Supporting Information

for

Free-radical cyclization approach to polyheterocycles containing pyrrole and pyridine rings

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Experimental procedures, compound characterization data, X-ray diffraction experiment, and copies of NMR spectra of new compounds
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Experimental section

General Information and Methods.

$^1$H (400 or 500 MHz) and $^{13}$C (101 or 126 MHz) NMR spectra were recorded on the Bruker AVANCE 400 spectrometer, chemical shift values are reported in ppm on the $\delta$ scale relative to TMS ($\delta = 0.00$). $^1$H NMR spectra were calibrated according to the residual peak of DMSO-$d_6$ (2.50 ppm). For all new compounds $^{13}$C($^1$H) and $^{13}$C DEPT135 were recorded and calibrated according to the peak of DMSO-$d_6$ (39.52 ppm). Mass spectra were recorded on the mass spectrometer Bruker maXis HRMS-ESI-QTOF, electrospray ionization, positive mode. Single-crystal X-ray data were collected by means of the Rigaku Oxford Diffraction «XtaLAB Supernova» with HyPix 3000 type detector. Crystallographic data for the structures 3a (CCDC 1974298), 13 (CCDC 2049334), and 17a (CCDC 2049337) have been deposited with the Cambridge Crystallographic Data Centre. Melting points were determined on melting point apparatus Stuart® SMP30. Thin-layer chromatography (TLC) was conducted on aluminum sheets ALUGRAM SIL G/UV254 with 0.2 mm silica gel (fluorescent indicator). 3-(2-Iodophenyl)-2H-azirine [1], azirines 4a,c,d [1] and azirine 4b[2] were obtained according to the published procedures. Pyridinium salts 5k,l,n–w were obtained from the corresponding 2-bromoacetophenones and pyridines in acetone or diethyl ether, salt 5m was obtained from 2-acetylpyridine and I$_2$ in pyridine [3]. Salts 1a, N-Me-1a, 16a,d were obtained according to the reported procedure [4].

Synthesis of starting materials.

Synthesis of 3-(2-iodophenyl)-2H-azirine

(a) Potassium tert-butoxide (3.48 g, 32.0 mmol, 1.75 equiv) was added in one portion to a suspension of methyltriphenylphosphonium bromide (10.4 g, 29.0 mmol, 1.6 equiv) in THF (40 mL). The reaction mixture was stirred for 30 min, cooled to 0 °C, a solution of 2-iodobenzaldehyde (4.25 g, 18.0 mmol) in THF (10 mL) was added from a dropping funnel for 30 min and the reaction mixture was refluxed for 2 h. The completion of the reaction was monitored by TLC analysis. The reaction mixture was cooled, THF was partially evaporated,
dichloromethane was added and the organic layer was washed with saturated aq NH₄Cl and water. The solvents were evaporated and the residue was suspended in petroleum ether, filtrated, the solvent was evaporated and the residue was resolved in DCM (70 mL). The solution was cooled and a cold solution of bromine (3.02 g, 18.9 mmol, 1.05 equiv) in DCM (50 mL) was added dropwise. The reaction mixture was stirred for an additional 30 min at rt, washed with water, 5% aq Na₂S₂O₃ and brine. The organic fraction was dried over Na₂SO₄ and the solvent was removed. 1-(1,2-dibromoethyl)-2-iodobenzene was isolated by chromatography on silica gel (petroleum ether). Yield 3.34 g (50%).

White solid, mp 45 °C. ¹H NMR (400 MHz, CDCl₃): δ 7.87 (dd, J = 8.0, 1.1 Hz, 1H), 7.52 (dd, J = 7.9, 1.5 Hz, 1H), 7.48–7.36 (m, 1H), 7.03 (td, J = 7.7, 1.6 Hz, 1H), 5.55 (dd, J = 9.6, 6.5 Hz, 1H), 4.18–3.99 (m, 2H). ¹³C NMR (101 MHz, CDCl₃): δ 140.7 (C), 140.0 (CH), 130.6 (CH), 129.1 (CH), 127.7 (CH), 100.8 (C), 53.8 (CH), 34.0 (CH₂). HRMS (ESI) m/z: 388.8032 calcld for C₈H₈Br₂I⁺ [M + H]⁺, found 388.8036.

(b) To a solution of 1-(1,2-dibromoethyl)-2-iodobenzene (2.81 g, 7.21 mmol) in DMSO (200 mL) sodium azide (702 mg, 10.8 mmol) was added in several portions. The reaction mixture was stirred at rt for 24 h, then a solution of NaOH (290 mg, 7.21 mmol, 1 equiv) in water (10 mL) was added and stirring was continued for another 24 h. The reaction mixture was poured in 2% aq NaHCO₃, the water layer was extracted with DCM, the combined organic layers were washed with brine, dried over Na₂SO₄ and the product was purified by chromatography on Al₂O₃ (petroleum ether). The solvent was removed, the residue dissolved in toluene (60 mL) and the solution was refluxed for 3 h. After evaporation of toluene the product was used without further purification.

Yield 826 mg (47 %). Yellowish solid, mp 92–94 °C. ¹H NMR (400 MHz, CDCl₃): δ 8.03 (dd, J = 8.1, 1.2 Hz, 1H), 7.81 (dd, J = 7.7, 1.7 Hz, 1H), 7.54 (td, J = 7.6, 1.2 Hz, 1H), 7.27 (td, J = 7.7, 1.8 Hz, 1H), 1.95 (s, 2H). ¹³C NMR (101 MHz, CDCl₃): δ 168.6 (C), 140.6 (CH), 133.6 (CH), 132.8 (CH), 128.4 (CH), 128.2 (C), 98.2 (C), 22.3 (CH₂). HRMS (ESI) m/z: 243.9618 calcld for C₈H₇IN⁺ [M + H]⁺, found 243.9621.

1-(1-Benzyl-4-(2-bromophenyl)-2-phenyl-1H-pyrrl-3-yl)pyridin-1-ium bromide (N-Bn-1a). To a stirred suspension of 4-(2-bromophenyl)-2-phenyl-3-(pyridin-1-ium-1-yl)pyrrol-1-ide [4] (220 mg, 0.59 mmol) and K₂CO₃ (162 mg, 1.17 mmol, 2 equiv) in acetonitrile (10 mL) benzyl bromide (281 mg, 2.05 mmol, 3.5 equiv) was added in one portion, and the reaction mixture was vigorously stirred at rt for 12 h. After the reaction was completed acetonitrile was evaporated.
and the residue was suspended in diethyl ether. The precipitate was collected, washed with diethyl ether (3×10 mL) and water (3×5 mL) and dried. Yield 180 mg, 56%. Red solid, mp 193–194 °C (MeCN). 1H NMR (400 MHz, DMSO-d6): δ 8.86–8.81 (m, 2H), 8.62–8.54 (m, 1H), 8.04 (t, J = 7.1 Hz, 2H), 7.62 (d, J = 8.0 Hz, 1H), 7.53 (s, 1H), 7.47–7.24 (m, 13H), 7.09–7.02 (m, 2H), 5.28 (s, 2H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 146.74 (CH), 146.68 (CH), 137.1 (C), 132.8 (CH), 131.6 (CH), 130.3 (CH), 130.1 (CH), 129.5 (CH), 129.1 (CH), 128.9 (C), 128.6 (CH), 128.2 (CH), 128.1 (CH), 127.7 (CH), 126.9 (CH), 126.8 (C), 126.4 (C), 124.4 (C), 123.4 (C), 122.2 (CH), 117.7 (C), 50.8 (CH2). HRMS (ESI) m/z: 465.0961 calcd for C28H2279BrN2+ [M – Br]+, found 465.0971.

1-(1-Acetyl-4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium chloride (N-Ac-1a). To a stirred suspension of 4-(2-bromophenyl)-2-phenyl-3-(pyridin-1-ium-1-yl)pyrrol-1-ide [4] (115 mg, 0.307 mmol) and K2CO3 (127 mg, 0.920 mmol, 3 equiv) in dry DCM (6 mL) acetyl chloride (36 mg, 0.46 mmol, 1.5 equiv) was added in one portion, and the reaction mixture was vigorously stirred at rt for 10 min. Then reaction mixture was washed with brine (3×15 mL), dried under Na2SO4 and evaporated to dryness. Yield 130 mg, 94%. Yellow-orange solid, mp 285–286 °C (dec., DCM). 1H NMR (400 MHz, DMSO-d6): δ 8.86–8.73 (m, 2H), 8.60 (tt, J = 7.9, 1.4 Hz, 1H), 8.11–8.01 (m, 2H), 7.60 (d, J = 7.9 Hz, 1H), 7.48–7.35 (m, 8H), 7.28 (ddd, J = 8.0, 5.6, 3.6 Hz, 1H), 3.71 (s, 3H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 146.7 (CH), 146.6 (CH), 132.9 (CH), 131.6 (C), 130.3 (CH), 130.08 (CH), 130.07 (CH), 130.0 (CH), 129.3 (CH), 129.2 (CH), 128.7 (C), 128.2 (CH), 126.9 (C), 123.9 (C), 123.4 (C), 122.7 (CH), 117.2 (C), 35.2 (CH3). HRMS (ESI) m/z: 417.0597 calcd for C23H1879BrN2O+ [M – Cl]+, found 417.0602.

General procedure A for the synthesis of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromides 1, 7, 9, 12 and 16. To a suspension of 2H-azirine 4 (1.5 equiv) and pyridinium salt 5 (1 equiv) in DCM triethylamine (1.5 equiv) was added in one portion. The reaction mixture was stirred at room temperature for 24 h (progress was monitored by TLC). The precipitate was filtrated off, washed with small amount of cold DCM and dried. In the case of high solubility of a product in DCM it was isolated by column chromatography on silica gel (DCM/MeOH from 20:1 to 10:1).

General procedure B for the synthesis of bromides 1 and 16 with strong EWD substituent.

To a suspension of 2H-azirine (1.5 equiv) and pyridinium salt (1 equiv) in acetone fresh NiBr2·3H2O (0.2 equiv) was added in one portion. The reaction mixture was heated at 40 °C for
6 h (progress was monitored by TLC). The precipitate was filtrated off, washed with acetone and dried.

\textit{1-(4-(2-Bromophenyl)-2-(4-fluorophenyl)-1H-pyrrol-3-yl)pyridin-1-ium} bromide (\textit{1b}). Compound \textit{1b} (347 mg, 72\%) was obtained from \textit{1-(2-(4-fluorophenyl)-2-oxoethyl)pyridin-1-ium} bromide [5] (\textit{5b}) (291 mg, 0.98 mmol, 1 equiv), triethylamine (149 mg, 1.48 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (\textit{4a}) (289 mg, 1.48 mmol, 1.5 equiv) in DCM (4 mL) according to the general procedure A. Colorless solid, mp 340–341 °C (dec., DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 12.52 (s, 1H), 8.91 (d, $J = 5.9$ Hz, 2H), 8.73–8.67 (m, 1H), 8.18–8.13 (m, 2H), 7.59 (d, $J = 7.9$ Hz, 1H), 7.45–7.40 (m, 2H), 7.35–7.21 (m, 6H). $^{13}$C{\textit{1H}} NMR (101 MHz, DMSO-$d_6$): $\delta$ 161.8 (d, $J = 246.4$ Hz, C), 147.0 (CH), 147.0 (CH), 132.8 (d, $J = 34.2$ Hz, CH), 132.0 (C), 130.0 (CH), 129.3 (CH), 129.2 (CH), 128.6 (CH), 128.1 (CH), 125.5 (C), 124.9 (d, $J = 3.2$ Hz, C), 123.7 (C), 122.9 (C), 119.2 (C), 118.8 (CH), 116.3 (d, $J = 21.8$ Hz, CH). HRMS (ESI) m/z: 393.0397 calcd for C$_{21}$H$_{15}$BrFN$_2$ $^{[\text{M – Br}]}^+$, found 393.0387.

\textit{1-(4-(2-Bromophenyl)-2-(4-chlorophenyl)-1H-pyrrol-3-yl)pyridin-1-ium} bromide (\textit{1c}). Compound \textit{1c} (385 mg, 80\%) was obtained from \textit{1-(2-(4-chlorophenyl)-2-oxoethyl)pyridin-1-ium} bromide [6] (\textit{5c}) (307 mg, 0.98 mmol, 1 equiv), triethylamine (145 mg, 1.47 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (\textit{4a}) (289 mg, 1.47 mmol, 1.5 equiv) in DCM (4 mL) according to the general procedure A. Yellow solid, mp 330–332 °C (dec., DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 12.56 (s, 1H), 8.92 (d, $J = 5.5$ Hz, 2H), 8.70 (t, $J = 7.8$ Hz, 1H), 8.21–8.11 (m, 2H), 7.60 (d, $J = 7.9$ Hz, 1H), 7.52–7.38 (m, 4H), 7.35 (s, 1H), 7.32–7.21 (m, 3H). $^{13}$C{\textit{1H}} NMR (101 MHz, DMSO-$d_6$): $\delta$ 147.0 (CH), 147.0 (CH), 133.0 (CH), 132.6 (CH), 131.9 (C), 130.1 (CH), 129.3 (CH), 128.7 (CH), 128.6 (CH), 128.1 (CH), 127.2 (C), 125.1 (C), 123.7 (C), 123.2 (C), 119.4 (C), 119.3 (CH). HRMS (ESI) m/z: 409.0107 calcd for C$_{21}$H$_{15}$BrClN$_2$ $^{[\text{M – Br}]}^+$, found 409.0114.

\textit{1-(4-(2-Bromophenyl)-2-(4-bromophenyl)-1H-pyrrol-3-yl)pyridin-1-ium} bromide (\textit{1d}). Compound \textit{1d} (383 mg, 79\%) was obtained from \textit{1-(2-(4-bromophenyl)-2-oxoethyl)pyridin-1-ium} bromide [6] (\textit{5d}) (323 mg, 0.90 mmol, 1 equiv), triethylamine (137 mg, 1.36 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (\textit{4a}) (266 mg, 1.36 mmol, 1.5 equiv) in DCM (4 mL) according to the general procedure A. Slightly-yellow solid, mp 338–339 °C (dec., DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 12.57 (s, 1H), 8.91 (d, $J = 5.7$ Hz, 2H), 8.70 (t, $J = 7.8$ Hz, 1H), 8.16 (t, $J = 7.1$ Hz, 2H), 7.62–7.58 (m, 3H), 7.45–7.38 (m, 2H), 7.35 (s, 1H), 7.28 (ddd, $J = 8.8$, 5.9, 3.4 Hz, 1H), 7.17 (d, $J = 8.5$ Hz, 2H). $^{13}$C{\textit{1H}} NMR (101 MHz, DMSO-$d_6$): $\delta$ 147.0 (CH), 146.97 (CH), 133.0 (CH), 132.6 (CH), 132.2 (CH), 131.9 (C), 130.1 (CH), 128.8 (CH), 128.7
(CH), 128.1 (CH), 127.6 (C), 125.2 (C), 123.7 (C), 123.2 (C), 121.6 (C), 119.5 (C), 119.3 (CH).

HRMS (ESI) m/z: 454.9577 calcd for C$_{22}$H$_{18}$Br$_{1}$N$_{2}$O$^+$ [M – Br]$^+$, found 454.9591.

1-(4-(2-Bromophenyl)-2-(p-tolyl)-1H-pyrrol-3-yl)pyridin-1-i um bromide (1e). Compound 1e (381 mg, 76%) was obtained from 1-(2-oxo-2-(4-methylphenyl)ethyl)pyridin-1-ium bromide [6] (5e) (310 mg, 1.06 mmol, 1 equiv), triethylamine (160 mg, 1.59 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (311 mg, 1.59 mmol, 1 equiv) in DCM (4 mL) according to the general procedure A. Slightly-yellow solid, mp 330–331 °C (dec., DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 12.42 (s, 1H), 8.91 (d, $J = 5.5$ Hz, 2H), 8.69 (t, $J = 7.9$ Hz, 1H), 8.20–8.11 (m, 2H), 7.59 (d, $J = 7.8$ Hz, 1H), 7.45–7.39 (m, 2H), 7.30–7.24 (m, 2H), 7.20 (d, $J = 8.0$ Hz, 2H), 7.10 (d, $J = 8.2$ Hz, 2H), 2.30 (s, 3H). $^{13}$C{$^1$H} NMR (101 MHz, DMSO-$d_6$): $\delta$ 147.1 (C), 146.9 (CH), 137.9 (C), 133.0 (CH), 132.6 (CH), 132.1 (C), 130.0 (CH), 129.8 (CH), 128.6 (CH), 128.1 (CH), 126.7 (CH), 126.5 (C), 125.5 (C), 123.7 (C), 122.7 (C), 119.2 (C), 118.6 (CH), 20.7 (CH$_3$).

HRMS (ESI) m/z: 389.0648 calcd for C$_{22}$H$_{18}$Br$_{1}$N$_{2}$O$^+$ [M – Br]$^+$, found 389.0652.

1-(4-(2-Bromophenyl)-2-(4-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1f). Compound 1f (400 mg, 83%) was obtained from 1-(2-(4-methoxyphenyl)-2-oxoethyl)pyridin-1-ium bromide [6] (5f) (305 mg, 0.99 mmol, 1 equiv), triethylamine (151 mg, 1.50 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (292 mg, 1.49 mmol, 1.5 equiv) in DCM (4 mL) according to the general procedure A. Slightly-yellow solid, mp 294 °C (dec., DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 12.35 (s, 1H), 8.90 (d, $J = 5.8$ Hz, 2H), 8.69 (t, $J = 7.7$ Hz, 1H), 8.19–8.07 (m, 2H), 7.59 (d, $J = 7.8$ Hz, 1H), 7.46–7.37 (m, 2H), 7.31–7.25 (m, 2H), 7.16 (d, $J = 8.7$ Hz, 2H), 6.96 (d, $J = 8.8$ Hz, 2H), 3.76 (s, 3H). $^{13}$C{$^1$H} NMR (101 MHz, DMSO-$d_6$): $\delta$ 159.2 (C), 147.1 (CH), 146.8 (CH), 133.0 (CH), 132.6 (CH), 132.2 (C), 129.9 (CH), 128.5 (CH), 128.4 (CH), 128.1 (CH), 126.4 (C), 123.7 (C), 122.4 (C), 120.6 (C), 119.0 (C), 118.2 (CH), 114.7 (CH), 55.2 (CH$_3$). HRMS (ESI) m/z: 405.0597 calcd for C$_{22}$H$_{18}$Br$_{1}$N$_{2}$O$^+$ [M – Br]$^+$, found 405.0593.

1-(4-(2-Bromophenyl)-2-(2-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1g). Compound 1g (306 mg, 63%) was obtained from 1-(2-(2-methoxyphenyl)-2-oxoethyl)pyridin-1-ium bromide [6] (5g) (305 mg, 0.99 mmol, 1 equiv), triethylamine (151 mg, 1.45 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (292 mg, 1.49 mmol, 1.5 equiv) in DCM (4 mL) according to the general procedure A. Yellow solid, mp 264 °C (dec., DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 12.30 (br. s, 1H), 8.71 (d, $J = 5.7$ Hz, 2H), 8.63 (t, $J = 7.8$ Hz, 1H), 8.08 (t, $J = 7.0$ Hz, 2H), 7.60 (d, $J = 7.9$ Hz, 1H), 7.54 (d, $J = 7.4$ Hz, 1H), 7.51–7.37 (m, 3H), 7.35–7.24 (m, 2H), 7.15–7.09 (m, 1H), 6.96 (d, $J = 8.3$ Hz, 1H), 3.24 (s, 3H). $^{13}$C{$^1$H} NMR (101 MHz,
DMSO-$d_6$): $\delta$ 155.1 (C), 146.1 (CH), 146.0 (CH), 133.1 (CH), 132.7 (CH), 132.2 (C), 130.6 (CH), 130.5 (CH), 129.9 (CH), 128.2 (CH), 128.1 (CH), 124.0 (C), 123.6 (C), 123.5 (C), 121.1 (CH), 119.1 (CH), 118.2 (C), 116.8 (C), 111.4 (CH), 54.8 (CH$_3$). HRMS (ESI) m/z: 405.0597 calcld for C$_{22}$H$_{18}^{79}$BrN$_2$O$^+$ [M – Br]$^+$, found 405.0611.

1-(4-(2-Bromophenyl)-2-(3-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (Ih). Compound 1h (235 mg, 68%) was obtained from 1-(2-(3-methoxyphenyl)-2-oxoethyl)pyridin-1-ium bromide [6] (5h) (215 mg, 0.99 mmol, 1 equiv), triethylamine (150 mg, 1.49 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (205 mg, 1.49 mmol, 1.5 equiv) in DCM (4 mL) according to the general procedure A. Yellow solid, mp 283–285 °C (dec., DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 12.49 (s, 1H), 8.94 (d, $J$ = 5.5 Hz, 2H), 8.70 (t, $J$ = 7.8 Hz, 1H), 8.25–8.04 (m, 2H), 7.60 (d, $J$ = 7.9 Hz, 1H), 7.46–7.38 (m, 2H), 7.33 (s, 1H), 7.32–7.25 (m, 2H), 6.93 (dd, $J$ = 8.2, 2.3 Hz, 1H), 6.85–6.82 (m, 1H), 6.67 (d, $J$ = 7.8 Hz, 1H), 3.70 (s, 3H). $^{13}$C{$^1$H} NMR (101 MHz, DMSO-$d_6$): $\delta$ 159.7 (C), 147.2 (CH), 147.0 (CH), 133.0 (CH), 132.6 (CH), 132.0 (C), 130.4 (CH), 130.0 (CH), 129.6 (C), 128.5 (CH), 128.1 (CH), 126.1 (C), 123.7 (C), 123.1 (C), 119.3 (C), 118.9 (CH), 118.7 (CH), 114.0 (CH), 112.2 (CH), 55.1 (CH$_3$). HRMS (ESI) m/z: 405.0597 calcld for C$_{22}$H$_{18}^{79}$BrN$_2$O$^+$ [M – Br]$^+$, found 405.0601.

1-(4-(2-Bromophenyl)-2-(2,4-dimethoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (Ii). Compound 1i (279 mg, 56%) was obtained from 1-(2-(2,4-dimethoxyphenyl)-2-oxoethyl)pyridin-1-ium bromide (5i) (327 mg, 0.97 mmol, 1 equiv), triethylamine (147 mg, 1.45 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (283 mg, 1.45 mmol, 1.5 equiv) in DCM (4 mL) according to the general procedure A. Bright-yellow solid, mp 250–251 °C (dec., DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 12.16 (br. s, 1H), 8.67 (d, $J$ = 5.5 Hz, 2H), 8.62 (t, $J$ = 7.8 Hz, 1H), 8.07 (t, $J$ = 7.8 Hz, 2H), 7.59 (d, $J$ = 7.9 Hz, 1H), 7.54–7.37 (m, 3H), 6.71 (dd, $J$ = 8.5, 2.4 Hz, 1H), 6.49 (d, $J$ = 2.4 Hz, 1H), 3.79 (s, 3H), 3.24 (s, 3H). $^{13}$C{$^1$H} NMR (101 MHz, DMSO-$d_6$): $\delta$ 161.3 (C), 156.4 (C), 146.1 (CH), 145.8 (CH), 133.1 (CH), 132.7 (CH), 132.3 (C), 131.4 (CH), 129.8 (CH), 128.2 (CH), 128.0 (CH), 123.6 (C), 123.46 (C), 118.5 (CH), 118.0 (C), 109.3 (C), 106.1 (CH), 98.4 (CH), 55.4 (CH$_3$), 54.9 (CH$_3$). HRMS (ESI) m/z: 435.0703 calcld for C$_{23}$H$_{20}^{79}$BrN$_2$O$^+$ [M – Br]$^+$, found 435.0693.

1-(4-(2-Bromophenyl)-2-(4-nitrophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (Ij). Compound 1j (350 mg, 72%) was obtained from 1-(2-(4-nitrophenyl)-2-oxoethyl)pyridin-1-ium bromide [6] (5j) (311 mg, 0.96 mmol, 1 equiv), triethylamine (146 mg, 1.45 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (284 mg, 1.45 mmol, 1.5 equiv) in DCM (4 mL) according to the general procedure A. Orange-yellow solid, mp > 400 °C (DCM). $^1$H NMR (400 MHz, DMSO-
d₈: δ 12.86 (s, 1H), 8.99 (d, J = 5.5 Hz, 2H), 8.75 (t, J = 7.9 Hz, 1H), 8.28–8.14 (m, 4H), 7.61 (d, J = 7.8 Hz, 1H), 7.51–7.39 (m, 5H), 7.35–7.23 (m, 1H). ¹³C{¹H} NMR (101 MHz, DMF-1): δ 147.4 (C), 147.0 (CH), 146.4 (C), 134.8 (C), 133.0 (CH), 132.7 (CH), 131.5 (C), 130.2 (CH), 128.8 (CH), 128.1 (CH), 127.5 (CH), 124.5 (CH), 124.0 (C), 123.7 (C), 120.8 (CH), 120.3 (C). HRMS (ESI) m/z: 420.0342 calcd for C₂₁H₁₅⁷⁹BrN₃O₂⁺ [M – Br]⁺, found 420.0349.

1-(4-(2-Bromophenyl)-2-(3-nitrophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (I₁k). Compound 1₁k (315 mg, 65%) was obtained from 1-(2-(3-nitrophenyl)-2-oxoethyl)pyridin-1-ium bromide [7] (5k) (311 mg, 0.96 mmol, 1 equiv), triethylamine (146 mg, 1.45 mmol, 1.5 equiv) and 3-(bromophenyl)-2H-azirine (4a) (283 mg, 1.45 mmol, 1.5 equiv) in DCM (4 mL) according to the general procedure A. Colorless solid, mp 319–320 °C (dec., DCM). ¹H NMR (400 MHz, DMF-d₈): δ 12.80 (s, 1H), 8.98 (d, J = 5.6 Hz, 2H), 8.73 (t, J = 7.8 Hz, 1H), 8.18 (t, J = 7.1 Hz, 3H), 8.10 (s, 1H), 7.71–7.54 (m, 3H), 7.48–7.39 (m, 3H), 7.35–7.26 (m, 1H). ¹³C{¹H} NMR (101 MHz, DMF-d₈): δ 148.2 (CH), 147.3 (C), 147.0 (CH), 133.0 (CH), 132.9 (CH), 130.9 (CH), 130.2 (CH), 130.0 (C), 128.8 (CH), 128.2 (CH), 124.0 (C), 123.9 (C), 123.7 (C), 122.7 (CH), 121.4 (CH), 120.0 (CH). HRMS (ESI) m/z: 420.0342 calcd for C₂₁H₁₅⁷⁹BrN₃O₂⁺ [M – Br]⁺, found 420.0352.

1-(4-(2-Bromophenyl)-2-(4-cyanophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (I₁l). Compound 1₁l (252 mg, 50%) was obtained from 1-(2-(4-cyanophenyl)-2-oxoethyl)pyridin-1-ium bromide [6] (5l) (315 mg, 1.04 mmol, 1 equiv), triethylamine (136 mg, 1.56 mmol, 1.5 equiv) and 3-(bromophenyl)-2H-azirine (4a) (264 mg, 1.56 mmol, 1.5 equiv) in DCM (10 mL) according to the general procedure A. Beige solid, mp 332–333 °C (dec., DCM). ¹H NMR (400 MHz, DMF-d₈): δ 12.76 (br. s, 1H), 9.00–8.91 (m, 2H), 8.73 (td, J = 7.9, 1.6 Hz, 1H), 8.22–8.13 (m, 2H), 7.90–7.81 (m, 2H), 7.60 (dd, J = 8.3, 3.5 Hz, 1H), 7.49–7.34 (m, 5H), 7.33–7.23 (m, 1H). ¹³C{¹H} NMR (101 MHz, DMF-d₈): δ 147.4 (CH), 147.0 (CH), 133.1 (CH), 133.0 (CH), 132.9 (C), 132.7 (CH), 131.6 (C), 130.2 (CH), 128.8 (CH), 128.1 (CH), 127.2 (CH), 124.4 (C), 124.1 (C), 123.7 (C), 120.4 (CH), 120.1 (C), 118.4 (C), 110.3 (C). HRMS (ESI) m/z: 400.0444 calcd for C₂₂H₂₅⁷⁹BrN₃⁺ [M – Br]⁺, found 400.0432.

1-(4-(2-Bromophenyl)-2-(pyridin-2-yl)-1H-pyrrol-3-yl)pyridin-1-ium iodide (I₁m). Compound 1₁m (503 mg, 89%) was obtained from 1-(2-oxo-2-(pyridin-2-yl)ethyl)pyridin-1-ium iodide [3] (5m) (411 mg, 1.26 mmol, 1 equiv), triethylamine (190 mg, 1.90 mmol, 1.5 equiv) and 3-(bromophenyl)-2H-azirine (4a) (372 mg, 1.90 mmol, 1.5 equiv) in DCM (6 mL) according to the general procedure A. Slightly-yellow solid, mp 287–288 °C (DCM). ¹H NMR (400 MHz, DMF-d₈): δ 12.74 (s, 1H), 9.12–9.03 (m, 2H), 8.72–8.67 (m, 1H), 8.22–8.20 (m, 1H), 8.17–58
8.09 (m, 2H), 7.90 (td, J = 7.8, 1.9 Hz, 1H), 7.77–7.73 (m, 1H), 7.60 (dd, J = 8.0, 1.2 Hz, 1H), 7.48–7.36 (m, 3H), 7.31–7.21 (m, 2H). $^{13}$C{[1H]} NMR (101 MHz, DMSO-$d_{6}$): δ 149.2 (CH), 148.1 (C), 147.7 (CH), 146.9 (CH), 137.6 (CH), 132.9 (CH), 132.6 (CH), 131.7 (C), 130.1 (CH), 127.9 (CH), 127.5 (CH), 124.6 (C), 123.8 (C), 122.6 (CH), 120.4 (C), 119.8 (CH), 119.4 (CH). HRMS (ESI) m/z: 376.0449 calcd for C$_{22}$H$_{18}$BrN$_{2}$+[M – Br]$^+$, found 376.0445.

1-(4-(2-Bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-methylpyridin-1-ium bromide (1n). Compound 1n (397 mg, 82%) was obtained from 4-methyl-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide [8] (5n) (300 mg, 1.03 mmol, 1 equiv), triethylamine (155 mg, 1.52 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (302 mg, 1.54 mmol, 1.5 equiv) in DCM (4 mL) according to the general procedure A. Grey solid, mp 256–257 °C (dec., DCM). $^1$H NMR (400 MHz, DMSO-$d_{6}$): δ 12.44 (s, 1H), 8.78 (d, J = 6.7 Hz, 2H), 7.97 (d, J = 6.4 Hz, 2H), 7.60 (d, J = 7.8 Hz, 1H), 7.45–7.24 (m, 7H), 7.23–7.18 (m, 2H), 2.63 (s, 3H). $^{13}$C{[1H]} NMR (101 MHz, DMSO-$d_{6}$): δ 160.8 (C), 146.0 (CH), 132.9 (CH), 132.6 (CH), 132.2 (C), 130.0 (CH), 129.3 (CH), 128.8 (CH), 128.5 (C), 128.2 (CH), 128.0 (CH), 126.6 (CH), 126.2 (C), 123.8 (C), 122.6 (C), 119.4 (C), 118.7 (CH), 21.7 (CH$_3$). HRMS (ESI) m/z: 389.0648 calcd for C$_{22}$H$_{18}$BrN$_{2}$+[M – Br]$^+$, found 389.0654.

1-(4-(2-Bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-methoxypyridin-1-ium bromide (1o). Compound 1o (277 mg, 55%) was obtained from 4-methoxy-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide [8] (5o) (317 mg, 1.03 mmol, 1 equiv), triethylamine (155 mg, 1.54 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (302 mg, 1.54 mmol, 1.5 equiv) in DCM (5 mL) according to the general procedure A. Yellow solid, mp 328–330 °C (dec., DCM). $^1$H NMR (400 MHz, DMSO-$d_{6}$): δ 12.32 (br. s, 1H), 8.73 (d, J = 7.0 Hz, 2H), 7.67–7.66 (m, 3H), 7.45–7.32 (m, 5H), 7.30–7.25 (m, 2H), 7.24–7.17 (m, 2H), 4.11 (s, 3H). $^{13}$C{[1H]} NMR (101 MHz, DMSO-$d_{6}$): δ 171.41 (C), 148.38 (CH), 132.9 (CH), 132.6 (CH), 132.4 (C), 129.9 (CH), 129.3 (CH), 128.7 (C), 128.04 (CH), 127.95 (CH), 126.4 (CH), 126.1 (C), 123.9 (C), 122.2 (C), 119.6 (C), 118.5 (CH), 113.9 (CH), 58.4 (CH$_3$). HRMS (ESI) m/z: 405.0597 calcd for C$_{22}$H$_{18}$BrN$_{2}$O+[M – Br]$^+$, found 405.0617.

1-(4-(2-Bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-(dimethylamino)pyridin-1-ium bromide (1p). Compound 1p (1.109 g, 51%) was obtained from 4-(dimethylamino)-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide [6] (5p) (680 mg, 2.12 mmol, 1 equiv), triethylamine (320 mg, 3.18 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (624 mg, 3.18 mmol, 1.5 equiv) in DCM (10 mL) according to the general procedure A. Colorless solid, mp 313 °C (DCM). $^1$H NMR (400 MHz, DMSO-$d_{6}$): δ 12.16 (s, 1H), 8.08 (d, J = 7.6 Hz, 2H), 7.64 (d, J = 7.7 Hz, 2H), 7.36 (m, 3H), 7.31–7.25 (m, 2H). $^{13}$C{[1H]} NMR (101 MHz, DMSO-$d_{6}$): δ 149.2 (CH), 148.1 (C), 147.7 (CH), 146.9 (CH), 137.6 (CH), 132.9 (CH), 132.6 (CH), 131.7 (C), 130.1 (CH), 127.9 (CH), 127.5 (CH), 124.6 (C), 123.8 (C), 122.6 (CH), 120.4 (C), 119.8 (CH), 119.4 (CH). HRMS (ESI) m/z: 376.0449 calcd for C$_{22}$H$_{18}$BrN$_{2}$+[M – Br]$^+$, found 376.0445.
8.0 Hz, 1H), 7.44–7.19 (m, 8H), 7.18 (s, 1H), 6.97 (d, J = 7.6 Hz, 2H), 3.18 (s, 6H). $^{13}$C{H} NMR (101 MHz, DMSO-$d_6$): δ 155.6 (C), 144.0 (CH), 133.1 (C), 132.7 (CH), 132.6 (CH), 129.7 (CH), 129.3 (C), 129.1 (CH), 127.8 (CH), 127.7 (CH), 126.1 (CH), 125.7 (C), 124.0 (C), 122.3 (C), 119.9 (C), 118.1 (CH), 107.8 (CH), 39.9 (CH$_3$). HRMS (ESI) m/z: вычислено 418.0913, найдено 418.0907.

1-(4-(2-Bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-phenylpyridin-1-ium bromide ($1q$). Compound $1q$ (480 mg, 80%) was obtained from 1-1-(2-oxo-2-phenylethyl)-4-phenylpyridin-1-ium bromide [8] ($5q$) (400 mg, 1.13 mmol, 1 equiv), triethylamine (172 mg, 1.70 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (332 mg, 1.70 mmol, 1.5 equiv) in DCM (10 mL) according to the general procedure A. Orange solid, mp 335 °C (dec., DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): δ 12.50 (s, 1H), 8.92 (d, J = 7.0 Hz, 2H), 8.53 (d, J = 7.0 Hz, 2H), 8.13 (d, J = 7.2 Hz, 2H), 7.71–7.55 (m, 4H), 7.50–7.24 (m, 9H). $^{13}$C{H} NMR (101 MHz, DMSO-$d_6$): δ 155.3 (C), 146.9 (CH), 133.0 (C), 132.8 (CH), 132.72 (C), 132.70 (CH), 132.2 (C), 130.0 (CH), 129.7 (CH), 129.3 (CH), 128.52 (C), 128.41 (CH), 128.2 (CH), 128.1 (CH), 126.8 (CH), 126.4 (C), 124.5 (CH), 123.8 (C), 119.4 (C), 119.0 (CH). HRMS (ESI) m/z: 451.0804 calcd for C$_{27}$H$_{20}$BrN$_2$+ [M – Br]$^+$, found 451.0817.

1-(4-(2-Bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-(4-methoxyphenyl)pyridin-1-ium bromide ($1r$). Compound $1r$ (306 mg, 61%) was obtained from 4-(4-methoxyphenyl)-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide [6] ($5r$) (342 mg, 0.89 mmol, 1 equiv), triethylamine (135 mg, 1.34 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (261 mg, 1.34 mmol, 1.5 equiv) in DCM (10 mL) according to the general procedure A. Yellow solid, mp 192–193 °C (DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): δ 12.42 (br. s, 1H), 8.86–8.70 (m, 2H), 8.51–8.38 (m, 2H), 8.20–8.08 (m, 2H), 7.62 (dd, J = 8.1, 1.2 Hz, 1H), 7.50–7.24 (m, 9H), 7.21–7.13 (m, 2H), 3.88 (s, 3H). $^{13}$C{H} NMR (101 MHz, DMSO-$d_6$): δ 163.3 (C), 154.6 (C), 146.4 (CH), 132.9 (CH), 132.7 (CH), 132.3 (C), 130.5 (CH), 130.0 (CH), 129.3 (CH), 128.6 (C), 128.2 (CH), 128.0 (C), 126.7 (CH), 126.3 (C), 124.6 (C), 123.8 (C), 123.0 (CH), 122.5 (C), 119.4 (C), 118.8 (CH), 115.3 (CH), 55.8 (CH$_3$). HRMS (ESI) m/z: 481.0910 calcd for C$_{28}$H$_{22}$BrN$_2$O$^+$ [M – Br]$^+$, found 481.0898.

1-(4-(2-Bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-3,5-dimethylpyridin-1-ium bromide ($1s$). Compound $1s$ (367 mg, 73%) was obtained from 3,5-dimethyl-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide [9] ($5s$) (316 mg, 1.03 mmol, 1 equiv), triethylamine (156 mg, 1.55 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (304 mg, 1.55 mmol, 1.5 equiv) in DCM (6 mL) according to the general procedure A. Bright yellow solid, mp 317–318 °C (DCM). $^1$H NMR
(400 MHz, DMSO-d$_6$): $\delta$ 12.44 (br. s, 1H), 8.74 (s, 2H), 8.42 (s, 1H), 7.60 (d, $J = 7.9$ Hz, 1H), 7.45–7.32 (m, 5H), 7.32–7.23 (m, 2H), 7.20 (d, $J = 6.9$ Hz, 2H), 2.34 (s, 6H). $^{13}$C{H} NMR (101 MHz, DMSO-d$_6$): $\delta$ 147.9 (CH), 143.9 (CH), 138.4 (C), 132.8 (CH), 132.6 (C), 132.1 (C), 129.9 (CH), 129.2 (CH), 128.5 (C), 128.2 (CH), 127.9 (CH), 126.3 (CH), 126.0 (C), 123.8 (C), 122.9 (C), 119.6 (C), 118.7 (CH), 17.4 (CH$_3$). HRMS (ESI) m/z: 403.0804 calcd for C$_{23}$H$_{20}$BrN$_2^+$ [M – Br]$^+$, found 403.0818.

2-(4-(2-Bromophenyl)-2-phenyl-1H-pyrrol-3-yl)isoquinolin-2-iumbromide (I). Compound 1t (240 mg, 40%) was obtained from 2-(2-oxo-2-phenylethyl)isoquinolin-2-ium bromide [8] (5t) (389 mg, 1.19 mmol, 1 equiv), triethylamine (180 mg, 1.78 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (349 mg, 1.78 mmol, 1.5 equiv) in DCM (6 mL) according to the general procedure A. Orange solid, mp 266–268 °C (DCM). $^1$H NMR (400 MHz, DMSO-d$_6$): $\delta$ 12.48 (d, $J = 3.4$ Hz, 1H), 10.02 (d, $J = 1.4$ Hz, 1H), 8.63–8.53 (m, 2H), 8.40–8.35 (m, 2H), 8.35–8.25 (m, 1H), 8.07–8.05 (m, 1H), 7.55–7.47 (m, 2H), 7.42–7.30 (m, 5H), 7.26–7.18 (m, 3H). $^{13}$C{H} NMR (101 MHz, DMSO-d$_6$): $\delta$ 152.0 (CH), 138.1 (CH), 137.2 (CH), 137.0 (C), 133.0 (CH), 132.6 (CH), 132.1 (C), 131.7 (CH), 130.7 (CH), 130.0 (CH), 129.3 (CH), 128.5 (C), 128.3 (CH), 128.1 (CH), 127.5 (CH), 127.3 (C), 126.7 (CH), 126.5 (C), 126.2 (CH), 123.6 (C), 123.1 (C), 119.7 (C), 119.0 (CH). HRMS (ESI) m/z: 425.0648 calcd for C$_{23}$H$_{18}$BrN$_2$ [M – Br]$^+$, found 425.0660.

1-(4-(2-Bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-(methoxycarbonyl)pyridin-1-ium bromide (1u). Compound 1u (246 mg, 52%) was obtained from 4-(methoxycarbonyl)-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5u) (309 mg, 0.920 mmol, 1 equiv), triethylamine (147 mg, 1.46 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (286 mg, 1.46 mmol, 1.5 equiv) in DCM (4 mL) according to the general procedure A. Red solid, mp 290–291 °C (dec., DCM). $^1$H NMR (400 MHz, DMSO-d$_6$): $\delta$ 12.52 (s, 1H), 9.06–8.97 (m, 2H), 8.47–8.39 (m, 2H), 7.60 (d, $J = 8.1$ Hz, 1H), 7.47–7.33 (m, 6H), 7.31–7.23 (m, 3H), 3.95 (s, 3H). $^{13}$C{H} NMR (101 MHz, DMSO-d$_6$): $\delta$ 162.2 (C), 148.1 (CH), 144.5 (C), 133.1 (CH), 132.7 (CH), 131.7 (C), 130.1 (CH), 129.4 (CH), 128.5 (CH), 128.3 (CH), 128.0 (C), 127.6 (CH), 127.0 (CH), 126.7 (C), 123.6 (C), 122.7 (C), 119.43 (CH), 119.17 (C), 53.80 (CH$_3$). HRMS (ESI) m/z: 433.0546 calcd for C$_{23}$H$_{18}$BrN$_2$O$_2^+$ [M – Br]$^+$, found 433.0564.

1-(4-(2-Bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-cyanopyridin-1-ium bromide (1v). Compound 1v (152 mg, 64%) was obtained from 4-cyano-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide [10] (5v) (150 mg, 0.495 mmol, 1 equiv), NiBr$_2$·3H$_2$O (27 mg, 0.10 mmol, 0.2 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (145 mg, 0.74 mmol, 1.5 equiv) in acetone (10 mL) according to
the general procedure B. Red solid, mp 301–302 °C (dec., acetone). 

\[ \text{H NMR (400 MHz, DMSO-}\text{d}_6): \delta \text{ 12.61 (s, 1H), 9.17 (d, } J = 6.2 \text{ Hz, 2H), 8.66 (d, } J = 6.3 \text{ Hz, 2H), 7.61 (d, } J = 8.0 \text{ Hz, 1H), 7.51–7.21 (m, 9H).} \]

\[ \text{C{[1H]} NMR (101 MHz, DMSO-}\text{d}_6): \delta \text{ 147.8 (CH), 133.1 (CH), 132.7 (CH), 131.5 (CH), 130.0 (CH), 129.3 (CH), 128.5 (CH), 128.2 (CH), 127.83 (C), 127.78 (C), 127.1 (CH), 126.9 (C), 123.5 (C), 122.6 (C), 119.5 (CH), 119.1 (C), 114.6 (C). HRMS (ESI) m/z: 400.0444 cacld for C_{22}H_{15}^{79}BrN_3^+ [M – Br]^+, found 400.0449.} \]

**4-Benzoyl-1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (1w).** Compound 1w (155 mg, 42%) was obtained from 4-benzoyl-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5w) (250 mg, 0.654 mmol, 1 equiv), NiBr₂·3H₂O (43 mg, 0.13 mmol, 0.2 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (192 mg, 0.98 mmol, 1.5 equiv) in acetone (20 mL) according to the general procedure B. Bright red solid, mp 280–282 °C (acetone). 

\[ \text{H NMR (400 MHz, DMSO-}\text{d}_6): \delta \text{ 12.55 (br. s, 1H), 9.08 (d, } J = 6.6 \text{ Hz, 2H), 8.34 (d, } J = 6.6 \text{ Hz, 2H), 7.84–7.77 (m, 3H), 7.68–7.62 (m, 3H), 7.51–7.34 (m, 8H), 7.34–7.28 (m, 1H).} \]

\[ \text{C{[1H]} NMR (101 MHz, DMSO-}\text{d}_6): \delta \text{ 192.6 (C), 152.1 (C), 147.4 (CH), 134.8 (CH), 134.0 (C), 133.2 (CH), 132.8 (CH), 131.8 (C), 130.12 (CH), 130.08 (CH), 129.1 (CH), 128.5 (CH), 128.3 (CH) 128.2 (C), 127.5 (CH), 127.1 (CH), 126.7 (C), 123.6 (C), 122.7 (C), 119.38 (CH), 119.29 (C).} \]

HRMS (ESI) m/z: 479.0754 cacld for C_{28}H_{20}^{79}BrN_2O^+ [M – Br]^+, found 479.0774.

**1-(4-(2-Iodophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (2).** Compound 2 (272 mg, 75%) was obtained from 1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5a) (200 mg, 0.72 mmol, 1 equiv), triethylamine (109 mg, 1.08 mmol, 1.5 equiv) and 3-(2-iodophenyl)-2H-azirine (262 mg, 1.08 mmol, 1.5 equiv) in DCM (4 mL) according to the general procedure A. Yellow solid, mp 318–320 °C (DCM). 

\[ \text{H NMR (400 MHz, DMSO-}\text{d}_6): \delta \text{ 12.41 (s, 1H), 8.96–8.84 (m, 2H), 8.67 (tt, } J = 7.9 \text{, 1.4 Hz, 1H), 8.20–8.09 (m, 2H), 7.93–7.78 (m, 1H), 7.43–7.32 (m, 5H), 7.28 (d, } J = 2.9 \text{ Hz, 1H), 7.23–7.19 (m, 2H), 7.08 (ddd, } J = 7.9 \text{, 6.5, 2.5 Hz, 1H).} \]

\[ \text{C{[1H]} NMR (101 MHz, DMSO-}\text{d}_6): \delta \text{ 147.1 (CH), 147.0 (CH), 139.0 (CH), 136.2 (C), 131.9 (CH), 130.0 (CH), 129.3 (CH), 128.6 (CH), 128.5 (CH), 128.4 (C), 128.3 (CH), 126.6 (CH), 126.1 (C), 122.8 (C), 122.7 (C), 118.7 (CH), 101.6 (C). HRMS (ESI) m/z: 423.0353 cacld for C_{21}H_{16}IN_2^+ [M – Br]^+, found 423.0368.} \]

**1-(1-Benzyl-4-(2-iodophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (N-Bn-2).** Compound N-Bn-2 (339 mg, 73%) was obtained from 4-(2-iodophenyl)-2-phenyl-3-(pyridin-1-ium-1-yl)pyrrol-1-ide (331 mg, 0.78 mmol), benzyl bromide (469 mg, 2.74 mmol, 3.5 equiv) and K₂CO₃ (216 mg, 1.57 mmol, 2 equiv) in acetonitrile (12 mL) likewise N-Bn-1. Yellow solid, mp 220–222 °C (MeCN). 

\[ \text{H NMR (400 MHz, DMSO-}\text{d}_6): \delta \text{ 8.79 (d, } J = 6.0 \text{ Hz, 2H), 8.56 (t, } J = \text{...} \]

s12
7.9 Hz, 1H), 8.04 (t, J = 7.0 Hz, 2H), 7.89 (d, J = 7.9 Hz, 1H), 7.49 (s, 1H), 7.46–7.22 (m, 10H), 7.14–7.02 (m, 3H), 5.30 (s, 2H). $^{13}$C 1H NMR (101 MHz, DMSO-d$_6$): δ 146.73 (CH), 146.70 (CH), 139.1 (CH), 137.2 (C), 135.8 (C), 131.7 (CH), 130.2 (CH), 130.0 (CH), 129.4 (CH), 129.1 (CH), 128.61 (CH), 128.59 (CH), 128.1 (CH), 127.6 (CH), 126.8 (C), 126.7 (CH), 124.2 (CH), 122.1 (C), 121.0 (C), 101.3 (C), 50.7 (CH$_2$). HRMS (ESI) m/z: 513.0822 calcld for $\text{C}_{28}\text{H}_{22}\text{IN}_2^+$ [M – Br]$^+$, found 513.0839.

General procedure C for the radical cyclization with TTMSS/AIBN. To a suspension of pyrolylpyridinium bromide (1 equiv) and AIBN (2 equiv) in dry MeCN (C$_{salt}$ = 10 mg/mL) in a screw top vial TTMSS (1.5 equiv) was added. Then argon was bubbled through the reaction mixture for 15 min. Then vial was screwed and reaction mixture was vigorously stirred at 75 ºC for 25 h (the completion of the reaction was checked by NMR of the reaction mixture). Then it was cooled down, ethyl acetate (MeCN/EtOAc, v/v 1:6) was added. The solution was kept in a refrigerator for 2–3 h, the precipitate was collected, washed with ethyl acetate and hexane and dried.

3-Phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3a). Compound 3a (122 mg, 74%) was obtained from 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrl-3-yl)pyridin-1-ium bromide (1a) (201 mg, 0.44 mmol, 1 equiv), TTMSS (163 mg, 0.65 mmol, 1.5 equiv) and AIBN (144 mg, 0.87 mmol, 2 equiv) according to the general procedure C. Orange solid, mp > 400 ºC (MeCN/EtOAc). $^1$H NMR (400 MHz, DMSO-d$_6$): δ 13.14 (br. s, 1H), 9.39 (d, J = 8.5 Hz, 1H), 9.13 (d, J = 6.6 Hz, 1H), 8.92 (d, J = 8.5 Hz, 1H), 8.53–8.47 (m, 1H), 8.46 (d, J = 7.9 Hz, 1H), 8.34 (d, J = 3.1 Hz, 1H), 8.02–7.97 (m, 2H), 7.76–7.61 (m, 6H). $^{13}$C (1H) NMR (101 MHz, DMSO-d$_6$): δ 142.7 (C), 140.0 (CH), 135.0 (CH),133.9 (CH), 130.7 (C), 130.2 (CH), 129.6 (CH), 129.51 (C), 129.45 (CH), 127.1 (CH), 126.7 (CH), 124.4 (CH), 124.1 (CH), 123.1 (CH), 121.6 (C), 120.9 (C), 117.5 (C), 113.9 (C), 112.5 (CH). HRMS (ESI) m/z: 295.1230 calcld for $\text{C}_{21}\text{H}_{15}\text{N}_2^+$ [M – Br]$^+$, found 295.1242.

Gram scale experiment. Compound 3a (736 mg, 88%) was obtained from 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrl-3-yl)pyridin-1-ium bromide (1a) (1 g, 2.19 mmol, 1 equiv), TTMSS (819 mg, 3.29 mmol, 1.5 equiv) and AIBN (718 mg, 4.38 mmol, 2 equiv) according to the general procedure C.

2-Methyl-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-4-ium iodide (N-Me-3a). Compound N-Me-3a (62 mg, 73%) was obtained from 1-(4-(2-bromophenyl)-1-methyl-2-phenyl-1H-pyrrl-3-yl)pyridin-1-ium iodide (N-Me-1a) (100 mg, 0.19 mmol, 1 equiv), TTMSS (71 mg, 0.28
mmol, 1.5 equiv) and AIBN (62 mg, 0.38 mmol, 2 equiv) according to the general procedure C. Compound \(N\text{-Me-}3\text{a}\) (15 mg, 100%) was obtained from 3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6a) (10 mg, 0.035 mmol) and methyl iodide (5 mg, 0.035 mmol, 1 equiv) in dry DCM (2 mL). The reaction mixture was stirred for 24 h and evaporated. The product was dried under vacuum. Orange solid, mp 279–281 °C (MeCN/EtOAc). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 9.38 (d, \(J = 8.7\) Hz, 1H), 8.92 (d, \(J = 8.5\) Hz, 1H), 8.81 (d, \(J = 6.7\) Hz, 1H), 8.50–8.45 (m, 1H), 8.40 (s, 1H), 8.38 (d, \(J = 11.5\) Hz, 1H), 8.04–7.97 (m, 1H), 7.95–7.88 (m, 1H), 7.78–7.63 (m, 6H), 3.71 (s, 3H). \(^{13}\)C{\(1\)H} NMR (101 MHz, DMSO-\(d_6\)): \(\delta\) 142.6 (C), 139.8 (CH), 134.3 (CH), 134.1 (CH), 131.3 (CH), 130.5 (CH), 130.0 (CH), 129.3 (C), 128.9 (C), 127.2 (CH), 126.8 (CH), 124.4 (CH), 124.1 (CH), 122.8 (CH), 122.7 (C), 120.8 (C), 118.3 (C), 116.1 (CH), 112.3 (C), 36.2 (CH\(_3\)). HRMS (ESI) m/z: 309.1387 calcd for C\(_{22}\)H\(_{17}\)N\(_2\)\(^{+}\) [M – I]\(^+\), found 309.1383.

2-Benzyl-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-4-ium bromide (N-Bn-3a). Compound N-Bn-3a (54 mg, 64% from N-Bn-1a; 56 mg, 67% from N-Bn-2) was obtained from 1-(1-benzyl-4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (N-Bn-1a) (100 mg, 0.18 mmol, 1 equiv) or 1-(1-benzyl-4-(2-iodophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (N-Bn-2) (107 mg, 0.18 mmol, 1 equiv), TTMSS (68 mg, 0.27 mmol, 1.5 equiv) and AIBN (60 mg, 0.37 mmol, 2 equiv) according to the general procedure C.

3-Phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6a) (14.5 mg, 0.05 mmol), benzyl bromide (9 mg, 0.05 mmol, 1 equiv) and K\(_2\)CO\(_3\) (7 mg, 0.10 mmol, 2 equiv) was mixed in dry acetonitrile (4 mL). The reaction mixture was heated at 40 °C for 24 h, evaporated. The residue was washed with water and Et\(_2\)O and dried under vacuum to obtain compound N-Bn-3a (23 mg, 100%). Yellow to brown solid, mp 249–250 °C (dec., MeCN/EtOAc). \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta\) 9.47 (d, \(J = 8.8\) Hz, 1H), 8.83–8.74 (m, 2H), 8.68 (d, \(J = 1.4\) Hz, 1H), 8.12 (dd, \(J = 8.0, 1.3\) Hz, 1H), 7.99 (s, 1H), 7.83–7.73 (m, 2H), 7.70–7.60 (m, 4H), 7.48–7.42 (m, 2H), 7.32–7.27 (m, 3H), 7.02–6.96 (m, 2H), 5.23 (s, 2H). \(^{13}\)C{\(1\)H} NMR (126 MHz, CDCl\(_3\)): \(\delta\) 143.1 (C), 140.9 (CH), 135.8 (C), 134.3 (CH), 133.8 (CH), 131.7 (CH), 131.4 (CH), 130.6 (CH), 129.14 (C), 129.3 (CH), 129.0 (C), 128.5 (CH), 128.0 (C), 127.5 (CH), 127.1 (CH), 125.7 (CH), 124.6 (CH), 123.3 (CH), 123.2 (C), 120.8 (C), 118.8 (C), 115.2 (CH), 113.6 (C), 53.0 (CH\(_2\)). HRMS (ESI) m/z: 385.1699 calcd for C\(_{28}\)H\(_{21}\)N\(_2\)\(^{+}\) [M – Br]\(^+\), found 385.1711.

3-(4-Fluorophenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3b). Compound 3b (80 mg, 60%) was obtained from 1-(4-(2-bromophenyl)-2-(4-fluorophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1b) (160 mg, 0.34 mmol, 1 equiv), TTMSS (126 mg, 0.506 mmol, 1.5 equiv) and AIBN (111 mg, 0.676 mmol, 2 equiv) according to the general procedure C. Orange
solid, mp 321–322 °C (MeCN/EtOAc). \(^1^H\) NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 13.13 (s, 1H), 9.39 (d, \(J = 8.8\) Hz, 1H), 9.08 (d, \(J = 6.8\) Hz, 1H), 8.91 (d, \(J = 8.5\) Hz, 1H), 8.57–8.41 (m, 2H), 8.33 (d, \(J = 3.2\) Hz, 1H), 8.03–7.94 (m, 2H), 7.82–7.69 (m, 3H), 7.55–7.47 (m, 2H). \(^1^C\)\{(1H)\} NMR (126 MHz, DMSO-\(d_6\)): \(\delta\) 162.8 (d, \(J = 247.2\) Hz, C), 142.8 (C), 140.0 (CH), 135.3 (CH), 134.0 (CH), 132.7 (CH), 132.6 (CH), 129.6 (C), 127.1 (d, \(J = 3.1\) Hz, C), 127.0 (d, \(J = 59.2\) Hz, CH), 124.4 (CH), 124.3 (CH), 123.1 (CH), 121.0 (C), 120.6 (C), 117.8 (C), 116.5 (d, \(J = 21.7\) Hz, CH), 113.9 (C), 112.4 (CH). HRMS (ESI) m/z: 313.1136 calcd for C\(_{21}\)H\(_{14}\)FN\(_2^+\) [M – Br]\(^+\), found 313.1148.

3-(4-Chlorophenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3c). Compound 3c (118 mg, 71%) was obtained from 1-(4-(2-bromophenyl)-2-(4-chlorophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1c) (200 mg, 0.41 mmol, 1 equiv), TTMSS (152 mg, 0.61 mmol, 1.5 equiv) and AIBN (133 mg, 0.82 mmol, 2 equiv) according to the general procedure C. Orange solid, mp > 400 °C (MeCN/EtOAc). \(^1^H\) NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 13.16 (s, 1H), 9.39 (d, \(J = 8.8\) Hz, 1H), 9.11 (d, \(J = 6.6\) Hz, 1H), 8.92 (d, \(J = 8.5\) Hz, 1H), 8.56–8.50 (m, 1H), 8.46 (d, \(J = 7.9\) Hz, 1H), 8.36 (d, \(J = 3.3\) Hz, 1H), 8.05–7.95 (m, 2H), 7.74 (s, 5H). \(^1^C\)\{(1H)\} NMR (101 MHz, DMSO-\(d_6\)): \(\delta\) 142.8 (CH), 140.1 (C), 135.5 (CH), 134.3 (C), 134.0 (CH), 132.0 (CH), 129.52 (CH), 129.48 (C), 127.3 (CH), 126.8 (CH), 124.33 (CH), 124.31 (CH), 121.3 (CH), 121.0 (C), 120.4 (C), 117.9 (C), 114.1 (C), 112.8 (CH). HRMS (ESI) m/z: 329.0845 calcd for C\(_{21}\)H\(_{14}\)ClN\(_2^+\) [M – Br]\(^+\), found 329.0849.

3-(4-Methylphenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3e). Compound 3e (96 mg, 58%) was obtained from 1-(4-(2-bromophenyl)-2-(4-methylphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1e) (200 mg, 0.42 mmol, 1 equiv), TTMSS (158 mg, 0.64 mmol, 1.5 equiv) and AIBN (139 mg, 0.85 mmol, 2 equiv) according to the general procedure C. Pale yellow solid, mp > 400 °C (MeCN/EtOAc). \(^1^H\) NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 13.13–13.01 (m, 1H), 9.41–9.32 (m, 1H), 9.16 (dd, \(J = 6.8, 1.3\) Hz, 1H), 8.89 (d, \(J = 8.4\) Hz, 1H), 8.53–8.47 (m, 1H), 8.43 (d, \(J = 8.7\)Hz, 1H), 8.47–8.41 (m, 1H), 8.30 (d, \(J = 3.2\) Hz, 1H), 8.02–7.93 (m, 2H), 7.75–7.68 (m, 1H), 7.63–7.57 (m, 2H), 7.47 (d, \(J = 7.9\) Hz, 2H), 2.47 (s, 3H). \(^1^C\)\{(1H)\} NMR (101 MHz, DMSO-\(d_6\)): \(\delta\) 142.7 (C), 140.0 (CH), 135.0 (CH), 133.9 (CH), 130.7 (C), 130.2 (CH), 129.6 (CH), 129.51 (C), 129.5 (CH), 127.1 (CH), 126.7 (CH), 124.4 (CH), 124.1 (CH), 123.1 (CH), 121.6 (C), 120.9 (C), 117.5 (C), 113.9 (C), 112.5 (CH), 21.0 (CH\(_3\)). HRMS (ESI) m/z: 309.1386 calcd for C\(_{22}\)H\(_{17}\)N\(_2^+\) [M – Br]\(^+\), found 309.1382.

3-(4-Methoxyphenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3f). Compound 3f (116 mg, 70%) was obtained from 1-(4-(2-bromophenyl)-2-(4-methoxyphenyl)-1H-pyrrol-3-
(3-Methoxyphenyl)pyridin-1-ium bromide (1f) (200 mg, 0.41 mmol, 1 equiv), TTMSS (153 mg, 0.62 mmol, 1.5 equiv) and AIBN (135 mg, 0.82 mmol, 2 equiv) according to the general procedure C. Red solid, mp > 400 °C (MeCN/EtOAc). 1H NMR (400 MHz, DMSO-d6): δ 13.03 (s, 1H), 9.37 (d, J = 8.7 Hz, 1H), 9.18 (d, J = 6.7 Hz, 1H), 8.90 (d, J = 8.5 Hz, 1H), 8.53–8.41 (m, 2H), 8.28 (d, J = 3.2 Hz, 1H), 8.01–7.94 (m, 2H), 7.76–7.69 (m, 1H), 7.66–7.59 (m, 2H), 7.25–7.18 (m, 2H), 3.89 (s, 3H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 160.0 (C), 142.5 (C), 139.7 (CH), 134.7 (CH), 133.8 (CH), 131.6 (CH), 129.5 (C), 127.0 (CH), 126.6 (CH), 124.3 (CH), 124.1 (CH), 123.0 (CH), 122.5 (C), 121.5 (C), 120.8 (C), 117.2 (C), 114.9 (CH), 113.6 (C), 111.9 (CH), 55.4 (CH3). HRMS (ESI) m/z: 325.1340 calcd for C22H17N2O+ [M – Br]+, found 325.1347.

3-(2-Methoxyphenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3g). Compound 3g (42 mg, 63%) was obtained from 1-(4-(2-bromophenyl)-2-(2-methoxyphenyl)-1H-pyrrolyl)pyridin-1-ium bromide (1g) (80 mg, 0.16 mmol, 1 equiv), TTMSS (61 mg, 0.25 mmol, 1.5 equiv) and AIBN (54 mg, 0.33 mmol, 2 equiv) according to the general procedure C. Orange solid, mp 240 °C (dec., MeCN/EtOAc). 1H NMR (400 MHz, DMSO-d6): δ 13.06 (br. s, 1H), 9.38 (d, J = 8.7 Hz, 1H), 8.91 (d, J = 8.4 Hz, 1H), 8.83–8.77 (m, 1H), 8.56–8.48 (m, 1H), 8.44 (d, J = 7.9 Hz, 1H), 8.34 (d, J = 3.3 Hz, 1H), 8.05–7.96 (m, 2H), 7.76–7.68 (m, 1H), 7.67–7.60 (m, 2H), 7.32 (d, J = 8.2 Hz, 1H), 7.28–7.23 (m, 1H), 3.65 (s, 3H). 13C{1H} NMR (126 MHz, DMSO-d6): δ 156.6 (C), 142.6 (C), 139.7 (CH), 135.9 (CH), 134.0 (CH), 131.8 (CH), 131.6 (CH), 129.6 (C), 127.2 (CH), 126.8 (CH), 123.9 (CH), 123.8 (CH), 123.1 (CH), 121.3 (CH), 120.9 (C), 119.0 (C), 118.5 (C), 117.8 (C), 113.7 (C), 112.6 (CH), 112.3 (CH), 55.4 (CH3). HRMS (ESI) m/z: 325.1335 calcd for C22H16N2O+ [M – Br]+, found 325.1331.

3-(3-Methoxyphenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3h). Compound 3h (122 mg, 74%) was obtained from 1-(4-(2-bromophenyl)-2-(3-methoxyphenyl)-1H-pyrrolyl)pyridin-1-ium bromide (1h) (200 mg, 0.412 mmol, 1 equiv), TTMSS (154 mg, 0.617 mmol, 1.5 equiv) and AIBN (135 mg, 0.823 mmol, 2 equiv) according to the general procedure C. Pale orange solid, mp 230–231 °C (dec., MeCN/EtOAc). 1H NMR (400 MHz, DMSO-d6): δ 13.14 (s, 1H), 9.38 (d, J = 8.8 Hz, 1H), 9.18 (d, J = 6.7 Hz, 1H), 8.90 (d, J = 8.4 Hz, 1H), 8.54–8.49 (m, 1H), 8.44 (d, J = 7.9 Hz, 1H), 8.32 (d, J = 3.3 Hz, 1H), 8.04–7.91 (m, 2H), 7.74–7.69 (m, 1H), 7.60–7.55 (m, 1H), 7.34–7.24 (m, 2H), 7.19 (dd, J = 8.4, 2.6 Hz, 1H), 3.84 (s, 3H). 13C{1H} NMR (126 MHz, DMSO-d6): δ 159.8 (C), 142.8 (C), 140.0 (CH), 135.4 (CH), 133.9 (CH), 131.9 (C), 130.7 (CH), 129.5 (C), 127.2 (CH), 126.7 (CH), 124.3 (CH), 124.1 (CH), 123.1 (CH), 122.2 (CH), 121.5 (C), 121.0 (C), 117.5 (C), 115.5 (CH), 115.4 (CH), 114.0, 112.4 (CH), 55.4 (CH3). HRMS (ESI) m/z: 325.1335 calcd for C22H16N2O+ [M – Br]+, found 325.1339.
3-(2,4-Dimethoxyphenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3i). Compound 3i (160 mg, 93%) was obtained from 1-(4-(2-bromophenyl)-2-(4-dimethoxyphenyl)-1H-pyrrolo-3-yl)pyridin-1-ium bromide (1i) (200 mg, 0.388 mmol, 1 equiv), TTMSS (145 mg, 0.581 mmol, 1.5 equiv) and AIBN (127 mg, 0.775 mmol, 2 equiv) according to the general procedure C. Orange solid, mp 212–213 °C (MeCN/EtOAc). 1H NMR (400 MHz, DMSO-d6): δ 12.96 (s, 1H), 9.36 (d, J = 8.7 Hz, 1H), 8.94–8.81 (m, 2H), 8.54–8.48 (m, 1H), 8.42 (dd, J = 8.1, 1.2 Hz, 1H), 8.28 (d, J = 3.2 Hz, 1H), 8.08–7.99 (m, 1H), 7.74–7.67 (m, 1H), 7.57–7.50 (m, 1H), 6.88–6.80 (m, 2H), 3.91 (s, 3H), 3.65 (s, 3H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 162.2 (C), 157.9 (C), 142.5 (C), 139.6 (CH), 135.6 (CH), 133.9 (CH), 132.6 (CH), 129.7 (C), 127.1 (CH), 126.8 (CH), 123.9 (CH), 123.1 (CH), 120.9 (C), 118.2 (C), 117.9 (C), 113.5 (C), 112.1 (CH), 111.3 (C), 106.2 (CH), 99.3 (CH), 55.6 (CH3), 55.5 (CH3). HRMS (ESI) m/z: 355.1441 calcd for C23H18N2O2+[M–Br]+, found 355.1458.

3-(4-Cyanophenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3l). Compound 3l (122 mg, 73%) was obtained from 1-(4-(2-bromophenyl)-2-(4-cyanophenyl)-1H-pyrrolo-3-yl)pyridin-1-ium bromide (1l) (200 mg, 0.416 mmol, 1 equiv), TTMSS (155 mg, 0.624 mmol, 1.5 equiv) and AIBN (137 mg, 0.832 mmol, 2 equiv) according to the general procedure C. Orange solid, mp > 400 °C (MeCN/EtOAc). 1H NMR (500 MHz, DMSO-d6): δ 13.38–13.26 (m, 1H), 9.41 (d, J = 8.7 Hz, 1H), 9.05 (d, J = 6.6 Hz, 1H), 8.92 (d, J = 8.5 Hz, 1H), 8.59–8.52 (m, 1H), 8.51–8.40 (m, 2H), 8.13 (d, J = 8.2 Hz, 2H), 8.01–7.90 (m, 4H), 7.78–7.73 (m, 1H). 13C{1H} NMR (126 MHz, DMSO-d6): δ 143.0 (C), 140.4 (CH), 136.0 (CH), 135.2 (C), 134.0 (CH), 133.2 (CH), 130.8 (CH), 129.3 (C), 127.4 (CH), 126.7 (CH), 124.38 (C), 124.35 (CH), 123.1 (CH), 121.1 (C), 119.9 (C), 118.6 (C), 118.4 (C), 114.5 (C), 113.8 (CH), 111.7 (C). HRMS (ESI) m/z: 320.1182 calcd for C22H14N3+[M–Br]+, found 320.1178.

3-(Pyridin-2-yl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium iodide (3m). Compound 3m (160 mg, 92%) was obtained from 1-(4-(2-bromophenyl)-2-(pyridin-2-yl)-1H-pyrrolo-3-yl)pyridin-1-ium iodide (1m) (200 mg, 0.49 mmol, 1 equiv), TTMSS (153 mg, 0.62 mmol, 1.5 equiv) and AIBN (135 mg, 0.82 mmol, 2 equiv) according to the general procedure C. Orange solid, mp > 400 °C (MeCN/EtOAc). 1H NMR (400 MHz, DMSO-d6): δ 11.57 (d, J = 6.7 Hz, 1H), 9.18 (dd, J = 8.8, 1.5 Hz, 1H), 8.73 (d, J = 8.4 Hz, 1H), 8.57 (dd, J = 5.0, 1.8 Hz, 1H), 8.29–8.19 (m, 3H), 8.06 (s, 1H), 7.94–7.88 (m, 1H), 7.83–7.77 (m, 2H), 7.51–7.45 (m, 1H), 7.22–7.17 (m, 1H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 156.8 (C), 147.2 (CH), 139.5 (C), 138.6 (CH), 136.4 (CH), 135.0 (CH), 132.8 (CH), 131.0 (C), 127.9(C), 125.9 (CH), 124.5 (CH), 123.4 (CH), 123.0
(CH), 122.66 (CH), 122.20 (CH), 122.08 (CH), 120.9 (C), 119.8 (CH), 118.9 (C), 116.7 (C).

HRMS (ESI) m/z: 296.1182 calcd for C_{20}H_{14}N_3^+ [M – I]^+, found 296.1186.

7-Methyl-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3n). Compound 3n (128 mg, 77%) was obtained from 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrro-3-yl)-4-methylpyridin-1-ium bromide (1n) (200 mg, 0.425 mmol, 1 equiv), TTMSS (158 mg, 0.64 mmol, 1.5 equiv) and AIBN (140 mg, 0.85 mmol, 2 equiv) according to the general procedure C. Orange solid, mp > 400 °C (MeCN/EtOAc). 1H NMR (400 MHz, DMSO-d6): δ 13.03 (s, 1H), 9.28–9.24 (m, 1H), 8.95 (d, J = 6.9 Hz, 1H), 8.90 (d, J = 8.4 Hz, 1H), 8.42 (dd, J = 8.0, 1.3 Hz, 1H), 8.29 (d, J = 3.2 Hz, 1H), 7.99–7.92 (m, 1H), 7.84 (dd, J = 7.0, 1.8 Hz, 1H), 7.75–7.61 (m, 6H), 2.69 (s, 3H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 152.9 (C), 142.1 (C), 134.1 (CH), 133.7 (CH), 130.7 (C), 130.1 (CH), 129.5 (CH), 129.4 (C), 127.0 (CH), 126.6 (CH), 125.2 (CH), 123.9 (CH), 123.4 (C), 123.1 (CH), 121.2 (C), 120.7 (C), 117.2 (C), 113.6 (C), 112.5 (CH), 21.4 (CH3). HRMS (ESI) m/z: 309.1386 calcd for C_{22}H_{17}N_2+[M – Br]^+, found 309.1390.

7-Methoxy-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3o). Compound 3o (119 mg, 72%) was obtained from 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrro-3-yl)-4-methoxypyridin-1-ium bromide (1o) (200 mg, 0.41 mmol, 1 equiv), TTMSS (153 mg, 0.616 mmol, 1.5 equiv) and AIBN (134 mg, 0.82 mmol, 2 equiv) according to the general procedure C. Yellow-green solid, mp 213–214 °C (MeCN/EtOAc). 1H NMR (400 MHz, DMSO-d6): δ 12.86 (s, 1H), 8.95–8.88 (m, 2H), 8.63 (d, J = 2.9 Hz, 1H), 8.37 (d, J = 7.9 Hz, 1H), 8.22 (d, J = 3.2 Hz, 1H), 7.96–7.90 (m, 1H), 7.71–7.59 (m, 7H), 4.21 (s, 3H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 166.9 (C), 145.1 (C), 136.7 (CH), 133.6 (CH), 130.8 (C), 130.2 (CH), 129.4 (CH), 129.3 (CH), 129.3 (C), 127.0 (CH), 126.7 (CH), 122.9 (CH), 120.6 (C), 120.3 (C), 117.0 (C), 112.9 (CH), 112.5 (CH), 106.8 (CH), 58.0 (CH3). HRMS (ESI) m/z: 325.1335 calcd for C_{22}H_{17}N_2O^+[M – Br]^+, found 325.1348.

7-(Dimethylamino)-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3p). Compound 3p (215 mg, 85%) was obtained from 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrro-3-yl)-4-(dimethylamino)pyridin-1-ium bromide (1p) (300 mg, 0.40 mmol, 1 equiv), TTMSS (223 mg, 0.60 mmol, 1.5 equiv) and AIBN (198 mg, 0.80 mmol, 2 equiv) according to the general procedure C. Yellow solid, mp 355–357 °C (dec., MeCN/EtOAc). 1H NMR (400 MHz, DMSO-d6): δ 12.47 (d, J = 3.2 Hz, 1H), 8.68 (d, J = 8.4 Hz, 1H), 8.31 (d, J = 7.9 Hz, 1H), 8.19–8.14 (m, 1H), 7.99 (d, J = 3.2 Hz, 1H), 7.78–7.70 (m, 2H), 7.64–7.56 (m, 5H), 7.53–7.47 (m, 1H), 7.14 (dd, J = 7.9, 3.0 Hz, 1H), 3.36–3.18 (m, 6H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 153.6 (C), 142.1 (C), 134.0 (CH), 132.5 (CH), 131.2 (C), 130.1 (CH), 129.2 (CH), 120.0 (CH), 126.4 (CH), 123.9 (CH), 123.4 (C), 123.1 (CH), 121.2 (C), 120.7 (C), 117.2 (C), 113.6 (C), 112.5 (CH), 21.4 (CH3). HRMS (ESI) m/z: 398.1749 calcd for C_{22}H_{15}N_2^+[M – Br]^+, found 398.1751.
126.3 (CH), 122.8 (CH), 120.9 (C), 118.8 (C), 116.8 (C), 112.4 (CH), 111.9 (C), 107.7 (CH), 101.1 (CH), 39.9 (CH₃). HRMS (ESI) m/z: 338.1652 calcd for C₂₃H₂₀N₃⁺ [M – Br]⁺, found 338.1656.

3,7-Diphenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3q). Compound 3q (68 mg, 53%) was obtained from 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrolo-3-yl)-4-phenylpyridin-1-ium bromide (1q) (150 mg, 0.282 mmol, 1 equiv), TTMSS (105 mg, 0.56 mmol, 1.5 equiv) and AIBN (92 mg, 0.75 mmol, 2 equiv) according to the general procedure C. Orange solid, mp > 400 °C (dec., MeCN/EtOAc). ¹H NMR (400 MHz, DMSO-d₆): δ 13.11 (s, 1H), 9.51 (d, J = 2.2 Hz, 1H), 9.22 (d, J = 8.5 Hz, 1H), 9.11 (d, J = 7.2 Hz, 1H), 8.49–8.39 (m, 2H), 8.32 (d, J = 3.2 Hz, 1H), 8.28–8.23 (m, 2H), 8.02–7.96 (m, 1H), 7.81–7.61 (m, 9H). ¹³C{¹H} NMR (101 MHz, DMSO-d₆): δ 112.5 (CH), 149.5 (C), 143.0 (C), 135.0 (CH), 134.0 (C), 133.8 (CH), 131.6 (CH), 130.8 (C), 130.3 (CH), 129.6 (CH), 129.5 (CH), 128.1 (CH), 127.4 (CH), 127.0 (CH), 123.3 (C), 123.0 (CH), 121.4 (C), 121.19 (CH), 121.14 (C), 120.0 (CH), 117.3 (C), 113.8 (C). HRMS (ESI) m/z: 371.1543 calcd for C₂₇H₁₉N₃⁺ [M – Br]⁺, found 371.1547.

7-(4-Methoxyphenyl)-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3r). Compound 3r (73 mg, 71%) was obtained from 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrolo-3-yl)-4-(4-methoxyphenyl)pyridin-1-ium bromide (1r) (120 mg, 0.214 mmol, 1 equiv), TTMSS (80 mg, 0.32 mmol, 1.5 equiv) and AIBN (70 mg, 0.43 mmol, 2 equiv) according to the general procedure C. Dark orange solid, mp 230–233 °C (MeCN/EtOAc). ¹H NMR (500 MHz, DMSO-d₆): δ 13.04 (d, J = 3.3 Hz, 1H), 9.33 (d, J = 2.3 Hz, 1H), 9.15 (d, J = 8.5 Hz, 1H), 8.96 (d, J = 7.2 Hz, 1H), 8.38 (d, J = 7.6 Hz, 1H), 8.34 (d, J = 7.4 Hz, 1H), 8.28–8.22 (m, 3H), 7.95–7.90 (m, 1H), 7.75–7.63 (m, 6H), 7.18–7.12 (m, 2H), 3.88 (s, 3H). ¹³C{¹H} NMR (126 MHz, DMSO-d₆): δ 162.3 (C), 149.0 (C), 142.8 (C), 134.7 (CH), 133.7 (CH), 130.8 (C), 130.2 (CH), 129.9 (CH), 129.50 (CH), 129.46 (CH), 127.3 (CH), 126.9 (CH), 125.8 (C), 123.0 (CH), 121.14 (C), 121.12 (C), 120.2 (CH), 118.4 (CH), 117.2 (CH), 114.9 (CH), 113.6 (C), 112.5 (CH), 55.6 (CH₃). HRMS (ESI) m/z: 401.1648 calcd for C₂₈H₂₁N₂O⁺ [M – Br]⁺, found 401.1663.

6,8-Dimethyl-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3s). Compound 3s (93 mg, 56%) was obtained from 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrolo-3-yl)-3,5-dimethylpyridin-1-ium bromide (1s) (200 mg, 0.41 mmol, 1 equiv), TTMSS (154 mg, 0.62 mmol, 1.5 equiv) and AIBN (135 mg, 0.83 mmol, 2 equiv) according to the general procedure C. Orange solid, mp > 400 °C (MeCN/EtOAc). ¹H NMR (400 MHz, DMSO-d₆): δ 13.08 (s, 1H), 8.92–8.87 (m, 1H), 8.68 (d, J = 8.5 Hz, 1H), 8.43 (dd, J = 7.9, 1.4 Hz, 1H), 8.38 (d, J = 1.8 Hz, 1H), 8.26 (d, J = 3.2 Hz, 1H), 7.94–7.89 (m, 1H), 7.69–7.60 (m, 6H), 3.08 (s, 3H), 2.24 (s, 3H).
$^{13}$C{[H]} NMR (101 MHz, DMSO-$d_6$): $\delta$ 145.1 (CH), 136.5 (C), 133.2 (CH), 132.7 (CH), 132.6 (C), 130.8 (C), 130.1 (C), 130.0 (CH), 129.5 (CH), 129.3 (CH), 128.5 (CH), 125.8 (CH), 122.9 (CH), 121.6 (C), 121.5 (C), 117.9 (C), 114.0 (C), 112.1 (CH), 25.6 (CH$_3$), 17.3 (CH$_3$). HRMS (ESI) m/z: 323.1543 calcd for C$_{22}$H$_{19}$N$_2$$^+$ [M – Br]$^+$, found 323.1538.

1-(2-(2,4-Dimethoxyphenyl)-2-oxoethyl)pyridin-1-ium bromide (5i). Compound 5i (391 mg, 75%) was obtained from pyridine (122 mg, 1.54 mmol, 1 equiv) and 2-bromo-1-(2,4-dimethoxyphenyl)ethan-1-one (400 mg, 1.54 mmol, 1 equiv) in acetone (10 mL). Pale yellow solid, mp 287–288 °C (acetone). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 8.99 (d, $J$ = 5.6 Hz, 2H), 8.69 (t, $J$ = 7.5 Hz, 1H), 8.22 (t, $J$ = 6.6 Hz, 2H), 7.86 (d, $J$ = 8.7 Hz, 1H), 6.80 (d, $J$ = 2.1 Hz, 1H), 6.73 (dd, $J$ = 8.9, 2.1 Hz, 1H), 6.16 (s, 2H), 4.04 (s, 3H), 3.90 (s, 3H). $^{13}$C{[H]} NMR (101 MHz, DMSO-$d_6$): $\delta$ 187.9 (C), 165.8 (C), 162.0 (C), 146.0 (CH), 145.8 (CH), 132.1 (CH), 127.2 (CH), 115.9 (C), 107.0 (CH), 98.2 (CH), 69.4 (CH$_2$), 56.2 (CH$_3$), 55.8 (CH$_3$). HRMS (ESI) m/z: 258.1125 calcd for C$_{15}$H$_{16}$NO$_3$$^+$ [M – Br]$^+$, found 258.1129.

4-(4-Methoxyphenyl)-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5r). Compound 5r (541 mg, 87%) was obtained from 4-(4-methoxyphenyl)pyridine (300 mg, 1.62 mmol, 1 equiv) and 2-bromo-1-phenylethan-1-one (323 mg, 1.62 mmol, 1 equiv) in acetone (10 mL). White solid, mp 256–257 °C (acetone). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 8.97 (d, $J$ = 6.8 Hz, 2H), 8.60 (d, $J$ = 6.9 Hz, 2H), 8.17 (d, $J$ = 8.8 Hz, 2H), 8.09 (d, $J$ = 7.5 Hz, 1H), 7.67 (t, $J$ = 7.7 Hz, 2H), 7.21 (d, $J$ = 8.8 Hz, 2H), 6.50 (s, 2H), 3.90 (s, 3H). $^{13}$C{[H]} NMR (101 MHz, DMSO-$d_6$): $\delta$ 191.0 (C), 162.9 (C), 154.6 (C), 145.8 (CH), 133.6 (C), 130.2 (CH), 129.1 (CH), 128.2 (CH), 125.3 (C), 122.8 (CH), 115.2 (CH), 65.1 (CH$_2$), 55.7 (CH$_3$). HRMS (ESI) m/z: 304.1332 calcd for C$_{20}$H$_{18}$NO$_2$$^+$ [M – Br]$^+$, found 304.1328.

4-(Methoxycarbonyl)-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5u). Compound (842 mg, 80%) 5u was obtained from methyl isonicotinate (400 mg, 2.92 mmol, 1 equiv) and 2-bromo-1-phenylethan-1-one (581 mg, 2.92 mmol, 1 equiv) in acetone (5 mL). White solid, mp 178 °C (dec., acetone). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 9.26 (d, $J$ = 6.5 Hz, 2H), 8.66 (d, $J$ = 6.5 Hz, 2H), 8.08 (d, $J$ = 7.5 Hz, 2H), 7.80 (t, $J$ = 7.4 Hz, 1H), 7.67 (t, $J$ = 7.7 Hz, 2H), 7.21 (d, $J$ = 8.8 Hz, 2H), 6.50 (s, 2H), 3.90 (s, 3H). $^{13}$C{[H]} NMR (101 MHz, DMSO-$d_6$): $\delta$ 190.3 (C), 162.5 (C), 147.8 (CH), 144.4 (C), 134.7 (CH), 133.5 (C), 129.1 (CH), 128.3 (CH), 127.0 (CH), 66.7 (CH$_2$), 53.8 (CH$_3$). HRMS (ESI) m/z: 256.0968 calcd for C$_{15}$H$_{14}$NO$_3$$^+$ [M – Br]$^+$, found 256.0973.

4-Benzoyl-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5w). Compound 5w (291 mg, 84%) was obtained from phenyl(pyridin-4-yl)methanone (166 mg, 0.905 mmol, 1 equiv) and 2-bromo-
1-phenylethan-1-one (180 mg, 0.905 mmol, 1 equiv) in acetone (8 mL). White solid, mp 191–192 °C (acetone). \(^1\)H NMR (400 MHz, DMSO-d6): \(\delta\) 9.25 (d, \(J = 6.7\) Hz, 1H), 8.51 (d, \(J = 6.7\) Hz, 1H), 8.15–8.08 (m, 1H), 7.93–7.86 (m, 1H), 7.85–7.80 (m, 1H), 7.71–7.65 (m, 2H), 6.65 (s, 1H). \(^1\)C NMR{1H} (101 MHz, DMSO-d6): \(\delta\) 192.0 (C), 190.4 (C), 152.1 (C), 147.3 (CH), 134.82 (CH), 134.78 (CH), 134.1 (C), 133.5 (C), 130.3 (CH), 129.1 (CH), 128.3 (CH), 126.8 (CH), 66.4 (CH2). HRMS (ESI) m/z: 302.1176 calcd for C\(_{20}\)H\(_{16}\)NO\(_2\)\([\text{M} - \text{Br}]^+\), found 302.1189.

**General procedure D for the synthesis of pyrido[2,1-a]pyrroloisoquinolines 6 and 17.**

The corresponding salt was dissolved in water (about 1 mg in 1 ml) and then aq 10% KOH (about 0.3 ml per 1 mg of salt) and DCM, in a volume sufficient to completely dissolve the product, were added. After stirring for 1 min the organic layer was separated. The water layer was twice extracted with DCM and the combined DCM solution was dried under Na\(_2\)SO\(_4\), filtered and evaporated to dryness to give the product.

3-Phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6a). Compound 6a (78 mg, 99%) was obtained from bromide (3a) (100 mg, 0.27 mmol) according to the general procedure D. Dark purple solid, mp 195–197 °C (DCM). \(^1\)H NMR (400 MHz, DMSO-d6): \(\delta\) 9.26 (dd, \(J = 6.8, 1.2\) Hz, 1H), 9.17 (dd, \(J = 9.0, 1.5\) Hz, 1H), 8.73 (d, \(J = 8.5\) Hz, 1H), 8.25 (dd, \(J = 8.2, 1.2\) Hz, 1H), 8.11 (dddd, \(J = 8.7, 7.2, 1.4\) Hz, 1H), 7.94 (s, 1H), 7.82–7.73 (m, 2H), 7.63–7.58 (m, 2H), 7.49–7.42 (m, 3H), 7.38–7.30 (m, 1H). \(^1\)C{1H} NMR (101 MHz, DMSO-d6): \(\delta\) 139.2 (C), 137.9 (C), 134.8 (CH), 133.4 (CH), 132.9 (CH), 131.2 (C), 129.6 (CH), 128.5 (CH), 127.8 (C), 126.5 (CH), 126.1 (CH), 124.3 (CH), 123.7 (CH), 122.6 (CH), 122.2 (CH), 119.9 (CH), 118.8 (C), 117.6 (C), 114.9 (C). HRMS (ESI) m/z: 295.1230 calcd for C\(_{21}\)H\(_{15}\)N\(_2\)\([\text{M} + \text{H}]^+\), found 295.1235.

3-(4-Chlorophenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6c). Compound 6c (22 mg, 99%) was obtained from bromide (3c) (27 mg, 0.066 mmol) according to the general procedure D. Dark red solid, mp 207–209 °C (dec., DCM). \(^1\)H NMR (400 MHz, DMSO-d6): \(\delta\) 9.25–9.14 (m, 2H), 8.75 (d, \(J = 8.5\) Hz, 1H), 8.26 (d, \(J = 8.1\) Hz, 1H), 8.19–8.14 (m, 1H), 7.97 (s, 1H), 7.85–7.77 (m, 2H), 7.67–7.60 (m, 2H), 7.53–7.44 (m, 3H). \(^1\)C{1H} NMR (101 MHz, DMSO-d6): \(\delta\) 138.9 (C), 137.7 (C), 134.3 (CH), 133.6 (CH), 132.8 (CH), 131.3 (C), 131.0 (CH), 130.5 (C), 128.3 (CH), 127.4 (C), 126.0 (CH), 124.0 (CH), 123.6 (CH), 122.6 (CH), 122.1 (CH), 121.4 (CH), 118.6 (C), 117.9 (C), 115.3 (C). HRMS (ESI) m/z: 329.0840 calcd for C\(_{21}\)H\(_{14}\)ClN\(_2\)\([\text{M} + \text{H}]^+\), found 329.0850.

3-(3-Methyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6e). Compound 6e (31 mg, 98%) was obtained from bromide (3e) (40 mg, 0.10 mmol) according to the general procedure D. Dark
3-(4-Methoxyphenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6f). Compound 6f (41 mg, 98%) was obtained from bromide (3f) (69 mg, 0.17 mmol) according to the general procedure D. Dark red solid, mp 150–151 °C (dec., DCM). 1H NMR (400 MHz, DMSO-d6): δ 9.23 (dd, J = 18.4, 7.7 Hz, 2H), 8.76 (d, J = 8.4 Hz, 1H), 8.74 (d, J = 8.0 Hz, 1H), 8.28 (m, 2H), 8.06 (s, 1H), 7.87–7.83 (m, 2H), 7.53 (m, 2H), 7.30 (d, J = 8.5, 6.4 Hz, 3H), 7.12–7.06 (m, 2H), 3.85 (s, 3H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 160.0 (C), 142.5 (C), 139.7 (CH), 134.7 (CH), 133.8 (CH), 131.6 (CH), 129.5 (C), 127.0 (CH), 126.6 (CH), 124.3 (CH), 124.1 (CH), 123.0 (CH), 122.5 (C), 121.5 (C), 120.7 (C), 117.2 (C), 114.9 (CH), 113.6 (C), 111.9 (CH), 55.4 (CH3). HRMS (ESI) m/z: 325.1335 calculated for C22H17N2O+ [M + H]+, found 325.1349.

3-(2-Methoxyphenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6g). Compound 6g (40 mg, 98%) was obtained from bromide (3g) (51 mg, 0.125 mmol) according to the general procedure D. Dark red solid, mp 176–177 °C (dec., DCM). 1H NMR (400 MHz, DMSO-d6): δ 9.23 (d, J = 8.7 Hz, 1H), 8.80 (d, J = 8.5 Hz, 1H), 8.74 (dd, J = 6.8, 1.3 Hz, 1H), 8.34–8.25 (m, 2H), 8.10 (s, 1H), 7.90–7.83 (m, 2H), 7.66 (dd, J = 7.6, 1.9 Hz, 1H), 7.59–7.48 (m, 2H), 7.23–7.14 (m, 2H), 3.58 (s, 3H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 155.9 (C), 138.9 (C), 134.4 (CH), 134.3 (CH), 132.8 (CH), 132.0 (CH), 131.2 (C), 128.5 (CH), 126.1 (CH), 124.2 (CH), 123.8 (C), 122.8 (CH), 122.2 (CH), 121.8 (CH), 120.8 (CH), 119.8 (CH), 119.2 (C), 118.7 (C), 114.3 (C), 111.3 (C), 54.8 (CH3). HRMS (ESI) m/z: 325.1335 calculated for C22H17N2O+ [M + H]+, found 325.1331.

3-(3-Methoxyphenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6h). Compound 6h (57 mg, 99%) was obtained from bromide (3h) (72 mg, 0.18 mmol) according to the general procedure D. Dark brown solid, mp 153–155 °C (DCM). 1H NMR (400 MHz, DMSO-d6): δ 9.30 (d, J = 6.7 Hz, 1H), 9.19 (d, J = 8.7 Hz, 1H), 8.76 (d, J = 8.5 Hz, 1H), 8.27 (d, J = 8.1 Hz, 1H), 8.19–8.12 (m, 1H), 7.96 (s, 1H), 7.84–7.77 (m, 2H), 7.48 (ddd, J = 8.4, 6.9, 1.3 Hz, 1H), 7.42–7.36 (m, 1H), 7.22–7.14 (m, 2H), 6.92 (d, J = 8.2, 2.6 Hz, 1H), 3.80 (s, 3H). 13C{1H} NMR (126 MHz, DMSO-d6): δ 159.3 (C), 139.8 (C), 139.0 (C), 134.4 (CH), 133.6 (CH), 132.8 (CH), 131.3 (C), 129.4 (CH), 128.3 (C), 126.0 (CH), 124.1 (CH), 123.6 (CH), 122.4 (CH), 122.2 (CH), 121.8
(CH), 120.4 (CH), 118.7 (C), 115.0 (C), 114.7 (CH), 112.3 (CH), 55.1 (CH). HRMS (ESI) m/z: 325.1335 calcd for C\(_{22}\)H\(_{17}\)N\(_2\)O\(_2\) [M + H]\(^+\), found 325.1339.

3-(2,4-Dimethoxyphenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6i). Compound 6i (46 mg, 99%) was obtained from bromide (3i) (59 mg, 0.13 mmol) according to the general procedure D. Dark brown solid, mp 202–205 °C (DCM). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 9.15 (d, \(J = 8.7\) Hz, 1H), 8.80–8.68 (m, 2H), 8.24 (d, \(J = 8.0\) Hz, 1H), 8.21–8.13 (m, 1H), 7.97 (s, 1H), 7.84–7.76 (m, 2H), 7.58–7.51 (m, 1H), 7.51–7.44 (m, 1H), 6.76–6.70 (m, 2H), 3.87 (s, 3H), 3.56 (s, 3H).

\(^{13}\)C{\(^1\)H} NMR (101 MHz, DMSO-\(d_6\)): \(\delta\) 160.4 (C), 157.1 (C), 139.3 (C), 134.8 (CH), 134.2 (CH), 132.9 (CH), 132.6 (CH), 131.1 (C), 126.1 (CH), 124.5 (CH), 123.0, 122.9 (CH), 122.23 (CH), 122.17 (CH), 118.9 (C), 118.7 (C), 118.3 (CH), 118.1 (C), 114.0 (C), 105.6 (CH), 98.7 (CH), 55.3 (CH\(_3\)), 55.0 (CH\(_3\)). HRMS (ESI) m/z: 355.1441 calcd for C\(_{23}\)H\(_{19}\)N\(_2\)O\(_2\) [M + H]\(^+\), found 355.1448.

4-(Pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-3-yl)benzonitrile (6l). Compound 6l (37 mg, 99%) was obtained from bromide (3l) (46 mg, 0.115 mmol) according to the general procedure D. Dark red solid, mp 225–227 °C (DCM). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 9.23 (d, \(J = 8.7\) Hz, 1H), 9.17 (d, \(J = 6.8\) Hz, 1H), 8.79 (d, \(J = 8.5\) Hz, 1H), 8.29 (d, \(J = 8.0\) Hz, 1H), 8.21 (ddd, \(J = 8.7, 7.2, 1.4\) Hz, 1H), 8.03 (s, 1H), 7.87–7.79 (m, 6H), 7.51 (ddd, \(J = 8.3, 6.9, 1.3\) Hz, 1H).

\(^{13}\)C{\(^1\)H} NMR (101 MHz, DMSO-\(d_6\)): \(\delta\) 143.4 (C), 139.2 (C), 134.8 (CH), 134.4 (CH), 132.9 (CH), 132.2 (CH), 131.1 (C), 129.2 (CH), 127.2 (C), 126.0 (CH), 124.3 (CH), 123.7 (CH), 123.1 (CH), 122.6 (CH), 122.2 (CH), 119.5 (C), 119.0 (C), 118.9 (C), 116.4 (C), 107.2 (C). HRMS (ESI) m/z: 320.1182 calcd for C\(_{22}\)H\(_{14}\)N\(_3\) [M + H]\(^+\), found 320.1186.

3-(Pyridin-2-yl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6m). Compound 6m (59 mg, 99%) was obtained from iodide (3m) (85 mg, 0.20 mmol) according to the general procedure D. Dark purple solid, mp 92–93 °C (DCM). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 11.57 (d, \(J = 6.7\) Hz, 1H), 9.18 (dd, \(J = 8.8, 1.5\) Hz, 1H), 8.73 (d, \(J = 8.4\) Hz, 1H), 8.57 (dd, \(J = 5.0, 1.8\) Hz, 1H), 8.32–8.18 (m, 3H), 8.06 (s, 1H), 7.95–7.90 (m, 1H), 7.83–7.76 (m, 2H), 7.48 (ddd, \(J = 8.3, 6.9, 1.3\) Hz, 1H), 7.19 (ddd, \(J = 7.3, 4.9, 1.2\) Hz, 1H).

\(^{13}\)C{\(^1\)H} NMR (101 MHz, DMSO-\(d_6\)): \(\delta\) 156.8 (C), 147.2 (CH), 139.5 (C), 138.6 (CH), 136.4 (CH), 135.0 (CH), 132.8 (CH), 131.0 (C), 127.9 (C), 125.9 (CH), 124.5 (CH), 123.5 (CH), 123.0 (CH), 122.7 (C), 122.21 (CH), 122.1 (CH), 120.9 (C), 119.8 (CH), 118.9 (C), 116.7 (C). HRMS (ESI) m/z: 296.1182 calcd for C\(_{20}\)H\(_{14}\)N\(_3^+\) [M + H]\(^+\), found 296.1193.
7-Methyl-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6n). Compound 6n (54.5 mg, 99%) was obtained from bromide (3n) (69 mg, 0.18 mmol) according to the general procedure D. Dark brown solid, mp > 400 °C (DCM). 1H NMR (400 MHz, DMSO-d6): δ 9.11–9.05 (m, 2H), 8.76 (d, J = 8.4 Hz, 1H), 8.25 (dd, J = 8.2, 1.2 Hz, 1H), 7.95 (s, 1H), 7.83–7.77 (m, 1H), 7.68 (dd, J = 7.0, 1.9 Hz, 1H), 7.62–7.58 (m, 2H), 7.51–7.45 (m, 3H), 7.39–7.34 (m, 1H), 2.63 (s, 3H). 13C{1H} NMR (126 MHz, DMSO-d6): δ 147.5 (C), 139.2 (C), 137.5 (C), 132.7 (CH), 131.2 (C), 129.5 (CH), 128.5 (CH), 127.0 (C), 126.6 (CH), 126.1 (CH), 124.2 (CH), 123.9 (CH), 123.1 (CH), 122.2 (CH), 119.4 (CH), 118.6 (C), 117.3 (C), 114.5 (C), 21.0 (CH3). HRMS (ESI) m/z: 309.1386 calcd for C22H17N2+ [M + H]+, found 309.1400.

7-Methoxy-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6o). Compound 6o (45 mg, 99%) was obtained from bromide (3o) (57 mg, 0.14 mmol) according to the general procedure D. Dark orange solid, mp 149–151 °C (dec., DCM). 1H NMR (400 MHz, DMSO-d6): δ 9.07 (d, J = 7.6 Hz, 1H), 8.77 (d, J = 8.4 Hz, 1H), 8.46 (d, J = 3.0 Hz, 1H), 8.18 (dd, J = 8.1, 1.2 Hz, 1H), 7.86 (s, 1H), 7.76 (ddd, J = 8.0, 6.9, 1.0 Hz, 1H), 7.59–7.52 (m, 3H), 7.48–7.39 (m, 3H), 7.36–7.31 (m, 1H), 4.15 (s, 3H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 163.3 (C), 142.0 (C), 138.5 (C), 135.2 (CH), 132.8 (CH), 131.6 (C), 129.5 (CH), 128.4 (CH), 127.0 (C), 126.4 (CH), 126.0 (CH), 123.5 (CH), 122.0 (CH), 120.5 (CH), 118.2 (C), 117.0 (C), 113.8 (C), 112.2 (CH), 105.3 (CH), 57.2 (CH3). HRMS (ESI) m/z: 325.1335 calcd for C22H17N2O+ [M + H]+, found 325.1333.

N,N-Dimethyl-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-7-amine (6p). Compound 6p (127 mg, 99%) was obtained from bromide (3p) (159 mg, 0.38 mmol) according to the general procedure D. Orange solid, mp 199–200 °C (DCM). 1H NMR (400 MHz, DMSO-d6): δ 8.69–8.61 (m, 2H), 8.09 (d, J = 7.9 Hz, 1H), 7.82–7.76 (m, 2H), 7.72–7.66 (m, 1H), 7.56 (d, J = 7.5 Hz, 2H), 7.50–7.45 (m, 2H), 7.41–7.34 (m, 2H), 7.22 (dd, J = 7.8, 3.0 Hz, 1H), 3.27 (s, 6H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 153.0 (C), 141.7 (C), 134.0 (CH), 132.4 (CH), 130.0 (C), 129.9 (C), 128.9 (CH), 128.1 (CH), 127.8 (CH), 127.4 (CH), 126.2 (CH), 125.3 (CH), 122.5 (CH), 121.2 (C), 120.2 (C), 116.9 (C), 112.1 (C), 107.6 (CH), 100.9 (CH), 39.5 (CH3). HRMS (ESI) m/z: 338.1652 calcd for C23H20N3+ [M + H]+, found 338.1656.

3,7-Diphenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6q). Compound 6q (49 mg, 99%) was obtained from bromide (3q) (60 mg, 0.135 mmol) according to the general procedure D. Dark brown solid, mp 195–198 °C (DCM). 1H NMR (400 MHz, DMSO-d6): δ 9.32 (d, J = 2.2 Hz, 1H), 9.21 (d, J = 7.2 Hz, 1H), 9.02 (d, J = 8.5 Hz, 1H), 8.27–8.14 (m, 4H), 7.97 (s, 1H), 7.84–7.78 (m, 1H), 7.66–7.46 (m, 8H), 7.43–7.38 (m, 1H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 144.7 (C), 139.5 (C), 137.8 (C), 134.7 (C), 133.4 (CH), 132.9 (CH), 131.2 (C), 130.6 (CH), 126.1 (CH), 125.3 (CH), 122.5 (CH), 121.2 (C), 120.2 (C), 116.9 (C), 112.1 (C), 107.6 (CH), 100.9 (CH), 39.5 (CH3).
129.6 (CH), 129.3 (CH), 128.6 (CH), 127.7 (C), 126.7 (CH), 126.6 (CH), 124.3 (CH), 122.1 (CH), 120.0 (CH), 119.8 (CH), 119.5 (CH), 119.1 (C), 117.4 (C), 114.8 (C). HRMS (ESI) m/z: 371.1543 calcd for C_{27}H_{19}N_{2}^+[M + H]^+, found 371.1531.

7-(4-Methoxyphenyl)-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6r). Compound 6r (31.5 mg, 99%) was obtained from bromide (3r) (38 mg, 0.079 mmol) according to the general procedure D. Dark brown solid, mp 149–151 °C (DCM). 1H NMR (400 MHz, DMSO-d$_6$): δ 9.25 (d, J = 2.3 Hz, 1H), 9.11 (d, J = 7.2 Hz, 1H), 9.03 (d, J = 8.5 Hz, 1H), 8.27–8.16 (m, 4H), 7.99 (s, 1H), 7.69–7.62 (m, 2H), 7.56–7.48 (m, 3H), 7.46–7.41 (m, 1H), 7.16–7.11 (m, 2H), 3.87 (s, 3H).

13C{1H} NMR (101 MHz, DMSO-d$_6$): δ 161.6 (C), 145.2 (C), 140.1 (C), 136.6 (C), 133.6 (CH), 132.9 (CH), 130.9 (C), 129.7 (CH), 129.3 (CH), 128.7 (CH), 127.0 (CH), 126.8 (CH), 126.6 (C), 126.3 (C), 124.6 (CH), 122.2 (CH), 119.5 (C), 119.4 (CH), 118.5 (CH), 118.1 (CH), 117.4 (C), 114.8 (CH), 114.4 (C), 55.5 (CH$_3$). HRMS (ESI) m/z: 401.1648 calcd for C$_{28}$H$_{21}$N$_2$O$_2$^+[M + H]^+, found 401.1644.

6,8-Dimethyl-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (6s). Compound 6s (32 mg, 99%) was obtained from bromide (3s) (40 mg, 0.1 mmol) according to the general procedure D. Brown solid, mp 208 °C (DCM). 1H NMR (400 MHz, DMSO-d$_6$): δ 9.04 (s, 1H), 8.61 (d, J = 8.6 Hz, 1H), 8.27 (d, J = 8.0 Hz, 1H), 8.05 (s, 1H), 7.93 (s, 1H), 7.81–7.75 (m, 1H), 7.64–7.58 (m, 2H), 7.51–7.36 (m, 4H), 3.06 (s, 3H), 2.23 (s, 3H).

13C{1H} NMR (101 MHz, DMSO-d$_6$): δ 142.33 (CH), 142.31 (CH), 139.1 (C), 135.9 (C), 132.3 (CH), 132.2 (CH), 131.6 (C), 131.2 (C), 129.7 (CH), 129.6 (CH), 128.7 (CH), 127.6 (CH), 124.0 (CH), 122.4 (CH), 120.3 (C), 118.0 (C), 116.5 (C), 114.7 (C), 25.7 (CH$_3$), 17.3 (CH$_3$). HRMS (ESI) m/z: 323.1543 calcd for C$_{22}$H$_{17}$N$_2$O$^+[M + H]^+$, found 323.1547.

1-(4-(2-Bromophenyl)-5-(tert-butoxycarbonyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (7). Compound 7 (366 mg, 73%) was obtained from 1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5a) (249 mg, 0.903 mmol, 1 equiv), triethylamine (136 mg, 1.35 mmol, 1.5 equiv) and tert-butyl 3-(2-bromophenyl)-2H-azirine-2-carboxylate (4b) (400 mg, 1.35 mmol, 1.5 equiv) in 10 mL of DCM according to the general procedure A. Colorless solid, mp 260–261 °C (dec., DCM). 1H NMR (400 MHz, DMSO-d$_6$): δ 13.23 (br. s, 1H), 9.02 (d, J = 5.9 Hz, 2H), 8.72–8.65 (m, 1H), 8.17 (t, J = 7.2 Hz, 2H), 7.63 (dd, J = 8.0, 1.2 Hz, 1H), 7.46 (dd, J = 7.6, 1.8 Hz, 1H), 7.42–7.23 (m, 7H), 1.21 (s, 9H). 13C{1H} NMR (101 MHz, DMSO-d$_6$): δ 159.1 (C), 147.9 (CH), 147.2 (CH), 132.1 (CH), 132.04 (CH), 131.98 (C), 130.4 (C), 130.2 (CH), 129.2 (CH), 129.0 (CH), 128.6 (CH), 127.8 (CH), 127.4 (C), 127.1 (C), 124.6 (C), 124.17 (C), 124.14 (C), 120.6
(C), 80.8 (C), 27.4 (CH₃). HRMS (ESI) m/z: 475.1016 calcd for C₅H₂₄Br₂N₂O₂⁺ [M – Br]⁺, found 475.1034.

1-(Tert-butoxycarbonyl)-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (8). Compound 8 (64 mg, 50%) was obtained from 1-(4-(2-bromophenyl)-5-(tert-butoxycarbonyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (7) (150 mg, 0.271 mmol, 1 equiv), TTMSS (101 mg, 0.406 mmol, 1.5 equiv) and AIBN (89 mg, 0.54 mmol, 2 equiv) according to the general procedure C. Pale orange solid, mp > 400 °C (MeCN/EtOAc).

1-(2-(Bromophenyl)-4-(2-iodophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (9). Compound 9 (240 mg, 49%) was obtained from 1-(2-(bromophenyl)-2-oxoethyl)pyridin-1-ium bromide (15a) (300 mg, 0.84 mmol, 1 equiv), triethylamine (106 mg, 1.05 mmol, 1.5 equiv) and 3-(2-iodophenyl)-2H-azirine (250 mg, 1.05 mmol, 1.5 equiv) in DCM (5 mL) according to the general procedure A. Isolated using column chromatography. Beige solid, mp 340 °C (DCM/MeOH). ¹H NMR (400 MHz, DMSO-d₆): δ 12.45–12.39 (m, 1H), 8.65–8.55 (m, 3H), 8.09 (t, J = 7.1 Hz, 2H), 7.88 (d, J = 7.9 Hz, 1H), 7.71 (dd, J = 8.1, 1.2 Hz, 1H), 7.62 (dd, J = 7.6, 1.8 Hz, 1H), 7.56–7.51 (m, 1H), 7.48–7.37 (m, 3H), 7.34 (d, J = 3.1 Hz, 1H), 7.13–7.09 (m, 1H). ¹³C{¹H} NMR (101 MHz, DMSO-d₆): δ 146.4 (CH), 146.1 (CH), 139.1 (CH), 136.1 (C), 133.3 (CH), 133.1 (CH), 132.1 (C), 131.5 (CH), 130.0 (CH), 129.3 (C), 128.7 (CH), 128.6 (CH), 128.4 (CH), 125.2 (C), 123.8 (C), 123.3 (C), 121.1 (C), 119.2 (CH), 101.4 (C). HRMS (ESI) m/z: 500.9458 calcd for C₂₁H₁₆⁷⁹BrN₂⁺ [M – Br]⁺, found 500.9454.

3-(2-Bromophenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (10). Compound 10 (36 mg, 58%) was obtained from 1-(2-(bromophenyl)-4-(2-iodophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (9) (80 mg, 0.14 mmol, 1 equiv), TTMSS (51 mg, 0.21 mmol, 1.5 equiv) and AIBN (45 mg, 0.28 mmol, 2 equiv) according to the general procedure C. Orange solid, mp > 400 °C (MeCN/EtOAc). ¹H NMR (400 MHz, DMSO-d₆): δ 13.14 (s, 1H), 9.39 (d, J = 8.7 Hz, 1H), 9.13 (d, J = 6.6 Hz, 1H), 8.92 (d, J = 8.4 Hz, 1H), 8.56–8.43 (m, 2H), 8.34 (d, J = 3.2 Hz, 1H), 8.02–7.95 (m, 2H), 7.77–7.62 (m, 6H). ¹³C{¹H} NMR (101 MHz, DMSO-d₆): δ 142.8 (C), 140.0 (CH), 135.0 (CH), 133.9 (CH), 130.7 (C), 130.2 (CH), 129.58 (CH), 129.47...
(CH), 127.2 (CH), 126.7 (CH), 124.4 (CH), 124.1 (CH), 123.1 (CH), 121.7 (C), 121.0 (C), 117.5 (C), 113.9 (C), 112.5 (CH). HRMS (ESI) m/z: 375.0314 calcd for C_{21}H_{14}BrN_2 [M – Br]^+, found 375.0333.

3-(2-Bromophenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinoline (11). Compound 11 (28 mg, 99%) was obtained from 3-(2-bromophenyl)pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-4-ium bromide (10) (35 mg, 0.077 mmol) according to the general procedure D. Dark purple solid, mp 298–300 °C (DCM). ^1H NMR (400 MHz, DMSO-d_6): δ 9.27–9.22 (m, 2H), 8.80 (d, J = 8.5 Hz, 1H), 8.32 (d, J = 8.6 Hz, 1H), 8.27–8.20 (m, 1H), 8.06 (s, 1H), 8.02–7.94 (m, 2H), 7.68–7.62 (m, 2H), 7.57–7.51 (m, 3H), 7.47–7.41 (m, 1H). ^13C{1H} NMR (101 MHz, DMSO-d_6): δ 139.7 (C), 136.9 (C), 135.5 (CH), 133.6 (CH), 133.13 (C), 133.06 (CH), 131.0 (C), 129.7 (CH), 129.6 (CH), 128.6 (CH), 127.0 (CH), 126.2 (CH), 124.7 (CH), 123.8 (CH), 122.8 (CH), 122.4 (CH), 119.1 (C), 118.9 (C), 117.6 (C), 114.7 (C). HRMS (ESI) m/z: 373.0335 calcd for C_{21}H_{14}BrN_2^+ [M + H]^+, found 373.0349.

1-(2,4-Bis(2-bromophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (12). Compound 12 (301 mg, 67%) was obtained from 1-(2-(2-bromophenyl)-2-oxoethyl)-pyridin-1-ium bromide (15a) (300 mg, 0.84 mmol, 1 equiv), triethylamine (127 mg, 1.26 mmol, 1.5 equiv) and 3-(2-bromophenyl)-2H-azirine (4a) (247 mg, 1.26 mmol, 1.5 equiv) in DCM (6 mL) according to the general procedure A. Isolated using column chromatography. Slightly-yellow solid, mp 341–342 °C (DCM/MeOH). ^1H NMR (400 MHz, DMSO-d_6): δ 12.47 (s, 1H), 8.70–8.55 (m, 3H), 8.08 (t, J = 7.0 Hz, 2H), 7.69 (d, J = 8.0 Hz, 1H), 7.67–7.58 (m, 2H), 7.58–7.37 (m, 5H), 7.33–7.29 (m, 1H). ^13C{1H} NMR (101 MHz, DMSO-d_6): δ 146.4 (CH), 146.1 (CH), 133.4 (CH), 133.1 (CH), 133.0 (CH), 132.8 (CH), 131.9 (C), 131.5 (CH), 130.0 (CH), 129.2 (C), 128.6 (CH), 128.4 (CH), 128.3 (CH), 125.4 (C), 124.1 (C), 123.5 (C), 123.3 (C), 119.5 (CH), 117.8 (C). HRMS (ESI) m/z: 454.9577 calcd for C_{21}H_{16}Br_2N_2^+ [M + H]^+, found 454.9573.

Dibenzo[b,g]pyrido[2,1,6-de]pyrrolo[2,3,4-ij]quinolinizin-1-ium bromide (13). Compound 13 (52 mg, 74%) was obtained from 1-(2,4-bis(2-bromophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (12) (100 mg, 0.19 mmol, 1 equiv), TTMSS (140 mg, 0.56 mmol, 4 equiv) and AIBN (184 mg, 1.12 mmol, 6 equiv) according to the general procedure C. Orange solid, mp > 400 °C (MeCN/EtOAc). ^1H NMR (500 MHz, DMSO-d_6): δ 13.87 (s, 1H), 9.34 (d, J = 8.5 Hz, 1H), 9.19 (d, J = 8.3 Hz, 1H), 9.03 (d, J = 8.5 Hz, 1H), 8.79 (d, J = 8.3 Hz, 1H), 8.60–8.53 (m, 1H), 8.49 (d, J = 2.7 Hz, 1H), 8.44 (d, J = 7.8 Hz, 1H), 8.24 (d, J = 7.7 Hz, 1H), 8.08–8.03 (m, 1H), 7.90–7.85 (m, 1H), 7.83–7.78 (m, 1H), 7.69–7.63 (m, 1H). ^13C{1H} NMR (101 MHz, DMSO-d_6): δ 140.0 (C), 139.3 (C), 135.6 (C), 133.7 (CH), 133.4 (CH), 128.4 (C), 127.8 (CH), 127.6 (CH), 527.
127.2 (CH), 127.0 (CH), 124.6 (C), 123.6 (CH), 123.3 (C), 122.5 (C), 121.5 (C), 120.8 (CH), 120.4 (CH), 119.8 (C), 119.4 (CH), 115.5 (CH), 110.3 (C). HRMS (ESI) m/z: 293.1073 calcd for C_{21}H_{13}N_{2}^+ [M – Br]^+, found 293.1080.

*Dibenzo[b,g]pyrido[2,1,6-de]pyrrolo[2,3,4-ij]quinoline (I4).* Compound 14 (41 mg, 99%) was obtained from dibenzo[b,g]pyrido[2,1,6-de]pyrrolo[2,3,4-ij]quinolizin-1-ium bromide (13) (53 mg, 0.14 mmol) according to the general procedure D. Dark brown solid, mp 155–157 °C (dec., DCM). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 9.03 (d, \(J = 8.6\) Hz, 1H), 8.86 (d, \(J = 8.2\) Hz, 1H), 8.79 (d, \(J = 8.5\) Hz, 1H), 8.62 (d, \(J = 8.3\) Hz, 1H), 8.44 (dd, \(J = 8.1, 1.3\) Hz, 1H), 8.32 (s, 1H), 8.20–8.10 (m, 2H), 7.86–7.80 (m, 1H), 7.74–7.68 (m, 1H), 7.51 (ddd, \(J = 8.4, 6.9, 1.4\) Hz, 1H), 7.43–7.37 (m, 1H). \(^{13}\)C\{1H\} NMR (101 MHz, DMSO-\(d_6\)): \(\delta\) 138.3 (C), 137.4 (C), 132.6 (CH), 132.3 (CH), 131.2 (C), 131.0 (CH), 130.4 (C), 127.0 (C), 126.5 (CH), 126.4 (CH), 125.5 (CH), 124.9 (CH), 124.5 (CH), 124.1 (C), 122.5 (CH), 121.5 (C), 120.5 (C), 120.3 (CH), 118.5 (CH), 116.9 (CH), 109.4 (C). HRMS (ESI) m/z: 292.9996 calcd for C_{21}H_{13}N_{2}^+ [M + H]^+, found 292.9992.

\(1\)-(2-(2-Bromophenyl)-2-oxoethyl)-4-methylpyridin-1-ium bromide (15b).* Compound 15b (1.18 g, 76%) was obtained from 4-methylpyridine (390 mg, 4.19 mmol, 1 equiv) and 2-bromo-1-(2-bromophenyl)ethan-1-one (1.167 g, 4.19 mmol, 1 equiv) in diethyl ether (18 mL). Bright yellow solid, mp 226–227 °C (Et\(\text{2}O\)). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 8.93 (d, \(J = 6.5\) Hz, 2H), 8.16–8.12 (m, 3H), 7.86 (d, \(J = 7.8\) Hz, 1H), 7.67 (td, \(J = 10.7, 4.1\) Hz, 1H), 7.61 (td, \(J = 7.8, 1.6\) Hz, 1H), 6.45 (s, 2H), 2.68 (s, 3H). \(^{13}\)C\{1H\} NMR (101 MHz, DMSO-\(d_6\)): \(\delta\) 192.0 (C), 160.1 (C), 145.0 (CH), 134.76 (CH), 134.61 (C), 134.28 (CH), 131.0 (CH), 128.19 (CH), 128.04 (CH), 119.8 (C), 66.6 (CH\(_2\)), 21.7 (CH\(_3\)). HRMS (ESI) m/z: 290.0175 calcd for C_{14}H_{13}BrNO^+ [M – Br]^+, found 290.0167.

\(1\)-(2-(2-Bromophenyl)-2-oxoethyl)-4-(4-methoxyphenyl)pyridin-1-ium bromide (15e).* Compound 15e (592 mg, 79%) was obtained from 4-(4-methoxyphenyl)pyridine (300 mg, 1.62 mmol, 1 equiv) and 2-bromo-1-(2-bromophenyl)ethan-1-one (451 mg, 1.62 mmol, 1 equiv) in acetone (10 mL). White solid, mp 240–241 °C (acetone). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 8.98 (d, \(J = 7.0\) Hz, 2H), 8.62 (d, \(J = 7.0\) Hz, 2H), 8.21–8.13 (m, 3H), 7.87 (dd, \(J = 7.9, 1.0\) Hz, 1H), 7.68 (td, \(J = 7.5, 1.1\) Hz, 1H), 7.62 (td, \(J = 7.7, 1.7\) Hz, 1H), 7.22 (d, \(J = 8.9\) Hz, 2H), 6.41 (s, 2H), 3.90 (s, 3H). \(^{13}\)C\{1H\} NMR (101 MHz, DMSO-\(d_6\)): \(\delta\) 192.0 (C), 163.0 (C), 154.8 (C), 145.7 (CH), 134.83 (CH), 134.57 (C), 134.32 (CH), 131.1 (CH), 130.2 (CH), 128.1 (CH), 125.3 (C), 122.9 (CH), 119.9 (C), 115.3 (CH), 66.2 (CH\(_2\)), 55.7 (CH\(_3\)). HRMS (ESI) m/z: 382.0437 calcd for C_{20}H_{17}BrNO_{2}^+ [M – Br]^+, found 382.0443.

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2-(2-(2-Bromophenyl)-2-oxoethyl)isoquinolin-2-ium bromide (15g). Compound 15g (453 mg, 90%) was obtained from isoquinoline (159 mg, 1.23 mmol, 1 equiv) and 2-bromo-1-(2-bromophenyl)ethan-1-one (342 mg, 1.23 mmol, 1 equiv) in acetone (5 mL). Beige solid, mp 216–218 °C (acetone). 1H NMR (400 MHz, DMSO-d6): δ 10.12 (s, 1H), 8.79 (dd, J = 6.9, 1.4 Hz, 1H), 8.72 (d, J = 6.8 Hz, 1H), 8.59 (d, J = 8.3 Hz, 1H), 8.44 (dd, J = 8.2 Hz, 1H), 8.34 (dd, J = 8.3, 1.2 Hz, 1H), 8.20 (dd, J = 7.7, 1.8 Hz, 1H), 8.13 (dd, J = 8.2, 6.9, 1.1 Hz, 1H), 7.88 (dd, J = 7.9, 1.2 Hz, 1H), 7.74–7.59 (m, 2H), 6.62 (s, 2H). 13C NMR (101 MHz, DMSO-d6): δ 192.0 (C), 151.6 (CH), 137.6 (CH), 137.3 (C), 136.2 (CH), 134.8 (CH), 134.6 (C), 134.4 (CH), 131.4 (CH), 131.1 (CH), 130.6 (CH), 128.1 (CH), 127.4 (CH), 126.8 (C), 125.6 (CH), 119.8 (C), 67.2 (CH2). HRMS (ESI) m/z: 326.0175 calcd for C17H13BrNO+ [M – Br]+, found 326.0170.

4-Benzoyl-1-(2-(2-bromophenyl)-2-oxoethyl)pyridin-1-ium bromide (15j). Compound 15j (613 mg, 61%) was obtained from phenyl(pyridin-4-yl)methanone (400 mg, 2.19 mmol, 1 equiv) and 2-bromo-1-(2-bromophenyl)ethan-1-one (607 mg, 2.19 mmol, 1 equiv) in acetone (10 mL). Pale yellow solid, mp 223 °C (acetone). 1H NMR (400 MHz, DMSO-d6): δ 9.30 (d, J = 6.6 Hz, 2H), 8.53 (d, J = 6.6 Hz, 2H), 8.21 (dd, J = 7.7, 1.5 Hz, 1H), 7.94–7.86 (m, 3H), 7.83 (t, J = 7.4 Hz, 1H), 7.73–7.60 (m, 4H), 6.63 (s, 2H). 13C NMR (101 MHz, DMSO-d6): δ 191.9 (C), 191.2 (C), 191.2 (C), 152.2 (C), 147.2 (CH), 134.9 (CH), 134.8 (CH), 134.5 (CH), 134.2 (C), 134.1 C, 131.3 (CH), 130.3 (CH), 129.1 (CH), 128.1 (CH), 126.9 (CH), 120.1 (C), 67.5 (CH2). HRMS (ESI) m/z: 380.0281 calcd for C20H15BrNO2+ [M – Br]+, found 380.0296.

1-(2-(2-Bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-methylpyridin-1-ium bromide (16b). Compound 16b (319 mg, 64%) was obtained from 1-(2-(2-bromophenyl)-2-oxoethyl)-4-methylpyridin-1-ium bromide (15b) (395 mg, 1.06 mmol, 1 equiv), triethylamine (161 mg, 1.60 mmol, 1.5 equiv) and 3-phenyl-2H-azirine (4c) (187 mg, 1.60 mmol, 1.5 equiv) in DCM (5 mL) according to the general procedure A. The product was isolated by column chromatography on silica gel (DCM/MeOH from v/v 20:1 to 10:1). Dark red solid, mp 240 °C (dec., DCM/MeOH). 1H NMR (400 MHz, DMSO-d6): δ 12.38–12.23 (m, 1H), 8.79–8.71 (m, 2H), 7.96 (d, J = 6.4 Hz, 2H), 7.68 (dd, J = 8.1, 1.3 Hz, 1H), 7.57 (dd, J = 7.6, 1.8 Hz, 1H), 7.52–7.46 (m, 2H), 7.40 (dd, J = 7.8, 1.9 Hz, 1H), 7.35–7.29 (m, 2H), 7.27–7.23 (m, 1H), 7.10–7.06 (m, 2H), 2.63 (s, 3H). 13C{1H} NMR (101 MHz, DMSO-d6): δ 160.8 (C), 145.8 (CH), 133.3 (CH), 132.9 (CH), 131.49 (C), 131.46 (CH), 129.6 (C), 129.2 (CH), 129.1 (CH), 128.8 (CH), 128.1 (CH), 126.9 (CH), 126.5 (C), 123.6 (C), 122.8 (C), 118.8 (C), 117.6 (CH), 21.7 (CH3). HRMS (ESI) m/z: 389.0648 calcd for C22H18BrN2+ [M – Br]+, found 389.0661.
1-(2-(2-Bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-methoxypyridin-1-ium bromide (16c). Compound 16c (240 mg, 48%) was obtained from 1-(2-(2-bromophenyl)-2-oxoethyl)-4-methoxypyridin-1-ium bromide\textsuperscript{11} (15c) (398 mg, 1.03 mmol, 1 equiv), triethylamine (156 mg, 1.54 mmol, 1.5 equiv) and 3-phenyl-2H-azirine (4c) (180 mg, 1.54 mmol, 1.5 equiv) in DCM (10 mL) according to the general procedure A. The product was isolated by column chromatography on silica gel (DCM/MeOH from v/v 20:1 to 10:1). Pale yellow solid, mp 106 °C (dec., DCM/MeOH). \textsuperscript{1}H NMR (500 MHz, DMSO-\textit{d}_6): \( \delta \) 12.21 (d, \( J = 3.0 \) Hz, 1H), 8.75–8.69 (m, 2H), 7.70 (dd, \( J = 8.1, 1.2 \) Hz, 1H), 7.62–7.58 (m, 2H), 7.56 (dd, \( J = 7.6, 1.8 \) Hz, 1H), 7.52–7.45 (m, 1H), 7.45 (d, \( J = 3.1 \) Hz, 1H), 7.40 (dd, \( J = 7.8, 1.9 \) Hz, 1H), 7.34–7.30 (m, 2H), 7.27–7.22 (m, 1H), 7.13–7.07 (m, 2H), 4.11 (s, 3H). HRMS (ESI) m/z: 405.0597 calcd for C\textsubscript{22}H\textsubscript{18}\textsuperscript{79}BrN\textsubscript{2}O\textsuperscript{+} [M – Br\textsuperscript{+}], found 405.0588.

1-(2-(2-Bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-(4-methoxyphenyl)pyridin-1-ium bromide (16e). Compound 16e (462 mg, 95%) was obtained from 1-(2-(2-bromophenyl)-2-oxoethyl)-4-(4-methoxyphenyl)pyridin-1-ium bromide (15e) (400 mg, 0.864 mmol, 1 equiv), triethylamine (131 mg, 1.30 mmol, 1.5 equiv) and 3-phenyl-2H-azirine (4c) (152 mg, 1.30 mmol, 1.5 equiv) in DCM (10 mL) according to the general procedure A. The product was isolated by column chromatography on silica gel (DCM/MeOH from v/v 20:1 to 10:1). Yellow solid, mp 209–210 °C (DCM/MeOH). \textsuperscript{1}H NMR (400 MHz, DMSO-\textit{d}_6): \( \delta \) 12.29 (d, \( J = 2.8 \) Hz, 1H), 8.79–8.73 (m, 2H), 8.46–8.42 (m, 2H), 8.17–8.11 (m, 2H), 7.70 (dd, \( J = 8.0, 1.2 \) Hz, 1H), 7.60 (dd, \( J = 7.7, 1.8 \) Hz, 1H), 7.54–7.48 (m, 2H), 7.43–7.36 (m, 1H), 7.36–7.30 (m, 2H), 7.28–7.22 (m, 1H), 7.19–7.13 (m, 4H), 3.88 (s, 3H). HRMS (ESI) m/z: 481.0910 calcd for C\textsubscript{28}H\textsubscript{22}\textsuperscript{79}BrN\textsubscript{2}O\textsuperscript{+} [M – Br\textsuperscript{+}], found 481.0895.

1-(2-(2-Bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-3,5-dimethylpyridin-1-ium bromide (16f). Compound 16f (177 mg, 35%) was obtained from 1-(2-(2-bromophenyl)-2-oxoethyl)-3,5-dimethylpyridin-1-ium bromide\textsuperscript{11} (15f) (398 mg, 1.03 mmol, 1 equiv), triethylamine (156 mg, 1.55 mmol, 1.5 equiv) and 3-phenyl-2H-azirine (4c) (181 mg, 1.55 mmol, 1.5 equiv) in DCM (6 mL) according to the general procedure A. The product was isolated by column chromatography on silica gel (DCM/MeOH from v/v 20:1 to 10:1). Pale yellow solid, mp 339–340 °C.
(DCM/MeOH). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 12.31 (br. s, 1H), 8.74 (s, 2H), 8.41 (s, 1H), 7.68 (d, $J = 7.5$ Hz, 1H), 7.57 (dd, $J = 7.6$, 1.5 Hz, 1H), 7.52–7.45 (m, 2H), 7.42–7.34 (m, 1H), 7.35–7.27 (m, 2H), 7.27–7.21 (m, 1H), 7.08 (d, $J = 7.1$ Hz, 2H), 2.35 (s, 6H). $^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$): $\delta$ 147.9 (CH), 143.7 (CH), 138.4 (C), 133.2 (CH), 132.8 (CH), 131.48 (C), 131.45 (CH), 129.5 (C), 129.0 (CH), 128.0 (CH), 126.9 (CH), 126.7 (C), 126.6 (CH), 123.6 (C), 123.0 (C), 118.7 (C), 117.4 (CH), 17.5 (CH$_3$). HRMS (ESI) m/z: 403.0804 calcd for C$_{23}$H$_{20}$BrN$_2$ $^+$ [M – Br]$^+$, found 403.0819.

2-(2-(2-Bromophenyl)-4-phenyl-1H-pyrrol-3-yl)isoquinolin-2-ium bromide (16g). Compound 16g (214 mg, 44%) was obtained from 2-(2-(2-bromophenyl)-2-oxoethyl)isoquinolin-2-ium bromide (15g) (388 mg, 0.956 mmol, 1 equiv), triethylamine (145 mg, 1.43 mmol, 1.5 equiv) and 3-phenyl-2H-azirine (4c) (168 mg, 1.43 mmol, 1.5 equiv) in DCM (6 mL) according to the general procedure A. The product was isolated by column chromatography on silica gel (DCM/MeOH from v/v 20:1 to 10:1). Pale orange solid, mp 182–183 °C (DCM/MeOH). $^1$H NMR (500 MHz, DMSO-$d_6$): $\delta$ 12.39 (br. s, 1H), 10.02 (s, 1H), 8.64–8.54 (m, 2H), 8.42 (d, $J = 8.3$ Hz, 1H), 8.38 (d, $J = 8.2$ Hz, 1H), 8.33–8.27 (m, 1H), 8.08–8.02 (m, 1H), 7.66–7.59 (m, 2H), 7.56 (d, $J = 2.9$ Hz, 1H), 7.48 (m, $J = 7.3$ Hz, 1H), 7.46–7.24 (m, 1H), 7.27–7.21 (m, 3H), 7.11 (d, $J = 7.1$ Hz, 2H). $^{13}$C{1H} NMR (126 MHz, DMSO-$d_6$): $\delta$ 151.7 (CH), 138.1 (CH), 137.1 (CH), 136.9 (C), 133.3 (CH), 132.8 (CH), 131.8 (CH), 131.5 (C), 131.4 (CH), 130.7 (CH), 129.5 (C), 129.1 (CH), 128.2 (CH), 127.5 (CH), 127.3 (C), 126.9 (CH), 126.3 (CH), 123.43 (C), 123.28 (C), 119.0 (C), 117.8 (CH). HRMS (ESI) m/z: 425.0648 calcd for C$_{25}$H$_{18}$BrN$_2$ $^+$ [M – Br]$^+$, found 425.0658.

1-(2-(2-Bromophenyl)-4-(4-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (16h). Compound 16h (249 mg, 50%) was obtained from 1-(2-(2-bromophenyl)-2-oxoethyl)pyridin-1-ium bromide (15h) (367 mg, 1.02 mmol, 1 equiv), triethylamine (156 mg, 1.54 mmol, 1.5 equiv) and 3-(4-methoxyphenyl)-2H-azirine (4d) (227 mg, 1.54 mmol, 1.5 equiv) in DCM (5 mL) according to the general procedure A. The product was isolated by column chromatography on silica gel (DCM/MeOH from v/v 20:1 to 10:1). Bright yellow solid, mp 254–255 °C (DCM/MeOH). $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 12.28 (br. s, 1H), 8.87 (d, $J = 5.5$ Hz, 2H), 8.68 (t, $J = 7.9$ Hz, 1H), 8.15 (dd, $J = 7.6$, 6.8 Hz, 2H), 7.67 (dd, $J = 8.0$, 0.8 Hz, 1H), 7.57 (dd, $J = 7.6$, 1.6 Hz, 1H), 7.53–7.47 (m, 1H), 7.43–7.34 (m, 2H), 7.06–6.96 (m, 2H), 6.93–6.83 (m, 2H), 3.73 (s, 3H). $^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$): $\delta$ 158.3 (C), 146.8 (CH), 133.3 (CH), 132.9 (CH), 131.4 (CH), 128.6 (CH), 128.3 (CH), 128.2 (CH), 126.2 (CH), 123.5 (C), 123.4 (C), 123.3 (C), 117.8 (CH), 3.73 (s, 3H).
123.2 (C), 117.2 (CH), 114.5 (CH), 55.1 (CH₃). HRMS (ESI) m/z: 405.0597 calcd for C₂₂H₁₆⁷⁹BrN₂O⁺ [M – Br]⁺, found 405.0614.

I-(2-(2-Bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-cyanopyridin-1-ium bromide (16i). Compound 16i (46 mg, 18%) was obtained from 1-(2-(2-bromophenyl)-2-oxoethyl)-4-cyanopyridin-1-ium bromide¹¹ (15i) (200 mg, 0.523 mmol, 1 equiv), NiBr₂·3H₂O (28.5 mg, 0.105 mmol, 0.2 equiv) and 3-phenyl-2H-azirine (4c) (92 mg, 0.785 mmol, 1.5 equiv) in acetone (10 mL) according to the general procedure B. Orange solid, mp 276–278 °C (acetone). ¹H NMR (400 MHz, DMSO-d₆): δ 12.49 (br. s, 1H), 9.13 (d, J = 6.2 Hz, 2H), 8.66 (d, J = 6.3 Hz, 2H), 7.68 (d, J = 8.1 Hz, 1H), 7.60 (d, J = 7.5 Hz, 1H), 7.55–7.49 (m, 2H), 7.42 (d, J = 7.8 Hz, 1H), 7.35–7.26 (m, 3H), 7.14 (d, J = 7.3 Hz, 2H). ¹³C{¹H} NMR (101 MHz, DMSO-d₆): δ 147.0 (CH), 133.0 (CH), 132.4 (CH), 131.1 (CH), 131.0 (CH), 130.2 (C), 128.6 (CH), 128.2 (C), 127.8 (CH), 127.2 (C), 126.6 (CH), 126.5 (CH), 126.4 (C), 122.7 (C), 122.4 (C), 118.1 (C), 117.9 (CH), 114.1 (C). HRMS (ESI) m/z: 400.0444 calcd for C₂₂H₁₅⁷⁹BrN₁⁺ [M – Br]⁺, found 400.0428.

4-Benzoyl-1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (16j). Compound 16j (219 mg, 45%) was obtained from 4-benzoyl-1-(2-(2-bromophenyl)-2-oxoethyl)pyridin-1-ium bromide (15j) (400 mg, 0.868 mmol, 1 equiv), NiBr₂·3H₂O (47 mg, 0.17 mmol, 0.2 equiv) and 3-phenyl-2H-azirine (4c) (203 mg, 1.74 mmol, 1.5 equiv) in acetone (20 mL) according to the general procedure B. Bright orange solid, mp 257–258 °C (acetone). ¹H NMR (400 MHz, DMSO-d₆): δ 12.44 (br. s, 1H), 9.04 (d, J = 6.4 Hz, 2H), 8.35 (d, J = 6.4 Hz, 2H), 7.80–7.78 (m, 3H), 7.72 (d, J = 7.8 Hz, 1H), 7.68–7.61 (m, 3H), 7.56–7.54 (m, 2H), 7.47–7.40 (m, 1H), 7.39–7.35 (m, 2H), 7.30–7.35 (m, 1H), 7.21 (d, J = 7.2 Hz, 2H). ¹³C{¹H} NMR (101 MHz, DMSO-d₆): δ 191.6 (C), 152.0 (C), 147.5 (CH), 134.8 (CH), 134.0 (C), 133.4 (CH), 133.0 (CH), 131.6 (CH), 131.1 (C), 130.1 (CH), 129.2 (CH), 129.1 (CH), 128.3 (CH), 127.5 (CH), 127.4 (CH), 127.1 (CH), 126.8 (C), 123.3 (C), 123.0 (C), 118.8 (C), 118.3 (CH). HRMS (ESI) m/z: 479.0754 calcd for C₂₈H₂₆⁷⁹BrN₂O⁺ [M – Br]⁺, found 479.0775.

3-Phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinolin-1-ium bromide (17a). Compound 17a (120 mg, 77%) was obtained from 1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (16a) (190 mg, 0.42 mmol, 1 equiv), TTMSS (155 mg, 0.62 mmol, 1.5 equiv) and AIBN (137 mg, 0.83 mmol, 2 equiv) according to the general procedure C. Yellow solid, mp 343–344 °C (dec., MeCN/EtOAc). ¹H NMR (400 MHz, DMSO-d₆): δ 13.57 (d, J = 3.1 Hz, 1H), 9.56 (d, J = 8.7 Hz, 1H), 9.18–9.13 (m, 2H), 8.67 (d, J = 8.1 Hz, 1H), 8.48 (ddd, J = 8.7, 7.2, 1.3 Hz, 1H), 8.18–8.12 (m, 1H), 8.07–8.01 (m, 1H), 7.93–7.86 (m, 2H), 7.66–7.53 (m, 5H). ¹³C{¹H} NMR
16b

(101 MHz, DMSO-<i>d</i><i>6</i>): δ 139.8 (C), 136.8 (CH), 133.7 (CH), 133.3 (CH), 132.8 (C), 130.2 (CH), 129.1 (CH), 128.2 (CH), 127.8 (CH), 126.5 (CH), 126.4 (CH), 124.5 (C), 124.2 (CH), 124.1 (C), 123.5 (CH), 121.2 (C), 121.0 (CH), 120.5 (C), 115.0 (C). HRMS (ESI) m/z: 295.1230 calcd for C<sub>21</sub>H<sub>15</sub>N<sub>2</sub><sup>+</sup> [M – Br]<sup>+</sup>, found 295.1234.

7-Methyl-3-phenylpyrido[2,1-<i>a</i>]pyrrolo[3,2-<i>c</i>]isoquinolin-1-ium bromide (17b). Compound 17b (43 mg, 46%) was obtained from 1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-methylpyridin-1-ium bromide (16b) (100 mg, 0.215 mmol, 1 equiv), TTMSS (80 mg, 0.32 mmol, 1.5 equiv) and AIBN (70 mg, 0.43 mmol, 2 equiv) according to the general procedure C. Pale yellow solid, mp > 400 °C (MeCN/EtOAc).

1H NMR (400 MHz, DMSO-<i>d</i><i>6</i>): δ 13.45 (d, <i>J</i> = 3.1 Hz, 1H), 9.43 (s, 1H), 9.14 (d, <i>J</i> = 8.5 Hz, 1H), 9.01 (d, J = 8.1 Hz, 1H), 8.62 (d, <i>J</i> = 8.1 Hz, 1H), 8.18–8.11 (m, 1H), 7.94–7.84 (m, 3H), 7.64–7.53 (m, 5H), 2.72 (s, 3H). 13C{1H} NMR (101 MHz, DMSO-<i>d</i><i>6</i>): δ 149.6 (C), 139.8 (C), 133.7 (CH), 132.9 (C), 132.7 (CH), 130.2 (CH), 129.1 (CH), 128.2 (CH), 127.7 (CH), 126.6 (CH), 126.1 (CH), 124.9 (CH), 124.4 (C), 124.0 (C), 123.6 (CH), 121.1 (C), 120.9 (CH), 120.3 (C), 114.9 (C), 21.2 (CH<sub>3</sub>). HRMS (ESI) m/z: 309.1386 calcd for C<sub>22</sub>H<sub>17</sub>N<sub>2</sub><sup>+</sup> [M – Br]<sup>+</sup>, found 309.1399.

7-Methoxy-3-phenylpyrido[2,1-<i>a</i>]pyrrolo[3,2-<i>c</i>]isoquinolin-1-ium bromide (17c). Compound 17c (86 mg, 60%) was obtained from 1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-methoxypyridin-1-ium bromide (16c) (173 mg, 0.357 mmol, 1 equiv), TTMSS (133 mg, 0.535 mmol, 1.5 equiv) and AIBN (117 mg, 0.713 mmol, 2 equiv) according to the general procedure C. Pale yellow solid, mp 296–298 °C (MeCN/EtOAc).

1H NMR (400 MHz, DMSO-<i>d</i><i>6</i>): δ 13.31 (d, <i>J</i> = 3.1 Hz, 1H), 9.15 (d, <i>J</i> = 8.6 Hz, 1H), 8.95 (d, J = 7.6 Hz, 1H), 8.75 (d, J = 3.0 Hz, 1H), 8.55 (dd, <i>J</i> = 8.2, 1.2 Hz, 1H), 8.13–8.06 (m, 1H), 7.82 (ddd, <i>J</i> = 8.4, 7.1, 1.2 Hz, 1H), 7.78–7.73 (m, 2H), 7.63–7.52 (m, 5H), 4.22 (s, 3H). 13C{1H} NMR (101 MHz, DMSO-<i>d</i><i>6</i>): δ 164.9 (C), 142.9 (C), 135.4 (CH), 133.8 (CH), 133.0 (C), 130.2 (CH), 129.1 (CH), 128.1 (CH), 127.3 (CH), 127.0 (CH), 125.5 (CH), 124.5 (C), 122.6 (C), 120.9 (C), 120.8 (CH), 120.0 (C), 114.6 (C), 113.4 (CH), 106.0 (CH), 57.8 (CH<sub>3</sub>). HRMS (ESI) m/z: 325.1335 calcd for C<sub>22</sub>H<sub>17</sub>N<sub>2</sub>O<sup>+</sup> [M – Br]<sup>+</sup>, found 325.1329.

3,7-Diphenylpyrido[2,1-<i>a</i>]pyrrolo[3,2-<i>c</i>]isoquinolin-1-ium bromide (17d). Compound 17d (58 mg, 69%) was obtained from 1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-phenylpyridin-1-ium bromide (16d) (100 mg, 0.19 mmol, 1 equiv), TTMSS (71 mg, 0.28 mmol, 1.5 equiv) and AIBN (62 mg, 0.38 mmol, 2 equiv) according to the general procedure C. Bright yellow, mp > 400 °C (MeCN/EtOAc). 1H NMR (400 MHz, DMSO-<i>d</i><i>6</i>): δ 13.53 (d, <i>J</i> = 1.4 Hz, 1H), 9.68 (d, <i>J</i> = 1.7 Hz, 1H), 9.47 (d, <i>J</i> = 8.6 Hz, 1H), 9.16 (d, J = 7.2 Hz, 1H), 8.65 (d, <i>J</i> = 8.0 Hz, 1H), 8.50
(dd, \( J = 7.3, 2.0 \) Hz, 1H), 8.27 (dd, \( J = 7.6, 1.9 \) Hz, 2H), 8.21–8.15 (m, 1H), 7.96–7.88 (m, 2H), 7.70–7.56 (m, 8H). \(^1\)\(\text{C}\{\text{\textit{H}}\}\) NMR (101 MHz, DMSO-\(d_6\)): \( \delta \) 146.7 (C), 140.4 (C), 134.3 (C), 133.9 (CH), 133.6 (CH), 131.2 (CH), 130.3 (CH), 129.5 (CH), 129.2 (CH), 128.3 (CH), 128.0 (CH), 127.7 (CH), 127.3 (CH), 126.5 (CH), 124.5 (C), 121.7 (C), 120.9 (CH), 120.5 (C), 119.8 (CH), 115.0 (C). HRMS (ESI) m/z: 371.1543 calcd for C\(_{27}\)H\(_{19}\)N\(_2^+\) [M – Br]\(^+\), found 371.1554.

7-(4-Methoxyphenyl)-3-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinolin-1-ium bromide (17e).

Compound 17e (66 mg, 46%) was obtained from 1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-(4-methoxyphenyl)pyridin-1-ium bromide (16e) (170 mg, 0.302 mmol, 1 equiv), TTMSS (113 mg, 0.456 mmol, 1.5 equiv) and AIBN (99 mg, 0.60 mmol, 2 equiv) according to the general procedure C. Bright yellow solid, mp 295–296 °C (MeCN/EtOAc). \(^1\)\(\text{H}\) NMR (400 MHz, DMSO-\(d_6\)): \( \delta \) 13.48–13.43 (m, 1H), 9.53 (d, \( J = 2.2 \) Hz, 1H), 9.41 (d, \( J = 8.6 \) Hz, 1H), 9.05 (d, \( J = 7.3 \) Hz, 1H), 8.60 (d, \( J = 8.1 \) Hz, 1H), 8.42 (dd, \( J = 7.3, 2.1 \) Hz, 1H), 8.30–8.22 (m, 2H), 8.16–8.09 (m, 1H), 7.92–7.83 (m, 2H), 7.70–7.53 (m, 5H), 7.19–7.10 (m, 2H), 3.88 (s, 3H). \(^1\)\(\text{C}\{\text{\textit{H}}\}\) NMR (101 MHz, DMSO-\(d_6\)): \( \delta \) 162.0 (C), 146.3 (C), 140.3 (C), 133.7 (CH), 133.3 (CH), 133.0 (C), 130.3 (CH), 129.7 (CH), 129.2 (CH), 128.2 (CH), 127.6 (CH), 127.1 (CH), 126.3 (CH), 126.1 (C), 124.4 (C), 124.1 (C), 121.6 (C), 120.8 (CH), 120.3 (C), 120.0 (CH), 118.2 (CH), 114.91 (CH), 114.86 (C), 55.6 (CH\(_3\)). HRMS (ESI) m/z: 401.1648 calcd for C\(_{28}\)H\(_{21}\)N\(_2\)O\(_2^+\) [M – Br]\(^+\), found 401.1644.

6,8-Dimethyl-3-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinolin-1-ium bromide (17f).

Compound 17f (52 mg, 64%) was obtained from 1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-3,5-dimethylpyridin-1-ium bromide (16f) (100 mg, 0.207 mmol, 1 equiv), TTMSS (77 mg, 0.31 mmol, 1.5 equiv) and AIBN (68 mg, 0.41 mmol, 2 equiv) according to the general procedure C. Bright yellow solid, mp > 400 °C (MeCN/EtOAc). \(^1\)\(\text{H}\) NMR (400 MHz, DMSO-\(d_6\)): \( \delta \) 13.45 (br. s, 1H), 9.00 (d, \( J = 8.7 \) Hz, 1H), 8.94 (s, 1H), 8.65 (d, \( J = 7.9 \) Hz, 1H), 8.35 (s, 1H), 8.17–8.09 (m, 1H), 7.89 (s, 1H), 7.89–7.83 (m, 1H), 7.66–7.50 (m, 5H), 3.19 (s, 3H), 2.26 (s, 3H). \(^1\)\(\text{C}\{\text{\textit{H}}\}\) NMR (101 MHz, DMSO-\(d_6\)): \( \delta \) 142.4 (CH), 138.5 (C), 136.3 (C), 133.0 (C), 132.7 (CH), 131.9 (C), 131.7 (CH), 130.2 (CH), 129.8 (CH), 129.0 (CH), 128.2 (CH), 126.6 (CH), 126.4 (CH), 124.8 (C), 124.6 (C), 120.8 (CH), 120.7 (C), 115.2 (C), 26.0 (CH\(_3\)), 17.4 (CH\(_3\)). HRMS (ESI) m/z: 323.1543 calcd for C\(_{23}\)H\(_{19}\)N\(_2^+\) [M – Br]\(^+\), found 323.1548.

3-Phenyl-1H-isoquinolinolo[1,2-a]pyrrolo[3,2-c]isoquinolin-4-ium bromide (17g).

Compound (40 mg, 49%) 17g was obtained from 2-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)isoquinolin-2-ium bromide (16g) (120 mg, 0.237 mmol, 1 equiv), TTMSS (89 mg, 0.36 mmol, 1.5 equiv) and AIBN (75 mg, 0.47 mmol, 2 equiv) according to the general procedure C. Pale orange solid,
250–253 °C (dec., MeCN/EtOAc). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta \) 13.69 (d, \(J = 2.9\) Hz, 1H), 9.13–9.05 (m, 2H), 8.83–8.76 (m, 2H), 8.33–8.27 (m, 3H), 8.19–8.15 (m, 1H), 8.12–8.07 (m, 2H), 7.99–7.95 (m, 1H), 7.66–7.57 (m, 5H). \(^1^3\)C{\(^1\)H} NMR (101 MHz, DMSO-\(d_6\)): \(\delta \) 141.7 (C), 134.4 (CH), 133.2 (CH), 132.8 (C), 132.7 (C), 132.2 (CH), 131.2 (CH), 130.5 (CH), 130.3 (CH), 129.0 (CH), 128.2 (CH), 128.1 (CH), 127.6 (CH), 127.5 (CH), 127.1 (CH), 125.9 (C), 125.5 (C), 124.9 (C), 122.0 (C), 121.4 (CH), 121.09 (C), 121.06 (CH), 114.8 (C). HRMS (ESI) m/z: 345.1386 calcd for C\(_{25}\)H\(_{17}\)N\(_2\)+ [M – Br]⁺, found 345.1398.

3-(4-Methoxyphenyl)pyrido[2,1-a]pyrrolo[3,2-c]isoquinolin-1-ium bromide (17h). Compound 17h (111 mg, 67%) was obtained from 1-(2-(2-bromophenyl)-4-(4-methoxyphenyl)-1H-pyrrolo-3-yl)pypyridin-1-ium bromide (16h) (200 mg, 0.412 mmol, 1 equiv), TTMSS (152 mg, 0.617 mmol, 1.5 equiv) and AIBN (135 mg, 0.823 mmol, 2 equiv) according to the general procedure C. Yellow solid, mp 249–251 °C (MeCN/EtOAc). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta \) 13.52–13.47 (m, 1H), 9.54 (d, \(J = 8.8\) Hz, 1H), 9.22 (d, \(J = 6.8\) Hz, 1H), 9.13 (d, \(J = 8.5\) Hz, 1H), 8.65 (d, \(J = 8.1\) Hz, 1H), 8.51–8.42 (m, 1H), 8.08–8.02 (m, 1H), 7.93–7.86 (m, 1H), 7.83 (d, \(J = 2.9\) Hz, 1H), 7.54 (d, \(J = 8.2\) Hz, 2H), 7.16 (d, \(J = 8.2\) Hz, 2H), 3.88 (s, 3H). \(^1^3\)C{\(^1\)H} NMR (101 MHz, DMSO-\(d_6\)): \(\delta \) 159.2 (C), 139.9 (C), 136.8 (CH), 133.8 (CH), 131.6 (CH), 127.8 (CH), 126.5 (CH), 126.4 (CH), 124.7 (C), 124.4 (C), 124.3 (C), 124.2 (CH), 123.5 (CH), 121.3 (C), 120.9 (CH), 120.7 (C), 114.7 (C), 114.6 (CH), 55.3 (CH\(_3\)). HRMS (ESI) m/z: 325.1335 calcd for C\(_{22}\)H\(_{17}\)N\(_2\)O+[M + H]⁺, found 325.1341.

3-Phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinoline (18a). Compound 18a (47 mg, 99%) was obtained from 3-phenylpyrido[2,1-a]pyrrrolo[3,2-c]isoquinolin-4-ium bromide (17a) (60 mg, 0.16 mmol) according to the general procedure D. Orange solid, mp > 400 °C (DCM). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta \) 9.41 (d, \(J = 8.8\) Hz, 1H), 9.17 (d, \(J = 6.8\) Hz, 1H), 9.01 (d, \(J = 8.6\) Hz, 1H), 8.70 (d, \(J = 8.2\) Hz, 1H), 8.24–8.14 (m, 1H), 8.04–7.97 (m, 1H), 7.87 (d, \(J = 6.9\) Hz, 1H), 7.73–7.65 (m, 2H), 7.58–7.50 (m, 3H), 7.46–7.39 (m, 1H). \(^1^3\)C{\(^1\)H} NMR (101 MHz, DMSO-\(d_6\)): \(\delta \) 140.1 (CH), 136.4 (C), 136.3 (C), 134.0 (C), 131.9 (CH), 131.3 (CH), 131.2 (CH), 129.72 (CH), 129.66 (C), 128.7 (CH), 126.0 (CH), 125.4 (CH), 124.5 (CH), 123.5 (C), 121.9 (C), 121.6 (CH), 121.1 (CH), 118.8 (C), 112.8 (C). HRMS (ESI) m/z: 295.1230 calcd for C\(_{21}\)H\(_{15}\)N\(_2\)+[M + H]⁺, found 295.1234.

1-Methyl-3-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinolin-4-ium iodide (N-Me-18a). Compound N-Me-18a (74 mg, 100%) was obtained from phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinoline (18a) (50 mg, 0.17 mmol) and methyl iodide (24.5 mg, 0.17 mmol, 1 equiv) in dry DCM (8 mL) likewise N-Me-3a.
1-Benzyl-3-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinolin-4-i um bromide (N-Bn-18a). Compound N-Bn-18a (55 mg, 100%) was obtained from 3-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinoline (18a) (35 mg, 0.12 mmol), benzyl bromide (21 mg, 0.12 mmol, 1 equiv) and K$_2$CO$_3$ (33 mg, 0.24 mmol, 2 equiv) in dry acetonitrile (5 mL) likewise N-Bn-3a.

7-Methoxy-3-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinoline (18c). Compound 18c (21 mg, 97%) was obtained from 7-methoxy-3-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinolin-4-i um bromide (17c) (27 mg, 0.067 mmol) according to the general procedure D. Orange solid, mp 225–227 °C (DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): δ 9.02 (d, $J = 7.7$ Hz, 1H), 8.93 (d, $J = 8.6$ Hz, 1H), 8.59–8.53 (m, 2H), 7.88–7.82 (m, 1H), 7.58–7.45 (m, 6H), 7.43 (s, 1H), 7.34 (ddd, $J = 10.2$, 6.1, 4.1 Hz, 1H), 4.16 (s, 3H). $^{13}$C{1H} NMR (126 MHz, DMSO-$d_6$): δ 161.4 (C), 139.9 (C), 136.4 (C), 133.6 (CH), 133.5 (C), 132.2 (CH), 130.1 (CH), 130.0 (C), 129.7 (CH), 128.7 (CH), 126.1 (CH), 126.0 (CH), 124.0 (CH), 121.0 (C), 120.9 (CH), 118.4 (C), 112.6 (CH), 112.5 (C), 104.5 (CH), 57.1 (CH$_3$). HRMS (ESI) m/z: 325.1335 calcld for C$_{22}$H$_{17}$N$_2$O$^+$ [M + H]$^+$, found 325.1350.

3,7-Diphenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinoline (18d). Compound 18d (30 mg, 99%) was obtained from 3,7-diphenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinolin-4-i um bromide (17d) (37 mg, 0.082 mmol) according to the general procedure D. Red solid, mp 224–225 °C (DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): δ 9.48 (d, $J = 2.4$ Hz, 1H), 9.24–9.12 (m, 2H), 8.65 (d, $J = 8.2$ Hz, 1H), 8.25–8.14 (m, 3H), 7.94–7.85 (m, 1H), 7.64–7.47 (m, 9H), 7.41–7.33 (m, 1H). $^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$): δ 141.2 (CH), 140.9 (C), 136.7 (C), 136.4 (C), 135.2 (C), 134.8 (CH), 131.8 (CH), 131.3 (CH), 130.3 (C), 130.0 (CH), 129.7 (CH), 129.3 (CH), 128.7 (CH), 126.0 (CH), 125.9 (CH), 124.2 (CH), 121.8 (C), 121.0 (CH), 119.3 (CH), 119.20 (CH), 119.06 (C), 112.6 (C). HRMS (ESI) m/z: 371.1543 calcld for C$_{27}$H$_{19}$N$_2$O$^+$ [M + H]$^+$, found 371.1534.

7-(4-Methoxyphenyl)-3-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinoline (18e). Compound 18e (21 mg, 99%) was obtained from 7-(4-methoxyphenyl)-3-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinolin-4-i um bromide (17e) (25 mg, 0.052 mmol) according to the general procedure D. Red solid, mp > 400 °C (DCM). $^1$H NMR (400 MHz, DMSO-$d_6$): δ 9.43 (d, $J = 2.2$ Hz, 1H), 9.21 (d, $J = 8.6$ Hz, 1H), 9.13 (d, $J = 7.3$ Hz, 1H), 8.67–8.62 (m, 1H), 8.25–8.18 (m, 3H), 7.93–7.87 (m, 1H), 7.65–7.59 (m, 1H), 7.58–7.49 (m, 5H), 7.41–7.36 (m, 1H), 7.19–7.12 (m, 2H), 3.88 (s, 3H). $^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$): δ 161.0 (C), 141.0 (C), 139.7 (CH), 136.8 (C), 136.5 (C), 133.7 (C), 131.8 (CH), 131.3 (CH), 129.9 (C), 129.8 (CH), 128.9 (CH), 128.7 (CH), 127.2 (C), 126.0 (CH), 124.2 (CH), 121.5 (C), 121.0 (CH), 119.1 (C), 118.6 (CH), 117.9
(CH), 114.7 (CH), 112.7 (C), 55.4 (CH). HRMS (ESI) m/z: 401.1648 calcd for C_{28}H_{21}N_{2}O^{+}[M + H]^+, found 401.1662.

6,8-Dimethyl-3-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinoline (18f). Compound 18f (28 mg, 99%) was obtained from 6,8-dimethyl-3-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinolin-4-ium bromide (17f) (35 mg, 0.087 mmol) according to the general procedure D. Orange solid, mp 220–222 °C (DCM). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 8.97 (s, 1H), 8.83 (d, \(J = 8.8\) Hz, 1H), 8.73–8.67 (m, 1H), 7.92 (s, 1H), 7.90–7.84 (m, 1H), 7.60–7.55 (m, 6H), 7.40–7.33 (m, 1H), 3.15 (s, 3H), 2.25 (s, 3H). \(^{13}\)C{\(^1\)H} NMR (101 MHz, DMSO-\(d_6\)): \(\delta\) 137.1 (CH), 136.6 (C), 135.3 (C), 134.4 (C), 130.8 (CH), 130.6 (C), 129.9 (C), 129.6 (CH), 129.4 (CH), 128.7 (CH), 128.5 (CH), 125.9 (C), 123.1 (CH), 122.2 (C), 121.0 (CH), 119.5 (C), 112.8 (C), 26.2 (CH), 17.4 (CH). HRMS (ESI) m/z: 323.1547 calcd for C_{23}H_{19}N_{2}O^{+}[M + H]^+, found 323.1547.

3-Phenylisoquinolino[1,2-a]pyrrolo[3,2-c]isoquinoline (18g). Compound 18g (25 mg, 99%) was obtained from 3-phenylisoquinolino[1,2-a]pyrrolo[3,2-c]isoquinolin-4-ium bromide (17g) (31 mg, 0.073 mmol) according to the general procedure D. Dark purple solid, mp 176–178 °C (DCM). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 9.01–8.92 (m, 2H), 8.84–8.76 (m, 2H), 8.31 (s, 1H), 8.22–8.17 (m, 1H), 8.14–7.96 (m, 3H), 7.85 (s, 1H), 7.74–7.67 (m, 1H), 7.59–7.50 (m, 4H), 7.45–7.39 (m, 1H), 13C{\(^1\)H} NMR (101 MHz, DMSO-\(d_6\)): \(\delta\) 135.4 (C), 132.49 (C), 132.47 (CH), 131.4 (CH), 131.2 (C), 130.7 (CH), 130.4 (CH), 129.8 (CH), 129.7 (CH), 129.6, 128.7 (CH), 127.3 (CH), 127.0 (CH), 126.6 (CH), 126.0 (C), 125.3 (CH), 125.2 (CH), 123.4 (C), 121.4 (CH), 119.8 (CH), 119.2 (C), 112.9 (C). HRMS (ESI) m/z: 345.1386 calcd for C_{25}H_{17}N_{2}O^{+}[M + H]^+, found 345.1391.

3-(4-Methoxyphenyl)pyrido[2,1-a]pyrrolo[3,2-c]isoquinoline (18h). Compound 18h (56 mg, 100%) was obtained from 3-(4-methoxyphenyl)pyrido[2,1-a]pyrrolo[3,2-c]isoquinolin-4-ium bromide (17h) (70 mg, 0.17 mmol) according to the general procedure D. Saturated red solid, mp 169–170 °C (DCM). \(^1\)H NMR (400 MHz, DMSO-\(d_6\)): \(\delta\) 9.32 (d, \(J = 8.9\) Hz, 1H), 9.18 (d, \(J = 6.8\) Hz, 1H), 8.92 (d, \(J = 8.6\) Hz, 1H), 8.65 (d, \(J = 8.2\) Hz, 1H), 8.14–8.03 (m, 1H), 7.94–7.87 (m, 1H), 7.83–7.76 (m, 1H), 7.66–7.56 (m, 1H), 7.55 (s, 1H), 7.43 (d, \(J = 8.1\) Hz, 2H), 7.07 (d, \(J = 8.2\) Hz, 2H), 3.84 (s, 3H). \(^{13}\)C{\(^1\)H} NMR (101 MHz, DMSO-\(d_6\)): \(\delta\) 158.0 (C), 139.3 (CH), 136.4 (C), 133.2 (C), 131.9 (CH), 131.3 (CH), 131.09 (CH), 131.06 (CH), 129.5 (C), 128.3 (C), 125.5 (CH), 124.6 (CH), 123.6 (CH), 121.9 (C), 121.7 (CH), 121.1 (CH), 118.8 (C), 114.2 (CH), 112.4, 55.1 (CH). HRMS (ESI) m/z: 325.1335 calcd for C_{22}H_{17}N_{2}O^{+}[M + H]^+, found 325.1346.
2-Phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinoline (19). 3-Phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinoline (18a) (70 mg, 0.24 mmol) was dissolved in dry benzene (3 mL), argon was bubbled through reaction mixture for 10 minutes and AlCl₃ (160 mg, 1.19 mmol, 5 equiv) was added in one portion. The reaction mixture was refluxed for 3 h, then it was quenched with aq 10% NaOH and extracted 3 times with DCM. The combined DCM phases were washed with brine and dried under Na₂SO₄, filtered and evaporated under reduced pressure. The residue was washed with Et₂O to produce 19 (63 mg, 90%), red solid, mp 164–165°C (DCM).

1-Methyl-2-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinolin-4-i um iodide (N-Me-19). Compound N-Me-19 (44 mg, 100%) was obtained from 2-phenylpyrido[2,1-a]pyrrolo[3,2-c]isoquinoline (19) (30 mg, 0.10 mmol) and methyl iodide (14.5 mg, 0.10 mmol, 1 equiv) in dry DCM (5 mL) likewise N-Me-3a. Orange solid, mp 165–166 °C (DCM). ¹H NMR (400 MHz, DMSO-дин): δ 9.88 (d, J = 6.6 Hz, 1H), 9.59 (d, J = 8.8 Hz, 1H), 9.27 (d, J = 8.5 Hz, 1H), 8.84 (d, J = 8.4 Hz, 1H), 8.59–8.52 (m, 1H), 8.30–8.26 (m, 1H), 8.22–8.18 (m, 1H), 7.99–7.93 (m, 1H), 7.86 (s, 1H), 7.73 (d, J = 6.3 Hz, 2H), 7.70–7.57 (m, 3H), 4.31 (s, 3H). ¹³C{¹H} NMR (101 MHz, DMSO-дин): δ 142.6 (C), 137.2 (CH), 134.4 (CH), 133.7 (CH), 130.1 (C), 129.6 (CH), 129.3 (CH), 129.1 (CH), 127.4 (CH), 127.2 (CH), 125.4 (C), 124.7 (C), 124.3 (C), 124.2 (CH), 123.8 (CH), 121.8 (CH), 121.6 (CH), 97.8 (CH), 36.7 (CH₃). HRMS (ESI) m/z: 309.1388 calcd for C₂₂H₁₇N₂⁺ [M – I]⁺, found 309.1397.

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$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(1-benzyl-4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (N-Bn-1a)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(1-benzyl-4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (N-Bn-1a)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(1-benzyl-4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (N-Bn-1a)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(1-acetyl-4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium chloride (N-Ac-1a)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(1-acetyl-4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium chloride (N-Ac-1a)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(1-acetyl-4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium chloride (N-Ac-Ia)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-fluorophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1b)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-fluorophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1b)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-fluorophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (Ib)
$^{1}H$ NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-chlorophenyl)-1$H$-pyrrol-3-yl)pyridin-1-ium bromide (1c)

$^{13}C\{^1H\}$ NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-chlorophenyl)-1$H$-pyrrol-3-yl)pyridin-1-ium bromide (1c)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-chlorophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (Ic)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-bromophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1d)

$^{13}$C{[H]} NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-bromophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1d)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-bromophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1d)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-methylphenyl)-1H-pyrrol-3-yl)pyridin-1-ylium bromide (1e)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-methylphenyl)-1H-pyrrol-3-yl)pyridin-1-ylium bromide (1e)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-methylphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1e)
$^1$H NMR (400 MHz, DMSO-d$_6$) of 1-(4-(2-bromophenyl)-2-(4-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1f)

$^{13}$C{[H]} NMR (101 MHz, DMSO-d$_6$) of 1-(4-(2-bromophenyl)-2-(4-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1f)
$^1$H NMR (101 MHz, DMSO-$d_6$) of 1-(2-(4-(2-bromophenyl)-2-(4-methoxyphenyl)-1H-pyrrolyl)pyridin-1-i um bromide (1f)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(2-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1g)

$^{13}$C{[1H]} NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(2-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1g)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(2-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1g)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(3-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1h)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(3-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1h)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(3-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (Ih)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(2,4-dimethoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (II)

$^{13}$C\[H\] NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(2,4-dimethoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (II)
$^1$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(2,4-dimethoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (II)
$^{13}$C\{1H\} NMR (101 MHz, DMSO-$d_6$) of $^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-nitrophenyl)-$H$-pyrrol-3-yl)pyridin-1-ium bromide (1j)

$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-nitrophenyl)-$H$-pyrrol-3-yl)pyridin-1-ium bromide (1j)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-nitrophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1j)
$^{1}H$ NMR (400 MHz, DMSO-$d_{6}$) of 1-(4-(2-bromophenyl)-2-(3-nitrophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1k)

$^{13}C\{1H\}$ NMR (101 MHz, DMSO-$d_{6}$) of 1-(4-(2-bromophenyl)-2-(3-nitrophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1k)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(3-nitrophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (1k)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-cyanophenyl)-1H-pyrrol-3-yl)pyridin-1ium bromide (II)

$^{13}$C{H} NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-cyanophenyl)-1H-pyrrol-3-yl)pyridin-1ium bromide (II)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(4-cyanophenyl)-1H-pyrrolyl-3-yl)pyridin-1-ium bromide (II)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(pyridin-2-yl)-1H-pyrrol-3-yl)pyridin-1-iium iodide (1m)

$^{13}$C($^1$H) NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(pyridin-2-yl)-1H-pyrrol-3-yl)pyridin-1-iium iodide (1m)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-(pyridin-2-yl)-1H-pyrrol-3-yl)pyridin-1-ium iodide (1m)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-methylpyridin-1-ium bromide (1n)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-methylpyridin-1-ium bromide (1n)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of $1$-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-methylpyridin-1-ium bromide (In)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-methoxypyridin-1-ium bromide (10)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-methoxypyridin-1-ium bromide (10)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-methoxypyridin-1-ium bromide (1o)
$\text{H NMR (400 MHz, DMSO-$d_6$) of 1-}(4\text{-}(2\text{-bromophenyl})\text{-}2\text{-phenyl}-1H\text{-pyrrol-3-yl})\text{-}4\text{-}(\text{dimethylamino})\text{pyridin-1-ium bromide (1p)}$

$\text{C [$^1\text{H}$] NMR (101 MHz, DMSO-$d_6$) of 1-}(4\text{-}(2\text{-bromophenyl})\text{-}2\text{-phenyl}-1H\text{-pyrrol-3-yl})\text{-}4\text{-}(\text{dimethylamino})\text{pyridin-1-ium bromide (1p)}$
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-(dimethylamino)pyridin-1-ium bromide (I\textit{p})
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-((4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-phenylpyridin-1-ium bromide (1q)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-((4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-phenylpyridin-1-ium bromide (1q)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-phenylpyridin-1-ium bromide (Iq)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-$(4$-(2-bromophenyl)-2-phenyl-$1H$-pyrrol-3-yl)-4-(4-methoxyphenyl)pyridin-1-ium bromide (1r)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-(4-methoxyphenyl)pyridin-1-ium bromide (1r)
\(^1\)H NMR (400 MHz, DMSO-\(d_6\)) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-3,5-dimethylpyridin-1-ium bromide (1s)

\(^{13}\)C\(^1\)H NMR (101 MHz, DMSO-\(d_6\)) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-3,5-dimethylpyridin-1-ium bromide (1s)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-$H$-pyrrol-3-yl)-3,5-dimethylpyridin-1-ium bromide (I)}
$^1$H NMR (400 MHz, DMSO-$d_6$) of 2-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)isoquinolin-2-iumbromide (1t)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 2-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)isoquinolin-2-iumbromide (1t)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-\textit{d}_6) of 2-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)isoquinolin-2-iambromide (11)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-(methoxycarbonyl)pyridin-1-ium bromide (1u)

$^{13}$C {$^1$H} NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-(methoxycarbonyl)pyridin-1-ium bromide (1u)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-\textit{d}$_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1\textit{H}-pyrrolo-3-yl)-4-(methoxycarbonyl)pyridin-1-ium bromide (\textit{Iu})
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-cyanopyridin-1-ium bromide (1v)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)-4-cyanopyridin-1-ium bromide (1v)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-2-phenyl-$1H$-pyrrol-3-yl)-4-cyanopyridin-1-ium bromide (Iv)
$^1\text{H NMR (400 MHz, DMSO-}$d$_6$) of 4-benzoyl-1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (Iw)

$^{13}\text{C\{1H\} NMR (101 MHz, DMSO-}$d$_6$) of 4-benzoyl-1-(4-(2-bromophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (Iw)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 4-benzoyl-1-((4-(2-bromophenyl)-2-phenyl-1$H$-pyrrol-3-yl)pyridin-1-ium bromide (Iw)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-iodophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (2)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-iodophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (2)
$^{13}\text{C DEPT135 NMR (101 MHz, DMSO-}d_6\text{)} \text{of 1-(4-(2-iodophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (2)}$
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(1-benzyl-4-(2-iodophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-i um bromide (N-Bn-2)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(1-benzyl-4-(2-iodophenyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-i um bromide (N-Bn-2)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-\textit{d}_6) of 1-(1-benzyl-4-(2-iodophenyl)-2-phenyl-1\textit{H}-pyrrol-3-yl)pyridin-1-ium bromide (N-Bn-2)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-iumbromide (3a)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-iumbromide (3a)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-iumbromide (3a)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 2-methyl-3-phenyl-2H-pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-4-ium iodide (N-Me-3a)

$^{13}$C($^1$H) NMR (101 MHz, DMSO-$d_6$) of 2-methyl-3-phenyl-2H-pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-4-ium iodide (N-Me-3a)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 2-methyl-3-phenyl-$2H$-pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-4-ium iodide (N-Me-3a)
$^1$H NMR (400 MHz, CDCl$_3$) of 2-benzyl-3-phenyl-2$H$-pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-4-ium bromide (N-Bn-$3a$)

$^{13}$C{$^1$H} NMR (101 MHz, CDCl$_3$) of 2-benzyl-3-phenyl-2$H$-pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-4-ium bromide (N-Bn-$3a$)
$^{13}$C DEPT135 NMR (101 MHz, CDCl$_3$) of 2-benzyl-3-phenyl-2$H$-pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-4-ium bromide (N-Bn-3a)
$^1$H NMR (400 MHz, DMSO-<i>d</i><sub>6</sub>) of 3-(4-fluorophenyl)pyrido[2,1-<i>a</i>]pyrrolo[3,4-<i>c</i>]isoquinolin-2-ium bromide (3b)

$^{13}$C{1H} NMR (101 MHz, DMSO-<i>d</i><sub>6</sub>) of 3-(4-fluorophenyl)pyrido[2,1-<i>a</i>]pyrrolo[3,4-<i>c</i>]isoquinolin-2-ium bromide (3b)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(4-fluorophenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3b)
$^1$H NMR (400 MHz, DMSO-d$_6$) of 3-(4-chlorophenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3c)

$^{13}$C$^\{1H\}$ NMR (101 MHz, DMSO-d$_6$) of 3-(4-chlorophenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3c)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(4-chlorophenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3c)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(4-methylphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3e)

$^{13}$C{$_1^1$H} NMR (101 MHz, DMSO-$d_6$) of 3-(4-methylphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3e)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(4-methylphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3e)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(4-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3f)

$^{13}$C\{1H\} NMR (101 MHz, DMSO-$d_6$) of 3-(4-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3f)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(4-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3f)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(2-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3g)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 3-(2-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3g)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(2-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3g)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(3-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3h)

$^{13}$C{$_1$H} NMR (101 MHz, DMSO-$d_6$) of 3-(3-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3h)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(3-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3h)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(2,4-dimethoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3i)

$^{13}$C($^1$H) NMR (101 MHz, DMSO-$d_6$) of 3-(2,4-dimethoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3i)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(2,4-dimethoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3i)
$^1$H NMR (500 MHz, DMSO-$d_6$) of 3-(4-cyanophenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3l)

$^{13}$C{1H} NMR (126 MHz, DMSO-$d_6$) of 3-(4-cyanophenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3l)
$^{13}$C DEPT135 NMR (126 MHz, DMSO-$d_6$) of 3-(4-cyanophenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3I)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(pyridin-2-yl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium iodide (3m)

$^{13}$C [1H] NMR (101 MHz, DMSO-$d_6$) of 3-(pyridin-2-yl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium iodide (3m)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(pyridin-2-yl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium iodide (3m)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 7-methyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3n)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 7-methyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3n)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 7-methyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3n)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 7-methoxy-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3o)

$^{13}$C{[H]} NMR (101 MHz, DMSO-$d_6$) of 7-methoxy-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3o)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 7-methoxy-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3o)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 7-(dimethylamino)-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3p)

$^{13}$C [$^1$H] NMR (101 MHz, DMSO-$d_6$) of 7-(dimethylamino)-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3p)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 7-(dimethylamino)-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3p)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3,7-diphenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3q)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 3,7-diphenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3q)
$^{13}\text{C DEPT135 NMR (101 MHz, DMSO-}$d_6$) of 3,7-diphenylpyrido[2,1-\alpha]pyrrolo[3,4-\alpha]$isoquinolin-2-iium bromide (3q)$
$^1$H NMR (500 MHz, DMSO-$d_6$) of 7-(4-methoxyphenyl)-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3r)

$^{13}$C{1H} NMR (126 MHz, DMSO-$d_6$) of 7-(4-methoxyphenyl)-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3r)
$^{13}$C DEPT135 NMR (126 MHz, DMSO-$_d_6$) of 7-(4-methoxyphenyl)-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3r)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 6,8-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3s)

$^{13}$C{$_1$H} NMR (101 MHz, DMSO-$d_6$) of 6,8-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3s)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 6,8-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-2-ium bromide (3s)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(2-(2,4-dimethoxyphenyl)-2-oxoethyl)pyridin-1-ium bromide (5i)

$^{13}$C{[H]} NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2,4-dimethoxyphenyl)-2-oxoethyl)pyridin-1-ium bromide (5i)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2,4-dimethoxyphenyl)-2-oxoethyl)pyridin-1-ium bromide (5i)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 4-(4-methoxyphenyl)-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5r).

$^{13}$C{$_1$H} NMR (101 MHz, DMSO-$d_6$) of 4-(4-methoxyphenyl)-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5r).
\^{13}C\ DEPT135\ NMR\ (101\ MHz,\ DMSO-d_6)\ of\ 4\-(4\-methoxyphenyl)-1\-(2\-oxo-2\-phenylethyl)pyridin-1\-ium\ bromide\ (5r).

\^{1}H\ NMR\ (400\ MHz,\ DMSO-d_6)\ of\ 4\-(methoxycarbonyl)-1\-(2\-oxo-2\-phenylethyl)pyridin-1\-ium\ bromide\ (5u)
$^{13}$C [1H] NMR (101 MHz, DMSO-$d_6$) of 4-(methoxycarbonyl)-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5u)

$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 4-(methoxycarbonyl)-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5u)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 4-benzoyl-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5w)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 4-benzoyl-1-(2-oxo-2-phenylethyl)pyridin-1-ium bromide (5w)
$\text{C DEPT135 NMR (101 MHz, DMSO-}d_6\text{) of 4-benzoyl-1-}(2\text{-oxo-2-phenylethyl})\text{pyridin-1-ium bromide (5w)}$
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6a)

$^{13}$C($^1$H) NMR (101 MHz, DMSO-$d_6$) of 3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6a)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6a)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(4-chlorophenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6c)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 3-(4-chlorophenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6c)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(4-chlorophenyl)pyrido[2,1-α]pyrrolo[3,4-c]isoquinoline (6c)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(3-methyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6e)

$^{13}$C{[1H]} NMR (101 MHz, DMSO-$d_6$) of 3-(3-methyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6e)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(3-methyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6c)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(4-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6f)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 3-(4-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6f)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(4-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6f)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(2-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6g)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 3-(2-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6g)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(2-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6g)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(3-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6h)

$^{13}$C$[^1]$H NMR (101 MHz, DMSO-$d_6$) of 3-(3-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6h)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(3-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6h)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(2,4-dimethoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6i)

$^{13}$C{$^1$H} NMR (101 MHz, DMSO-$d_6$) of 3-(2,4-dimethoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6i)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(2,4-dimethoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6i)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 4-[(pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-3-yl)benzonitrile (6i)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 4-[(pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-3-yl)benzonitrile (6i)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 4-(pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-3-yl)benzonitrile (6l)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(pyridin-2-yl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6m)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 3-(pyridin-2-yl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6m)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(pyridin-2-yl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6m)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 7-methyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6n)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 7-methyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6n)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 7-methyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6n)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 7-methoxy-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (60)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 7-methoxy-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (60)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 7-methoxy-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (60)
$^1$H NMR (400 MHz, DMSO-$d_6$) of N,N-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-7-amine (6p)

$^{13}$C{[H]} NMR (101 MHz, DMSO-$d_6$) of N,N-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-7-amine (6p)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of N,N-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-7-amine (6p)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3,7-diphenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6q)

$^{13}$C [$^1$H] NMR (101 MHz, DMSO-$d_6$) of 3,7-diphenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6q)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3,7-diphenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]-isoquinoline (6q)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 7-(4-methoxyphenyl)-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6r)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 7-(4-methoxyphenyl)-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6r)
$\text{DEPT 135 NMR (101 MHz, DMSO-$d_6$) of 7-(4-methoxyphenyl)-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6r)}$
$^1$H NMR (400 MHz, DMSO-$d_6$) of 6,8-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6s)

$^{13}$C\{1H\} NMR (101 MHz, DMSO-$d_6$) of 6,8-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (6s)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 6,8-dimethyl-3-phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinoline ($6s$)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-5-(tert-butoxycarbonyl)-2-phenyl-1$H$-pyrrol-3-yl)pyridin-1-ium bromide (7)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl)-5-(tert-butoxycarbonyl)-2-phenyl-1$H$-pyrrol-3-yl)pyridin-1-ium bromide (7)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(4-(2-bromophenyl))-5-(tert-butoxycarbonyl)-2-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (7)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(tert-butoxycarbonyl)-3-phenyl-2H-pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-4-ium bromide (8)

$^{13}$C{[1H]} NMR (101 MHz, DMSO-$d_6$) of 1-(tert-butoxycarbonyl)-3-phenyl-2H-pyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-4-ium bromide (8)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(tert-butoxycarbonyl)-3-phenyl-2H-pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-4-ium bromide (8)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-(2-iodophenyl)-1$H$-pyrrol-3-yl)pyridin-1-ium bromide (9)

$^{13}$C\{1H\} NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-(2-iodophenyl)-1$H$-pyrrol-3-yl)pyridin-1-ium bromide (9)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-(2-iodophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (9)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(2-bromophenyl)-2$H$-pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-4-ium bromide (10)

$^{13}$C{${}^1$H} NMR (101 MHz, DMSO-$d_6$) of 3-(2-bromophenyl)-2$H$-pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-4-ium bromide (10)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(2-bromophenyl)-2H-pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinolin-4-ium bromide (10)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(2-bromophenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (11)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 3-(2-bromophenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (11)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(2-bromophenyl)pyrido[2,1-$a$]pyrrolo[3,4-$c$]isoquinoline (11)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(2,4-bis(2-bromophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (12)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(2,4-bis(2-bromophenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (12)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(2,4-bis(2-bromophenyl)-1$H$-pyrrol-3-yl)pyridin-1-ium bromide (12)
$^1$H NMR (500 MHz, DMSO-$d_6$) of dibenzo[\textit{b,\textit{g}}]pyrido[2,1,6-de\textit{j}]pyrrolo[2,3,4-\textit{i}]quinolizin-1-i um bromide (13)

$^{13}$C{\textit{1H}} NMR (126 MHz, DMSO-$d_6$) of dibenzo[\textit{b,\textit{g}}]pyrido[2,1,6-de\textit{j}]pyrrolo[2,3,4-\textit{i}]quinolizin-1-i um bromide (13)
$^{13}$C DEPT135 NMR (126 MHz, DMSO-$d_6$) of dibenzo[b,g]pyrido[2,1,6-de]pyrrolo[2,3,4-i]quinolizin-1-ium bromide (13)
$^1$H NMR (400 MHz, DMSO-d$_6$) of dibenzo[b,g]pyrido[2,1,6-de]pyrrolo[2,3,4-ij]quinoline (14)

$^{13}$C($^1$H) NMR (101 MHz, DMSO-d$_6$) of dibenzo[b,g]pyrido[2,1,6-de]pyrrolo[2,3,4-ij]quinoline (14)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of dibenzo[b,g]pyrido[2,1,6-de]pyrrolo[2,3,4-ij]quinoline (14)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-2-oxoethyl)-4-methylpyridin-1-ium bromide (15b)

$^{13}$C\,$^1$H NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-2-oxoethyl)-4-methylpyridin-1-ium bromide (15b)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-2-oxoethyl)-4-methylpyridin-1-ium bromide (15b)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-2-oxoethyl)-4-(4-methoxyphenyl)pyridin-1-ium bromide (15e)

$^{13}$C{H} NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-2-oxoethyl)-4-(4-methoxyphenyl)pyridin-1-ium bromide (15e)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-2-oxoethyl)-4-(4-methoxyphenyl)pyridin-1-ium bromide (15e)
$^1$H NMR (400 MHz, DMSO-$_d_6$) of 2-(2-(bromophenyl)-2-oxoethyl)isoquinolin-2-ium bromide (15g)

$^{13}$C{¹H} NMR (101 MHz, DMSO-$_d_6$) of 2-(2-(bromophenyl)-2-oxoethyl)isoquinolin-2-ium bromide (15g)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 2-(2-(2-bromophenyl)-2-oxoethyl)isoquinolin-2-iium bromide (15g)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 4-benzoyl-1-(2-(2-bromophenyl)-2-oxoethyl)pyridin-1-ium bromide (15j)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 4-benzoyl-1-(2-(2-bromophenyl)-2-oxoethyl)pyridin-1-ium bromide (15j)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 4-benzoyl-1-(2-(2-bromophenyl)-2-oxoethyl)pyridin-1-ium bromide (15j)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-phenyl-$1H$-pyrrol-3-yl)-4-methylpyridin-1-ium bromide (16b)

$^{13}$C$[1H]$ NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-phenyl-$1H$-pyrrol-3-yl)-4-methylpyridin-1-ium bromide (16b)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-methylpyridin-1-ium bromide (16b)
$^1$H NMR (500 MHz, DMSO-$d_6$) of 1-(2-(2-Bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-methoxypyridin-1-ium bromide (16c)

$^{13}$C{$_^1$H} NMR (126 MHz, DMSO-$d_6$) of 1-(2-(2-Bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-methoxypyridin-1-ium bromide (16c)
$^{13}$C DEPT135 NMR (126 MHz, DMSO-$d_6$) of 1-(2-(2-Bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-methoxypyridin-1-ium bromide (16c)
\[ ^1H \text{ NMR (400 MHz, DMSO-}d_6 \text{) of 1-} \text{(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-(4-methoxyphenyl)pyridin-1-ium bromide} \ (16e) \]

\[ ^{13}C\{^1H\} \text{ NMR (101 MHz, DMSO-}d_6 \text{) of 1-} \text{(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-(4-methoxyphenyl)pyridin-1-ium bromide} \ (16e) \]
\[^{13}C\ DEPT135\ NMR\ (101\ MHz,\ DMSO-d_6)\ of\ 1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-(4-methoxyphenyl)pyridin-1-ium\ bromide\ (16e)\]
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-phenyl-1$H$-pyrrol-3-yl)-3,5-dimethylpyridin-1-ium bromide (16f)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-phenyl-$1H$-pyrrol-3-yl)-3,5-dimethylpyridin-1-ium bromide (16f)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-3,5-dimethylpyridin-1-ium bromide (16f)
$^1$H NMR (500 MHz, DMSO-$d_6$) of 2-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)isoquinolin-2-ium bromide (16g)

$^{13}$C{1H} NMR (126 MHz, DMSO-$d_6$) of 2-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)isoquinolin-2-ium bromide (16g)
$^1$C DEPT135 NMR (126 MHz, DMSO-$d_6$) of 2-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)isoquinolin-2-ium bromide (16g)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-(4-methoxyphenyl)-1H-pyrrolo-3-yl)pyridin-1-ium bromide (16h)

$^{13}$C [$^1$H] NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-(4-methoxyphenyl)-1H-pyrrolo-3-yl)pyridin-1-ium bromide (16h)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-(4-methoxyphenyl)-1H-pyrrol-3-yl)pyridin-1-ium bromide (16h)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-cyanopyridin-1-ium bromide (16i)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-cyanopyridin-1-ium bromide (16i)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)-4-cyanopyridin-1-ium bromide (16i)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 4-benzoyl-1-(2-(2-bromophenyl)-4-phenyl-$1H$-pyrrol-3-yl)pyridin-1-ium bromide (16j)

$^{13}$C{$^1$H} NMR (101 MHz, DMSO-$d_6$) of 4-benzoyl-1-(2-(2-bromophenyl)-4-phenyl-$1H$-pyrrol-3-yl)pyridin-1-ium bromide (16j)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 4-benzoyl-1-(2-(2-bromophenyl)-4-phenyl-1H-pyrrol-3-yl)pyridin-1-ium bromide (16j)
$^1$H NMR (400 MHz, DMSO-\textit{d}_6) of 3-phenylpyrido[2,1-\textit{a}]pyrrolo[3,2-\textit{c}]isoquinolin-1-ium bromide (17a)

$^{13}$C\{\textit{1H}\} NMR (101 MHz, DMSO-\textit{d}_6) of 3-phenylpyrido[2,1-\textit{a}]pyrrolo[3,2-\textit{c}]isoquinolin-1-ium bromide (17a)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-1-ium bromide (17a)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 7-methyl-3-phenyl-$1H$-pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-i um bromide (17b)

$^{13}$C{${^1}$H} NMR (101 MHz, DMSO-$d_6$) of 7-methyl-3-phenyl-$1H$-pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-i um bromide (17b)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 7-methyl-3-phenyl-1H-pyrirdo[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium bromide (17b)
\(^1\)H NMR (400 MHz, DMSO-d6) of 7-methoxy-3-phenyl-1H-pyrrolo[2,1-a]pyrrolo[3,2-c]isoquinolin-4-ium bromide (17c)

\(^{13}\)C\{\(^1\)H\} NMR (101 MHz, DMSO-d6) of 7-methoxy-3-phenyl-1H-pyrrolo[2,1-a]pyrrolo[3,2-c]isoquinolin-4-ium bromide (17c)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 7-methoxy-3-phenyl-1H-pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium bromide (17c)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3,7-diphenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-1-ium bromide (17d)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 3,7-diphenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-1-ium bromide (17d)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3,7-diphenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-1-ium bromide (17d)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 7-(4-methoxyphenyl)-3-phenyl-1H-pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium bromide (17e)

$^{13}$C[$^1$H] NMR (101 MHz, DMSO-$d_6$) of 7-(4-methoxyphenyl)-3-phenyl-1H-pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium bromide (17e)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 7-(4-methoxyphenyl)-3-phenyl-1$H$-pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium bromide (17e)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 6,8-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-1-ium bromide (17f)

$^{13}$C ($^1$H) NMR (101 MHz, DMSO-$d_6$) of 6,8-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-1-ium bromide (17f)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 6,8-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-1-ium bromide (17f)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-phenyl-1H-isoquinolino[1,2-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium bromide (17g)

$^{13}$C{^1}H NMR (101 MHz, DMSO-$d_6$) of 3-phenyl-1H-isoquinolino[1,2-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium bromide (17g)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$_d_6$) of 3-phenyl-1$H$-isoquinolino[1,2-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium bromide (17g)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(4-methoxyphenyl)-1$H$-pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium bromide (17h)

$^{13}$C($^1$H) NMR (101 MHz, DMSO-$d_6$) of 3-(4-methoxyphenyl)-1$H$-pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium bromide (17h)
$\textsuperscript{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-(4-methoxyphenyl)-1$H$-pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-i um bromide (17h)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18a)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18a)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18a)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 7-methoxy-3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18c)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 7-methoxy-3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18c)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 7-methoxy-3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18c)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3,7-diphenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18d)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 3,7-diphenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18d)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3,7-diphenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18d)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 7-(4-methoxyphenyl)-3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18e)

$^{13}$C{H} NMR (101 MHz, DMSO-$d_6$) of 7-(4-methoxyphenyl)-3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18e)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$_{d_6}$) of 7-(4-methoxyphenyl)-3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18e)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 6,8-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18f)

$^{13}$C{[H]} NMR (101 MHz, DMSO-$d_6$) of 6,8-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18f)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 6,8-dimethyl-3-phenylpyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18f)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-phenylisoquinolino[1,2-$a$]pyrrolo[3,2-$c$]isoquinoline (18g)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 3-phenylisoquinolino[1,2-$a$]pyrrolo[3,2-$c$]isoquinoline (18g)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 3-phenylisoquinolino[1,2-$a$]pyrrolo[3,2-$c$]isoquinoline (18g)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 3-(4-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18h)

$^{13}$C{[$^1$H]} NMR (101 MHz, DMSO-$d_6$) of 3-(4-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18h)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$_d_6$) of 3-(4-methoxyphenyl)pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinoline (18h)
$^1$H NMR (400 MHz, DMSO-$d_6$) of 1-methyl-2-phenyl-1$H$-pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium iodide (N-Me-19)

$^{13}$C{1H} NMR (101 MHz, DMSO-$d_6$) of 1-methyl-2-phenyl-1$H$-pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium iodide (N-Me-19)
$^{13}$C DEPT135 NMR (101 MHz, DMSO-$d_6$) of 1-methyl-2-phenyl-1H-pyrido[2,1-$a$]pyrrolo[3,2-$c$]isoquinolin-4-ium iodide (N-Me-19)
$^1$H NMR (400 MHz, CDCl₃) of 1-(1,2-dibromoethyl)-2-iodobenzene

$^{13}$C{¹H} NMR (101 MHz, CDCl₃) of 1-(1,2-dibromoethyl)-2-iodobenzene
$^{13}$C DEPT135 NMR (101 MHz, CDCl$_3$) of 1-(1,2-dibromoethyl)-2-iodobenzene
$^1$H NMR (400 MHz, CDCl$_3$) of 3-(2-iodophenyl)-2H-azirine

$^{13}$C{¹H} NMR (101 MHz, CDCl$_3$) of 3-(2-iodophenyl)-2H-azirine
$^{13}$C DEPT135 NMR (101 MHz, CDCl$_3$) of 3-(2-iodophenyl)-2H-azirine
X-ray diffraction experiments

A suitable crystal was selected and studied on a Rigaku Oxford Diffraction «XtaLAB Supernova» with HyPix 3000 type detector. The crystal was kept at 100(2) K during data collection. The structure was solved using Olex2 [1] with SHELXT [2] structure solution program using Intrinsic Phasing. Structural refinement was carried out with SHELXL refinement package [2] using Least Squares minimisation.

[1] Dolomanov, O. V.; Bourhis, L. J.; Gildea, R. J.; Howard, J. A. K.; Puschmann, H., OLEX2: a complete structure solution, refinement and analysis program. *Journal of Applied Crystallography* 2009, 42, 339-341.

[2] Sheldrick, G., SHELXT - Integrated space-group and crystal-structure determination. *Acta Crystallographica Section A* 2015, 71, 3-8.

3-Phenylpyrido[2,1-a]pyrrolo[3,4-c]isoquinolin-2-ium bromide (3a).

Single crystals of 3a were growth from methanol/diethyl ether at room temperature.

(CCDC 1974298).

**Crystal Data** for C\textsubscript{21}H\textsubscript{15}BrN\textsubscript{2} (M = 375.26 g/mol): monoclinic, space group P2\textsubscript{1}/n (no. 14), a = 9.3373(3) Å, \( b = 9.3695(3) \) Å, \( c = 17.9629(5) \) Å, \( \beta = 97.580(3) \)°, \( V = 1557.77(8) \) Å\(^3\), \( Z = 4 \), \( T = 100(2) \) K, \( \mu(\text{CuK}\alpha) = 3.606 \text{ mm}^{-1} \), \( D_{\text{calc}} = 1.600 \text{ g/cm}^3 \), 27246 reflections measured (9.936° ≤ 2θ ≤ 152.942°), 3252 unique (\( R_{\text{int}} = 0.0785 \), \( R_{\text{sigma}} = 0.0343 \)) which were used in all calculations. The final \( R_1 \) was 0.0326 (\( I \geq 2\sigma(I) \)) and \( wR_2 \) was 0.0847 (\( I \geq 2\sigma(I) \)).

**Table S1 Crystal data and structure refinement for 3a.**

| Identification code | 3a          |
|---------------------|-------------|
| Empirical formula   | C\textsubscript{21}H\textsubscript{15}BrN\textsubscript{2} |
| Formula weight      | 375.26      |
| Temperature/K       | 100(2)      |
| Crystal system      | monoclinic  |
| Spacegroup          | P2\textsubscript{1}/n |
| a/Å                  | 9.3373(3)   |
| b/Å                  | 9.3695(3)   |
\(c/\text{Å}\) 17.9629(5)
\(\omega/\degree\) 90
\(\beta/\degree\) 97.580(3)
\(\gamma/\degree\) 90
Volume/Å\(^3\) 1557.77(8)
\(Z\) 4
\(D_{\text{calc}}/\text{g/cm}^3\) 1.600
\(\mu/\text{mm}^{-1}\) 3.606
\(F(000)\) 760.0
Crystalsize/mm\(^3\) 0.21 × 0.15 × 0.1
Radiation CuK\(\alpha\) (\(\lambda = 1.54184\))
2\(\Theta\) range for data collection/\(\degree\) 9.936 to 152.942
Indexranges -11 ≤ \(h\) ≤ 11, -11 ≤ \(k\) ≤ 11, -22 ≤ \(l\) ≤ 22
Reflectionscollected 27246
Independentreflections 3252 [\(R_{\text{int}} = 0.0785, R_{\text{sigma}} = 0.0343\)]
Data/restraints/parameters 3252/0/217
Goodness-of-fit on \(F^2\) 1.063
Final R indexes [\(I \geq 2\sigma(I)\)] \(R_1 = 0.0326, wR_2 = 0.0847\)
Final R indexes [all data] \(R_1 = 0.0395, wR_2 = 0.0886\)
Largest diff. peak/hole / e Å\(^{-3}\) 0.51/−0.73

**Table S2 Fractional Atomic Coordinates (×10\(^4\)) and Equivalent Isotropic Displacement Parameters (Å\(^2\)×10\(^3\)) for 3a. \(U_{\text{eq}}\) is defined as 1/3 of the trace of the orthogonalised \(U_{IJ}\) tensor.**

| Atom | \(x\)       | \(y\)       | \(z\)       | \(U(\text{eq})\) |
|------|-------------|-------------|-------------|-----------------|
| Br1  | 3820.3(2)   | 6148.2(3)   | 7966.3(2)   | 17.96(10)       |
| N2   | 6410(2)     | 3028(2)     | 4998.6(11)  | 14.5(4)         |
| N1   | 4699(2)     | 4463(2)     | 6511.3(11)  | 15.2(4)         |
| C14  | 4149(2)     | 2988(2)     | 5554.1(13)  | 14.9(4)         |
| C15  | 3620(3)     | 3649(2)     | 6150.8(13)  | 15.9(5)         |
| C13  | 3519(2)     | 1969(2)     | 5008.1(13)  | 15.4(5)         |
| C8   | 4421(3)     | 1415(2)     | 4504.6(13)  | 15.1(5)         |
| C5   | 8092(3)     | 2148(3)     | 3929.5(14)  | 20.7(5)         |
| C2   | 5600(2)     | 3457(3)     | 5575.0(13)  | 14.4(4)         |
| C3   | 7696(3)     | 3689(3)     | 4937.8(14)  | 18.2(5)         |
| C7   | 5878(3)     | 1980(3)     | 4496.4(13)  | 15.3(4)         |
| C4   | 8551(3)     | 3262(3)     | 4416.5(14)  | 20.3(5)         |
| C16  | 7283(2)     | 5029(3)     | 6558.4(13)  | 14.7(4)         |
| C10  | 2453(3)     | 74(3)       | 3948.4(14)  | 20.4(5)         |
| C6   | 6765(3)     | 1531(3)     | 3968.3(14)  | 19.6(5)         |
| C1   | 5952(2)     | 4354(3)     | 6189.3(13)  | 14.9(4)         |
| C9   | 3862(3)     | 371(3)      | 3984.1(13)  | 18.0(5)         |
| C20  | 9839(3)     | 4915(3)     | 7039.4(13)  | 18.5(5)         |
| C18  | 8488(3)     | 7053(3)     | 7201.0(13)  | 19.0(5)         |
| C17  | 7240(3)     | 6412(3)     | 6841.4(13)  | 17.6(5)         |
| C11  | 1559(3)     | 485(3)      | 4444.9(14)  | 20.1(5)         |
Table S3 Anisotropic Displacement Parameters (Å²×10³) for 3a. The Anisotropic displacement factor exponent takes the form: -2π²[h²a*²U11+2hka*b*U12+…].

| Atom | U₁₁  | U₂₂  | U₃₃  | U₂₃  | U₁₃  | U₁₂  |
|------|------|------|------|------|------|------|
| Br1  | 15.96(14) | 19.73(15) | 19.01(15) | -1.14(9) | 5.35(9) | 1.28(8) |
| N2   | 13.7(9)    | 16.0(10)   | 14.5(9)   | 1.3(7)   | 4.7(7)  | 1.3(7) |
| N1   | 13.8(9)    | 18.0(10)   | 14.6(9)   | -2.4(8)  | 4.3(7)  | 0.8(7) |
| C14  | 13.7(10)   | 15.0(11)   | 16.5(11)  | 2.8(9)   | 3.7(8)  | 2.1(8) |
| C15  | 12.9(10)   | 17.8(12)   | 17.1(11)  | 0.4(9)   | 2.9(9)  | 0.9(8) |
| C13  | 15.0(11)   | 15.0(11)   | 15.8(11)  | 2.7(9)   | 1.1(9)  | 1.2(8) |
| C8   | 16.7(11)   | 13.0(11)   | 15.8(11)  | 2.5(9)   | 2.3(9)  | 2.9(8) |
| C5   | 20.3(12)   | 24.4(13)   | 18.9(11)  | 1.1(10)  | 8.5(9)  | 4.8(10) |
| C2   | 13.6(10)   | 14.4(11)   | 16.1(11)  | 1.5(9)   | 4.6(8)  | 0.9(8) |
| C3   | 15.2(11)   | 21.0(12)   | 18.4(11)  | 3.6(9)   | 2.7(9)  | -1.2(9) |
| C7   | 16.6(11)   | 14.8(11)   | 14.4(10)  | 1.8(8)   | 2.4(8)  | 2.2(8) |
| C4   | 14.9(11)   | 25.9(13)   | 21.5(12)  | 3.3(10)  | 7.4(9)  | -1.1(9) |
| C16  | 14.1(11)   | 16.3(11)   | 14.5(10)  | 1.3(9)   | 4.4(8)  | -0.7(8) |
| C10  | 25.5(13)   | 16.7(12)   | 18.0(12)  | 0.1(9)   | -1.4(10) | -2.0(9) |
| C6   | 20.3(12)   | 22.5(12)   | 16.7(11)  | -0.2(9)  | 5.4(9)  | 3.3(9) |
| C1   | 14.2(10)   | 14.6(11)   | 16.7(11)  | 1.3(9)   | 4.9(9)  | 2.3(8) |
| C9   | 21.5(12)   | 15.9(12)   | 16.9(11)  | 0.6(9)   | 4.0(9)  | 2.0(9) |
| C20  | 14.7(11)   | 22.8(12)   | 18.9(11)  | 2.6(10)  | 6.1(9)  | 1.6(9) |
| C18  | 22.7(12)   | 16.4(11)   | 17.9(11)  | -2.9(9)  | 3.0(9)  | -4.3(9) |
| C17  | 17.5(11)   | 18.5(12)   | 17.2(11)  | 2.4(9)   | 4.2(9)  | 4.0(9) |
| C11  | 16.1(11)   | 22.8(13)   | 20.9(12)  | 2.2(10)  | 0.4(9)  | -4.2(9) |
| C21  | 16.7(11)   | 16.4(11)   | 18.4(11)  | 1.0(9)   | 6.2(9)  | 1.5(9) |
| C19  | 16.3(11)   | 24.5(13)   | 17.5(11)  | 0.6(9)   | 4.1(9)  | -5.8(9) |
| C12  | 16.5(11)   | 21.5(12)   | 18.9(12)  | 1.9(10)  | 3.9(9)  | -0.2(9) |

Table S4 Bond Lengths for 3a.

| Atom | Atom | Length/Å | Atom | Atom | Length/Å |
|------|------|----------|------|------|----------|
| N2   | C2   | 1.418(3) | C2   | C1   | 1.392(3) |
| N2   | C3   | 1.369(3) | C3   | C4   | 1.368(3) |
| N2   | C7   | 1.381(3) | C7   | C6   | 1.404(3) |
| N1   | C15  | 1.358(3) | C16  | C1   | 1.472(3) |
| N1   | C1   | 1.376(3) | C16  | C17  | 1.395(3) |
| C14  | C15  | 1.384(3) | C16  | C21  | 1.406(3) |
| C14  | C13  | 1.438(3) | C10  | C9   | 1.374(4) |
| C14  | C2   | 1.420(3) | C10  | C11  | 1.401(4) |
| C13  | C8   | 1.414(3) | C20  | C21  | 1.390(3) |

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Table S5 Bond Angles for 3a.

| Atom | Atom | Atom | Angle/° | Atom | Atom | Atom | Angle/° |
|------|------|------|---------|------|------|------|---------|
| C3   | N2   | C2   | 119.2(2) | N2   | C7   | C6   | 117.4(2) |
| C3   | N2   | C7   | 120.9(2) | C6   | C7   | C8   | 122.1(2) |
| C7   | N2   | C2   | 119.86(19) | C3   | C4   | C5   | 119.4(2) |
| C15  | N1   | C1   | 112.1(2) | C17  | C16  | C1   | 120.0(2) |
| C15  | C14  | C13  | 132.0(2) | C17  | C16  | C21  | 118.6(2) |
| C15  | C14  | C2   | 106.1(2) | C21  | C16  | C1   | 121.3(2) |
| C2   | C14  | C13  | 121.8(2) | C9   | C10  | C11  | 120.3(2) |
| N1   | C15  | C14  | 107.6(2) | C5   | C6   | C7   | 121.6(2) |
| C8   | C13  | C14  | 117.1(2) | N1   | C1   | C2   | 104.7(2) |
| C12  | C13  | C14  | 123.1(2) | N1   | C1   | C16  | 119.5(2) |
| C12  | C13  | C8   | 119.8(2) | C2   | C1   | C16  | 135.5(2) |
| C13  | C8   | C7   | 120.5(2) | C10  | C9   | C8   | 120.8(2) |
| C9   | C8   | C13  | 118.7(2) | C19  | C20  | C21  | 120.1(2) |
| C9   | C8   | C7   | 120.6(2) | C17  | C18  | C19  | 120.4(2) |
| C6   | C5   | C4   | 119.2(2) | C18  | C17  | C16  | 120.5(2) |
| N2   | C2   | C14  | 119.4(2) | C12  | C11  | C10  | 120.2(2) |
| C1   | C2   | N2   | 131.1(2) | C20  | C21  | C16  | 120.8(2) |
| C1   | C2   | C14  | 109.4(2) | C20  | C19  | C18  | 119.6(2) |
| C4   | C3   | N2   | 121.3(2) | C11  | C12  | C13  | 120.1(2) |
| N2   | C7   | C8   | 120.4(2) |      |      |      |         |

Table S6 Hydrogen Atom Coordinates (Å×10^4) and Isotropic Displacement Parameters (Å^2×10^3) for 3a.

| Atom | x    | y    | z    | U(eq) |
|------|------|------|------|-------|
| H1   | 4607 | 4998 | 6905 | 18    |
| H15  | 2674 | 3550 | 6284 | 19    |
| H5   | 8686 | 1818 | 3575 | 25    |
| H3   | 8002 | 4460 | 5264 | 22    |
| H4   | 9448 | 3721 | 4387 | 24    |
| H10  | 2084 | -765 | 3586 | 25    |
| H6   | 6443 | 784  | 3630 | 23    |
| H9   | 4466 | -31  | 3653 | 22    |
| H20  | 10722| 4398 | 7110 | 22    |
| H18  | 8451 | 8003 | 7382 | 23    |
| H17  | 6352 | 6921 | 6788 | 21    |
1H-dibenzo[b,g]pyrido[2,1,6-de]pyrrolo[2,3,4-ij]quinolizin-14-ium bromide (13).

Single crystals of 13 were growth from methanol/hexane at room temperature.

(CCDC 2049334).

**Crystal Data** for C22H17BrN2O (M = 405.28 g/mol): triclinic, space group P-1 (no. 2), a = 7.7049(3) A, b = 9.5333(4) A, c = 12.7349(3) Å, α = 111.349(3)°, β = 92.627(2)°, γ = 98.001(3)°, V = 858.01(6) A³, Z = 2, T = 100(2) K, μ(CuKα) = 3.366 mm⁻¹, Dcalc = 1.569 g/cm³, 7090 reflections measured (7.494° ≤ 2θ ≤ 139.994°), 3243 unique (Rint = 0.0195, Rsigma = 0.0241) which were used in all calculations. The final R₁ was 0.0343 (I≥2σ(I)) and wR₂ was 0.0948(I≥2σ(I)).

| Identificationcode | 13 |
|--------------------|----|
| **Empiricalformula** | C22H17BrN2O |
| **Formulaweight** | 405.28 |
| **Temperature/K** | 112.0(5) |
| **Crystalsystem** | triclinic |
Spacegroup  P-1
a/Å  7.7049(3)
b/Å  9.5333(4)
c/Å  12.7349(3)
α/°  111.349(3)
β/°  92.627(2)
γ/°  98.001(3)
Volume/Å³  858.01(6)
Z  2
D_c calc./g/cm³  1.569
µ/mm⁻¹  3.366
F(000)  412.0
Crystalsize/mm³  0.16 × 0.09 × 0.05
Radiation  CuKα (λ = 1.54184)
2Θ range for data collection/°  7.494 to 139.994
Indexranges  -9 ≤ h ≤ 9, -11 ≤ k ≤ 11, -12 ≤ l ≤ 15
Reflectionscollected  7090
Independentreflections  3243 [R_int = 0.0195, R_sigma = 0.0241]
Data/restraints/parameters  3243/0/238
Goodness-of-fit on F²  1.084
Final R indexes [I≥2σ (I)]  R₁ = 0.0343, wR₂ = 0.0948
Final R indexes [all data]  R₁ = 0.0388, wR₂ = 0.0974
Largest diff. peak/hole / e Å⁻³  0.91/-0.64

Table S8 Fractional Atomic Coordinates (×10⁴) and Equivalent Isotropic Displacement Parameters (Å²×10³) for 13. U eq is defined as 1/3 of of the trace of the orthogonalised UIJ tensor.

| Atom | x    | y    | z    | U(eq) |
|------|------|------|------|-------|
| Br01 | 581.9(4) | 8833.5(3) | 2505.1(2) | 42.21(12) |
| O003 | 4827(3) | 9252(2) | 2517.6(16) | 44.4(5) |
| C00Q | 5360(4) | 8753(4) | 1406(2) | 44.5(6) |
| N002 | 7380(2) | 5512(2) | 4502.4(16) | 27.4(4) |
| N004 | 8791(3) | 2013(3) | 4138(2) | 38.1(6) |
| N006 | 8479(3) | 2531(3) | 5290(2) | 38.9(7) |
| C00H | 7323(3) | 4706(3) | 7609(2) | 36.8(6) |
| C00P | 9034(4) | 2216(3) | 637(2) | 39.9(6) |
| C00C | 7356(3) | 4943(3) | 6581(2) | 31.4(5) |
| C00B | 6318(3) | 7838(3) | 5339(2) | 32.3(5) |
| C00F | 6823(3) | 6560(3) | 5449(2) | 28.9(5) |
| C00G | 6940(3) | 7002(3) | 3412(2) | 32.2(5) |
| C00O | 6761(3) | 5753(4) | 8538(2) | 41.2(6) |

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Table S9 Anisotropic Displacement Parameters (Å²×10³) for 13. The Anisotropic displacement factor exponent takes the form: \(-2\pi^2[\mathbf{h}^2 \mathbf{a}^*2\mathbf{U}_{11} + 2\mathbf{h}\mathbf{a}\mathbf{b}^*\mathbf{U}_{12} + ...].\)

| Atom | U₁₁     | U₂₂     | U₃₃     | U₁₂     | U₁₃     | U₂₃     |
|------|---------|---------|---------|---------|---------|---------|
| Br01 | 44.41(18)| 39.32(18)|40.96(18)|13.79(12)|11.67(12)| 1.84(12)|
| O003 | 45.2(11) | 53.9(12)|35.7(10)|18.9(9)| 3.4(8) | 8.1(9) |
| C00Q | 43.1(15) | 53.2(18)|40.2(14)|20.3(13)| 5.6(12)| 9.4(13)|
| N002 | 23.2(9)  | 30.8(10)|30.2(10)|15.2(8)| 0.7(7) | 1.4(8)|
| N004 | 29.0(11) | 31.4(12)|54.8(15)|17.8(11)| 0.6(10)| 4.7(9)|
| N006 | 28.7(11) | 42.1(14)|54.1(15)|31.4(12)|-5.3(10)|-1.6(10)|
| C00H | 31.5(12) | 46.4(15)|39.0(13)|27.1(12)|-1.3(10)|-1.2(11)|
| C00P | 38.8(14) | 40.7(15)|31.7(13)| 5.7(11)| 3.0(10)| 1.0(11)|
| C00C | 23.1(10) | 39.7(13)|34.5(12)|20.9(11)|-2.1(9) | -2.7(9)|
| C00B | 27.3(11) | 35.6(13)|34.2(12)|14.5(10)| 1.5(9) | 2.7(10)|
| C00F | 22.3(10) | 36.1(13)|29.6(11)|15.7(10)| 0.2(8) | 0.2(9) |
| C00G | 29.2(11) | 35.4(13)|35.0(12)|18.9(10)|-0.8(9)| 1.2(10)|
| C00O | 35.2(13) | 58.9(18)|35.9(13)|28.2(13)| 1.9(11)| 0.1(12)|
| C00J | 32.5(12) | 35.1(13)|34.4(12)|17.7(10)| 1.2(10)| 5.3(10)|
| C00E | 25.7(11) | 32.4(12)|32.4(12)|11.9(10)| 0.6(9) | -0.3(9)|
| C00D | 24.6(11) | 35.1(13)|31.1(12)|12.4(10)|-0.3(9)|-1.7(9)|
| C00M | 37.6(13) | 55.3(17)|31.8(13)|19.4(12)| 6.2(10)| 5.2(12)|
| C00N | 32.7(12) | 46.4(15)|31.6(12)|13.0(11)|-0.2(10)|-0.5(11)|
| C00A | 23.0(11) | 41.4(14)|30.8(12)|18.7(11)| 0.2(9) | -1.9(10)|
| C00L | 32.5(12) | 36.0(14)|42.0(14)|11.8(11)| 2.2(10)| 3.0(10)|
| C00I | 30.4(12) | 39.7(14)|31.7(12)|14.5(11)|-0.1(10)| 1.9(10)|
| C00K | 32.2(12) | 44.2(15)|35.2(13)|20.5(11)| 3.0(10)| 5.4(11)|
C004  29.0(11)  31.4(12)  54.8(15)  17.8(11)  0.6(10)  4.7(9)
C005  22.7(10)  30.9(12)  35.1(12)  17.4(10) -1.7(9) -0.9(9)
C006  28.7(11)  42.1(14)  54.1(15)  31.4(12) -5.3(10) -1.6(10)
C007  25.6(11)  30.0(12)  37.0(12)  12.6(10)  0.1(9)  1.0(9)
C008  24.4(10)  33.1(12)  28.1(11)  15.1(10) -1.2(9) -1.3(9)
C009  24.2(10)  38.1(13)  36.9(12)  22.0(11) -3.0(9) -2.7(9)

Table S10 BondLengths for 13.

| Atom | Atom | Length/Å |
|------|------|----------|
| O003 | C00Q | 1.419(3) |
| N002 | C00F | 1.388(3) |
| N002 | C005 | 1.378(3) |
| N002 | C008 | 1.397(3) |
| N004 | C006 | 1.411(4) |
| N004 | C007 | 1.368(3) |
| N006 | C009 | 1.361(4) |
| C00H | C00C | 1.408(3) |
| C00H | C00A | 1.375(4) |
| C00P | C00N | 1.394(4) |
| C00P | C00L | 1.380(4) |
| C00C | C00A | 1.416(4) |
| C00C | C009 | 1.436(4) |
| C00B | C00F | 1.381(3) |
| C00B | C00J | 1.380(3) |

Table S11 BondAngles for 13.

| Atom | Atom | Angle/°  |
|------|------|----------|
| C00F | N002 | 123.2(2) |
| C005 | N002 | 118.55(19) |
| C005 | N002 | 118.2(2) |
| C007 | N004 | 108.7(2) |
| C009 | N006 | 108.9(2) |
| C00O | C00H | 120.2(3) |
| C00L | C00P | 120.0(3) |
| C00H | C00C | 119.8(2) |
| C00H | C00C | 123.6(2) |
| C00A | C00C | 116.6(2) |
| C00F | C00B | 121.0(2) |
| N002 | C00F | 119.0(2) |
| C00B | C00F | 117.2(2) |
| C00B | C00F | 123.8(2) |
| A   | B   | C   | D   | Angle/° | A   | B   | C   | D   | Angle/° |
|-----|-----|-----|-----|---------|-----|-----|-----|-----|---------|
| N002| C00F| C00A| C00C | 0.3(3)  | C00D| C00E| C007| C004| -177.4(2) |
| N002| C00F| C00A| C00K | -179.9(2)| |     |     |     |     |         |
| N002| C005| C007| N004 | 179.7(2)| |     |     |     |     |         |
| N002| C005| C007| C00E | 0.4(4)  | C00A| C00C| C009| N006 | -178.7(2) |
| N002| C005| C007| C004 | 179.7(2)| |     |     |     |     |         |
| N002| C005| C009| N006 | -179.6(2)| |     |     |     |     |         |
| N002| C005| C009| C00C | 1.4(3)  | C00L| C00P| C00N| C001 | -0.9(4)  |
| N002| C005| C009| C006 | -179.6(2)| |     |     |     |     |         |
| N004| C006| C009| C00C | 178.5(3)| |     |     |     |     |         |
| N004| C006| C009| C005 | -0.2(3) | C00L| C00E| C007| N004 | 2.3(4)   |
| N006| C004| C007| C00E | 179.2(3)| |     |     |     |     |         |
| N006| C004| C007| C005 | 0.1(3)  | C00L| C00E| C007| C005 | -178.7(2) |
| C00H| C00C| C00A| C00F | 179.9(2)| |     |     |     |     |         |
| C00H| C00C| C00A| C00K | 0.1(3)  | C00I| C00D| C008| N002 | -179.4(2) |
| C00H| C00C| C00A| C00K | 0.1(3)  | |     |     |     |     |         |
| C00H| C00C| C009| N006 | 0.7(4)  | C004| N006| C009| C00C | 178.5(3) |
| C00H| C00C| C009| C005 | 179.3(2)| |     |     |     |     |         |
| C00H| C00C| C009| C006 | 0.7(4)  | C005| N002| C00F| C00B | -179.4(2) |
| C00H| C00O| C00M| C00K | 0.0(4)  | C005| N002| C00F| C00A | 0.9(3)   |
| C00P| C00N| C001| C00D | -0.7(4) | C005| N002| C008| C00G | 179.7(2) |
| C00C| C00H| C00O| C00M | -0.1(4) | C005| N002| C008| C00D | 0.3(3)   |
| C00C| C00A| C00K| C00M | -0.2(4) | C006| N004| C007| C00E | 179.2(3) |
| C00B| C00F| C00A| C00C | -179.3(2)| |     |     |     |     |         |
| C00B| C00F| C00A| C00K | 0.5(3)  | C007| N004| C006| C009 | 0.1(3)   |
| C00F| N002| C005| C007 | 178.3(2)| |     |     |     |     |         |
| C00F| N002| C009 | -1.8(3)| |     |     |     |     |         |
| C00F| N002| C008| C00G | 0.1(3)  | |     |     |     |     |         |
| C00F| N002| C008| C00D | -179.3(2)| |     |     |     |     |         |

| C00J| C00G| C008 | 121.6(2) | C004| C007| C005| 105.9(2) |
| C00H| C00O| C00M | 120.2(2) | C005| C007| C00E| 120.4(2) |
| C00G| C00J| C00B | 120.2(2) | N002| C008| C00D| 118.8(2) |
| C00D| C00E| C007 | 116.0(2) | C00G| C008| N002| 116.8(2) |
| C00L| C00E| C00D | 120.1(2) | C00G| C008| C00D| 124.4(2) |
| C00L| C00E| C007 | 124.0(2) | N006| C009| C00C| 134.7(2) |
| C00E| C00D| C008 | 121.9(2) | N006| C009| C005| 105.7(2) |
| C00I| C00D| C00E | 118.3(2) | C005| C009| C00C| 119.6(2) |
| C00I| C00D| C008 | 119.8(2) | C006| C009| C00C| 134.7(2) |
| C00K| C00M| C00O | 120.7(3) | C006| C009| C005| 105.7(2) |
C00F  C00B  C00J  C00G  0.6(4)  C007  C005  C009  C00C  -178.7(2)
C00F  C00A  C00K  C00M  -180.0(2)  C007  C005  C009  C006  0.3(3)
C00O  C00H  C00C  C00A  0.1(4)  C008  N002  C00F  C00B  0.2(3)
C00O  C00H  C00C  C009  -179.3(2)  C008  N002  C00F  C00A  -179.50(19)
C00O  C00M  C00K  C00A  0.1(4)  C008  N002  C005  C007  -1.3(3)
C00J  C00B  C00F  N002  -0.6(3)  C008  N002  C005  C009  178.6(2)
C00J  C00B  C00F  C00A  179.1(2)  C008  C00G  C00J  C00B  -0.2(4)
C00J  C00G  C008  N002  -0.1(3)  C008  C00D  C00I  C00N  -177.2(2)
C00J  C00G  C008  C00D  179.3(2)  C009  N006  C004  C007  0.1(3)
C00E  C00D  C00I  C00N  1.7(3)  C009  C00C  C00A  C00F  -0.7(3)
C00E  C00D  C008  N002  1.7(3)  C009  C00C  C00A  C00K  179.5(2)
C00E  C00D  C008  C00G  -177.7(2)  C009  C005  C007  N004  -0.3(3)
C00D  C00E  C00L  C00P  -0.4(4)  C009  C005  C007  C00E  -179.5(2)
C00D  C00E  C007  N004  -177.4(2)  C009  C005  C007  C004  -0.3(3)

Table S13 Hydrogen Atom Coordinates (Å×10^4) and Isotropic Displacement Parameters (Å^2×10^3) for 13.

| Atom | x    | y    | z    | U(eq) |
|------|------|------|------|-------|
| H003 | 3752.5 | 9032.3 | 2482.23 | 67    |
| H00D | 4896.57 | 9313.06 | 997.4  | 67    |
| H00E | 4920.03 | 7682.7  | 1020.21 | 67    |
| H00F | 6623.2  | 8927.46 | 1450.17 | 67    |
| H004 | 9158.4  | 1175.53 | 3771.54 | 46    |
| H006 | 8626.05 | 2060.89 | 5741.18 | 47    |
| H00H | 7683.37 | 3839.71 | 7660.48 | 44    |
| H00P | 9337.84 | 1452.9  | 8.09   | 48    |
| H00B | 5928.25 | 8559.55 | 5954.95 | 39    |
| H00G | 6973.53 | 7165.33 | 2735.78 | 39    |
| H00O | 6739.76 | 5592.22 | 9215.53 | 49    |
| H00J | 6049.93 | 8932.5  | 4270.66 | 39    |
| H00M | 5844.31 | 7756.86 | 9099.45 | 49    |
| H00N | 8667.13 | 3671.61 | -146.04 | 46    |
| H00L | 9295.56 | 1152.06 | 1726.18 | 46    |
| H00I | 7884.53 | 5564.29 | 1387.45 | 41    |
| H00K | 5883.84 | 8188.08 | 7433.24 | 43    |
| H00A | 9188.3  | 1107.34 | 3741.68 | 46    |
| H00C | 8638.03 | 2022.61 | 5777.89 | 47    |

Table S14 Atomic Occupancy for 13.

| Atom Occupancy | Atom Occupancy | Atom Occupancy |
|----------------|----------------|----------------|
N004 0.56(3)  H004 0.56(3)  N006 0.44(3)
H006 0.44(3)  C004 0.44(3)  H00A 0.44(3)
C006 0.56(3)  H00C 0.56(3)

3-Phenylpyrido[2,1-\(a\)]pyrrolo[3,2-\(c\)]isoquinolin-4-ium bromide (17a).

Single crystals of 17a were growth from methanol/diethyl ether at room temperature.
(CCDC 2049337).

Crystal Data for \(\text{C}_{22}\text{H}_{19}\text{BrN}_{2}\text{O}\) \((M = 407.30\text{g/mol})\): monoclinic, space group \(\text{C}2/c\) (no. 15), \(a = 25.8474(4)\ \text{Å},\ b = 10.7503(2)\ \text{Å},\ c = 13.1889(3)\ \text{Å},\ \beta = 99.922(2)^\circ,\ V = 3609.95(12)\ \text{Å}^3,\ Z = 8,\ T = 100(2)\ \text{K},\ \mu(\text{CuK}\alpha) = 3.200\ \text{mm}^{-1},\ D_{\text{calc}} = 1.499\ \text{g/cm}^3,\ 9610\ \text{reflections measured (6.944}^\circ \leq 2\Theta \leq 139.99^\circ),\ 3421\ \text{unique (}\text{R}_{\text{int}} = 0.0304,\ R_{\text{sigma}} = 0.0325)\ \text{which were used in all calculations. The final } R_1 \text{ was 0.0299 (I} \geq 2\sigma(I))\ \text{and } wR_2 \text{ was 0.0784 (I} \geq 2\sigma(I)).\

Table S15 Crystal data and structure refinement for 17a.

| Identification code | 17a |
|---------------------|-----|
| Empirical formula   | \(\text{C}_{22}\text{H}_{19}\text{BrN}_{2}\text{O}\) |
| Formula weight      | 407.30 |
| Temperature/K       | 100.0(2) |
| Crystal system      | monoclinic |
Spacegroup | C2/c  
---|---
a/Å | 25.8474(4)  
b/Å | 10.7503(2)  
c/Å | 13.1889(3)  
α/° | 90  
β/° | 99.922(2)  
γ/° | 90  
Volume/Å³ | 3609.95(12)  
Z | 8  
\(D_{\text{calc}}\)/g/cm³ | 1.499  
\(\mu\)/mm⁻¹ | 3.200  
F(000) | 1664.0  
Crystalsize/mm³ | 0.15 × 0.11 × 0.02  
Radiation | CuKα (\(\lambda = 1.54184\))  
2Θ range for data collection/° | 6.944 to 139.99  
Indexranges | -26 ≤ h ≤ 31, -12 ≤ k ≤ 13, -16 ≤ l ≤ 14  
Reflectionscollected | 9610  
Independentreflections | 3421 [\(R_{\text{int}} = 0.0304, R_{\text{sigma}} = 0.0325\)]  
Data/restraints/parameters | 3421/0/237  
Goodness-of-fit on \(F^2\) | 1.103  
Final R indexes [I≥2σ (I)] | \(R_1 = 0.0299, wR_2 = 0.0784\)  
Final R indexes [all data] | \(R_1 = 0.0327, wR_2 = 0.0799\)  
Largest diff. peak/hole / e Å⁻³ | 0.41/-0.62  

Table S16 Fractional Atomic Coordinates (×10⁴) and Equivalent Isotropic Displacement Parameters (Å²×10³) for 17a. \(U_{\text{eq}}\) is defined as 1/3 of of the trace of the orthogonalised \(U_{ij}\) tensor.

| Atom | x    | y     | z     | \(U_{\text{eq}}\) |
|------|------|-------|-------|------------------|
| Br01 | 4210.0(2) | 7762.4(2) | 3507.3(2) | 20.88(9) |
| O003 | 6912.8(7) | -975.4(19) | 2506.9(15) | 41.7(5) |
| C00Q | 7255.5(10) | -1513(3) | 1911(2) | 38.0(6) |
| N002 | 5004.2(7) | 5404.0(16) | 3718.9(13) | 19.7(4) |
| N004 | 5598.7(7) | 2438.6(16) | 3853.1(13) | 17.5(3) |
| C00K | 7183.0(9) | 6240(2) | 4156.0(18) | 27.5(5) |
| C00F | 6208.4(9) | 792(2) | 3748.3(17) | 24.5(5) |
| C00N | 3732.6(9) | 1677(2) | 3773.9(17) | 26.3(5) |
| C00O | 7235.3(8) | 4672(2) | 5465.5(17) | 24.1(5) |
| C00M | 6716.7(8) | 4332(2) | 5101.8(16) | 21.4(4) |
| C00J | 7467.4(8) | 5636(2) | 5004.0(17) | 26.6(5) |
| C00C | 4548.7(8) | 3346(2) | 3705.0(15) | 18.7(4) |
| C00L | 4233.9(8) | 1233(2) | 3834.4(16) | 22.9(4) |
| C00D | 5806.7(9) | -75(2) | 3742.2(17) | 24.3(5) |
Table S17 Anisotropic Displacement Parameters (Å\(^2\times10^3\)) for 17a. The Anisotropic displacement factor exponent takes the form: 
\[-2\pi^2[h^2a^*2U_{11}+2hka*b*U_{12}+...].\]

| Atom | U\(_{11}\) | U\(_{22}\) | U\(_{33}\) | U\(_{23}\) | U\(_{13}\) | U\(_{12}\) |
|------|------------|------------|----------|------------|----------|----------|
| Br01 | 22.69(13)  | 17.21(14)  | 20.89(14)| 0.45(7)    | -1.47(9) | 1.78(8)  |
| O003 | 28.7(9)    | 42.9(11)   | 49.2(11) | -19.1(9)   | -5.3(8)  | -2.1(8)  |
| C00Q | 36.9(14)   | 39.1(14)   | 37.4(14) | 3.1(11)    | 4.7(11)  | -2.7(11) |
| N002 | 19.4(8)    | 16.7(8)    | 21.4(9)  | 1.4(7)     | -1.4(7)  | 3.4(7)   |
| N004 | 19.7(9)    | 17.4(8)    | 13.8(8)  | -0.2(6)    | -1.7(6)  | 2.2(7)   |
| C00K | 25.4(11)   | 25.2(11)   | 31.5(12) | 4.2(9)     | 3.4(9)   | -3.6(9)  |
| C00F | 23.7(10)   | 24.6(11)   | 23.5(11) | -0.6(9)    | -0.3(8)  | 5.5(9)   |
| C00N | 25.3(11)   | 29.2(12)   | 23.7(11) | -4.2(9)    | 2.3(8)   | -7.4(9)  |
| C00O | 21.1(10)   | 24.3(11)   | 24.6(11) | 3.1(9)     | -2.8(8)  | 2.4(9)   |
| C00M | 21.3(10)   | 19.3(11)   | 22.8(10) | 2.0(8)     | 1.5(8)   | 0.4(8)   |
| C00J | 19.6(10)   | 27.3(11)   | 31.0(12) | 0.7(10)    | -1.2(9)  | -2.6(9)  |
| C00C | 20.9(10)   | 21.1(10)   | 12.8(9)  | -1.3(8)    | -0.8(7)  | 0.7(8)   |
| C00L | 25.9(11)   | 21.4(11)   | 20.1(10) | -0.1(8)    | 0.8(8)   | -3.0(9)  |
| C00D | 31.3(12)   | 19.1(10)   | 20.5(10) | -1.4(8)    | -1.2(9)  | 4.2(9)   |
| C00G | 24.3(11)   | 22.3(10)   | 22.4(11) | 2.9(8)     | -2.2(8)  | 0.0(9)   |
| C00E | 22.1(10)   | 19.8(10)   | 13.4(9)  | -0.6(8)    | -0.9(7)  | -1.1(8)  |
| C00A | 26.6(11)   | 20.0(10)   | 17.3(10) | -1.2(8)    | -2.2(8)  | -1.2(9)  |
| C00H | 20.5(10)   | 21.3(10)   | 14.2(10) | -1.0(8)    | -1.7(8)  | 0.3(8)   |
| C00I | 20.9(10)   | 25.1(11)   | 17.3(10) | -1.2(8)    | -2.0(8)  | 1.6(9)   |
| C00B | 19.5(10)   | 22.3(10)   | 19.6(10) | -1.5(8)    | -0.3(8)  | 1.6(8)   |
| C00P | 19.5(10)   | 31.1(12)   | 23.1(11) | -4.0(9)    | 0.0(8)   | 2.5(9)   |
| C005 | 20.7(10)   | 18.3(10)   | 20.4(10) | 0.3(8)     | -2.4(8)  | -0.7(8)  |
| C006 | 20.5(10)   | 18.5(10)   | 16.4(10) | 0.6(8)     | -0.7(7)  | 0.5(8)   |
| C007 | 19.4(10)   | 18.0(10)   | 14.4(9)  | 1.0(7)     | -1.4(7)  | 1.0(8)   |
| C008 | 21.5(10)   | 19.8(10)   | 15.2(10) | 1.1(8)     | -0.9(8)  | 1.5(8)   |

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| Atom | Atom | Atom | Length/Å | Atom | Atom | Atom | Length/Å |
|------|------|------|----------|------|------|------|----------|
| O003 | C00Q | 1.406(3) | C00M | C009 | 1.398(3) |
| N002 | C005 | 1.355(3) | C00C | C00H | 1.416(3) |
| N002 | C006 | 1.357(3) | C00C | C00I | 1.409(3) |
| N004 | C00E | 1.387(3) | C00C | C006 | 1.417(3) |
| N004 | C00B | 1.373(3) | C00L | C00H | 1.415(3) |
| N004 | C007 | 1.405(3) | C00D | C00A | 1.372(3) |
| C00K | C00J | 1.389(3) | C00G | C009 | 1.400(3) |
| C00K | C00G | 1.388(3) | C00E | C00A | 1.406(3) |
| C00F | C00D | 1.394(3) | C00E | C00H | 1.454(3) |
| C00N | C00L | 1.370(3) | C005 | C008 | 1.382(3) |
| C00N | C00P | 1.403(3) | C006 | C007 | 1.393(3) |
| C00 O | C00M | 1.392(3) | C007 | C008 | 1.433(3) |
| C00 O | C00J | 1.389(3) | C008 | C009 | 1.481(3) |

Table S18 Bond Lengths for 17a.

| Atom | Atom | Atom | Angle/° | Atom | Atom | Atom | Angle/° |
|------|------|------|---------|------|------|------|---------|
| C005 | N002 | C006 | 109.25(17) | C00C | C00H | C00E | 120.35(19) |
| C00E | N004 | C007 | 120.47(17) | C00L | C00H | C00C | 118.23(19) |
| C00B | N004 | C00E | 120.57(18) | C00L | C00H | C00E | 121.40(19) |
| C00B | N004 | C007 | 118.93(18) | C00P | C00I | C00C | 120.2(2) |
| C00G | C00K | C00J | 120.3(2) | C00F | C00B | N004 | 121.6(2) |
| C00B | C00F | C00D | 119.2(2) | C00I | C00P | C00N | 119.8(2) |
| C00L | C00N | C00P | 121.0(2) | N002 | C005 | C008 | 111.00(19) |
| C00J | C00O | C00M | 120.5(2) | N002 | C006 | C00C | 129.00(19) |
| C00O | C00M | C009 | 120.2(2) | N002 | C006 | C007 | 107.11(18) |
| C00O | C00J | C00K | 119.6(2) | C007 | C006 | C00C | 123.80(19) |
| C00H | C00C | C006 | 116.25(18) | N004 | C007 | C008 | 132.39(19) |
| C00I | C00C | C00H | 120.2(2) | C006 | C007 | N004 | 118.53(18) |
| C00I | C00C | C006 | 123.5(2) | C006 | C007 | C008 | 108.86(18) |
| C00N | C00L | C00H | 120.6(2) | C005 | C008 | C007 | 103.76(18) |
| C00A | C00D | C00F | 119.7(2) | C005 | C008 | C009 | 120.93(19) |
| C00K | C00G | C009 | 120.6(2) | C007 | C008 | C009 | 134.71(19) |
| N004 | C00E | C00A | 117.64(19) | C00M | C009 | C00G | 118.83(19) |
| N004 | C00E | C00H | 119.68(18) | C00M | C009 | C008 | 121.71(19) |
Table S20 Torsion Angles for 17a.

| A   | B   | C   | D   | Angle/° | A   | B   | C   | D   | Angle/° |
|-----|-----|-----|-----|---------|-----|-----|-----|-----|---------|
| N002| C005| C008| C007| -171.52(18) | C00H| C00C| C00I| C00P| 1.0(2)  |
| N002| C005| C008| C009| -174.22(17) | C00H| C00C| C006| N002| -177.1(2)|
| N002| C006| C007| N004| -1.1(3)    | C00H| C00C| C006| C007| -1.1(3)  |
| N004| C00E| C00A| C00D| -0.6(3)    | C00H| C00E| C00A| C00D| 175.95(19)|
| N004| C00E| C00H| C00C| 5.7(3)     | C00I| C00C| C00H| C00E| 176.19(18)|
| N004| C00E| C00H| C00L| -176.37(18) | C00I| C00C| C006| N002| 0.4(3)   |
| N004| C007| C008| C009| 173.2(2)   | C00I| C00C| C006| C007| 176.39(19)|
| N004| C007| C008| C009| -16.0(4)   | C00B| N004| C00E| C00A| 1.4(3)   |
| C00K| C00G| C009| C00M| -2.3(3)    | C00B| N004| C00E| C00H| -175.32(18)|
| C00K| C00G| C009| C008| 169.2(2)   | C00B| N004| C007| C006| 168.27(18)|
| C00F| C00D| C00A| C00E| -0.5(3)    | C00B| N004| C007| C008| -5.6(3)  |
| C00N| C00L| C00H| C00C| 0.1(3)     | C00B| C00F| C00D| C00A| 1.0(3)   |
| C00N| C00L| C00H| C00E| -177.89(19)| C00P| C00N| C00L| C00H| 0.9(3)   |
| C00O| C00M| C009| C00G| 1.9(3)     | C005| N002| C006| C00C| 176.1(2) |
| C00O| C00M| C009| C008| -169.3(2)  | C005| N002| C006| C007| -0.5(2)  |
| C00M| C00O| C00J| C00K| -1.8(3)    | C005| C008| C009| C00M| 127.5(2) |
| C00J| C00K| C00G| C009| 0.6(4)     | C005| C008| C009| C00G| -43.7(3) |
| C00J| C00O| C00M| C009| 0.1(3)     | C006| N002| C005| C008| -0.2(2)  |
| C00C| C00I| C00P| C00N| -1.5(3)    | C006| C00C| C00H| C00L| 175.72(18)|
| C00C| C006| C007| N004| 9.0(3)     | C006| C00C| C00H| C00E| -6.3(3)  |
| C00C| C006| C007| C008| -175.75(18)| C006| C00C| C00I| C00P| -174.79(19)|
| C00L| C00N| C00P| C00I| -0.2(3)    | C006| C007| C008| C005| -1.1(2)  |
| C00D| C00F| C00B| N004| -0.3(3)    | C006| C007| C008| C009| 169.6(2) |
| C00G| C00K| C00J| C00O| 1.4(4)     | C007| N004| C00E| C00A| 179.17(17)|
| C00E| N004| C00B| C00F| -1.0(3)    | C007| N004| C00E| C00H| 2.5(3)   |
| C00E| N004| C007| C006| -9.6(3)    | C007| N004| C00B| C00F| -178.78(19)|
| C00E| N004| C007| C008| 176.6(2)   | C007| C008| C009| C00M| -42.0(3) |
| C00A| C00E| C00H| C00C| -170.85(19)| C007| C008| C009| C00G| 146.8(2) |
| C00A| C00E| C00H| C00L| 7.1(3)     | C007| C008| C009| C00G| 146.8(2) |

Table S21 Hydrogen Atom Coordinates ($\times 10^4$) and Isotropic Displacement Parameters ($\times 10^3$) for 17a.

| Atom | x     | y     | z     | U(eq) |
|------|-------|-------|-------|-------|
| H003 | 6608.71 | -1259.77 | 2319.19 | 63   |

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| H00C   | 7097.87 | -1467.18 | 1180.97 | 57   |
|--------|---------|----------|---------|-----|
| H00E   | 7317.66 | -2385.63 | 2110.67 | 57   |
| H00H   | 7589.79 | -1061.31 | 2026.09 | 57   |
| H002   | 4728.41 | 5897.33  | 3630.75 | 24   |
| H00K   | 7342.62 | 6887.42  | 3828.23 | 33   |
| H00F   | 6555.28 | 525.84   | 3713.07 | 29   |
| H00N   | 3453.6  | 1111.52  | 3807.82 | 32   |
| H00O   | 7431.9  | 4240.95  | 6033.41 | 29   |
| H00M   | 6561.09 | 3672.7   | 5422.67 | 26   |
| H00J   | 7818.15 | 5879.51  | 5266.35 | 32   |
| H00L   | 4297.61 | 363.86   | 3899.6  | 27   |
| H00D   | 5879.11 | -939.31  | 3713.58 | 29   |
| H00A   | 6476.3  | 6316.27  | 3201.61 | 28   |
| H00I   | 5033.66 | -267.64  | 3767.41 | 26   |
| H00B   | 3955.21 | 4641.25  | 3523.64 | 26   |
| H00P   | 6370.84 | 2619.74  | 3812.52 | 25   |
| H005   | 3275.58 | 3248.04  | 3619.42 | 30   |

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