Supporting Information

Chemoselective Acylation of 2-Amino-8-quinolinol in the Generation of C2-Amides or C8-Esters

Youngseok Park,† Xiang Fei,† Yuan Yue,† Sanha Lee,† Joonseong Hur,‡ Sung Jean Park,† Jae-Kyung Jung,§ and Seung-Yong Seo*,†

†College of Pharmacy and Gachon Institute of Pharmaceutical Sciences, Gachon University, Incheon 21936, South Korea
‡College of Pharmacy, Seoul National University, Seoul 08826, South Korea
§College of Pharmacy, Chungbuk National University, Cheongju, Chungbuk 28644, South Korea

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1. General experimental information

All starting materials and reagents were obtained from commercial suppliers and were used without further purification. Air and moisture sensitive reactions were performed under N₂ atmosphere. Flash column chromatography was performed using silica gel 60 (230-400 mesh, Merck) with the indicated solvents. Thin-layer chromatography was performed using 0.25 mm silica gel plates (Merck). ¹H and ¹³C NMR spectra were recorded on a Bruker 600 MHz spectrometer as solutions in deuteriochloroform (CDCl₃) or methanol-d4 or DMSO-d₆. ¹H NMR data were reported in the order of chemical shift, multiplicity (s, singlet; d, doublet; t, triplet; m, multiplet and/or multiple resonances), number of protons, and coupling constant (J) in hertz (Hz). High-resolution mass spectra (HRMS) were recorded on a JEOL JMS-700 (FAB and EI) and an Agilent 6530 Q-TOF LC/MS/MS system (ESI).

For conversion measurements, the samples prepared for the HPLC were analyzed at 256 nm using an Agilent 1260 HPLC system equipped with a 6 mm x 50 mm Sunfire 5µ C18 column, in which the mobile phase was a gradient from water to acetonitrile for 30 min.
2. Experimental procedures

**General procedure of condition A (Table 4) for the O-acylation at C8:**
To a solution of 2-amino-8-quinolinol (30 mg, 0.19 mmol) and a carboxylic acid (1.2 equiv) in anhydrous tetrahydrofuran (4 mL) were added EDCI (1.3 equiv), DMAP (0.5 equiv) and \( N,N \)-diisopropylethylamine (3.0 equiv) under N\(_2\) atmosphere with an ice bath. After stirring for 3 h at ambient temperature, the mixture was diluted with dichloromethane, washed by sat. NH\(_4\)Cl, sat. NaHCO\(_3\), and brine, dried by MgSO\(_4\), filtered, and concentrated. The residue was purified by silica gel column chromatography to afford the desired product.

**General procedure of condition B (Table 4) for the O-acylation at C8:**
To a solution of 2-amino-8-quinolinol (30 mg, 0.19 mmol) and a carboxylic acid (1.2 equiv) in anhydrous tetrahydrofuran were added PyBop (1.3 equiv) and \( N,N \)-diisopropylethylamine (3.0 equiv) under N\(_2\) atmosphere with an ice bath and stirring for 4 h at ambient temperature. The reaction mixture was diluted with dichloromethane, washed by NH\(_4\)Cl, saturated NaHCO\(_3\), and brine, dried by MgSO\(_4\), filtered, and concentrated. The residue was purified by flash column chromatography to the desired product.

**General procedure of condition C (Table 5) for the N-acylation at C2:**
To a solution of a carboxylic acid (1.2 equiv) in tetrahydrofuran was added 1,1'-carbodiimidazole (1.3 equiv). After stirring for 1 h under N\(_2\) atmosphere, 2-amino-8-quinolinol (30 mg, 0.19 mmol) was added to the reaction mixture. After stirring for 24 h at reflux, the mixture was diluted with tetrahydrofuran, washed by NH\(_4\)Cl, saturated NaHCO\(_3\), and brine, dried by MgSO\(_4\), filtered, and concentrated. The residue was purified by flash column chromatography to the desired product.

**General procedure condition D (Table 5) for the N-acylation at C2:**
To a solution of carboxylic acid (1.2 equiv) in anhydrous tetrahydrofuran (4 mL) under N\(_2\) atmosphere, 1,1'-carbonyldimidazole (1.3 equiv) was added under N\(_2\) atmosphere at ambient temperature. After stirred for 1 h. The mixture was diluted with dichloromethane, extracted by brine and dichloromethane, dried by MgSO\(_4\), filtered, and concentrated to obtain the acyl imidazolide.
intermediate. To a solution of 2-amino-8-quinolinol (30 mg, 0.19 mmol) and NaH (2.0 equiv) in anhydrous tetrahydrofuran (4 mL) was added the acyl imidazolide intermediate under N\textsubscript{2} atmosphere with an ice bath. After stirring for 2 h at ambient temperature, the reaction was quenched with sat. NH\textsubscript{4}Cl, washed by dichloromethane and dried by MgSO\textsubscript{4}, filtered, and concentrated. The residue was purified by silica gel column chromatography to afford the desired product.

**General procedure E for the O-acylation at C8**

To a solution of 2-amino-8-quinolinol (30 mg, 0.19 mmol) in anhydrous tetrahydrofuran (4 mL), was added an acid chloride or anhydride (1.2 equiv) and triethylamine (3.0 equiv) under N\textsubscript{2} atmosphere with an ice bath. After stirring for 2 h at ambient temperature, the mixture was diluted with dichloromethane, washed by NH\textsubscript{4}Cl, NaHCO\textsubscript{3}, and brine, dried by MgSO\textsubscript{4}, filtered, and concentrated. The residue was purified by silica gel column chromatography to afford the desired product.

**General procedure F for the N-acylation at C2:**

To a solution of an acid chloride or anhydride (1.2 equiv) in anhydrous tetrahydrofuran (4 mL) under N\textsubscript{2} atmosphere, imidazole (1.3 equiv) was added with an ice bath. After stirring for 1 h, the mixture was diluted with dichloromethane, extracted by brine and dichloromethane, dried by MgSO\textsubscript{4}, filtered, and concentrated to obtain the resulting acyl imidazolide intermediate. To a solution of 2-amino-8-quinolinol (30 mg, 0.19 mmol) and NaH (2.0 equiv) in anhydrous tetrahydrofuran (4 mL) was added the acyl imidazolide under N\textsubscript{2} atmosphere with an ice bath. After stirring for 2 h at room temperature, the reaction was quenched with sat. NH\textsubscript{4}Cl, washed by dichloromethane and dried by MgSO\textsubscript{4}, filtered, and concentrated. The residue was purified by silica gel column chromatography to the desired product.

**General procedure G for the N,O-diacylation at C2, C8:**

To a solution of 2-amino-8-quinolinol (30 mg, 0.19 mmol) and a carboxylic acid (5.0 equiv) in anhydrous dichloromethane were added EDCI (2.0 equiv), HOBr (0.5 equiv) and N,N-diisopropylethylamine (5.0 equiv) under N\textsubscript{2} atmosphere with an ice bath. After stirring overnight at ambient temperature, the reaction mixture was diluted with dichloromethane,
washed by saturated NH₄Cl, saturated NaHCO₃ and brine, dried by MgSO₄, filtered, and concentrated. The residue was purified by silica gel column chromatography to the pure products.
3. Experimental data

2-aminoquinolin-8-yl 4-chlorobenzoate (3b)

Following the general procedure A, the product was obtained 3b as white solid (50 mg, 90%) upon purification by column chromatography ($R_f = 0.15$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) δ 8.24 (dd, 2H, $J = 8.4$ Hz), 7.87 (d, 1H, $J = 9$ Hz), 7.55 (dd, 1H, $J = 8.4$ and 1.2 Hz), 7.47 (d, 2H, $J = 7.8$ Hz), 7.39 (dd, 1H, $J = 7.2$ and 1.2 Hz), 7.27 (t, 1H, $J = 7.8$ Hz), 6.65 (d, 1H, $J = 9$ Hz), 4.79 (bs, 2H); $^{13}$C-NMR (150 MHz, CDCl$_3$) δ 164.7, 157.0, 144.9, 140.2, 139.7, 138.0, 131.8, 128.7, 128.3, 125.7, 124.9, 121.9, 112.4; HRMS (EI): m/z calcd for C$_{16}$H$_{11}$ClN$_2$O$_2$: 298.0509; found: 298.0506.

2-aminoquinolin-8-yl 4-(trifluoromethyl)benzoate (3c)

Following the general procedure A, the product was obtained 3c as white solid (57 mg, 92%) upon purification by column chromatography ($R_f = 0.2$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, DMSO-d$_6$) δ 8.41 (d, 2H, $J = 7.8$ Hz), 8.01 (d, 2H, $J = 7.8$ Hz), 7.97(d, 1H, $J = 9.0$ Hz), 7.61 (d, 1H, $J = 8.4$ Hz), 7.42 (d, 1H, $J = 7.8$ Hz), 7.20 (t, 1H, $J = 7.5$ Hz), 6.81 (d, 1H, $J = 9$ Hz), 6.49 (bs, 2H); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) δ 164.0, 158.6, 144.6, 140.9, 137.4, 133.7, 133.7, 131.2, 126.4, 126.3, 126.2, 124.6, 121.9, 120.7, 113.7; HRMS (EI): m/z calcd for C$_{17}$H$_{13}$F$_3$N$_2$O$_2$: 332.0773; found: 332.0771.

2-aminoquinolin-8-yl 4-(tert-butyl)benzoate (3d)

Following the general procedure A, the product was obtained 3d as white solid (56 mg, 94%) upon purification by column chromatography ($R_f = 0.25$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) δ 8.26 (d, 2H, $J = 8.4$ Hz), 7.85 (d, 1H, $J = 9.0$ Hz), 7.55 (d, 2H, $J = 8.4$ Hz), 7.52 (s, 1H), 7.38 (d, 1H, $J = 7.8$ Hz), 7.24 (d, 1H, $J =7.8$ Hz), 6.63 (d, 1H, $J = 9.0$ Hz), 4.78 (bs, 2H), 1.38 (s, 9H); $^{13}$C-NMR (150 MHz, CDCl$_3$) δ 165.5, 157.2, 157.1, 145.3, 140.7, 137.7, 130.3, 127.1, 125.5, 125.4, 125.0, 121.9, 121.8, 112.2, 35.2, 31.1; HRMS (EI): m/z calcd for C$_{20}$H$_{29}$N$_2$O$_2$: 320.1525; found: 320.1527.
2-aminoquinolin-8-yl 3-methoxybenzoate (3e)

Following the general procedure A, the product was obtained 3e as white solid (50 mg, 91%) upon purification by column chromatography ($R_f = 0.1$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 7.96 (d, 1H, $J = 7.2$ Hz), 7.88 (d, 1H, $J = 9.0$ Hz), 7.83 (s, 1H), 7.57 (d, 1H, $J = 8.4$ Hz), 7.46 (t, 1H, $J = 7.8$ Hz), 7.42 (d, 1H, $J = 7.2$ Hz), 7.28 – 7.26 (m, 1H), 7.21 (d, 1H, $J = 7.8$ Hz), 6.66 (d, 1H, $J = 9.0$ Hz), 4.86 (bs, 2H), 3.89 (s, 3H); $^{13}$C-NMR (150 MHz, CDCl$_3$) $\delta$ 165.4, 159.6, 157.0, 145.2, 140.6, 137.8, 131.2, 129.5, 125.6, 125.0, 122.9, 121.9, 121.8, 120.1, 114.5, 112.3, 55.5; HRMS (EI): m/z calcd for C$_{17}$H$_{14}$N$_2$O$_3$: 294.1004; found: 294.1005.

2-aminoquinolin-8-yl 3,4,5-tris(benzyloxy)benzoate (3f)

Following the general procedure A, the product was obtained 3f as white solid (98mg, 90%) upon purification by column chromatography ($R_f = 0.35$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, DMSO-d$_6$) $\delta$ 7.97 (d, 1H, $J = 9.0$ Hz), 7.62-7.32 (m, 19H), 7.20 (t, 1H, $J = 7.8$ Hz), 6.82 (d, 1H, $J = 8.4$ Hz), 6.52 (bs, 2H), 5.25 (s, 4H), 5.13 (s, 2H); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) $\delta$ 164.5, 158.6, 152.7, 144.8, 142.1, 141.3, 137.7, 137.4, 137.2, 128.9, 128.7, 128.6, 128.4, 128.4, 128.1, 126.1, 125.2, 124.6, 122.0, 120.8, 113.7, 109.2, 74.7, 70.8; HRMS (EI): m/z calcd for C$_{37}$H$_{30}$N$_2$O$_5$: 582.2155; found: 582.2157.

2-aminoquinolin-8-yl furan-2-carboxylate (3g)

Following the general procedure A, the product was obtained 3g as white solid (42mg, 89%) upon purification by column chromatography ($R_f = 0.2$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 7.83 (d, 1H, $J = 9.0$ Hz), 7.67 (t, 1H, $J = 0.9$ Hz), 7.53 (dd, 1H, $J = 7.8$ and 1.2 Hz), 7.47 (dd, 1H, $J = 3.6$ and 0.6 Hz), 7.39 (dd, 1H, $J = 7.8$ and 1.2 Hz), 7.24 (t, 1H, $J = 7.8$ Hz), 6.65 (d, 1H, $J = 8.4$ Hz), 6.59 (q, 1H, $J = 1.8$ Hz), 4.91 (bs, 2H); $^{13}$C-NMR (150 MHz, CDCl$_3$) $\delta$ 157.2, 157.1, 146.8, 144.3, 144.3, 140.5, 137.8, 125.8, 125.0, 121.9, 121.7, 119.4, 112.4, 112.1; HRMS (EI): m/z calcd for C$_{14}$H$_{10}$N$_2$O$_3$: 254.0691; found: 254.0691.

2-aminoquinolin-8-yl benzoate (3j)
Following the general procedure A, the product was obtained 3j as white solid (45 mg, 91%) upon purification by column chromatography ($R_f = 0.2$, ethyl acetate / $n$-hexane = 1 : 3). $^1$H-NMR (600 MHz, DMSO-$_d_6$) $\delta$ 8.22 (d, 2H, $J = 7.8$ Hz), 7.97 (d, 1H, $J = 9.0$ Hz), 7.76 (t, 1H, $J = 7.5$ Hz), 7.64 – 7.59 (m, 3H), 7.39 (d, 1H, $J = 7.8$ Hz), 7.20 (t, 1H, $J = 7.8$ Hz), 6.82 (d, 1H, $J = 9.0$ Hz), 6.50 (bs, 2H); $^{13}$C-NMR (150 MHz, DMSO-$_d_6$) $\delta$ 165.0, 158.6, 144.8, 141.3, 137.4, 134.1, 130.4, 129.9, 126.1, 124.6, 122.1, 120.8, 113.7; HRMS (EI): m/z calcd for C$_{16}$H$_{12}$N$_2$O$_2$: 264.0899; found: 264.0897

2-aminoquinolin-8-yl 3,5-dichlorobenzoate (3k)

Following the general procedure A, the product was obtained 3k as white solid (56 mg, 90%) upon purification by column chromatography ($R_f = 0.1$, ethyl acetate / $n$-hexane = 1 : 3). $^1$H-NMR (600 MHz, DMSO-$_d_6$) $\delta$ 8.12 (s, 2H), 8.06 (s, 1H), 7.96 (d, 1H, $J = 9.0$ Hz), 7.61 (d, 1H, $J = 7.8$ Hz), 7.41 (d, 1H, $J = 7.8$ Hz), 7.19 (t, 1H, $J = 7.8$ Hz), 6.80 (d, 1H, $J = 8.4$ Hz), 6.51 (bs, 2H); $^{13}$C-NMR (150 MHz, DMSO-$_d_6$) $\delta$ 162.8, 158.6, 144.4, 140.7, 137.4, 135.3, 133.5, 133.2, 128.8, 126.3, 124.5, 121.8, 120.7, 113.7.

(S)-2-aminoquinolin-8-yl 2-((tert-butoxycarbonyl)amino)-3-methylbutanoate (3o)

Following the general procedure A, the product was obtained 3o as white solid (42 mg, 62%) upon purification by column chromatography ($R_f = 0.2$, ethyl acetate / $n$-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 7.82 (d, 1H, $J = 9.0$ Hz), 7.50 (d, 1H, $J = 7.8$ Hz), 7.30 (d, 1H, $J = 7.2$ Hz), 7.22 (t, 1H, $J = 7.8$ Hz), 6.68 (d, 1H, $J = 8.4$ Hz), 5.47 (d, 1H, $J = 9.0$ Hz), 5.14 (bs, 2H), 4.73 (q, 1H, $J = 4.6$ Hz), 2.63-2.57 (m, 1H), 1.50 (s, 9H), 1.18 (dd, 6H, $J = 9.6$ and 6.6 Hz); $^{13}$C-NMR (150 MHz, CDCl$_3$) $\delta$ 171.3, 157.1, 156.0, 144.6, 140.0, 137.7, 125.6, 124.8, 121.6, 121.6, 112.5, 79.8, 58.9, 31.2, 28.4, 19.4, 17.5; HRMS (EI): m/z calcd for C$_{19}$H$_{25}$N$_3$O$_4$: 359.1845; found: 359.1847.

2-aminoquinolin-8-yl 1-acetylpiperidine-4-carboxylate (3p)

Following the general procedure A, the product was obtained 3p as white solid (50 mg, 85%) upon purification by column chromatography ($R_f = 0.1$, ethyl acetate / $n$-hexane = 1 : 3). $^1$H-NMR (600 MHz, DMSO-$_d_6$) $\delta$ 7.88 (d, 1H, $J = 8.4$ Hz), 7.10 (dd, 1H, $J = 8.4$ and 1.2 Hz), 7.01 (t, 1H, $J = 7.8$ Hz), 6.89 (dd, 1H, $J = 7.2$ and 1.2 Hz), 6.80 (d, 1H, $J = 9.0$ Hz), 6.44 (bs, 2H), 4.21-4.18 (m, 1H),
3.74-3.71 (m, 1H), 3.10-3.05 (m, 1H), 2.71-2.66 (m, 1H), 2.49-2.44 (m, 1H), 1.98 (s, 3H), 1.84-1.77 (m, 2H), 1.52-1.45 (m, 1H), 1.38-1.31 (m, 1H); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) $\delta$ 176.1, 168.4, 157.4, 150.4, 137.6, 137.6, 123.2, 121.9, 118.1, 113.3, 111.0, 45.5, 40.5, 28.8, 28.1, 21.7; HRMS (EI): m/z calcd for C$_{17}$H$_{19}$N$_3$O$_3$: 313.1426; found: 313.1428.

2-aminoquinolin-8-yl 3-methylbutanoate (3q)

Following the general procedure A, the product was obtained 3q as colorless oil (33 mg, 72%) upon purification by column chromatography ($R_f$ = 0.15, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 7.83 (d, 1H, $J$ = 9.0 Hz), 7.51 (dd, 1H, $J$ = 7.8 and 1.2 Hz), 7.29 (dd, 1H, $J$ = 7.8 and 1.8 Hz), 7.23 (t, 1H, $J$ = 7.8 Hz), 6.65 (d, 1H, $J$ = 8.4 Hz), 4.95 (bs, 2H), 2.65 (d, 2H, $J$ = 7.2 Hz), 2.42-2.35 (m, 1H), 1.16 (d, 6H, $J$ = 6.6 Hz); $^{13}$C-NMR (150 MHz, CDCl$_3$) $\delta$ 172.0, 157.1, 145.0, 140.5, 137.8, 125.4, 124.9, 121.8, 121.7, 112.3, 43.2, 25.9, 22.5; HRMS (EI): m/z calcd for C$_{14}$H$_{16}$N$_2$O$_2$: 244.1212; found: 244.1214.

2-aminoquinolin-8-yl pivalate (3r)

Following the general procedure E, the product was obtained 3r as white solid (35 mg, 76%) upon purification by column chromatography ($R_f$ = 0.25, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 7.84 (d, 1H, $J$ = 9.0 Hz), 7.49 (dd, 1H, $J$ = 7.8 and 1.8 Hz), 7.25 (dd, 1H, $J$ = 7.8 and 1.8 Hz), 7.21 (t, 1H, $J$ = 7.8 Hz), 6.66 (d, 1H, $J$ = 9.0 Hz), 4.71 (bs, 2H), 1.49 (s, 9H); $^{13}$C-NMR (150 MHz, CDCl$_3$) $\delta$ 177.4, 156.8, 145.4, 140.6, 137.8, 125.2, 125.0, 121.8, 121.7, 112.1, 39.2, 27.5; HRMS (EI): m/z calcd for C$_{14}$H$_{16}$N$_2$O$_2$: 244.1212; found: 244.1210.

(3r,5r,7r)-2-aminoquinolin-8-yl adamantane-1-carboxylate (3s)

Following the general procedure A, the product was obtained 3s as yellow solid (50 mg, 83%) upon purification by column chromatography ($R_f$ = 0.1, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 7.85 (d, 1H, $J$ = 9.0 Hz), 7.50 (d, 1H, $J$ = 6.6 Hz), 7.28-7.20 (m, 2H), 6.68 (d, 1H, $J$ = 8.4 Hz), 4.75 (bs, 2H), 2.25 (s, 6H), 2.14 (s, 3H), 1.83 (s, 3H); $^{13}$C-NMR (150 MHz, CDCl$_3$) $\delta$ 176.5, 156.8, 145.4, 140.5, 137.8, 125.1, 124.9, 121.8, 121.7, 112.0, 41.2, 39.1, 36.6, 28.1; HRMS (EI): m/z calcd for C$_{20}$H$_{22}$N$_2$O$_2$: 322.1681; found: 322.1680.
2-aminoquinolin-8-yl 4-methylbenzenesulfonate (3t)

Following the general procedure E, the product was obtained 3t as white solid (51 mg, 87%) upon purification by column chromatography ($R_f = 0.1$, ethyl acetate / $n$-hexane = 1 : 3). $^1$H-NMR (600 MHz, DMSO-d$_6$) $\delta$ 7.86-7.84 (m, 3H), 7.55 (d, 1H, $J = 7.8$ Hz), 7.38 (d, 1H, $J = 7.8$ Hz), 7.25 (d, 1H, $J = 7.8$ Hz), 7.08 (t, 1H, $J = 7.8$ Hz), 6.73 (d, 1H, $J = 9.0$ Hz), 6.55 (bs, 2H), 2.36 (s, 3H); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) $\delta$ 158.6, 145.4, 142.5, 141.3, 137.1, 132.9, 129.9, 129.0, 127.2, 124.9, 122.1, 120.4, 113.7, 21.6; HRMS (EI): m/z calcd for C$_{16}$H$_{14}$N$_2$O$_3$: 314.0725; found: 314.0724.

2-aminoquinolin-8-yl benzyl carbonate (3u)

Following the general procedure E, the product was obtained 3u as white solid (47 mg, 85%) upon purification by column chromatography ($R_f = 0.15$, ethyl acetate / $n$-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 7.95 (d, 1H, $J = 9.0$ Hz), 7.57 (d, 1H, $J = 8.4$ Hz), 7.47-7.34 (m, 6H), 7.14 (t, 1H, $J = 7.8$ Hz), 6.83 (d, 1H, $J = 9.0$ Hz), 6.59 (bs, 2H), 5.28 (s, 2H); $^{13}$C-NMR (150 MHz, CDCl$_3$) $\delta$ 158.6, 153.5, 144.6, 140.9, 137.3, 135.7, 128.9, 128.5, 126.1, 124.6, 121.2, 120.7, 113.7, 70.0; HRMS (EI): m/z calcd for C$_{17}$H$_{14}$N$_2$O$_3$: 294.1004; found: 294.1004.

2-aminoquinolin-8-yl tert-butyl carbonate (3v)

To a solution of commercially available 2-amino-8-quinolinol (30 mg, 0.19 mmol) in anhydrous tetrahydrofuran (4 ml) and triethylamine (78 $\mu$L, 0.56 mmol) was added di-tert-butyl carbonate (52 $\mu$L, 0.22 mmol) under N$_2$ atmosphere with an ice bath and stirring for 4 hour at room temperature. The mixture was diluted with dichloromethane, washed by NH$_4$Cl, saturated NaHCO$_3$, and brine, dried by MgSO$_4$, filtered, concentrated. The residue was purified by silica gel column chromatography ($R_f = 0.2$, ethyl acetate / $n$-hexane = 1 : 3) to afford 3v (45 mg, 92%) as white solid. $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 7.85 (d, 1H, $J = 8.4$ Hz), 7.50 (d, 1H, $J = 7.8$ Hz), 7.39 (d, 1H, $J = 7.2$ Hz), 7.21 (t, 1H, $J = 7.8$ Hz), 6.70 (d, 1H, $J = 9.0$ Hz), 1.59 (s, 9H); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) $\delta$ 157.3, 152.0, 144.8, 140.0, 137.8, 125.4, 124.8, 121.5, 121.4, 112.6, 83.3, 27.7; HRMS (EI): m/z calcd for C$_{14}$H$_{16}$N$_2$O$_3$: 260.1161; found: 260.1161.
4-chloro-N-(8-hydroxyquinolin-2-yl)benzamide (4b)

Following the general procedure D, the product was obtained 4b as white solid (49 mg, 88%) upon purification by column chromatography ($R_f = 0.5$, dichloromethane / methanol = 20 : 1). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 8.73 (bs, 1H), 8.56 (d, 1H, $J = 9$Hz), 8.23 (d, 1H, $J = 9$ Hz), 7.94 (d, 2H, $J = 8.4$ Hz), 7.62 (bs, 1H), 7.52 (d, 2H, $J = 8.4$ Hz), 7.38 (t, 1H, $J = 7.8$ Hz), 7.34 (d, 1H, $J = 7.2$ Hz), 7.15 (d, 1H, $J = 6.6$ Hz); $^{13}$C-NMR (150 MHz, CDCl$_3$) $\delta$ 164.7, 150.7, 149.4, 139.0, 138.9, 136.2, 132.3, 129.2, 128.7, 126.6, 126.2, 118.1, 114.7, 110.9; HRMS (EI): m/z calcd for C$_{16}$H$_{11}$ClN$_2$O$_2$: 298.0509; found: 298.0511.

N-(8-hydroxyquinolin-2-yl)-4-(trifluoromethyl)benzamide (4c)

Following the general procedure D, the product was obtained 4c as white solid (58 mg, 93%) upon purification by column chromatography ($R_f = 0.5$, dichloromethane / methanol = 20 : 1). $^1$H-NMR (600 MHz, DMSO-d$_6$) $\delta$ 11.21 (bs, 1H), 9.42 (s, 1H), 8.38 (d, 1H, $J = 8.4$ Hz), 8.29 (t, 3H, $J = 11.4$ Hz), 7.93 (d, 2H, $J = 7.8$ Hz), 7.40-7.35 (m, 2H), 7.12 (d, 1H, $J = 7.2$ Hz); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) $\delta$ 165.7, 152.6, 150.3, 138.6, 138.3, 129.5, 127.3, 126.4, 125.8, 125.8, 125.2, 123.4, 118.2, 116.3, 112.2; HRMS (EI): m/z calcd for C$_{17}$H$_{11}$F$_3$N$_2$O$_2$: 332.0773; found: 332.0770.

4-(tert-butyl)-N-(8-hydroxyquinolin-2-yl)benzamide (4d)

Following the general procedure D, the product was obtained 4d as white solid (55 mg, 91%) upon purification by column chromatography ($R_f = 0.65$, dichloromethane / methanol = 20 : 1). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 8.70 (s, 1H), 8.61 (d, 1H, $J = 9.0$ Hz), 8.23 (d, 1H, $J = 9.0$ Hz), 7.94 (dt, 2H, $J = 8.4$ and 1.8 Hz), 7.59 (s, 1H), 7.57 (dt, 2H, $J = 9.0$ and 1.8 Hz), 7.38 (t, 1H, $J = 7.8$ Hz), 7.34 (dd, 1H, $J = 7.8$ and 1.8 Hz), 7.16 (dd, 1H, $J = 7.2$ and 1.2 Hz), 1.38 (s, 9H); $^{13}$C-NMR (150 MHz, CDCl$_3$) $\delta$ 165.7, 156.3, 150.7, 149.7, 138.9, 136.2, 131.1, 127.1, 126.5, 126.0, 125.9, 118.0, 114.8, 110.7, 35.1, 31.1; HRMS (EI): m/z calcd for C$_{20}$H$_{20}$N$_2$O$_2$: 320.1525; found: 320.1527.

2-(3-methoxybenzamido)quinolin-8-yl 3-methoxybenzoate (4e)

Following the general procedure D, the product was obtained 4e as white solid (55 mg, 99%) upon purification by column chromatography ($R_f = 0.2$, dichloromethane / methanol = 20 : 1). $^1$H-NMR
(600 MHz, DMSO-\textsubscript{d\textsubscript{6}}) \(\delta\) 10.87 (bs, 1H), 9.35 (bs, 1H), 8.36 (d, 1H, \(J = 9.0\) Hz), 8.29 (d, 1H, \(J = 8.4\) Hz), 7.68 (t, 2H, \(J = 7.5\) Hz), 7.47 (t, 1H, \(J = 7.8\) Hz), 7.39-7.34 (m, 2H), 7.19 (d, 2H, \(J = 7.8\) Hz), 7.12 (d, 1H, \(J = 7.2\) Hz); \(^{13}\)C-NMR (150 MHz, DMSO-\textsubscript{d\textsubscript{6}}) \(\delta\) 166.3, 159.6, 152.4, 150.5, 138.5, 137.2, 135.7, 130.0, 127.3, 118.7, 118.2, 116.5, 113.3, 112.1, 55.8; HRMS (EI): m/z calcd for C\textsubscript{17}H\textsubscript{14}N\textsubscript{2}O\textsubscript{3}: 294.1004; found: 294.1005.

3,4,5-tris(benzyloxy)-N-(8-hydroxyquinolin-2-yl)benzamide (4f)
Following the general procedure D, the product was obtained as white solid (84 mg, 77%) upon purification by column chromatography (\(R_f = 0.2\), dichloromethane / methanol = 20 : 1). \(^1\)H-NMR (600 MHz, DMSO-\textsubscript{d\textsubscript{6}}) \(\delta\) 10.94 (bs, 1H), 9.42 (bs, 1H), 8.35 (d, 1H, \(J = 8.4\) Hz), 8.25 (d, 1H, \(J = 8.4\) Hz), 7.62 (s, 2H), 7.52-7.29 (m, 17H), 7.12 (d, 1H, \(J = 7.2\) Hz), 5.26 (s, 4H), 5.05 (s, 2H); \(^{13}\)C-NMR (150 MHz, DMSO-\textsubscript{d\textsubscript{6}}) \(\delta\) 165.8, 152.5, 152.4, 150.6, 140.8, 138.3, 137.8, 137.4, 137.3, 129.3, 128.9, 128.6, 128.5, 128.4, 128.3, 128.1, 127.2, 126.3, 118.2, 116.7, 112.2, 107.7, 74.7, 70.8; HRMS (EI): m/z calcd for C\textsubscript{37}H\textsubscript{30}N\textsubscript{2}O\textsubscript{5}: 582.2155; found: 582.2155.

N-(8-hydroxyquinolin-2-yl)furan-2-carboxamide (4g)
Following the general procedure D, the product was obtained as white solid (43 mg, 90%) upon purification by column chromatography (\(R_f = 0.4\), dichloromethane / methanol = 20 : 1). \(^1\)H-NMR (600 MHz, DMSO-\textsubscript{d\textsubscript{6}}) \(\delta\) 10.48 (bs, 1H), 9.45 (bs, 1H), 8.35 (d, 1H, \(J = 9.0\) Hz), 8.29 (d, 1H, \(J = 9.0\) Hz), 8.01 (s, 1H), 7.62 (d, 1H, \(J = 3.0\) Hz), 7.37–7.32 (m, 2H), 7.10 (d, 1H, \(J = 7.2\) Hz), 6.47 (s, 1H); \(^{13}\)C-NMR (150 MHz, DMSO-\textsubscript{d\textsubscript{6}}) \(\delta\) 157.0, 152.5, 152.4, 149.8, 147.1, 147.0, 138.3, 137.8, 137.4, 137.3, 129.3, 128.9, 128.6, 128.5, 128.4, 128.3, 128.1, 127.2, 126.3, 118.2, 116.7, 112.2, 107.7, 74.7, 70.8; HRMS (EI): m/z calcd for C\textsubscript{14}H\textsubscript{10}N\textsubscript{2}O\textsubscript{3}: 254.0691; found: 254.0691.

N-(8-hydroxyquinolin-2-yl)picolinamide (4h)
Following the general procedure D, the product was obtained as white solid (47mg, 95%) upon purification by column chromatography (\(R_f = 0.55\), dichloromethane / methanol = 10 : 1). \(^1\)H-NMR (600 MHz, CDCl\textsubscript{3}) \(\delta\) 10.66 (bs, 1H), 8.59-8.58 (m, 2H), 8.26 (td, 1H, \(J = 7.2\) and 0.9 Hz), 8.14 (d, 1H), 7.85 (td, 1H, \(J = 7.5\) and 1.2 Hz), 7.78 (bs, 1H), 7.44 – 7.41 (m, 1H), 7.32 (t, 1H, \(J = 7.8\) Hz), 7.26 (dd, 1H, \(J = 8.4\) and 1.2 Hz), 7.13 (dd, 1H, \(J = 7.2\) and 1.2 ); \(^{13}\)C-NMR (150 MHz, CDCl\textsubscript{3}) \(\delta\)
N-(8-hydroxyquinolin-2-yl)pyrazine-2-carboxamide (4i)

Following the general procedure D, the product was obtained 4i as white solid (46 mg, 92%) upon purification by column chromatography ($R_f = 0.2$, dichloromethane / methanol = 10 : 1). $^1$H-NMR (600 MHz, DMSO-d$_6$) $\delta$ 10.60 (bs, 1H), 9.72 (bs, 1H), 9.41 (s, 1H), 9.02 (d, 1H, $J = 1.2$ Hz), 8.88 (s, 1H), 8.50 (d, 1H, $J = 9.0$ Hz), 8.46 (d, 1H, $J = 8.4$ Hz), 7.40-7.36 (m, 2H), 7.09 (d, 1H, $J = 6.6$ Hz);
$^{13}$C-NMR (150 MHz, DMSO-d$_6$) $\delta$ 161.9, 152.7, 149.0, 148.8, 144.4, 144.0, 143.9, 139.5, 137.2, 127.3, 126.7, 118.1, 114.2, 112.6; HRMS (EI): m/z calcd for C$_{15}$H$_{11}$N$_3$O$_2$: 265.0851; found: 265.0846.

N-(8-hydroxyquinolin-2-yl)benzamide (4j)

Following the general procedure D, the product was obtained 4j as white solid (49 mg, 98%) upon purification by column chromatography ($R_f = 0.35$, dichloromethane / methanol = 20 : 1). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 8.75 (bs, 1H), 8.61 (d, 1H, $J = 9.0$ Hz), 8.24 (d, 1H, $J = 9$ Hz), 8.00-7.99 (m, 2H), 7.63-7.60 (m, 2H), 7.56-7.53 (m, 2H), 7.38-7.33 (m, 2H), 7.16 (dd, 1H, $J = 7.8$ and 1.2 Hz);
$^{13}$C-NMR (100 MHz, CDCl$_3$) $\delta$ 165.7, 150.7, 149.5, 138.9, 136.2, 133.9, 132.5, 128.9, 127.2, 126.5, 126.1, 118.0, 114.7, 110.7; HRMS (EI): m/z calcd for C$_{16}$H$_{12}$N$_2$O$_2$: 264.0899; found: 264.0897.

3,5-dichloro-N-(8-hydroxyquinolin-2-yl)benzamide (4k)

Following the general procedure D, the product was obtained 4k as white solid (56 mg, 90%) upon purification by column chromatography ($R_f = 0.45$, dichloromethane / methanol = 20 : 1) $^1$H-NMR (600 MHz, DMSO-d$_6$) $\delta$ 11.19 (bs, 1H), 9.40 (bs, 1H), 8.35 (d, 1H, $J = 9$ Hz), 8.23 (d, 1H, $J = 9$ Hz), 8.08 (d, 2H, $J = 1.8$ Hz), 7.88 (s, 1H), 7.39-7.32 (2H, m), 7.10 (d, 1H, $J = 6.6$ Hz);
$^{13}$C-NMR (150 MHz, DMSO-d$_6$) $\delta$ 164.1, 152.6, 150.1, 138.6, 137.7, 137.3, 134.7, 131.8, 127.4, 127.3, 126.5, 118.2, 116.2, 112.3; HRMS (EI): m/z calcd for C$_{16}$H$_{10}$Cl$_2$N$_2$O$_2$: 332.0119; found: 332.0118.

N-(8-hydroxyquinolin-2-yl)nicotinamide (4l)
Following the general procedure C, the product was obtained 4l as white solid (37 mg, 75%) upon purification by column chromatography ($R_f = 0.2$, dichloromethane / methanol = 20 : 1). $^1\text{H-NMR}$ (600 MHz, DMSO-$d_6$) $\delta$ 11.24 (bs, 1H), 9.44 (bs, 1H), 9.21 (d, 1H, $J = 1.8$ Hz), 8.79 (dd, 1H, $J = 4.8$ and 1.8 Hz), 8.42-8.40 (m, 1H), 8.36 (d, 1H, $J = 9.0$ Hz), 8.29 (bs, 1H), 7.58 (q, 1H, $J = 4.2$ Hz), 7.39- 7.34 (m, 2H), 7.13 (dd, 1H, $J = 7.2$ and 1.2); $^{13}\text{C-NMR}$ (150 MHz, DMSO-$d_6$) $\delta$ 165.5, 152.9, 152.5, 150.4, 149.5, 138.6, 137.3, 136.3, 130.3, 127.2, 126.4, 123.8, 118.2, 116.3, 112.3; HRMS (EI): m/z calcd for C$_{15}$H$_{11}$N$_3$O$_2$: 265.0851; found: 265.0854.

$N$-(8-hydroxyquinolin-2-yl)isonicotinamide (4m)

Following the general procedure C, the product was obtained 4m as white solid (42 mg, 85%) upon purification by column chromatography ($R_f = 0.2$, dichloromethane / methanol = 20 : 1). $^1\text{H-NMR}$ (600 MHz, CDCl$_3$) $\delta$ 8.90-8.87 (m, 3H), 8.58 (d, 1H, $J = 9.0$ Hz), 8.29 (d, 1H, $J = 8.4$ Hz), 7.85 (dd, 2H, $J = 4.2$ and 1.2 Hz), 7.64 (bs, 1H), 7.43 (t, 1H, $J = 7.8$ Hz), 7.38 (dd, 1H, $J = 8.4$ and 1.2 Hz), 7.19 (dd, 1H, $J = 7.2$ and 1.2 Hz); $^{13}\text{C-NMR}$ (150 MHz, CDCl$_3$) $\delta$ 163.9, 151.0, 150.7, 148.9, 141.1, 139.2, 136.2, 128.7, 126.5, 120.9, 118.2, 114.7, 111.1; HRMS (EI): m/z calcd for C$_{15}$H$_{11}$N$_3$O$_2$: 265.0851; found: 265.0850.

(S)-$\text{tert}$-butyl (1-((8-hydroxyquinolin-2-yl)amino)-4-methyl-1-oxopentan-2-yl)carbamate (4n)

Following the general procedure C, the product was obtained 4n as white solid (55 mg, 78%) upon purification by column chromatography ($R_f = 0.2$, dichloromethane / methanol = 20 : 1). $^1\text{H-NMR}$ (600 MHz, CDCl$_3$) $\delta$ 9.63 (bs, 1H), 7.98 (d, 1H, $J = 7.8$ Hz), 7.61 (d, 2H, $J = 11.4$ Hz), 7.24 (d, 1H, $J = 7.2$ Hz), 7.09 (d, 1H, $J = 7.2$ Hz), 7.03 (d, 1H, $J = 7.2$ Hz), 5.19 (d, 1H, $J = 8.4$ Hz), 4.66 (bs, 1H), 1.84-1.79 (m, 1H), 1.76-1.65 (m, 2H), 1.47 (s, 9H), 1.01 (t, 6H, $J = 7.2$ Hz); $^{13}\text{C-NMR}$ (150 MHz, CDCl$_3$) $\delta$ 172.7, 156.7, 151.0, 149.1, 137.5, 136.1, 126.1, 125.6, 117.5, 114.4, 110.6, 80.9, 54.0, 40.9, 28.3, 24.8, 23.2, 21.6; HRMS (EI): m/z calcd for C$_{20}$H$_{27}$N$_3$O$_4$: 373.2002; found: 373.2004.

(S)-$\text{tert}$-butyl (1-((8-hydroxyquinolin-2-yl)amino)-3-methyl-1-oxobutan-2-yl)carbamate (4o)

(S)-$\text{tert}$-butyl (1-((8-hydroxyquinolin-2-yl)amino)-3-methyl-1-oxobutan-2-yl)carbamate (4o)
Following the general procedure C, the product was obtained 4o as colorless oil (63 mg, 93%) upon purification by column chromatography ($R_f = 0.15$, dichloromethane / methanol = 10 : 1). $^1$H-NMR (600 MHz, DMSO-d$_6$) δ 10.61 (bs, 1H), 9.48 (bs, 1H), 8.29-8.24 (m, 2H), 7.33 (dd, 1H, $J = 7.8$ and 1.2 Hz), 7.31 (t, 1H, $J = 7.8$ Hz), 7.09 (dd, 1H, $J = 7.8$ and 1.8 Hz), 7.03 (d, 2H, $J = 8.4$ Hz), 4.14 (bs, 1H), 2.10-2.06 (m, 1H), 1.39 (s, 9H), 0.94 (q, 6H, $J = 7.0$ Hz); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) δ 172.5, 156.0, 152.2, 150.2, 138.6, 137.4, 127.1, 125.9, 118.2, 115.0, 112.3, 78.6, 61.0, 30.6, 28.6, 19.6, 18.7; HRMS (EI): m/z calcd for C$_{19}$H$_{25}$N$_3$O$_4$: 359.1845; found: 359.1845.

1-acetyl-N-(8-hydroxyquinolin-2-yl)piperidine-4-carboxamide (4p)

Following the general procedure C, the product was obtained 4p as white solid (48 mg, 82%) upon purification by column chromatography ($R_f = 0.1$, dichloromethane / methanol = 20 : 1). $^1$H-NMR (600 MHz, DMSO-d$_6$) δ 10.74 (bs, 1H), 9.41 (bs, 1H), 8.26 (bs, 2H), 7.33 (dd, 1H, $J = 7.8$ and 1.2 Hz), 7.30 (t, 1H, $J = 7.8$ Hz), 7.08 (dd, 1H, $J = 7.2$ and 1.2 Hz), 4.43 (d, 1H, $J = 13.2$ Hz), 3.89 (d, 1H, $J = 13.8$ Hz), 3.08-3.03 (m, 1H), 2.83 (bs, 1H), 2.60 (td, 1H, $J = 12.6$ and 2.4 Hz), 2.01 (s, 3H), 1.88 (t, 2H, $J = 15.0$ Hz), 1.64-1.57 (m, 1H), 1.48-1.42 (m, 1H); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) δ 174.7, 168.4, 152.5, 150.6, 138.5, 137.4, 127.0, 125.8, 118.2, 115.1, 112.2, 45.7, 42.7, 40.7, 29.1, 28.5, 21.7; HRMS (EI): m/z calcd for C$_{17}$H$_{19}$N$_3$O$_3$: 313.1426; found: 313.1428.

N-(8-hydroxyquinolin-2-yl)-3-methylbutanamide (4q)

Following the general procedure C, the product was obtained 4q as white solid (40 mg, 88%) upon purification by column chromatography ($R_f = 0.1$, dichloromethane / methanol = 20 : 1). $^1$H-NMR (600 MHz, DMSO-d$_6$) δ 10.66 (bs, 1H), 9.36 (bs, 1H), 8.27-8.25 (m, 2H), 7.33-7.28 (m, 2H), 7.07 (d, 1H, $J = 7.2$ Hz), 2.35 (d, 2H, $J = 7.2$ Hz), 2.15–2.08 (m, 1H), 0.96 (d, 6H, $J = 6.6$ Hz); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) δ 174.7, 168.4, 152.5, 150.6, 138.5, 137.4, 127.0, 125.8, 118.2, 115.1, 112.2, 45.6, 26.0, 22.7; HRMS (EI): m/z calcd for C$_{16}$H$_{16}$N$_2$O$_2$: 244.1212; found: 244.1210.

N-(8-hydroxyquinolin-2-yl)pivalamide (4r)

Following the general procedure F, the product was obtained 4r as white solid (41 mg, 90%) upon purification by column chromatography ($R_f = 0.45$, dichloromethane / methanol = 20 : 1). $^1$H-NMR (600 MHz, DMSO-d$_6$) δ 10.66 (bs, 1H), 9.36 (bs, 1H), 8.27-8.25 (m, 2H), 7.33-7.28 (m, 2H), 7.07 (d, 1H, $J = 7.2$ Hz), 2.35 (d, 2H, $J = 7.2$ Hz), 2.15–2.08 (m, 1H), 0.96 (d, 6H, $J = 6.6$ Hz); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) δ 174.7, 168.4, 152.5, 150.6, 138.5, 137.4, 127.0, 125.7, 118.2, 115.2, 112.2, 45.6, 26.0, 22.7; HRMS (EI): m/z calcd for C$_{16}$H$_{16}$N$_2$O$_2$: 244.1212; found: 244.1210.
(600 MHz, DMSO-d$_6$) δ 9.74 (bs, 1H), 9.28 (bs, 1H), 8.28 (d, 1H, $J = 9.0$ Hz), 8.21 (d, 1H, $J = 9.0$ Hz), 7.34-7.29 (m, 2H), 7.08 (d, 1H, $J = 7.2$ Hz), 1.24 (s, 9H); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) δ 177.8, 152.3, 150.6, 138.4, 137.1, 126.9, 126.0, 118.1, 115.8, 111.9, 39.9, 27.4; HRMS (EI): m/z calcd for C$_{14}$H$_{16}$N$_2$O$_2$: 244.1212; found: 244.1210.

(3r,5r,7r)-N-(8-hydroxyquinolin-2-yl)adamantane-1-carboxamide (4s)

Following the general procedure C, the product was obtained 4s as white solid (27 mg, 45%) upon purification by column chromatography ($R_f = 0.55$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, DMSO-d$_6$) δ 9.59 (bs, 1H), 9.28 (bs, 1H), 8.29 (d, 1H, $J = 9.0$ Hz), 8.22 (d, 1H, $J = 9.0$ Hz), 7.34-7.29 (m, 2H), 7.07 (d, 1H, $J = 7.2$ Hz), 2.04 (s, 3H), 1.98 (s, 6H), 1.75 (t, 6H, $J = 13.5$ Hz); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) δ 177.1, 152.3, 150.5, 138.4, 137.1, 126.8, 126.0, 118.1, 115.7, 111.8, 41.6, 38.5, 36.3, 28.1; HRMS (EI): m/z calcd for C$_{20}$H$_{22}$N$_2$O$_2$: 322.1681; found: 322.1682.

benzyl (8-hydroxyquinolin-2-yl)carbamate (4u)

Following the general procedure F, the product was obtained 4u as white solid (50 mg, 91%) upon purification by column chromatography ($R_f = 0.5$, dichloromethane / methanol = 20 : 1). $^1$H-NMR (600 MHz, DMSO-d$_6$) δ 10.49 (bs, 1H), 9.11 (bs, 1H), 8.29 (d, 1H, $J = 9.0$ Hz), 8.05 (d, 1H, $J = 9.0$ Hz), 7.46 (d, 2H, $J = 7.2$ Hz), 7.41 (t, 2H, $J = 7.5$ Hz), 7.35-7.28 (m, 3H), 7.08 (d, 1H, $J = 7.2$ Hz), 5.23 (s, 2H); $^{13}$C-NMR (150 MHz, DMSO-d$_6$) δ 154.1, 152.1, 150.4, 138.7, 137.2, 136.9, 128.9, 128.4, 128.2, 126.4, 125.7, 118.2, 114.2, 112.0, 66.42; HRMS (EI): m/z calcd for C$_{17}$H$_{14}$N$_2$O$_3$: 294.1004; found: 294.1003.

tert-butyl (8-hydroxyquinolin-2-yl)carbamate (4v)

To a solution of commercially available 2-amino-8-quinolinol (30 mg, 0.19 mmol) and NaH (2 equiv) in anhydrous tetrahydrofuran (4 ml) was added tert-butyl 1H-imidazole-1-carboxylate (1.2 equiv) under N$_2$ atmosphere with an ice bath and stirring for 2 h at room temperature. The reaction was quenched with sat. NH$_4$Cl, washed by dichloromethane and dried by MgSO$_4$, filtered, concentrated. The residue was purified by silica gel column chromatography ($R_f = 0.6$, dichloromethane / methanol = 20 : 1) to afford 4v (46 mg, 95%). $^1$H-NMR (600 MHz, CDCl$_3$) δ 8.23 (d, 1H, $J = 9.0$ Hz), 8.14 (d,
Following the general procedure G, the product was obtained 5a as white solid (yield = 60%) upon purification by column chromatography ($R_f = 0.3$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) δ 9.11 (s, 1H), 8.50 (d, 1H, $J = 9.0$ Hz), 8.17 – 8.19 (m, 3H). 7.73 (d, 2H, $J = 8.4$ Hz), 7.69 (d, 1H, $J = 7.8$ Hz), 7.44 – 7.49 (m, 3H), 6.82 (d, 2H, $J = 8.4$ Hz), 6.74 (d, 2H, $J = 8.4$ Hz), 3.81 (s, 3H), 3.76 (s, 3H); $^{13}$C NMR (150 MHz, CDCl$_3$) δ 165.8, 164.9, 163.6, 162.6, 151.7, 146.1, 139.9, 138.4, 132.5, 129.3, 127.5, 126.2, 125.4, 124.6, 122.3, 121.7, 115.2, 113.7, 113.6, 55.4, 55.3.

Following the general procedure G, the product was obtained 5b as white solid (yield = 55%) upon purification by column chromatography ($R_f = 0.5$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) δ 9.4 (1H, s), 8.43 (1H, d, $J = 9$ Hz), 8.20 (2H, d, $J = 7.8$ Hz), 8.17 (1H, d, $J = 9$ Hz), 7.71 (1H, d, $J = 8.4$ Hz), 7.63 (2H, d, $J = 8.4$ Hz), 7.51 – 7.47 (2H, m), 7.26 (2H, d, $J = 9$ Hz), 7.17 (2H, d, $J = 8.4$); $^{13}$C NMR (150 MHz, CDCl$_3$) δ 165.6, 164.3, 151.5, 145.6, 139.9, 139.4, 138.7, 138.4, 132.4, 131.6, 128.7, 128.6, 128.6, 127.6, 127.6, 125.8, 124.9, 122.4, 115.2.

Following the general procedure G, the product was obtained 5c as white solid (yield = 56%) upon purification by column chromatography ($R_f = 0.5$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) δ 9.92 (1H, bs), 8.37 (1H, d, $J = 9$ Hz), 8.20 (2H, d, $J = 7.8$ Hz), 8.17 (1H, d, $J = 9$ Hz), 7.73 (1H, dd, $J = 8.4$ and 1.2 Hz), 7.70 (2H, d, $J = 7.8$ Hz), 7.50 – 7.43 (4H, m), 7.33 (2H, d, $J = 8.4$ Hz); $^{13}$C NMR (150 MHz, CDCl$_3$) δ 165.8, 163.8, 151.4, 145.2, 139.2, 137.5, 134.7, 133.5, 132.3, 130.5, 127.5, 127.4, 125.9, 125.2, 125.2, 125.2 125.1, 125.1, 125.1, 122.4, 115.0.
Following the general procedure G, the product was obtained 5d as white solid (yield = 60%) upon purification by column chromatography ($R_f = 0.55$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, DMSO-d$_6$) $\delta$ 8.47 (1H, d, $J = 9$ Hz), 8.28 (1H, d, $J = 9$ Hz), 8.13 (2H, d, $J = 8.4$ Hz), 7.91 (1H, dd, $J = 7.8$ and 1.2 Hz), 7.88 (2H, dd, $J = 8.4$ and 1.8 Hz), 7.64 (2H, dd, $J = 7.2$ and 2.4 Hz), 7.61 (2H, dd, $J = 7.2$ and 1.2 Hz), 7.56 (1H, t, $J = 7.8$ Hz), 7.48 (2H, dd, $J = 6.6$ and 1.8 Hz); $^{13}$C NMR (150 MHz, DMSO-d$_6$) $\delta$ 130.4, 128.6, 126.2, 125.5, 125.3, 35.4, 35.1, 31.3, 31.3.

2-(3-methoxybenzamido)quinolin-8-yl 3-methoxybenzoate (5e)

Following the general procedure G, the product was obtained 5e as white solid (yield = 59%) upon purification by column chromatography ($R_f = 0.3$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 9.11 (1H, s), 8.55 (1H, d, $J = 9$ Hz), 8.25 (1H, d, $J = 9$ Hz), 7.90 (1H, dt, $J = 7.8$ and 1.2 Hz), 7.75 (2H, dd, $J = 6.6$ and 3.0 Hz), 7.52 – 7.45 (2H, m), 7.41 – 7.40 (1H, m), 7.38 (2H, d, $J = 9.0$ Hz), 7.31 – 7.25 (1H, m), 7.15 (1H, dd, $J = 8.4$ and 3 Hz); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 166.2, 165.2, 159.8, 159.6, 151.4, 146.1, 139.7, 138.7, 135.6, 130.8, 129.6, 129.5, 127.7, 125.7, 124.8, 122.8, 122.3, 120.2, 119.2, 118.5, 115.3, 114.5, 112.5, 55.4.

2-(3,4,5-tris(benzyloxy)benzamido)quinolin-8-yl 3,4,5-tris(benzyloxy)benzoate (5f)

Following the general procedure G, the product was obtained 5f as white solid (yield = 50%) upon purification by column chromatography ($R_f = 0.4$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 8.34 (1H, d, $J = 9.0$ Hz), 7.97 (1H, d, $J = 8.4$ Hz), 7.53 (1H, d, $J = 7.8$ Hz), 7.44 – 7.34 (14H, m), 7.32 – 7.29 (22H, m), 7.12 (2H, s), 5.13 (2H, s), 4.95 (2H, s), 4.87 (4H, s), 4.74 (4H, s); $^{13}$C NMR (150 MHz, CDCl$_3$) $\delta$ 166.2, 164.9, 152.6, 152.4, 152.0, 146.1, 142.5, 141.7, 139.7, 138.6, 137.6, 137.3, 136.6, 136.4, 129.4, 128.4, 128.4, 128.4, 128.4, 128.4, 128.4, 128.4, 128.4, 127.9, 127.9, 127.9, 127.6, 127.5, 125.9, 124.7, 124.2, 122.4, 115.6, 109.0, 107.1, 75.1, 75.0, 71.0, 70.7.

2-(furan-2-carboxamido)quinolin-8-yl furan-2-carboxylate (5g)

Following the general procedure G, the product was obtained 5g as white solid (yield = 65%) upon purification by column chromatography ($R_f = 0.2$, ethyl acetate / n-hexane = 1 : 3). $^1$H-NMR (600 MHz, CDCl$_3$) $\delta$ 9.09 (1H, bs), 8.56 (1H, d, $J = 9$ Hz), 8.22 (1H, d, $J = 9$ Hz), 7.73 (1H, d, $J = 7.8$ Hz), 7.35 (1H, dd, 7.68 Hz), 7.37 (1H, dd, 7.68 Hz), 7.38 (1H, d, $J = 7.8$ Hz), 6.97 (1H, d, $J = 7.8$ Hz), 4.95 (2H, s), 4.87 (4H, s), 4.74 (4H, s).
7.66 (1H, s), 7.51 (1H, dd, \( J = 7.8 \) and 1.2 Hz), 7.47 (1H, d, \( J = 3.6 \) Hz), 7.45 (1H, d, \( J = 7.8 \) Hz), 7.33 (1H, s), 7.24 (1H, d, \( J = 3.6 \) Hz), 6.56 (1H, dd, \( J = 3.6 \) and 1.8 Hz), 6.49 (1H, dd, \( J = 3.6 \) and 1.8 Hz); \(^{13}\)C NMR (150 MHz, CDCl\(_3\)) \( \delta \) 156.9, 156.4, 150.8, 147.1, 147.0, 145.3, 144.8, 144.0, 139.8, 138.6, 127.6, 125.9, 124.7, 122.3, 119.7, 116.3, 115.1, 112.6, 112.2.
4. $^1$H and $^{13}$C NMR Spectra

There was an amine peak at about 6.5 ppm in the NMR analysis. SG-HQ1 was also confirmed to be an ester in X-ray crystallography (vide infra). Consequently, SG-HQ1 was also confirmed to be an ester.

Figure S1. The $^1$H-NMR of SG-HQ1 dissolved in DMSO-d$_6$. 

Two protons of NH$_2$ at C2
Figure S2. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 3a.

Figure S3. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 3a.
Figure S4. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 3b.

Figure S5. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 3b.
Figure S6. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 3c.

Figure S7. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 3c.
Figure S8. $^1$H-NMR ($\text{CDCl}_3$, 600 MHz) of compound 3d.

Figure S9. $^{13}$C-NMR (150 MHz, $\text{CDCl}_3$) of compound 3d.
Figure S10. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 3e.

Figure S11. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 3e.
Figure S12. $^1$H-NMR (DMSO-d$_6$, 600 MHz) of compound 3f.

Figure S13. $^{13}$C-NMR (150 MHz, DMSO-d$_6$) of compound 3f.
Figure S14. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 3g.

Figure S15. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 3g.
Figure S16. $^1$H-NMR (DMSO-d$_6$, 600 MHz) of compound 3j.

Figure S17. $^{13}$C-NMR (150 MHz, DMSO-d$_6$) of compound 3j.
Figure S18. $^1$H-NMR (DMSO-d$_6$, 600 MHz) of compound 3k.

Figure S19. $^{13}$C-NMR (150 MHz, DMSO-d$_6$) of compound 3k.
Figure S20. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 3o.

Figure S21. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 3o.
Figure S22. $^1$H-NMR (DMSO-d$_6$, 600 MHz) of compound 3p.

Figure S23. $^{13}$C-NMR (150 MHz, DMSO-d$_6$) of compound 3p.
Figure S24. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 3q.

Figure S25. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 3q.
Figure S26. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 3r.

Figure S27. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 3r.
Figure S28. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 3s.

Figure S29. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 3s.
Figure S30. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 3t.

Figure S31. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 3t.
Figure S32. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 3u.

Figure S33. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 3u.
Figure S34. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 3v.

Figure S35. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 3v.
Figure S36. $^1$H-NMR (DMSO-d$_6$, 600 MHz) of compound 4a.

Figure S37. $^{13}$C-NMR (150 MHz, DMSO-d$_6$) of compound 4a.
Figure S38. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 4b.

Figure S39. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 4b.
Figure S40. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 4c.

Figure S41. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 4c.
Figure S42. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 4d.

Figure S43. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 4d.
Figure S44. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 4e.

Figure S45. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 4e.
Figure S46. $^1$H-NMR (DMSO-d$_6$, 600 MHz) of compound 4f.

Figure S47. $^{13}$C-NMR (150 MHz, DMSO-d$_6$) of compound 4f.
Figure S48. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 4g.

Figure S49. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 4g.
Figure S50. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 4h.

Figure S51. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 4h.
Figure S52. $^1$H-NMR (DMSO-d$_6$, 600 MHz) of compound 4i.

Figure S53. $^{13}$C-NMR (150 MHz, DMSO-d$_6$) of compound 4i.
Figure S54. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 4j.

Figure S55. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 4j.
Figure S56. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 4k.

Figure S57. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 4k.
Figure S58. ¹H-NMR (DMSO-d₆, 600 MHz) of compound 4l.

Figure S59. ¹³C-NMR (150 MHz, DMSO-d₆) of compound 4l.
Figure S60. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 4m.

Figure S61. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 4m.
Figure S62. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 4n.

Figure S63. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 4n.
Figure S64. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 4o.

Figure S65. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 4o.
Figure S66. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 4p.

Figure S67. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 4p.
Figure S68. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 4q.

Figure S69. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 4q.
Figure S70. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 4r.

Figure S71. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 4r.
Figure S72. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 4s.

Figure S73. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 4s.
Figure S74. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 4u.

Figure S75. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 4u.
Figure S76. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 4v.

Figure S77. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 4v.
Figure S78. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 5a.

Figure S79. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 5a.
Figure S80. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 5b.

Figure S81. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 5b.
Figure S82. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 5c.

Figure S83. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 5c.
Figure S84. $^1$H-NMR (DMSO-$d_6$, 600 MHz) of compound 5d.

Figure S85. $^{13}$C-NMR (150 MHz, DMSO-$d_6$) of compound 5d.
Figure S86. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 5e.

Figure S87. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 5e.
Figure S88. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 5f.

Figure S89. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 5f.
Figure S90. $^1$H-NMR (CDCl$_3$, 600 MHz) of compound 5g.

Figure S91. $^{13}$C-NMR (150 MHz, CDCl$_3$) of compound 5g.
5. Preparation of single crystal for X-ray analysis

3,4,5-tris(benzyloxy)-N-(8-hydroxyquinolin-2-yl)benzamide (4h)

Single crystal of the 4h was grown by layering in NMR tube in CDCl$_3$ solution, hexane was used as an antisolvent and a drop of benzene was added. The single crystal was obtained after keeping at 4 °C for 1 week.

2-aminoquinolin-8-yl 4-chlorobenzoate (3b)

Single crystal of 3b was made by vapor diffusion in a diffusion chamber with 1 mL THF and 2 mL cyclohexane as an antisolvent. The single crystal was obtained after keeping at 4 °C for 4 days.

4-chloro-N-(8-hydroxyquinolin-2-yl)benzamide (4c)

Single crystal of the 4c ester was made by vapor diffusion in a diffusion chamber with 1 mL THF solution and 2 mL cyclohexane as an antisolvent. The single crystal was obtained after keeping at 4 °C for 4 days.

Analysis of single crystal X-ray diffraction

A suitable crystal (approximate dimensions 0.3 x 0.2 x 0.1 mm$^3$) was selected and placed onto a nylon loop with Paratone-N oil and mounted on a SuperNova, Dual, Cu at zero, AtlasS2 diffractometer. The crystal was kept at room temperature during data collection. The structure was solved with the ShelXL structure solution program using direct methods and refined with the ShelXL refinement package of OLEX2.
Table S1 Crystal data and structure refinement for SG-HQ2 (4h), 3b, 4b

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The X-ray crystal structures of 4h, 3c and 4c

![Figure S92. ORTEP diagrams of 4h with thermal ellipsoids at 30% probability.](image)
**Figure S93.** ORTEP diagrams of 3b with thermal ellipsoids at 50% probability.

**Figure S94.** ORTEP diagrams of 4b with thermal ellipsoids at 50% probability.
6. HPLC analysis in Table 1

**Figure S95** HPLC analysis of authentic mixture of \( p \)-methoxybenzoyl ester (3a) and amide (4a)

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**Figure S96** HPLC analysis of authentic \( p \)-methoxybenzoyl C8-ester (3a)

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Figure S97 HPLC analysis of p-methoxybenzoyl C2-amide (4a)

Figure S98. HPLC analysis of Table 1, entry 1, DCC (1.3 equiv), DMAP (0.5 equiv), rt, 24 h
Figure S99. HPLC analysis of Table 1, entry 2, EDCI (1.3 equiv), iPr$_2$NEt, rt, 24 h

Figure S100. HPLC analysis of Table 1, entry 3, EDCI (1.3 equiv), DMAP (0.5 equiv), iPr$_2$NEt, rt, 24 h
Figure S101 HPLC analysis of Table 1, entry 4, EDCI (1.3 equiv), DMAP (0.5 equiv), iPr$_2$NEt, reflux, 24 h

Figure S102 HPLC analysis of Table 1, entry 5, EDCI (1.3 equiv), HOBr (0.5 equiv), Et$_3$N, rt, 24 h
**Figure S103** HPLC analysis of Table 1, entry 6, EDCI (1.3 equiv), HOAt (0.5 equiv), iPr$_2$NEt, rt, 24 h

**Figure S104** HPLC analysis of Table 1, entry 7, EDCI (1.3 equiv), DMAP (0.5 equiv), iPr$_2$NEt, rt, 3 h
Figure S105 HPLC analysis of Table 1, entry 8, HATU (1.3 equiv), iPr2NEt, rt, 24 h

Figure S106 HPLC analysis of Table 1, entry 9, PyBop (1.3 equiv), iPr2NEt, rt, 4 h
**Figure S107** HPLC analysis of Table 1, entry 10, 4-methoxybenzoyl chloride (1.2 equiv), Et$_3$N, rt, 4 h

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**Figure S108** HPLC analysis of Table 1, entry 11, 4-methoxybenzoyl chloride (1.2 equiv), pyridine, rt, 24h

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Figure S109 HPLC analysis of Table 1, entry 12, CDI (1.3 equiv), rt, 24 h

Figure S110 HPLC analysis of Table 1, entry 13, CDI (1.3 equiv), reflux, 24 h
Figure S112 HPLC analysis of Table 1, entry 14, CDI (1.0 equiv), reflux, 24 h

Figure S112 HPLC analysis of Table 1, entry 15, CDI (1.3 equiv), NaH (2 equiv), rt, 3 h
7. HPLC analysis in Table 2

Figure S13 HPLC analysis of Table 2, entry 2, NaH (2.0 equiv), 24 h

Figure S14 HPLC analysis of Table 2, entry 3, n-BuLi (2.0 equiv), 4 h
Figure S115 HPLC analysis of Table 2, entry 4, iPrMgCl (2.0 equiv), 24 h

Figure S116 HPLC analysis of Table 2, entry 5, r-BuOK (1.0 equiv), 24 h
Figure S117 HPLC analysis of Table 2, entry 6, t-BuOK (2.0 equiv), 2 h

Figure S118 HPLC analysis of Table 2, entry 7, t-BuOK (2.5 equiv), 1 h
Figure S119 HPLC analysis of Table 2, entry 8, t-BuOK (3.0 equiv), 0.5 h
8. HPLC analysis in Table 3

Figure S120. HPLC analysis of Table 3, entry 1

Figure S121. HPLC analysis of Table 3, entry 2
Figure S122. HPLC analysis of Table 3, entry 3

Figure S123. HPLC analysis of Table 3, entry 4
**Figure S124.** HPLC analysis of Table 3, entry 5

**Figure S125.** HPLC analysis of Table 3, entry 6
9. $pK_a$ Value determination of 2-amino-8-quinolinol

(1) ACD/LABS calculation

Strongest $pK_a$/Acid: 6.7 ± 0.5
Strongest $pK_a$/Base: 10.5 ± 0.5

6.7 ± 0.5 (Atom number: 11), 56% MS1, 44% MS2
10.5 ± 0.5 (Atom number: 8), 56% MS3, 44% MS4

Net Charge vs pH

MS1

MS2

MS3

$PS_1 + H^+ \rightarrow PK_1$ (microconstant) = 7.0
$PS_1 + H^+ \rightarrow PK_1$ (microconstant) = 7.1

$PS_2 + H^+ \rightarrow PK_1$ (microconstant) = 10.2
(2) An experimental curve for NMR chemical shift perturbation depending on pHs