Supporting Information

Synthetic Studies of Neoclerodane Diterpenes from *Salvia divinorum*: Role of the Furan in Affinity for Opioid Receptors

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(2S,4aR,6aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-6a,10b-dimethyl-4,10-dioxo-2-(phenylcarbamoyl)dodecahydro-1H-benzo[f]isochromene-7-carboxylate (5). Compound 5 was synthesized from 4 using Procedure A and aniline to afford 0.1891g (47.4%) as a white solid, mp 136 – 140 ºC; ¹H NMR (500 MHz, CDCl₃) δ 8.14 (s, 1H), 7.54 (dd, J = 1.0, 8.6, 2H), 7.38 – 7.31 (m, 2H), 7.18 – 7.13 (m, 1H), 5.18 (dd, J = 8.2, 11.9, 1H), 5.03 (dd, J = 6.1, 11.0, 1H), 3.72 (s, 3H), 2.77 (ddd, J = 5.3, 13.1, 16.8, 2H), 2.36 – 2.25 (m, 2H), 2.19 (d, J = 9.4, 4H), 2.15 – 2.03 (m, 2H), 1.82 – 1.74 (m, 1H), 1.72 – 1.60 (m, 2H), 1.60 – 1.51 (m, 1H), 1.42 (s, 3H), 1.11 (s, 3H). ¹³C NMR (126 MHz, CDCl₃) δ 201.62, 171.68, 170.29, 169.85, 167.32, 136.77, 129.27, 125.16, 120.18, 76.01, 74.84, 63.96, 53.49, 52.15, 51.21, 42.00, 39.18, 37.92, 35.52, 30.87, 20.73, 18.19, 16.44, 15.59. HRMS (m/z): [M+Na] calcd for C₂₆H₃₁NO₈Na, 508.1948; found, 508.1970. HPLC tᵣ = 5.568 min; purity = 98.23%.

(2S,4aR,6aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-2-(indoline-1-carbonyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate (6). Compound 6 was synthesized from 4 using Procedure A and indoline to afford 0.0866g (34.1%) as a white solid, mp 146 – 149 ºC; ¹H NMR (500 MHz, CDCl₃) δ 8.21 – 8.16 (m, 1H), 7.22 (t, J = 7.0, 2H), 7.11 – 7.04 (m, 1H), 5.22 (t, J = 7.8, 1H), 5.19 – 5.11 (m, 1H), 4.34 – 4.26 (m, 1H), 4.08 – 4.00 (m, J = 7.3, 9.5, 1H), 3.73 (s, 3H), 3.23 (t, J = 8.5, 2H), 2.77 (dd, J = 6.1, 10.7, 1H), 2.54 (dd, J = 8.3, 13.5, 1H), 2.43 (dd, J = 3.2, 11.6, 1H), 2.33 – 2.26 (m, 2H), 2.16 (s, 3H), 2.11 (dd, J = 3.2, 13.9, 1H), 1.92 (dd, J = 7.3, 13.5, 1H), 1.75 (dd, J = 3.1, 12.9, 1H), 1.72 – 1.54 (m, 3H), 1.42 (s, 3H), 1.07 (s, 3H). ¹³C NMR (126 MHz, CDCl₃) δ 202.44, 171.81, 171.30, 169.98, 166.93, 142.42, 131.61, 127.76, 124.92, 124.88, 117.53, 75.12, 73.58, 64.74, 53.33, 52.12, 49.15, 47.75, 42.15, 37.83, 37.50, 35.28, 30.80, 28.21,
20.74, 18.31, 17.17, 16.12. HRMS (m/z): [M+H] calcd for C_{28}H_{34}NO_{8}, 512.2285; found, 512.2294. HPLC \( t_R = 6.680 \) min; purity = 98.00%.

\((2S,4aR,6aR,7R,9S,10aS,10bR)\)-methyl 9-acetoxy-2-(cyclohexylcarbamoyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate (7).

Compound 7 was synthesized from 4 using Procedure A and cyclohexylamine to afford 0.0525 g (21.0%) as a white solid, mp 141 – 145 °C; \(^1\)H NMR (500 MHz, CDCl\(_3\)) \( \delta \) 6.26 (d, \( J = 8.3, 1H \)), 5.16 (dd, \( J = 8.0, 12.1, 1H \)), 4.86 (dd, \( J = 6.1, 10.8, 1H \)), 3.81 – 3.69 (m, 4H), 2.77 – 2.66 (m, 2H), 2.35 – 2.20 (m, 2H), 2.17 (d, \( J = 3.8, 4H \)), 2.13 – 2.06 (m, 1H), 2.06 – 2.00 (m, 1H), 1.88 (t, \( J = 15.0, 2H \)), 1.81 – 1.69 (m, 4H), 1.66 – 1.47 (m, 4H), 1.44 – 1.22 (m, 7H), 1.10 (d, \( J = 8.9, 3H \)). \(^{13}\)C NMR (126 MHz, CDCl\(_3\)) \( \delta \) 201.56, 171.68, 170.65, 169.80, 168.32, 76.01, 74.83, 64.07, 53.54, 52.09, 51.11, 48.38, 42.01, 39.35, 37.98, 35.46, 33.17, 32.99, 30.92, 25.50, 24.99, 24.97, 20.69, 18.20, 16.41, 15.65. HRMS (m/z): [M+H] calcd for C\(_{28}\)H\(_{38}\)NO\(_{8}\), 492.2598; found, 492.2597. HPLC \( t_R = 5.793 \) min; purity = 98.29%.

\((2S,4aR,6aR,7R,9S,10aS,10bR)\)-methyl 9-acetoxy-2-(cyclopentylcarbamoyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate (8).

Compound 8 was synthesized from 4 using Procedure A and cyclopentylamine to afford 0.0580 g (24.4%) as a white solid, mp 188 – 190 °C; \(^1\)H NMR (500 MHz, CDCl\(_3\)) \( \delta \) 6.30 (d, \( J = 7.6, 1H \)), 5.16 (dd, \( J = 7.9, 12.1, 1H \)), 4.86 (dd, \( J = 6.1, 10.8, 1H \)), 4.19 (dd, \( J = 7.2, 14.4, 1H \)), 3.72 (s, 3H), 2.77 – 2.66 (m, 2H), 2.35 – 2.20 (m, 2H), 2.17 (s, 4H), 2.10 (dd, \( J = 3.2, 14.0, 1H \)), 2.00 (m, 3H), 1.78 (d, \( J = 13.1, 1H \)), 1.73 – 1.49 (m, 7H), 1.44 – 1.30 (m, 5H), 1.09 (s, 3H). \(^{13}\)C NMR (126 MHz, CDCl\(_3\)) \( \delta \) 201.55, 171.69, 170.63, 169.82, 168.82, 76.03,
 Compound 9 was synthesized from 4 using Procedure A and 3-aminopyridine to afford 0.0870 g (36.7%) as a white solid, mp 148 – 150 °C; $^1$H NMR (300 MHz, CDCl$_3$) $\delta$ 9.15 (s, 1H), 8.60 (s, 1H), 8.26 (d, $J = 4.1$, 1H), 8.06 (d, $J = 8.5$, 1H), 7.20 (dd, $J = 8.2$, 4.7, 1H), 5.11 (dd, $J = 11.6$, 8.4, 1H), 4.99 (dd, $J = 10.8$, 6.2, 1H), 3.63 (s, 3H), 3.01 (s, 1H), 2.79 – 2.50 (m, 2H), 2.28 – 2.13 (m, 3H), 2.09 (S, 3H), 1.71 – 1.42 (m, 4H), 1.27 (s, 3H), 0.99 (s, 3H). $^{13}$C NMR (75 MHz, CDCl$_3$) $\delta$ 202.09, 171.80, 170.83, 170.07, 168.64, 145.65, 141.80, 134.52, 128.03, 123.96, 76.15, 75.09, 63.62, 53.35, 52.11, 50.79, 42.04, 39.00, 37.88, 35.44, 31.10, 30.91, 20.76, 16.44, 15.56. HRMS (m/z): [M+H] calcd for C$_{25}$H$_{31}$N$_2$O$_8$, 487.2080; found, 487.2068. HPLC $t_R = 8.904$ min; purity = 98.10%.

 Compound 10 was synthesized from 4 using procedure A and $o$-anisidine to afford 0.0472 g (38.4%) as a white solid, mp 127 – 128 °C; $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 8.66 (s, 1H), 8.30 (dd, $J = 1.6$, 8.0, 1H), 7.12 – 7.06 (m, 1H), 6.96 (dd, $J = 4.5$, 11.1, 1H), 6.89 (dd, $J = 1.2$, 8.2, 1H), 5.17 (dd, $J = 8.2$, 11.8, 1H), 5.03 (dd, $J = 6.5$, 10.3, 1H), 3.88 (s, 3H), 3.72 (s, 3H), 2.81 – 2.71 (m, 2H), 2.34 – 2.28 (m, 2H), 2.17 (s, 3H), 2.15 – 2.07 (m, 2H), 1.82 –
1.71 (m, 2H), 1.71 – 1.62 (m, 1H), 1.61 – 1.51 (m, 2H), 1.42 (s, 3H), 1.11 (s, 3H). $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 201.69, 171.77, 170.37, 169.88, 167.35, 148.58, 126.64, 124.84, 121.19, 120.19, 110.22, 77.48, 76.20, 74.95, 64.35, 55.96, 53.64, 52.19, 51.05, 42.13, 39.28, 38.02, 35.69, 20.79, 18.37, 16.48, 16.01. HRMS ($m/z$): [M+Na] calcd for C$_{27}$H$_{33}$NO$_8$Na, 538.2055; found, 538.2053. HPLC $t_R = 6.932$ min; purity = 98.38%.

(2S,4aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-2-(3-methoxyphenylcarbamoyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate (11). Compound 11 was synthesized from 4 using procedure A and $m$-anisidine to afford 0.0361 g (29.7%) as a white solid, mp 122 – 124 ºC; $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 8.68 – 8.65 (m, 1H), 8.32 – 8.28 (m, 1H), 7.11 – 7.07 (m, 1H), 6.99 – 6.95 (m, 2H), 5.19 – 5.13 (m, 2H), 5.05 – 5.01 (m, 1H), 3.88 (s, 3H), 3.72 (s, 3H), 2.85 – 2.67 (m, 5H), 2.38 – 2.30 (m, 2H), 2.17 (s, 3H), 1.72 – 1.62 (m, 3H), 1.43 (s, 3H), 1.11 (s, 3H). $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 201.35, 171.85, 171.02, 168.98, 167.31, 148.72, 126.84, 124.62, 121.19, 120.97, 119.97, 110.00, 77.48, 75.97, 74.73, 64.13, 55.74, 53.42, 51.97, 50.83, 41.91, 39.06, 35.47, 20.57, 18.15, 16.25, 15.79. HRMS ($m/z$): [M+H] calcd for C$_{27}$H$_{34}$NO$_8$, 516.2216; found, 516.2234. HPLC $t_R = 6.003$ min; purity = 95.39%.

(2S,4aR,6aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-2-(4-methoxyphenylcarbamoyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate (12). Compound 12 was synthesized from 4 using procedure A and $p$-anisidine to afford 0.0813 g (32.4%) as a white solid, mp 147 – 150 ºC; $^1$H NMR (300 MHz, acetone-d$_6$) $\delta$ 9.22 (s, 1H), 7.60 (d, $J = 9.1$, 2H), 6.88 (d, $J = 9.1$, 2H), 5.27 (dd, $J = 12.5$, 7.5, 1H), 5.05 (dd, $J = 10.8$, 3H), 3.88 (s, 3H), 3.72 (s, 3H), 2.85 – 2.67 (m, 5H), 2.38 – 2.30 (m, 2H), 2.17 (s, 3H), 1.72 – 1.62 (m, 3H), 1.43 (s, 3H), 1.11 (s, 3H). $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 201.35, 171.85, 171.02, 168.98, 167.31, 148.72, 126.84, 124.62, 121.19, 120.97, 119.97, 110.00, 77.48, 75.97, 74.73, 64.13, 55.74, 53.42, 51.97, 50.83, 41.91, 39.06, 35.47, 20.57, 18.15, 16.25, 15.79. HRMS ($m/z$): [M+H] calcd for C$_{27}$H$_{34}$NO$_8$, 516.2216; found, 516.2234. HPLC $t_R = 6.003$ min; purity = 95.39%.
6.4, 1H), 3.76 (s, 3H), 3.68 (s, 3H), 3.03 (dd, \( J = 13.2, 3.5, 1\)H), 2.52 (dd, \( J = 13.5, 6.4, 1\)H), 2.32 (ddd, \( J = 10.9, 7.7, 3.7, 2\)H), 2.25 – 2.13 (m, 1H), 2.09 (s, 3H), 2.07 – 1.99 (m, 2H), 1.66 (dtd, \( J = 18.3, 11.4, 5.0, 4\)H), 1.36 (s, 3H), 1.07 (s, 3H).  

\(^{13}\)C NMR (75 MHz, acetone-\( d_6\)) \( \delta \) 203.50, 172.70, 170.90, 169.91, 168.71, 157.35, 132.41, 122.40 (2C), 114.72 (2C), 76.65, 76.02, 63.39, 55.71, 53.50, 52.02, 50.82, 42.62, 39.97, 38.46, 36.02, 31.63, 20.60, 19.10, 16.55, 15.77. HRMS (m/z): [M+H] calcd for \( C_{27}H_{34}NO_9 \), 516.2155; found, 516.2227. 

HPLC \( t_R = 13.023 \) min; purity = 98.80%.

\((2S,4aR,6aR,7R,9S,10aS,10bR)-methyl \; 9\)-acetoxy-2-(3,5-dimethoxyphenyl-carbamoyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate \; (13)\). Compound 13 was synthesized from 4 using procedure A and 3,5-dimethoxyaniline to afford 0.0364 g (18.3%) as a white solid, mp 130 – 133 ºC; \(^1\)H NMR (300 MHz, CDCl\(_3\)) \( \delta \) 8.24 (s, 1H), 6.81 (t, \( J = 6.0, 2\)H), 6.27 (t, \( J = 1.9, 1\)H), 5.17 (dd, \( J = 11.5, 8.5, 1\)H), 4.99 (dd, \( J = 10.9, 6.1, 1\)H), 3.79 (s, 6H), 3.72 (s, 3H), 2.81 – 2.64 (m, 2H), 2.34 – 2.19 (m, 3H), 2.16 (s, 3H), 2.04 (td, \( J = 13.1, 2.6, 2\)H), 1.81 – 1.49 (m, 4H), 1.38 (s, 3H), 1.08 (s, 3H).  

\(^{13}\)C NMR (75 MHz, CDCl\(_3\)) \( \delta \) 201.81, 171.77, 170.49, 169.91, 167.60, 161.23 (2C), 138.73, 98.57 (2C), 97.64, 76.09, 74.95, 63.79, 55.59 (2C), 53.41, 52.08, 50.98, 42.01, 39.05, 37.89, 35.48, 30.94, 20.75, 18.24, 16.44, 15.59. HRMS (m/z): [M+H] calcd for \( C_{28}H_{36}NO_{10} \), 546.2339; found, 546.2321. HPLC \( t_R = 6.388 \) min; purity = 98.30%.

\((2S,4aR,6aR,7R,9S,10aS,10bR)-methyl \; 9\)-acetoxy-2-(2,5-dimethoxyphenyl-carbamoyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate \; (14)\). Compound 14 was synthesized from 4 using procedure A and 2,5-dimethoxyaniline to
afford 0.034 g (26.8%) as a white solid, mp 119 – 121 °C; $^1$H NMR (500 MHz, CDCl$_3$) δ 8.68 (s, 1H), 8.04 (d, $J$ = 3.0, 1H), 6.62 (dd, $J$ = 3.0, 8.9, 1H), 5.16 (dd, $J$ = 8.2, 11.8, 1H), 5.02 (dd, $J$ = 6.4, 10.3, 1H), 3.84 (s, 3H), 3.78 (s, 3H), 3.72 (s, 3H), 2.82 – 2.71 (m, 3H), 2.37 – 2.28 (m, 2H), 2.18 (d, $J$ = 9.6, 4H), 2.15 – 2.04 (m, 3H), 1.81 – 1.69 (m, 3H), 1.42 (s, 3H), 1.11 (s, 3H). $^{13}$C NMR (126 MHz, CDCl$_3$) δ 201.47, 171.55, 170.06, 169.68, 167.19, 153.70, 142.54, 127.01, 110.78, 109.58, 106.03, 77.22, 75.94, 74.74, 64.12, 56.22, 55.80, 53.44, 51.98, 50.87, 41.92, 39.08, 37.82, 35.47, 20.57, 18.14, 16.26, 15.74. HRMS (m/z): [M+Na] calcd for C$_{28}$H$_{35}$NO$_{10}$Na, 568.2161; found, 568.2164. HPLC $t_R$ = 7.896 min; purity = 99.38%.

(2S,4aR,6aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-2-(3,4-dimethoxyphenylcarbamoyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate (15). Compound 15 was synthesized from 4 using procedure A and 3,4-dimethoxyaniline to afford 0.0632 g (48.5%) as a white solid, mp 124 – 126 °C; $^1$H NMR (400 MHz, CDCl$_3$) δ 8.05 (s, 1H), 6.98 (dd, $J$ = 2.4, 8.6, 1H), 6.84 (d, $J$ = 8.7, 1H), 5.19 (dd, $J$ = 8.4, 11.7, 1H), 5.04 (dd, $J$ = 6.1, 11.0, 1H), 3.90 (s, 3H), 3.89 (s, 3H), 3.74 (s, 3H), 2.80 (d, $J$ = 6.1, 1H), 2.74 (d, $J$ = 5.0, 1H), 2.32 (dd, $J$ = 4.3, 7.6, 2H), 2.19 (s, 3H), 2.17 – 2.05 (m, 2H), 1.81 (d, $J$ = 13.0, 1H), 1.75 – 1.59 (m, 4H), 1.56 (d, $J$ = 10.0, 1H), 1.46 (d, $J$ = 12.3, 3H), 1.18 – 1.09 (m, 3H). $^{13}$C NMR (101 MHz, CDCl$_3$) δ 201.42, 171.52, 170.15, 169.70, 166.98, 149.07, 146.29, 122.79, 112.01, 111.24, 104.73, 76.71, 76.64, 74.74, 63.94, 56.08, 55.97, 52.00, 51.17, 50.38, 41.91, 39.17, 37.85, 35.42, 20.57, 18.11, 16.32, 15.47. HRMS (m/z): [M+Na] calcd for C$_{28}$H$_{35}$NO$_{10}$Na, 568.2161; found, 568.2154. HPLC $t_R$ = 4.645 min; purity = 98.44%.
(2S,4aR,6aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-2-(2,4-dimethoxyphenylcarbamoyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate (16). Compound 16 was synthesized from 4 using procedure A and 2,4-dimethoxyaniline to afford 0.0244 g (18.4%) as a white solid, mp 121 – 123 ºC; $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.45 (s, 1H), 8.17 (d, $J$ = 9.6, 1H), 6.49 (d, $J$ = 6.8, 2H), 5.18 (dd, $J$ = 8.4, 11.6, 1H), 5.03 (dd, $J$ = 6.5, 10.1, 1H), 3.87 (s, 3H), 3.82 (s, 3H), 3.73 (s, 3H), 2.84 – 2.70 (m, 2H), 2.32 (dd, $J$ = 4.4, 7.8, 2H), 2.19 (s, 3H), 2.12 (d, $J$ = 9.5, 2H), 1.85 – 1.66 (m, 3H), 1.63 – 1.53 (m, 2H), 1.44 (s, 3H), 1.12 (s, 3H). 13C NMR (126 MHz, CDCl$_3$) $\delta$ 201.63, 174.11, 171.43, 169.99, 168.79, 160.07, 156.40, 141.81, 121.26, 120.01, 103.92, 98.68, 75.96, 74.70, 64.23, 55.76, 55.54, 53.35, 51.97, 50.81, 41.87, 39.16, 37.98, 35.46, 20.57, 18.09, 16.26, 15.80. HRMS (m/z): [M+Na] calcd for C$_{28}$H$_{35}$NO$_{10}$Na, 568.2161; found, 568.2175. HPLC $t_R$ = 6.468 min; purity = 98.92%.

(2S,4aR,6aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-2-(2-bromophenylcarbamoyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate (17). Compound 17 was synthesized from 4 using procedure A and o-bromoaniline to afford 0.0382 g (18.5%) as a white solid, mp 125 – 128 ºC; $^1$H NMR (300 MHz, CDCl$_3$) $\delta$ 8.62 (s, 1H), 8.18 (d, $J$ = 11.7, 1H), 7.48 (d, $J$ = 8.0, 1H), 7.24 (dd, $J$ = 15.3, 7.3, 1H), 6.97 (t, $J$ = 7.8, 1H), 5.15 – 5.04 (m, 1H), 4.99 (dd, $J$ = 10.5, 6.3, 1H), 3.64 (s, 3H), 2.79 – 2.59 (m, 2H), 2.36 – 2.13 (m, 3H), 2.06 (s, 3H), 2.01 (t, $J$ = 10.2, 2H), 1.82 – 1.41 (m, 4H), 1.35 (s, 3H), 1.03 (s, 3H). 13C NMR (75 MHz, CDCl$_3$) $\delta$ 201.71, 171.72, 169.86, 169.78, 167.76, 134.79, 132.61, 128.59, 126.19, 122.22, 114.45, 76.10, 74.93, 64.06, 53.52, 52.13, 51.11, 42.07,
(2S,4aR,6aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-2-(3-bromophenylcarbamoyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate (18).

Compound 18 was synthesized from 4 using procedure A and m-bromoaniline to afford 0.0600 g (29.1%) as a white solid, mp 145 – 148 ºC; $^1$H NMR (300 MHz, CDCl$_3$) $\delta$ 8.46 (s, 1H), 7.80 (s, 1H), 7.49 (d, $J = 8.0$, 1H), 7.32 – 7.12 (m, 2H), 5.25 – 5.08 (m, 1H), 5.01 (dd, $J = 6.1$, 10.8, 1H), 3.71 (s, 3H), 2.83 – 2.61 (m, 2H), 2.38 – 2.11 (m, 6H), 2.11 – 1.87 (m, 2H), 1.82 – 1.44 (m, 4H), 1.38 (s, 3H), 1.08 (s, 3H). $^{13}$C NMR (75 MHz, CDCl$_3$) $\delta$ 201.79, 171.72, 170.52, 169.92, 167.80, 138.39, 130.54, 128.05, 123.31, 122.72, 118.88, 76.09, 74.93, 63.80, 53.44, 52.11, 51.02, 42.00, 39.05, 37.91, 35.50, 30.92, 20.75, 18.26, 16.44, 15.59. HRMS (m/z): [M+Na] calcd for C$_{26}$H$_{30}$BrNO$_8$Na, 586.1052; found, 586.1050. HPLC $t_R = 9.178$ min; purity = 100%.

(2S,4aR,6aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-2-(4-bromophenylcarbamoyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate (19). Compound 19 was synthesized from 4 using procedure A and p-bromoaniline to afford 0.0486 g (23.6%) as a white solid, mp 159 – 162 ºC; $^1$H NMR (300 MHz, CDCl$_3$) $\delta$ 8.41 (s, 1H), 7.53 – 7.37 (m, 4H), 5.25 – 5.09 (m, 1H), 5.00 (dd, $J = 6.1$, 11.0, 1H), 3.73 (d, $J = 12.6$, 3H), 2.83 – 2.60 (m, 2H), 2.38 – 2.11 (m, 6H), 2.02 (t, $J = 14.3$, 2H), 1.76 (d, $J = 12.3$, 1H), 1.71 – 1.43 (m, 3H), 1.37 (s, 3H), 1.08 (s, 3H). $^{13}$C NMR (75 MHz, CDCl$_3$) $\delta$ 201.79, 171.69, 170.43, 169.94, 167.65, 156.16, 132.21, 121.96, 117.80, 76.08, 74.96, 63.81, 53.47, 52.12, 51.06, 42.00, 39.05, 37.92, 35.48,
30.91, 20.74, 18.24, 16.44, 15.54. HRMS (m/z): [M+NH₄] calcd for C₂₆H₃₄BrN₂O₈, 581.1498; found, 581.1497. HPLC $t_R = 8.672$ min; purity = 100%.

(2S,4aR,6aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-6a,10b-dimethyl-4,10-dioxo-2-(pyrrolidine-1-carbonyl)dodecahydro-1H-benzo[f]isochromene-7-carboxylate (22).

Compound 22 was synthesized from 4 using procedure A and pyrrolidine to afford 0.0640 g (56.6%) as a white solid, mp 234 – 236 °C (dec.); $^1$H NMR (300 MHz, CDCl₃) $\delta$ 5.19 – 5.03 (m, 2H), 3.67 (s, 3H), 3.59 (dd, $J = 11.7, 5.0, 1$H), 3.52 – 3.29 (m, 3H), 2.76 (dd, $J = 10.7, 6.0, 1$H), 2.44 – 2.30 (m, 3H), 2.30 – 2.18 (m, 2H), 2.14 (s, 3H), 1.93 (dd, $J = 12.7, 6.3, 2$H), 1.89 – 1.51 (m, 7H), 1.33 (s, 3H), 1.02 (s, 3H). $^{13}$C NMR (75 MHz, CDCl₃) $\delta$ 202.43, 171.82, 171.39, 169.88, 167.47, 75.11, 73.26, 64.47, 53.25, 51.98, 49.19, 46.53, 46.50, 42.10, 37.80, 37.68, 35.16, 30.84, 26.16, 24.05, 20.68, 18.27, 16.90, 16.10. HRMS (m/z): [M+Na] calcd for C₂₄H₃₃NO₈Na, 486.2104; found, 486.2095. HPLC $t_R = 7.314$ min; purity = 98.67%.

(2S,4aR,6aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-2-(4-bromopiperidine-1-carbonyl)-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-7-carboxylate (24).

Compound 24 was synthesized from 4 using procedure A and 4-bromopiperidine hydrochloride to afford 0.1770 g (64.5%) as a white solid, mp 198 – 201 °C; $^1$H NMR (400 MHz, CDCl₃) $\delta$ 5.36 – 5.25 (m, 1H), 5.24 – 5.12 (m, 1H), 4.42 (dd, $J = 31.6, 27.9, 1$H), 3.95 – 3.82 (m, 1H), 3.81 – 3.63 (m, 4H), 3.61 – 3.33 (m, 2H), 2.82 (dd, $J = 12.2, 4.4, 1$H), 2.49 – 2.22 (m, 5H), 2.21 – 2.11 (m, 4H), 2.10 – 1.92 (m, 4H), 1.89 – 1.53 (m, 4H), 1.41 – 1.33 (m, 3H), 1.06 (s, 3H). $^{13}$C NMR (101 MHz, CDCl₃) $\delta$ 202.35, 171.73, 171.07, 169.73, 167.34,
(2S,4aR,6aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-6a,10b-dimethyl-4,10-dioxo-2-((R)-tetrahydrofuran-3-ylcarbamoyl)dodecahydro-1H-benzo[f]isochromene-7-carboxylate (25). Compound 25 was synthesized from 4 using procedure A and R- (+)-3- aminotetrahydrofuran toluene-4-sulfonate to afford 0.1490 g (63.9%) as a white solid, mp 134 – 137 °C; \(^1H\) NMR (300 MHz, CDCl\(_3\)) \(\delta\) 6.86 (d, \(J = 9.7, 1H\)), 5.13 (dd, \(J = 11.7, 8.3, 1H\)), 4.84 (dt, \(J = 12.4, 6.2, 1H\)), 4.44 (td, \(J = 10.2, 5.3, 1H\)), 3.92 – 3.80 (m, 2H), 3.80 – 3.70 (m, 2H), 3.65 (d, \(J = 12.3, 3H\)), 3.59 (dd, \(J = 9.5, 2.7, 1H\)), 2.72 (dd, \(J = 12.1, 4.7, 1H\)), 2.62 (dd, \(J = 13.7, 5.9, 1H\)), 2.31 – 2.15 (m, 4H), 2.15 – 2.08 (m, 3H), 1.86 – 1.66 (m, 3H), 1.51 (ddd, \(J = 14.3, 13.0, 8.0, 3H\)), 1.32 (s, 3H), 1.03 (s, \(J = 11.3, 3H\)). \(^{13}C\) NMR (75 MHz, CDCl\(_3\)) \(\delta\) 201.70, 171.65, 170.51, 169.76, 169.25, 76.01, 74.83, 73.22, 66.96, 63.71, 53.40, 52.01, 50.99, 50.23, 41.93, 39.31, 37.89, 35.37, 32.84, 30.86, 30.86, 20.64, 18.13, 16.36, 15.33. HRMS (m/z): [M+H] calcd for C\(_{24}\)H\(_{34}\)NO\(_9\), 480.2234; found, 480.2226. HPLC \(t_R = 10.948\) min; purity = 95.30%.

(2S,4aR,6aR,7R,9S,10aS,10bR)-methyl 9-acetoxy-6a,10b-dimethyl-4,10-dioxo-2-(((R)-tetrahydrofuran-2-yl)methylcarbamoyl)dodecahydro-1H-benzo[f]iso-chromene-7-carboxylate (26). Compound 26 was synthesized from 4 using procedure A and R-(-)-tetrahydrofurfurlyamine to afford 0.1660 g (69.2%) as a white solid, mp 111 – 113 °C; \(^1H\) NMR (300 MHz, CDCl\(_3\)) \(\delta\) 6.86 (t, \(J = 5.6, 1H\)), 5.18 (dd, \(J = 11.7, 8.3, 1H\)), 4.92 (dd, \(J =
10.4, 6.3, 1H), 4.02 – 3.78 (m, 2H), 3.78 – 3.66 (m, 4H), 3.61 – 3.45 (m, 1H), 3.26 – 3.07 (m, 1H), 2.77 (dt, J = 13.9, 6.9, 1H), 2.64 (dd, J = 13.8, 6.3, 1H), 2.35 – 2.21 (m, 3H), 2.16 (s, 3H), 2.13 – 2.03 (m, 2H), 2.02 – 1.82 (m, 3H), 1.81 – 1.70 (m, 1H), 1.67 – 1.46 (m, 4H), 1.37 (s, 3H), 1.09 (s, 3H). \( ^{13} \text{C} \) NMR (75 MHz, CDCl\(_3\)) \( \delta \) 201.73, 171.68, 170.51, 169.72, 169.60, 77.36, 75.85, 74.81, 68.10, 63.81, 53.30, 51.95, 50.71, 43.24, 41.90, 39.11, 37.84, 35.33, 30.83, 28.82, 25.80, 20.62, 18.15, 16.29, 15.65. HRMS (m/z): [M+H] calcd for C\(_{25}\)H\(_{36}\)NO\(_9\), 494.2390; found, 494.2383. HPLC \( t_R = 9.580 \) min; purity = 98.10%.

\((2S,4aR,6aR,7R,9S,10aS,10bR)\)-methyl 9-acetoxy-6a,10b-dimethyl-4,10-dioxo-2-(((S)-
tetrahydrofuran-2-yl)methylcarbamoyl)dodecahydro-1H-benzo[f]iso-chromene-7-
carboxylate (27). Compound 27 was synthesized from 4 using procedure A and (S)-(+)
tetrahydrofurfurylamine to afford 0.1470 g (61.3%) as a white solid, mp 99 – 101 \(^\circ\)C; \(^1\)H NMR (300 MHz, CDCl\(_3\)) \( \delta \) 6.82 (t, J = 5.5, 1H), 5.14 (dd, J = 11.4, 8.5, 1H), 4.87 (dd, J = 10.9, 6.0, 1H), 3.99 – 3.86 (m, 1H), 3.81 (dd, J = 14.6, 6.8, 1H), 3.75 – 3.63 (m, 4H), 3.58 – 3.40 (m, 1H), 3.20 – 3.03 (m, 1H), 2.69 (ddd, J = 19.7, 12.7, 5.4, 2H), 2.32 – 2.22 (m, 2H), 2.13 (s, 3H), 2.03 (dd, J = 14.2, 7.5, 3H), 1.90 (ddt, J = 26.7, 13.6, 6.7, 3H), 1.74 (d, J = 10.1, 1H), 1.64 – 1.43 (m, 4H), 1.31 (d, J = 15.3, 3H), 1.06 (s, 3H). \( ^{13} \text{C} \) NMR (75 MHz, CDCl\(_3\)) \( \delta \) 201.71, 171.72, 170.44, 169.77, 169.65, 77.47, 75.99, 74.86, 68.20, 63.87, 53.43, 52.02, 50.97, 43.16, 42.00, 39.42, 37.95, 35.44, 30.91, 28.78, 25.90, 20.67, 18.18, 16.38, 15.53. HRMS (m/z): [M+H] calcd for C\(_{25}\)H\(_{36}\)NO\(_9\), 494.2390; found, 494.2383. HPLC \( t_R = 9.114 \) min; purity = 99.20%.

\((2S,4aR,6aR,7R,9S,10aS,10bR)-2-((3aS,4R,6aS)-hexahydro-2H-cyclopenta[b]furan-4-yl)
7-methyl 9-acetoxy-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-2,7-dicarboxylate (28). Compound 28 was synthesized from 4 using procedure A and (3aR,4R,6aS)-hexahydro-2H-cyclopenta[b]furan-4-ol\textsuperscript{56} to afford 0.1820 g (72.4%) as a white solid, mp 229 – 231 °C; \textsuperscript{1}H NMR (300 MHz, CDCl\textsubscript{3}) \(\delta\) 5.21 – 4.90 (m, 3H), 4.37 (t, \(J = 6.0\), 1H), 3.97 – 3.81 (m, 1H), 3.72 (s, 3H), 3.58 (dd, \(J = 15.4, 7.8\), 1H), 2.99 – 2.83 (m, 1H), 2.77 (dd, \(J = 10.6, 6.0\), 1H), 2.58 (dd, \(J = 13.4, 7.0\), 1H), 2.37 – 2.02 (m, 8H), 1.98 – 1.47 (m, 10H), 1.37 (s, 3H), 1.08 (s, 3H). \textsuperscript{13}C NMR (75 MHz, CDCl\textsubscript{3}) \(\delta\) 201.97, 171.59, 170.08, 169.89, 169.79, 83.33, 77.66, 75.04, 74.07, 69.15, 64.31, 53.47, 52.06, 50.18, 44.80, 42.14, 39.10, 37.95, 35.34, 30.80, 29.03, 28.79, 27.65, 20.66, 18.26, 16.25, 15.84. HRMS (m/z): [M+H] calcd for C\textsubscript{27}H\textsubscript{37}O\textsubscript{10}, 521.2387; found, 521.2388. HPLC \(t_R = 5.704\) min; purity = 95.70%.

(2S,4aR,6aR,7R,9S,10aS,10bR)-7-methyl 2-((R)-tetrahydrofuran-3-yl) 9-acetoxy-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-2,7-dicarboxylate (29). Compound 29 was synthesized from 4 using procedure A and (R)-(--)-3-hydroxytetrahydrofuran to afford 0.1820 g (40.6%) as a white solid, mp 161 – 163 °C; \textsuperscript{1}H NMR (400 MHz, CDCl\textsubscript{3}) \(\delta\) 5.39 – 5.31 (m, 1H), 5.20 – 5.11 (m, 1H), 4.97 (dd, \(J = 10.1, 7.0\), 1H), 3.97 – 3.80 (m, 4H), 3.72 (s, 3H), 2.74 (dt, \(J = 12.9, 5.9\), 1H), 2.59 (dd, \(J = 13.4, 7.0\), 1H), 2.37 – 2.26 (m, 2H), 2.24 – 2.08 (m, 7H), 2.07 – 1.99 (m, 1H), 1.78 (dd, \(J = 12.5, 3.3\), 1H), 1.67 – 1.47 (m, 3H), 1.37 (s, 3H), 1.09 (s, 3H). \textsuperscript{13}C NMR (101 MHz, CDCl\textsubscript{3}) \(\delta\) 201.94, 171.67, 170.14, 170.08, 170.06, 77.55, 77.23, 76.91, 75.12, 74.00, 73.17, 67.21, 64.42, 53.58, 52.20, 52.19, 50.41, 42.19, 35.47, 32.66, 20.80, 18.30, 16.33, 15.80. HRMS (m/z): [M+Na] calcd for C\textsubscript{24}H\textsubscript{32}O\textsubscript{10}Na, 503.1893; found, 503.1898. HPLC \(t_R = 4.304\) min; purity =
(2S,4aR,6aR,7R,9S,10aS,10bR)-7-methyl 2-((S)-tetrahydrofuran-3-yl) 9-acetoxy-6a,10b-dimethyl-4,10-dioxododecahydro-1H-benzo[f]isochromene-2,7-dicarboxylate (30).

Compound 30 was synthesized from 4 using procedure A and (S)-(+) 3-hydroxytetrahydrofuran to afford 0.1110 g (47.4%) as a white solid, mp 159 – 161 ºC; $^1$H NMR (300 MHz, CDCl$_3$) $\delta$ 5.28 (dd, $J = 6.0$, 4.5, 1H), 5.13 (dd, $J = 11.3$, 8.6, 1H), 4.92 (dd, $J = 9.7$, 7.1, 1H), 3.96 – 3.73 (m, 4H), 3.64 (d, $J = 19.7$, 3H), 2.74 (dd, $J = 11.7$, 5.0, 1H), 2.52 (dd, $J = 13.5$, 7.0, 1H), 2.31 – 1.85 (m, 10H), 1.81 – 1.43 (m, 4H), 1.37 (s, 3H), 1.10 (s, 3H). $^{13}$C NMR (75 MHz, CDCl$_3$) $\delta$ 202.00, 171.63, 170.12, 170.00, 169.92, 76.75, 74.96, 73.89, 72.73, 66.99, 64.08, 53.29, 52.01, 50.11, 42.02, 38.79, 37.83, 35.31, 32.77, 30.78, 20.65, 18.19, 16.25, 15.87. HRMS ($m/z$): [M+H] calcd for C$_{24}$H$_{33}$O$_{10}$, 481.2074; found, 481.2072. HPLC $t_R = 9.502$ min; purity = 98.40%.
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 2.3 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 98.23%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 1.2 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 98.00%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 2.4 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 98.29%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 1.7 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 95.33%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 1.1 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 2 mL/min
purity: 98.1%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.5 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 98.38%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.7 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 95.93%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 1.8 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 2 mL/min
purity: 98.8%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.9 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 98.3%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.5 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 99.38%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.7 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 98.44%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.5 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 98.92%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.5 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 95.03%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 1.4 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 100%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.9 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 100%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.7 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 98.69%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 1.1 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 2.5 mL/min
purity: 97.04%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 1.1 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 2.5 mL/min
purity: 98.67%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C18, 5 micron, 10 x 250 mm
sample size: 100 microliter
sample concentration: 2.1 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 2 mL/min
purity: 98.4%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 1.5 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 2 mL/min
purity: 98.4%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C18, 5 micron, 10 x 250 mm
sample size: 100 microliter
sample concentration: 0.1 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 1.5 mL/min
purity: 95.3%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 1.5 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 2 mL/min
purity: 98.1%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 1.9 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 2 mL/min
purity: 99.2%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.8 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 95.70%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 3.0 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 97.10%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C18, 5 micron, 10 x 250 mm
sample size: 100 microliter
sample concentration: 0.3 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 3 mL/min
purity: 98.4%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 2.8 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 98.31%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 3.0 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 95.63%
pump: Agilent 1100 series quaternary pump
column: Daicel Chiralcel OD-H, 4.6 x 150 mm
sample size: 10 microliter
sample concentration: 1.0 mg/mL
mobile phase: 30% hexane - 70% ethanol
flow rate: 0.1 mL/min
purity: 100%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.7 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 98.1%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.7 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 100%
pump: Agilent 1100 series quaternary pump
column: Phenomenex Luna C-18, 5 micron, 10 x 250 mm
sample size: 100 microliters
sample concentration: 0.1 mg/mL
mobile phase: 60% acetonitrile - 40% water
flow rate: 5 mL/min
purity: 100%