Supplementary Information

Metal-free polychloromethyl radical-initiated cyclization of unactivated N-allylindoles towards pyrrolo[1,2-α]indoles

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1. General Considerations

**General Information:** Unless otherwise noted, all chemicals were purchased and used without further purification. $^1$H NMR and $^{13}$C NMR spectra were recorded at ambient temperature on 400 MHz NMR spectrometer (100 MHz for $^{13}$C). NMR experiments are reported in $\delta$ units, parts per million (ppm), and were referenced to CDCl$_3$ ($\delta$ 7.26 or 77.0) as the internal standard. The coupling constants $J$ are given in Hz. Column chromatography was performed using EM Silica gel 60 (300-400 mesh).

2. General Synthetic Procedures

All indole derivatives 1 were prepared according to the previous reports.$^{[1]}$

**General procedure for the synthesis of trichloromethylated 2,3-dihydro-$1H$-pyrrolo[1,2-$a$]indoles (2):**

Under air, the mixture of 1 (0.2 mmol), DTBP (3 eq), TFA (2 eq) and chloroform (or CCl$_4$) (2 mL) was added to a Schlenk tube and sealed. The mixture was stirred at 140° C for 12 hours. Then, the solvent was evaporated under reduced pressure, and the residue was purified by silica gel flash column chromatography to obtain product 2.

**General procedure for the synthesis of dichloromethylated and dibromomethylated 2,3-dihydro-$1H$-pyrrolo[1,2-$a$]indoles (3 or 5):**

Under air, the mixture of 1 (0.2 mmol), DTBP (3 eq), TFA (1 eq), NaOAc (1 eq) and dichloromethane (or dibromomethane) (2 mL) were added to a Schlenk tube and sealed. The mixture was stirred at 140° C for 12 hours. Then, the solvent was evaporated under reduced pressure, and the residue was purified by silica gel flash column chromatography to obtain product 3 (or 5).

**Derivatization reactions**

A mixture of 2a (39.2 mg, 0.1 mmol), TsOH (95 mg, 5 equiv.) and ethylene glycol (50 mg, 8 equiv.) in 2.0 mL of benzene was stirred under 120 °C for 36 hours and cooled.$^{[2]}$ Saturated sodium bicarbonate solution (1 mL) was added and the
organic layer was separated. Combined organic phase were dried over anhydrous Na₂SO₄, evaporated under vacuum and purified by silica gel flash column chromatography to give 6 (23 mg, 66% yield).

Under N₂, a 20 mL Schlenk tube was equipped with a stir bar and charged with 2o (47.2 mg, 0.1 mmol), PhB(OH)₂ (14.6 mg, 1.2 mmol), K₂CO₃ (45.5 mg, 3.3 mmol), Pd(PPh₃)₄ (5.8 mg, 5 mol %), 0.5 mL of dioxane and 0.5 mL of H₂O, sealed with a Teflon lined cap. The mixture was stirred at 100 °C for 12 h. Upon the completion of the reaction, the mixture was poured into ethyl acetate (5 mL×3). The organic layer was separated and dried over Na₂SO₄ and then filtered. The resulting residue was purified by silica gel flash column chromatography to afford 7 (32.7 mg, 70%).

Under air, the mixture of 2ac (34.5 mg, 0.1 mmol), H₂O (0.5 mL) and EtOH (2.5 mL) heated to reflux and stirred for 48 h. Upon the completion of the reaction, the mixture was extracted with acetate (5 mL×3). The organic layers were collected and dried over Na₂SO₄ and then filtered. The resulting residue was purified by silica gel flash column chromatography to afford 8 (15.1 mg, 50%).

A mixture of 2ac (34.5 mg, 0.1 mmol)) and KOH (56 mg, 10 eq) in EtOH (6 mL) was added into a flask and reflux for 1 h. After the completion of the reaction, the mixture was cooled to room temperature. Afterwards, ice was added and neutralized by 1N HCl. The mixture was extracted by acetate (5 mL×3) and washed with brine (5 mL×3). The combined organic layers were dried and concentrated under reduced pressure. The residue was purified using silica gel flash column chromatography to afford the compound 9 (19.2 mg, 62%).
3. Mechanism Studies

3.1 The KIE experiment:

\[
\begin{align*}
1a + CD_2Cl_2 & \quad + \quad CH_2Cl_2 & \quad \text{standard conditions} & \quad 3a + D-3a \\
\text{43\% yield} & \quad \text{KIE} = 6.7
\end{align*}
\]

The mixture of \(1a\) (0.1 mmol), DTBP (3 eq), TFA (1 eq), NaOAc (1 equiv), \(CH_2Cl_2\) (0.5 mL) and \(CD_2Cl_2\) (0.5 mL) was added to a sealed tube. The mixture was stirred at 140°C for 12 hours. Then, the solvent was evaporated under reduced pressure, and the residue was purified by silica gel flash column chromatography to obtain product \(3a\) and \(D-3a\) in 43\% yield. A KIE value of 6.69 was observed.

![Figure S1 1H NMR spectrum of the KIE experiment](image)

3.2 Radical inhibiting and trapping experiment

\[
\begin{align*}
1a + CHCl_3 & \quad \text{BHT (3 eq)} & \quad \text{standard conditions} & \quad 2a + 4 \\
\text{trace}
\end{align*}
\]

Under air, the mixture of \(1\) (0.1 mmol), DTBP (3 eq), TFA (2 eq), chloroform (2 mL) and BHT (3 eq) was added to a Schlenk tube and sealed. The mixture was stirred at 140 °C for 12 hours. Only trace amount of product \(2a\) was formed. The adduct \(4\) formed from BHT and trichloromethyl radical was detected by GCMS.
Figure S2 GC spectrum of the reaction mixture and MS spectrum of adduct 4
4. Characterization Data for the Products

![Structure of the product](image)

1-(1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2a, 63.3 mg, 81% yield), yellow solid; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.33-8.30 (m, 1H), 7.41-7.39 (m, 1H), 7.35-7.28 (m, 5H), 7.19-7.17 (m, 2H), 5.16 (d, $J = 1.9$ Hz, 1H), 4.65 (dd, $J = 12.4$, 8.1 Hz, 1H), 4.55 (dd, $J = 12.4$, 2.7 Hz, 1H), 4.04 (dt, $J = 8.2$, 2.4 Hz, 1H), 2.31 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.5, 151.0, 140.3, 132.2, 130.8, 129.3, 127.9, 127.4, 123.0, 123.0, 122.7, 110.6, 110.1, 101.1, 71.7, 50.0, 47.0, 29.9. HRMS (ESI) $m/z$ calcld for C$_{20}$H$_{17}$Cl$_3$NO [M+H$^+$]: 392.0370, found 392.0375.

![Structure of the product](image)

1-(1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2b, 56.7 mg, 70% yield), yellow solid; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.34-7.28 (m, 3H), 7.24-7.20 (m, 2H), 7.17-7.13 (m, 2H), 7.08 (d, $J = 6.8$ Hz, 1H), 5.13 (d, $J = 2.0$ Hz, 1H), 4.59 (dd, $J = 12.4$, 7.9 Hz, 1H), 4.51 (dd, $J = 12.4$, 2.7 Hz, 1H), 3.98 (dt, $J = 7.9$, 2.3 Hz, 1H), 2.75 (s, 3H), 2.26 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.8, 149.6, 140.4, 133.9, 133.0, 129.5, 129.4, 128.1, 127.3, 125.2, 113.1, 107.5, 101.1, 71.6, 50.5, 46.8, 30.6, 23.2. HRMS (ESI) $m/z$ calcld for C$_{21}$H$_{19}$Cl$_3$NO [M+H$^+$]: 406.0527, found 406.0533.

![Structure of the product](image)

1-(1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2c, 55.1 mg, 68% yield), yellow solid; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.15 (s, 1H), 7.35-7.28 (m, 4H), 7.19-7.15 (m, 3H), 5.15 (d, $J = 1.8$ Hz, 1H), 4.62 (dd, $J = 12.4$, 8.0 Hz, 1H), 4.52 (dd, $J = 12.4$, 2.6 Hz, 1H), 4.02 (dt, $J = 8.1$, 2.3 Hz, 1H), 2.52 (s, 3H), 2.30 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.5, 151.0, 140.4, 132.7, 131.1, 130.5, 129.3, 127.9, 127.4, 124.5, 122.5, 110.2, 109.7, 101.1, 71.7, 50.1, 47.0, 29.8, 21.8. HRMS (ESI) $m/z$ calcld for C$_{21}$H$_{19}$Cl$_3$NO [M+H$^+$]: 406.0527, found 406.0533.
1-(6-methyl-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2d, 58.3 mg, 72% yield), yellow oil; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.17 (d, \(J = 8.2\) Hz, 1H), 7.34-7.28 (m, 3H), 7.22 (s, 1H), 7.19-7.17 (m, 3H), 5.14 (dd, \(J = 2.4\) Hz, 1H), 4.61 (dd, \(J = 12.4, 8.0\) Hz, 1H), 4.52 (dd, \(J = 12.4, 2.7\) Hz, 1H), 4.03 (dt, \(J = 8.1, 2.4\) Hz, 1H), 2.53 (s, 3H), 2.31 (s, 3H); \(^13\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 192.5, 150.7, 140.4, 133.1, 132.6, 129.3, 128.5, 127.9, 127.4, 124.7, 122.3, 110.4, 110.1, 101.1, 71.7, 50.0, 46.9, 29.7, 21.7. HRMS (ESI) \(m/z\) calcd for C\(_{21}\)H\(_{19}\)Cl\(_3\)NO \([M+H]^+\): 406.0527, found 406.0533.

![Chemical Structure](image)

1-(5-methyl-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2e, 48.6 mg, 60% yield); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.15 (d, \(J = 8.1\) Hz, 1H), 7.35-7.30 (m, 3H), 7.20-7.18 (m, 3H), 5.14 (d, \(J = 1.9\) Hz, 1H), 4.94 (dd, \(J = 12.3, 8.0\) Hz, 1H), 4.85 (dd, \(J = 12.4, 2.7\) Hz, 1H), 4.00-3.98 (m, 1H), 2.79 (s, 3H), 2.32 (s, 3H); \(^13\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 192.5, 151.4, 140.5, 131.9, 131.1, 129.3, 127.8, 127.4, 124.7, 123.1, 121.0, 120.4, 110.5, 101.2, 71.7, 49.8, 49.3, 30.0, 18.2. HRMS (ESI) \(m/z\) calcd for C\(_{21}\)H\(_{19}\)Cl\(_3\)NO \([M+H]^+\): 406.0527, found 406.0533.

![Chemical Structure](image)

1-(7-methoxy-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2f, 64.0 mg, 76% yield), yellow solid; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 7.89 (d, \(J = 2.4\) Hz, 1H), 7.35-7.28 (m, 4H), 7.17-7.15 (m, 2H), 6.96 (dd, \(J = 8.8, 2.4\) Hz, 1H), 5.12 (d, \(J = 1.8\) Hz, 1H), 4.61 (dd, \(J = 12.4, 8.1\) Hz, 1H), 4.51 (dd, \(J = 12.4, 2.7\) Hz, 1H), 4.01 (dt, \(J = 8.1, 2.3\) Hz, 1H), 3.90 (s, 3H), 2.24 (s, 3H); \(^13\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 192.5, 156.8, 150.8, 140.3, 131.8, 129.4, 128.0, 127.4, 127.2, 113.2, 110.7, 110.4, 104.6, 101.1, 71.8, 55.9, 50.3, 47.1, 29.6. HRMS (ESI) \(m/z\) calcd for C\(_{21}\)H\(_{19}\)Cl\(_3\)NO\(_2\) \([M+H]^+\): 422.0476, found 422.0465.

![Chemical Structure](image)

1-(6-methoxy-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2g, 58.9 mg, 70% yield), yellow oil; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.20 (d, \(J = 8.7\) Hz, 1H), 7.34-7.28 (m, 3H), 7.18 (d, \(J = 7.8\) Hz, 2H), 6.99-6.96 (m, 1H), 6.87 (t, \(J = 1.7\) Hz, 1H), 5.12 (d, \(J = 1.9\) Hz, 1H), 4.60 (dd, \(J = 12.3, 8.1\) Hz, 1H), 4.01 (dt, \(J = 8.1, 2.3\) Hz, 1H), 3.90 (s, 3H), 2.24 (s, 3H); \(^13\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 192.5, 150.7, 140.4, 133.1, 132.6, 129.3, 128.5, 127.9, 127.4, 124.7, 122.3, 110.4, 110.1, 101.1, 71.7, 50.0, 46.9, 29.7, 21.7. HRMS (ESI) \(m/z\) calcd for C\(_{21}\)H\(_{19}\)Cl\(_3\)NO \([M+H]^+\): 406.0527, found 406.0533.
4.50 (dd, J = 12.3, 2.6 Hz, 1H), 4.02 (dt, J = 8.3, 2.2 Hz, 1H), 3.90 (s, 3H), 2.26 (s, 3H); 13C NMR (101 MHz, CDCl3) δ 192.5, 156.9, 149.9, 140.5, 133.0, 129.3, 127.9, 127.4, 124.7, 123.5, 112.2, 110.5, 101.1, 93.7, 71.8, 55.8, 49.9, 46.8, 29.7. HRMS (ESI) m/z calcd for C21H19Cl3NO2 [M+H+]: 422.0476, found 422.0465.

1-(8-fluoro-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-α]indol-9-yl)ethane (2h, 61.4 mg, 75% yield), yellow solid; 1H NMR (400 MHz, CDCl3) δ 7.32-7.28 (m, 2H), 7.26-7.16 (m, 5H), 6.99 (dd, J = 12.2, 7.5 Hz, 1H), 5.21 (d, J = 2.0 Hz, 1H), 4.64 (dd, J = 12.4, 8.1 Hz, 1H), 4.51 (dd, J = 12.4, 2.7 Hz, 1H), 4.03 (dt, J = 8.1, 2.4 Hz, 1H), 2.53 (d, J = 3.9 Hz, 3H); 13C NMR (101 MHz, CDCl3) δ 192.8, 157.3, 154.8, 152.6, 140.5, 134.7 (d, JCF = 11.1 Hz), 128.2 (d, JCF = 172.2 Hz), 127.6, 123.4 (d, JCF = 8.5 Hz), 117.7 (d, JCF = 19.4 Hz), 109.5 (d, JCF = 3.0 Hz), 108.7 (d, JCF = 22.9 Hz), 106.5 (d, JCF = 3.7 Hz), 101.1, 71.5, 50.2, 47.4, 30.5 (d, JCF = 14.1 Hz). HRMS (ESI) m/z calcd for C20H16Cl3FNO [M+H+]: 410.0276, found 410.0282.

1-(7-fluoro-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-α]indol-9-yl)ethane (2i, 60.5 mg, 74% yield), yellow oil; 1H NMR (400 MHz, CDCl3) δ 8.03 (dt, J = 10.1, 1.9 Hz, 1H), 7.35-7.29 (m, 4H), 7.17-7.15 (m, 2H), 7.07-7.02 (m, 1H), 5.14 (d, J = 1.9 Hz, 1H), 4.65 (dd, J = 12.4, 8.0 Hz, 1H), 4.53 (dd, J = 12.4, 2.6 Hz, 1H), 4.03 (dt, J = 8.1, 2.2 Hz, 1H), 2.25 (s, 3H); 13C NMR (101 MHz, CDCl3) δ 192.2, 160.0 (d, JCF = 238.9 Hz), 152.0, 140.0, 131.6 (d, JCF = 10.9 Hz), 128.8, 128.4 (d, JCF = 211.3 Hz), 128.1, 111.3 (d, JCF = 26.6 Hz), 110.8, 110.7, 110.7, 108.4 (d, JCF = 25.5 Hz), 101.0, 71.7, 50.2, 47.2, 29.7. HRMS (ESI) m/z calcd for C20H16Cl3FNO [M+H+]: 410.0276, found 410.0282.

1-(6-fluoro-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-α]indol-9-yl)ethane (2j, 67.9 mg, 83% yield), yellow solid; 1H NMR (400 MHz, CDCl3) δ 8.30-8.26 (m, 1H), 7.36-7.29 (m, 3H), 7.16 (d, J = 7.3 Hz, 2H), 7.10-7.06 (m, 2H), 5.22-5.04 (m, 1H), 4.60 (dd, J = 12.3, 8.1 Hz, 1H), 4.50 (dd, J = 12.4, 2.7 Hz, 1H), 4.04-4.01 (m, 1H), 2.25 (s, 3H); 13C NMR (101 MHz, CDCl3) δ 192.4, 160.0 (d, JCF = 241.8 Hz), 151.1, 140.1, 132.2 (d, JCF = 11.8 Hz), 129.4, 128.0, 127.3, 127.2, 123.9
(d, $J_{CF} = 9.6$ Hz), 111.4 (d, $J_{CF} = 23.7$ Hz), 110.6, 100.9, 96.7 (d, $J_{CF} = 26.5$ Hz), 71.7, 49.9, 46.9, 29.7. HRMS (ESI) $m/z$ calcd for C$_{20}$H$_{16}$Cl$_{3}$FNO [M+H$^+$]: 410.0276, found 410.0282.

1-(8-chloro-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2k, 59.5 mg, 70% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.35-7.28 (m, 5H), 7.24-7.20 (m, 1H), 7.16 (d, $J = 8.2$ Hz, 2H), 5.12 (d, $J = 2.4$ Hz, 1H), 4.66 (dd, $J = 12.2, 8.2$ Hz, 1H), 4.53 (dd, $J = 12.2, 3.1$ Hz, 1H), 4.05 (dt, $J = 8.2, 2.8$ Hz, 1H), 2.37 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 194.0, 150.5, 140.3, 133.7, 129.2, 127.9, 127.4, 127.3, 126.7, 124.1, 123.4, 112.2, 108.9, 100.9, 71.4, 49.7, 47.3, 31.9. HRMS (ESI) $m/z$ calcd for C$_{20}$H$_{16}$Cl$_{4}$NO [M+H$^+$]: 425.9981, found 425.9990.

1-(7-chloro-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2l, 64.6 mg, 76% yield), yellow solid; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.34 (d, $J = 1.7$ Hz, 1H), 7.36-7.28 (m, 5H), 7.16 (d, $J = 8.2$ Hz, 1H), 5.14 (d, $J = 1.8$ Hz, 1H), 4.64 (dd, $J = 12.4, 8.1$ Hz, 1H), 4.53 (dd, $J = 12.4, 2.7$ Hz, 1H), 4.04 (dt, $J = 8.1, 2.4$ Hz, 1H), 2.26 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.2, 151.8, 139.9, 131.8, 130.6, 129.5, 129.1, 128.1, 127.3, 123.4, 122.4, 111.0, 110.2, 100.9, 71.7, 50.1, 47.1, 29.8. HRMS (ESI) $m/z$ calcd for C$_{20}$H$_{16}$Cl$_{4}$NO [M+H$^+$]: 425.9981, found 425.9990.

(6-Chloro-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2m, 68.9 mg, 81% yield), yellow solid; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.25 (d, $J = 8.6$ Hz, 1H), 7.40 (d, $J = 1.8$ Hz, 1H), 7.35-7.27 (m, 4H), 7.17-7.14 (m, 2H), 5.14 (d, $J = 1.8$ Hz, 1H), 4.61 (dd, $J = 12.4, 8.0$ Hz, 1H), 4.52 (dd, $J = 12.4, 2.6$ Hz, 1H), 4.04-4.01 (m, 1H), 2.26 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.3, 151.3, 139.9, 132.6, 129.4, 129.3, 128.9, 128.1, 127.3, 123.8, 123.5, 110.6, 110.1, 100.9, 71.7, 49.9, 46.9, 29.8. HRMS (ESI) $m/z$ calcd for C$_{20}$H$_{16}$Cl$_{4}$NO [M+H$^+$]: 425.9981, found 425.9990.
1-(7-bromo-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2n, 75.0 mg, 80% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) δ 8.42 (s, 1H), 7.31 (d, $J$ = 11.9 Hz, 1H), 7.24-7.16 (m, 4H), 7.06 (d, $J$ = 7.8 Hz, 2H), 5.05 (d, $J$ = 1.9 Hz, 1H), 4.54 (dd, $J$ = 12.4, 8.1 Hz, 1H), 4.44 (dd, $J$ = 12.5, 2.6 Hz, 1H), 3.96-3.93 (m, 1H), 2.16 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ 192.2, 151.6, 139.9, 132.3, 130.6, 129.5, 128.1, 127.3, 126.0, 125.4, 116.8, 111.2, 110.2, 100.9, 71.7, 50.0, 47.1, 29.8. HRMS (ESI) m/z calc'd for C$_{20}$H$_{16}$BrCl$_3$NO [M+H$^+$]: 469.9475, found 469.9463.

1-(6-bromo-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2o, 74.1 mg, 79% yield), yellow solid; $^1$H NMR (400 MHz, CDCl$_3$) δ 8.20 (d, $J$ = 8.6 Hz, 1H), 7.56 (s, 1H), 7.41 (d, $J$ = 8.6 Hz, 1H), 7.31 (t, $J$ = 8.4 Hz, 3H), 7.15 (d, $J$ = 7.2 Hz, 2H), 5.13 (s, 1H), 4.61 (dd, $J$ = 12.4, 8.0 Hz, 1H), 4.51 (dd, $J$ = 12.5, 2.6 Hz, 1H), 4.02 (d, $J$ = 7.8 Hz, 1H), 2.25 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ 192.4, 151.2, 139.9, 133.0, 129.7, 129.5, 128.1, 127.1, 126.2, 124.1, 116.4, 113.1, 110.6, 100.6, 71.7, 49.9, 47.0, 29.8. HRMS (ESI) m/z calc'd for C$_{20}$H$_{16}$BrCl$_3$NO [M+H$^+$]: 469.9475, found 469.9463.

Methyl-9-acetyl-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-7-carboxylate (2p, 66.7 mg, 72% yield), yellow solid; $^1$H NMR (400 MHz, CDCl$_3$) δ 8.99 (s, 1H), 8.03 (dd, $J$ = 8.5, 1.6 Hz, 1H), 7.41 (d, $J$ = 8.5 Hz, 1H), 7.34-7.28 (m, 3H), 7.17-7.15 (m, 2H), 5.16 (d, $J$ = 2.0 Hz, 1H), 4.67 (dd, $J$ = 12.5, 8.1 Hz, 1H), 4.57 (dd, $J$ = 12.5, 2.7 Hz, 1H), 4.05 (dt, $J$ = 8.1, 2.3 Hz, 1H), 3.94 (s, 3H), 2.33 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ 192.3, 167.8, 152.3, 139.9, 134.6, 130.3, 129.4, 128.0, 127.3, 125.0, 124.9, 124.5, 111.3, 109.8, 100.9, 71.7, 52.1, 49.9, 47.0, 30.0. HRMS (ESI) m/z calc'd for C$_{23}$H$_{21}$Cl$_3$NO$_3$ [M+H$^+$]: 464.0582, found 464.0573.
9-acetyl-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-8-carbonitrile (2q, 52.4 mg, 63% yield), yellow solid; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 7.65 (dd, \(J = 14.7, 7.8\) Hz, 2H), 7.36-7.29 (m, 4H), 7.12-7.10 (m, 2H), 5.15 (d, \(J = 1.8\) Hz, 1H), 4.71 (dd, \(J = 12.4, 8.1\) Hz, 1H), 4.59 (dd, \(J = 12.5, 2.5\) Hz, 1H), 4.03 (dt, \(J = 8.0, 2.2\) Hz, 1H), 2.25 (s, 3H); \(^13\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 191.7, 151.8, 139.4, 132.8, 131.0, 129.6, 129.1, 128.3, 127.2, 122.8, 119.3, 114.9, 111.4, 105.9, 100.7, 71.4, 50.2, 47.2, 30.0. HRMS (ESI) \(m/z\) calcd for C\(_{21}\)H\(_{16}\)Cl\(_3\)N\(_2\)O \([M+H]^+\): 417.0323, found 417.0328.

9-acetyl-1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-7-carbonitrile (2r, 53.2 mg, 64% yield), yellow solid; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.70 (d, \(J = 1.4\) Hz, 1H), 7.51 (d, \(J = 1.5\) Hz, 1H), 7.46 (d, \(J = 8.4\) Hz, 1H), 7.36-7.31 (m, 3H), 7.15 (d, \(J = 8.3\) Hz, 2H), 5.16 (d, \(J = 1.8\) Hz, 1H), 4.69 (dd, \(J = 12.5, 8.0\) Hz, 1H), 4.59 (dd, \(J = 12.5, 2.6\) Hz, 1H), 4.06 (dt, \(J = 7.9, 2.3\) Hz, 1H), 2.24 (s, 3H); \(^13\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 192.2, 152.6, 139.4, 133.7, 130.6, 129.6, 128.3, 128.2, 127.3, 126.2, 120.1, 111.0, 110.8, 106.2, 100.7, 71.6, 49.9, 47.1, 29.8. HRMS (ESI) \(m/z\) calcd for C\(_{21}\)H\(_{16}\)Cl\(_3\)N\(_2\)O \([M+H]^+\): 417.0323, found 417.0328.

Methyl 1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-9-carboxylate (2s, 60.3 mg, 74% yield), light yellow solid; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.22-8.20 (m, 1H), 7.43-7.40 (m, 1H), 7.35-7.37 (m, 5H), 7.22-7.20 (d, \(J = 7.4\) Hz, 2H), 5.16 (d, \(J = 2.4\) Hz, 1H), 4.73-4.67 (m, 1H), 4.57-4.53 (m, 1H), 4.12-4.08 (m, 1H), 3.70 (s, 3H); \(^13\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 164.7, 151.8, 141.3, 132.2, 131.0, 128.9, 127.5, 127.4, 122.6, 122.4, 122.0, 110.1, 101.2, 100.0, 71.7, 50.7, 49.6, 47.5. HRMS (ESI) \(m/z\) calcd for C\(_{20}\)H\(_{17}\)Cl\(_3\)NO \([M+H]^+\): 408.0319, found 408.0323.

1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-9-carbaldehyde (2t, 32.4 mg, 43% yield), brown solid; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 9.55 (s, 1H), 8.17-8.15 (m, 1H), 7.32-7.19 (m, 1H), 7.27-7.21 (m, 4H), 7.16-7.15 (m, 2H), 5.04 (d, \(J = 3.9\) Hz, 1H), 4.65 (dd, \(J = 12.1, 8.5\) Hz, 1H), 4.45 (dd, \(J = 12.1, 4.3\) Hz, 1H),
4.14-4.10 (m, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 183.7, 140.6, 132.5, 129.8, 129.4, 128.2, 127.8, 123.7, 123.6, 122.4, 110.2, 110.1, 100.6, 71.5, 48.8, 48.0. HRMS (ESI) m/z calcd for C$_{19}$H$_{15}$Cl$_3$NO [M+H$^+$]: 378.0214, found 378.0216.

1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole-9-carbonitrile (2u, 49.5 mg, 66% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.68-7.66 (m, 1H), 7.41-7.28 (m, 6H), 7.24-7.22 (m, 2H), 4.98 (d, J = 3.9 Hz, 1H), 4.70 (dd, J = 11.9, 8.4 Hz, 1H), 4.52 (dd, J = 11.9, 4.3 Hz, 1H), 4.19 (dt, J = 8.4, 4.2 Hz, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 152.4, 139.2, 132.2, 131.4, 129.4, 128.3, 127.8, 123.6, 122.6, 120.1, 114.9, 110.8, 100.5, 79.1, 71.2, 48.6, 48.2. HRMS (ESI) m/z calcd for C$_{19}$H$_{14}$Cl$_3$N$_2$ [M+H$^+$]: 375.0217, found 375.0220.

1-(1-(4-ethylphenyl)-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethan-1-one (2x, 57.2 mg, 68% yield), white solid; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.34-8.31 (m, 1H), 7.40-7.32 (m, 3H), 7.14 (d, J = 8.0 Hz, 2H), 7.08 (d, J = 7.9 Hz, 2H), 5.13 (d, J = 1.9 Hz, 1H), 4.63 (dd, J = 12.4, 8.1 Hz, 1H), 4.53 (dd, J = 12.4, 2.7 Hz, 1H), 4.02 (dt, J = 8.1, 2.4 Hz, 1H), 2.62 (q, J = 7.6 Hz, 2H), 2.31 (s, 3H), 1.22 (t, J = 7.6 Hz, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.6, 151.2, 144.0, 137.5, 132.2, 130.8, 128.8, 127.3, 123.0, 122.9, 122.7, 110.5, 110.0, 101.1, 71.8, 49.7, 46.9, 29.8, 28.5, 15.5. HRMS (ESI) m/z calcd for C$_{22}$H$_{21}$Cl$_3$NO [M+H$^+$]: 420.0683, found 420.0688.

1-(1-(4-fluorophenyl)-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethan-1-one (2y, 59.1 mg, 72% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.26-8.23 (m, 1H), 7.42-7.32 (m, 3H), 7.18-7.14 (m, 2H), 7.03-6.99 (m, 2H), 5.16 (d, J = 2.1 Hz, 1H), 4.65 (dd, J = 12.4, 8.2 Hz, 1H), 4.54 (dd, J = 12.4, 2.9 Hz, 1H), 4.02 (dt, J = 8.1, 2.5 Hz, 1H), 2.35 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.4, 162.1 (d, $J_{C,F} = 248.1$ Hz), 150.9, 136.3, 136.3, 132.2, 130.6, 129.1 (d, $J_{C,F} = 8.3$ Hz), 123.0, 122.4, 116.2 (d, $J_{C,F} = 8.3$ Hz), 110.5, 110.2, 101.0, 71.7, 49.3, 47.0, 30.0. HRMS (ESI) m/z calcd for C$_{20}$H$_{16}$Cl$_3$FNO [M+H$^+$]: 410.0276, found 410.0280.
1-(1-methyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2z, 20.4 mg, 31% yield), yellow solid; $^1$H NMR (400 MHz, CDCl$_3$) δ 8.02 (dd, $J = 7.1$, 1.5 Hz, 1H), 7.34-7.27 (m, 3H), 4.55 (dd, $J = 12.3$, 8.5 Hz, 1H), 4.40 (dd, $J = 12.3$, 3.3 Hz, 1H), 4.09-4.03 (m, 1H), 3.76 (dt, $J = 8.4$, 2.9 Hz, 1H), 2.67 (s, 3H), 1.65 (d, $J = 7.1$ Hz, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ 192.9, 154.6, 132.1, 130.3, 122.6, 122.4, 121.4, 110.3, 109.9, 101.3, 69.0, 47.0, 39.9, 30.3, 20.1. HRMS (ESI) m/z calcd for C$_{15}$H$_{15}$Cl$_3$NO [M+H$^+$]: 330.0214, found 330.0209.

1-(1-methyl-1-(2,2,2-trichloroethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2aa, 33.0 mg, 48% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) δ 7.92-7.90 (m, 1H), 7.35-7.28 (m, 3H), 4.31-4.20 (m, 2H), 3.97 (d, $J = 15.5$ Hz, 1H), 3.67 (d, $J = 15.5$ Hz, 1H), 3.46-3.40 (m, 1H), 2.74 (s, 3H), 2.65-2.58 (m, 1H), 1.72 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ 193.6, 156.6, 132.1, 130.5, 122.3, 122.1, 121.0, 110.7, 110.5, 98.1, 59.0, 45.7, 43.9, 39.6, 31.5, 25.6. HRMS (ESI) m/z calcd for C$_{16}$H$_{17}$Cl$_3$NO [M+H$^+$]: 344.0370, found 344.0368.

1-(1-(2,2,2-trichloroethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (2ab, 40.8 mg, 62% yield), yellow solid; $^1$H NMR (400 MHz, CDCl$_3$) δ 7.98-7.96 (m, 1H), 7.34-7.27 (m, 3H), 4.26-4.12 (m, 3H), 3.78 (d, $J = 14.7$ Hz, 1H), 3.10-2.97 (m, 2H), 2.80 (dd, $J = 14.8$, 10.2 Hz, 1H), 2.70 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ 193.4, 153.4, 132.6, 130.1, 122.5, 122.4, 121.2, 110.6, 110.3, 98.7, 55.7, 43.5, 38.0, 33.0, 30.6. HRMS (ESI) m/z calcd for C$_{16}$H$_{15}$Cl$_3$NO [M+H$^+$]: 330.0214, found 330.0209.

1-(9-(2,2,2-trichloroethyl)-6,7,8,9-tetrahydropyrido[1,2-a]indol-10-yl)ethanone (2ac, 43.9 mg, 64% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) δ 7.93-7.91 (m, 1H), 7.38-7.28 (m, 3H), 4.59-4.54 (m, 1H), 4.39-4.33 (m, 1H), 3.98-3.90 (m, 1H), 3.48 (dd, $J = 14.9$, 3.4 Hz, 1H), 2.99 (dd, $J = 15.0$, 11.1 Hz, 1H), 2.82-2.76 (m, 1H), 2.73 (s, 3H), 2.38-2.29 (m, 1H), 2.16 (d, $J = 20.6$ Hz, 1H), 1.86-1.77 (m, 1H); $^{13}$C
NMR (101 MHz, CDCl$_3$) $\delta$ 193.9, 147.4, 136.3, 126.1, 122.7, 122.3, 120.6, 112.3, 109.9, 98.4, 53.3, 42.7, 33.2, 31.7, 21.1, 17.1. HRMS (ESI) $m/z$ calcd for C$_{16}$H$_{17}$Cl$_3$NO $[^{[M+H]^+}]$: 344.0370, found 344.0377.

1-(10-(2,2,2-trichloroethyl)-7,8,9,10-tetrahydro-6H-azepino[1,2-a]indol-11-yl)ethanone (2ad, 34.3 mg, 48% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.93-7.91 (m, 1H), 7.40-7.38 (m, 1H), 7.30-7.27 (m, 2H), 5.49-5.45 (m, 1H), 4.69-4.64 (m, 1H), 4.00-3.94 (m, 1H), 3.25-3.23 (m, 2H), 2.74 (s, 3H), 2.36-2.31 (m, 1H), 2.20-2.14 (m, 1H), 2.05-1.99 (m, 2H), 1.85-1.71 (m, 1H), 1.53-1.46 (m, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 195.7, 149.0, 136.3, 126.0, 122.3, 121.8, 121.0, 115.0, 109.6, 98.9, 55.2, 44.9, 32.2, 32.1, 30.4, 28.4, 24.8. HRMS (ESI) $m/z$ calcd for C$_{17}$H$_{19}$Cl$_3$NO $[^{[M+H]^+}]$: 358.0527, found 358.0531.

1-(2-(dichloromethyl)-1-phenyl-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (3a, 45.7 mg, 64% yield), yellow solid; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.36-8.33 (m, 1H), 7.39-7.30 (m, 6H), 7.13 (d, $J$ = 7.2 Hz, 2H), 6.02 (d, $J$ = 4.8 Hz, 1H), 4.94 (d, $J$ = 2.9 Hz, 1H), 4.54 (dd, $J$ = 11.7, 7.9 Hz, 1H), 4.38 (dd, $J$ = 11.6, 3.5 Hz, 1H), 3.63-3.60 (m, 1H), 2.23 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.8, 151.0, 140.4, 132.4, 130.8, 129.4, 127.9, 127.2, 123.0, 123.0, 122.8, 110.7, 110.1, 74.0, 62.1, 49.2, 45.7, 29.7. HRMS (ESI) $m/z$ calcd for C$_{20}$H$_{18}$Cl$_2$NO $[^{[M+H]^+}]$: 358.0760, found 358.0762.

1-(2-(dichloromethyl)-8-methyl-1-phenyl-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (3b, 38.6 mg, 52% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.33-7.29 (m, 3H), 7.24-7.16 (m, 2H), 7.12-7.07 (m, 3H), 5.99 (d, $J$ = 4.9 Hz, 1H), 4.93 (d, $J$ = 3.2 Hz, 1H), 4.49 (dd, $J$ = 11.6, 7.9 Hz, 1H), 4.35 (dd, $J$ = 11.5, 3.6 Hz, 1H), 3.59-3.54 (m, 1H), 2.73 (s, 3H), 2.19 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 193.3, 149.3, 140.4, 133.8, 133.1, 129.5, 129.2, 128.0, 127.2, 125.0, 123.3, 113.2, 107.4, 73.9, 62.1, 49.6, 45.6, 30.6, 23.1. HRMS (ESI) $m/z$ calcd for C$_{21}$H$_{20}$Cl$_2$NO $[^{[M+H]^+}]$: 372.0916, found 372.0909.
1-(2-(dichloromethyl)-6-methyl-1-phenyl-2,3-dihydro-1\textit{H}-pyrrolo[1,2-\textit{a}]indol-9-yl)ethanone (3c, 37.9 mg, 51% yield), yellow solid; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.19 (d, $J = 8.1$ Hz, 1H), 7.34-7.28 (m, 3H), 7.18-7.11 (m, 4H), 6.00 (d, $J = 4.9$ Hz, 1H), 4.91 (d, $J = 3.0$ Hz, 1H), 4.49 (dd, $J = 11.6, 7.9$ Hz, 1H), 4.35 (dd, $J = 11.6, 3.5$ Hz, 1H), 3.62-3.57 (m, 1H), 2.52 (s, 3H), 2.22 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.7, 150.3, 140.6, 133.0, 132.7, 129.3, 128.5, 127.8, 127.2, 124.6, 122.4, 110.7, 110.0, 74.1, 62.2, 49.1, 45.5, 29.7, 21.7. HRMS (ESI) m/z calcd for C$_{21}$H$_{20}$Cl$_2$NO [M+H$^+$]: 372.0916, found 372.0909.

1-(2-(dichloromethyl)-7-methoxy-1-phenyl-2,3-dihydro-1\textit{H}-pyrrolo[1,2-\textit{a}]indol-9-yl)ethanone (3d, 39.5 mg, 51% yield), yellow solid; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.94 (d, $J = 2.4$ Hz, 1H), 7.37-7.28 (m, 5H), 7.16-7.14 (m, 2H), 6.98 (dd, $J = 8.8, 2.5$ Hz, 1H), 6.04 (d, $J = 4.7$ Hz, 1H), 4.94 (d, $J = 3.0$ Hz, 1H), 4.53 (dd, $J = 11.6, 7.9$ Hz, 1H), 4.38-4.35 (m, 1H), 3.93 (s, 3H), 3.64-3.59 (m, 1H), 2.19 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.7, 156.7, 150.6, 140.5, 131.8, 129.4, 127.9, 127.3, 127.2, 113.2, 110.7, 104.6, 74.0, 62.2, 55.9, 49.4, 45.8, 29.7. HRMS (ESI) m/z calcd for C$_{21}$H$_{20}$Cl$_2$NO [M+H$^+$]: 388.0866, found 388.0862.

1-(2-(dichloromethyl)-6-fluoro-1-phenyl-2,3-dihydro-1\textit{H}-pyrrolo[1,2-\textit{a}]indol-9-yl)ethanone (3e, 48.8 mg, 65% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.32-8.28 (m, 1H), 7.34-7.29 (m, 3H), 7.13-7.11 (m, 2H), 7.06-7.02 (m, 2H), 6.03 (d, $J = 4.6$ Hz, 1H), 4.91 (d, $J = 3.0$ Hz, 1H), 4.49 (dd, $J = 11.5, 7.9$ Hz, 1H), 4.32 (dd, $J = 11.5, 3.6$ Hz, 1H), 3.64-3.59 (m, 1H), 2.16 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.6, 161.2, 158.8, 151.0, 140.3, 132.4 (d, $J_{C\text{--}F} = 12.0$ Hz), 128.3 (d, $J_{C\text{--}F} = 229.6$ Hz), 128.0, 123.9 (d, $J_{C\text{--}F} = 9.6$ Hz), 111.1, 111.1 (d, $J_{C\text{--}F} = 55.1$ Hz), 96.7 (d, $J_{C\text{--}F} = 26.4$ Hz), 73.9, 62.1, 49.1, 45.6, 29.7. HRMS (ESI) m/z calcd for C$_{20}$H$_{17}$Cl$_2$FNO [M+H$^+$]: 376.0666, found 376.0672.
1-(6-bromo-2-(dichloromethyl)-1-phenyl-2,3-dihydro-1H-pyrrolo[1,2-α]indol-9-yl)ethanone (3f, 53.9 mg, 62% yield), yellow oil; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.21 (d, \(J = 8.6\) Hz, 1H), 7.52 (s, 1H), 7.41-7.38 (m, 1H), 7.35-7.29 (m, 3H), 7.12-7.10 (m, 2H), 6.02 (d, \(J = 4.6\) Hz, 1H), 4.91 (d, \(J = 2.9\) Hz, 1H), 4.50 (dd, \(J = 11.6, \) 7.9 Hz), 4.35-4.31 (m, 1H), 3.63-3.59 (m, 1H), 2.17 (s, 3H); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.21 (d, \(J = 8.6\) Hz, 1H), 7.52 (s, 1H), 7.41-7.38 (m, 1H), 7.35-7.29 (m, 3H), 7.12-7.10 (m, 2H), 6.02 (d, \(J = 4.6\) Hz, 1H), 4.91 (d, \(J = 2.9\) Hz, 1H), 4.50 (dd, \(J = 11.6, \) 7.9 Hz), 4.35-4.31 (m, 1H), 3.63-3.59 (m, 1H), 2.17 (s, 3H); \(^1\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 192.6, 151.1, 140.1, 133.1, 129.7, 129.5, 128.0, 127.2, 126.1, 116.4, 113.1, 110.8, 73.9, 62.1, 49.0, 45.7, 29.8.

HRMS (ESI) \(m/z\) calcd for C\(_{20}\)H\(_{17}\)BrCl\(_2\)NO [M+H\(^+\)]: 435.9865, found 435.9877.

Methyl-2-(dichloromethyl)-1-phenyl-2,3-dihydro-1H-pyrrolo[1,2-α]indole-9-carboxylate (3g, 41.1 mg, 55% yield), yellow oil; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.20-8.18 (m, 1H), 7.38-7.27 (m, 6H), 7.16-7.14 (m, 2H), 6.00 (d, \(J = 4.4\) Hz, 1H), 4.88 (d, \(J = 4.0\) Hz, 1H), 4.58 (dd, \(J = 11.4, 8.1\) Hz), 4.39 (dd, \(J = 11.4, 4.4\) Hz, 1H), 3.68-3.62 (m, 1H), 3.59 (s, 3H); \(^1\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 164.7, 151.4, 141.1, 132.3, 131.0, 128.9, 127.4, 127.3, 122.6, 122.3, 121.9, 110.1, 100.3, 73.9, 62.0, 50.5, 48.9, 45.8. HRMS (ESI) \(m/z\) calcd for C\(_{20}\)H\(_{18}\)Cl\(_2\)NO\(_2\) [M+H\(^+\)]: 374.0709, found 374.0715.

1-(1-(2,2-dichloroethyl)-2,3-dihydro-1H-pyrrolo[1,2-α]indol-9-yl)ethanone (3h, 31.3 mg, 53% yield), yellow solid; \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 8.01-7.99 (m, 1H), 7.34-7.27 (m, 3H), 6.02-5.99 (m, 1H), 4.20-4.17 (m, 2H), 3.96-3.90 (m, 1H), 3.06-2.99 (m, 1H), 2.95-2.87 (m, 1H), 2.69 (s, 3H), 2.62-2.56 (m, 1H), 2.46-2.38 (t, \(J = 14.7\) Hz), 1H); \(^1\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 193.3, 153.8, 132.6, 130.1, 122.4, 122.4, 121.3, 110.5, 110.2, 72.1, 46.4, 43.3, 37.2, 32.9, 30.4. HRMS (ESI) \(m/z\) calcd for C\(_{15}\)H\(_{16}\)Cl\(_2\)NO [M+H\(^+\)]: 296.0603, found 296.0604.
1-(9-(2,2-dichloroethyl)-6,7,8,9-tetrahydropyrido[1,2-a]indol-10-yl)ethanone (3i, 31.5 mg, 51% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.90 (d, $J = 8.2$ Hz, 1H), 7.36-7.28 (m, 3H), 6.33 (t, $J = 6.7$ Hz, 1H), 4.34-4.29 (m, 1H), 4.04-3.99 (m, 1H), 3.93-3.85 (m, 1H), 2.74-2.68 (m, 4H), 2.48-2.41 (m, 1H), 2.28-2.11 (m, 3H), 1.93-1.85 (m, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 194.0, 148.4, 136.1, 126.1, 122.6, 122.2, 120.5, 112.2, 109.8, 73.1, 46.9, 42.5, 31.8, 31.7, 23.8, 17.6. HRMS (ESI) m/z calcd for C$_{16}$H$_{18}$Cl$_2$NO [M+H$^+$]: 310.0760, found 310.0756.

1-(2-(dibromomethyl)-1-phenyl-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (5i, 40.1 mg, 45% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.34-8.32 (m, 1H), 7.40-7.37 (m, 1H), 7.34-7.30 (m, 5H), 7.16-7.14 (m, 2H), 5.96 (d, $J = 4.3$ Hz, 1H), 4.85 (d, $J = 3.2$ Hz, 1H), 4.54 (dd, $J = 11.5$, 7.9 Hz, 1H), 4.34 (dd, $J = 11.6$, 3.8 Hz, 1H), 3.72-3.68 (m, 1H), 2.23 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.7, 150.8, 140.4, 132.4, 130.8, 129.4, 127.9, 127.3, 123.0, 122.9, 122.7, 110.8, 110.0, 62.7, 51.0, 47.4, 47.2, 29.9. HRMS (ESI) m/z calcd for C$_{20}$H$_{18}$Br$_2$NO [M+H$^+$]: 445.9750, found 445.9742.

1-phenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indole (6i, 23.0 mg, 66% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.57 (d, $J = 7.9$ Hz, 1H), 7.37-7.26 (m, 6H), 7.22 (t, $J = 7.6$ Hz, 1H), 7.13 (t, $J = 7.5$ Hz, 1H), 6.08 (s, 1H), 4.86 (d, $J = 4.3$ Hz, 1H), 4.67 (dd, $J = 11.3$, 8.5 Hz, 1H), 4.48 (dd, $J = 11.4$, 4.7 Hz, 1H), 4.16 (dt, $J = 8.8$, 4.6 Hz, 1H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 145.7, 142.3, 133.1, 132.2, 128.9, 128.1, 127.5, 121.0, 121.0, 119.9, 109.6, 101.3, 94.0, 71.9, 48.2, 47.1. HRMS (ESI) m/z calcd for C$_{18}$H$_{15}$Cl$_3$N [M+H$^+$]: 350.0265, found 350.0269.

1-(1,6-diphenyl-2-(trichloromethyl)-2,3-dihydro-1H-pyrrolo[1,2-a]indol-9-yl)ethanone (7i, 32.7 mg, 70% yield), yellow oil; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.34 (d, $J = 8.8$ Hz, 1H), 7.70 (d, $J = 7.8$ Hz, 2H), 7.60 (d, $J = 7.3$ Hz, 2H), 7.48 (t, $J = 7.5$ Hz, 2H), 7.37-7.31 (m, 4H), 7.20 (d, $J = 7.5$ Hz, 2H), 5.17 (d, $J = 1.8$ Hz, 1H), 4.68 (dd, $J = 12.4$, 8.0 Hz, 1H), 4.60 (dd, $J = 12.4$, 2.8 Hz, 1H), 4.07-4.04 (m, 1H), 2.32 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 192.4, 151.4, 141.5, 140.3, 136.6, 132.8, 131.0, 130.0, 129.4, 128.9, 127.9, 127.4, 127.4, 127.2, 122.9, 122.7, 108.5, 101.1, 71.7, 50.0, 47.0, 29.9. HRMS (ESI) m/z calcd for C$_{26}$H$_{21}$Cl$_3$NO [M+H$^+$]: 468.0683, found 468.0692.
ethyl 2-(10-acetyl-6,7,8,9-tetrahydropyrido[1,2-\(\alpha\])indol-9-yl)acetate \(8\), 15.1 mg, 50% yield), yellow oil; \(^1\text{H} \text{NMR} \,(400 \text{ MHz, CDCl}_3) \delta\) 7.93-7.91 (m, 1H), 7.36-7.27 (m, 3H), 4.32-4.28 (m, 2H), 4.24-4.16 (m, 2H), 3.93-3.86 (m, 1H), 3.02 (dd, \(J = 16.1, 3.0\) Hz, 1H), 2.70 (s, 3H), 2.55 (dd, \(J = 16.0, 10.8\) Hz, 1H), 2.12-2.03 (m, 2H), 1.94-1.86 (m, 2H), 1.29 (t, \(J = 7.1\) Hz, 3H); \(^{13}\text{C} \text{NMR} \,(75 \text{ MHz, CDCl}_3) \delta\) 193.7, 172.0, 148.4, 136.1, 126.2, 122.5, 122.0, 120.5, 112.3, 109.7, 60.6, 42.6, 37.6, 31.6, 30.3, 23.8, 17.8, 14.3. HRMS (ESI) \(m/z\) calcld for C\(_{18}\)H\(_{22}\)NO\(_3\) [M+H\(^+\)]: 300.1594, found 300.1591.

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\begin{align*}
\text{ethyl 2-(10-acetyl-6,7,8,9-tetrahydropyrido[1,2-\(\alpha\])indol-9-yl)acetate (8)}
\end{align*}
\]

\(1\)-\((2,2\text{-dichloro-7',8'-dihydro-6'H-spiro[cyclopropane-1,9'-pyrido[1,2-\(\alpha\)]indol]-10'-yl})ethan-1-one \(9\), 19.2 mg, 62% yield), yellow oil; \(^1\text{H} \text{NMR} \,(400 \text{ MHz, CDCl}_3) \delta\) 7.76-7.74 (m, 1H), 7.33-7.30 (m, 1H), 7.24-7.18 (m, 2H), 4.21-4.14 (m, 1H), 2.98 (d, \(J = 8.7\) Hz, 1H), 2.59 (s, 3H), 2.38-2.28 (m, 2H), 2.07-1.98 (m, 2H), 1.80 (d, \(J = 8.7\) Hz, 1H); \(^{13}\text{C} \text{NMR} \,(101 \text{ MHz, CDCl}_3) \delta\) 196.6, 140.0, 135.4, 125.9, 122.6, 121.8, 120.8, 116.9, 109.4, 67.3, 41.6, 33.7, 33.4, 32.0, 30.2, 21.5. HRMS (ESI) \(m/z\) calcld for C\(_{16}\)H\(_{16}\)Cl\(_2\)NO [M+H\(^+\)]: 308.0603, found 308.0601.
5. References

6. Copies of the $^1$H NMR and $^{13}$C NMR Spectra
$2h$

![Chemical Structure](image_url)

$2h$

![NMR Spectrum](image_url)
$2q$

[Chemical structure image]

$2q$

[Chemical structure image]