SUPPLEMENTARY MATERIALS

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Copper Catalyzed Stereospecific *N*-Allenylations of Amides. Syntheses of Optically Enriched Chiral Allenamides.

authored by

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General Procedure of Copper Catalyzed Cross-Coupling to Synthesize Allenamide 3.

A solution of oxalidinone **1** (48.9 mg, 0.3 mmol), CuCN (3 mg, 10mol%, 0.03 mmol), Cs_2CO_3 (195.6 mg, 2 equiv, 0.6 mmol), *N*, *N*'-dimethylethylene diamine (6.4 μL, 20mol%, 0.06 mmol) and allenyl iodide **2** (43.2 mg, 0.8 equiv, 0.24 mmol) in toluene (4 mL) was heated to 50 °C for 18 h before being cooled to rt. After filtration through Celite™, the filtrate was concentrated under reduced pressure, and the crude residue was purified using flash silica gel column chromatography (gradient eluent: 0-10% EtOAc in hexane) to provide 35.6 mg (69% yield) of compound **3** as thick oil.

3: R_f= 0.57 (50% EtOAc/hexane); "&" indicates two diastereomers are present in ^{1}H and/or ^{13}C NMR.

^{1}H NMR (500 MHz, $CDCl_3$) δ 1.02 & 1.62 (dd, 3 H, *J* = 7.5, 3.0 Hz), 4.13 & 4.15 (t, 1 H, *J* = 5.5 Hz), 4.69 (t, 1 H, *J* = 8.5 Hz), 4.83 & 4.88 (dd, 1 H, *J* = 8.5, 5.5 Hz), 5.19 & 5.49 (quintet, 1 H, *J* = 6.5 Hz), 6.68 (m, 1 H, *J* = 3.0 Hz), 7.22-7.25 (m, 2 H), 7.29-7.40 (m, 3 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 15.1 & 16.1, 59.1 & 59.3, 70.4 & 70.5, 94.6 & 94.9, 98.7 & 99.0, 126.3 & 126.6, 128.5 & 128.6, 128.9, 138.4 & 138.8, 155.6 & 155.7, 196.3 & 197; IR (thin film) cm^{-1} 3035w, 2982w, 2915w, 1974w, 1757s, 1397m; mass spectrum (ACPI): *m/e* (% relative intensity) 216 (81) (M + H)$^+$, 172 (100), 145 (12); HRMS (ESI) *m/e* calcd for $C_{13}H_{13}NO_2Na^+$ 238.0838, found 238.0837.

Compound 6 (46.3 mg, 84% yield)

R_f= 0.60 (50% EtOAc/hexane); "&" indicates two diastereomers are present in ^{1}H and/or ^{13}C NMR.

^{1}H NMR (500 MHz, $CDCl_3$) δ 1.86 & 1.88 (dd, 3 H, *J* = 7.0, 3.0 Hz), 2.70-2.76 (m, 1 H), 3.19-3.24 (m, 1 H), 4.04-4.10 (m, 1 H), 4.10-4.15 (m, 1 H), 4.19-4.25 (m, 1H), 5.88 & 5.94 (quintet, 1 H, *J* = 7.0 Hz), 6.79 (m, 1 H, *J* = 3.0 Hz), 7.14-7.16 (m, 2 H), 7.25-7.29 (m, 1 H), 7.31-7.35 (m, 2 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 16.1 & 16.4, 36.3 & 37.4, 55.6 & 55.8, 66.5 & 66.6, 95.0 & 95.2, 98.8 & 99.0, 127.2 & 127.3, 128.9 & 129.0, 129.2 & 129.3, 135.5, 155.0 & 155.2, 195.7 & 196.2; IR (thin film) cm^{-1} 3030w, 2981w, 2919w, 1972w, 1756s, 1403m; mass spectrum (ACPI): *m/e* (% relative intensity) 230 (100) (M + H)$^+$, 186 (56), 117 (38); HRMS (ESI) *m/e* calcd for $C_{14}H_{15}NO_2Na^+$ 252.0995, found 252.0992.

Compound 7 (26.1 mg, 60% yield)

R_f= 0.57 (50% EtOAc/hexane); "&" indicates two diastereomers are present in ^{1}H and/or ^{13}C NMR.

^{1}H NMR (500 MHz, $CDCl_3$) δ 0.82-0.87 (m, 6 H), 1.75 & 1.76 (dd, 3 H, *J* = 7.0, 3.0 Hz), 2.25-2.33 (m, 1 H), 3.80 & 3.84 (dt, 1 H, *J* = 4.0, 9.0 Hz), 4.16 & 4.18 (dd, 1 H, *J* = 2.0, 4.5 Hz), 4.26 (dt, 1 H, *J* = 3.0, 9.0 Hz), 5.70 & 5.77 (quintet, 1 H, *J* = 7.0 Hz), 6.70 (m, 1 H, *J* = 3.0 Hz); ^{13}C NMR (125 MHz, $CDCl_3$) δ 13.7 & 13.8, 15.8 & 16.3, 17.6 & 177.7, 26.4 & 27.0, 58.8 & 59.0, 62.9 & 63.0, 94.8 & 94.9, 98.3 & 98.6, 155.5 & 155.6, 195.4 & 196.0; IR (thin film) cm^{-1} 2967w, 2938w, 1972w, 1756s, 1407m; mass spectrum (ACPI): *m/e* (% relative intensity) 182 (100) (M + H)$^+$, 138 (54), 130 (23); HRMS (ESI) *m/e* calcd for $C_{10}H_{15}NO_2Na^+$ 204.0995, found 204.0990.

Compound 8 (22.8 mg, 90% yield)

R_f= 0.33 (25% EtOAc/hexane);

^{1}H NMR (300 MHz, $CDCl_3$) δ 1.78 (dd, 3 H, *J* = 6.9, 2.6 Hz), 3.66 (m, 2 H), 4.42 (t, 2 H, *J* = 7.8 Hz), 5.81 (quintet, 1 H, *J* = 6.9 Hz), 6.73-6.80 (m, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 16.5, 43.3, 62.3, 96.2, 99.1, 155.5, 195.5; IR (thin film) cm^{-1} 2986m, 2918m, 1971w, 1758s, 1486s; mass spectrum (ESI): *m/e* (% relative intensity) 162 (100) (M + Na)$^+$; HRMS (ESI) *m/e* calcd for $C_7H_9NO_2Na^+$ 162.0526, found 162.0526.

Compound 9 (29.7 mg, 51% yield)

R_f= 0.46 (50% EtOAc/hexane); $[\alpha]_D^{23}$ = -423.7 º (c 0.59, CH_2Cl_2);

^{1}H NMR (300 MHz, $CDCl_3$) δ 1.90 (d, 3 H, *J* = 2.7 Hz), 1.92 (d, 3 H, *J* = 2.7 Hz), 2.72 (dd, 1 H, *J* = 9.0, 13.5 Hz), 3.20 (dd, 1 H, *J* = 2.4, 13.5 Hz), 4.01-4.08 (m, 1 H0, 4.13 (dd, 1 H, *J* = 3.9, 9.0 Hz), 4.23 (t, 1 H, *J* = 9.0 Hz), 6.67 (m, 1 H), 7.13 (d, 2 H, *J* = 6.6 Hz), 7.26-7.36 (m, 3 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 22.1, 22.3, 38.9, 55.9, 66.5, 93.2, 108.6, 127.2, 128.9, 129.2, 135.6, 155.2, 191.8; IR (thin film) cm^{-1} 2981w, 2914w, 1966w, 1756s, 1240s; mass spectrum (AIPC): *m/e* (% relative intensity) 244 (100) (M + H)$^+$, 200 (20), 188 (10); HRMS (ESI) *m/e* calcd for $C_{15}H_{17}NO_2Na^+$ 266.1152, found 266.1156.

Compound 10 (26.0 mg, 49% yield)

R_f= 0.47 (50% EtOAc/hexane); mp 85-86 ºC; $[\alpha]_D^{23}$ = -158.9 º (c 0.42, CH_2Cl_2);

^{1}H NMR (300 MHz, $CDCl_3$) δ 1.01 (d, 3 H, *J* = 2.4 Hz), 1.65 (d, 3 H, *J* = 2.4 Hz), 4.13 (dd, 1 H, *J* = 6.0, 9.0 Hz), 4.69 (t, 1 H, *J* = 9.0 Hz), 4.82 (dd, 1 H, *J* = 6.0, 9.0 Hz), 6.56 (m, 1 H), 7.22-7.41 (m, 5 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 21.0, 21.9, 59.5, 70.4, 92.9, 108.9, 126.3, 128.4, 128.9, 138.9, 155.8, 192.7; IR (thin film) cm^{-1} 2984w, 2911w, 1970w, 1757s, 1394m; mass spectrum (ACPI): *m/e* (% relative intensity) 230 (100) (M + H)$^+$, 186 (34); HRMS (ESI) *m/e* calcd for $C_{14}H_{15}NO_2Na^+$ 252.0995, found 252.0999.

Compound 11 (18.8 mg, 41% yield)

R_f= 0.70 (50% EtOAc/hexane); $[\alpha]_D^{23}$ = -18.5 º (c 0.53, CH_2Cl_2);

^{1}H NMR (500 MHz, $CDCl_3$) δ 1.58-1.78 (m, 6 H), 2.26-2.31 (m, 4 H), 2.72 (dd, 1 H, *J* = 9.0, 14.0 Hz), 3.23 (dd, 1 H, *J* = 3.0, 14.0 Hz), 4.06-4.12 (m, 2 H), 4.21 (t, 1 H, *J* = 8.0 Hz), 6.67 (t, 1 H, *J* = 2.0 Hz), 7.15-7.17 (m, 2 H), 7.27-7.35 (m, 3 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 25.7, 27.1, 27.2, 32.7, 32.8, 36.4, 55.5, 66.2, 92.8, 115.4, 127.1, 128.8, 129.2, 135.5, 155.1, 188.2; IR (thin film) cm^{-1} 2933w, 2855w, 1964w, 1755s, 1401m; mass spectrum (ACPI): *m/e* (% relative intensity) 284 (100) (M + H)$^+$, 190 (40); HRMS (ESI) *m/e* calcd for $C_{18}H_{22}NO_2^+$ 284.1645, found 284.1641.

Compound 12 (30.8 mg, 55% yield)

R_f= 0.37 (33% EtOAc/hexane); "&" indicates two diastereomers are present in ^{1}H and/or ^{13}C NMR.

^{1}H NMR (300 MHz, $CDCl_3$) δ 1.74-1.82 (m, 3 H), 1.88-2.02 (m, 1 H), 2.12-2.28 (m, 1 H), 2.58-2.80 (m, 2 H), 3.86-3.98 (m, 1 H), 4.03 (dd, 1 H, *J* = 7.0, 15.0 Hz), 4.41 (dt, 1 H, *J* = 1.5, 15.0 Hz), 5.79 (m, 1 H), 6.05 (dd, 1 H, *J* = 1.0, 4.0 Hz), 6.32 (dd, 1 H, *J* = 4.0, 4.0 Hz), 6.68-6.76 (m, 1 H), 7.34 (m, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 15.6 & 16.0, 22.4 & 22.5, 29.1 & 29.7, 53.7 & 53.9, 67.0 & 67.1, 94.7 & 94.8, 98.5 & 98.8, 105.5 & 195.6, 110.2, 141.3 & 141.2, 153.7 & 155.1, 170.4, 195.1 & 195.7; IR (thin film) cm^{-1} 3119w, 2921s, 1972m, 1758s, 1470s; mass spectrum (ESI): *m/e* (% relative intensity) 256 (100) $(M + Na)^+$; HRMS (ESI) *m/e* calcd for $C_{13}H_{15}NO_3Na^+$ 256.0944, found 256.0937.

Compound 13 (16.2 mg, 35% yield)

R_f= 0.25 (33% EtOAc/hexane); "&" indicates two diastereomers are present in ^{1}H and/or ^{13}C NMR.

^{1}H NMR (500 MHz, $CDCl_3$) δ 1.76-1.79 (m, 3 H), 2.13-2.19 (m, 2 H), 2.20-2.29 (m, 1 H), 2.94-3.04 (m, 1 H), 3.30-3.42 (m, 1 H), 3.93-4.00 (m, 1 H), 5.24-4.30 (m, 1 H), 5.12 (d, 1 H, *J* = 16.5 Hz), 5.13 (d, 1 H, *J* = 10.5 Hz), 5.71-5.83 (m, 2 H), 7.21 (dd, 1 H, *J* = 3.0, 6.0 Hz); ^{13}C NMR (125 MHz, $CDCl_3$) δ 16.3 & 16.4, 31.2, 33.5, 48.0 & 48.2, 69.9 & 70.0, 99.2 & 99.3, 100.5 & 100.6, 118.2, 133.7 & 133.8, 151.1, 195.4; IR (thin film) cm^{-1} 3056w, 2977m, 1966w, 1702s, 1482s; mass spectrum (ESI): *m/e* (% relative intensity) 216 (100) $(M + Na)^+$, 194 (4) $(M + H)^+$; HRMS (ESI) *m/e* calcd for $C_{11}H_{15}NO_2Na^+$ 216.0995, found 216.0995.

Compound 14 (26.6 mg, 60% yield)

R_f= 0.55 (50% EtOAc/hexane);

^{1}H NMR (500 MHz, $CDCl_3$) δ 1.91 (dd, 3 H, *J* = 2.5, 6.5 Hz), 3.55 (s, 2 H), 5.91 (m, 1 H), 7.08 (t, 1 H, *J* = 7.5 Hz), 7.12 (m, 1 H), 7.25-7.28 (m, 2 H), 7.39 (d, 1 H, *J* = 8.0 Hz); ^{13}C NMR (125 MHz, $CDCl_3$) δ 16.1, 35.0, 91.6, 97.9, 110.7, 122.9, 124.2, 124.5, 127.9, 143.1, 173.4, 197.9; IR (thin film) cm^{-1} 3027w, 1970w, 1719s, 1315m; mass spectrum (ACPI): *m/e* (% relative intensity) 186 (30) $(M + H)^+$, 158 (100); HRMS (ESI) *m/e* calcd for $C_{12}H_{11}NONa^+$ 208.0733, found 208.0734.

Compound 15 (30.5 mg, 65% yield)

R_f= 0.47 (50% EtOAc/hexane);

^{1}H NMR (500 MHz, $CDCl_3$) δ 1.92 (dd, 3 H, *J* = 3.0, 7.0 Hz), 3.42 (s, 3 H), 5.96 (quintet, 1 H, *J* = 7.0 Hz), 6.97 (dd, 1 H, *J* = 1.0, 9.0 Hz), 7.08 (dt, 1 H, *J* = 1.0, 9.0 Hz), 7.13 (dt, 1 H *J* = 1.0, 9.0 Hz), 7.27 (m, 1 H, *J* = 3.0 Hz), 7.42 (dd, 1 H, *J* = 1.0, 9.0 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 16.4, 27.3, 92.7, 98.5, 107.4, 109.9, 121.5, 122.0, 127.8, 130.2, 152.7, 197.4; IR (thin film) cm^{-1} 3064w, 2938w, 1972w, 1714s, 1498m; mass spectrum (ACPI): *m/e* (% relative intensity) 201 (100) $(M + H)^+$, 186 (11); HRMS (ESI) *m/e* calcd for $C_{12}H_{12}N_2ONa^+$ 223.0842, found 223.0844.

Compound 16 (45.0 mg, 60% yield)

R_f= 0.67 (50% EtOAc/hexane); "&" indicates two rotamers are present in ^{1}H and/or ^{13}C NMR.

^{1}H NMR (500 MHz, $CDCl_3$) δ 1.16 & 1.32 (d, 3 H, *J* = 7.5 Hz), 2.44 & 2.17 (d, 3 H, *J* = 2.5 Hz), 4.19 & 4.09 (d, 1 H, *J* = 15 Hz), 4.68 &, 4.47 (d, 1 H, *J* = 15 Hz), 4.96-4.97 & 4.43-4.48 (m, 1 H), 7.21-7.22 & 6.70-6.74 (m, 1 H), 7.26-7.33 9m, 6 H), 7.44 (d, 2 H *J* = 7.5 Hz), 7.7.73-7.78 (m, 2 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 21.6, 23.0, 48.5, 99.1, 113.0, 127.4, 127.9, 128.0, 128.4, 129.5, 136.3, 138.3, 143.5, 197.1; IR (thin film) cm^{-1} 3064w, 2928w, 1959w, 1338s, 1160s; mass spectrum (ACPI): *m/e* (% relative intensity) 314 (100) (M + H)$^+$, 159 (8), 143 (11); HRMS (ESI) *m/e* calcd for $C_{18}H_{19}NO_2SNa^+$ 336.1029, found 336.1030.

Compound 17 (12.2 mg, 54% yield)

R_f= 0.31 (33% EtOAc/hexane);

^{1}H NMR (500 MHz, CD_2Cl_2) δ 1.78 (dd, 3 H, *J* = 3.0, 6.5 Hz), 2.05 (quintet, 2 H, *J* = 7.0 Hz), 2.42 (t, 2 H, *J* = 8.0 Hz), 3.38 (m, 2 H), 5.78 (quintet, 1 H, *J* = 7.0 Hz), 6.91-6.97 (m, 1 H); ^{13}C NMR (75 MHz, CD_2Cl_2) δ 16.2, 17.5, 31.3, 45.8, 94.9, 97.4, 172.6, 196.5; IR (thin film) cm^{-1} 2938w, 1972w, 1749m, 1698s; mass spectrum (ESI): *m/e* (% relative intensity) 138 (100) (M + H)$^+$; HRMS (ESI) *m/e* calcd for $C_8H_{12}NO^+$ 138.0913, found 138.0906.

Compound 18 (6.3 mg, 27% yield)

R_f= 0.30 (25% EtOAc/hexane);

^{1}H NMR (500 MHz, CD_2Cl_2) δ 1.77 (dd, 3 H, *J* = 3.0, 6.5 Hz), 1.78-1.90 (m, 4 H), 2.41 (t, 2 H, *J* = 6.5 Hz), 3.22-3.34 (m, 2 H), 5.78 (quintet, 1 H, *J* = 6.5 Hz), 7.43-7.49 9m, 1 H); ^{13}C NMR (75 MHz, CD_2Cl_2) δ 16.7, 21.6, 23.2, 33.3, 46.4, 98.4, 98.7, 168.4, 196.8; IR (thin film) cm^{-1} 2948w, 1653s; mass spectrum (ESI): *m/e* (% relative intensity) 174 (100) (M + Na)$^+$, 152 (23) (M + H)$^+$; HRMS (ESI) *m/e* calcd for $C_9H_{13}NONa^+$ 174.0889, found 174.0892.

Compound 19 (30.5 mg, 65% yield)

R_f= 0.40 (50% EtOAc/hexane);

^{1}H NMR (500 MHz, $CDCl_3$) δ 1.46 (dd, 3 H, *J* = 2.0, 7.0 Hz), 1.89 (s, 3 H), 5.33 (quintet, 1 H, *J* = 7.0 Hz), 7.15-7.17 (m, 2 H), 7.34-7.37 (m, 1 H), 7.39-7.42 (m, 2 H), 7.56 (br s, 1 H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 15.2, 23.1, 80.9, 97.4, 100.5, 128.3, 140.6, 168.5, 196.6; IR (thin film) cm^{-1} 3059w, 2980w, 2935w, 1970w, 1673s, 1496m; mass spectrum (ACPI): *m/e* (% relative intensity) 188 (10) (M + H)$^+$, 146 (100); HRMS (ESI) *m/e* calcd for $C_{12}H_{13}NONa^+$ 210.0889, found 210.0891.

Compound 20 (22.8 mg, 44% yield)

R_f= 0.61 (50% EtOAc/hexane); "&" indicates the minor diastereomer present in ^{1}H NMR.

^{1}H NMR (500 MHz, $CDCl_3$) δ 0.86 & 0.66 (d, 3 H, *J* = 7.0 Hz), 0.87 & 0.68 (d, 3H, *J* = 7.0 Hz), 1.49 & 1.43 (s, 9 H), 1.72-1.75 (m, 1 H), 3.88 & 3.42 (m, 1 H), 4.15 & 4.1 (dd, 1 H, *J* = 6.0, 9.0 Hz), 4.56 &4.89 (d, 1 H, *J* = 9.0 Hz), 4.73 & 4.71 (t, 1 H, *J* = 9.0 Hz), 4.96 & 4.87 (dd, 1 H, *J* = 6.0, 9.0 Hz), 5.19 & 5.63 (t, 1 H, *J* = 6.5 Hz), 6.85 & 6.99 (m, 1 H), 7.24-7.25 (m, 2 H), 7.31-7.43 (m, 3H); IR (thin film) cm^{-1} 2972m, 1971w, 1763s, 1703s; mass spectrum (ACPI): *m/e* (% relative intensity) 273 (30) (M – Boc + H)$^+$, 120 (81), 110 (100); HRMS (ESI) *m/e* calcd for $C_{21}H_{28}N_2O_4Na^+$ 395.1941, found 395.1953.

Compound 21 (23.4 mg, 45% yield)

R_f= 0.58 (50% EtOAc/hexane); "&" indicates the minor diastereomer present in ^{1}H NMR.

^{1}H NMR (300 MHz, $CDCl_3$) δ 0.69 & 0.89 (t, 6 H, *J* = 6.0 Hz), 1.46 & 1.51 (s, 9 H), 1.71-1.80 (m, 1 H), 3.45 & 3.89 (m, 1 H), 3.61 & 4.59 (m, 1 H), 4.13 &4.17 (dd, 1 H, *J* = 6.0, 9.0 Hz), 4.73 & 4.74 (t, 1 H, *J* = 9.0 Hz), 4.90 & 4.99 (dd, 1 H, *J* = 6.0, 9.0 Hz), 5.64 & 5.21 (t, 1 H, *J* = 6.0 Hz), 7.00 & 6.87 (dd, 1 H, *J* = 2.4, 6.0 Hz), 7.24-7.28 (m, 2 H), 7.31-7.46 (m, 3H)); IR (thin film) cm^{-1} 2974m, 1973w, 1774s, 1695s; mass spectrum (ACPI): *m/e* (% relative intensity) 273 (33) (M – Boc + H)$^+$, 120 (78), 110 (100); HRMS (ESI) *m/e* calcd for $C_{21}H_{28}N_2O_4Na^+$ 395.1941, found 395.1935.

Compound 22

R_f = 0.30 (14% ethyl acetate/hexane); $[\alpha]_D^{23}$ = 2.7 ° (c 0.011, CH_2Cl_2);

^{1}H NMR (300 MHz, $CDCl_3$) δ 1.41 (s, 9H), 2.85 (dd, 1H, *J* = 6.6, 13.5 Hz), 2.92 (dd, 1H, *J* = 5.4, 14.0 Hz), 4.57 (bs, 2H), 5.16 (t, 1H, *J* = 4.8 Hz), 5.85 (dd, 1H, *J* = 2.7, 6.0 Hz), 7.19 – 7.34 (m, 5H); ^{13}C NMR (75.5 MHz, $CDCl_3$) δ 28.1, 38.3, 40.8, 48.9, 56.1, 79.6, 97.6, 126.6, 128.4, 129.4, 136.8, 203.6, missing four carbons due to overlap; IR (thin film) cm^{-1} 3303brw, 3029w, 2966m, 2927m, 1704s; mass spectrum (ESI): *m/e* (% relative intensity) 408 (100) (M + Na)$^+$; HRMS (ESI) *m/e* calcd for $C_{16}H_{20}INO_2Na^+$ 408.0436, found 408.0431.

Compound 23

R_f = 0.31 (14% ethyl acetate/hexane); $[\alpha]_D^{23}$ = 5.6 ° (c 0.006, CH_2Cl_2);

^{1}H NMR (300 MHz, $CDCl_3$) δ 1.34 (s, 9H), 2.67 (d, 1H, *J* = 1.5 Hz), 2.77 (dd, 1H, *J* = 7.5, 13.5 Hz), 2.99 (dd, 1H, 7.0, 7.8 Hz), 3.73 (bd, 1H, *J* = 7.5 Hz), 4.65 (s, 1H), 4.73 (bd, 1H, *J* = 10.5 Hz), 7.13 – 7.25 (m, 5H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 28.1, 29.5, 38.1, 50.6, 75.9, 79.6, 82.1, 126.8, 128.6, 129.0, 154.8, 203.6, missing four carbons due to overlap; IR (thin film) cm^{-1} 3303brw, 3029w, 2966m, 2927m, 1704s; mass spectrum (ESI): *m/e* (% relative intensity) 408 (100) (M + Na)$^+$; HRMS (ESI) *m/e* calcd for $C_{16}H_{20}INO_2Na^+$ 408.0436, found 408.0431.

Compound 25 (28.8 mg, 73% yield)

R_f= 0.40 (50% EtOAc/hexane); $[\alpha]_D^{23}$ = 38.4 ° (c 0.073, CH_2Cl_2);

^{1}H NMR (500 MHz, $CDCl_3$) δ 1.4 (s, 9 H), 2.75-2.84 (m, 1 H), 2.95 (d, 2 H, *J* = 6.0 Hz), 3.20-3.25 (m, 1 H), 4.20-4.35 (m, 2 H), 4.54 (br s, 1 H), 4.62 (br s, 1 H), 5.87 (t, 1 H, *J* = 5.5 Hz), 6.89-6.92 (m, 1 H), 7.17-7.25 (m, 3 H), 7.28-7.32 (m, 2 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 28.2, 40.2, 42.4, 50.6, 62.1, 79.6, 99.8, 105.1, 126.3, 128.2, 129.7, 137.9, 154.9, 155.1, 193.8; IR (thin film) cm^{-1} 2978w, 2928m, 1970w, 1756s, 1707s; mass spectrum (ACPI): *m/e* (% relative intensity) 271 (10) (M – O^{t}Bu)$^+$, 245 (20) (M – Boc + H)$^+$, 158 (100); HRMS (ESI) *m*/*e* calcd for $C_{19}H_{24}N_2O_4Na^+$ 367.1628, found 367.1635.

Compound 26 (0.8 mg, 67% yield)

R_f= 0.40 (50% EtOAc/hexane); $[\alpha]_D^{23}$ = 146 ° (c 0.03, CH_2Cl_2);

^{1}H NMR (300 MHz, $CDCl_3$) δ 1.43 (s, 9 H), 2.73-2.86 (m, 1 H), 2.96-3.02 (m, 1 H), 3.20-3.24 (m, 1 H), 3.38-3.42 (m, 1 H), 4.23-4.38 (m, 2 H), 4.41-4.57 (m, 2 H), 5.83-5.87 (m, 1 H), 6.94 (dd, 1 H, *J* = 2.7, 6.0 Hz), 7.26-7.32 (m, 5 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 28.1, 40.2, 42.6, 62.1, 64.0, 76.4, 92.9, 103.8, 126.6, 128.4, 129.7, 137.1, 152.7, 160.9, 196.9; IR (thin film) cm^{-1} 2972w, 2927w, 1966w, 1754s, 1709s; mass spectrum (ACPI): *m/e* (% relative intensity) 245 (100) (M – Boc + H)$^+$, 228 (18), 158 (54), 141 (19); HRMS (ESI) *m*/*e* calcd for $C_{19}H_{24}N_2O_4Na^+$ 367.1628, found 367.1639.

Compound (*P*)-14 (28.7 mg, 75% yield, 47% *ee*)

t_r = 24.0 min (major), 29.6 min (minor) (0.7% *i*-PrOH in Hexane).

Compound (*P*)-15 (30.0 mg, 63% yield, 47% *ee*)

t_r = 16.5 min (major), 20.5 min (minor) (2.5% *i*-PrOH in Hexane).

Compound (*M*)-14 (27.8 mg, 71% yield, 75% *ee*)

t_r = 21.9 min (minor), 24.5 min (major) (0.7% *i*-PrOH in Hexane).

Compound (*M*)-15 (44.6 mg, 79% yield, 75% *ee*)

t_r = 15.6 min (minor), 17.5 min (major) (2.5% *i*-PrOH in Hexane).