Supporting Information

Efficient Base Catalyzed Alkylation
Reactions with Aziridine Electrophiles

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Experimental

1) Solvents and Reagents

All reagents bought from commercial sources were used as sold. Organic solvents were concentrated under reduced pressure using a Büchi rotary evaporator. Syringes, needles and cannulae were oven dried at 140 °C. Anhydrous tetrahydrofuran was freshly distilled from sodium-benzophenone under an atmosphere of nitrogen. Anhydrous dichloromethane, toluene and HN\textsuperscript{1}Pr\textsubscript{2} were purified by distillation over calcium hydride.

2) Chromatography

TLC analyses were performed using Merck aluminium-backed or glass-backed plates pre-coated with silica (0.25 mm, 60 F\textsubscript{254}) and visualized under UV light (254 nm) and/or by the use of potassium permanganate using the solvent system indicated. Systems using ‘petroleum ether’ refer to light petroleum 40-60 °C. Column chromatography was performed on silica (Kieselgel 60 (40-60 μm)).

3) Spectra

Infrared spectra were recorded on an ATI Matison: Genesis Series FTIR spectrometer from a thin film or with Nujol deposited on a sodium chloride plate, with absorption maxima (v\textsubscript{max}) recorded in wavenumbers (cm\textsuperscript{-1}), and labelled as broad (br), strong (s), medium (m), or weak (w). Only selected absorptions are recorded. NMR spectra were recorded using a Bruker Avance 500 MHz spectrometer, chemical shifts (δ) are quoted in parts per million referenced to the residual solvent peak (7.26
CDCl₃ ′H, 77.1 CDCl₃ ¹³C). The multiplicity of each signal is designated using the following abbreviations; s, singlet; d, doublet; t, triplet; q, quartet; m, multiplet. Coupling constants (J) are reported in Hertz (Hz). Low resolution mass spectra were recorded on a Fissions VG Trio 2000 quadrupole mass spectrometer. High resolution mass spectra were recorded on a Thermo Finnigan Mat 95XP mass spectrometer. Melting points were obtained using a Griffin melting point apparatus and remain uncorrected.

4) Starting Materials

N-tosyl (2a), N-Nosyl (2d), N-Phosphoryl (2e) and N-CbZ (2c) aziridines were synthesised according to known procedures. S¹-S⁴ The starting material for 3f was synthesised by esterification of adipoyl dichloride followed by Dieckmann condensation. S⁵ The starting material for 3g and 3o was synthesised by treatment of 1-indanone with NaH and dimethylcarbonate. S⁶ Starting materials for 3h was synthesised by a transesterification reaction from the methyl ester. S⁷ Starting material for 3k was obtained from a Thorpe-Ziegler condensation. S⁸ Starting material for 3i was synthesised by treatment of pyrrolidin-2-one with Boc₂O and 10 mol% DMAP at room temperature in CH₂Cl₂ followed by esterification with LiHMDS and dimethylcarbonate at -78 °C. The starting material for 3p was synthesised via an SNAr reaction of 2-fluoronitrobenzene and dimethyl malonate with NaH, followed by reduction of the aromatic nitro group with H₂ / Pd according to a known procedure. S⁹
2.2 Reactions and Preparations

2,4-(Dimesitylsulfonyl)ethanolamine

Ethanolamine (1.0 g, 16.4 mmol) in 1.0 mL dry pyridine was added to a stirred solution of 2,4,6-trimethylbenzene sulfonyl chloride (7.52 g, 34.4 mmol) in 5 mL dry pyridine at -10 °C. Following warming to room temperature, the solution was stirred overnight. Water (5 mL) and CH₂Cl₂ (10 mL) were added, and the two layers were separated. The organic layer was washed with 1 N HCl (2 x 10 mL), and the combined aqueous layers were extracted with CH₂Cl₂ (2 x 10 mL). The combined organic layers were washed with a saturated copper sulfate solution (10 mL), dried (MgSO₄) and concentrated under reduced pressure to give the titled product as a white solid (5.66 g, 81 %); m.p. 82-84 °C; νmax (nujol)/cm⁻¹ 3328 (br, NH), 2852 (s), 1601 (w), 1464 (s), 1455 (s), 1377 (m), 1316 (w, SO₂), 1303 (w, SO₂), (s), 1170 (w, SO₂), 1147 (w, SO₂); δH (500MHz, CDCl₃) 6.97 (s, 2 H, O-Mes aromatic), 6.94 (s, 2 H, NH-Mes aromatic), 4.95 (t, 1 H, J = 6, NH), 3.97 (t, 2 H, J = 6, CH₂O), 3.20 (q, 2 H, J = 6, CH₂NH), 2.59 (s, 6 H, 2 x CH₃, O-Mes), 2.57 (s, 6 H, 2 x CH₃, N-Mes), 2.32 (s, 3 H, CH₃, O-Mes), 2.30 (s, 3 H, CH₃, N-Mes); δC (125MHz, CDCl₃) 143.8 (C), 142.5 (C), 139.9 (C), 139.0 (C), 133.3 (C), 132.1 (CH), 131.9 (CH), 130.0 (C), 67.7 (CH₂O), 41.8 (CH₂N), 22.9 (2 x CH₃), 22.6 (2 x CH₃), 21.1 (CH₃), 21.0 (CH₃); m/z (Cl⁺, NH₃) 443 ([M+NH₄]⁺, 100), 261 (21), 243 (37), 226 (72), 167 (22), 136 (25), 119 (23); HRMS 443.1663 [M+NH₄]⁺, C₂₀H₃₁O₅N₂S₂ requires 443.1669.
\textit{N-mesityl sulfonyl aziridine 2b}

\begin{center}
\includegraphics[width=0.2\textwidth]{n-mesityl_sulfonyl_aziridine_2b.pdf}
\end{center}

Potassium hydroxide (3.70 g, 65.9 mmol) in 18 mL water was added in one portion to 2,4-(dimesitylsulfonyl)ethanolamine (5.60 g, 13.2 mmol) in 100 mL benzene, and the biphasic mixture was stirred rapidly at room temperature overnight. The two layers were separated and the benzene layer was washed with water (20 mL), brine (20 mL), dried (Na$_2$SO$_4$) and concentrated under reduced pressure to give an off-white solid. The residue was purified by column chromatography [diethyl ether / petroleum ether] (1:2) to give the titled product as a crystalline white solid (2.81 g, 95%); m.p 59-62 °C; $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 3056 (m), 2986 (m), 2942 (m), 2306 (m), 1751 (m), 1605 (m), 1456 (m), 1442 (m), 1320 (s, SO$_2$), 1266 (s), 1157 (s, SO$_2$); $\delta_H$ (500MHz, CDCl$_3$) 6.96 (s, 2 H, CH aromatic), 2.68 (s, 6 H, 2 x CH$_3$), 2.40-2.25 (s, 4 H, 2 x CH$_2$), 2.29 (s, 3 H, CH$_3$); $\delta_C$ (125MHz, CDCl$_3$) 143.1 (C), 140.2 (2 x C), 132.5 (C), 131.8 (2 x CH), 26.6 (2 x CH$_2$), 23.0 (2 x CH$_3$), 21.0 (CH$_3$); $m/z$ (Cl$^+$, NH$_3$) 226 ([M+H]$^+$, 100%); HRMS ([M+NH$_4$]$^+$) 243.1168, C$_{11}$H$_{19}$O$_2$N$_2$S requires 243.1162.

\textit{N-(2-(Trifluoromethane)benzenesulfonyl)ethanolamine}

\begin{center}
\includegraphics[width=0.2\textwidth]{n-(2-(trifluoromethane)benzenesulfonyl)ethanolamine.pdf}
\end{center}

Ethanolamine (1.25 g, 20.44 mmol) and triethylamine (2.86 mL, 20.44 mmol) in 10 mL CH$_2$Cl$_2$ were added dropwise to a solution of 2-(Trifluoromethyl)benzenesulfonyl chloride (5.0 g, 20.44 mmol) in 15 mL CH$_2$Cl$_2$ at 0
°C. Following warming to room temperature, the solution was stirred overnight. 1 N HCl was added (10 mL), and the two layers were separated. The organic layer was washed with 1 N HCl (2 x 20 mL). The combined aqueous fractions were extracted with CH$_2$Cl$_2$ (20 mL). The combined organic fractions were then dried (Na$_2$SO$_4$) and concentrated. The residue was filtered through a silica plug (Et$_2$O) to give the titled product as a white solid (4.90 g, 79 %). $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 3367 (br, OH, NH), 1310 (s, SO$_2$), 1166 (s, SO$_2$); $\delta^H$ (500MHz, CDCl$_3$) 8.21 (dd, 1 H, $J = 6, 8$, CH), 7.87 (dd, 1 H, $J = 6, 8.0$, CH), 7.74-7.69 (m, 2 H, 2 x CH), 5.48 (t, 1 H, $J = 6$, NH), 3.70 (t, 2 H, $J = 6$, CH$_2$), 3.12 (q, 2 H, $J = 6, 11$, CH$_2$N); $\delta^C$ (125MHz, CDCl$_3$) 138.3 (i-C), 132.8 (CH), 132.5 (CH), 131.5 (CH), 128.6 (q, $J = 4$, CH), 127.5 (q, $J = 33$, C(CF$_3$)), 122.9 (q, $J = 274$, CF$_3$), 61.2 (CH$_2$O), 45.3 (CH$_2$N); $m/z$ (Cl$^+$, NH$_3$) 287 ([M+NH$_4$]$^+$, 100%), 270 (12), 62 (10); HRMS (ES, [M+NH$_4$]$^+$ 287.0669, C$_9$H$_{14}$O$_3$N$_2$F$_3$S requires 287.0672.

**N-2-(Trifluoromethane)benzenesulfonyl aziridine 2f**

![Structure diagram]

Triethylamine (3.81 mL, 27.24 mmol) and mesitylsulfonyl chloride (2.84 g, 12.97 mmol) in 5 mL CH$_2$Cl$_2$ were added to a solution of N-(2-(Trifluoromethane)benzenesulfonyl)ethanolamine (3.49g, 12.97 mmol) in 10 mL CH$_2$Cl$_2$ at -20 °C over 30 minutes. Following warming to 0 °C, the solution was stirred for 16 h. 1 N HCl was added (10 mL), and the two layers were separated. The organic layer was washed with 1 N HCl (2 x 15 mL). The combined aqueous fractions were extracted with CH$_2$Cl$_2$ (15 mL). The combined organic fractions were dried (Na$_2$SO$_4$) and concentrated. The residue was dissolved in benzene (100 mL) and
potassium hydroxide (2.83 g, 50.47 mmol) in 14 mL H$_2$O was added. The biphasic mixture was stirred vigorously for 16 h. Water (25 mL) was added and the two layers were separated. The organic layer was dried (Na$_2$SO$_4$) and concentrated to give the titled compound as a white solid (2.44 g, 75 %). m.p. 54-56 °C; $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 3020 (m), 1361 (m), 1314 (s, SO$_2$), 1216 (s), 1162 (s, SO$_2$); $\delta_{\text{H}}$ (500MHz, CDCl$_3$) 8.80 (dd, 1 H, $J = 6, 8$, CH), 7.85 (dd, 1 H, $J = 6, 8$, CH), 7.75-7.68 (m, 2 H, 2 x CH), 2.40 (s, 4 H, 2 x CH$_2$); $\delta_{\text{C}}$ (125MHz, CDCl$_3$) 137.2 (i-C), 133.6 (CH), 132.4 (CH), 131.9 (CH), 128.7 (q, $J = 34$, C(CF$_3$)), 128.4 (q, $J = 6$, CH), 122.4 (q, $J = 274$, CF$_3$), 28.8 (2 x CH$_2$); m/z (ES) 268 ([M+NH$_4$]$^+$ 36), 252 (25), 199 (100); HRMS 252.0295 [M+H]$^+$, C$_9$H$_9$O$_2$N$_1$F$_3$S requires 252.0301.

**Methyl 2-cyano-2-phenylacetate**

Phenylacetonitrile (3.80 mL, 33.0 mmol) followed by dimethyl carbonate (13.9 mL, 264.0 mmol) were added to a suspension of sodium hydride (2.64 g, 66.0 mmol, 60% dispersion in mineral oil) in 80 mL of toluene at room temperature. Following warming to 80 °C for 30 min, a white and pale yellow cake formed, which was heated at 80 °C for a further 1 h. 1 N HCl was added until the solid dissolved (~ 60 mL), and the solution was extracted with EtOAc (2 x 40 mL). The combined organic extracts were dried (MgSO$_4$) and concentrated, and the resulting yellow oil was purified by column chromatography [diethyl ether / petroleum ether] (1:3) to give the titled product as a clear oil (5.51 g, 95%); $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 2957 (m), 2252 (w, CN), 1750 (s, C=O), 1497 (m), 1456 (s), 1436 (s), 1313 (s), 1257 (s), 1236 (s); $\delta_{\text{H}}$ (500MHz, CDCl$_3$) 8.80 (dd, 1 H, $J = 6, 8$, CH), 7.85 (dd, 1 H, $J = 6, 8$, CH), 7.75-7.68 (m, 2 H, 2 x CH), 2.40 (s, 4 H, 2 x CH$_2$); $\delta_{\text{C}}$ (125MHz, CDCl$_3$) 137.2 (i-C), 133.6 (CH), 132.4 (CH), 131.9 (CH), 128.7 (q, $J = 34$, C(CF$_3$)), 128.4 (q, $J = 6$, CH), 122.4 (q, $J = 274$, CF$_3$), 28.8 (2 x CH$_2$); m/z (ES) 268 ([M+NH$_4$]$^+$ 36), 252 (25), 199 (100); HRMS 252.0295 [M+H]$^+$, C$_9$H$_9$O$_2$N$_1$F$_3$S requires 252.0301.
CDCl₃ 7.22-7.13 (m, 5 H, 5 x CH), 4.54 (s, 1 H), 3.52 (s, 3 H, OCH₃); δ_C (125MHz, CDCl₃) 165.6 (C=O), 130.0 (C), 129.4 (2 x CH), 129.1 (CH), 128.0 (2 x CH), 115.8 (CN), 53.9 (OCH₃), 43.5 (CH); m/z (Cl⁺, NH₃) 193 ([M+NH₄]⁺, 100%); HRMS 193.0965 [M+NH₄]⁺, C₁₀H₁₃O₂N₂ requires 193.0977.

**Benzyl 2-cyano-2-phenylacetate**

BuLi (1.6M solution in hexanes, 8.1 mL, 13.0 mmol) was added dropwise to a solution of diisopropylamine (1.82 mL, 13.0 mmol) in 40 mL dry THF at -78 °C. Following warming to 0 °C for 20 min, phenylacetonitrile (1.0 mL, 8.7 mmol) was added in 5 mL dry THF dropwise and the solution was stirred for 20 min. Benzyl chloroformate (1.83 mL, 13.0 mmol) was then added in 10 mL dry THF and the solution was stirred at 0 °C for 48 h and then at RT for 16 h. 1 N HCl was added (50 mL), and the solution was extracted with CH₂Cl₂ (2 x 30 mL). The combined organic portions were washed with 1 N HCl (2 x 30 mL), brine (30 mL), dried (MgSO₄) and concentrated. The residue was purified by column chromatography [diethyl ether / petroleum ether] (1:2) to give the titled product as a white solid (1.72 g, 80 %); m.p. 32-35 °C; ν_max (neat)/cm⁻¹ 2975 (m), 2254 (w, CN), 1748 (s, C=O), 1497 (s), 1456 (s), 1378 (m), 1194 (s); δ_H (500MHz, CDCl₃) 7.38-7.17 (m, 10 H, 2 x Phenyl), 5.02 and 5.01 (d and d, J = 12 and 12, CH₂OCO), 4.68 (s, 1 H, CHCN); δ_C (125MHz, CDCl₃) 164.9 (C=O), 134.4 (C), 129.8 (C, Bn), 129.4 (CH), 129.3 (CH), 128.8 (CH), 128.7 (CH), 128.2 (CH), 128.0 (CH), 115.5 (CN), 68.7 (CH₂O), 43.8 (CHCN); m/z (Cl⁺, NH₃).
NH₃) 269 ([M+NH₄]⁺, 100%), 108 (32), 91 (47) HRMS 269.1277 [M+NH₄]⁺,
C₁₆H₁₇O₂N₂ requires 269.1280.

1-Oxo-indan-2-carboxylic acid tert-butylamide

NaH (60% dispersion, 636 mg, 15.9 mmol) was suspended in 10 mL dry THF
under nitrogen in an oven dried flask. Following stirring for 10 minutes, the
suspension was allowed to settle and the THF was syringed off. The residue was
suspected in dry THF (15 mL). Following warming to reflux, tert-butyl isocyanate
(726 μL, 6.4 mmol) and 1-indanone (750 mg, 6.4 mmol) was added in 2 mL THF over
10 minutes. Following stirring at reflux for 1 h, a white/yellow cake formed which was
heated for a further 3 h. After cooling to 0 °C, 1 N HCl was added cautiously until the
solid had completely dissolved (c.a 20 mL). The solution was extracted with Et₂O (2 x
20 mL) and the organic phase was washed with sat NaHCO₃ (20 mL), brine (20 mL),
dried (Na₂SO₄) and concentrated. The residue was triturated with Et₂O to give the
titled compound as a white solid (760 mg, 58 %); m.p. 134-136 °C; νₒₘₙ (neat)/cm⁻¹
3561 (br, NH), 3054 (m), 1698 (m, C=O ketone), 1665 (m, C=O amide), 1233 (s); δₜ (500MHz, CDCl₃) 7.72 (d, 1 H, J = 8, CH), 7.60 (t, 1 H, J = 7, CH), 7.49 (d, 1 H, J = 8,
CH), 7.36 (t, 1 H, J = 7, CH), 7.00 (br, NH), 3.75 (dd, 1 H, J = 4, 18, CHH'), 3.48 (dd,
J = 4, 8, CH), 3.28 (dd, J = 8, 18, CHH'), 1.37 (s, 9 H, 3 x CH₃); δ (125MHz, CDCl₃)
203.8 (C=O ketone), 165.2 (C=O amide), 154.4 (C), 135.7 (CH), 135.4 (C), 127.5
(CH), 126.7 (CH), 124.3 (CH), 53.5 (CH), 51.4 (C(CH₃)₃), 29.2 (3 x CH₃), 28.5 (CH₂);
m/z (ES) 254 ([M+Na]^+ 100%); HRMS 254.1159 [M+Na]^+, C_{14}H_{17}O_{2}N_{1}Na requires 254.1157.

**General procedure for the base catalyzed ring opening of N-protected aziridines**

BEMP (10.4 μL, 0.036 mmol) was added to a stirred solution of pronucleophile (0.72 mmol) in 700 μL THF and the solution was stirred at room temperature for 10 minutes. Aziridine (0.36 mmol) was added and the solution was stirred at room temperature. After completion of the reaction, the solution was concentrated under reduced pressure and the residue was purified by flash column chromatography [diethyl ether / petroleum ether].

**Compound 3a**

Following general procedure, the titled product was obtained as a colourless oil (129 mg, 93%) after flash column chromatography [diethyl ether / petroleum ether] (1:1); ν_{max} (neat)/cm^{-1} 3283 (br, NH), 2980 (m), 2240 (m, CN), 1743 (s, C=O), 1332 (s, SO₂), 1158 (s, SO₂); δ_{H} (500MHz, CDCl₃) 7.74 (d, 2 H, J = 8, 2 x CH), 7.53-7.40 (m, 5 H, Ph), 7.34 (d, 2 H, J = 8, 2 x CH), 4.75 (br, 1 H, NH), 4.34-4.18 (m, 2 H, OCH₂), 3.26-3.00 (m, 2 H, CH₂N), 2.68 (ddd, 1 H, J = 7, 9, 14, CHCH₂N), 2.47 (s, 3 H, CH₃), 2.47-2.37 (m, 1 H, CH′CH₂N), 1.27 (t, 3 H, J = 7, CH₃); δ_{C} (125MHz, CDCl₃) 167.3 (C=O), 144.0 (C), 136.7, 133.8, 130.1, 129.6, 129.5, 127.4, 126.1, 117.9 (CN), 63.9 (OCH₂), 52.3 (quaternary C), 40.0 (CH₂), 37.9 (CH₂), 21.8 (CH₃), 14.0 (CH₃); m/z
(Cl⁺, NH₃) 501 ([M+NH₄]⁺ 40%), 387 (28), 279 (65), 110 (100), 102 (43), 91 (22); HRMS (ES) [M+H]⁺ 387.1370, C₂₀H₂₃O₄N₂S requires 387.1373.

**Compound 3b**

Following general procedure, the titled product was obtained as a colourless oil (150 mg, 99 %) after flash column chromatography [diethyl ether / petroleum ether] (1:1); ν_{max} (neat)/cm⁻¹ 3322 (br, NH), 3059m(w), 2983 (m), 2934 (m), 2245 (w, CN), 1744 (s, C=O), 1604 (m), 1450 (s), 1330 (s, SO₂), 1265 (s), 1229 (s), 1155 (s, SO₂); δ_{H} (500MHz, CDCl₃) 7.45-7.36 (m, 5 H, 5 x CH phenyl), 6.93 (s, 2 H, 2 x CH), 5.03 (t, 1 H, J = 6, NH), 4.25-4.14 (m, 2 H, J = 7, 11, OCH₂), 3.00 (tdd, 1 H, J = 6, 10, 13, CHN), 2.88 (dddd, J = 5, 6, 10, 12, 1 H CH'N), 2.61-2.58 (m, 1 H, CHCH₂N), 2.57 (s, 6 H, 2 x CH₃), 2.38-2.33 (m, 1 H, CH'CH₂N), 2.28 (s, 3 H, CH₃), 1.20 (t, 3 H, J = 7, CH₃); δ_{C} (125MHz, CDCl₃) 167.0 (C=O), 142.4 (C), 139.2 (2 x C Mes), 133.5 (C), 133.3 (C phenyl), 132.1 (2 x CH Mes), 129.4 (2 x CH phenyl), 129.2 (2 x CH phenyl), 125.9 (CH phenyl), 117.7 (CN), 63.6 (OCH₂), 52.0 (quaternary C), 39.1 (CH₂N), 37.6 (CH₂), 22.9 (2 x CH₃), 20.9 (CH₃), 13.7 (CH₃ ester); m/z (Cl⁺, NH₃) 432 ([M+NH₄]⁺ 34), 415 ([M+H]⁺ 100), 386 (15), 369 (20), 231 (27), 183 (12), 136 (25), 119 (22); HRMS 415.1696 [M+H]⁺, C₂₂H₂₇O₄N₂S₁ requires 415.1686.
Compound 3c

Following general procedure (50mg, 0.28mmol of aziridine was used), the titled product was obtained as a colourless oil (86 mg, 83%), after flash column chromatography [dichloromethane / methanol] (99:1); $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 3350 (br, NH), 2990 (m), 2245 (m, CN), 1740 (s, C=O), 1710 (s, C=O); $\delta_H$ (500MHz, CDCl$_3$) 7.55 (d, 2 H, J = 7, CH), 7.42-7.31 (m, 8 H, 8 x CH), 5.07 (s, 2 H, CH$_2$ benzyl), 4.92 (t, 1 H, J = 7, NH), 4.25-4.14 (m, 2 H, CH$_2$O), 3.36 (q, 2 H, J = 7, CH$_2$N), 2.69-2.63 (m, 1 H, CHCH$_2$N), 2.44-2.39 (m, 1 H, CH'CH$_2$N), 1.22 (t, 3 H, J = 7, CH$_3$); $\delta_C$ (125MHz, CDCl$_3$) 167.7 (C=O ester), 156.5 (C=O carbamate), 136.8 (C), 134.3 (C), 129.7 (CH), 129.5 (CH), 128.9 (CH), 128.6 (CH), 128.6 (CH), 128.6 (CH), 126.4 (CH), 118.4 (CN), 67.2 (CH$_2$ benzyl), 63.9 (OCH$_2$), 53.9 (quaternary C), 38.1 (CH$_2$N), 37.8 (CH$_2$), 14.2 (CH$_3$); m/z (Cl$^+$, NH$_3$) 384 ([M+NH$_4$]$^+$ 50), 367 (45), 323 (47), 276 (41), 233 (22), 204 (37), 108 (100), 91 (75); HRMS [M+H]$^+$, 367.1657 C$_{20}$H$_{22}$O$_4$N$_2$ requires 367.1658.

Compound 3d

Following general procedure, the titled product was obtained as a colourless oil (129 mg, 98 %) after flash column chromatography [diethyl ether / petroleum ether] (3:2); $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 3393(NH), 2979 (w), 2956 (w), 2254 (m), 1748 (m, C=O), 1726 (m, C=O ester), 1329 (m, SO$_2$), 1157 (s, SO$_2$); $\delta_H$ (500MHz, CDCl$_3$) 6.93
(s, 2 H, CH aromatic), 5.02 (t, 1 H, J = 6, NH), 3.64 (s, 3 H, OCH₃), 2.95 (q, 2 H, J = 6, CH₂N), 2.60 (s, 6 H, 2 x CH₃), 2.47-2.37 (m, 2 H, C(1)H₂), 2.28 (s, 3 H, CH₃), 2.31-2.23 (m, 1 H, C(4)H) 2.06-1.80 (m, 5 H, C(4)H’, C(2)H₂, C(3)H₂) ; δ_C (125MHz, CDCl₃) 215.1 (C=O ester), 171.7 (C=O ketone), 142.1 (C), 139.0 (2 x C), 133.5 (C), 132.0 (2 x CH), 58.9 (quaternary C), 52.8 (OCH₃), 39.9 (CH₂N), 37.7 (CH₂CH₂N), 33.5 (C(1)H₂), 33.1 (C(3)H₂), 22.9 (2 x CH₃), 20.9 (CH₃), 19.6 (C(2)H₂); m/z (CI +, NH₃) 385 ([M+NH₄]⁺, 70), 368 ([M+H]⁺, 25), 350 (70), 336 (15), 243 (18), 203 (23), 168 (100), 160 (12); HRMS ([M+H]⁺) 368.1528 [M+H]⁺, C₁₈H₂₆O₅N₁S₁ requires 368.1526.

**Compound 3e**

Following general procedure, the titled product was obtained as a colourless oil (134 mg, 99 %) after flash column chromatography [diethyl ether / petroleum ether] (3:2); ν_max (neat)/cm⁻¹ 3307 (br, NH), 2979 (w), 2256 (w), 1748 (s, C=O), 1722 (s, C=O ester), 1327 (s, SO₂), 1155 (s, SO₂); δ_H (500MHz, CDCl₃) 6.93 (s, 2 H, CH aromatic), 5.06 (t, 1 H, J = 6, NH), 4.13-4.06 (q, 2 H, J = 7, OCH₂), 2.95 (q, 2 H, J = 6, CH₂N), 2.60 (s, 6 H, 2 x CH₃), 2.43-2.37 (m, 2 H, C(1)H₂), 2.97-2.22 (m, 1 H, C(4)H), 2.27 (s, 3 H, CH₃), 2.05-1.79 (m, 5 H, C(2)H₂, C(4)H’, C(3)H₂), 1.10 (t, 3 H, J = 7, CH₃ ester); δ_C (125MHz, CDCl₃) 215.2 (C=O), 171.2 (C=O ester), 142.1 (C), 139.0 (2 x C), 133.5 (C), 131.9 (2 x CH), 61.7 (OCH₂), 58.9 (quaternary C), 38.9 (CH₂N), 37.7 (CH₂CH₂N), 33.6 (C(1)H₂), 33.0 (C(3)H₂), 22.9 (2 x CH₃), 20.9 (CH₃),
19.6 (C(2)H₂), 14.0 (CH₃ ester); \( m/z \) (Cl⁺, NH₃) 399 ([M+NH₄]⁺, 15), 364 (23), 182 (100), 174 (16); HRMS ([M+NH₄]⁺) 399.1949 [M+NH₄]⁺, \( \text{C}_{19}\text{H}_{31}\text{O}_{5}\text{N}_{2}\text{S}_{1} \) requires 399.1948.

**Compound 3f**

Following general procedure, the titled product was obtained as a colourless oil (116 mg, 78 %) after flash column chromatography [diethyl ether / petroleum ether] (3:2); \( \nu_{\text{max}} \) (neat)/cm⁻¹ 3325 (br, NH), 3054 (m), 2983 (m), 2925 (m), 2305 (w), 1745 (s, C=O), 1720 (s, C=O ester), 1604 (w), 1456 (w), 1422 (w), 1369 (w), 1328 (s, SO₂), 1265 (s), 1155 (s, SO₂); \( \delta_{\text{H}} \) (500MHz, CDCl₃) 6.93 (s, 2 H, 2 x CH), 5.17 (t, 1 H, J = 6, NH), 2.95 (q, 2 H, J = 6, CH₂N), 2.61 (s, 6 H, 2 x CH₃), 2.42-2.33 (m, 2 H, C(1)H₂), 2.27 (s, 3 H, CH₃), 2.26-2.18 (m, 1 H, C(4)H), 1.97-1.76 (m, 5 H, C(4)H', C(2)H₂, C(3)H₂), 1.36 (s, 9 H, 3 x CH₃); \( \delta_{\text{C}} \) (125MHz, CDCl₃) 215.6 (C=O ketone), 170.5 (C=O ester), 142.0 (C), 139.0 (2 x C), 133.5 (C), 131.9 (2 x CH), 82.6 (OC(CH₃)₃), 59.8 (quaternary C), 38.9 (CH₂N), 37.6 (CH₂CH₂N) 34.0 (C(1)H₂), 32.8 (C(3)H₂), 27.7 (3 x CH₃), 22.9 (2 x CH₃), 20.9 (CH₃), 19.6 (C(2)H₂); \( m/z \) (Cl⁺, NH₃) 427 ([M+NH₄]⁺ 10), 392 (100), 354 (15), 310 (10), 170 (11), 136 (14), 110 (13); HRMS 427.2255 [M+NH₄]⁺, \( \text{C}_{21}\text{H}_{35}\text{O}_{5}\text{N}_{2}\text{S}_{1} \) requires 427.2261.
Compound 3g

Following general procedure, the titled product was obtained as a colourless oil, which crystallized upon storage (130 mg, 88 %) after flash column chromatography [diethyl ether / petroleum ether] (2:1); m.p. 82-85 °C; $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 3315 (br, NH), 2979 (m), 2930 (m), 1741 (s, C=O), 1715 (C=O ester), 1601 (s), 1456 (m), 1329 (s, SO$_2$), 1154 (s, SO$_2$); $\delta_1$H (500MHz, CDCl$_3$) 7.72 (d, 1 H, $J = 8$, CH), 7.62 (t, 1 H, $J = 8$, CH), 7.40 (d, 1 H, $J = 8$, CH), 7.38 (t, 1 H, $J = 8$, CH), 6.91 (s, 2 H, CH aromatic), 5.09 (t, 1 H, $J = 6$, NH), 3.64 (d, 1 H, $J = 17$, CH$H'$ indanone), 3.62 (s, 3 H, OCH$_3$), 3.07 (d, 1 H, $J = 17$, CHH'$^{'}$ indanone), 3.05-3.00 (m, 2 H, CH$_2$N), 2.58 (s, 6 H, 2 x CH$_3$), 2.26 (s, 3 H, CH$_3$), 2.26-2.24 (m 1 H, CHCH$_2$N), 2.04-1.99 (m, 1 H, CH$H'$CH$_2$N); $\delta_C$ (125MHz, CDCl$_3$) 201.0 (C=O), 170.3 (C=O ester), 151.7 (C), 141.1 (C), 137.9 (2 x C), 134.7 (C), 133.5 (C), 132.6 (CH), 130.9 (2 x CH), 127.0 (CH), 125.4 (CH), 123.9 (CH), 57.9 (quaternary C), 51.9 (O-CH$_3$), 38.0 (CH$_2$N), 36.2 (CH$_2$CH$_2$N), 33.4 (C(7)H$_2$), 21.9 (2 x CH$_3$), 19.9 (CH$_3$); m/z (Cl$^+$, NH$_3$) 433 ([M+NH$_4^+$]+ 53%), 416 ([M+H]$^+$ 63), 401 (38), 384 (15), 234 (32), 216 (100), 208 (33), 202 (18), 159 (31), 151 (21), 137 (54), 123 (33), 112 (25), 97 (21), 84 (23), 69 (19), 59 (34); HRMS 416.1526 [M+H]$^+$, C$_{22}$H$_{26}$O$_5$N$_1$S$_1$ requires 416.1526.
Compound 3h

Following general procedure, the titled product was obtained as a white solid (148 mg, 91 %) after flash column chromatography [diethyl ether / petroleum ether] (1:1); m.p 24-26 °C; v$_\text{max}$ (neat)/cm$^{-1}$ 3311 (br, NH), 2977 (m), 2932 (m), 1738 (s, C=O), 1716 (C=O ester), 1605 (s), 1455 (m), 1328 (s, SO$_2$), 1152 (s, SO$_2$); δ$_H$ (500MHz, CDCl$_3$) 7.70 (d, 1 H, J = 8, C(1)H), 7.59 (t, 1 H, J = 8, C(3)H), 7.42 (d, 1 H, J = 8, C(4)H), 7.36 (t, 1 H, J = 8, C(2)H), 6.90 (s, 2 H, CH aromatic), 5.11 (t, 1 H, J = 6, NH), 3.56 (d, 1 H, J = 17, C(5)H), 3.05-2.97 (m, 3 H, C(5)H', CH$_2$N), 2.59 (s, 6 H, 2 x CH$_3$), 2.25 (s, 3 H, CH$_3$), 2.22-2.15 (m, 1 H, CHCH$_2$N), 1.97-1.93 (m, 1 H, CH'$CH_2$N), 1.30 (s, 9 H, 3 x CH$_3$ tert butyl); δ$_C$ (125MHz, CDCl$_3$) 202.5 (C=O ketone), 169.9 (C=O ester), 152.7 (C), 142.1 (C), 139.0 (2 x C), 135.5 (C), 134.8 (C), 133.6 (CH), 131.9 (2 x CH), 127.8 (CH), 126.3 (CH), 124.8 (CH), 82.4 (quaternary C ester), 59.9 (quaternary C), 39.1 (CH$_2$N), 37.4 (CH$_2$CH$_2$N), 34.1 (CH$_2$), 27.7 (3 x CH$_3$), 22.9 (2 x CH$_3$), 20.9 (CH$_3$); m/z (Cl$^+$, NH$_3$) 475 ([M+NH$_4^+$]$^+$ 10), 458 (21), 419 (60), 402 (100), 358 (62), 276 (29), 258 (40), 218 (30), 193 (39), 174 (25), 168 (17), 158 (58), 136 (24), 120 (21), 91 (13), 59 (16); HRMS 475.2261 [M+NH$_4^+$]$^+$, C$_{25}$H$_{35}$O$_5$N$_2$S$_1$ requires 475.2261.
Compound 3i

Following general procedure, the titled product was obtained as a colourless oil (121 mg, 73 %) after flash column chromatography [diethyl ether / petroleum ether (1:1) then chloroform / diethyl ether (4:1)]; \( \nu_{\text{max}} \) (neat)/cm\(^{-1} \) 3309 (br, NH), 3021 (m), 2980 (m), 2954 (m), 2938 (m), 1782 (s, C=O), 1728 (br, C=O carbamate and C=O amide), 1605 (m), 1456 (m), 1369 (s, SO\(_2\)), 1305 (s), 1215 (s), 1154 (s, SO\(_2\)); \( \delta_H \) (500MHz, CDCl\(_3\)) 6.94 (s, 2 H, 2 x CH), 4.99 (t, 1 H, \( J = 6 \), NH), 3.73-3.69 (m, 2 H, C(1)H\(_2\)), 3.71 (s, 3 H, OCH\(_3\)), 3.01 (q, 2H, \( J = 7 \), C(4)H\(_2\)N), 2.60 (s, 6 H, 2 x CH\(_3\)), 2.44 (ddd, 1 H, \( J = 4, 7, 13 \), C(2)H), 2.28 (s, 3 H, CH\(_3\)), 2.21 (td, 1 H, \( J = 7, 14 \), C(3)H), 2.02-1.97 (m, 1H), 1.92 (td, 1 H, \( J = 9, 13 \)), 1.52 (s, 9 H, 3 x CH\(_3\)); \( \delta_C \) (125MHz, CDCl\(_3\)) 171.2 (C=O), 170.7 (C=O), 149.8 (C=O carbamate), 142.2 (C), 139.0 (2 x C), 133.5 (C), 132.0 (2 x CH), 83.7 (C(CH\(_3\))\(_3\)), 56.1 (OCH\(_3\)), 53.2 (quaternary C), 43.9 (C(1)H\(_2\)), 38.7 (C(4)H\(_2\)), 33.8 (C(3)H\(_2\)), 28.0 (3 x CH\(_3\)), 27.8 (C(2)H\(_2\)), 22.9 (2 x CH\(_3\)), 20.9 (CH\(_3\)); \textit{m/z} (Cl\(^+\), NH\(_3\)) 486 ([M+NH\(_4\)]\(^+\) 10), 385 (30), 369 (100), 287 (15), 256 (12), 185 (11), 172 (11); HRMS 486.2274 [M+NH\(_4\)]\(^+\), \( C_{22}H_{36}O_7N_3S_1 \) requires 486.2268.
**Compound 3j**

Following general procedure, the titled product was obtained as a colourless oil (91 mg, 73 %) after flash silica chromatography [diethyl ether / petroleum ether] (3:2); $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 3397 (br, NH), 1738 (m, C=O), 1703 (m, C=O), 1330 (m, SO$_2$), 1217 (s), 1156 (m, SO$_2$); $\delta$$_H$ (500MHz, CDCl$_3$) 6.94 (s, 2 H, 2 x CH), 4.78 (t, 1 H, $J$ = 6, NH), 2.88-2.75 (m, 2 H, CH$_2$N), 2.60 (s, 6 H, 2 x CH$_3$) 2.56-2.49 (m, 1 H, C(1)H), 2.35-2.24 (m, 1 H, C(4)H), 2.29 (s, 3 H, CH$_3$), 2.16 (s, 3 H, CH$_3$ acetyl), 2.10-2.06 (m, 1 H, C(1)H'), 1.95-1.69 (m, 5 H, C(2)H$_2$, C(3)H$_2$, C(4)H'); $\delta$$_C$ (125MHz, CDCl$_3$) 216.05 (C=O ketone cyclic), 204.4 (C=O ketone), 142.3 (C), 138.9 (2 x C), 133.4 (C), 132.0 (2 x CH), 67.2 (quaternary C), 38.9 (CH$_2$N), 38.1 (CH$_2$CH$_2$N), 34.1 (C(1)H$_2$), 31.1 (C(3)H$_2$), 26.1 (CH$_3$ acetyl), 22.9 (2 x CH$_3$), 20.9 (CH$_3$), 19.5 (C(2)H$_2$); m/z (CI$^+$, NH$_3$) 369 ([M+NH$_4$]$^+$ 12), 352 (12), 334 (100), 152 (20), 127 (12); HRMS 352.1571 [M+H]$^+$, C$_{18}$H$_{26}$O$_4$N$_1$S$_1$ requires 352.1577.

**Compound 3k**

Following general procedure, the reaction was stirred at reflux (65 °C). The titled product was obtained as a white solid (55 mg, 43 %) after flash column chromatography [diethyl ether / petroleum ether] (3:1); m.p. 90-93 °C; $\nu_{\text{max}}$ (nujol)/cm$^{-1}$ 3290 (br, NH), 2851 (s), 2324 (w, CN), 1457 (m), 1376 (m), 1330 (w, SO$_2$), 1164 (s, SO$_2$); $\delta$$_H$ (500MHz, CDCl$_3$) 6.95 (s, 2 H, 2 x CH), 4.88 (t, 1 H, $J$ = 6,
NH), 3.09-2.94 (m, 2 H, CH₂N), 2.71-2.62 (m, 2 H, CH₂), 2.60 (s, 6 H, 2 x CH₃), 2.29 (s, 3 H, CH₃), 2.26-2.13 (m, 2 H, CH₂), 1.97-1.89 (m, 4 H, 2 x CH₂), 1.71-1.54 (m, 3 H, CH₂, CH'H'), 1.33-1.24 (m, 1 H, CH'H); δ_C (125MHz, CDCl₃) 205.8 (C=O), 142.5 (C), 139.0 (2 x C), 133.1 (C), 132.1 (2 x CH), 119.6 (CN), 53.6 (quaternary C), 40.5 (CH₂), 38.9 (CH₂), 37.0 (CH₂), 36.3 (CH₂), 28.7 (CH₂), 25.6 (CH₂), 24.6 (CH₂), 23.0 (2 x CH₃), 21.0 (CH₃); m/z (CI+, NH₃) 380 ([M+NH₄]⁺, 28), 363 (40), 179 (23), 163 (100), 136 (20); HRMS 363.1737 [M+H]⁺, C₁₉H₂₇O₃N₂S₁ requires 363.1737.

**Compound 3l**

Following general procedure, the titled product was obtained as a colourless oil (141 mg, 99 %) after flash column chromatography [diethyl ether / petroleum ether] (1:1)]; ν_max (neat)/cm⁻¹ 3325 (br, NH), 2954 (m), 2246 (w, CN), 1746 (s, C=O), 1603 (m), 1450 (s), 1329 (s, SO₂), 1247 (s), 1155 (s, SO₂); δ_H (500MHz, CDCl₃) 7.45-7.36 (m, 5 H, 5 x CH phenyl), 6.94 (s, 2 H, CH aromatic), 5.03 (t, 1 H, J = 6, NH), 3.75 (s, 3 H, OCH₃), 3.00 (tdd, 1 H, J = 6, 10, 13, CHN), 2.99-2.92 (m, 1 H, CH'N), 2.64-2.59 (m, 1 H, CHCH₂N), 2.57 (s, 6 H, 2 x CH₃), 2.40-2.34 (m, 1 H, CH'CH₂N), 2.29 (s, 3 H, CH₃); δ_C (125MHz, CDCl₃) 167.6 (C=O), 142.4 (C), 139.2 (2 x C), 133.3 (C Mes), 133.3 (C phenyl), 132.1 (2 x CH Mes), 129.4 (2 x CH phenyl), 129.3 (2 x CH phenyl), 125.8 (CH), 117.6 (CN), 54.2 (OCH₃), 51.8 (quaternary C), 39.0 (CH₂N), 37.7 (CH₂CH₂N), 22.9 (2 x CH₃), 20.9 (CH₃); m/z (CI⁺, NH₃) 418 ([M+NH₄]⁺ 100), 401 (56), 219 (10); HRMS 418.1794 [M+NH₄]⁺, C₂₁H₂₈O₄N₃S₁ requires 418.1795.
Compound 3m

Following general procedure, the titled product was obtained as a colourless oil (166 mg, 98 %) after flash silica chromatography [diethyl ether / petroleum ether (1:1)]; $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 3325 (br, NH), 2939 (w), 2246 (w, CN), 1747 (s, C=O), 1450 (m), 1329 (s, SO$_2$), 1218 (s), 1156 (s, SO$_2$); $\delta_H$ (500MHz, CDCl$_3$) 7.31-7.29 (m, 2 H, 2 x CH), 7.25-7.23 (m, 3 H, 3 x CH), 7.20-7.16 (m, 3 H, 3 x CH), 7.08-7.06 (m, 2 H, 2 x CH), 6.83 (s, 2 H, 2 x CH ), 5.07 and 5.06 (d and d, 1 H and 1H, $J = 14$ and 14, CH$_2$O), 4.89 (t, 1 H, $J = 6$, NH), 2.98 (tdd, 1 H, $J = 6$, 10, 13, CHN), 2.86 (dddd, 1 H, $J = 5$, 6, 10, 12, CH’N), 2.54-2.48 (m, 1 H, CHCH$_2$N), 2.47 (s, 6 H, 2 x CH$_3$), 2.31-2.23 (m, 1 H, CH’CH$_2$N), 2.19 (s, 3 H, CH$_3$); $\delta_C$ (125MHz, CDCl$_3$) 166.8 (C=O), 142.4 (C Mes), 139.2 (2 x C, Mes), 134.3 (C Bn), 133.3 (C Mes), 133.2 (C phenyl), 132.1 (2 x CH Mes), 129.4 (2 x CH phenyl), 129.2 (2 x CH phenyl), 128.6 (2 x CH Bn), 128.6 (2 x CH Bn), 127.8 (CH benzyl), 125.9 (CH phenyl), 117.5 (CN), 68.8 (OCH$_2$), 52.0 (quaternary C), 39.0 (CH$_2$N), 37.5 (CH$_2$), 23.0 (2 x CH$_3$), 21.0 (CH$_3$); $m/z$ (Cl$^+$, NH$_3$ 494 ([M+NH$_4$]$^+$, 24), 477 (13), 386 (11), 360 (44), 295 (43), 269 (17), 217 (16), 204 (59), 161 (100), 136 (27), 120 (18), 106 (22), 91 (17); HRMS 494.2101 [M+NH$_4$]$^+$, C$_{27}$H$_{32}$O$_4$N$_3$S$_1$ requires 494.2108.
Following general procedure, the titled product was obtained as a white solid (153 mg, 94 %) after flash silica chromatography [diethyl ether / petroleum ether] (1 :1); m.p. 38-40 °C; $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 3349 (br, 2 x NH), 2976 (m), 1700 (C=O ketone), 1658 (C=O amide), 1537 (m), 1465 (m), 1328 (m, SO$_2$), 1266 (s), 1156 (s, SO$_2$); $\delta_H$ (500MHz, CDCl$_3$) 7.71 (d, 1 H, $J = 8$, CH), 7.63 (dt, 1 H, $J = 1$, 8, CH), 7.45 (d, 1 H, $J = 8$, CH), 7.37 (t, 1 H, $J = 8$, CH), 7.11 (s, 1 H, NH amide), 6.92 (s, 2 H, 2 x CH sulfonamide), 5.22 (t, 1 H, $J = 7$, NH sulfonamide), 3.89 (d, 1 H, $J = 18$, CHH'), 3.09 (d, 1 H, $J = 18$, CHH'), 3.02 (dtd, 1 H, $J = 5$, 8, 13, CHH'N), 2.90 (dd, 1 H, $J = 6$, 12, CHH'N), 2.61 (s, 6 H, 2 x CH$_3$), 2.27 (s, 3 H, CH$_3$), 2.07 (ddd, 1 H, $J = 5$, 7, 13, CHCH$_2$N), 1.86 (td, 1 H, $J = 8$, 14, CH/CH$_2$N), 1.26 (s, 9 H, 3 x CH$_3$); $\delta_C$ (125MHz, CDCl$_3$) 207.3 (C=O ketone), 168.0 (C=O amide), 153.3 (C), 142.1 (C), 139.0 (C), 136.3 (CH), 134.4 (CH), 133.5 (C), 132.0 (2 x CH), 127.8 (CH), 126.7 (CH), 124.6 (CH), 59.6 (quaternary C), 51.4 (C(CH$_3$)$_3$), 39.6 (CH$_2$), 39.5 (CH$_2$), 36.3 (CH$_2$), 28.5 (3 x CH$_3$), 22.9 (2 x CH$_3$), 20.9 (CH$_3$); m/z (ES, NH$_3$) 479 ([M+Na]$^+$ 45), 457 ([M+H]$^+$, 100); HRMS 457.2154 [M+H]$^+$, C$_{25}$H$_{33}$O$_4$N$_2$S requires 457.2156.
Compound 3o

Following general procedure, the titled product was obtained as a white solid (135 mg, 97%), after flash silica chromatography [diethyl ether / petroleum ether] (2 :1)]; $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 3287 (br, NH), 1739 (m, C=O), 1711 (s, C=O ester), 1329 (s, SO$_2$), 1155 (s, SO$_2$); $\delta_H$ (500MHz, CDCl$_3$) 7.67 (d, 1 H, $J = 8$, CH), 7.62 (d, 2 H, $J = 8$, 2 x CH tosyl), 7.57 (dt, 1 H, $J = 1$, 8, CH), 7.40 (d, 1 H, $J = 8$, CH), 7.33 (t, 1 H, $J = 8$, CH), 7.20 (d, 2 H, $J = 8$, 2 x CH tosyl), 4.92 (t, 1 H, $J = 6$, NH), 3.60 (d, 1 H, $J = 17$, CHH$'$), 3.57 (s, 3 H, CH$_3$), 3.04 (d, 1 H, $J = 17$, CHH$'$), 3.08-2.97 (m, 2 H, CH$_2$N), 2.33 (s, 3 H, CH$_3$ tosyl), 2.22 (ddd, 1 H, $J = 6$, 8, 14, CHCH$_2$N), 1.96 (ddd, 1 H, $J = 6$, 8, 14, CH'CH$_3$N); $\delta_C$ (125MHz, CDCl$_3$) 202.1 (C=O), 171.4 (C=O), 152.3 (C), 143.4 (C), 136.8 (C), 135.7 (CH), 134.6 (C), 129.7 (CH), 128.0 (CH), 127.0 (CH), 126.5 (CH), 125.0 (CH), 59.0 (quaternary C), 53.0 (OCH$_3$), 39.7 (CH$_2$), 37.0 (CH$_2$), 34.4 (CH$_2$), 21.5 (CH$_3$); $m/z$ (ES, NH$_3$) 388 ([M+H]$^+$, 100), HRMS [M+H]$^+$, 388.1219. $C_{20}H_{21}O_4N_1S$ requires 388.1219.
**Compound 3p**

Following general procedure, the titled product was obtained as a white solid (136 mg, 98 %) after flash silica chromatography [chloroform / acetone] (9 :1)]; \(\nu_{\text{max}}\) (neat)/cm\(^{-1}\) 3283 (br, NH), 1741 (s, C=O), 1714 (s, C=O), 1329 (s, SO\(_2\)), 1158 (s, SO\(_2\)), \(\delta_H\) (500MHz, CDCl\(_3\)) 9.17 (s, 1 H, NH oxindole), 7.63 (d, 2 H, \(J = 8\), 2 x CH tosyl), 7.32 (dt, 1 H, \(J = 1, 8\), CH), 7.22 (d, 2 H, \(J = 8\), 2 x CH tosyl), 7.18 (d, 1 H, \(J = 7\), CH), 7.09 (t, 1 H, \(J = 8\), CH), 7.01 (d, 1 H, \(J = 8\), CH), 5.83 (dd, 1 H, \(J = 3, 9\), NH), 3.67 (s, 3 H, OCH\(_3\)), 2.92-2.84 (m, 1 H, CHN), 2.80-2.76 (m, 1 H, CH'N), 2.58 (ddd, 1 H, \(J = 5, 10, 15\), C\(\text{HCH}_2\text{N}\)), 2.49 (td, 1 H, \(J = 5, 15\), C\(\text{H'}\text{CH}_2\text{N}\)), 2.37 (s, 3 H, CH\(_3\) tosyl); \(\delta_C\) (125MHz, CDCl\(_3\)) 177.3 (C=O), 169.7 (C=O), 143.2 (C), 142.0 (C), 136.4 (C), 129.8 (CH), 129.6 (CH), 127.1 (CH), 123.7 (CH), 122.9 (CH), 111.1 (CH), 58.4 (quaternary C), 53.5 (OCH\(_3\)), 39.3 (CH\(_2\)N), 32.3 (CH\(_2\)), 21.5 (CH\(_3\)); \(m/z\) (ES, NH\(_3\)) 406 \([\text{M+NH}_4]^+\) 100, 389 (50); HRMS \([\text{M+NH}_4]^+\) 406.1431, \(C_{19}H_{24}O_5N_3S\) requires 406.1431.

**Diol-alcohol 6**

LiAlH\(_4\) (2.0 M solution in THF, 0.91 mL) was added dropwise to a solution of 3d (190 mg, 0.52 mmol) in 4 mL dry Et\(_2\)O at 0\(^\circ\)C. Following stirring at this
temperature for 4 h, the solution was diluted with Et$_2$O (5 mL), and water (5 mL) was added cautiously whilst maintaining cooling at 0°C. The layers were separated, and the aqueous layer was acidified to pH 2 with 1.0 N HCl. The aqueous portion was then extracted with Et$_2$O (3 x 10 mL), and the combined organic fractions were dried (Na$_2$SO$_4$) and concentrated. The residue was purified by flash column chromatography (Et$_2$O) to give the titled compound as a clear oil (155 mg, 88%); $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 3488 (br, OH and NH), 3055 (m), 2962 (m), 1734 (w), 1605 (m), 1451 (m), 1422 (m), 1321 (s, SO$_2$), 1266 (s), 1155 (s, SO$_2$); $\delta_H$ (500MHz, CDCl$_3$) 6.95 (s, 2 H, 2 x CH), 5.62 (t, 1 H, $J$ = 6, NH), 3.99 and 3.92 (q and q, 0.75 H and 0.25 H, $J$ = 4 and 7), 3.45 and 3.33 (dd and dd, 0.8 H and 1.2 H, $J$ = 4, 11 and 4, 11, CH$_2$OH), 3.00-2.85 (m, 2 H, CH$_2$N), 2.56 (s, 6 H, 2 x CH$_3$), 2.50 (t, 1 H, $J$ = 4, OH), 2.29 (s, 3 H, CH$_3$), 2.00-1.84 (m, 2 H), 1.69-1.62 (m, 1 H), 1.58-1.24 (m, 5 H); $\delta_C$ (125MHz, CDCl$_3$) 142.1 (C), 139.1 (2 x C), 133.5 (C), 131.9 (2 x CH), 81.0 and 78.7 (CHOH), 67.9 and 65.3 (CH$_2$OH), 48.7 and 47.5 (quaternary C), 39.1 and 39.0 (CH$_2$N), 33.5 and 32.7 (CH$_2$), 32.8 and 31.4 (CH$_2$), 29.4 (CH$_2$), 23.0 (2 x CH$_3$), 20.9 (CH$_3$), 20.3 and 19.8 (CH$_2$); m/z (CI$,^+$, NH$_3$) 342 ([M+H]$^+$, 81%), 322 (10), 217 (11), 167 (49), 160 (72), 140 (100), 126 (12), 120 (27), 110 (14); HRMS [M+H]$^+$ 342.1734, C$_{17}$H$_{28}$O$_4$NS requires 342.1734
Spiro-fused mono-alcohol 7

\[
\begin{array}{c}
\text{OH} \\
\end{array}
\text{NSO}_2\text{Mes}
\begin{array}{c}
\begin{array}{c}
\text{OH} \\
\end{array}
\text{NSO}_2\text{Mes}
\end{array}
\]

Diol 6 (100 mg, 0.29 mmol) in CH$_2$Cl$_2$ (0.5 mL) was added dropwise to a solution of Et$_3$N (189 μL, 1.35 mmol), TsCl (54 mg, 0.29 mmol) and a single crystal of DMAP in CH$_2$Cl$_2$ (1 mL) and the solution was stirred at RT for 1 h, before warming to reflux and stirring for a further 48 h. Following cooling to RT, CH$_2$Cl$_2$ (3 mL) was added and the solution was washed with 1.0 N HCl (3 x 3 mL) and brine (3 mL). The HCl portions were extracted with CH$_2$Cl$_2$ (2 x 5 mL), dried (Na$_2$SO$_4$), and concentrated. The residue was purified by flash column chromatography ([diethyl ether / petroleum ether] 1:1 to 100:0) to give the spiro cyclised adduct (67 mg) and 10 mg of the starting diol (78% brsm); \(\nu_{\text{max}}\) (neat)/cm$^{-1}$ 3511 (br, OH and NH), 3055 (m), 2986 (m), 1712 (m), 1310 (m, SO$_2$), 1266 (s), 1153 (m, SO$_2$); \(\delta_H\) (500MHz, CDCl$_3$) 6.94 (s, 2 H, 2 x CH), 3.95 (t, 0.35 H, \(J = 4\), CHOH minor), 3.87-3.86 (m, 0.65 H, CHOH major), 3.52 (d, 0.65 H, \(J = 10\), CHH'N, major), 3.47 (ddd, 0.35 H, \(J = 7\), 8, 10, CHH'N minor), 3.39-3.30 (m, 1.30 H, CH$_2$N, major), 3.24 (ddd, 0.35 H, \(J = 6\), 8, 9, CHH'N, minor), 3.11 (d, 0.35 H, \(J = 10\), CHH', minor), 3.00 (d, 0.35 H, \(J = 10\), CHH', minor), 2.92 (d, 0.65 H, \(J = 10\), CHH', major), 2.63 (s, 3.9 H, 2 x CH$_3$, major), 2.62 (s, 2.1 H, 2 x CH$_3$, minor), 2.30 (s, 3 H, CH$_3$), 2.04-1.95 (m, 2 H, CH$_2$), 1.80-1.43 (m, 6 H, 3 x CH$_2$); \(\delta_C\) (125MHz, CDCl$_3$) 142.5 (i-C), 140.1 (2 x C), 132.8 (p-C), 131.9 (2 x CH), 77.6 and 77.5 (CHOH), 55.7 and 51.3 (CH$_2$N), 54.4 and 53.9 (quaternary C), 46.2 and 45.8 (CH$_2$), 35.8 (CH$_2$), 33.9 and 33.5 (CH$_2$), 31.2 and 29.7 (CH$_2$), 22.9 and
22.8 (2 x CH₃), 21.0 (p-CH₃), 21.0 and 20.3 (CH₂); m/z (Cl⁺, NH₃) 324 ([M+H]⁺, 100%), 140 (60); HRMS HRMS [M+H]⁺ 324.1623, C₁₇H₂₆O₃NS requires 324.1628.

**General procedure for one pot trifluoroacetylation / sulfonamide cleavage:**

Trifluoroacetic anhydride (197 μL, 1.37 mmol) was added to a stirred solution of sulfonamide (0.68 mmol) and Et₃N (206 μL, 1.37 mmol) in dry CH₂Cl₂ (10 mL) under N₂. Following stirring at RT for 30 mins, the residue was concentrated under reduced pressure, and diluted with dry THF (5 mL). The solution was cooled to -78 °C, and SmI₂ (0.1 M in THF) was added dropwise until the blue/green colour persisted for 20 minutes (typically 5 equivs). Following exposure to air until the solution turned yellow, the solution was concentrated, and filtered through a plug of silica (eluent: Et₂O). The filtrate was concentrated, and purified by flash column chromatography.

**Compound 8a**

Following the general procedure, the titled product was obtained as a pale yellow oil (145 mg, 74 %) after flash column chromatography [diethyl ether / petroleum ether] (3 : 2)]; νₘₐₓ (neat)/cm⁻¹ 3340 (br, NH), 1730 (m, C=O ketone), 1708 (br, C=O ester, amide), 1556 (m), 1213 (m), 1162 (m); δₜ (500MHz, CDCl₃) 7.36 (br, 1 H, NH), 3.72 (s, 3 H, OCH₃), 3.50 (dt, 1 H, J = 6, 13, CHN), 3.39 (dt, 1 H, J = 6, 13, CH’N), 2.51-2.46 (m, 2 H), 2.35 (m, 1 H), 2.10-1.92 (m, 5 H); δC (125MHz,
CDCl$_3$ 215.3 (C=O ketone), 171.9 (C=O ester), 157.2 (q, $J = 37$, C=O amide), 115.8 (q, $J = 286$, CF$_3$), 59.1 (quaternary C), 52.9 (OCH$_3$), 37.1 (CH$_2$N), 36.3 (CH$_2$), 34.3 (CH$_2$), 32.0 (CH$_2$), 19.7 (CH$_2$); $m/z$ (ES) 299 ([M+NH$_4$]$^+$, 100); HRMS 299.1222 [M+NH$_4$]$^+$, $C_{11}H_{18}O_4N_2F_3$ requires 299.1219.

**Compound 8b**

Following the general procedure, the titled product was obtained as a pale yellow oil, (162 mg, 73 %) after flash column chromatography [diethyl ether / petroleum ether] (3 : 2); $\nu_{\text{max}}$ (neat)/cm$^{-1}$ 3335 (br, NH), 2249 (w, CN), 1735 (s, C=O), 1704 (br, C=O ester, amide), 1556 (m), 1451 (m), 1215 (s), 1182 (s); $\delta_H$ (500MHz, CDCl$_3$) 7.53-7.52 (m, 2 H, 2 x CH), 7.44-7.38 (m, 3 H, 3 x CH), 6.92 (br, 1 H, NH), 4.23 (dq, 2 H, $J = 7, 11$, OCH$_2$), 3.57-3.44 (m, 2 H, CH$_2$N), 2.67 (td, 1 H, $J = 7, 14$, CHCH$_2$N), 2.50 (dd, 1 H, $J = 6, 8, 14$, CH‘CH$_2$N), 1.22 (t, 3 H, $J = 7$, CH$_3$); $\delta_C$ (125MHz, CDCl$_3$) 167.0 (C=O), 157.4 (q, $J = 37$, C=O amide), 133.3 (C), 129.5 (2 x CH), 129.4 (CH), 125.8 (2 x CH), 117.7 (CN), 115.6 (q, $J = 288$, CF$_3$), 63.6 (OCH$_2$), 52.2 (quaternary C), 36.7 (CH$_2$), 36.2 (CH$_2$), 13.7 (CH$_3$); $m/z$ (ES) 346 ([M+NH$_4$]$^+$, 100); HRMS 346.1365 [M+NH$_4$]$^+$, $C_{15}H_{19}O_3N_3F_3$ 346.1373.
References


$^1$H NMR of 2,4-(Dimesitylsulfonyl)ethanolamine

![1H NMR Spectrum of 2,4-(Dimesitylsulfonyl)ethanolamine](image)

$^{13}$C NMR of 2,4-(Dimesitylsulfonyl)ethanolamine

![13C NMR Spectrum of 2,4-(Dimesitylsulfonyl)ethanolamine](image)
$^1$H NMR of $N$-mesitylsulfonyl aziridine 2b

$^{13}$C NMR of $N$-mesitylsulfonyl aziridine 2b
$^1$H NMR of \textit{N}-(2-(Trifluoromethane)benzenesulfonyl)ethanolamine

\begin{center}
\includegraphics[width=\textwidth]{hnmr.png}
\end{center}

$^{13}$C NMR of \textit{N}-(2-(Trifluoromethane)benzenesulfonyl)ethanolamine

\begin{center}
\includegraphics[width=\textwidth]{cmr.png}
\end{center}
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\(^1\)H NMR of \(N\)-(2-(Trifluoromethane)benzenesulfonyl aziridine 2f

\[^{13}\text{C}\) NMR of \(N\)-(2-(Trifluoromethane)benzenesulfonyl aziridine 2f
$^1$H NMR for Methyl 2-cyano-2-phenylacetate

$^{13}$C NMR of Methyl 2-cyano-2-phenylacetate
$^1$H NMR of Benzyl 2-cyano-2-phenylacetate

$^{13}$C NMR of Benzyl 2-cyano-2-phenylacetate
$^1$H NMR of 1-Oxo-indan-2-carboxylic acid tert-butylamide

$^{13}$C NMR of 1-Oxo-indan-2-carboxylic acid tert-butylamide
\(^1\)H NMR of compound 3a

\[\text{ppm (f1)}\]

\[\text{ppm (f1)}\]

\(^{13}\)C NMR of compound 3a

\[\text{ppm (f1)}\]

\[\text{ppm (f1)}\]
$^1$H NMR of compound 3b

$^{13}$C NMR of compound 3b
$^1$H NMR of compound 3c

$^{13}$C NMR of compound 3c
$^1$H NMR of compound 3d

$^{13}$C NMR of compound 3d
$^1$H NMR of compound 3e

$^{13}$C NMR of compound 3e
$^1$H NMR of compound 3f

$^{13}$C NMR of compound 3f
$^1$H NMR of compound 3g

$^{13}$C NMR of compound 3g
$^1$H NMR of compound 3h

$^{13}$C NMR of compound 3h
$^1$H NMR of compound 3i

$^{13}$C NMR of compound 3i
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$^1$H NMR of compound 3j

$^{13}$C NMR of compound 3j
$^1$H NMR of compound 3k

$^{13}$C NMR of compound 3k
$^1$H NMR of compound 3I

$^{13}$C NMR of compound 3I
$^1$H NMR of compound 3m

$^{13}$C NMR of compound 3m
$^1$H NMR of compound 3n

$^{13}$C NMR of compound 3n
$^1$H NMR of compound 3o

$^{13}$C NMR of compound 3o
$^1$H NMR of compound 3p

$^{13}$C NMR of compound 3p
$^1$H NMR of Di-alcohol 6

$^{13}$C NMR of Di-alcohol 6
**1H NMR of spiro-fused mono alcohol 7**

![1H NMR spectrum](image)

**13C NMR of spiro-fused mono alcohol 7**

![13C NMR spectrum](image)
\(^1\)H NMR of compound 8b

\[^{13}\text{C}\] NMR of compound 8b