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APPENDICES

APPENDIX A

PREPARATION OF REAGENTS

Growth medium of PC12 cells

DMEM powder (1 package) was dissolved with deionized distilled water and the 3.7 g sodium bicarbonate was added. The medium was mixed well and adjusted pH to 7.2 with 1-5 N HCl. The medium was then adjusted volume to 1,000 ml and further sterilized by filtration with 0.2 μm millipore filter membrane. Before use, the medium was supplemented with 10% FBS, 5% HS, and penicillin (50 unit/ml) and streptomycin (50 μg/ml).

Phosphate buffered saline (PBS)

To make 1 liter of PBS, the ingredients including 8 g NaCl, 0.2 g KCl, 0.2 g KH_2PO_4, and 1.15 g Na_2HPO_4 were dissolved in deionized water. The solution was mixed well and adjusted the pH to 7.4 with 1-5 N NaOH. The solution was adjusted volume to 1,000 ml.

MTT solution

MTT powder 50 mg was solubilized well in 10 ml PBS and filtrate through 0.44 μm membrane. The MTT solution was stored at 4 °C in a dark bottle equipped with a tight cap. The solution was prepared freshly each month.

Lysis buffer for MTT assay

To prepare 50 ml lysis buffer for MTT assay, 25 ml *N*,*N*-dimethyl formamide was diluted with 25 ml H_2O and 10 g SDS was added. The mixture was stirred until completely solubilized and then adjusted pH to 4.7 with 2.5% solution of a mixture of 80% citric acid and 1 N HCl.

2.5% solution of a mixture of 80% citric acid and 1 N HCl

(0.5 ml of 80% citric acid, 0.5 ml of 1 N HCl, and 39 ml H_2O)

Acrylamide gel

solution A	0.8% methylene bis acrylamide, 30% acrylamide
solution B	1.5 M Tris HCl (pH 8.8)
solution C	10% SDS
solution D	0.5 M Tris-HCl (pH 6.8)
APS (ammonium persulfate)	10% APS in DDW

TEMED (N, N, N′, N′-tetramethylenediamine)

solution A, B, APS, and TEMED	stored at 4 °C
solution C	stored at room temperature
APS	prepared every week

The gel apparatus and spacers (1.5 mm thick) were assembly.

1. Preparation of separating gel

To make 2 plates of 10% acrylamide gel, the ingredients of separating gel including, solution A 6.7 ml, solution B 5.0 ml, solution C 0.2 ml, and DDW 7.9 ml, were thoroughly mixed. The mixture was supplemented with 200 µl APS and 8 µl TEMED, then thoroughly gentle mixed, and immediately pour the gel between the glass plates. Before gel polymerization was complete, DDW was layered on the top of the separating gel (4-5 mm). Leave the separating gel for approximately 30 min to polymerize.

2. Preparation of stacking gel

Once the separating gel has completely polymerized, DDW was removed from the top of the polymerized gel, and washed with DDW. To make stacking gel, the ingredients including, solution A 1.3 ml, solution C 34 µl, solution D 2.5 ml, and DDW 6.1 ml, were thoroughly mixed. The mixture was supplemented with 50 µl APS and 10 µl TEMED, then thoroughly gentle mixed, and immediately pour the gel between the glass plates. The combs were inserted between the 2 plates of 2 sets of gel apparatus. The gels were leaved for approximately 30 min to polymerize.

3. Application of samples

Once the stacking gel has completely polymerized, DDW was added and gently removed combs. The wells were flushed out thoroughly with running buffer. The clips and sealing tapes were removed and set up the gel chamber. Running buffer was filled out both inner and outer chamber. Before loading samples and protein marker, all air bubbles between layers were removed by gentle rolling the chamber.

Running buffer

To make 1 liter of 5×running buffer (250 mM Tris, 1.92 M glycine, and 0.5% SDS) for stock solution, the ingredients including 30.2 g Tris, 144.13 g glycine, and 5 g SDS were dissolved in DDW with continuously stirring. The solution was adjusted volume to 1,000 ml. Before use, the solution was diluted to 1×running buffer (50 mM Tris, 0.384 M glycine, and 0.1% SDS) with DDW, 5×running buffer: DDW = 4: 1.

Transfer buffer

To make 1 liter of 10×transfer buffer (1 M Tris, and 1.92 M glycine) for stock solution, the ingredients including 121.14 g Tris, and 144.13 g glycine were dissolved in DDW with continuously stirring. The solution was adjusted volume to 1,000 ml. Before use, the solution was diluted to 1,000 ml of 1×transfer buffer (0.1 M Tris, 0.192 M glycine) supplemented with 5% methanol, 10×running buffer : methanol : DDW = 100 ml : 50 ml : 850 ml.

Tris-buffered saline, 0.1% Tween 20 (TBST)

To make 1 liter of 10×TBST (100 mM Tris, 1 M NaCl, and 0.1% Tween 20) for stock solution, the ingredients including 12.114 g Tris, 58.44 g NaCl, and 10 ml Tween 20 were dissolved in DDW with continuously stirring. The solution was adjusted volume to 1,000 ml. Before use, the solution was diluted to 1×TBST (10 mM Tris, 0.1 M NaCl, and 0.01% Tween 20) with DDW, 10×TBST : DDW = 9 : 1.

Sample buffer

To make 50 ml of 3×sample buffer (225 mM Tris-HCl, pH 6.8, 6% SDS, 30% glycerol, 9% 2-mercaptoethanol, and 0.009% bromphenol blue) for stock solution, the ingredients including 22.5 ml 0.5 M Tris-HCl, 3 g SDS, 10 ml glycerol, 4.5 ml 2-mercaptoethanol, and 225 μl 2% bromphenol blue were dissolved in DDW with continuously stirring. The solution was adjusted volume to 50 ml. 3×sample buffer was aliquot into 1 ml/tube and stored at -20 °C. Before use, the solution was diluted to 1×sample buffer (75 mM Tris-HCl, 2% SDS, 10% glycerol, 3% 2-mercaptoethanol, and 0.003% bromphenol blue) with DDW, 3×sample buffer : DDW = 2 : 1, and then heat 95 °C, 5-10 min..

Lysis buffer for Western blot analysis

To make 50 ml of lysis buffer (50 mM Tris-HCl, pH 8.0, 150 mM NaCl, 20 mM EDTA, 50 mM NaF, 1% NP-40, 0.02% NaN_3 supplemented with 1 mM phenylmethanesulfonyl fluoride (PMSF), 2 μg/ml leupeptin, and 2 μg/ml aprotinin), the ingredients including 2.5 ml 1 M Tris HCl, pH 8.0, 0.4383 g NaCl, 0.3722 g EDTA, 2.5 ml 1 M NaF, 0.51 ml NP-40, and 0.01 g NaN_3 were mixed well in DDW 40 ml. The solution was aliquot into 5 tubes and stored at 4 °C. Before use, the solution was supplemented with 200 μl 50 mM PMSF, 20 μl 1 mg/ml leupeptin, and 3.51 μl 5.7 mg/ml aprotinin).and the volume was adjusted to 10 ml.

Commassie Brilliant Blue G-250 for protein determination

To prepare 1 L of Commassie Brilliant Blue G–250 solution, 100 g Commassie Brilliant Blue G-250 was mixed with 50 ml ethanol and 100 ml 85% (w/v) phosphoric acid, and then adjusted volume to 1,000 ml with DDW. After the mixture was mixed well by continuous stirring, the solution was filtrated through Whatman No 10. The solution was kept in container with tight cap and avoid from light.

APPENDIX B

TABLES OF EXPERIMENTAL RESULTS

Table 1 The percentage of cytotoxicity of satratoxin H–treated PC12 cells in concentration-dependent manner for 24 h.

Satratoxin H (nM)	% Cell survival (compared to control)
0	100 ± 0.00
1	100.37 ± 9.67
5	96.06 ± 6.14
10	81.95 ± 11.75*
20	58.79 ± 15.61*
50	43.02 ± 5.44*
100	34.48 ± 3.93*

Each value represented the mean value with SEM of three independent experiments. Asterisks refer significant differences from the control group: $*P<0.05$ determined by one-way ANOVA.

Table 2 The percentage of cytotoxicity of satratoxin H at the concentration of its IC_{50} (50 nM)–treated PC12 cells at various time points (time dependency).

Time (hour)	% Cell survival (compared to control)
0	100 ± 4.48
6	74.75 ± 7.45*
12	63.71 ± 5.04*
18	59.53 ± 4.26*
24	50.17 ± 6.37*

Each value represented the mean value with SEM of three independent experiments. Asterisks refer significant differences from the control group: $*P<0.05$ determined by one-way ANOVA.

Table 3 The percentage of fragmented DNA, detected by Hoechst 33342 assay induced by satratoxin H at the concentration of 50 nM in PC12 cells at various time points (time dependency).

Time (hour)	% Apoptosis (compared to control)	
	Serum-free medium	Complete medium
0	5.24 ± 0.46	4.08 ± 0.53
12	7.56 ± 0.61	6.30 ± 0.30
24	14.81 ± 1.01*	12.45 ± 0.86*
36	13.33 ± 0.70*	12.92 ± 0.95*
48	12.70 ± 0.71*	17.09 ± 1.22*

Each value represented the mean value of % of control with SEM of four independent experiments. Asterisks refer significant differences from the control group: *$P<0.01$ determined by one-way ANOVA.

Table 4 The percentage of fragmented DNA in PC12 cells by flow cytometry using propidium iodide, induced by satratoxin H at the concentration of 50 nM at various time points (time dependency).

Time (hour)	% Apoptosis (compared to control)	
	Serum-free medium	Complete medium
0	13.89 ± 0.80	0.83 ± 0.19
12	18.62 ± 1.6	1.28 ± 0.34
24	20.48 ± 1.42*	2.28 ± 0.46
36	18.52 ± 1.06	2.69 ± 0.84
48	17.45 ± 2.2	7.08 ± 2.68**

Each value represented the mean value of % of control with SEM of five independent experiments for complete medium, and four experiments for serum-free medium. Asterisks refer significant differences from the control group (vehicle): *$P<0.05$, **$P<0.01$ determined by one-way ANOVA.

Table 5 The relative intensity in PC12 cells quantitated by a flow cytometry using DCFH-DA induced by satratoxin H (50 nM) and incubated in serum-free medium at various time points (time dependency).

Time (hour)	Relative fluorescence intensity
0	255.48 ± 11.33
0.5	264.88 ± 13.29
1	254.35 ± 10.32
3	287.94 ± 13.16
6	310.78 ± 12.94*
12	312.73 ± 10.75*
24	318.55 ± 11.42*

Each value represented the mean value of % of control with SEM of six independent experiments. Asterisks refer significant differences from the control group (vehicle): *$P<0.05$ determined by one-way ANOVA.

Table 6 The MDA content of satratoxin H (50 nM)–treated PC12 cells in time-dependency incubated in serum–free medium.

Time (hour)	MDA content (nM)
0	156.04 ± 18.48
12	177.75 ± 9.88
24	199.16 ± 10.89
36	353.08 ± 64.92*
48	372.5 ± 69.28*

Each value represented the mean value with SEM of four independent experiments. Asterisks refer significant differences from the control group treated with the same concentration of satratoxin H: *$P<0.05$, determined by one-way ANOVA.

Table 7 The percentage of cytotoxicity of satratoxin H – treated PC12 cells with and without MAPKs inhibitors; SB203580 p38 MAPK inhibitor, SP600125 JNK inhibitor, and PD98059 ERK1/2 inhibitor.

Satratoxin H (nM)	% cell survival (compared to own control)[a]			
	vehicle	30 μM SB203580	10 μM SP600125	30 μM PD98059
control	100 ± 1.81	100 ± 1.48	100 ± 2.21	100 ± 1.27
1	89.93 ± 2.99	90.21 ± 2.42	91.95 ± 2.14	86.84 ± 1.51
5	83.62 ± 2.68	93.80 ± 1.96	87.04 ± 1.99	78.91 ± 2.06
10	62.43 ± 1.02	77.15 ± 4.05	66.87 ± 2.93	63.67 ± 2.62
20	39.51 ± 2.53	58.68 ± 1.40*	53.10 ± 5.75	38.07 ± 1.72
50	33.01 ± 3.31	57.61 ± 1.64*	53.32 ± 5.77*	33.41 ± 2.16
100	33.49 ± 3.25	57.57 ± 1.76*	53.55 ± 6.08*	33.47 ± 2.38

[a]Each value represented the mean value with SEM of three independent experiments. Asterisks refer significant differences from the control (vehicle) group treated with the same concentration of satratoxin H: $*P<0.05$ determined by two-way ANOVA.

Table 8A The percentage of cytotoxicity of satratoxin H–treated PC12 cells with and without antioxidant glutathione (GSH) for 6 h in serum-free medium.

Satratoxin H (nM)	% cell survival (compared to own control)[a]			
	vehicle	1 mM GSH	5 mM GSH	10 mM GSH
0	100 ± 2.23	100 ± 1.28	100 ± 4.13	100 ± 0.69
1	99.81 ± 2.93	98.22 ± 3.09	95.03 ± 3.10	100.41 ± 6.31
5	92.57 ± 1.74	91.80 ± 2.40	88.99 ± 2.03	100.39 ± 5.68
10	88.53 ± 2.00	82.97 ± 1.44	86.80 ± 3.05	89.97 ± 4.32
20	75.30 ± 1.11	72.34 ± 1.82	80.62 ± 4.97	86.63 ± 3.98
50	66.43 ± 3.51	66.03 ± 1.25	70.80 ± 3.53	79.44 ± 3.94
100	68.31 ± 1.13	66.37 ± 2.41	65.59 ± 2.72	74.47 ± 1.47

[a]Each value represented the mean value with SEM of three independent experiments determined by two-way ANOVA.

Table 8B The percentage of cytotoxicity of satratoxin H–treated PC12 cells with and without antioxidant glutathione (GSH) for 12 h in serum-free medium.

Satratoxin H (nM)	% cell survival (compared to own control)[a]			
	vehicle	1 mM GSH	5 mM GSH	10 mM GSH
0	100 ± 1.15	100 ± 1.19	100 ± 1.35	100 ± 1.30
1	99.96 ± 1.60	96.84 ± 3.66	98.37 ± 2.89	94.96 ± 2.52
5	89.98 ± 2.85	90.93 ± 1.69	92.97 ± 2.13	93.34 ± 2.18
10	78.37 ± 2.84	78.61 ± 2.46	84.23 ± 2.95	93.07 ± 3.01
20	66.77 ± 2.20	65.43 ± 1.72	72.54 ± 1.77	86.14 ± 4.42
50	62.79 ± 1.47	59.28 ± 2.40	64.69 ± 2.21	75.26 ± 3.84
100	59.44 ± 2.08	57.32 ± 1.67	62.61 ± 1.97	68.81 ± 2.79

[a]Each value represented the mean value with SEM of three independent experiments determined by two-way ANOVA.

Table 8C The percentage of cytotoxicity of satratoxin H–treated PC12 cells with and without antioxidant glutathione (GSH) for 18 h in serum-free medium.

Satratoxin H (nM)	% cell survival (compared to own control)[a]			
	vehicle	1 mM GSH	5 mM GSH	10 mM GSH
0	100 ± 0.86	100 ± 1.72	100 ± 2.21	100 ± 3.57
1	103.48 ± 2.10	97.56 ± 2.01	91.76 ± 3.90	110.07 ± 10.04
5	92.87 ± 2.55	86.85 ± 3.30	84.66 ± 1.43	83.73 ± 3.62
10	76.67 ± 3.06	72.07 ± 2.55	71.05 ± 2.86	76.89 ± 4.30
20	58.70 ± 1.66	56.98 ± 2.99	55.05 ± 3.05	71.05 ± 4.16
50	51.84 ± 1.08	47.30 ± 0.89	46.82 ± 1.87	68.91 ± 4.46
100	46.92 ± 1.02	45.00 ± 1.48	47.55 ± 2.43	73.34 ± 9.30

[a]Each value represented the mean value with SEM of three independent experiments determined by two-way ANOVA.

Table 8D The percentage of cytotoxicity of satratoxin H – treated PC12 cells with and without antioxidant glutathione (GSH) for 24 h in serum-free medium.

Satratoxin H (nM)	% cell survival (compared to own control)[a]			
	vehicle	1 mM GSH	5 mM GSH	10 mM GSH
0	100 ± 5.35	100 ± 1.41	100 ± 3.37	100 ± 2.05
1	86.68 ± 2.70	96.47 ± 1.47	85.87 ± 3.06	101.05 ± 11.06
5	76.08 ± 2.72	84.25 ± 3.48	84.36 ± 5.00	88.98 ± 3.39
10	63.49 ± 3.25	70.49 ± 4.99	72.50 ± 6.93	77.89 ± 3.08
20	46.91 ± 1.88	55.68 ± 4.04	56.50 ± 5.30	66.27 ± 3.38
50	44.97 ± 2.20	50.44 ± 2.75	44.94 ± 3.23	59.57 ± 1.77
100	43.46 ± 2.40	47.83 ± 2.15	51.73 ± 3.38	62.43 ± 3.93

[a]Each value represented the mean value with SEM of three independent experiments determined by two-way ANOVA.

Table 8E The percentage of cytotoxicity of satratoxin H–treated PC12 cells with and without antioxidant *N*-acetylcysteine (NAC) for 6 h in serum-free medium.

Satratoxin H (nM)	% cell survival (compared to own control)[a]			
	vehicle	1 mM NAC	5 mM NAC	10 mM NAC
0	100 ± 1.09	100 ± 1.15	100 ± 1.54	100 ± 4.97
1	102.15 ± 1.85	97.88 ± 0.89	97.31 ± 2.19	91.10 ± 4.02
5	93.91 ± 2.39	91.81 ± 2.56	94.97 ± 2.20	93.58 ± 5.98
10	87.11 ± 2.71	88.15 ± 3.45	90.84 ± 6.54	87.07 ± 2.91
20	76.72 ± 2.17	77.11 ± 2.36	80.62 ± 2.21	78.19 ± 4.42
50	71.85 ± 1.87	67.65 ± 1.60	74.11 ± 1.61	80.72 ± 1.65
100	72.81 ± 1.20	73.20 ± 2.24	73.84 ± 2.53	78.82 ± 6.97

[a]Each value represented the mean value with SEM of three independent experiments determined by two-way ANOVA.

Table 8F The percentage of cytotoxicity of satratoxin H–treated PC12 cells with and without antioxidant *N*-acetylcysteine (NAC) for 12 h in serum-free medium.

Satratoxin H (nM)	% cell survival (compared to own control)[a]			
	vehicle	1 mM NAC	5 mM NAC	10 mM NAC
0	100 ± 0.85	100 ± 1.77	100 ± 1.11	100 ± 2.52
1	97.23 ± 2.22	101.61 ± 1.21	97.24 ± 2.60	101.40 ± 6.92
5	85.96 ± 2.76	90.60 ± 2.82	92.02 ± 1.20	92.52 ± 2.14
10	75.59 ± 1.48	78.26 ± 4.19	82.61 ± 1.78	89.30 ± 2 43
20	62.52 ± 1.39	63.18 ± 1.97	69.62 ± 2.13	77.57 ± 2.95
50	58.77 ± 1.18	60.17 ± 1.05	63.37 ± 2.33	72.75 ± 1.93
100	58.79 ± 1.27	56.17 ± 1.08	65.16 ± 2.58	70.89 ± 2.05

[a]Each value represented the mean value with SEM of three independent experiments determined by two-way ANOVA.

Table 8G The percentage of cytotoxicity of satratoxin H–treated PC12 cells with and without antioxidant *N*-acetylcysteine (NAC) for 18 h in serum-free medium.

Satratoxin H (nM)	% cell survival (compared to own control)[a]			
	vehicle	1 mM NAC	5 mM NAC	10 mM NAC
0	100 ± 1.82	100 ± 0.86	100 ± 2.71	100 ± 3.95
1	107.72 ± 2.20	101.36 ± 2.01	97.51 ± 4.04	106.69 ± 8.16
5	91.30 ± 1.82	90.93 ± 2.31	88.55 ± 2.02	107.27 ± 11.49
10	77.44 ± 2.34	74.42 ± 1.77	80.02 ± 3.92	92.80 ± 6.87
20	61.44 ± 1.46	55.94 ± 1.09	62.66 ± 5.21	84.63 ± 5.21
50	54.85 ± 1.61	49.68 ± 1.65	53.81 ± 1.69	80.79 ± 5.01
100	51.80 ± 1.94	50.28 ± 1.81	51.91 ± 4.05	74.52 ± 2.72

[a]Each value represented the mean value with SEM of three independent experiments determined by two-way ANOVA.

Table 8H The percentage of cytotoxicity of satratoxin H–treated PC12 cells with and without antioxidant *N*-acetylcysteine (NAC) for 24 h in serum-free medium.

Satratoxin H (nM)	% cell survival (compared to own control)[a]			
	vehicle	1 mM NAC	5 mM NAC	10 mM NAC
0	100 ± 2.23	100 ± 1.11	100 ± 4.04	100 ± 6.69
1	96.04 ± 2.95	96.64 ± 1.87	91.34 ± 4.98	78.79 ± 3.09
5	82.77 ± 3.59	78.64 ± 2.40	74.82 ± 3.61	70.94 ± 3.65
10	63.92 ± 2.04	59.23 ± 2.25	56.44 ± 2.61	65.13 ± 3.69
20	48.77 ± 1.37	47.38 ± 2.50	39.38 ± 1.52	58.92 ± 4.22
50	46.26 ± 1.34	42.96 ± 2.04	40.13 ± 2.54	52.18 ± 1.09
100	44.08 ± 1.07	43.69 ± 2.06	35.79 ± 0.72	47.75 ± 1.42

[a]Each value represented the mean value with SEM of three independent experiments determined by two-way ANOVA.

Table 8I The percentage of cytotoxicity of satratoxin H–treated PC12 cells with and without antioxidant trolox for 24 h in serum-free medium.

Satratoxin H (nM)	% cell survival (compared to own control)[a]			
	vehicle	0.01 mM trolox	0.1 mM trolox	1 mM trolox
0	100 ± 2.13	100 ± 0.79	100 ± 0.49	100 ± 1.24
1	103.42 ± 1.59	93.72 ± 3.03	89.94 ± 2.27	95.43 ± 2.58
5	81.52 ± 6.03	74.06 ± 5.73	72.27 ± 5.55	73.28 ± 5.38
10	53.16 ± 4.12	50.59 ± 4.51	49.00 ± 4.26	52.36 ± 4.17
20	43.42 ± 2.52	38.20 ± 3.00	38.47 ± 2.79	45.06 ± 2.80
50	44.85 ± 2.38	36.28 ± 2.44	35.97 ± 1.86	38.73 ± 2.25
100	40.10 ± 3.16	35.94 ± 2.58	35.57 ± 2.19	37.89 ± 2.48

[a]Each value represented the mean value with SEM of three independent experiments determined by two-way ANOVA.

Table 8J The percentage of cytotoxicity of satratoxin H–treated PC12 cells with and without antioxidant trolox for 36 h in serum-free medium.

Satratoxin H (nM)	% cell survival (compared to own control)[a]			
	vehicle	0.01 mM trolox	0.1 mM trolox	1 mM trolox
0	100 ± 1.81	100 ± 1.87	100 ± 0.96	100 ± 2.12
1	99.92 ± 2.23	98.75 ± 1.23	98.56 ± 2.10	103.60 ± 1.79
5	73.68 ± 1.15	71.08 ± 1.26	76.05 ± 3.12	73.65 ± 2.34
10	41.52 ± 0.45	43.22 ± 1.54	43.61 ± 1.44	45.86 ± 1.18
20	33.26 ± 0.78	31.31 ± 1.07	31.78 ± 1.08	34.86 ± 0.94
50	32.54 ± 1.05	30.64 ± 1.05	31.41 ± 0.33	33.36 ± 0.92
100	31.00 ± 1.33	29.22 ± 1.01	30.32 ± 1.19	33.12 ± 1.18

[a]Each value represented the mean value with SEM of three independent experiments determined by two-way ANOVA.

Table 8K The percentage of cytotoxicity of satratoxin H–treated PC12 cells with and without antioxidant trolox for 48 h in serum-free medium.

Satratoxin H (nM)	% cell survival (compared to own control)[a]			
	vehicle	0.01 mM trolox	0.1 mM trolox	1 mM trolox
0	100 ± 1.65	100 ± 1.09	100 ± 0.74	100 ± 1.50
1	90.87 ± 1.68	87.48 ± 2.46	85.55 ± 3.48	95.23 ± 4.35
5	68.99 ± 3.20	63.17 ± 5.66	65.05 ± 7.08	64.36 ± 5.84
10	36.41 ± 6.03	36.24 ± 6.89	37.36 ± 7.58	38.68 ± 7.04
20	20.89 ± 2.18	20.39 ± 2.34	20.38 ± 2.76	23.70 ± 2.25
50	22.07 ± 1.79	20.29 ± 2.18	21.13 ± 2.97	23.48 ± 2.25
100	22.28 ± 1.74	20.71 ± 1.60	22.25 ± 1.67	23.94 ± 1.69

[a]Each value represented the mean value with SEM of three independent experiments determined by two-way ANOVA.

Table 9 The percentage of antioxidant-treated PC12 cells in satratoxin H-free medium. The cells were incubated in serum-free medium for 24 h determined by MTT assay.

Treatment	% cell survival (compared to control)
control	100.00 ± 0.87
1 mM GSH	102.71 ± 2.99
5 mM GSH	102.90 ± 4.04
10 mM GSH	88.96 ± 8.57
1 mM NAC	99.93 ± 2.3
5 mM NAC	106.41 ± 2.92
10 mM NAC	102.48 ± 5.18
10 μM trolox	106.57 ± 2.26
100 μM trolox	105.58 ± 2.05
1 mM trolox	109.21 ± 2.37

Each value represented the mean value with SEM of nine independent experiments for control and three independent experiments in GSH, NAC, or trolox treatment determined by one-way ANOVA.

Table 10 The percentage of fragmented DNA in PC12 cells by flow cytometry using propidium iodide, induced by satratoxin H (50 nM) and antioxidants (GSH or NAC) at indicated concentration for 24 h.

Treatment	% Apoptosis	
	Satratoxin H-free	50 nM Satratoxin H
control	11.51 ± 0.65	18.34 ± 2.12*
1 mM GSH	7.12 ± 0.88	15.28 ± 3.14
5 mM GSH	9.01 ± 1.44	19.40 ± 3.82
10 mM GSH	8.48 ± 1.7	31.70 ± 7.91
1 mM NAC	6.21 ± 0.73	11.53 ± 1.91
5 mM NAC	10.14 ± 3.07	26.67 ± 8.13
10 mM NAC	8.68 ± 2.03	25.57 ± 7.54

Each value represented the mean value of % of control with SEM of nine independent experiments for satratoxin H-free medium (control) and satratoxin H, and three-five experiments for the rest. Asterisks refer significant differences from the control group: *$P<0.05$ when compared to control, determined by one-way ANOVA.

Table 11 The relative fluorescence intensity in PC12 cells quantitated by a flow cytometry using DCFH-DA, cocultivated with or without satratoxin H (50 nM) and antioxidant (GSH or NAC) or antioxidant alone at indicated concentration for 6 h.

Treatment	Relative fluorescence intensity	
	Satratoxin H-free	50 nM Satratoxin H
control	267.91 ± 11.00	315.84 ± 6.03*
1 mM GSH	266.61 ± 11.10	255.80 ± 13.34#
5 mM GSH	262.96 ± 12.44	266.35 ± 14.90
10 mM GSH	279.29 ± 23.32	326.56 ± 17.71
1 mM NAC	258.41 ± 16.08	300.44 ± 15.07
5 mM NAC	263.55 ± 20.43	293.42 ± 16.33
10 mM NAC	273.56 ± 25.02	306.11 ± 6.75

Each value represented the mean value the relative fluorescence intensity of control with SEM of eight independent experiments for control (satratoxin H-free) and satratoxin H, and three independent experiments for the rest. $^{*}P<0.05$ compared to control, $^{\#}P<0.05$, compared to satratoxin H determined by one-way ANOVA.

Table 12 The MDA content of satratoxin H-treated PC12 cells incubated with indicated concentration of glutathione (GSH) or trolox in serum-free medium for 48 h.

Treatment	MDA content (nM)	
	Satratoxin H-free	50 nM Satratoxin H
control	165.05 ± 12.42	392.17 ± 33.12*
1 mM GSH	147.30 ± 15.18	244.96 ± 10.59
5 mM GSH	147.30 ± 15.18	374.20 ± 41.48
10 mM GSH	213.87 ± 59.51	426.22 ± 56.68
10 μM trolox	216.61 ± 44.79	389.64 ± 40.21
100 μM trolox	209.15 ± 25.03	479.27 ± 54.56
1 mM trolox	189.72 ± 19.75	374.42 ± 39.15

Each value represented the mean value with SEM of six independent experiments determined by one-way ANOVA. *$P<0.01$ compared to control

Vita

Miss Punnee Nusuetrong was born on December 27, 1960 in Nakornpathom Province. She was graduated in Bachelor of Science in 1984 and Master degree (Physiology) in 1990 from Mahidol University. She worked as an instructor for undergraduate student in 1995 at Department of Physiology, Faculty of Medicine, Srinakharinwirot University, Bangkok, Thailand. She sat a position as Assistant Professor in 2001 until now.