

# Investigation of Weather Triggers Preceding Outbreaks of Acute Bovine Liver Disease in Australia

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**Table S1.** Weather dataset for the 15-days preceding an outbreak of acute bovine liver disease in the outbreak year (0) and two preceding years (-1, -2) when no outbreak occurred, inclusive of property and outbreak identification, and outbreak date. Abbreviations: avg, average; cum, cumulative; DP, dewpoint (degrees Celsius; °C); OID, outbreak identification; Odate, outbreak date; PID, property identification; prec, precipitation (millimetres; mm); sol, solar exposure (Joule(s) per square metre; MJ/m<sup>2</sup>); Tmax, maximum temperature (degrees Celsius; °C); Tmin, minimum temperature (degrees Celsius; °C); Tmin-DP, average of daily minimum and dewpoint at 9am temperature gap (degrees Celsius; °C).

PID	OID	Odate	Case	Year	Tmin (avg)	Tmax (avg)	Prec (avg)	Prec (cum)	Sol (avg)	Sol (cum)	DP 0900 (avg)	DP 1500 (avg)	Tmin-DP	Tmax-DP
A	1	20/2/2008	1	0	8.55	20.46	0.49	7.42	12.03	180.49	10.69	9.71	-2.14	10.75
A	1	20/2/2008	0	-1	9.63	22.82	0.08	1.25	12.97	194.57	9.77	8.82	-0.14	14.00
A	1	20/2/2008	0	-2	8.71	17.29	1.96	29.41	9.56	133.90	8.17	7.57	0.54	9.72
B	2	17/5/2017	1	0	9.49	18.02	0.73	10.96	8.23	123.42	10.10	10.26	-0.61	7.76
B	2	17/5/2017	0	-1	11.45	19.13	1.45	21.70	7.18	107.67	11.70	12.10	-0.25	7.02
B	2	17/5/2017	0	-2	8.86	15.65	3.27	49.03	6.60	92.39	9.24	9.58	-0.38	6.07
C	3	31/3/2010	1	0	13.06	23.71	1.09	16.35	12.66	189.93	12.83	13.09	0.23	10.62
C	3	31/3/2010	0	-1	10.21	23.21	0.54	8.09	15.80	236.98	10.34	9.65	-0.13	13.56
C	3	31/3/2010	0	-2	11.34	23.95	1.63	24.51	14.42	216.32	10.08	9.45	1.26	14.51
D	4	1/4/2010	1	0	13.43	24.33	1.66	24.97	12.60	189.06	13.48	13.42	-0.06	10.91
D	4	1/4/2010	0	-1	11.87	23.42	4.23	63.40	17.05	255.82	13.24	12.71	-1.38	10.71
D	4	1/4/2010	0	-2	12.72	23.18	1.66	24.97	13.61	204.14	12.67	13.04	0.04	10.14
E	5	20/4/2010	1	0	12.37	19.82	2.25	33.79	8.60	128.95	12.08	12.49	0.29	7.33
E	5	20/4/2010	0	-1	8.92	18.90	1.26	18.85	12.01	180.22	10.55	10.10	-1.62	8.80
E	5	20/4/2010	0	-2	9.22	20.56	0.59	8.91	12.43	186.44	11.11	10.38	-1.90	10.19
E	6	20/4/2010	1	0	13.05	20.27	2.24	33.58	8.56	128.40	12.33	12.81	0.73	7.46
E	6	20/4/2010	0	-1	9.73	19.27	1.31	19.67	12.19	182.87	10.84	10.47	-1.12	8.80
E	6	20/4/2010	0	-2	9.99	20.96	0.64	9.61	12.62	189.29	11.40	10.79	-1.41	10.17
F	7	23/4/2010	1	0	12.03	20.39	1.65	24.74	8.91	133.67	12.37	12.61	-0.34	7.79
F	7	23/4/2010	0	-1	8.14	20.62	0.82	12.31	13.10	196.52	10.19	9.51	-2.06	11.12
F	7	23/4/2010	0	-2	8.44	20.95	0.22	3.24	11.75	176.31	10.61	9.67	-2.17	11.28
G	8	10/3/2011	1	0	12.98	21.44	1.15	17.28	17.01	255.15	11.45	12.92	1.53	8.52
G	8	10/3/2011	0	-1	13.30	22.40	2.16	32.38	17.79	266.89	12.25	12.80	1.05	9.61
G	8	10/3/2011	0	-2	12.03	22.66	0.85	12.78	17.23	258.45	10.66	11.28	1.37	11.38

H	9	26/4/2011	1	0	9.73	18.08	5.61	84.14	10.25	153.69	11.75	12.08	-2.01	6.00
H	9	26/4/2011	0	-1	13.01	20.37	2.13	31.91	9.27	139.00	12.14	12.59	0.87	7.78
H	9	26/4/2011	0	-2	9.74	20.62	2.15	32.21	11.53	173.02	10.42	10.42	-0.68	10.20
I	10	21/5/2013	1	0	8.86	19.62	1.55	23.30	9.94	149.17	8.79	7.46	0.07	12.16
I	10	21/5/2013	0	-1	8.59	17.67	1.88	28.26	8.33	124.99	8.83	8.67	-0.24	9.00
I	10	21/5/2013	0	-2	8.22	15.30	2.67	40.01	6.41	96.09	7.62	7.83	0.60	7.47
J	11	9/6/2013	1	0	8.19	15.72	2.17	32.61	5.88	88.14	9.40	9.72	-1.21	6.00
J	11	9/6/2013	0	-1	7.03	13.77	3.11	46.63	5.25	78.79	8.11	8.61	-1.08	5.15
J	11	9/6/2013	0	-2	5.66	13.88	1.69	25.30	5.97	89.50	7.07	7.54	-1.41	6.34
J	12	6/7/2013	1	0	5.46	14.49	0.97	14.49	6.18	92.74	6.88	8.16	-1.42	6.33
J	12	6/7/2013	0	-1	5.40	12.05	3.09	46.29	5.57	83.59	6.52	7.15	-1.12	4.90
J	12	6/7/2013	0	-2	6.17	14.20	3.22	48.37	5.86	87.84	6.72	8.06	-0.54	6.14
K	13	19/4/2014	1	0	8.08	16.70	9.57	143.60	9.04	135.65	10.01	10.56	-1.93	6.15
K	13	19/4/2014	0	-1	7.72	19.07	1.13	16.99	11.98	179.69	9.22	9.85	-1.48	9.23
K	13	19/4/2014	0	-2	6.85	18.66	0.72	10.74	14.60	219.04	8.56	9.24	-1.36	9.42
L	14	24/4/2014	1	0	10.49	19.56	2.57	38.50	9.55	143.25	12.19	11.28	-1.71	8.27
L	14	24/4/2014	0	-1	8.59	20.43	0.57	8.50	10.97	164.48	10.21	8.24	-1.61	12.19
L	14	24/4/2014	0	-2	10.08	21.88	0.89	13.31	12.42	186.29	10.92	9.32	-0.80	12.71
M	15	25/4/2014	1	0	11.13	17.96	2.62	39.28	10.46	156.90	11.74	11.08	-0.61	6.89
M	15	25/4/2014	0	-1	9.80	18.41	1.03	15.48	9.77	146.61	9.94	8.99	-0.14	9.42
M	15	25/4/2014	0	-2	11.11	20.01	2.44	36.60	11.30	169.52	11.36	10.41	-0.20	9.61
N	16	4/6/2014	1	0	8.98	17.34	2.04	30.54	5.82	87.33	11.28	11.87	-2.30	5.48
N	16	4/6/2014	0	-1	7.19	15.90	1.85	27.78	5.91	88.71	9.08	9.61	-1.89	6.29
N	16	4/6/2014	0	-2	6.76	14.70	2.57	38.60	5.91	88.61	7.99	8.19	-1.23	6.50
O	17	20/4/2015	1	0	9.92	19.23	1.81	27.16	11.46	171.90	11.65	11.02	-1.73	8.21
O	17	20/4/2015	0	-1	12.53	20.26	2.18	32.68	10.75	161.22	13.41	13.15	-0.87	7.11
O	17	20/4/2015	0	-2	10.61	20.39	0.78	11.70	12.12	181.80	11.93	11.85	-1.52	8.54
P	18	23/11/2017	1	0	10.62	24.75	0.35	5.26	24.95	374.18	13.00	12.43	-2.39	12.33
P	18	23/11/2017	0	-1	9.90	20.73	1.64	24.56	19.67	295.04	10.68	10.89	-0.78	9.84
P	18	23/11/2017	0	-2	9.20	22.15	1.59	23.82	20.60	309.01	10.93	10.99	-1.72	11.16
Q	19	21/4/2018	1	0	10.43	22.47	1.78	26.67	11.07	166.06	10.94	10.12	-0.52	12.35
Q	19	21/4/2018	0	-1	9.58	20.49	1.81	27.20	10.16	152.35	9.81	10.14	-0.23	10.36
Q	19	21/4/2018	0	-2	10.00	20.27	1.45	21.72	10.80	161.98	11.15	10.60	-1.16	9.67
R	20	21/5/2018	1	0	7.61	14.97	4.33	64.96	6.81	102.14	9.11	8.42	-1.50	6.55
R	20	21/5/2018	0	-1	5.60	15.58	1.20	18.02	7.42	111.30	8.73	9.34	-3.13	6.24
R	20	21/5/2018	0	-2	10.19	18.01	4.47	67.05	7.40	111.02	11.06	10.84	-0.87	7.17
S	21	21/5/2018	1	0	7.61	14.97	4.33	64.96	6.81	102.14	9.11	8.42	-1.50	6.55
S	21	21/5/2018	0	-1	5.60	15.58	1.20	18.02	7.42	111.30	8.73	9.34	-3.13	6.24
S	21	21/5/2018	0	-2	10.19	18.01	4.47	67.05	7.40	111.02	11.06	10.84	-0.87	7.17
T	22	26/9/2018	1	0	4.55	16.31	1.06	15.83	15.20	227.97	5.45	4.92	-0.90	11.38
T	22	26/9/2018	0	-1	5.91	17.15	3.08	46.21	15.42	231.27	7.04	6.74	-1.13	10.42
T	22	26/9/2018	0	-2	7.00	15.28	1.40	20.94	12.70	190.48	8.20	7.82	-1.20	7.46

U	23	15/4/2019	1	0	9.38	21.64	0.85	12.71	12.52	187.76	10.20	10.10	-0.83	11.54
U	23	15/4/2019	0	-1	11.56	25.54	0.11	1.67	13.45	201.70	11.43	10.67	0.13	14.87
U	23	15/4/2019	0	-2	8.63	21.40	4.95	74.22	12.10	181.48	10.01	9.33	-1.38	12.07
V	24	4/5/2019	1	0	9.04	21.72	6.57	98.50	11.31	169.59	10.57	10.27	-1.54	11.44
V	24	4/5/2019	0	-1	7.66	23.05	0.20	3.03	12.59	188.90	8.51	8.06	-0.85	14.99
V	24	4/5/2019	0	-2	7.49	18.67	3.91	58.58	9.99	149.88	9.59	9.55	-2.10	9.12
U	25	5/7/2019	1	0	3.38	15.46	0.28	4.25	8.38	125.69	4.22	5.31	-0.84	10.16
U	25	5/7/2019	0	-1	2.69	14.60	0.17	2.61	7.80	117.04	3.12	5.22	-0.43	9.37
U	25	5/7/2019	0	-2	3.06	14.53	0.33	4.98	7.54	113.06	3.87	4.76	-0.80	9.76
W	26	20/4/2020	1	0	9.34	18.17	2.10	31.51	10.24	153.65	10.37	9.29	-1.04	8.88
W	26	20/4/2020	0	-1	10.06	22.30	0.58	8.73	11.56	173.46	9.67	8.04	0.38	14.26
W	26	20/4/2020	0	-2	10.39	22.49	1.67	25.01	10.59	158.84	10.98	9.20	-0.59	13.29

**Table S2.** Correlation matrix across the weather parameters summarised over a 15-day prior the report of an acute bovine liver disease event or the same calendar date the one or two years prior. Reported estimates are pairwise Pearson's correlation coefficient ( $r$ , ranging between -1 and +1).

Abbreviations: avg, average; cum, cumulative; DP, dewpoint (degrees Celsius; °C); OID, outbreak identification; Odate, outbreak date; PID, property identification; prec, precipitation (millimetres; mm); RH, relative humidity (per cent; %); sol. exp, solar exposure (Joule(s) per square metre; MJ/m<sup>2</sup>); Tav, average temperature (degrees Celsius; °C); Tgap, average temperature gap (Tmax-Tmin); Tmax, maximum temperature (degrees Celsius; °C); Tmin, minimum temperature (degrees Celsius; °C); Tmin-DP, average of daily minimum and dewpoint at 9am temperature gap (degrees Celsius; °C); vap. press, vapour pressure (hectopascals; hPa).

	<i>Avg. daily <math>T_{min}</math></i>	<i>Avg. daily <math>T_{max}</math></i>	<i>Avg. daily <math>T_{avg}</math></i>	<i>Avg. daily <math>T_{gap}</math></i>	<i>Avg. daily vap. press<sub>3pm</sub></i>	<i>Cum. daily prec.</i>	<i>Avg. daily sol. exp</i>	<i>Cum. daily sol. exp</i>	<i>Avg. daily RH<sub>9am</sub></i>	<i>Avg. daily RH<sub>3pm</sub></i>	<i>Avg. DP<sub>9am</sub></i>	<i>Avg. DP<sub>3pm</sub></i>	<i>Avg. min. to 9am DP<sub>gap</sub></i>	<i>Avg. max. to 3pm DP<sub>gap</sub></i>
<i>Avg. daily <math>T_{min}</math></i>	-													
<i>Avg. daily <math>T_{max}</math></i>	0.7380*	-												
<i>Avg. daily <math>T_{avg}</math></i>	0.9144*	0.9480*	-											
<i>Avg. daily <math>T_{gap}</math></i>	-0.0723	0.6197*	0.3376*	-										
<i>Avg. daily vap. press<sub>3pm</sub></i>	0.8756*	0.5836*	0.7632*	-0.1558	-									
<i>Cum. daily prec.</i>	0.0295	-0.2479*	-0.1346	-0.4004*	0.1319	-								
<i>Avg. daily sol. exp</i>	0.3837*	0.7174*	0.6114*	0.6143*	0.3275*	-0.2576*	-							
<i>Cum. daily sol. exp</i>	0.3832*	0.7185*	0.6118*	0.6165*	0.3293*	-0.2582*	0.9997*	-						
<i>Avg. daily RH<sub>9am</sub></i>	-0.4764*	-0.2708*	-0.3873*	0.154	-0.1817	0.1098	-0.0869	-0.0827	-					
<i>Avg. daily RH<sub>3pm</sub></i>	-0.5994*	-0.5304*	-0.6008*	-0.0868	-0.1574	0.1427	-0.2540*	-0.2500*	0.7299*	-				
<i>Avg. DP<sub>9am</sub></i>	0.9165*	0.7024*	0.8537*	-0.0276	0.9201*	0.1022	0.3832*	0.3845*	-0.0901	-0.3310*	-			
<i>Avg. DP<sub>3pm</sub></i>	0.8725*	0.5810*	0.7602*	-0.1561	0.9958*	0.1393	0.3135*	0.3154*	-0.1481	-0.137	0.9326*	-		
<i>Avg. min. to 9am DP<sub>gap</sub></i>	0.4882*	0.3055*	0.4136*	-0.1166	0.1728	-0.1509	0.124	0.1199	-0.9892*	-0.7521*	0.0988	0.1375	-	
<i>Avg. max. to 3pm DP<sub>gap</sub></i>	0.2164	0.7670*	0.5621*	0.8819*	-0.07	-0.4135*	0.6316*	0.6316*	-0.2144	-0.5417*	0.1257	-0.0765	0.2655*	-

Correlation estimates with a star (\*) were significantly different from  $r = 0.00$  at the 5% significance level. Strong ( $r \geq 0.67$ ) significant ( $P < 0.05$ ) positive ( $r > 0.00$ ) correlations are reported in green, mild to moderate ( $0 > r < 0.67$ ) significant ( $P < 0.05$ ) positive ( $r > 0.00$ ) correlations in clear green, strong ( $r \leq -0.67$ ) significant ( $P < 0.05$ ) negative ( $r < 0.00$ ) correlations are reported in dark red, mild to moderate ( $-0.67 > r < 0$ ) significant ( $P < 0.05$ ) negative ( $r < 0.00$ ) correlations in weak orange, and non-significant correlation ( $P > 0.05$ ) correlation in gray.