

Enzymatic enantiomeric resolution of phenylethylamines structurally related to amphetamine

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SUPPLEMENTARY INFORMATION

*1-Phenyl-2-propanamine (4a)*¹

77% yield. ¹H NMR (400 MHz, CDCl₃): δ 7.31-7.15 (m, 5H); 3.15 (m, 1H); 2.69 (dd, J₁=13.2 Hz, J₂=5.4 Hz, 1H); 2.50 (dd, J₁=13.2 Hz, J₂=8.1 Hz, 1H); 1.29 (bs, 2H); 1.24 (d, J=6.6 Hz, 3H) ppm. ¹³C NMR (100 MHz, CDCl₃): δ 139.6 (C); 129.2 (2CH); 128.3 (2CH); 126.1 (CH); 48.5 (CH); 46.7 (CH₂); 23.6 (CH₃) ppm. IR (film) ν: 3350, 3026, 3962, 2359, 1578, 1453, 1371, 1090, 741, 700 cm⁻¹. MS (EI) *m/z* (%): 134 [(M-1)⁺, 11]; 120 (35); 115 (28); 103 (26); 91 (50); 77 (33); 65 (43); 60 (43); 51 (35); 44 (100).

*1-(4'-Fluoro)phenyl-2-propanamine (4b)*²

77% yield. ¹H NMR (300 MHz, CDCl₃): δ 7.13 (m, 2H); 6.98 (m, 2H); 3.15 (m, 1H); 2.66 (dd, J₁=12.0 Hz, J₂=6.0 Hz, 1H); 2.48 (dd, J₁=12.0 Hz, J₂=9.0 Hz, 1H); 1.20 (bs, 2H); 1.11 (d, J=6.4 Hz, 3H) ppm. ¹³C NMR (75 MHz, CDCl₃): δ 161.5 (d, J=242.2 Hz, CF); 135.3 (d, J=3.0 Hz, C); 130.5 (d, J=7.5 Hz, 2CH); 115.1 (d, J=21.0 Hz, 2CH); 48.5 (CH); 45.7 (CH₂); 23.5 (CH₃) ppm. ¹⁹F NMR (282 MHz, CDCl₃): δ -117.8 (m) ppm. IR (film) ν: 3363, 2882, 2575, 1685, 1515, 1354, 1225, 982 cm⁻¹. MS (EI) *m/z* (%): 152 [(M-1)⁺, 3]; 138 (9); 109 (75); 83 (47); 44 (100).

*1-(4'-Chloro)phenyl-2-propanamine (4c)*³

82% yield. ¹H NMR (400 MHz, CDCl₃): δ 7.24 (d, J=8.4 Hz, 2H); 7.06 (d, J=8.4 Hz, 2H); 3.11 (m, 1H); 2.65 (dd, J₁=13.2 Hz, J₂=5.4 Hz, 1H); 2.49 (dd, J₁=13.2 Hz, J₂=8.1 Hz, 1H); 1.17 (bs, 2H); 1.08 (d, J=6.3 Hz, 3H) ppm. ¹³C NMR (100 MHz, CDCl₃): δ 138.1 (C); 131.8 (C); 130.4 (2CH); 128.3 (2CH); 48.3 (CH); 45.8 (CH₂); 23.5 (CH₃) ppm. IR (film) ν: 3357, 2961, 1582, 1491, 1089, 1015, 795, 665, 521 cm⁻¹. MS (EI) *m/z* (%): 170 [(M+1)⁺, 17]; 168 [(M-1)⁺, 22]; 154 (48); 125 (68); 119 (50); 99 (50); 89 (66); 75 (48); 63 (57); 60 (81); 51 (49); 44 (100).

*1-(4'-Bromo)phenyl-2-propanamine (4d)*⁴

80% yield. ¹H NMR (300 MHz, CDCl₃): δ 7.39 (d, J=8.4 Hz, 2H); 7.05 (d, J=8.7 Hz, 2H); 3.11 (m, 1H); 2.63 (dd, J₁=13.2 Hz, J₂=5.4 Hz, 1H); 2.46 (dd, J₁=13.2 Hz, J₂=7.8 Hz, 1H); 1.31 (bs, 2H); 1.08 (d, J=6.3 Hz, 3H) ppm. ¹³C NMR (75 MHz, CDCl₃): δ 138.4 (C); 131.4 (2CH); 130.9 (2CH); 119.9 (C); 48.3 (CH); 45.9 (CH₂); 23.5 (CH₃) ppm. IR (film) ν: 3360, 2960, 2925, 1589, 1488, 1072, 1011, 791 cm⁻¹. MS (EI) *m/z* (%): 214 (M⁺, 5); 212 (11); 198 (10); 169 (41); 143 (6); 130 (10); 117 (37); 90(46); 77 (31); 56 (79); 44 (100).

*1-(4'-Trifluoromethyl)phenyl-2-propanamine (4e)*⁵

73% yield. ¹H NMR (400 MHz, CDCl₃): δ 7.53 (d, J=8.0 Hz, 2H); 7.27 (d, J=8.0 Hz, 2H); 3.17 (m, 1H); 2.72 (dd, J₁=9.9 Hz, J₂=3.9 Hz, 1H); 2.57 (dd, J₁=9.9 Hz, J₂=6.0 Hz, 1H); 1.28 (bs, 2H); 1.09 (d, J=4.8 Hz, 3H) ppm. ¹³C NMR (75 MHz,

CDCl₃): δ 143.8 (C); 129.5 (2CH); 128.5 (q, $J=32.2$ Hz, CCF₃); 125.3 (q, $J=3.7$ Hz, 2CH); 124.3 (q, $J=270$ Hz, CF₃); 48.3 (CH); 46.3 (CH₂); 23.6 (CH₃) ppm. ¹⁹F NMR (282 MHz, CDCl₃): δ -62.90 (s) ppm. IR (film) ν : 3525, 2965, 1619, 1326, 1150, 1067, 808, 759, 731, 503 cm⁻¹. MS (EI) m/z (%): 202 [(M-1)⁺, 16]; 188 (37); 159 (44); 140 (29); 119 (36); 109 (43); 89 (36); 75 (19); 69 (29); 63 (32); 57 (14); 51 (25); 44 (100).

*1-(4'-Methyl)phenyl-2-propanamine (4f)*⁶

71% yield. ¹H NMR (300 MHz, CDCl₃): δ 7.06 (m, 4H); 3.10 (m, 1H); 2.67 (dd, $J_1=13.5$ Hz, $J_2=5.4$ Hz, 1H); 2.45 (dd, $J_1=12.9$ Hz, $J_2=7.8$ Hz, 1H); 2.30 (s, 3H); 1.24 (bs 2H); 1.09 (d, $J=6.3$ Hz, 3H) ppm. ¹³C NMR (75 MHz, CDCl₃): δ 136.5 (C); 135.6 (C); 129.1 (2CH); 129.0 (2CH); 48.5 (CH); 46.2 (CH₂); 23.5 (CH₃); 21.0 (CH₃) ppm. IR (film) ν : 3358, 2922, 2359, 1581, 1515, 1455, 1377, 796 cm⁻¹. MS (EI) m/z (%): 148 [(M-1)⁺, 9]; 134 (28); 115 (31); 105 (46); 91 (48); 77 (45); 65 (39); 51 (34); 44 (100).

*1-(4'-Methoxy)phenyl-2-propanamine (4g)*⁷

86% yield. ¹H NMR (300 MHz, CDCl₃): δ 7.08 (d, $J=8.7$ Hz, 2H); 6.8 (d, $J=8.4$ Hz, 2H); 3.76 (s, 3H); 3.10 (m, 1H); 2.70 (dd, $J_1=6.0$ Hz, $J_2=15.0$ Hz, 1H); 2.49 (dd, $J_1=9.0$ Hz, $J_2=12.0$ Hz, 1H); 1.20 (bs, 2H); 1.13 (d, $J=6.3$ Hz, 3H) ppm. ¹³C NMR (75 MHz, CDCl₃): δ 157.9 (C); 131.6 (C); 130.0 (2CH); 113.7 (2CH); 55.1 (CH₃); 48.4 (CH); 45.6 (CH₂); 23.4 (CH₃) ppm. IR (film) ν : 3358, 2959, 2360, 1601, 1584, 1488, 1261, 1153, 1043, 780, 697 cm⁻¹. MS (EI) m/z (%): 165 (M⁺, 28); 150 (27); 134 (31); 122 (100); 107 (37); 91 (39); 78 (44); 65 (35); 52 (37); 44 (92).

*1-(4'-Nitro)phenyl-2-propanamine (4h)*⁸

89% yield. ¹H NMR (400 MHz, CDCl₃): δ 8.14 (d, $J=8.4$ Hz, 2H); 7.36 (d, $J=8.7$ Hz, 2H); 3.24 (m, 1H); 2.76 (dd, $J_1=13.2$ Hz, $J_2=5.6$ Hz, 1H); 2.64 (dd, $J_1=13.2$ Hz, $J_2=5.6$ Hz, 1H); 1.39 (bs, 2H); 1.14 (d, $J=6.4$ Hz, 3H) ppm. ¹³C NMR (100 MHz, CDCl₃): δ 147.6 (C); 146.6 (C); 129.9 (2CH); 123.6 (2CH); 48.3 (CH); 46.2 (CH₂); 23.6 (CH₃) ppm. IR (film) ν : 3361, 2964, 1598, 1516, 1346, 1109, 859, 744 cm⁻¹. MS (EI) m/z (%): 179 [(M-1)⁺, 6]; 165 (19); 119 (14); 89 (52); 78 (16); 63 (28); 51 (18); 44 (100).

*1-(4'-hydroxy)phenyl-2-propanamine (4i)*⁹

85% yield. ¹H NMR (400 MHz, CD₃OD): δ 6.99 (d, $J=8.4$ Hz, 2H); 6.72 (d, $J=8.0$ Hz, 2H); 3.71 (bs, 1H); 3.15 (m, 1H); 2.69 (dd, $J_1=13.6$ Hz, $J_2=4.4$ Hz, 1H); 2.43 (dd, $J_1=13.2$ Hz, $J_2=8.4$ Hz, 1H); 1.17 (d, $J=6.0$ Hz, 3H) ppm. ¹³C NMR (100 MHz, CD₃OD): δ 157.2 (C); 131.2 (2CH); 131.1 (C); 116.3 (2CH); 49.7 (CH); 45.6 (CH₂); 22.3 (CH₃) ppm. IR (film) ν : 3344, 2968, 2924, 1592, 1515, 1254, 1171, 1108, 909, 848 cm⁻¹. MS (EI) m/z (%): 151 (M⁺, 6); 136 (3); 107 (48); 91 (9); 77 (34); 68 (8); 51 (10); 44 (100).

*1-Cyclohexyl-2-propanamine (5)*¹⁰

87% yield. ¹H NMR (300 MHz, CDCl₃): δ 7.07 (d, $J=8.4$ Hz, 2H); 6.81 (d, $J=8.8$ Hz, 2H); 3.75 (s, 3H); 3.10-3.05 (m, 1H); 2.62 (dd, $J_1=13.2$ Hz, $J_2=5.2$ Hz, 1H); 2.41 (dd, $J_1=13.2$ Hz, $J_2=8.0$ Hz, 1H); 1.45 (bs, 2H); 1.07 (d, $J=6.4$ Hz, 3H) ppm. ¹³C NMR (75 MHz, CDCl₃): δ 48.1 (CH₂); 43.8 (CH); 34.6 (CH₂); 33.8 (CH₂); 33.2 (CH₂); 26.6 (CH₂); 26.3 (CH₂); 26.3 (CH₂); 24.3 (CH₃) ppm. IR (film) ν : 2923, 2851, 1584, 1448, 1373, 733 cm⁻¹. MS (EI) m/z (%): 140 [(M-1)⁺, 11]; 126 (30); 109 (12); 95 (11); 81 (28); 67 (30); 55 (36); 44 (100).

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