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128.96, 128.90, 128.87, 128.84, 128.74, 128.61, 128.29, 127.87, 127.56, 127.50, 127.14, 124.74, 117.02, 100.68, 77.56, 74.90, 66.66, 66.11, 57.86, and 50.22; IR (KBr) 3416, 3023, 1715, and 1675 cm^{-1} ; LRMS-El m/z 539 ($[\text{M}^+]$, 1%), 167 ($[\text{Ph}_2\text{CH}_3^+]$, 74%), and 91 ($[\text{PhCH}_2^+]$, 100%).

(E)-Benzyl 1-benzyl-4-(3-ethoxy-3-oxoprop-1-enyl)-5-(4-hydroxy-3,3-diphenylbut-1-ynyl)-1H-pyrrole-2-carboxylate (6)

A 7-mL vial was charged with 5 (0.20 g, 0.37 mmol), (ethoxycarbonylmethylene)triphenylphosphorane (0.20 g, 0.56 mol) and benzene (3 mL). The vial was capped and heated at 80° C. for 12 hours. The solvent was evaporated and the residue was purified by MPLC on silica gel (gradient from Hex to EtOAc) to afford 0.20 g (86%) of a light tan foam. ^1H NMR (400 MHz, CDCl_3) δ 7.64 (d, J=16.0 Hz, 1H), 7.39-7.16 (m 19H), 6.96 (m, 2H), 6.31 (d, J=16.0 Hz, 1H), 5.36-5.33 (m, 3H), 5.20 (s, 2H), 4.33 (d, J=7.4 Hz, 1H), 4.26 (q, J=7.1 Hz, 2H), 2.94 (d, J=5.7 Hz, 1H), and 1.33 (t, J=7.1 Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 167.77, 159.94, 140.76, 140.25, 137.71, 136.38, 135.98, 129.12, 129.00, 128.99, 128.88, 128.85, 128.81, 128.73, 128.54, 128.41, 128.33, 128.20, 127.60, 127.33, 127.02, 124.27, 124.22, 123.65, 116.77, 115.89, 100.57, 77.58, 76.17, 66.43, 66.13, 60.64, 57.81, 50.18, and 14.66; IR (KBr) 3444, 3027, 1703, and 1634 cm^{-1} ; LRMS-El m/z 592 ($[\text{M}-\text{H}_2\text{O}^+]$, 100%).

1-Benzyl-4-(3-ethoxy-3-oxopropyl)-5-(4-hydroxy-3,3-diphenylbutyl)-1H-pyrrole-2-carboxylic acid (7)

A 25-mL flask was charged with 6 (21 mg, 0.03 mmol), 20% Pd(OH)₂ on carbon (nominally 50% in water, 7 mg), and 1 mL each of EtOAc and MeOH. The suspension was stirred under a hydrogen balloon at room temperature for 5-17 hours. The catalyst was filtered off (Celite), the residue concentrated to give 20 mg (quantitative) of a pale yellow foam, which was used without further purification. ^1H NMR (400 MHz, CDCl_3) δ 7.30-7.15 (m, 13H), 6.95 (s, 1H), 6.90 (m, 2H), 5.45 (ABq, J=16.4 Hz, 2H), 4.21 (td, J=8.5, 2.1 Hz, 1H), 4.09 (q, J=7.0 Hz, 2H), 3.75 (d, J=8.6 Hz, 1H), 2.72-2.58 (m, 4H), 2.46 (t, J=7.4 Hz, 2H), 1.06-1.51 (m, 2H), 1.48-1.44 (m, 2H), and 1.22 (t, J=7.0 Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 173.45, 165.67, 142.18, 141.36, 139.65, 138.95, 129.11, 128.99, 128.88, 128.72, 128.30, 127.20, 127.15, 126.94, 126.01, 120.86, 120.09, 119.67, 73.09, 60.66, 58.67, 48.23, 35.37, 34.81, 21.23, 20.70, and 14.50; IR (KBr) 3428, 3027, 2933, 1732, 1663, and 1450 cm^{-1} ; LRMS-El m/z 481 ($[\text{M}-\text{CO}_2^+]$, 64%), 167 ($[\text{Ph}_2\text{CH}_3^+]$, 75%), and 91 ($[\text{PhCH}_2^+]$, 100%).

Ethyl 3-(1-benzyl-5-(bis(7-(1,3-dioxoisindolin-2-yl)heptyl)carbamoyl)-2-(4-hydroxy-3,3-diphenylbutyl)-1H-pyrrol-3-yl)propanoate (8)

The compound 7 (20 mg, 0.04 mmol) was charged into a 7-mL vial, followed by 2,2'-(7,7'-azanediyl)bis(heptane-7,1-diyl)diisindoline-1,3-dione (38 mg, 0.12 mmol), BOP (50 mg, 0.12 mmol) and 1 mL each of NMM and dry DMF. The vial was capped and stirred at room temperature for 19 hours. Water (3 mL) was added into the reaction mixture, extracted with EtOAc (3x5 mL), the organic layers were combined, washed with brine (5 mL), dried over MgSO_4 , and purified by MPLC (silica gel, gradient from Hex to EtOAc) to give 24 mg (63%) of a tan solid foam. ^1H NMR (400 MHz, CDCl_3) δ 7.84-7.82 (m, 4H), 7.71-7.69 (m, 4H), 7.39-7.12 (m, 13H), 6.74-6.72 (m, 2H), 6.14 (s, 1H), 5.06 (ABq, J=16.6 Hz, 2H),

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4.33 (br t, 1H), 4.06 (q, J=7.0 Hz, 2H), 3.83 (d, J=8.6 Hz, 1H), 3.65 (t, J=7.2 Hz, 4H), 3.18 (m, 4H), 2.79-2.69 (m, 2H), 2.65 (t, J=8.4 Hz, 2H), 2.41 (t, J=7.5 Hz, 2H), 1.65-1.53 (m, 6H), 1.27-1.21 (m, 12H), and 1.22 (t, J=7.1 Hz, 3H), and 1.19 (m, 4H); ^{13}C NMR (100 MHz, CDCl_3) δ 173.79, 168.75, 165.70, 142.15, 141.42, 139.16, 134.71, 134.16, 132.31, 129.07, 128.96, 128.87, 128.62, 128.30, 127.33, 127.14, 126.89, 126.28, 123.55, 123.43, 118.52, 112.44, 73.42, 60.68, 58.59, 47.78, 38.16, 35.93, 35.32, 29.08, 28.70, 26.92, 26.85, 21.40, 20.46, and 14.44; IR (KBr) 3460, 2929, 2856, and 1716; LRMS-El m/z 1011 ($[\text{M}^+]$).

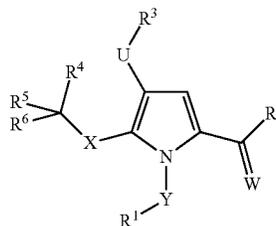
N,N-Bis(7-aminoheptyl)-1-benzyl-5-(4-hydroxy-3,3-diphenylbutyl)-4-(3-(hydroxyamino)-3-oxopropyl)-1H-pyrrole-2-carboxamide (E4b)(TFA)₂

A 20-mL scintillation vial was charged with 8 (51 mg, 0.05 mmol), 50% hydroxylamine in water (2 mL), KCN (16 mg, 0.25 mmol), and 2 mL each of MeOH and THF. The vial was capped, heated at 65° C. for 48 hours. The resulting mixture was directly used for HPLC purification on a reversed-phase column to afford 13 mg (27%) of the title compound as a colorless oily residue. Preparative HPLC conditions: Phenomenex Gemini C18, 21.2x250 mm, linear gradient from 20% solvent B and 80% solvent A to 100% solvent B over 40 minutes, solvent A=water (0.1% TFA), solvent B=9:1 mixture of MeCN/water (0.1% TFA), flow rate 10 mL/min, collected portion at R_f=18.56 minutes. Analytical HPLC condition: Phenomenex HyperClone BDS C18 column, 4.6x250 mm, linear gradient from 20% B to 100% B over 20 min, same solvent system as the preparative, R_f=12.18 minutes. ^1H NMR (400 MHz, CD_3OD) δ 7.37-7.35 (m, 2H), 7.26-7.12 (m, 10H), 7.39-7.12 (m, 13H), 6.75-6.74 (m, 2H), 6.18 (s, 1H), 5.05 (ABq, J=16.6 Hz, 2H), 4.40 (t, J=8.2 Hz, 1H), 3.85 (d, J=9.4 Hz, 1H), 3.25 (t, J=7.2 Hz, 4H), 2.89 (t, J=7.5 Hz, 4H), 2.85-2.63 (m, 4H), 2.20-2.18 (m, 2H), 1.63-1.49 (m, 6H), 1.40-1.31 (m, 12H), and 1.20-1.10 (m, 4H); ^{13}C NMR (100 MHz, CD_3OD) δ 231.42, 171.17, 165.58, 143.32, 142.97, 139.36, 134.21, 128.51, 128.35, 128.16, 126.98, 126.30, 126.08, 125.99, 124.53, 118.05, 111.85, 72.62, 58.54, 39.52, 36.33, 34.34, 28.57, 27.23, 26.23, 26.04, 21.52, and 19.93; IR (KBr) 3424, 2933, 2864, 1679, and 1205; LRMS-El m/z 738 ($[\text{M}^+]$).

A number of embodiments of the invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. Accordingly, other embodiments are within the scope of the following claims.

What is claimed is:

1. A composition comprising a compound of Formula (IIA):



or a pharmaceutically acceptable salt or derivative thereof, wherein:

R¹ is chosen from NH₂, aryl, and heteroaryl;
R² is chosen from NR^{2a}R^{2b};