Supporting information

Isocyanide Addition to Pyridinium Salts.

Efficient Entry into Substituted Nicotinonitrile Derivatives

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Isocyanide addition to *N*-alkylpyridinium salts. General Procedure

To a solution of the *N*-alkylpyridinium salt (1 mmol) in MeOH (5 mL), CH₃COONa (2 mmol) and the isocyanide (1 mmol) were added. The reaction mixture stirred at reflux temperature and monitored by TLC. On consumption of the starting pyridinium salt, a mixture of H₂O (4 mL) and CH₂Cl₂ (4 mL) was added and the phases were separated. The aqueous phase was extracted twice with CH₂Cl₂ (10 mL). The organic phases were combined, dried over Na₂SO₄ and concentrated under reduced pressure. The resulting crude mixture was purified by column chromatography (mixtures of hexane and EtOAc) to afford the desired product.

N4-cyclohexyl-1-benzyl-3-cyano-1,4-dihydro-4-pyridinecarboxamide (2a): 71%, obtained as a foam. IR (NaCl, cm⁻¹): 3302, 2930, 2853, 2195, 1676, 1649, 1592; ¹H-NMR (400 MHz, CDCl₃): δ 7.41-7.34 (m, 3H), 7.19 (d, 2H, *J*=6.8 Hz), 6.77 (d, 1H, *J*=1.2 Hz), 5.97 (d, 1H, *J*=7.6 Hz), 5.65 (bd, 1H, *J*=6.8 Hz), 4.88 (dd, 1H, *J*=4.8, 8 Hz), 4.37 (s, 2H), 3.85 (d, 1H, *J*=4.4 Hz), 3.82-3.74 (m, 1H), 1.94-1.13 (m, 10H); ¹³C-NMR (100 MHz, CDCl₃): δ 170.5, 143.7, 136.0, 129.4, 129.3, 128.6, 127.3, 120.4, 102.7, 78.7, 57.9, 48.9, 41.9, 33.1, 25.7, 24.9; UV [$\lambda_{\max}$ nm (log ϵ), MeOH]: 335 (3.72); MS (EI) *m/z* (%): 322 (M⁺+H, 10), 321 (5), 230 (14), 195 (53); HRMS: calcd for C₂₀H₂₃N₃O 321.1841, found 321.1854.

N4-(2,6-dimethylphenyl)-1-benzyl-3-cyano-1,4-dihydro-4-pyridinecarboxamide (2b): 67%, obtained as a yellow foam. IR (NaCl, cm⁻¹): 3231, 2193, 1668, 1642; ¹H-NMR (400 MHz, CDCl₃): δ 7.41-7.33 (m, 3H), 7.23-7.06 (m, 5H), 6.87 (d, 1H, *J*=6.4 Hz), 6.04 (d, 1H, *J*=8 Hz), 5.05 (dd, 1H, *J*=4.4, 8 Hz), 4.41 (s, 2H), 4.12 (d, 1H, *J*=4.8 Hz), 2.22 (s, 6H); ¹³C-NMR (100 MHz, CDCl₃): δ 169.8, 143.9, 135.8, 133.5, 129.5, 129.4, 128.8, 128.5,

127.8, 127.4, 120.3, 103.2, 78.6, 58.1, 42.5, 29.9, 18.5; UV [λ_{max} nm (log ϵ), MeOH]: 337 (3.52); MS (EI) m/z (%): 343 (M^+ , 6), 195 (29), 91 (100); HRMS: calcd for $C_{22}H_{21}N_3O$ 343.1685, found 343.1681.

N4-(*tert*-butyl)-1-benzyl-3-cyano-1,4-dihydro-4-pyridinecarboxamide (2c): 63%, obtained as a brown foam. IR (NaCl, cm^{-1}): 3320, 2968, 2930, 2196, 1674, 1591; ^1H -NMR (400 MHz, CDCl_3): δ 7.39-7.19 (m, 5H), 6.76 (d, 1H, $J=1.6$ Hz), 5.98 (d, 1H, 8 Hz), 5.65 (bs, 1H), 4.84 (dd, 1H, $J=4.4$, 8 Hz), 4.37 (s, 2H), 3.77 (d, 1H, $J=4.4$ Hz), 1.34 (s, 9H); ^{13}C -NMR (100 MHz, CDCl_3): δ 171.1, 142.7, 136.0, 129.8, 129.0, 127.8, 120.5, 102.3, 78.9, 58.9, 42.1, 30.8, 28.2; UV [λ_{max} nm (log ϵ), MeOH]: 275 (4.14); MS (EI) m/z (%): 295 (M^+ , 3), 294 (10), 91 (100); HRMS: calcd for $C_{18}H_{21}N_3O$ 295.1685, found 295.1697.

N4-cyclohexyl-3-cyano-1-[2-(1*H*-3-indolyl)ethyl]-1,4-dihydro-4-pyridinecarboxamide (2d): 66%, obtained as a pale yellow foam. IR (NaCl, cm^{-1}): 3319, 2194, 1650; ^1H -NMR (400 MHz, CDCl_3): δ 8.74 (bs, 1H), 7.48 (d, 1H, $J=8$ Hz), 7.36 (d, 1H, $J=8$ Hz), 7.17 (t, 1H, $J=7.2$ Hz), 7.10 (d, 1H, $J=7.2$ Hz), 7.01, (s, 1H), 6.40 (s, 1H), 5.84 (d, 1H, $J=8$ Hz), 5.80 (d, 1H, $J=8$ Hz), 4.74 (dd, 1H, $J=8$, 4.4 Hz), 3.81 (d, 1H, $J=4.4$ Hz), 3.79-3.70 (m, 1H), 3.38 (t, 2H, $J=6.4$ Hz), 2.92 (t, 2H, $J=6.4$ Hz), 1.91-1.12 (m, 10H); ^{13}C -NMR (100 MHz, CDCl_3): δ 171.1, 143.9, 133.6, 129.2, 126.9, 123.5, 122.3, 120.9, 119.7, 118.3, 111.9, 110.8, 101.9, 66.1, 54.9, 48.9, 41.8, 33.1, 26.2, 25.7, 25.0; UV [λ_{max} nm (log ϵ), MeOH]: 268 (4.32); MS (EI) m/z (%): 374 (M^+ , 6), 248 (53), 144 (100); HRMS: calcd for $C_{23}H_{26}N_4O$ 374.2107, found 374.2121.

Isocyanide addition to *N*-acylpyridinium salts. General Procedure.

To a suspension of pyridine (quino- or isoquinoline)- β -carboxamide (1 mmol) in anhydrous CH_2Cl_2 (10 mL) the acylating agent (2 mmol) and the isocyanide (1 mmol) were added. The mixture was stirred at room temperature until consumption of the amide starting material. H_2O (5 mL) was added and the phases separated. The aqueous phase was extracted twice with CH_2Cl_2 (10 mL) and the organic phases were combined, dried over Na_2SO_4 and concentrated under reduced pressure to yield a residue which was purified by column chromatography (mixtures of hexane and EtOAc) to afford the desired product.

Methyl 3-cyano-4-cyclohexylcarbamoyl-1,4-dihydro-1-pyridinecarboxylate (2e):

66%, obtained as a yellowish foam. IR (NaCl, cm^{-1}): 3281, 2217, 1744, 1649; ^1H -NMR (400 MHz, CDCl_3): δ 7.64 (bs, 1H), 6.92 (bs, 1H), 5.67 (bs, 1H), 5.11 (bs, 1H), 3.90 (s, 3H), 3.81 (bs, 2H), 2.17-0.86 (m, 10H); ^{13}C -NMR (100 MHz, CDCl_3): δ 168.3, 136.7, 123.2, 118.0, 105.7, 89.0, 54.9, 49.2, 42.4, 33.1, 25.6, 24.9; UV [λ_{max} nm (log ϵ), MeOH]: 233 (4.21), 294 (3.75); MS (EI) m/z (%): 289 (M^+ , 1), 163 (100), 119 (51); HRMS: calcd for $\text{C}_{15}\text{H}_{19}\text{N}_3\text{O}_3$ 289.1426, found 289.1418.

9H-9-fluorenylmethyl 3-cyano-4-cyclohexylcarbamoyl-1,4-dihydro-1-pyridinecarboxylate (2f):

62%, obtained as a brown foam. IR (NaCl, cm^{-1}): 3218, 3039, 2923, 2846, 2206, 1668; ^1H -NMR (400 MHz, CDCl_3): δ 7.79 (d, $J=7.6$ Hz, 2H), 7.52 (d, $J=7.6$ Hz, 2H), 7.44 (t, $J=7.2$ Hz, 2H), 7.35 (t, $J=7.2$ Hz, 2H), 7.25 (s, 1H), 6.80 (bs, 1H), 5.61 (d, $J=7.2$ Hz, 1H), 5.10 (dd, $J=4.0, 8.4$ Hz, 1H), 4.63 (d, $J=6.0$ Hz, 2H), 4.29 (t, $J=6.0$ Hz, 1H), 3.78-3.80 (m, 2H), 2.01-1.19 (m, 10H); ^{13}C -NMR (100 MHz, CDCl_3): δ 168.2, 143.0, 141.6, 128.4, 127.6, 124.9, 120.5, 117.9, 105.9, 69.9, 49.2, 46.9, 42.5, 33.1, 25.6, 24.9; UV [λ_{max} nm (log ϵ), MeOH]: 265 (4.34), 290 (3.95), 300 (4.02); MS (EI) m/z (%): 454 ($\text{M}^+ + \text{H}$, 1), 371 (3), 178 (91), 105 (100).

Allyl 3-cyano-4-cyclohexylcarbamoyl-1,4-dihydro-1-pyridinecarboxylate (2g):

60%, obtained as a pale foam. IR (NaCl, cm^{-1}): 3293, 2932, 2854, 2200, 1741, 1687; ^1H -NMR (400 MHz, CDCl_3): δ 7.65 (bs, 1H), 6.94 (bs, 1H), 5.98-5.91 (m, 1H), 5.65 (d, 1H, $J=7.2$ Hz); 5.41-5.33 (m, 2H), 5.12 (d, 1H, $J=4.0$ Hz), 4.75 (d, 2H, $J=6.0$ Hz), 3.81-3.77 (m, 2H), 1.94-1.15 (m, 10H); ^{13}C -NMR (100 MHz, CDCl_3): δ 168.3, 136.7, 130.9, 123.2, 120.4, 117.9, 105.7, 68.8, 49.21, 42.4, 33.1, 25.6, 24.9; UV [λ_{max} nm (log ϵ), MeOH]: 233 (3.82), 294 (3.75); MS (EI) m/z (%): 316 ($\text{M}^+ + \text{H}$, 10), 315 (M^+ , 5), 189 (66), 145 (100), 105 (80); HRMS: calcd for $\text{C}_{17}\text{H}_{21}\text{N}_3\text{O}_3$ 315.1583, found 315.1598.

Methyl 3-cyano-2-cyclohexylcarbamoyl-1,2-dihydro-1-quinolinecarboxylate (3):

61%, obtained as a pale foam. IR (NaCl, cm^{-1}): 3423, 2932, 2854, 2216, 1716, 1657; ^1H -NMR (400 MHz, CDCl_3): δ 7.59 (d, 1H, $J=8.0$ Hz), 7.41-7.37 (m, 1H), 7.28 (s, 1H), 7.23-7.13 (m, 2H), 5.79 (bd, 1H, $J=7.6$ Hz), 5.69 (s, 1H), 3.89 (s, 3H), 3.73-3.61 (m, 1H), 1.88-1.00 (m, 10H); ^{13}C -NMR (100 MHz, CDCl_3): δ 165.9, 155.0, 139.6, 135.2, 131.5, 128.8, 125.7, 124.4, 124.3, 117.3, 107.8, 56.1, 54.4, 48.8, 32.8, 25.5, 24.7; UV [λ_{max} nm (log

ϵ), MeOH]: 244 (4.4), 294 (3.99), 331 (3.45); MS (EI) m/z (%): 339 (M^+ , 5), 214 (100), 213 (100), 169 (88); HRMS: calcd for $C_{19}H_{21}N_3O_3$ 339.1583, found 315.1571.

Following the general procedure, when isoquinoline-4-carboxamide was treated with methyl chloroformate and cyclohexylisocyanide, (reaction temperature between 0-21°C) afforded a mixture of dihydroderivatives **4** and **5** described below which were separated by column chromatography:

Methyl 4-carbamoyl-1-cyclohexylcarbamoyl-1,2-dihydro-2-isoquinolinecarboxylate (4): 61%, obtained as a white foam. IR (NaCl, cm^{-1}): 3302, 3459, 1720, 1679, 1652, 1632; 1H -NMR (400 MHz, DMSO- d_6): δ 7.96 (bs, 1H), 7.71 (d, 1H, $J=7.2$ Hz), 7.53 (bs, 2H), 7.22-7.15 (m, 4H), 5.63 (bs, 1H), 3.78 (m, 1H), 3.31 (bs, 3H), 1.82-0.91 (m, 10H); ^{13}C -NMR (100 MHz, $CDCl_3$): δ 168.6, 154.1, 153.5, 130.1, 130.4, 129.1, 128.9, 128.6, 127.5, 125.2, 113.1, 59.8, 54.5, 48.3, 32.9, 25.8, 24.9; UV [λ_{max} nm (log ϵ), MeOH]: 308 (3.82), 243 (4.19) MS (EI) m/z (%): 357 (M^+ , 1), 231 (100), 187 (14).

Methyl 4-cyano-1-cyclohexylcarbamoyl-1,2-dihydro-2-isoquinolinecarboxylate (5): 27%, obtained as a pale foam. IR (NaCl, cm^{-1}): 3419, 2217, 1719, 1653; 1H -NMR (400 MHz, DMSO- d_6): δ 8.11 (d, 1H, $J=8$ Hz), 7.93 (s, 1H), 7.57 (d, 1H, $J=7.6$ Hz), 7.37-7.27 (m, 2H), 7.16 (d, 1H, $J=7.6$, 1.6 Hz), 5.73 (s, 1H), 3.79 (s, 3H), 3.38 (m, 1H), 1.8-1.0 (m, 10H); ^{13}C -NMR (100 MHz, DMSO- d_6): δ 168.1, 152.7, 139.4, 129.7, 129.1, 127.9, 127.6, 125.5, 122.9, 117.3, 90.0, 59.2, 55.1, 48.4, 32.8, 25.7, 24.8; UV [λ_{max} nm (log ϵ), MeOH]: 324 (0.265), 245 (0.655); MS (EI) m/z (%): 339 (M^+ , 3), 213 (100), 169 (37); HRMS: calcd for $C_{19}H_{21}N_3O_3$ 339.1583, found 339.1592. This compound was also obtained (63%) from the interaction of 4-cyanoisoquinoline, methyl chloroformate and cyclohexylisocyanide, following the general procedure.

N4-cyclohexyl-1-benzyl-5-cyano-1,2,3,4-tetrahydro-4-pyridinecarboxamide (6): A solution of N4-cyclohexyl-1-benzyl-3-cyano-1,4-dihydro-4-pyridinecarboxamide (**2a**) (75 mg, 0.23 mmol) in EtOAc (6 mL) was hydrogenated over activated palladium hydroxide (29 mg) at atmospheric pressure. On disappearance of the starting material (8h, TLC control) the reaction was stopped and the catalyst filtered off. The filtrate was evaporated to give a foam which was purified by column chromatography (100% EtOAc) to afford the desired product **6** as a white foam (60 mg, 80%). IR (NaCl, cm^{-1}): 3304, 2931, 2854, 2185, 1652, 1622; 1H -NMR (400 MHz, $CDCl_3$): δ 7.39-7.16 (m, 5H), 7.10 (s, 1H), 5.89 (bd, 1H, $J=7.6$ Hz), 4.31 (dd, 2H,

$J=7.6, 15.2$ Hz), 3.76-3.70 (m, 1H), 3.08-3.01 (m, 3H), 2.28 (dd, 2H, $J=2.8, 13.6$ Hz), 1.94-1.08 (m, 10H); $^{13}\text{C-NMR}$ (100 MHz, CDCl_3): δ 171.3, 148.6, 135.9, 129.2, 128.5, 127.6, 122.8, 70.7, 60.1, 48.7, 42.8, 38.9, 33.0, 25.7, 24.9, 23.5; UV [λ_{max} nm (log ϵ), MeOH]: 276 (4.26); MS (EI) m/z (%): 323 (M^+ , 7), 197 (50), 91 (100); HRMS: calcd for $\text{C}_{20}\text{H}_{25}\text{N}_3\text{O}$ 323.1998, found 323.2013.

N4-cyclohexyl-3-cyanoisonicotinamide (7): Methyl 3-cyano-4-cyclohexylcarbamoyl-1,4-dihydro-1-pyridinecarboxylate (**2e**, 100 mg, 0.34 mmol) and DDQ (117 mg, 0.52 mmol) were suspended in DCM and stirred at room temperature for 6h. The reaction mixture was washed with H_2O and brine and the phases separated. The aqueous phase was further extracted with CH_2Cl_2 and the combined organic phases were dried over Na_2SO_4 and concentrated under vacuum to afford a crude mixture which was purified by column chromatography to yield a pale foam (68 mg, 86%). IR (NaCl, cm^{-1}): 3300, 2170, 1650, 1619; $^1\text{H-NMR}$ (400 MHz, CDCl_3): δ 8.96 (s, 1H), 8.89 (d, 1H, $J=4.8$ Hz), 7.73 (d, 1H, $J=4.8$ Hz), 6.28 (bs, 1H), 4.07-3.97 (m, 1H), 2.09-1.22 (m, 10H); $^{13}\text{C-NMR}$ (100 MHz, CDCl_3): δ 162.2, 154.0, 153.9, 145.7, 122.5, 115.8, 106.9, 49.9, 32.9, 25.6, 24.9; UV [λ_{max} nm (log ϵ), MeOH]: 269 (3.60); MS (EI) m/z (%): 229 (M^+ , 6%), 186 (46), 148 (100), 131 (70); HRMS: calcd for $\text{C}_{13}\text{H}_{15}\text{N}_3\text{O}$ 229.1215, found 229.1228.

N4-cyclohexyl-3-cyano-1,4-dihydro-4-pyridinecarboxamide (8): (a) Via Fmoc deprotection: dihydropyridine **2f** (40 mg, 88.2 μmol) was treated with a solution of 20% piperidine in CH_2Cl_2 (2 mL) for 2h at room temperature. Hexane (4 mL) was added to the reaction mixture and a precipitate was formed which was further washed with EtOAc to afford the desired product as a pale foam (18 mg, 90%). (b) Via Alloc deprotection: **2g** (75 mg, 0.24 mmol) was dissolved in CH_2Cl_2 (5 mL) and treated with $\text{Pd}(\text{PPh}_3)_4$ (5.47 mg, 4.74 μmol) followed by PhSiH_3 (59 μL , 0.48 mmol). The reaction was stirred at room temperature for 2h. H_2O (10 mL) was added, the phases were separated and the aqueous layer extracted with CH_2Cl_2 . The combined organic layers were washed with brine, dried over Na_2SO_4 and concentrated to afford a residue which was purified by column chromatography (CH_2Cl_2) to afford the desired product as a foam (42 mg, 75%). IR (KBr, cm^{-1}): 3299, 2926, 2190, 1675, 1640, 1610; $^1\text{H-NMR}$ (400 MHz, $\text{DMSO}-d_6$): δ 8.34 (bs, 1H), 7.58 (bs, 1H), 6.96 (bs, 1H), 6.04 (bs, 1H), 4.49 (bs, 1H), 3.76 (bs, 1H), 3.48 (bs, 1H), 1.65-1.11 (m, 10H); $^{13}\text{C-NMR}$ (100 MHz, $\text{DMSO}-d_6$): δ 171.2, 141.4, 125.8, 121.9, 100.4, 77.1, 48.3, 41.3, 33.2, 25.9, 25.2; UV [λ_{max} nm (log ϵ), MeOH]: 326 (3.60); MS (EI) m/z (%): 231 (M^+ , 5), 186 (5), 148 (10), 105 (100).

N2-cyclohexyl-(2*S*,12*bR*)-3-cyano-1,2,6,7,12,12*b*-hexahydropyrido[2,1-*a*]β-carboline-2-carboxamide (9) and N2-cyclohexyl-(2*S*,12*bS*)-3-cyano-1,2,6,7,12,12*b*-hexahydropyrido[2,1-*a*]β-carboline-2-carboxamide (10): N4-cyclohexyl-3-cyano-1-[2-(1*H*-3-indolyl)ethyl]-1,4-dihydro-4-pyridinecarboxamide (**2d**) (60 mg, 0.16 mmol) was dissolved in CH₂Cl₂ (3 mL) and a couple of drops of TFA were added. The reaction was stirred at room temperature until the disappearance of the starting material (1 h). The reaction was quenched with an aqueous Na₂CO₃ saturated solution, the phases separated and the aqueous phase extracted with CH₂Cl₂. The combined organic phases were further washed with brine, dried over Na₂SO₄ and concentrated under reduced pressure to afford a residue (a mixture of the *trans* and *cis* isomers in a 3:1 ratio) which was further purified by chromatography.

Trans-isomer (9): 38 mg, 63%; IR (NaCl, cm⁻¹): 3298, 2186, 1652; ¹H-NMR (400 MHz, CDCl₃): δ 8.83 (s, 1H), 7.48 (d, 1H, *J*=7.6 Hz), 7.34 (d, 1H, *J*=8 Hz), 7.18 (m, 1H), 7.11 (m, 2H), 6.06 (d, 1H, *J*=8 Hz), 4.60 (d, 1H, *J*=11.6 Hz), 3.80 (m, 1H), 3.64-3.61 (m, 2H), 3.19 (dd, 1H, *J*=5.2, 1.2 Hz), 2.96-2.79 (m, 3H), 1.94-1.81 (m, 11H); ¹³C-NMR (100 MHz, CDCl₃): δ 172.3, 149.5, 136.9, 133.5, 127.0, 123.0, 121.7, 119.3, 118.3, 111.8, 107.3, 71.7, 50.5, 48.9, 38.0, 36.9, 33.2, 30.6, 25.9, 25.1, 22.2; UV [λ_{max} nm (log ϵ), MeOH]: 279 (4.19); MS (EI) *m/z* (%): 374 (25); 248 (100); HRMS: calcd for C₂₃H₂₆N₄O 374.2107, found 374.2119.

Cis-isomer (10): 13 mg, 21%; IR (NaCl, cm⁻¹): 3296, 2188, 1652; ¹H-NMR (400 MHz, CDCl₃): δ 8.42 (s, 1H), 7.41 (d, 1H, *J*=7.6 Hz), 7.34 (d, 1H, *J*=8.4 Hz), 7.16 (t, 1H, *J*=6.8 Hz), 7.08 (m, 2H), 5.56 (d, 1H, *J*=8.8 Hz), 4.70 (bs, 1H), 3.75 (m, 1H), 3.55 (m, 1H), 3.24-3.31 (m, 1H), 3.21 (t, 1H, *J*=6 Hz), 2.93-2.79 (m, 2H), 2.73-2.67 (m, 1H), 2.54-2.48 (m, 1H), 1.8-0.4 (m, 10H); UV [λ_{max} nm (log ϵ), MeOH]: 281 (4.09); MS (EI) *m/z* (%): 374 (37), 248 (100), 143 (21).

General procedure for DDQ oxidation

To a solution of **4** or **5** (0.29 mmol) in CH₂Cl₂ (5 mL) was added DDQ (0.44 mmol). and the resulting mixture was stirred for 12 h (some starting material was still present as evidenced by TLC control). H₂O (20 mL) was added and the phases separated. The aqueous phase was extracted twice with CH₂Cl₂. The organic phases were combined and further washed with NaOH solution (20%) then dried over Na₂SO₄ and concentrated under reduced pressure to afford a residue which was purified by column chromatography to afford the desired products **11** and **12** (unoptimized yields).

N1-cyclohexyl-1,4-isoquinolinedicarboxamide (11): 62%, obtained as a white foam.

IR (KBr, cm^{-1}): 3305, 2925, 2853, 1653; $^1\text{H-NMR}$ (400 MHz, $\text{DMSO-}d_6$): δ 8.68-8.63 (m, 2H), 8.59 (s, 1H), 8.34 (d, $J=8.4$ Hz, 1H), 8.20 (bs, 1H), 7.87-7.83 (m, 2H), 7.73 (m, 1H), 3.85 (m, 1H), 1.89-1.12 (m, 10H); $^{13}\text{C-NMR}$ (100 MHz, $\text{DMSO-}d_6$): δ 168.8, 165.7, 155.0, 140.1, 139.9, 131.9, 129.9, 128.9, 127.3, 125.6, 48.8, 32.9, 25.8, 25.4; UV [λ_{max} nm (log ϵ), MeOH]: 324 (3.61), 281 (3.56), 224 (4.45), 201 (4.32); MS (EI) m/z (%): 297 (61), 240 (70), 172 (56), 128 (100), 98 (89); HRMS: calcd for $\text{C}_{17}\text{H}_{19}\text{N}_3\text{O}_2$ 297.1477, found 297.1491.

N1-cyclohexyl-4-cyano-1-isoquinolinecarboxamide (12): 50%, obtained as a white foam. IR (NaCl, cm^{-1}): 3288, 2918, 2222, 1637; $^1\text{H-NMR}$ (400 MHz, CDCl_3): δ 9.72 (d, $J=8.8$ Hz, 1H), 8.81 (s, 1H), 8.23 (d, $J=4.4$ Hz, 1H), 7.99 (bd, $J=7.2$ Hz, 1H), 7.94 (m, 1H), 7.83 (m, 1H), 4.03 (m, 1H), 2.09-2.05 (m, 2H), 1.83-1.25 (m, 8H); $^{13}\text{C-NMR}$ (100 MHz, CDCl_3): δ 163.9, 152.2, 145.5, 136.5, 133.3, 130.4, 129.3, 126.2, 124.4, 115.9, 108.9, 48.8, 33.1, 25.8, 25.1; UV [λ_{max} nm (log ϵ), MeOH]: 228 (4.53), 204 (4.47); MS (EI) m/z (%): 279 (52), 222 (37); 181 (27), 153 (100); HRMS: calcd for $\text{C}_{17}\text{H}_{17}\text{N}_3\text{O}$ 279.1372, found 279.1378.