 MHz, $CDCl_3$) δ: 12.67 (C-15), 15.77 (angeloyl C-5), 15.84 (C-13), 20.59 (acetyl C-2), 21.33 (isopropylidene C-3), 22.49 (angeloyl C-4), 23.61 (C-14), 30.49 (isopropylidene C-1), 37.87 (C-9), 56.56 (C-1), 65.81 (C-8), 75.96 (C-6), 78.05 (C-2), 79.05, 79.41 (C-7/C-11), 83.63 (C-10), 84.92 (C-3), 101.11 (isopropylidene C-2), 125.33 (naphtoyl C-11), 126.62 (naphtoyl C-2), 127.26 (naphtoyl C-6), 127.55 (naphtoyl C-3), 127.77 (naphtoyl C-10), 128.20 (naphtoyl C-7), 128.26 (angeloyl C-2), 128.32 (naphtoyl C-8), 129.39 (naphtoyl C-5), 131.29 (naphtoyl C-4), 132.48 (C-4), 135.62 (naphtoyl C-9), 138.46 (angeloyl C-3), 138.67 (C-5), 165.73 (naphtoyl C-1), 167.50 (angeloyl C-1), 170.67 (acetyl C-1), 173.14 (C-12).

Compound **IVd.** To a solution compound **IIId** (61 mg, 0.09 mmol) in 5 mL of CH_3OH was added 0.1 mL of 6N HCl and the mixture was stirred at room temperature for 4h. The mixture was concentrated and the residue was purified by rversed phase chromatography (Rp-18) using CH_3OH-H_2O (5:1) added 0.1 % of acetic acid to give the compound **IVd** (57 mg, 99%). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 1.35 (s, 3 H, H-14), 1.4s (m, 3 H, H-13) 1.61 (s, 3 H, acetyl H-2) 1.79 (s, 3 H, H-15) 1.87 (quin, *J*=1.50 Hz, 3 H, angeloyl H-5) 1.91 (dq, *J*=7.30, 1.50 Hz, 3 H, angeloyl H-4) 2.35 (dd, *J*=14.18, 2.93 Hz, 1 H, H-9b) 2.76 (br. dd, *J*=12.00, 2.90 Hz, 1 H, H-9a) 3.58 (br. s., 1 H, OH) 4.21 (br. t, *J*=4.20, 4.20 Hz, 1 H, H-8) 4.36 (br. s., 1 H, H-1) 5.69 (t, *J*=4.16 Hz, 1 H, H-2), 5.73 (br. s., 1 H, H-6), 5.85 (br. s., 1 H, H-3), 6.04 (qq, *J*=7.20, 1.30 Hz, 1 H, angeloyl H-3), 7.42 (t, *J*=7.10 Hz, 1 H, naphtoyl H-7), 7.47 (t, *J*=7.10 Hz, 1 H, naphtoyl H-6), 7.75 (d, *J*=8.56 Hz, 2 H, naphtoyl H-5, H-8) 7.83 (d, *J*=8.07 Hz, 1 H, naphtoyl H-10), 7.92 (dd, *J*=8.68, 1.59 Hz, 1 H, naphtoyl H-11) 8.48 (s, 1 H, naphtoyl H-3). ^{13}C NMR (100 MHz, $CDCl_3$) δ: 12.93 (C-15), 15.87 (angeloyl C-4), 16.14 (C-13), 20.61 (acetyl C-2), 22.61 (angeloyl C-5), 22.84 (C-14), 39.06 (C-9), 56.83 (C-1), 68.59 (C-8), 77.24 (C-6), 79.11 (C-2), 79.41, 79.55 (C-7/C-11), 83.89 (C-3), 85.69 (C-10), 125.22 (naphtoyl C-11), 126.70 (naphtoyl C-2), 127.06 (naphtoyl C-3), 127.50 (naphtoyl C-10), 127.75 (naphtoyl C-6), 128.21 (naphtoyl C-7), 128.37 (naphtoyl C-8), 129.39 (angeloyl C-2), 129.80 (naphtoyl C-5), 131.33 (naphtoyl C-4), 132.47 (C-4), 135.62 (naphtoyl C-9), 138.81 (angeloyl C-3), 140.65 (C-5), 165.68 (naphtoyl C-1), 167.47 (angeloyl C-1), 171.62 (acetyl C-1), 175.82 (C-12).

Compound **Vd (HzL18072015).** To solution compound **IVd** (57mg, 0.01mmol) in 2 mL of CH_2Cl_2 was added butyric anhydride (18 mg, 0.11 mmol) and 10 mg of DMAP (10 mg, 0.03 mmol). The reaction mixture was stirred at room temperature for 18 h. The mixture was concentrated in vacuo and residue was purified by reversed phase chromatography (Rp-18) to give compound **Vd** (50 mg, 78%). ^{1}H NMR (600 MHz, $CDCl_3$) δ: ^{1}H NMR (600 MHz, $CDCl_3$) δ ppm 0.92 (t, *J*=7.52 Hz, 3 H, butanoly H-4) 1.48 (s, 3 H, H-13) 1.49 (br. s., 3

H, H-14) 1.62 (dq, *J*=14.31, 7.21 Hz, 2 H, butanoly H-3) 1.69 (s, 3 H, acetyl H-2) 1.92 (s, 3 H, H-15) 1.95 - 1.99 (m, 3 H, angeloyl H-4) 2.01 (dd, *J*=7.15, 1.28 Hz, 3 H, angeloyl H-5) 2.26 (td, *J*=7.61, 1.65 Hz, 2 H, butanoyl H-2) 2.29 (dd, *J*=15.00, 3.70 Hz, 1 H, H-9b) 2.95 (br. s., 1 H, OH) 3.08 (dd, *J*=14.86, 3.12 Hz, 1 H, H-9a) 3.64 (br. s., 1 H, OH) 4.54 (br. s., 1 H, H-1) 5.64 (t, *J*=3.67 Hz, 1 H, H-2) 5.72 (br. s., 1 H, H-6) 5.81 (t, *J*=4.03 Hz, 1 H, H-8) 5.95 (d, *J*=0.73 Hz, 1 H, H-3) 6.13 (qd, *J*=7.21, 1.47 Hz, 1 H, angeloyl H-3) 7.51 (t, *J*=7.3 Hz, 1 H, naphtoyl H-7) 7.556 (t, J=7.3 Hz, 1 H, naphtoyl H-6) 7.83 (d, *J*=8.07 Hz, 1 H, naphtoyl H-8) 7.86 (d, *J*=8.44 Hz, 1 H, naphtoyl H-5) 7.92 (d, *J*=8.07 Hz, 1 H, naphtoyl H-10) 8.02 (dd, *J*=8.62, 1.65 Hz, 1 H, naphtoyl H-11) 8.59 (s, 1 H, naphtoyl H-3). ^{13}C NMR (150 MHz, $CDCl_3$) δ:13.06 (C-15), 13.69 (butanoyl C-4), 15.85 (angeloyl C-4), 16.18 (C-13), 17.98 (butanoly C-3), 20.62 (acetyl C-2), 22.46 C-5), 22.97 (C-14), 36.57 (butanoyl C-2), 38.21 (C-9), 56.57 (C-1), 66.23 (C-8), 77.30 (C-6), 78.63, 78.66 (C-7/C-11), 79.02 (C-2), 83.79 (C-3), 84.84 (C-10), 125.25 (naphtoyl C-11), 126.63 (napthtoyl C-8), 127.02 (naphtoyl C-10), 127.57 (naphtoyl C-3), 127.74 (naphtoyl C-2), 128.26 (naphtoyl C-7), 128.32 (naphtoyl C-6), 129.42 (naphtoyl C-5), 129.75 (angeloyl C-2), 131.37 (naphtoyl C-4), 132.48 (C-4), 135.64 (napthoyl C-9), 138.58 (angeloyl C-3), 141.60 (C-5), 165.73 (naphtoyl C-1), 167.22 (angeloyl C-1), 171.07 (acetyl C-1), 172.69 (butanoly C-1), 175.64 (C-1). HRMS 701,25683, Calc. $(C_{37}H_{42}NaO_{12})^+$: 701,25685.

Compound IIe: To solution of **I** (100 mg, 0.2 mmol) in 3 mL of dichloromethane was added 4-phenylbenzoic acid (50 mg, 0.24 mmol), DCC (50 mg, 0.24 mmol), and DMAP (20 mg, 0.16 mmol) and the reaction mixture was stirred at room temperaturet for 18 h. The mixture was filtered and the filtrate was concentrated in vacuo. The residue was purified by column chromatography using toluene ethyl acetate (3:1) as an eluent to give the compound **IIe** (101 mg, 73%). ^{1}H NMR (600 MHz, $CDCl_3$) δ: 1.31 (s, 3 H, H-14) 1.43 (s, 3 H, isoropylidene H-3) 1.52 (s, 3 H, H-13) 1.54 (s, 3 H, isoipropylidene H-1) 1.93 (d, *J*=1.10 Hz, 3 H, angeloyl H-4) 1.95 (br. s., 3 H, H-15) 1.98 (d, *J*=7.34 Hz, 3 H, angeloyl H-4) 2.06 (br. d, *J*=14.70 Hz, 1 H, H-9b)) 2.25 (dd, *J*=14.31, 4.40 Hz, 1 H, H-9a) 3.63 (br. s, 1 H, H-8) 4.21 (br. s, 1 H, H-1) 5.63 (t, *J*=4.40 Hz, 1 H, H-2) 5.86 (br. s, 1 H, H-6) 6.02 (br. s, 1 H, H-3) 6.12 (q, *J*=6.20 Hz, 1 H, angeloyl H-3) 7.41 (t, *J*=7.00 Hz, 1 H, biphenyl H-9) 7.47 (t, *J*=6.20 Hz, 2 H, biphenyl H-8 and 10) 7.63 (d, *J*=7.70 Hz, 2 H, biphenyl H-4 and 12) 7.60 (d, *J*=7.70 Hz, 2 H, biphenyl H-7 and 11) 8.10 (d, *J*=8.44 Hz, 2 H, biphenyl H-3 and 13). ^{13}C NMR (150 MHz, $CDCl_3$) δ: 12.64 (C-15), 15.83 (angeloyl C-5), 15.90 (C-13) 20.60 (angeloyl C-4), 23.65 (isopropylidene C-3), 24.10 (C-13), 30.50 (isopropylidene C-1), 44.41 (C-9), 60.35 (C-1), 65.85 (C-8), 76.03 (C-6), 77.72 (C-2), 77.88, 79.26 (C-7/C-11), 79.76 (C-10), 83.52 (C-3), 100.93 (isopropylidene C-2), 127.04 (bibenzoyll C-13 and 3), 127.25 (bibenzoyl C-7 and 11), 127.27 (bibenzoyl C-7), 127.35 (angeloyl C-2), 128.31 (C-5) 128.94 (bibenzoyl C-4 and 12), 130.47 (bibenzoyl C-10), 130.47 (angeloyl C-3), 130.47 (bibezoyl C-8) 137.53 (bibenzoyl C-5), 139.85 (C-5), 146.10 (bibenzoyl C-5), 167.17 (bibenzoyl C-1), 167.49 (angeloyl C-1), 173.03 (C-12).

Compound IIIe: To a solution of compoud **IIe** (101 mg, 0.16 mmol) in Isopropenyl acetate (5 mL) was added p-toluenesulfonic acid (10 mg, 0.34 mmol) and the mixture was stirred at rt for 18 h. Ten mL of aqueous $NaHCO_3$ (saturated) was added and the mixture was extracted with EtOAc (3x10 mL). The organic phases were combined and then concentrated in vacuo. The residue was purified by Rp-18 chromatography using CH_3OH/H_2O (5:1) added 0.1% glacial acetic acid as an eluent to give **IIIe** (55 mg, 51%).^{1}H NMR (600 MHz, $CDCl_3$) δ: 1.43 (s, 3 H, H-14), 1.53 (s, 3 H, isopropylidene H-3), 1.54 (s, 3 H, H-13), 1.57 (s, 3 H, isopropylidene H-1), 1.64 (s, 3 H, H-15), 1.91 (br. s., 1 H, angeloyl H-5), 1.95 (s, 3 H, acetyl H-2), 1.99 (dq, *J*=7.11 and 1.42 Hz, 3 H, angeloyl H-4), 2.60 (d, *J*=14.67 Hz, 1 H, H-9b), 2.83 (dd, *J*=14.67 and 4.58 Hz, 1 H, H-9a), 3.32 (br.s, 1 H, OH), 4.17 (br. s., 1 H, H-1 and H-8), 4.26 (dd, J=4.6 and 3.1 Hz, H-8), 5.77 (dd, *J*=5.87 and 4.77 Hz, 1 H, H-2), 5.83 (br. q, J=2.9 Hz, 1 H, H-2), 5.93 (br. s, 1 H, H-3), 6.11 (qq, *J*=5.90 and 1.50 Hz, 1 H, angeloyl H-3), 7.37 (tt, *J*=7.30 and 1.10 Hz, 1 H, bibenzoyl H-9), 7.44 (br. t, *J*=7.70 Hz, 2 H, bibenzoyl H-8 and 10), 7.58 (br.d, *J*=7.70 Hz, 2 H, bibenzoyl H-7 and 11), 7.62 (br.d, *J*=7.80 Hz, 2 H, bibenzoyl H-4

and 12), 8.08 (d, *J*=7.80 Hz, 2 H, bibenzoyl H-3 and 13). ^{13}C NMR (150 MHz, $CDCl_3$) δ: 12.66 (C-15), 15.77 (angeloyl C-5), 15.83 (C-13) 20.58 (angeloyl C-4), 22.48 (isopropylidene C-3), 21.36 (acetyl C-2), 22.49 (angeloyl C-4), 23.64 (C-14), 30.49 (isopropylidene C-1), 37.92 (C-9), 56.44 (C-1), 65.86 (C-8), 76.03 (C-6), 78.02 (C-2), 78.96, 79.40 (C-7/C-11), 83.58 (C-10), 84.86 (C-3), 101.15 (isopropylidene C-2), 127.08 (bibenzoyll C-11 snd 7), 127.25 (bibenzoyl C-4 and 12), 128.16 (bibenzoyl C-9), 128.73 (angeloyl C-3), 12.93 (bibenzoyl C-3 and 13), 130.29 (bibenzoyl C-10), 130.29 (angeloyl C-2), 138.59 (bibenzoyl C-6), 138.69 (angeloyl C-3), 139.65 (C-5), 145.79 (bibenzoyl C-5), 165.47 (bibenzoyl C-1), 167.48 (angeloyl C-1), 170.67 (acetyl C-1), 173.04 (C-12).

Compound IVe: A solution of **IIIe** (23mg, 0.03 mmol) in methanol (2 mL) was added 6N HCl (0.1 mL) and stirred at rt for 4h. The mixture was concentrated and the residue was purified by Rp-18 using CH_3OH-H_2O (5:1) added 0.1% glacial acetic acid as an eluent to give **Vf** (20 mg, 91%). ^{1}H NMR (600 MHz, $CDCl_3$) δ: 1.39 (s, 3H, H-13), 1.43 (s, 3H, H-14), 1.63 (s, 3 H, H-15) 1.79 (br.s, 3 H, angeloyl H-5), 1.83 (br.d, *J*=4.44, 3 H, angeloyl H-4), 2.37 (br.d, *J*=12.10, 1 H, H-9b), 2.83 (br.d, *J*=13.20, 1 H, H-9a), 4.27 (br. s., 1 H, H-8), 4.35 (br.s, 1H, H-1) 5.48 (t, *J*=3.85 Hz, 1 H, H-2) 5.65 (t, *J*=4.03 Hz, 1 H, H-2), 5.76 (br.s, 1 H, H-6), 5.81 (br.s, 1H, H-3), 6.03 (br.q, *J*=7.30 Hz, 1 H, angeloyl H-3) 7.27 (t, *J*=7.29, 1 H, bibenzoyl H-9) 7.36 (br. t, *J*=7.70, Hz, 2 H, bibenzoyl H-8 and H-10) 7.51 (br.d, *J*=7.34, 2 H, bibenzoyl H-7 and H-11) 7.55 (br. d, *J*=8.10 Hz, 2 H, bibenzoyl H-4 and 12) 7.97 (br. d, *J*=8.07 Hz, 2 H, binbenzoyl H-3 and H-13). ^{13}C NMR (150 MHz, $CDCl_3$) δ: 12.84 (C-15), 14.07 (angeloyl C-5), 15.84 (C-13), 20.56 (acetyl C-2), 22.73 (angeloyl C-4), 24.80 (C-14), 39.10 (C-9), 56.68 (C-1), 68.65 (C-8), 77.35 (C-6), 79.03, 79.41 (C-7/C-11), 79.57 (C-2), 83.85 (C-10), 85.69 (C-3), 127.09 (bibenzoyl C-15), 127.27 (bibenzoyl C-12 and 14), 127.51 (bibenzoyl C-11 and 17), 128.57 (angelooyl C-2), 128.94 (bibenzoyl C-8 and 10) 129.77 (C-4), 130.26 (bibenzoyl C-3 and 13), 138.72 (bibenzoyl C-6) 139.86 (angeloyl C-3), 140.58 (C-5), 145.87 (bibenzoyl C-2) 165.47 (bibenzoyl C-1), 167.48 (angeloyl C-1), 171.58 (acetyl C-1), 175.88 (C-1).

Compound Ve (HzL17072015): A solution of **IVe** (20mg, 0.03mmol) dichloromethane (2 mL) was added butyric anhydride (6 mg, 0.04 mmol) and 10 mg of DMAP (10 mg, 0.16 mmol). The reaction mixture was stirred at room temperature for 18 h and concentrated in vacco. The residue was purified by Rp-18 chromatography using using CH_3OH-H_2O (5:1) added 0.1% glacial acetic acid as an eluent to give **Ve** (19 mg, 86%). ^{1}H NMR (600 MHz, $CDCl_3$) δ: 0.76 (t, *J*=7.34 Hz, 3 H, butanoyl H-4) 1.31 (s, 10 6H, H-13 and H-14) 1.46 (sxtd, *J*=7.60, Hz, 2 H, butanoyl H-3) 1.53 (s, 3 H, acetyl H-2) 1.73 (s, 3 H, H-15) 1.79 (quin, *J*=1.50 Hz, 3 H, angeloyl H-4) 1.83 (dq, *J*=7.70, 1.50 Hz, 3 H, angeloyl H-5) 2.10 (t, *J*=8.40 Hz, 2 H, butanoly H-2) 2.12 (dd, *J*=14.00, 4.00 Hz, 1 H, H-9b) 2.64 (s, 1 H, OH) 2.96 (dd, *J*=14.86, 3.48 Hz, 1 H, H-9a) 3.28 (s, 1 H, OH) 4.34 (br. s., 1 H, H-1) 5.48 (t, *J*=3.85 Hz, 1 H, H-2) 5.54 (br. d, *J*=1.10 Hz, 1 H, H-6) 5.60 (t, *J*=3.30 Hz, 1 H, H-8) 5.74 (br. d, *J*=1.10 Hz, 1 H, H-3) 5.94 (qq, *J*=7.70, 1.80 Hz, 1 H, angeloyl H-3) 7.21 (tt, *J*=7.30, 1.50 Hz, 1 H, bibenzoyl H-9) 7.28 (br. t, *J*=7.30, 7.30 Hz, 2 H, bibenzoyl H-8 and H-10) 7.43 (br. dd, *J*=7.00, 1.50 Hz, 2 H, bibenzoyl H-7 and H-11) 7.47 (br. d, *J*=8.10 Hz, 2 H, bibenzoyl H-4 and 12) 7.90 (br. d, *J*=8.40 Hz, 2 H, binbenzoyl H-3 and H-13). ^{13}C NMR (150 MHz, $CDCl_3$) δ: 13.06 (C-15), 13.71 (butanoyl C-4), 15.84 (angeloyl C-5), 16.25 (C-13), 18.01 (butanoly C-3), 20.61 (acetyl C-2), 22.46 (angeloyl C-4), 22.99 (C-14), 36.58 (butanoyl C-2), 38.27 (C-9), 56.53 (C-1), 66.22 (C-8), 77.20 (C-6), 78.65, 78.68 (C-7/C-11), 78.91 (C-2), 83.72 (C-10), 84.65 (C-3), 127.30 (bibenzoyl C-12 and 4), 127.57 (bibenzoyl C-11 and 7))128.15 (bibenzoyl C-9), 128.52 (angelooyl C-2), 128.91 (bibenzoyl C-10) 129.51 (C-4), 130.28 (bibenzoyl C-13 and 3), 138.55 (bibenzoyl C-3 and 6) 139.98 (angeloyl C-3), 141.72 (C-5), 145.48 (bibenzoyl C-2) 165.47 (bibenzoyl C-1), 167.19 (angeloyl C-1), 170.95 (acetyl C-1), 172.61 (butanoly C-1), 175.42 (C-1). HRMS 727,27234, Calc. $(C_{39}H_{44}NaO_{12})^+$: 727,2725.

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