Supporting Information

Stereocontrolled synthesis of cyclopropanol aminoacids from allylic sulfones : conformationally restricted building blocks.

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(+)-(2*S*,3*Z*)-5-Benzenesulfonyl-pent-3-ene-1,2-diol (**11**)

To a solution of **10** (2.08 g, 7.37 mmol) in MeOH (20 mL) was added HCl 2 N (7.5 mL, 15.0 mmol). The mixture was left to stir for 2 h before completion. It was then added solid NaHCO₃ until neutralization occurs. The mixture was poured into an Erlenmeyer with Et₂O, dried over anhydrous Na₂SO₄, filtered and removed the solvent *in vacuo*. The crude was purified by flash silica column chromatography (hexane-EtOAc, 1:1) to yield 1.61 g (6.63 mmol, 90 %) of **11** as a white solid.

$[\alpha]_D^{20} +30.2^\circ$ (*c* 0.98, CHCl₃). IR: 3700-3710, 2928, 1449, 1306, 1142, 1084, 1026, 731, 691. ¹H NMR (200 MHz, CDCl₃): δ = 3.36 (m, 2H, 1-H), 4.00 (d, *J* = 8.0 Hz, 2H, 5-H), 4.33 (m, 1H, 2-H), 5.43 (dt, *J* = 11.0 and 8.0 Hz, 1H, 4-H), 5.78 (dd, *J* = 8.2 and 11.0 Hz, 1H, 3-H), 7.56 (m, 3H, H_{meta} and H_{para} -SO₂Ph), 7.83 (m, 2H, H_{ortho} -SO₂Ph). ¹³C NMR (50 MHz, CDCl₃): δ = 55.4 (C-5), 65.8 (C-1), 68.9 (C-2), 118.4 (C-3), 128.5 (C_{ortho}, -SO₂Ph), 129.6 (C_{meta}, -SO₂Ph), 134.3 (C_{para}, -SO₂Ph), 138.2 (C-4), 138.5 (C_{ipso},

-SO₂Ph). MS: m/z (%) = 243 (45) [M+1]⁺, 154 (100), 125 (50), 83 (57). HRMS: calcd. for C₁₁H₁₅O₄S [M+1]⁺: 243.0691, found: 243.0682.

(+)-(2*S*,3*Z*)-5-Benzenesulfonyl-1-tosyloxy-pent-3-en-2-ol (12)

To a solution of **11** (1.16 g, 4.79 mmol) in pyridine (7 mL) was added tosyl chloride (1.11 g, 5.82 mmol). The solution was allowed to stir for 7 h. H₂O (2 mL) was then added, and the mixture extracted with Et₂O. The organic phase was washed with a solution of HCl 2N, H₂O and saturated brine, then dried with anhydrous Na₂SO₄, filtered and removed the solvent *in vacuo*. The resultant oil was purified by flash silica column chromatography (hexane-EtOAc, 7:3) and used subsequently in the next step.

[α]_D²⁰ +40.4° (*c* 0.97, CHCl₃). IR: 3600-3200, 3065, 2928, 1449, 1358, 1308, 1177, 1144, 1086, 972, 816, 733. ¹H NMR (200 MHz, CDCl₃): δ = 2.39 (s, 3H, CH₃-), 3.10 (br s, 1H, -OH), 3.85 (m, 2H, 1-H), 3.94 (d, *J* = 8.0 Hz, 2H, 5-H), 4.48 (m, 1H, 2-H), 5.50 (dt, *J* = 11.0 and 8.0 Hz, 1H, 4-H), 5.72 (dd, *J* = 11.0 and 8.0 Hz, 1H, 3-H), 7.31 (d, *J* = 8.4 Hz, 2H, H_{meta} Ts-), 7.55 (m, 3H, H_{meta} and H_{para} -SO₂Ph), 7.78 (m, 4H, H_{ortho} Ts- and H_{ortho} -SO₂Ph). ¹³C NMR (50 MHz, CDCl₃): δ = 21.9 (CH₃-), 55.3 (C-5), 66.2 (C-2), 72.5 (C-1), 119.9 (C-3), 128.2 (C_{ortho}, Ts-), 128.5 (C_{ortho}, -SO₂Ph), 129.6 (C_{meta}, -SO₂Ph), 130.2 (C_{meta}, Ts-), 132.6 (C_{ipso}, Ts-), 134.4 (C_{para}, -SO₂Ph), 136.4 (C-4), 138.6 (C_{ipso}, -SO₂Ph), 145.5 (C_{para}, Ts-). MS: m/z (%) = 397 (10) [M+1]⁺, 154 (100), 91 (50). HRMS: calcd. for C₁₈H₂₁O₆S₂ [M+1]⁺: 397.0780, found: 397.0776.

(+)-(2*S*,3*Z*)-5-Benzenesulfonyl-1-iodo-pent-3-en-2-ol (13)

To a solution of **3** in acetone (20 mL) was added sodium iodide (2.90 g, 19.16 mmol). The solution was refluxed (80°C) overnight under Ar atmosphere, and allowed to cool.

The solvent was removed and the mixture dissolved in H₂O and Et₂O. It was extracted with Et₂O and the organic phase washed with a saturated Na₂S₂O₃ solution, NaHCO₃ (5 % solution), H₂O and brine, then dried with anhydrous Na₂SO₄, filtered and removed the solvent *in vacuo*. The resultant oil was purified by flash silica column chromatography (hexane-EtOAc, 8:2) to yield 1.19 g (3.38 mmol, 71 %) of **13** over the two steps.

$[\alpha]_D^{20} +17.0^\circ$ (*c* 0.84, CHCl₃). IR: 3600-3200, 3063, 2965, 2922, 1447, 1306, 1144, 1084, 733. ¹H NMR (200 MHz, CDCl₃): δ = 3.03 (d, *J* = 6.6 Hz, 2H, 1-H), 3.16 (br s, 1H, -OH), 3.98 (m, 2H, 5-H), 4.26 (m, 1H, 2-H), 5.46 (dt, *J* = 11.0 and 8.0 Hz, 1H, 4-H), 5.77 (dd, *J* = 11.0 and 7.8 Hz, 1H, 3-H), 7.61 (m, 3H, H_{meta} and H_{para} -SO₂Ph), 7.84 (m, 2H, H_{ortho} -SO₂Ph). ¹³C NMR (50 MHz, CDCl₃): δ = 12.3 (C-1), 55.6 (C-5), 67.5 (C-2), 118.6 (C-3), 128.6 (C_{ortho}, -SO₂Ph), 129.7 (C_{meta}, -SO₂Ph), 134.5 (C_{para}, -SO₂Ph), 138.5 (C_{ipso}, -SO₂Ph), 139.7 (C-4). MS: *m/z* (%) = 353 (5) [M+1]⁺, 335 (55), 154 (100), 67 (70). HRMS: calcd. for C₁₁H₁₄IO₃S [M+1]⁺: 352.9708, found: 352.9693.

(-)-(2*S*,3*Z*)-5-Benzenesulfonyl-1-iodo-2-(tetrahydropyran-2-yloxy)-pent-3-ene (14**)**

To a solution of **13** (181 mg, 0.51 mmol) in CH₂Cl₂ (1ml) was added DHP (0.14 ml, 1.53 mmol) and *p*-TsOH (5.7 mg, 0.03 mmol). The reaction was left to stir for 4 h before addition of Et₂O. The mixture was washed with NaHCO₃ (5 % solution), H₂O and saturated brine. The organic phase was dried with anhydrous Na₂SO₄, filtered and removed the solvent *in vacuo*. The crude was then purified by flash silica column chromatography (hexane-EtOAc 9:1) to yield 204 mg (0.47 mmol, 91 %) of **14** as a colourless oil.

$[\alpha]_D^{20} -75.4^\circ$ (*c* 0.84, CHCl₃). IR: 2944, 2870, 1447, 1316, 1150, 1119, 1084, 1022, 735. ¹H NMR (200 MHz, CDCl₃): δ = 1.38-1.90 (m, 6H, 2'-H, 3'-H and 4'-H), 2.81 (m, 1H, 1-H_A), 2.98 (m, 1H, 1-H_B), 3.46 (m, 1H, 5'-H_A), 3.81-4.20 (m, 3H, 5'-H_B and 5-H), 4.39 (m, 1H, 2-H), 4.54 and 4.67 (m, 1H, 1'-H), 5.52 (m, 1H, 4-H), 5.71 (m, 1H, 3-H), 7.60 (m, 3H, H_{meta} and H_{para} -SO₂Ph), 7.85 (m, 2H, H_{ortho} -SO₂Ph). ¹³C NMR (50 MHz, CDCl₃): δ = 7.9 and 8.6 (C-1), 18.9 and 19.6 (C-3'), 25.4 and 25.6 (C-4'), 30.4

and 30.5 (C-2'), 55.6 and 55.8 (C-5), 62.1 and 62.9 (C-5'), 68.9 and 72.1 (C-2), 94.7 and 99.1 (C-1'), 118.5 and 121.7 (C-3), 128.6 (*C_{ortho}*, -SO₂Ph), 129.6 (*C_{meta}*, -SO₂Ph), 134.2 (*C_{para}*, -SO₂Ph), 136.4 and 137.8 (C-4), 138.6 (*C_{ipso}*, -SO₂Ph). MS: *m/z* (%) = 437 (5) [M+1]⁺, 335 (20), 154 (25), 85 (100), 67 (25). HRMS: calcd. for C₁₆H₂₂IO₄S [M+1]⁺: 437.0284, found: 437.0298.

(-)-(2*S*,3*Z*)-5-Benzenesulfonyl-1-iodo-2-*tert*-butyldimethylsilyloxy-pent-3-ene (15)

To a solution of **13** (416 mg, 1.18 mmol) in THF (3 mL) was added 2,6 lutidine (0.42 mL, 3.54 mmol). The mixture was cooled to 0°C. It was added then *t*-butyldimethyl silyl triflate (0.80 mL, 3.54 mmol). The mixture was left to stir at room temperature for 1 h before addition of saturated NaHCO₃ solution until neutralization. This mixture was diluted with EtOAc and washed with H₂O, saturated NaHCO₃ solution and saturated brine. The organic phase was dried with anhydrous Na₂SO₄, filtered and removed the solvent *in vacuo*. The resultant oil was purified by column chromatography (hexane-EtOAc 95:5) to yield 523 mg (1.12 mmol 95%) of **15**.

[α]_D²⁰ -79.7° (*c* 1.57, CHCl₃). IR: 2932, 2857, 1447, 1317, 1254, 1150, 1101, 839, 806, 778. ¹H NMR (200 MHz, CDCl₃): δ = -0.06 (s, 3H, Me_A-Si), 0.03 (s, 3H, Me_B-Si), 0.83 (s, 9H, *t*Bu-), 2.73 (dd, *J* = 10.2 and 4.8 Hz, 1H, 1-H_A), 2.88 (dd, *J* = 10.2 and 7.0 Hz, 1H, 1-H_B), 3.91 (m, 2H, 5-H), 4.22 (m, 1H, 2-H), 5.48 (dt, *J* = 11.0 and 8.2 Hz, 1H, 4-H), 5.69 (dd, *J* = 11.0 and 8.4 Hz, 1H, 3-H), 7.60 (m, 3H, H_{*meta*} and H_{*para*}-SO₂Ph), 7.86 (m, 2H, H_{*ortho*}-SO₂Ph). ¹³C NMR (50 MHz, CDCl₃): δ = -4.5 (Me_A-Si), -4.2 (Me_B-Si), 12.1 (C-1), 18.3 [(CH₃)₃CSi], 26.0 [(CH₃)₃CSi], 56.1 (C-5), 68.9 (C-2), 117.2 (C-3), 128.6 (*C_{ortho}*, -SO₂Ph), 129.6 (*C_{meta}*, -SO₂Ph), 134.3 (*C_{para}*, -SO₂Ph), 138.7 (*C_{ipso}*, -SO₂Ph), 140.1 (C-4). MS: *m/z* (%) = 467 (5) [M+1]⁺, 409 (25), 335 (30), 199 (15), 135 (25), 73 (100). HRMS: calcd. for C₁₇H₂₈IO₃SSi [M+1]⁺: 467.0573, found: 467.0583.

(-)-(2*S*,3*Z*)-5-Benzenesulfonyl-1-iodo-2-methoxymethoxy-pent-3-ene (16)

To a solution of **13** (390 mg, 1.11 mmol) in CHCl_3 (6 mL) was added dimethoxy methane (3 mL, 33.30 mmol). The mixture was cooled to 0°C . It was added then P_2O_5 (1.58 g, 11.10 mmol). The mixture was left to stir at room temperature for 1 h before addition of ice. This solution was extracted with EtOAc and the organic extracts combined and washed with NaHCO_3 (5 % solution), H_2O (until pH = 7) and saturated brine. The organic phase was dried with anhydrous Na_2SO_4 , filtered and removed the solvent *in vacuo*. The crude was then purified by flash silica column chromatography (hexane-EtOAc 9:1) to yield 416 mg (1.05 mmol, 95 %) of **16** as a colourless oil.

$[\alpha]_D^{20} -59.6^\circ$ (*c* 0.86, CHCl_3). IR: 2930, 1447, 1310, 1144, 1088, 1022, 733. ^1H NMR (200 MHz, CDCl_3): δ = 2.86 (dd, J = 10.6 and 4.4 Hz, 1H, 1- H_A), 3.01 (dd, J = 10.4 and 7.2 Hz, 1H, 1- H_B), 3.37 (s, 3H, $-\text{OCH}_2\text{OCH}_3$), 3.95 (m, 2H, 5-H), 4.12 (m, 1H, 2-H), 4.45 (s, 2H, $-\text{OCH}_2\text{OCH}_3$), 5.66 (m, 2H, 3-H and 4-H), 7.63 (m, 3H, H_meta and H_para - SO_2Ph), 7.89 (m, 2H, H_ortho - SO_2Ph). ^{13}C NMR (50 MHz, CDCl_3): δ = 7.9 (C-1), 55.7 (C-5), 56.2 ($-\text{OCH}_2\text{OCH}_3$), 70.2 (C-2), 94.0 ($-\text{OCH}_2\text{OCH}_3$), 121.1 (C-3), 128.6 (C $_\text{ortho}$, - SO_2Ph), 129.6 (C $_\text{meta}$, - SO_2Ph), 134.3 (C $_\text{para}$, - SO_2Ph), 136.7 (C-4), 138.6 (C $_\text{ipso}$, - SO_2Ph). MS: m/z (%) = 397 (5) $[\text{M}+1]^+$, 335 (20), 307 (20), 154 (100), 77 (30). HRMS: calcd. for $\text{C}_{13}\text{H}_{18}\text{IO}_4\text{S}$ $[\text{M}+1]^+$: 396.9971, found: 397.0012.

Reaction of compound **14** with HMDSNa

To a solution of **14** (156 mg, 0.36 mmol) in THF (2 mL) was added HMDSNa 1.0 M in THF (0.43 mL, 0.43 mmol) at -78°C . The reaction mixture was left to stir for 1 h at -78°C under Ar before the addition of saturated NH_4Cl solution (2 mL). The product was extracted into EtOAc. The organic extracts were combined, washed with H_2O and saturated brine, then dried over anhydrous Na_2SO_4 , filtered and removed the solvent. Cyclopropanes **6** and **7**, 99 mg (0.32 mmol, 91 %) were obtained in a 95:5 ratio separated by flash silica column chromatography (hexane-EtOAc, 9:1). Both compounds have been already described see ref.5b

Reaction of compound **15** with HMDSNa

To a solution of **15** (216 mg, 0.46 mmol) in THF (2.5 mL) was added HMDSNa 1.0 M in THF (0.55 mL, 0.55 mmol) at -78°C . The reaction mixture was left to stir for 1 h at -78°C under Ar before the addition of saturated NH_4Cl solution (2 mL). The product was extracted into EtOAc. The organic extracts were combined, washed with H_2O and saturated brine, then dried over anhydrous Na_2SO_4 , filtered and removed the solvent. Cyclopropanes **8** and **9**, 154 mg (0.46 mmol, 98 %) were obtained in a 95:5 ratio separated by flash silica column chromatography (hexane-EtOAc, 95:5).

Reaction of compound **16** with HMDSNa

To a solution of **16** (326 mg, 0.82 mmol) in THF (4.2 mL) was added HMDSNa 1.0 M in THF (1 mL, 1 mmol) at -78°C . The reaction mixture was left to stir for 1 h at -78°C under Ar before the addition of saturated NH_4Cl solution (2 mL). The product was extracted into EtOAc. The organic extracts were combined, washed with H_2O and saturated brine, then dried over anhydrous Na_2SO_4 , filtered and removed the solvent. Cyclopropanes **17** and **18**, 200 mg (0.75 mmol, 91 %) were obtained in a 95:5 ratio separated by flash silica column chromatography (hexane-EtOAc, 8:2).

The crystal structure for **17** has been deposited at the Cambridge Crystallographic Data Centre and allocated the deposition number

CCDC 216479

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Journal: Organic Letters (1336)

Formula: $\text{C}_{13}\text{H}_{16}\text{O}_4\text{S}_1$

Unit cell parameters: a 8.604(2) b 8.287(2) c 10.110(2) beta 107.15(3) space group P21

(+)-2-[2-Benzenesulfonyl-1-(2-methoxymethoxy-cyclopropyl)-ethyl] 5-isopropyl-3,6-dimethoxy-2,5-dihydro-pyrazine (20)

BuLi 1.6 M in hexane (0.6 mL, 0.95 mmol) was added to a -78°C solution of *R*-2,5-dihydro-3,6-dimethoxy-2-isopropylpyrazine **19** (134.6 mg, 0.73 mmol) in dry THF (5 mL). After 30 min, a solution of **17** (84 mg, 0.31 mmol) in dry THF (2 mL) was added. After 1 hour at -78°C the reaction mixture was quenched with saturated NH_4Cl solution (2 mL). The product was then extracted into EtOAc. The organic extracts were combined, washed with H_2O and saturated brine, then dried over anhydrous Na_2SO_4 , filtered and removed the solvent. The crude was purified by flash silica column chromatography (hexane-EtOAc 85:15) to yield 135 mg (0.30 mmol, 96 %) of **20**.

$[\alpha]_{\text{D}}^{20} +16.5^{\circ}$ (c 0.99, CHCl_3). IR: 2959, 1696, 1447, 1308, 1240, 1150, 1059. ^1H NMR (400 MHz, CDCl_3): δ = 0.55 (q, J = 6.4 Hz, 1H, 3''- H_{w}), 0.66 and 1.00 (2d, J = 6.8 Hz, 3H each, $(\text{CH}_3)_2\text{CH-}$), 0.83 (m, 1H, 3''- H_{B}), 1.38 (m, 1H, 1''-H), 1.97 (m, 1H, 1'-H), 2.21 (m, 1H, $(\text{CH}_3)_2\text{CH-}$), 3.08, (dd, J = 14.4 and 4.4 Hz, 1H, 2'- H_{A}), 3.22 (dd, J = 14.4 and 6.8 Hz, 1H, 2'- H_{B}), 3.40 (s, 3H, $-\text{OCH}_2\text{OCH}_3$), 3.45 (m, 1H, 2''-H), 3.56 and 3.64 (2s, 3H each, MeO-), 3.92 (m, 1H, 5-H), 4.13 (m, 1H, 2-H), 4.66 (m, 2H, $-\text{OCH}_2\text{OCH}_3$), 7.55 (m, 2H, $\text{H}_{\text{meta}}-\text{SO}_2\text{Ph}$), 7.63 (m, 1H, $\text{H}_{\text{para}}-\text{SO}_2\text{Ph}$), 7.90 (m, 2H, $\text{H}_{\text{ortho}}-\text{SO}_2\text{Ph}$). ^{13}C NMR (100 MHz, CDCl_3): δ = 12.4 (C-3''), 16.6 and 18.9 $[(\text{CH}_3)_2\text{CH-}]$, 21.8 (C-1''), 32.0 $[(\text{CH}_3)_2\text{CH-}]$, 39.4 (C-1'), 52.4 (MeO-), 55.5 ($-\text{OCH}_2\text{OCH}_3$), 56.4 (C-2''), 57.8 (C-2'), 58.2 (C-2), 60.9 (C-5), 96.3 ($-\text{OCH}_2\text{OCH}_3$), 127.9 (C_{ortho} , $-\text{SO}_2\text{Ph}$), 129.1 (C_{meta} , $-\text{SO}_2\text{Ph}$), 133.4 (C_{para} , $-\text{SO}_2\text{Ph}$), 140.1 (C_{ipso} , $-\text{SO}_2\text{Ph}$), 161.6 (C-6), 164.5 (C-3). MS: m/z (%) = 453 (30) $[\text{M}+1]^+$, 307 (15), 154 (100), 77 (30). HRMS: calcd. for $\text{C}_{22}\text{H}_{33}\text{N}_2\text{O}_6\text{S}$ $[\text{M}+1]^+$: 453.2059, found: 453.2016.

(+)-5-Isopropyl-3,6-dimethoxy-2-[-1-(2-methoxymethoxy-cyclopropyl)-ethyl]-2,5-dihydro-pyrazine (21)

A solution of **20** (130 mg, 0.29 mmol) in dry MeOH (3 mL) was added to Na-Hg 2 % amalgam (5 g) via cannula. The reaction mixture was left to stir for 3 h at room temperature under Ar. The residue was filtered and diluted with EtOAc. The mixture was washed with H₂O and brine, dried over anhydrous Na₂SO₄, filtered and removed the solvent. The crude product was purified by flash silica column chromatography (hexane-EtOAc 9:1) to yield 66 mg (0.21 mmol, 72 %) of **21** as a colourless oil. It was also recovered starting material **20** (8 %).

$[\alpha]_D^{20} +8.3^\circ$ (*c* 1.09, CHCl₃). IR: 2961, 1696, 1458, 1235, 1047, 1015. ¹H NMR (400 MHz, CDCl₃): δ = 0.55 (q, *J* = 6.0 Hz, 1H, 3''-H_α), 0.70 and 1.05 (2d, *J* = 6.8 Hz, 3H each, (CH₃)₂CH-), 0.81 (d, *J* = 6.2 Hz, 3H, 2'-H), 0.85 (m, 1H, 3''-H_β), 1.33 (m, 2H, 1''-H and 1'-H), 2.27 (m, 1H, (CH₃)₂CH-), 3.30 (m, 1H, 2''-H), 3.41 (s, 3H, -OCH₂OCH₃), 3.66 and 3.71 (2s, 3H each, MeO-), 3.94 (m, 1H, 5-H), 4.03 (m, 1H, 2-H), 4.64 (s, 2H, -OCH₂OCH₃). ¹³C NMR (100 MHz, CDCl₃): δ = 12.4 (C-3''), 13.9 (C-2'), 16.5 and 19.0 [(CH₃)₂CH-], 22.9 (C-1''), 31.7 [(CH₃)₂CH-], 39.7 (C-1'), 52.2 (MeO-), 55.5 (-OCH₂OCH₃), 56.8 (C-2''), 58.4 (C-2), 60.6 (C-5), 96.4 (-OCH₂OCH₃), 163.0 (C-6), 163.7 (C-3). MS: *m/z* (%) = 312 (5) [M]⁺, 267 (35), 185 (80), 141 (100). HRMS: calcd. for C₁₆H₂₈N₂O₄ [M]⁺: 312.2049, found: 312.2052.

(+)-2-Amino-3-(2-methoxymethoxy-cyclopropyl)-butyric acid methyl ester (**22**)

To a solution of **21** (19.5 mg, 0.062 mmol) in THF (1 mL) was added HCl 0.5 M (0.31 mL, 0.155 mmol). The mixture was left to stir for 7h at room temperature. Concentrated ammonia was then added to the stirred mixture until a pH of 9 was reached. The product was extracted into CH₂Cl₂, dried over anhydrous Na₂SO₄, filtered

and removed the solvent. The crude product was purified by flash silica column chromatography (CHCl₃-MeOH 99:1) and used subsequently for the next step.

$[\alpha]_D^{20} +41.0^\circ$ (*c* 0.98, CHCl₃). IR: 3387, 2957, 1736, 1219, 1159, 1049, 920. ¹H NMR (200 MHz, CDCl₃): δ = 0.50 (q, *J* = 6.6 Hz, 1H, 3'-H_α), 0.82 (ddd, *J* = 3.4, 6.0 and 9.2 Hz, 1H, 3'-H_β), 0.95-1.16 (m, 2H, 1'-H and 3-H), 1.02 (d, *J* = 5.4 Hz, 3H, 4-H), 1.53 (br s, 2H, -NH₂), 3.25, (dt, *J* = 6.6 and 3.0 Hz, 1H, 2'-H), 3.39 (s, 3H, -OCH₂OCH₃), 3.44 (d, *J* = 4.0 Hz, 1H, 2-H), 3.70 (s, 3H, -COOMe) 4.62 (s, 2H, -OCH₂OCH₃). ¹³C NMR (50 MHz, CDCl₃): δ = 12.5 (C-3'), 14.6 (C-4), 23.1 (C-1'), 40.3 (C-3), 52.0 (-COOMe), 55.7 (-OCH₂OCH₃), 56.5 (C-2'), 58.2 (C-2), 96.6 (-OCH₂OCH₃), 176.0 (-COOMe). MS: *m/z* (%) = 218 (85) [M+1]⁺, 154 (100), 88 (70). HRMS: calcd. for C₁₀H₂₀NO₄ [M+1]⁺: 218.1392, found: 218.1391.

(+)-2-Amino-3-(2-hydroxy-cyclopropyl)-butyric acid methyl ester (23)

Compound **22** was dissolved in 1ml of the mixture: THF / water/ HCl 6N (1 / 5 / 2). The mixture was left to stir for 5 h before the addition of concentrated ammonia to the stirred mixture until a pH of 9 was reached. The product was extracted into CH₂Cl₂, dried over anhydrous Na₂SO₄, filtered and removed the solvent. It was purified by flash silica column chromatography (CHCl₃-MeOH 99:1) to yield 10.5 mg (0.061 mmol, 98 % yield over the two steps) of **23**.

$[\alpha]_D^{20} +18.7^\circ$ (*c* 0.45, CHCl₃). IR: 3600-3100, 2963, 1734, 1439, 1262, 1206, 1018. ¹H NMR (200 MHz, CDCl₃): δ = 0.47 (q, *J* = 6.6 Hz, 1H, 3'-H_α), 0.75 (ddd, *J* = 2.8, 6.6 and 8.4 Hz, 1H, 3'-H_β), 0.96-1.16 (m, 2H, 1'-H and 3-H), 0.99 (d, *J* = 6.6 Hz, 3H, 4-H), 1.83 (br s, 3H, -NH₂ and -OH), 3.28, (dt, *J* = 6.6 and 2.6 Hz, 1H, 2'-H), 3.44 (d, *J* = 4.4 Hz, 1H, 2-H), 3.71 (s, 3H, -COOMe). ¹³C NMR (50 MHz, CDCl₃): δ = 14.5 (C-3' and C-4), 25.1 (C-1'), 40.3 (C-3), 52.1 (-COOMe), 52.4 (C-2'), 58.3 (C-2), 176.0 (-COOMe). MS: *m/z* (%) = 174 (15) [M+1]⁺, 154 (100), 107 (30), 89 (40). HRMS: calcd. for C₈H₁₆NO₃ [M+1]⁺: 174.1130, found: 174.1121.

^1H and ^{13}C NMR and MASS for compound **20**:

^1H and ^{13}C NMR and MASS for compound **23**:

F090622#1 x1 Bgd=1 7-MAY-87 03:29+0:00:32 TS250 FB+
 BpM=0 I=228mV Hm=0 TIC=8522000 Acnt: JULIO Sys: HRFAB
 PI-R315 PT= 67° Cal: #1 1499000 1.0
 69000

Single Mass Input					Page: 1-1		ACC.MASS
M/E	C	H	O	N	PPM	DBE	
12							
174	6	14	2	4	4.2	2.0	174.1116759
	8	16	3	1	-3.6	1.5	174.1130186

?=help RETURN=next page 'S=skip 'Q=return to parameters 'X=exit 'E=editor