Bayesian modelling results from 'The role of ligand-gated chloride channels in behavioural alterations at elevated CO_2 in a cephalopod'

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31 May, 2021

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Gabazine Experiment

Estimate Tables

Outputs from the chosen model for each response variable. Estimate = Bayesian posterior median value on the response scale (i.e. estimates have been backtransformed where appropriate and are in the units of the response variable), lower HPDI = lower 95% highest posterior density interval, upper HPDI = upper 95% highest posterior density interval. The chosen model for each response variable, including explanatory variables, distribution family and link function are also shown.

Space Use

Time in Zone A (s) ~ CO2 * Drug, Gaussian (identity)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	386.05	168.49	604.23
Ambient	Gabazine	441.34	212.27	648.70
Elevated	Sham	670.18	443.31	893.38
Elevated	Gabazine	362.83	184.58	563.83

No. of visits to Zone A ~ CO2 * Drug + Mantle length, Negative binomial (log)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	14.99	7.01	29.10
Ambient	Gabazine	5.61	2.64	10.34
Elevated	Sham	3.57	1.73	6.57
Elevated	Gabazine	5.75	2.97	10.00

Soft mirror touch

Proportion of squid that touched mirror softly ~ CO2 * Drug, Binomial (logit)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	0.59	0.39	0.78
Ambient	Gabazine	0.46	0.26	0.65
Elevated	Sham	0.54	0.34	0.74
Elevated	Gabazine	0.48	0.28	0.68

Latency to first soft mirror touch (s) ~ CO2 * Drug, Gamma (log)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	107.69	48.39	217.69
Ambient	Gabazine	178.55	69.22	374.23
Elevated	Sham	72.52	30.50	149.48
Elevated	Gabazine	146.82	60.08	313.83

No. of soft mirror touches ~ CO2 * Drug + Behavioural tank + Time of test, Negative binomial (log)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	13.33	6.63	24.81
Ambient	Gabazine	33.00	15.38	63.95
Elevated	Sham	26.98	11.86	49.54
Elevated	Gabazine	38.75	18.09	73.62

Aggressive mirror touch

Proportion of squid that touched mirror aggressively ~ CO2 * Drug, Binomial (logit)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	0.31	0.14	0.52
Ambient	Gabazine	0.41	0.23	0.61
Elevated	Sham	0.45	0.25	0.66
Elevated	Gabazine	0.48	0.29	0.69

Latency to first aggressive mirror touch (s) ~ CO2 * Drug + Behavioural tank + Time of test, Gamma (log)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	30.83	9.77	75.57
Ambient	Gabazine	235.32	99.95	483.33
Elevated	Sham	48.94	19.83	101.18
Elevated	Gabazine	97.85	40.87	196.26

No. of aggressive mirror touches ~ CO2 * Drug, Negative binomial (log)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	11.93	5.19	23.50
Ambient	Gabazine	13.56	7.02	23.80
Elevated	Sham	29.59	15.69	52.21
Elevated	Gabazine	45.34	24.33	76.39

Activity

Active time (s) ~ CO2 * Drug, Gamma (log)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	161.46	100.99	243.73
Ambient	Gabazine	162.42	101.00	242.28
Elevated	Sham	228.23	141.65	334.04
Elevated	Gabazine	319.03	212.37	453.75

Total distance moved (cm) ~ CO2 * Drug, Gamma (log)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	359.97	203.95	569.06
Ambient	Gabazine	389.16	233.29	624.39
Elevated	Sham	566.61	338.89	896.77
Elevated	Gabazine	872.17	545.24	1310.09

Average speed (cm/s) ~ CO2 * Drug, Gaussian (identity)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	2.07	1.74	2.39
Ambient	Gabazine	2.20	1.86	2.52
Elevated	Sham	2.32	2.00	2.63
Elevated	Gabazine	2.41	2.15	2.71

Contrast Tables

Effect size for each contrast, from the chosen model for each response variable. Estimate = median effect size (an odds ratio for proportion data or a fold-change for all others, 1 means no effect), Lower HPDI = lower 95% highest posterior density interval, Upper HPDI = upper 95% highest posterior density interval, Prob = probability of the effect occurring as a percentage, Prob(20%) = probability of a larger than 20% effect occurring as a percentage (i.e. probability of an effect < 0.8 or > 1.2 fold-change/odds ratio). The chosen model for each response variable, including explanatory variables, distribution family and link function are also shown.

Space Use

Time in Zone A (s) ~ CO2 * Drug, Gaussian (identity)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.74	0.72	3.55	95.9	88.0
Gabazine - Sham	Ambient	1.15	0.35	2.47	64.4	45.8
Gabazine - Sham	Elevated	0.54	0.22	0.94	97.5	89.8
Interaction	-	0.47	0.07	1.11	93.3	86.4

No. of visits to Zone A ~ CO2 * Drug + Mantle length, Negative binomial (log)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	0.24	0.06	0.55	99.9	99.2
Gabazine - Sham	Ambient	0.37	0.11	0.85	97.7	94.3
Gabazine - Sham	Elevated	1.63	0.48	3.34	86.5	75.8
Interaction	-	4.35	0.73	12.70	98.8	97.7

Soft mirror touch

Proportion of squid that touched mirror softly ~ CO2 * Drug, Binomial (logit)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	0.82	0.12	2.30	62.2	48.0
Gabazine - Sham	Ambient	0.57	0.11	1.59	82.1	71.3
Gabazine - Sham	Elevated	0.76	0.13	2.13	66.9	53.2
Interaction	-	1.34	0.09	5.57	63.2	55.4

Latency to first soft mirror touch (s) ~ CO2 * Drug, Gamma (log)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	0.67	0.16	1.67	77.9	63.2
Gabazine - Sham	Ambient	1.66	0.36	4.16	83.2	73.5
Gabazine - Sham	Elevated	2.03	0.38	5.37	89.8	82.3
Interaction	-	1.22	0.08	4.55	60.3	51.1

No. of soft mirror touches ~ CO2 * Drug + Behavioural tank + Time of test, Negative binomial (log)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	2.02	0.63	4.53	93.2	87.1
Gabazine - Sham	Ambient	2.48	0.64	5.63	97.1	93.4
Gabazine - Sham	Elevated	1.44	0.43	3.22	78.7	65.5
Interaction	-	0.58	0.06	1.74	78.9	68.4

Aggressive mirror touch

Proportion of squid that touched mirror aggressively ~ CO2 * Drug, Binomial (logit)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.82	0.31	5.47	83.2	75.0
Gabazine - Sham	Ambient	1.54	0.28	4.55	75.9	65.6
Gabazine - Sham	Elevated	1.11	0.18	2.95	57.4	45.1
Interaction	-	0.72	0.04	2.95	65.0	54.8

Latency to first aggressive mirror touch (s) ~ CO2 * Drug + Behavioural tank + Time of test, Gamma (log)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.60	0.17	4.44	76.5	67.1
Gabazine - Sham	Ambient	7.64	0.86	19.95	99.8	99.6
Gabazine - Sham	Elevated	2.03	0.44	4.78	91.3	84.8
Interaction	-	0.26	0.02	1.07	94.2	90.9

No. of aggressive mirror touches ~ CO2 * Drug, Negative binomial (log)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	2.50	0.64	5.43	97.3	94.2
Gabazine - Sham	Ambient	1.14	0.30	2.49	61.5	46.1
Gabazine - Sham	Elevated	1.53	0.61	3.07	85.7	72.9
Interaction	-	1.35	0.21	3.78	68.6	57.4

Activity

Active time (s) ~ CO2 * Drug, Gamma (log)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.41	0.67	2.37	87.8	71.7
Gabazine - Sham	Ambient	1.01	0.46	1.69	50.7	28.6
Gabazine - Sham	Elevated	1.40	0.73	2.31	88.7	71.2
Interaction	-	1.40	0.50	2.85	78.9	64.3

Total distance moved (cm) ~ CO2 * Drug, Gamma (log)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.57	0.69	2.88	90.3	78.2
Gabazine - Sham	Ambient	1.08	0.47	2.00	57.8	38.7
Gabazine - Sham	Elevated	1.54	0.67	2.71	90.7	77.6
Interaction	-	1.43	0.39	3.13	76.9	64.3

Average speed (cm/s) ~ CO2 * Drug, Gaussian (identity)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.12	0.90	1.38	86.8	26.1
Gabazine - Sham	Ambient	1.06	0.83	1.29	71.2	13.2
Gabazine - Sham	Elevated	1.04	0.86	1.25	66.6	6.1
Interaction	-	0.98	0.74	1.29	55.9	8.1

Picrotoxin Experiment

Estimate Tables

Outputs from the chosen model for each response variable. Estimate = Bayesian posterior median value on the response scale (i.e. estimates have been backtransformed where appropriate and are in the units of the response variable), lower HPDI = lower 95% highest posterior density interval, upper HPDI = upper 95% highest posterior density interval. The chosen model for each response variable, including explanatory variables, distribution family and link function are also shown.

Space Use

Time in Zone A (s) ~ CO2 * Drug + Behavioural tank + Time of test, Gaussian (identity)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	409.36	247.23	590.38
Ambient	Picrotoxin	577.12	411.64	735.09
Elevated	Sham	529.07	369.82	680.80
Elevated	Picrotoxin	558.01	409.18	701.63

No. of visits to Zone A ~ CO2 * Drug + System, Negative binomial (log)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	10.53	6.10	16.41
Ambient	Picrotoxin	13.40	7.59	21.30
Elevated	Sham	9.89	6.00	15.54
Elevated	Picrotoxin	8.35	5.08	12.92

Soft mirror touch

Proportion of squid that touched mirror softly ~ CO2 * Drug, Binomial (logit)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	0.29	0.14	0.46
Ambient	Picrotoxin	0.54	0.36	0.73
Elevated	Sham	0.50	0.30	0.68
Elevated	Picrotoxin	0.70	0.51	0.86

Latency to first soft mirror touch (s) ~ CO2 * Drug, Gamma (log)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	257.28	102.99	566.94
Ambient	Picrotoxin	140.54	72.57	257.00
Elevated	Sham	75.77	37.10	137.01
Elevated	Picrotoxin	203.24	113.37	342.22

No. of soft mirror touches ~ CO2 * Drug + Mantle length, Negative binomial (log)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	32.07	12.17	73.63
Ambient	Picrotoxin	17.51	8.50	32.41
Elevated	Sham	49.09	23.58	87.05
Elevated	Picrotoxin	33.39	18.43	55.11

Aggressive mirror touch

Proportion of squid that touched mirror aggressively ~ CO2 * Drug, Binomial (logit)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	0.25	0.11	0.43
Ambient	Picrotoxin	0.34	0.18	0.53
Elevated	Sham	0.50	0.32	0.69
Elevated	Picrotoxin	0.50	0.31	0.68

Latency to first aggressive mirror touch (s) ~ CO2 * Drug + System, Gamma (log)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	108.14	37.10	259.64
Ambient	Picrotoxin	84.77	32.49	180.79
Elevated	Sham	201.83	94.39	372.86
Elevated	Picrotoxin	142.08	69.73	269.42

No. of aggressive mirror touches ~ CO2 * Drug + Number of acclimation days + Date introduced to treatment tank, Negative binomial (log)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	9.68	4.24	18.01
Ambient	Picrotoxin	20.96	10.46	37.63
Elevated	Sham	17.44	9.85	28.64
Elevated	Picrotoxin	30.78	18.23	48.21

Activity

Active time (s) ~ CO2 * Drug, Gaussian (identity)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	258.35	180.93	332.51
Ambient	Picrotoxin	333.48	252.54	411.87
Elevated	Sham	316.12	244.21	388.50
Elevated	Picrotoxin	333.89	263.48	402.61

Total distance moved (cm) ~ CO2 * Drug, Gaussian (identity)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	613.46	355.60	857.79
Ambient	Picrotoxin	892.76	638.87	1178.31
Elevated	Sham	833.91	593.75	1088.21
Elevated	Picrotoxin	975.98	741.45	1221.64

Average speed (cm/s) ~ CO2 * Drug, Gaussian (identity)

CO2	Drug	Estimate	Lower HPDI	Upper HPDI
Ambient	Sham	2.21	1.94	2.47
Ambient	Picrotoxin	2.53	2.28	2.81
Elevated	Sham	2.42	2.18	2.68
Elevated	Picrotoxin	2.81	2.57	3.06

Contrast Tables

Effect size for each contrast, from the chosen model for each response variable. Estimate = median effect size (an odds ratio for proportion data or a fold-change for all others, 1 means no effect), Lower HPDI = lower 95% highest posterior density interval, Upper HPDI = upper 95% highest posterior density interval, Prob = probability of the effect occurring as a percentage, Prob(20%) = probability of a larger than 20% effect occurring as a percentage (i.e. probability of an effect < 0.8 or > 1.2 fold-change/odds ratio). The chosen model for each response variable, including explanatory variables, distribution family and link function are also shown.

Space Use

Time in Zone A (s) ~ CO2 * Drug + Behavioural tank + Time of test, Gaussian (identity)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.29	0.71	2.16	83.6	60.8
Picrotoxin - Sham	Ambient	1.41	0.84	2.36	91.8	73.6
Picrotoxin - Sham	Elevated	1.06	0.67	1.56	60.6	26.5
Interaction	-	0.75	0.32	1.30	80.8	57.5

No. of visits to Zone A ~ CO2 * Drug + System, Negative binomial (log)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	0.95	0.42	1.70	56.7	31.5
Picrotoxin - Sham	Ambient	1.28	0.53	2.26	75.9	57.4
Picrotoxin - Sham	Elevated	0.84	0.38	1.50	69.7	44.1
Interaction	-	0.66	0.21	1.49	80.9	65.8

Soft mirror touch

Proportion of squid that touched mirror softly ~ CO2 * Drug, Binomial (logit)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	2.44	0.47	6.52	94.4	89.6
Picrotoxin - Sham	Ambient	2.88	0.58	7.85	96.9	93.6
Picrotoxin - Sham	Elevated	2.31	0.51	6.28	92.2	86.5
Interaction	-	0.81	0.06	3.21	60.8	49.4

Latency to first soft mirror touch (s) ~ CO2 * Drug, Gamma (log)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	0.30	0.06	0.70	99.0	97.5
Picrotoxin - Sham	Ambient	0.55	0.09	1.28	88.4	77.0
Picrotoxin - Sham	Elevated	2.69	0.86	5.46	98.8	96.7
Interaction	-	4.89	0.53	15.33	99.1	98.1

No. of soft mirror touches ~ CO2 * Drug + Mantle length, Negative binomial (log)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.53	0.38	3.71	78.9	67.4
Picrotoxin - Sham	Ambient	0.54	0.12	1.35	86.7	75.9
Picrotoxin - Sham	Elevated	0.68	0.22	1.35	82.5	65.0
Interaction	-	1.25	0.18	4.21	62.4	52.8

Aggressive mirror touch

Proportion of squid that touched mirror aggressively ~ CO2 * Drug, Binomial (logit)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	3.01	0.49	8.45	97.2	94.3
Picrotoxin - Sham	Ambient	1.53	0.24	4.28	75.9	65.6
Picrotoxin - Sham	Elevated	0.98	0.22	2.57	51.4	36.0
Interaction	-	0.64	0.04	2.56	70.7	61.1

Latency to first aggressive mirror touch (s) ~ CO2 * Drug + System, Gamma (log)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.85	0.41	4.60	86.0	78.0
Picrotoxin - Sham	Ambient	0.78	0.16	2.01	67.5	52.5
Picrotoxin - Sham	Elevated	0.70	0.20	1.55	78.5	62.4
Interaction	-	0.91	0.09	3.12	55.5	43.3

No. of aggressive mirror touches ~ CO2 * Drug + Number of acclimation days + Date introduced to treatment tank, Negative binomial (log)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.79	0.65	3.32	93.3	85.1
Picrotoxin - Sham	Ambient	2.16	0.58	4.54	95.6	90.7
Picrotoxin - Sham	Elevated	1.77	0.72	3.36	93.8	85.4
Interaction	-	0.82	0.19	2.08	64.9	48.1

Activity

Active time (s) ~ CO2 * Drug, Gaussian (identity)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.23	0.79	1.76	86.6	54.6
Picrotoxin - Sham	Ambient	1.29	0.83	1.86	91.6	65.1
Picrotoxin - Sham	Elevated	1.06	0.73	1.41	63.5	21.1
Interaction	-	0.82	0.45	1.27	79.5	46.4

Total distance moved (cm) ~ CO2 * Drug, Gaussian (identity)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.36	0.73	2.28	88.9	69.4
Picrotoxin - Sham	Ambient	1.46	0.76	2.41	93.4	78.1
Picrotoxin - Sham	Elevated	1.17	0.76	1.70	78.9	44.4
Interaction	-	0.80	0.34	1.45	75.3	51.0

Average speed (cm/s) ~ CO2 * Drug, Gaussian (identity)

Contrast	Treatment	Estimate	Lower HPDI	Upper HPDI	Prob	Prob(20%)
Elevated - Ambient	Sham	1.10	0.93	1.28	87.4	13.2
Picrotoxin - Sham	Ambient	1.14	0.96	1.34	95.2	28.2
Picrotoxin - Sham	Elevated	1.16	1.01	1.33	98.3	29.6
Interaction	-	1.01	0.81	1.24	54.4	5.7