Electronic Supplementary Material (ESI) for RSC Advances.

Modulation of aggregation with Electric Field; scientific roadmap for a potential non-invasive therapy against tauopathies

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Section 1

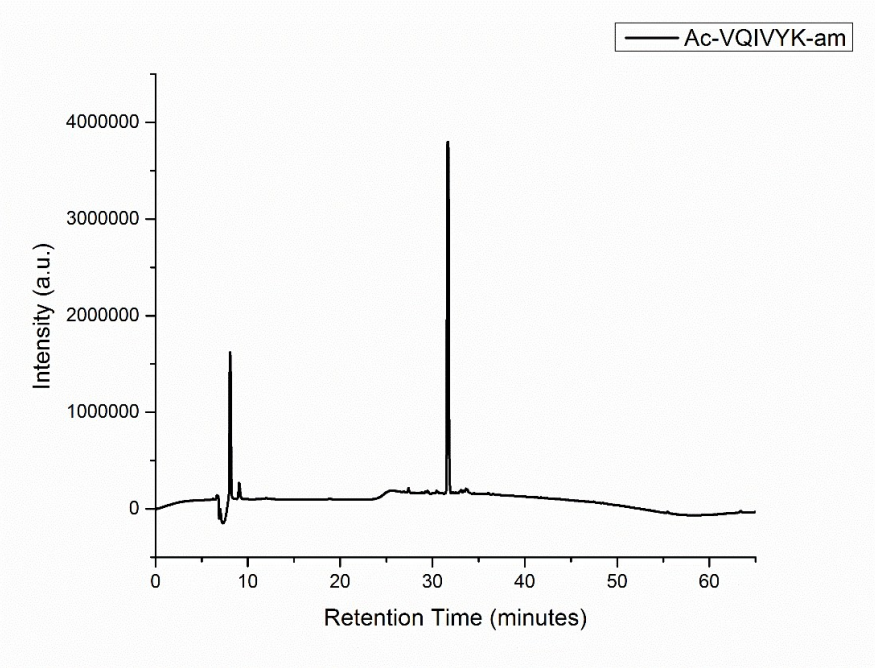

Figure S1. HPLC profile of synthesized Ac-VQIVYK (PhF6) peptide.

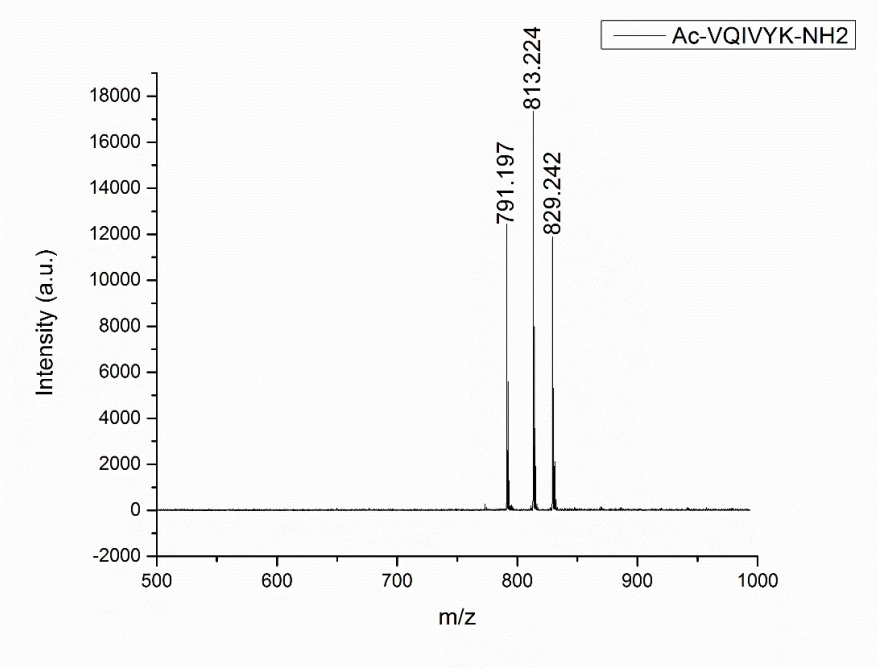

Figure S2. MALDI-TOF mass spectrum of synthesized Ac-VQIVYK (PhF6) peptide. Calculated mass for PhF6 is 789.956, observed mass is 791.197 $[M+H]^+$, 813.224 $[M+Na]^+$, and 829.242 $[M+Ca]^+$.

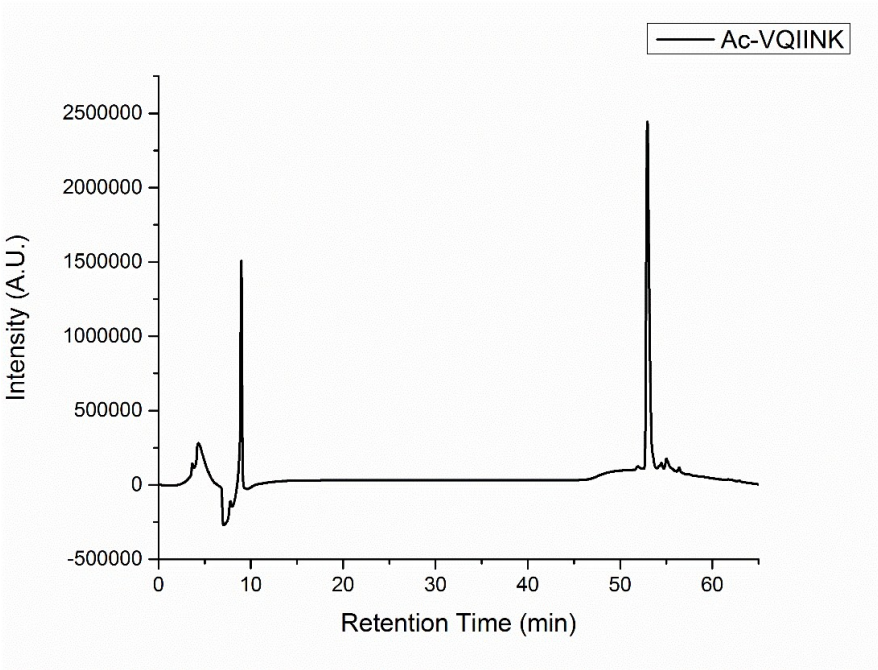

Figure S3. HPLC profile of synthesized Ac-VQIINK (PhF6*) peptide.

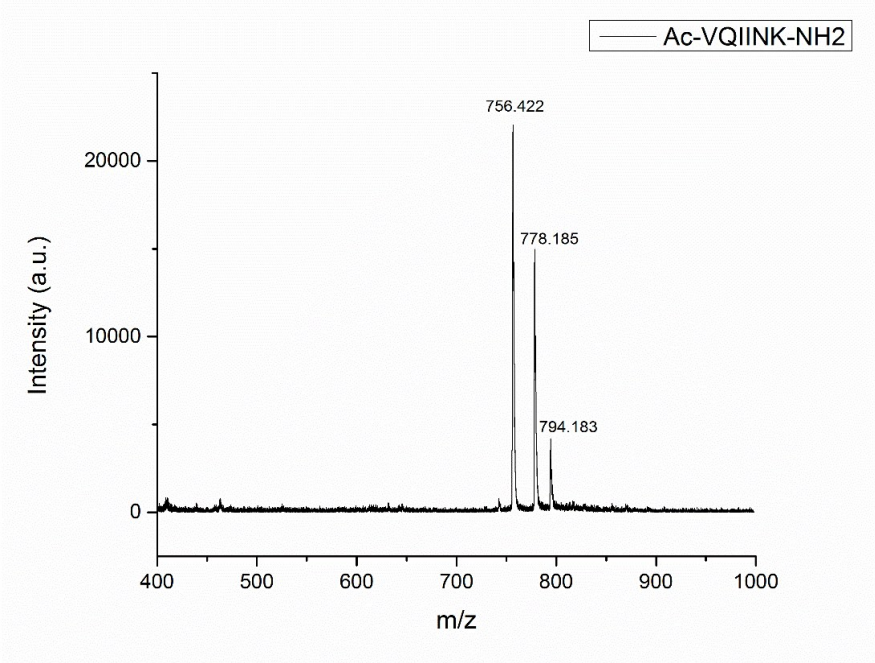

Figure S4. MALDI-TOF mass spectrum of synthesized Ac-VQIINK (PhF6*) peptide. Calculated mass for PhF6* is 754.911, observed mass is 756.422 $[M+H]^+$, 778.185 $[M+Na]^+$, and 794.183 $[M+Ca]^+$.

Section 2

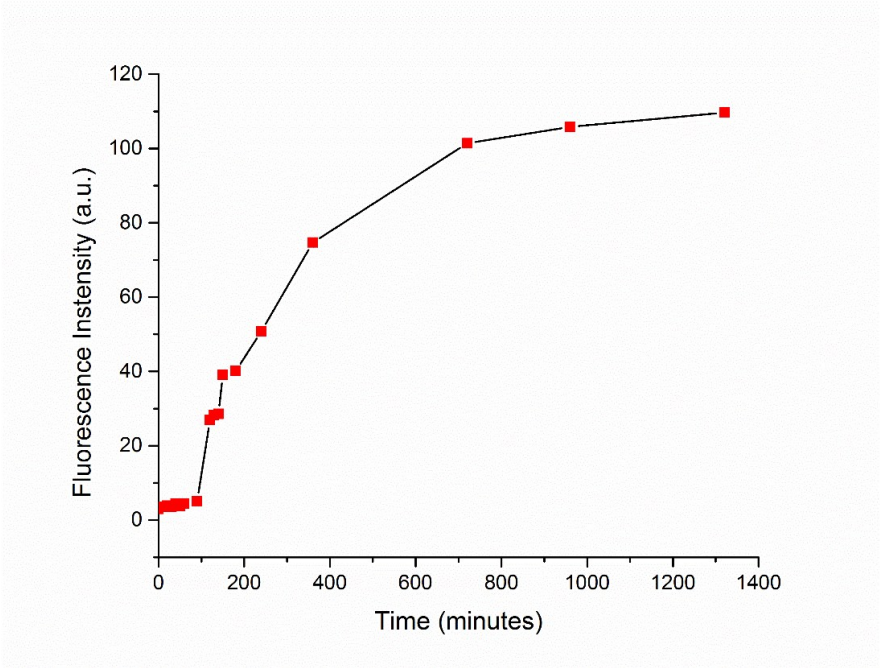

Figure S5. Aggregation Kinetics profile of PhF6 peptide, determined by time dependent thioflavin T fluorescence assay.

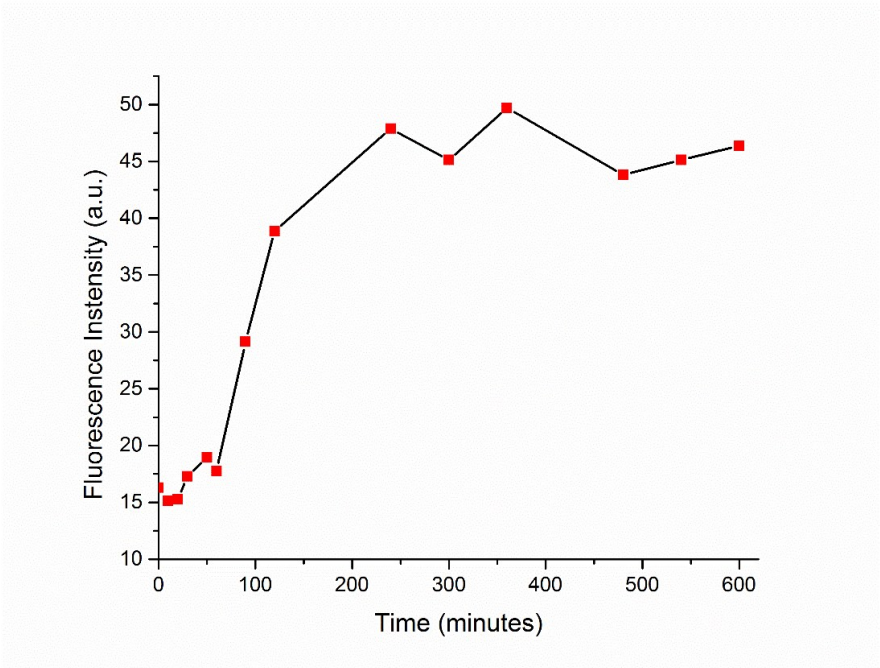

Figure S6. Aggregation Kinetics profile of PhF6* peptide, determined by time dependent thioflavin T fluorescence assay.

Section 3

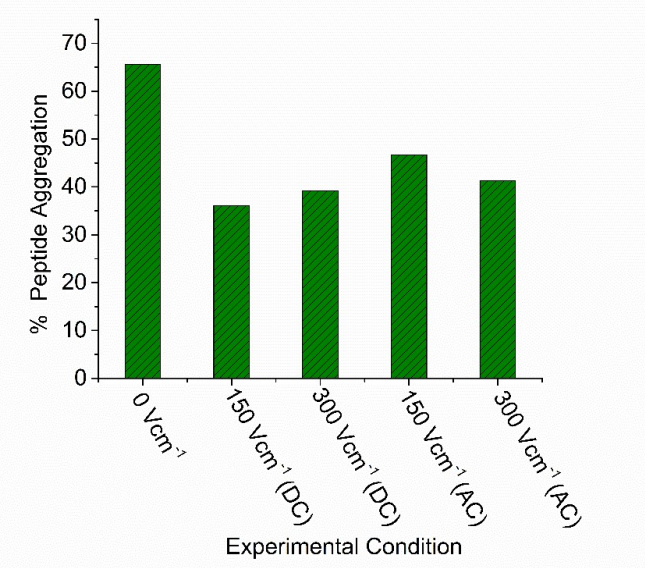

Figure S7. Estimation of percentage aggregation using tyrosine estimation, by measuring the absorbance intensity of PhF6 peptide in solution. Absorbance at 280 nm is measured after an incubation period of 16 hours in presence and absence of electric field.

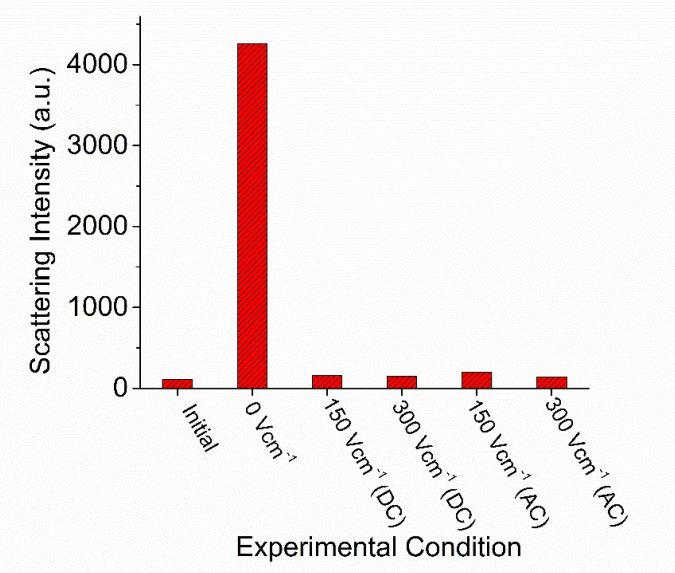

Figure S8. Static right angle scatter plots. Graph represent comparative static light scattering by PhF6 peptide solution allowed to aggregate in ambient conditions (0 Vcm^{-1}), AC and DC electric fields. The 0 Vcm^{-1} showed a very high scattering intensity compared to field samples, thus indicating higher aggregation compared to treated samples.

Section 4

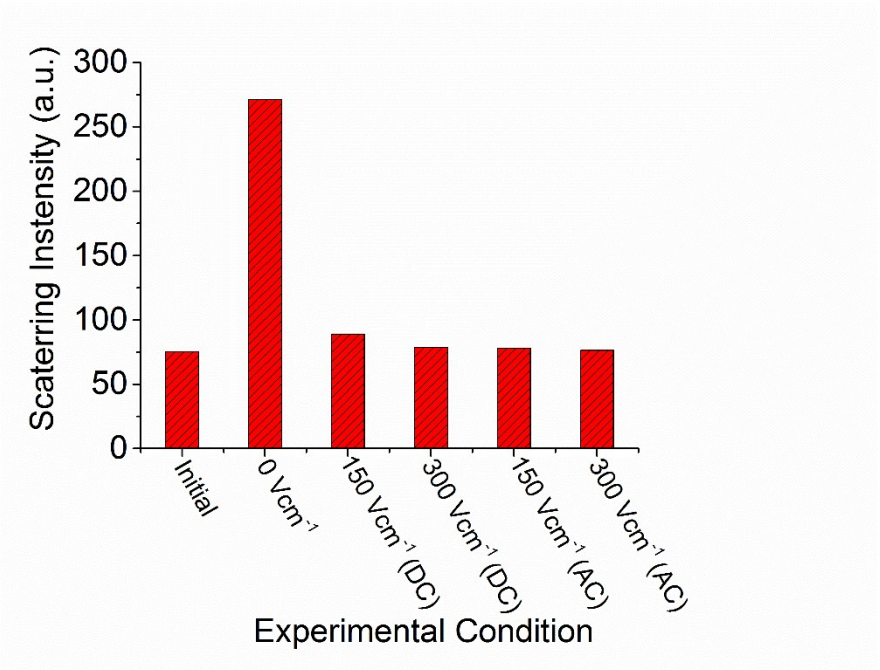

Figure S9. Static right angle scatter plots. Graph represent comparative static light scattering by PhF6* peptide solution allowed to aggregate in ambient conditions (0 Vcm^{-1}), AC and DC electric fields. The 0 Vcm^{-1} showed a very high scattering intensity compared to field samples, thus indicating higher aggregation compared to treated samples.

Section 6

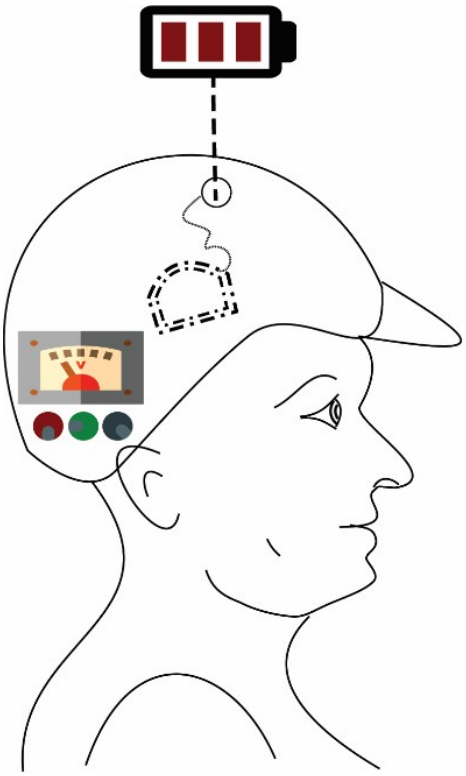

Figure S10. Schematic illustration of a potential electric field based therapeutic device against taupathies.

Section 6

Table S1: Comparative thioflavin T fluorescence data for treated (electric field) and untreated PhF6 peptide samples.

Time (min.)	Fluorescence Intensity (a.u.) 0 V/cm	Std. Dev.	Fluorescence Intensity (a.u.) 150 V/cm (DC)	Std. Dev.	Fluorescence Intensity (a.u.) 300 V/cm (DC)	Std. Dev.	Fluorescence Intensity (a.u.) 150 V/cm (AC)	Std. Dev.	Fluorescence Intensity (a.u.) 300 V/cm (AC)	Std. Dev.
0	3.78466	0.11362	3.78466	0.11362	3.78466	0.11362	3.78466	0.11362	3.78466	0.11362
20	3.49173	0.0706	3.16595	0.06933	5.54196	0.09839	3.94184	0.07166	4.63786	0.07586
40	7.64945	0.32159	4.14102	0.16139	3.89939	0.11331	4.62679	0.09555	6.62668	0.08811
60	8.21572	0.17852	4.82133	0.11965	6.58798	0.08255	4.35337	0.24532	7.54103	0.27692
80	10.23876	0.3023	5.17981	0.07746	7.02221	0.08574	5.96412	0.07929	7.37728	0.21763
100	11.39967	0.51601	5.40583	0.14331	7.94105	0.08985	5.65875	0.12512	7.2354	0.33141
120	17.93171	0.16115	4.83675	0.1694	6.93912	0.28923	7.361	0.0902	6.44631	0.3605
150	30.61325	0.25589	7.17733	0.08934	6.63268	0.54475	8.55075	0.1079	8.78657	0.10024
240	36.1836	0.36474	7.38816	0.31358	8.42042	0.21639	7.66766	0.30546	11.63167	0.0989
360	74.44483	0.32742	7.91511	0.42257	9.31676	0.39744	8.71079	0.17352	10.07957	0.14558
480	90.13458	0.48547	18.95891	0.15037	14.97963	0.17174	14.58304	0.19087	20.59567	0.15189
600	101.0842	1.68668	21.00824	0.34084	16.97724	0.11511	16.18648	0.85326	20.30977	0.62177
720	121.6417	4.31804	26.6759	0.55251	18.54152	0.75316	19.32805	0.55964	24.71845	0.31217
960	127.1251	2.36654	33.37058	0.29541	23.54854	0.33164	32.07641	0.68747	20.21911	0.48271

Table S2: Comparative thioflavin T fluorescence data for treated (electric field) and untreated PhF6* peptide samples.

Time (min.)	Fluorescence Intensity (a.u.) 0 V/cm	Std. Dev.	Fluorescence Intensity (a.u.) 150 V/cm (DC)	Std. Dev.	Fluorescence Intensity (a.u.) 300 V/cm (DC)	Std. Dev.	Fluorescence Intensity (a.u.) 150 V/cm (AC)	Std. Dev.	Fluorescence Intensity (a.u.) 300 V/cm (AC)	Std. Dev.
0	3.65543	0.19374	3.65543	0.19374	3.65543	0.19374	3.65543	0.19374	3.65543	0.19374
20	11.61434	0.1326	4.83019	0.07256	4.91645	0.29585	4.53997	0.5867	5.2249	0.2176
40	8.06531	0.16883	4.40173	0.66074	4.23282	0.88534	3.95734	0.40161	3.75338	0.20492
60	8.9155	1.17015	4.81716	0.21556	4.987	0.06713	3.61079	0.2402	3.83191	0.29964
90	13.65369	0.95364	6.10656	0.27155	5.26822	0.78605	6.10953	0.52616	5.02986	0.45221
120	43.64246	0.50713	5.35128	0.46102	6.16659	1.42783	4.59655	0.28731	4.70611	0.56348
240	48.95573	0.81686	6.13732	1.27464	4.90916	0.3253	8.5425	0.3875	5.48153	0.41479
300	54.12469	0.25612	5.98967	0.84064	6.70051	1.349	7.24982	1.49903	7.06711	1.26756
360	49.62951	1.40278	6.46123	1.4182	7.56686	1.16942	7.19581	0.32818	5.70447	0.64689

Section 7

Table S3: Summary of MTT assay data for SH-SY5Y cell viability in presence of treated and untreated PhF6 and PhF6* peptide samples.

Experimental Condition	% Cell Viability (SH-SY5Y) Ac-VQIVYK-NH2	Std. Dev. Ac-VQIVYK-NH2	% Cell Viability (SH-SY5Y) Ac-VQIINK-NH2	Std. Dev. Ac-VQIINK-NH2
0V	55.64322	1.768472	60.80617	5.274733
150 AC	75.04288	3.484566	73.27616	5.860087
150 DC	73.92796	5.787593	69.26244	5.920028
300 AC	82.43568	5.734737	67.49571	6.215325
300 DC	83.15609	3.480342	69.25386	5.518031
Staurosporine	69.7084	7.887985	69.7084	7.887985
Untreated	99.97141	11.8114	99.97141	11.8114

Table S4: Summary of MTT assay data for IMR-32 cell viability in presence of treated and untreated PhF6 and PhF6* peptide samples.

Experimental Condition	% Cell Viability (IMR-32) Ac-VQIVYK-NH2	Std. Dev. Ac-VQIVYK-NH2	% Cell Viability (IMR-32) Ac-VQIINK-NH2	Std. Dev. Ac-VQIINK-NH2
0V	68.16654	12.90302	91.57246	4.90684
150 AC	83.72123	4.24394	93.13977	8.43164
150 DC	101.7585	3.33622	88.30935	7.29277
300 AC	84.94957	8.32598	96.61271	4.25072
300 DC	102.8704	5.46537	93.51019	6.13001
Staurosporine	66.58273	5.74858	66.58273	5.74858
Untreated	99.98715	8.50592	99.98715	8.50592

Table S5: Summary of MTT assay data for PC-12 cell viability in presence of treated and untreated PhF6 and PhF6* peptide samples.

Experimental Condition	% Cell Viability (PC-12) Ac-VQIVYK-NH2	Std. Dev. Ac-VQIVYK-NH2	% Cell Viability (PC-12) Ac-VQIINK-NH2	Std. Dev. Ac-VQIINK-NH2
0V	50.50437	5.01388	76.26093	3.92647
150 AC	61.71262	6.52366	76.6308	3.15261
150 DC	59.49899	3.73679	78.70433	7.20627
300 AC	57.17552	2.11028	79.11231	7.91041
300 DC	72.42771	6.21394	85.44048	4.6816
Staurosporine	49.58529	3.12509	49.58529	3.12509
Untreated	104.33759	6.58416	104.33759	6.58416