

Supplemental data

Evaluation of the Effects of Fucoindans from *Fucus* Species and *Laminaria hyperborea* Against Oxidative Stress and Iron-dependent Cell Death

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Table S1. Detailed statistical analyses of erastin and H₂O₂ concentration-responses.

	Kolmogorov-Smirnov test	Levené test	Kruskal-Wallis test	Post hoc Mann-Whitney U with Bonferroni-Holm correction
ARPE-19 cells, erastin 24 hours	Z = 0.100, P = 0.200	F(5,36) = 6.158, P < 0.001	[chi]2(5,N = 42) = 15.846, P = 0.007, η^2 = 0.386	P = 0.633 for 5 μ M, P = 0.004 for 10 μ M, P = 0.009 for 15 μ M, P = 0.004 for 20 μ M, P = 0.034 for 25 μ M erastin vs. vehicle
ARPE-19 cells, H ₂ O ₂ 24 hours	Z = 0.148, P = 0.028	F(4,35) = 11.384, P < 0.001	[chi]2(4,N = 40) = 20.823, P < 0.001, η^2 = 0.534	P = 0.001 for 100 μ M, P = 0.007 for 250 μ M, P = 0.001 for 500-1000 μ M H ₂ O ₂ vs. vehicle
OMM-1, erastin 48 hours	Z = 0.101, P = 0.200	F(6,35) = 4.067, P = 0.003	[chi]2(6,N = 42) = 25.305, P < 0.001, η^2 = 0.690	P = 1.000 for 5-20 μ M, P = 0.012 for 25-30 μ M erastin vs. vehicle
OMM-1, H ₂ O ₂ 48 hours	Z = 0.128, P = 0.200	F(4,25) = 10.237, P < 0.001	[chi]2(4,N = 30) = 26.963, P < 0.001, η^2 = 0.930	P = 0.008 for 100-1000 μ M H ₂ O ₂ vs. vehicle
HT-22 cells, erastin 24 hours	Z = 0.169, P = 0.001	F(7,42) = 14.274, P < 0.001	[chi]2(7,N = 49) = 40.251, P < 0.001, η^2 = 0.839	P = 1.000 for 0.1-0.2 μ M, P = 0.005 for 0.3-1 μ M erastin vs. vehicle
SH-SY5Y cells, erastin 24 hours	Z = 0.106, P = 0.174	F(6,49) = 5.270, P < 0.001	[chi]2(6,N = 56) = 42.423, P < 0.001, η^2 = 0.771	P = 0.002 for 5-10 μ M, P = 0.007 for 15 μ M, P = 0.002 for 20-30 μ M erastin vs. vehicle
Primary neurons, erastin 24 hours	Z = 0.111, P = 0.200	F(4,20) = 1.953, P = 0.141	[chi]2(4,N = 25) = 21.522, P < 0.001, η^2 = 0.897	P = 0.021 for 0.2-1 μ M erastin vs. vehicle

Table S2. Detailed statistical analyses of ARPE-19 cells exposed to 20 μ M erastin and fucoidan for 24 hours.

	Kolmogorov-Smirnov test	Levené test	Kruskal-Wallis test	Post hoc Mann-Whitney U with Bonferroni-Holm correction
FVs	$Z = 0.132, P = 0.007$	$F(9,55) = 3.177, P = 0.004$	$[\chi^2]2(9, N = 65) = 46.782, P < 0.001, \eta^2 = 0.731$	20 μ M erastin vs. control: $P = 0.008$ 20 μ M erastin + fucoidan vs. 20 μ M erastin: 1-50 μ g/ml, $P = 1.000$
FVm	$Z = 0.111, P = 0.045$	$F(9,55) = 1.705, P = 0.110$	$[\chi^2]2(9, N = 65) = 45.719, P < 0.001, \eta^2 = 0.714$	20 μ M erastin vs. control: $P = 0.008$ 20 μ M erastin + fucoidan vs. 20 μ M erastin: 1-50 μ g/ml, $P = 1.000$
UPm	$Z = 0.112, P = 0.041$	$F(9,55) = 3.661, P = 0.001$	$[\chi^2]2(9, N = 65) = 40.794, P < 0.001, \eta^2 = 0.637$	20 μ M erastin vs. control: $P = 0.008$ 20 μ M erastin + fucoidan vs. 20 μ M erastin: 1 μ g/ml: $P = 0.567$, 5-50 μ g/ml: $P = 1.000$
FV1	$Z = 0.181, P < 0.001$	$F(9,55) = 3.322, P = 0.003$	$[\chi^2]2(9, N = 65) = 35.555, P < 0.001, \eta^2 = 0.556$	20 μ M erastin vs. control: $P = 0.008$ 20 μ M erastin + fucoidan vs. 20 μ M erastin: 1-50 μ g/ml, $P = 1.000$
FV2	$Z = 0.122, P = 0.017$	$F(9,55) = 3.492, P = 0.002$	$[\chi^2]2(9, N = 65) = 37.982, P < 0.001, \eta^2 = 0.593$	20 μ M erastin vs. control: $P = 0.008$ 20 μ M erastin + fucoidan vs. 20 μ M erastin: 1-50 μ g/ml, $P = 0.899$
FV3	$Z = 0.213, P < 0.001$	$F(9,55) = 3.374, P = 0.002$	$[\chi^2]2(9, N = 65) = 38.937, P < 0.001, \eta^2 = 0.608$	20 μ M erastin vs. control: $P = 0.008$ 20 μ M erastin + fucoidan vs. 20 μ M erastin: 1 μ g/ml: $P = 0.567$, 5-50 μ g/ml: $P = 1.000$
FS	$Z = 0.105, P = 0.099$	$F(9,50) = 2.981,$	$[\chi^2]2(9, N = 60) = 36.363, P < 0.001,$	20 μ M erastin vs. control: $P = 0.008$

		$P = 0.006$	$\eta^2 = 0.616$	20 μM erastin + fucoidan vs. 20 μM erastin: 1 $\mu\text{g/ml}$: $P = 0.109$, 5 $\mu\text{g/ml}$: $P = 0.049$, 10 $\mu\text{g/ml}$: $P = 0.075$, 50 $\mu\text{g/ml}$: $P = 0.016$
FE	$Z = 0.101, P = 0.200$	$F(9,50) = 6.172$, $P < 0.001$	$[\text{chi}]^2(9, N = 60) = 47.236, P < 0.001$, $\eta^2 = 0.801$	20 μM erastin vs. control: $P = 0.008$ 20 μM erastin + fucoidan vs. 20 μM erastin: 1 $\mu\text{g/ml}$: $P = 0.423$, 5 $\mu\text{g/ml}$: $P = 0.109$, 10 $\mu\text{g/ml}$: $P = 0.075$, 50 $\mu\text{g/ml}$: $P = 0.026$
Fuc1	$Z = 0.114, P = 0.050$	$F(9,50) = 2.461$, $P = 0.021$	$[\text{chi}]^2(9, N = 60) = 47.516, P < 0.001$, $\eta^2 = 0.805$	20 μM erastin vs. control: $P = 0.008$ 20 μM erastin + fucoidan vs. 20 μM erastin: 1-5 $\mu\text{g/ml}$: $P = 0.400$, 10 $\mu\text{g/ml}$: $P = 0.100$, 50 $\mu\text{g/ml}$: $P = 0.164$

Table S3. Detailed statistical analyses of ARPE-19 cells exposed to 500 μM H_2O_2 and fucoidan for 24 hours.

	Kolmogorov-Smirnov test	Levené test	Kruskal-Wallis test	Post hoc Mann-Whitney U with Bonferroni-Holm correction
FVs	$Z = 0.199, P < 0.001$	$F(9,50) = 3.572, P = 0.002$	$[\chi^2]2(9, N = 60) = 45.165, P < 0.001, \eta^2 = 0.766$	500 μM H_2O_2 vs. control: $P = 0.010$ 500 μM H_2O_2 + fucoidan vs. 500 μM H_2O_2 : 1-50 $\mu\text{g/ml}$: $P = 1.000$
FVm	$Z = 0.216, P < 0.001$	$F(9,50) = 2.561, P = 0.017$	$[\chi^2]2(9, N = 60) = 47.020, P < 0.001, \eta^2 = 0.797$	500 μM H_2O_2 vs. control: $P = 0.010$ 500 μM H_2O_2 + fucoidan vs. 500 μM H_2O_2 : 1 $\mu\text{g/ml}$: $P = 1.000$, 5 $\mu\text{g/ml}$: $P = 0.313$, 10 $\mu\text{g/ml}$: $P = 0.449$, 50 $\mu\text{g/ml}$: $P = 1.000$
UPm	$Z = 0.154, P < 0.001$	$F(9,50) = 4.056, P = 0.001$	$[\chi^2]2(9, N = 60) = 46.497, P < 0.001, \eta^2 = 0.788$	500 μM H_2O_2 vs. control: $P = 0.010$ 500 μM H_2O_2 + fucoidan vs. 500 μM H_2O_2 : 1 $\mu\text{g/ml}$: $P = 1.000$, 5 $\mu\text{g/ml}$: $P = 0.313$, 10-50 $\mu\text{g/ml}$: $P = 1.000$
FV1	$Z = 0.201, P < 0.001$	$F(9,50) = 2.908, P = 0.008$	$[\chi^2]2(9, N = 60) = 43.350, P < 0.001, \eta^2 = 0.735$	500 μM H_2O_2 vs. control: $P = 0.010$ 500 μM H_2O_2 + fucoidan vs. 500 μM H_2O_2 : 1 $\mu\text{g/ml}$: $P = 0.749$, 5 $\mu\text{g/ml}$: $P = 0.345$, 10 $\mu\text{g/ml}$: $P = 0.164$, 50 $\mu\text{g/ml}$: $P = 0.100$
FV2	$Z = 0.145, P = 0.003$	$F(9,50) = 3.134, P = 0.005$	$[\chi^2]2(9, N = 60) = 45.944, P < 0.001, \eta^2 = 0.779$	500 μM H_2O_2 vs. control: $P = 0.010$ 500 μM H_2O_2 + fucoidan vs. 500 μM H_2O_2 : 1-50 $\mu\text{g/ml}$: $P = 1.000$
FV3	$Z = 0.198, P < 0.001$	$F(9,50) = 2.425, P = 0.023$	$[\chi^2]2(9, N = 60) = 44.866, P < 0.001, \eta^2 = 0.760$	500 μM H_2O_2 vs. control: $P = 0.010$ 500 μM H_2O_2 + fucoidan vs. 500 μM H_2O_2 :

				1-50 µg/ml: $P = 1.000$
FS	$Z = 0.163, P < 0.001$	$F(9,50) = 3.219,$ $P = 0.004$	$[\chi^2]2(9, N = 60) = 45.096, P < 0.001,$ $\eta^2 = 0.764$	500 µM H ₂ O ₂ vs. control: $P = 0.010$ 500 µM H ₂ O ₂ + fucoidan vs. 500 µM H ₂ O ₂ : 1 µg/ml: $P = 0.601$, 5 µg/ml: $P = 0.598$, 10-50 µg/ml: $P = 1.000$
FE	$Z = 0.085, P = 0.200$	$F(9,50) = 4.539,$ $P < 0.001$	$[\chi^2]2(9, N = 60) = 47.391, P < 0.001,$ $\eta^2 = 0.803$	500 µM H ₂ O ₂ vs. control: $P = 0.010$ 500 µM H ₂ O ₂ + fucoidan vs. 500 µM H ₂ O ₂ : 1-10 µg/ml: $P = 1.000$, 50 µg/ml: $P = 0.065$
Fuc1	$Z = 0.139, P = 0.005$	$F(9,50) = 2.693,$ $P = 0.012$	$[\chi^2]2(9, N = 60) = 47.522, P < 0.001,$ $\eta^2 = 0.805$	500 µM H ₂ O ₂ vs. control: $P = 0.010$ 500 µM H ₂ O ₂ + fucoidan vs. 500 µM H ₂ O ₂ : 1-5 µg/ml: $P = 0.328$, 10 µg/ml: $P = 0.337$, 50 µg/ml: $P = 0.219$

Table S4. Detailed statistical analyses of OMM-1 cells exposed to 25 μ M erastin and fucoidan for 48 hours.

	Kolmogorov-Smirnov test	Levené test	Kruskal-Wallis test	Post hoc Mann-Whitney U with Bonferroni-Holm correction
FVs	$Z = 0.131, P = 0.005$	$F(9,60) = 4.144, P < 0.001$	$[\chi^2]2(9, N = 70) = 54.176, P < 0.001, \eta^2 = 0.785$	25 μ M erastin vs. control: $P = 0.004$ 25 μ M erastin + fucoidan vs. 25 μ M erastin: 1 μ g/ml: $P = 0.072$, 5 μ g/ml: $P = 0.105$, 10 μ g/ml: $P = 0.225$, 50 μ g/ml: $P = 0.128$
FVm	$Z = 0.183, P < 0.001$	$F(9,50) = 5.551, P < 0.001$	$[\chi^2]2(9, N = 60) = 49.615, P < 0.001, \eta^2 = 0.841$	25 μ M erastin vs. control: $P = 0.010$ 25 μ M erastin + fucoidan vs. 25 μ M erastin: 1-5 μ g/ml: $P = 0.065$, 10 μ g/ml: $P = 0.525$, 50 μ g/ml: $P = 0.749$
UPm	$Z = 0.190, P < 0.001$	$F(9,60) = 3.473, P = 0.002$	$[\chi^2]2(9, N = 70) = 53.145, P < 0.001, \eta^2 = 0.770$	25 μ M erastin vs. control: $P = 0.004$ 25 μ M erastin + fucoidan vs. 25 μ M erastin: 1-10 μ g/ml: $P = 1.000$, 50 μ g/ml: $P = 0.072$
FV1	$Z = 0.197, P < 0.001$	$F(9,80) = 3.723, P < 0.001$	$[\chi^2]2(9, N = 90) = 69.130, P < 0.001, \eta^2 = 0.777$	25 μ M erastin vs. control: $P < 0.001$ 25 μ M erastin + fucoidan vs. 25 μ M erastin: 1 μ g/ml: $P = 0.825$, 5 μ g/ml: $P = 0.648$, 10 μ g/ml: $P = 0.340$, 50 μ g/ml: $P = 0.648$
FV2	$Z = 0.229, P < 0.001$	$F(9,70) = 3.881, P < 0.001$	$[\chi^2]2(9, N = 80) = 63.329, P < 0.001, \eta^2 = 0.802$	25 μ M erastin vs. control: $P = 0.002$ 25 μ M erastin + fucoidan vs. 25 μ M erastin: 1-10 μ g/ml: $P = 0.345$, 50 μ g/ml: $P = 0.063$
FV3	$Z = 0.197, P < 0.001$	$F(9,70) = 7.136, P < 0.001$	$[\chi^2]2(9, N = 80) = 62.196, P < 0.001, \eta^2 = 0.787$	25 μ M erastin vs. control: $P = 0.002$ 25 μ M erastin + fucoidan vs. 25 μ M erastin:

				1-50 µg/ml: $P = 0.992$
FS	$Z = 0.173, P < 0.001$	$F(9,60) = 2.994,$ $P = 0.005$	$[\chi^2_2(9, N = 70) = 58.165, P < 0.001,$ $\eta^2 = 0.868$	25 µM erastin vs. control: $P = 0.004$ 25 µM erastin + fucoidan vs. 25 µM erastin: 1 µg/ml: $P = 0.812$, 5 µg/ml: $P = 0.478$, 10 µg/ml: $P = 0.812$, 50 µg/ml, $P = 0.101$
FE	$Z = 0.194, P < 0.001$	$F(9,50) = 3.602,$ $P = 0.002$	$[\chi^2_2(9, N = 60) = 52.338, P < 0.001,$ $\eta^2 = 0.887$	25 µM erastin vs. control: $P = 0.010$ 25 µM erastin + fucoidan vs. 25 µM erastin: 1 µg/ml: $P = 0.109$, 5 µg/ml: $P = 0.019$, 10 µg/ml: $P = 0.021$, 50 µg/ml, $P = 0.016$
Fuc1	$Z = 0.149, P = 0.002$	$F(9,50) = 4.641,$ $P < 0.001$	$[\chi^2_2(9, N = 60) = 47.508, P < 0.001,$ $\eta^2 = 0.805$	25 µM erastin vs. control: $P = 0.010$ 25 µM erastin + fucoidan vs. 25 µM erastin: 1 µg/ml: $P = 0.337$, 5 µg/ml: $P = 0.112$, 10 µg/ml: $P = 0.026$, 50 µg/ml, $P = 0.112$

Table S5. Detailed statistical analyses of OMM-1 cells exposed to 250 μM H_2O_2 and fucoidan for 48 hours.

	Kolmogorov-Smirnov test	Levené test	Kruskal-Wallis test	Post hoc Mann-Whitney U with Bonferroni correction at $\alpha = 0.01$
FVs	$Z = 0.172, P < 0.001$	$F(9,60) = 2.931, P = 0.006$	$[\text{chi}]2(9, N = 70) = 53.978, P < 0.001, \eta^2 = 0.782$	250 μM H_2O_2 vs. control: $P = 0.004$ 250 μM H_2O_2 + fucoidan vs. 250 μM H_2O_2 : 1 $\mu\text{g/ml}$: $P = 0.035$, 5-50 $\mu\text{g/ml}$: $P = 0.539$
FVm	$Z = 0.172, P < 0.001$	$F(9,50) = 4.671, P < 0.001$	$[\text{chi}]2(9, N = 60) = 43.561, P < 0.001, \eta^2 = 0.738$	250 μM H_2O_2 vs. control: $P = 0.010$ 250 μM H_2O_2 + fucoidan vs. 250 μM H_2O_2 : 1-50 $\mu\text{g/ml}$: $P = 1.000$
UPm	$Z = 0.231, P < 0.001$	$F(9,60) = 2.652, P = 0.012$	$[\text{chi}]2(9, N = 70) = 54.380, P < 0.001, \eta^2 = 0.788$	250 μM H_2O_2 vs. control: $P = 0.004$ 250 μM H_2O_2 + fucoidan vs. 250 μM H_2O_2 : 1 $\mu\text{g/ml}$: $P = 0.283$, 5 $\mu\text{g/ml}$: $P = 0.051$, 10 $\mu\text{g/ml}$: $P = 0.749$, 50 $\mu\text{g/ml}$, $P = 0.191$
FV1	$Z = 0.218, P < 0.001$	$F(9,80) = 8.801, P < 0.001$	$[\text{chi}]2(9, N = 90) = 67.971, P < 0.001, \eta^2 = 0.764$	250 μM H_2O_2 vs. control: $P < 0.001$ 250 μM H_2O_2 + fucoidan vs. 250 μM H_2O_2 : 1-50 $\mu\text{g/ml}$: $P = 1.000$
FV2	$Z = 0.211, P < 0.001$	$F(9,70) = 3.359, P = 0.002$	$[\text{chi}]2(9, N = 80) = 62.416, P < 0.001, \eta^2 = 0.790$	250 μM H_2O_2 vs. control: $P = 0.002$ 250 μM H_2O_2 + fucoidan vs. 250 μM H_2O_2 : 1-50 $\mu\text{g/ml}$: $P = 0.992$
FV3	$Z = 0.229, P < 0.001$	$F(9,70) = 2.354, P = 0.022$	$[\text{chi}]2(9, N = 80) = 61.882, P < 0.001, \eta^2 = 0.783$	250 μM H_2O_2 vs. control: $P = 0.002$ 250 μM H_2O_2 + fucoidan vs. 250 μM H_2O_2 : 1-50 $\mu\text{g/ml}$: $P = 1.000$

FS	$Z = 0.226, P < 0.001$	$F(9,60) = 2.072,$ $P = 0.046$	$[\chi^2]_2(9, N = 70) = 57.434, P < 0.001,$ $\eta^2 = 0.832$	250 μM H_2O_2 vs. control: $P = 0.004$ 250 μM H_2O_2 + fucoidan vs. 250 μM H_2O_2 : 1-50 $\mu\text{g/ml}$: $P = 1.000$
FE	$Z = 0.232, P < 0.001$	$F(9,50) = 3.764,$ $P = 0.001$	$[\chi^2]_2(9, N = 60) = 49.196, P < 0.001,$ $\eta^2 = 0.834$	250 μM H_2O_2 vs. control: $P = 0.010$ 250 μM H_2O_2 + fucoidan vs. 250 μM H_2O_2 : 1-5 $\mu\text{g/ml}$: $P = 1.000$, 10 $\mu\text{g/ml}$: $P = 0.801$, 50 $\mu\text{g/ml}$: $P = 1.000$
Fuc1	$Z = 0.190, P < 0.001$	$F(9,50) = 5.600,$ $P < 0.001$	$[\chi^2]_2(9, N = 60) = 45.491, P < 0.001,$ $\eta^2 = 0.771$	250 μM H_2O_2 vs. control: $P = 0.010$ 250 μM H_2O_2 + fucoidan vs. 250 μM H_2O_2 : 1-50 $\mu\text{g/ml}$: $P = 1.000$

Table S6. Detailed statistical analyses of HT-22 cells exposed to 0.35 μ M erastin and fucoidan for 24 hours.

	Kolmogorov-Smirnov test	Levené test	Kruskal-Wallis test	Post hoc Mann-Whitney U with Bonferroni-Holm correction
FVs	$Z = 0.205, P < 0.001$	$F(9,50) = 4.001, P = 0.001$	$[\chi^2]2(9, N = 60) = 49.291, P < 0.001, \eta^2 = 0.835$	0.35 μ M erastin vs. control: $P = 0.010$ 0.35 μ M erastin + fucoidan vs. 0.35 μ M erastin: 1-10 μ g/ml: $P = 0.016$, 50 μ g/ml: $P = 0.200$
FVm	$Z = 0.201, P < 0.001$	$F(9,50) = 4.320, P < 0.001$	$[\chi^2]2(9, N = 60) = 44.747, P < 0.001, \eta^2 = 0.809$	0.35 μ M erastin vs. control: $P = 0.010$ 0.35 μ M erastin + fucoidan vs. 0.35 μ M erastin: 1-50 μ g/ml: $P = 1.000$
UPm	$Z = 0.246, P < 0.001$	$F(9,50) = 6.034, P < 0.001$	$[\chi^2]2(9, N = 60) = 46.279, P < 0.001, \eta^2 = 0.784$	0.35 μ M erastin vs. control: $P = 0.010$ 0.35 μ M erastin + fucoidan vs. 0.35 μ M erastin: 1-50 μ g/ml: $P = 1.000$
FV1	$Z = 0.213, P < 0.001$	$F(9,50) = 4.994, P < 0.001$	$[\chi^2]2(9, N = 60) = 49.314, P < 0.001, \eta^2 = 0.836$	0.35 μ M erastin vs. control: $P = 0.010$ 0.35 μ M erastin + fucoidan vs. 0.35 μ M erastin: 1 μ g/ml: $P = 0.525$, 5 μ g/ml: $P = 0.149$, 10 μ g/ml: $P = 0.749$, 50 μ g/ml: $P = 0.149$
FV2	$Z = 0.200, P < 0.001$	$F(9,50) = 3.196, P = 0.004$	$[\chi^2]2(9, N = 60) = 44.811, P < 0.001, \eta^2 = 0.760$	0.35 μ M erastin vs. control: $P = 0.010$ 0.35 μ M erastin + fucoidan vs. 0.35 μ M erastin: 1-50 μ g/ml: $P = 1.000$
FV3	$Z = 0.195, P < 0.001$	$F(9,50) = 1.789, P = 0.094$	$[\chi^2]2(9, N = 60) = 45.782, P < 0.001, \eta^2 = 0.776$	0.35 μ M erastin vs. control: $P = 0.010$ 0.35 μ M erastin + fucoidan vs. 0.35 μ M erastin: 1-50 μ g/ml: $P = 1.000$

FS	$Z = 0.179, P < 0.001$	$F(9,50) = 2.917,$ $P = 0.007$	$[\chi^2_2(9, N = 60) = 44.854, P < 0.001,$ $\eta^2 = 0.760$	0.35 μM erastin vs. control: $P = 0.010$ 0.35 μM erastin + fucoidan vs. 0.35 μM erastin: 1-50 $\mu\text{g/ml}$: $P = 1.000$
FE	$Z = 0.172, P < 0.001$	$F(9,50) = 2.393,$ $P = 0.024$	$[\chi^2_2(9, N = 60) = 45.571, P < 0.001,$ $\eta^2 = 0.772$	0.35 μM erastin vs. control: $P = 0.010$ 0.35 μM erastin + fucoidan vs. 0.35 μM erastin: 1-50 $\mu\text{g/ml}$: $P = 1.000$
Fuc1	$Z = 0.178, P < 0.001$	$F(9,50) = 2.537,$ $P = 0.018$	$[\chi^2_2(9, N = 60) = 46.860, P < 0.001,$ $\eta^2 = 0.794$	0.35 μM erastin vs. control: $P = 0.010$ 0.35 μM erastin + fucoidan vs. 0.35 μM erastin: 1-50 $\mu\text{g/ml}$: $P = 1.000$
Ferrostatin-1	$Z = 0.310, P < 0.001$	$F(3,16) = 7.654,$ $P = 0.002$	$[\chi^2_2(3, N = 20) = 15.275, P = 0.002,$ $\eta^2 = 0.804$	0.35 μM erastin vs. control: $P = 0.011$ 0.35 μM erastin + ferrostatin-1 vs. 0.35 μM erastin: $P = 0.011$

Table S7. Detailed statistical analyses of SH-SY5Y cells exposed to 30 μ M erastin and fucoidan for 24 hours.

	Kolmogorov-Smirnov test	Levené test	Kruskal-Wallis test	Post hoc Mann-Whitney U with Bonferroni-Holm correction
FVs	$Z = 0.260, P < 0.001$	$F(9,50) = 1.818, P = 0.088$	$[\chi^2]2(9, N = 60) = 47.225, P < 0.001, \eta^2 = 0.800$	30 μ M erastin vs. control: $P = 0.010$ 30 μ M erastin + fucoidan vs. 30 μ M erastin: 1-5 μ g/ml: $P = 0.313$, 10 μ g/ml: $P = 0.631$, 50 μ g/ml: $P = 0.458$
FVm	$Z = 0.180, P < 0.001$	$F(9,50) = 2.680, P = 0.013$	$[\chi^2]2(9, N = 60) = 48.297, P < 0.001, \eta^2 = 0.819$	30 μ M erastin vs. control: $P = 0.010$ 30 μ M erastin + fucoidan vs. 30 μ M erastin: 1-50 μ g/ml: $P = 0.598$
UPm	$Z = 0.216, P < 0.001$	$F(9,50) = 7.232, P < 0.001$	$[\chi^2]2(9, N = 60) = 48.985, P < 0.001, \eta^2 = 0.830$	30 μ M erastin vs. control: $P = 0.010$ 30 μ M erastin + fucoidan vs. 30 μ M erastin: 1 μ g/ml: $P = 0.601$, 5-10 μ g/ml: $P = 0.673$, 50 μ g/ml: $P = 0.313$
FV1	$Z = 0.255, P < 0.001$	$F(9,50) = 2.505, P = 0.019$	$[\chi^2]2(9, N = 60) = 47.787, P < 0.001, \eta^2 = 0.810$	30 μ M erastin vs. control: $P = 0.010$ 30 μ M erastin + fucoidan vs. 30 μ M erastin: 1 μ g/ml: $P = 0.078$, 5-10 μ g/ml: $P = 0.075$, 50 μ g/ml: $P = 0.065$
FV2	$Z = 0.208, P < 0.001$	$F(9,50) = 4.117, P = 0.001$	$[\chi^2]2(9, N = 60) = 45.144, P < 0.001, \eta^2 = 0.765$	30 μ M erastin vs. control: $P = 0.010$ 30 μ M erastin + fucoidan vs. 30 μ M erastin: 1-50 μ g/ml: $P = 1.000$
FV3	$Z = 0.237, P < 0.001$	$F(9,50) = 2.059, P = 0.052$	$[\chi^2]2(9, N = 60) = 45.781, P < 0.001, \eta^2 = 0.776$	30 μ M erastin vs. control: $P = 0.010$ 30 μ M erastin + fucoidan vs. 30 μ M erastin: 1-50 μ g/ml: $P = 1.000$
FS	$Z = 0.224, P < 0.001$	$F(9,50) = 3.730, P = 0.001$	$[\chi^2]2(9, N = 60) = 46.224, P < 0.001, \eta^2 = 0.776$	30 μ M erastin vs. control: $P = 0.010$

		$P = 0.001$	$\eta^2 = 0.783$	30 μM erastin + fucoidan vs. 30 μM erastin: 1-50 $\mu\text{g/ml}$: $P = 1.000$
FE	$Z = 0.201, P < 0.001$	$F(9,50) = 3.075,$ $P = 0.005$	$[\text{chi}]2(9, N = 60) = 47.749, P < 0.001,$ $\eta^2 = 0.809$	30 μM erastin vs. control: $P = 0.010$ 30 μM erastin + fucoidan vs. 30 μM erastin: 1-50 $\mu\text{g/ml}$: $P = 1.000$
Fuc1	$Z = 0.210, P < 0.001$	$F(9,50) = 3.218,$ $P = 0.004$	$[\text{chi}]2(9, N = 60) = 48.272, P < 0.001,$ $\eta^2 = 0.818$	30 μM erastin vs. control: $P = 0.010$ 30 μM erastin + fucoidan vs. 30 μM erastin: 1-10 $\mu\text{g/ml}$: $P = 1.000$, 50 $\mu\text{g/ml}$: $P = 0.801$
Ferrostatin-1	$Z = 0.257, P = 0.001$	$F(3,16) = 3.492,$ $P = 0.040$	$[\text{chi}]2(3, N = 20) = 16.459, P = 0.001,$ $\eta^2 = 0.866$	30 μM erastin vs. control: $P = 0.011$ 30 μM erastin + ferrostatin-1 vs. 30 μM erastin: $P = 0.465$

Table S8. Detailed statistical analyses of primary cortical neurons exposed to 0.5 μ M erastin and fucoidan for 24 hours.

	Kolmogorov-Smirnov test	Levené test	Kruskal-Wallis test	Post hoc Mann-Whitney U with Bonferroni-Holm correction
FVs	$Z = 0.211, P < 0.001$	$F(9,50) = 2.161, P = 0.041$	$[\chi^2]2(9, N = 60) = 45.233, P < 0.001, \eta^2 = 0.767$	0.5 μ M erastin vs. control: $P = 0.010$ 0.5 μ M erastin + fucoidan vs. 0.5 μ M erastin: 0.1-5 μ g/ml: $P = 0.437$
FVm	$Z = 0.210, P < 0.001$	$F(9,50) = 2.628, P = 0.014$	$[\chi^2]2(9, N = 60) = 46.032, P < 0.001, \eta^2 = 0.780$	0.5 μ M erastin vs. control: $P = 0.010$ 0.5 μ M erastin + fucoidan vs. 0.5 μ M erastin: 0.1-5 μ g/ml: $P = 1.000$
UPm	$Z = 0.211, P < 0.001$	$F(9,50) = 3.081, P = 0.005$	$[\chi^2]2(9, N = 60) = 46.690, P < 0.001, \eta^2 = 0.791$	0.5 μ M erastin vs. control: $P = 0.010$ 0.5 μ M erastin + fucoidan vs. 0.5 μ M erastin: 0.1 μ g/ml: $P = 0.749$, 0.5-1 μ g/ml: $P = 0.449$, 5 μ g/ml: $P = 0.313$
FV1	$Z = 0.147, P = 0.003$	$F(9,50) = 2.167, P = 0.041$	$[\chi^2]2(9, N = 60) = 45.190, P < 0.001, \eta^2 = 0.766$	0.5 μ M erastin vs. control: $P = 0.010$ 0.5 μ M erastin + fucoidan vs. 0.5 μ M erastin: 0.1-5 μ g/ml: $P = 1.000$
FV2	$Z = 0.135, P = 0.008$	$F(9,50) = 2.879, P = 0.008$	$[\chi^2]2(9, N = 60) = 44.990, P < 0.001, \eta^2 = 0.763$	0.5 μ M erastin vs. control: $P = 0.010$ 0.5 μ M erastin + fucoidan vs. 0.5 μ M erastin: 0.1-5 μ g/ml: $P = 1.000$
FV3	$Z = 0.183, P < 0.001$	$F(9,50) = 3.958, P = 0.001$	$[\chi^2]2(9, N = 60) = 46.217, P < 0.001, \eta^2 = 0.783$	0.5 μ M erastin vs. control: $P = 0.010$ 0.5 μ M erastin + fucoidan vs. 0.5 μ M erastin: 0.1-5 μ g/ml: $P = 1.000$
FS	$Z = 0.161, P = 0.001$	$F(9,50) = 1.698,$	$[\chi^2]2(9, N = 60) = 43.851, P < 0.001,$	0.5 μ M erastin vs. control: $P = 0.010$

		$P = 0.114$	$\eta^2 = 0.743$	0.5 μM erastin + fucoidan vs. 0.5 μM erastin: 0.1-5 $\mu\text{g/ml}$: $P = 1.000$
FE	$Z = 0.186, P < 0.001$	$F(9,50) = 2.444,$ $P = 0.022$	$[\chi^2]2(9, N = 60) = 46.595, P < 0.001,$ $\eta^2 = 0.790$	0.5 μM erastin vs. control: $P = 0.010$ 0.5 μM erastin + fucoidan vs. 0.5 μM erastin: 0.1-0.5 $\mu\text{g/ml}$: $P = 0.112$, 1 $\mu\text{g/ml}$: $P = 0.065$, 5 $\mu\text{g/ml}$: $P = 0.423$
Fuc1	$Z = 0.200, P < 0.001$	$F(9,50) = 2.877,$ $P = 0.008$	$[\chi^2]2(9, N = 60) = 48.351, P < 0.001,$ $\eta^2 = 0.820$	0.5 μM erastin vs. control: $P = 0.010$ 0.5 μM erastin + fucoidan vs. 0.5 μM erastin: 0.1-0.5 $\mu\text{g/ml}$: $P = 0.847$, 1 $\mu\text{g/ml}$: $P = 0.328$, 5 $\mu\text{g/ml}$: $P = 0.149$
Ferrostatin-1	$Z = 0.212, P = 0.019$	$F(3,16) = 20.026,$ $P < 0.001$	$[\chi^2]2(3, N = 20) = 13.489, P = 0.004,$ $\eta^2 = 0.710$	0.5 μM erastin vs. control: $P = 0.011$ 0.5 μM erastin + ferrostatin-1 vs. 0.5 μM erastin: $P = 0.011$