Supporting Information

Urotensin-II⁽⁴⁻¹¹⁾ Azasulfuryl Peptides: Synthesis and Biological Activity

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Preparation of cumyl carbazate

Synthesis of 2-phenylisopropyl alcohol (cumyl alcohol)



To a solution of methyl benzoate (630 μ L, 5 mmol) in 5 mL of anhydrous ether, 5 mL of a solution of 3 M methyl magnesium bromide in ether was added drop-wise at 0 °C. The reaction was brought to 45 °C with a warm water bath. After 2 h, TLC (70:30 hexanes/EtOAc) demonstrated complete conversion of the ester to 2-phenyl-propan-2-ol. The reaction mixture was poured slowly into an ice-cooled saturated solution of NH₄Cl, and extracted with EtOAc (3 x 20 mL). The organic phase were washed with brine (2 x 10 mL), dried over MgSO₄, filtered and evaporated to afford 2-phenyl-propan-2-ol (98% yield): ¹H NMR (CDCl₃, 400 MHz) δ 1.60 (6H, s), 1.75 (1H, s), 7.26 (1H, t, *J* = 7.1), 7.36 (2H, t, *J* = 7.5), 7.5 (2H, d, *J* = 7.4); ¹³C NMR (CDCl₃, 100 MHz) δ 150.0, 128.6, 127.1, 124.8, 72.5, 32.2.

Synthesis of cumyl carbonate



To a stirred solution of cumyl alcohol (800 mg, 5.88 mmol) in DCM (5 mL) and pyridine (750 μ L, 1.5 mol-equiv) at -5 °C, a solution of phenyl chloroformate (1 mL, 1.3 mol-equiv) in 4 mL of DCM was added drop-wise over 30 min. A thick paste formed gradually after the addition of the chloroformate, and the reaction mixture was further stirred overnight at 0 °C. The mixture was diluted with DCM (50 mL), washed with 1N HCl, 1N NaOH, H₂O and brine, dried over MgSO₄, filtered and evaporated to afford a quantitative yield of cumyl carbonate as colorless oil: ¹H NMR (CDCl₃, 400 MHz) δ 1.80 (6H, s), 7.26 (2H, t, *J* = 7.1), 7.29 (2H, t, *J* = 7.5), 7.38 (2H, t, *J* = 7.5),

7.42 (2H, d, *J* = 7.4), 7.54 (2H, d, *J* = 7.4); ¹³C NMR (CDCl₃, 100 MHz) δ 151.6, 151.1, 144.7, 133.0, 129.4, 128.6, 125.1, 124.1, 121.8, 84.5, 28.2.

Synthesis of cumyl carbazate



Hydrazine hydrate (2.2 mL of a 50-60% solution in H₂O) was mixed with cumyl carbonate (1 g, 3.9 mmol) with vigorous stirring for 18 h. The mixture was poured into ice water, extracted with ethyl acetate (3 x 20 mL), and the combined organic phase was washed with NaOH 1N, H₂O, and brine, dried with sodium sulfate, filtered, and evaporated to a residue that was purified by trituration with hexane to afford cumyl carbazate as a pale yellow oil (88% yield): $R_f = 0.15$ (60:40 hexanes/EtOAc); ¹H NMR (CDCl₃, 400 MHz) δ 1.60 (6H, s), 1.75 (1H, s), 3.73 (2H, s) 7.26 (1H, t, J = 7.1), 7.36 (2H, t, J = 7.5), 7.5 (2H, d, J = 7.4); ¹³C NMR (CDCl₃, 100 MHz) δ 145.7, 128.4, 127.5, 127.6, 124.3, 81.8, 29.3.

NMR spectra











Characterization of azasulfuryl peptides mimics of UII⁽⁴⁻¹¹⁾

Peptide	% crude purity ^a	% isolated purity ^a (yield ^b)	HRMS <i>m</i> / <i>z</i> calcd (<i>m</i> / <i>z</i> observed)
[AsF ⁷]UII ⁽⁴⁻¹¹⁾ (6)	43	>99 (1%)	1059.3733 (1059.3706)
[AsBip ⁷]UII ⁽⁴⁻¹¹⁾ (7)	78	>99 (2%)	1135.4046 (1135.4064)
[AsNal(1') ⁷]UII ⁽⁴⁻¹¹⁾ (8)	58	>99 (4%)	1109.3889 (1109.3879)
[AsNal(2') ⁷]UII ⁽⁴⁻¹¹⁾ (9)	80	>99 (9%)	1109.3889 (1109.3887)
[AsK ⁸]UII ⁽⁴⁻¹¹⁾ (10)	51	>99 (1%)	550.6172° (550.6153)
$[AsK(N,N^{\varepsilon}-Me_2)^8]UII^{(4-11)}$ (11)	44	>99 (2%)	564.7192° (564.7173)

Table S1. Characterization of synthesized peptides 6-11.

^{*a*}Crude and isolated purity were assessed by LC-MS analysis at 214 nm and 254 nm using H₂O (0.1% formic acic)/MeOH (0.1% formic acid) and H₂O (0.1% formic acid)/MeCN (0.1% formic acid) as eluents. ^{*b*}Isolated yields calculated from resin loading. ^cHRMS indicate $[M+2H]^{2+}$.

Purity check/Gradient #1 - purity: >99%, t_R : 14.18 min [analytical HPLC, 20 to 80% methanol in water (0.1% formic acid) over 15 min + 90% methanol in water (0.1% formic acid) over 5 min, flow rate of 0.5 mL/min] on a Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm X 100 mm).

Purity check/Gradient #2 - purity: >99%, t_R : 7.68 min [analytical HPLC, 20 to 80% acetonitrile in water (0.1% formic acid) over 15 min + 90% acetonitrile in water (0.1% formic acid) over 5 min, flow rate of 0.5 mL/min] on a Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm X 100 mm).

Purity check: Gradient #1 - purity: >99%, t_R : 16.19 min [analytical HPLC, 20 to 80% methanol in water (0.1% formic acid) over 15 min + 90% methanol in water (0.1% formic acid) over 5 min, flow rate of 0.5 mL/min] on a Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm X 100 mm).

Purity check/Gradient #2 - purity: >99%, t_R : 12.44 min [analytical HPLC, 20 to 80% acetonitrile in water (0.1% formic acid) over 15 min + 90% acetonitrile in water (0.1% formic acid) over 5 min, flow rate of 0.5 mL/min] on a Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm X 100 mm).

Purity check: Gradient #1 - purity: >99%; t_R : 7.37 min [analytical HPLC, 20 to 60% methanol in water (0.1% formic acid) over 6 min + 90% methanol in water (0.1% formic acid) over 2 min, flow rate of 0.5 mL/min] on a Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm X 100 mm).

Purity check: Gradient #2 - purity: >99%, t_R : 4.61 min [analytical HPLC, 20 to 60% acetonitrile in water (0.1% formic acid) over 6 min + 90% acetonitrile in water (0.1% formic acid) over 2 min, flow rate of 0.5 mL/min] on a Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm X 100 mm).

Purity check/Gradient #1 - purity: >99%, t_R : 15.60 min [analytical HPLC, 20 to 80% methanol in water (0.1% formic acid) over 15 min + 90% methanol in water (0.1% formic acid) over 5 min, flow rate of 0.5 mL/min] on a Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm X 100 mm).

Purity check/Gradient #2 - purity: >99%, t_R : 10.44 min [analytical HPLC, 20 to 80% acetonitrile in water (0.1% formic acid) over 15 min + 90% acetonitrile in water (0.1% formic acid) over 5 min, flow rate of 0.5 mL/min] on a Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm X 100 mm).

Purity check/Gradient #1 - purity: >99%, t_R : 7.51 min [analytical HPLC, 10-90% acetonitrile in water (0.1% formic acid) over 8 min + 90% acetonitrile in water (0.1% formic acid) over 2 min, flow rate of 0.5 mL/min] on a Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm X 100 mm).

Purity check/Gradient #2 - purity: >99%, t_R : 8.71 min [analytical HPLC, 10 to 90% methanol in water (0.1% formic acid) over 8 min + 90% methanol in water (0.1% formic acid) over 2 min, flow rate of 0.5 mL/min] on a Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm X 100 mm).

Peptide $[As(N,N-Me_2)K^8]UII^{(4-11)}$ (11)

Purity check/Gradient #1 - purity: >99%, t_R : 8.04 min [analytical HPLC, 10 to 90% acetonitrile in water (0.1% formic acid) over 8 min + 90% acetonitrile in water (0.1% formic acid) over 2 min, flow rate of 0.5 mL/min] on a Sunfire C18 analytical column (100 Å, 3.5 µm, 4.6 mm X 100 mm).

Purity check/Gradient #2 - Purity: >99%, t_R : 8.61 min [analytical HPLC, 10 to 90% methanol in water (0.1% formic acid) over 8 min + 90% methanol in water (0.1% formic acid) over 2 min, flow rate of 0.5 mL/min] on a Sunfire C18 analytical column (100 Å, 3.5 µm, 4.6 mm X 100 mm).

LC-MS Analyses

LC-MS chromatogram (10 to 80% MeOH over 15 min, t_R : 17.40 min) of small amount of resin **31a** conveniently cleaved and analyzed on Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm x 100 mm).

LC-MS chromatogram (10 to 80% MeOH over 15 min, t_R : 18.69 min) of resin **31b** aliquot cleaved and analyzed on Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm x 100 mm).

LC-MS chromatogram (15 to 80% MeOH over 8 min, t_R : 5.17 min) of resin **31c** aliquot cleaved and analyzed on Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm x 100 mm).

LC-MS chromatogram (20 to 80% MeOH over 15 min, t_R : 16.99 min) of resin **31d** aliquot cleaved and analyzed on Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm x 100 mm).

LC-MS chromatogram of **35** (20-90% MeOH, 14 min, $t_R = 6.8$ min), on a Sunfire C18 analytical column (100Å, 3.5 μ m, 4.6 mm x 100 mm).

column (100Å, 3.5 µm, 4.6 mm x 100 mm).

LC-MS chromatogram of **37** (20-90% MeOH, 14 min, $t_R = 8.3$ min), on a Sunfire C18 analytical column (100Å, 3.5 µm, 4.6 mm x 100 mm).

Azide reduction on solid support

LC-MS chromatogram of **42** (10-90% MeOH, 15 min, $t_R = 7.6$ min), on a Sunfire C18 analytical column (100Å, 3.5 μ m, 4.6 mm X 100 mm).