University of New England (UNE) trial – NSW, Australia

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Location: Animal Respiratory Chambers, University of New England, Armidale, NSW, Australia.

Length: 36 days (October - November 2018)
Full trial report in Appendix A

Aim:
The primary aim of the UNE trial was to obtain high resolution data supporting rumen pH management in animals fed ProTect C. Secondary goals of the trial were to obtain data supporting the effects ProTect C has on volatile fatty acid (VFA) levels, as well as exploring any effects ProTect C has on methane emissions.

Study overview:
Ten Angus steers (18-19 months of age) with a mean live weight of 472kg were individually housed for 36 days. All cattle were allocated to the UNE-Monensin control (n=5) or ProTect C (n=5) supplemented diets by stratified randomisation based on live weight (LW). After randomisation and before offering test diets, a smaXtec intraruminal pH bolus was inserted into the rumen of each animal.

Variables measured:
Ruminal pH at 10-minute intervals, volatile fatty acid (VFA) concentrations (mMol/L), VFA molar proportions from sampled rumen fluid, methane production (g/d), and methane yield (g/kg DMI).

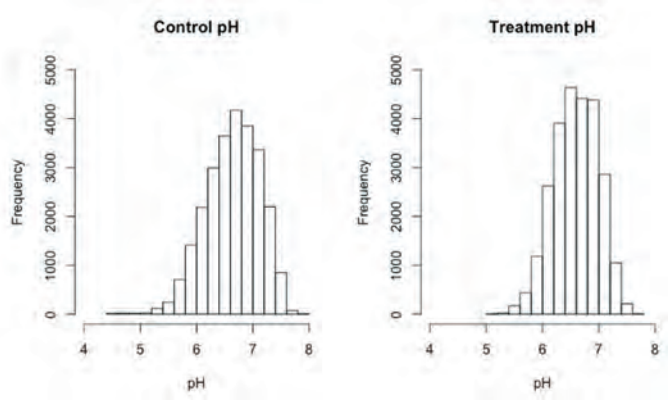
Key findings:
The proportion of time that rumen pH was outside the optimal range was significantly lower for the ProTect C fed cattle than the control. This was consistent for time spent below pH 6 (P<0.01), time spent below pH 5.5 (P<0.01), and time spent above pH7 (P<0.01).

- **VFA levels**
  Cattle fed ProTect C had higher VFA levels at day 26 and day 36 (P=0.06).
- **Production**
  There were no significant differences in the production metrics, live weight, and dry matter intake between the cattle fed ProTect C and cattle fed Monensin.
- **Methane**
  The control cattle had lower methane emissions (P=0.03) on day 26 and day 36 of the trial.
- **Proportion of time rumen pH outside optimal range**

The ProTect C group had more stable rumen pH throughout the trial period than the control group. The stability in rumen pH was reflected in individual animals and across the different weeks of the trial, including induction period and after day 21 on the finisher diet.

- **Proportion of time outside optimal pH ranges**

	Control	Protect C	P Value
pH<6	0.0949	0.0646	<0.001
pH<5.5	0.0113	0.0027	<0.001
pH>7	0.2487	0.1591	<0.001



Histogram showing frequency of pH readings throughout the 36-day trial period. Each reading represents a 10-minute time interval at that pH.

Limitations:
One of the key benefits of using ProTect C commercially in Australia is the ability for livestock producers to accelerate the transition from a grass diet to a grain diet, reducing the cost and work associated with the induction period. As this trial consisted of only two groups, we were unable to measure the effects of ProTect C on rumen pH under an accelerated induction period. Additionally, we were able to obtain only two one-day readings for methane emissions and VFA production.

Learnings:

The relatively short trial length limited the ability to obtain greater data on the effect of ProTect C and Monensin on rumen pH later in the feeding period. To obtain accurate and relevant methane levels and VFA levels will require higher resolution data than obtained in this study.

Rumen pH boluses are a valuable tool in monitoring the effects of feed on animals. ProAgni plans on further utilising this technology in ProTect C and probiotic product development.

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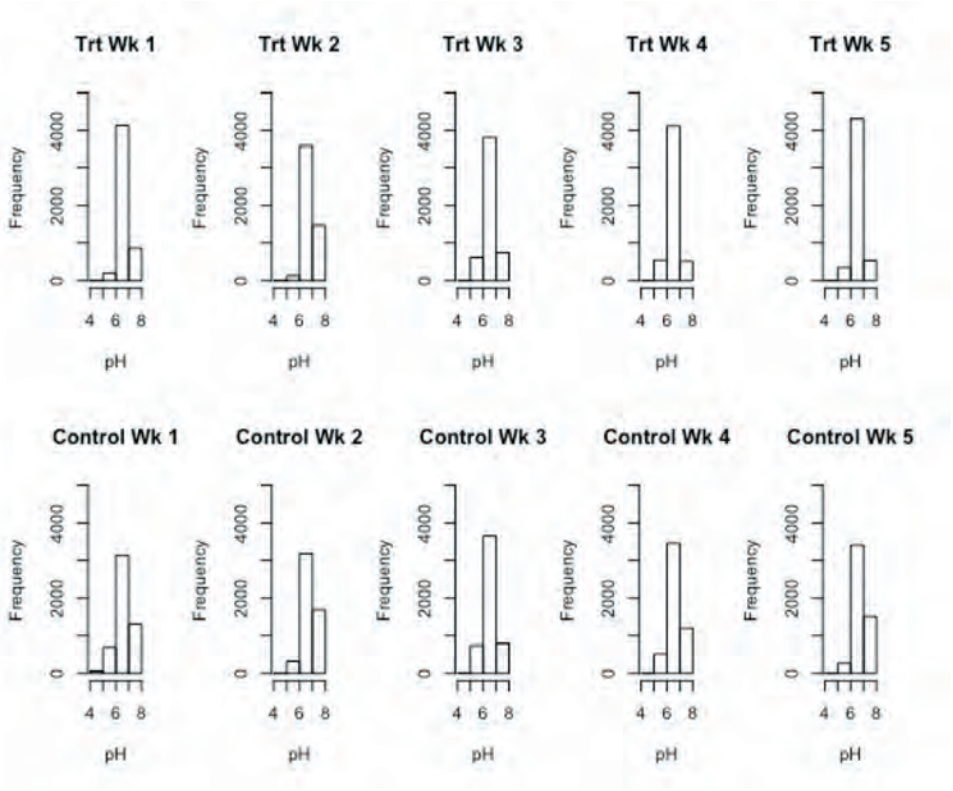
Rumen pH data

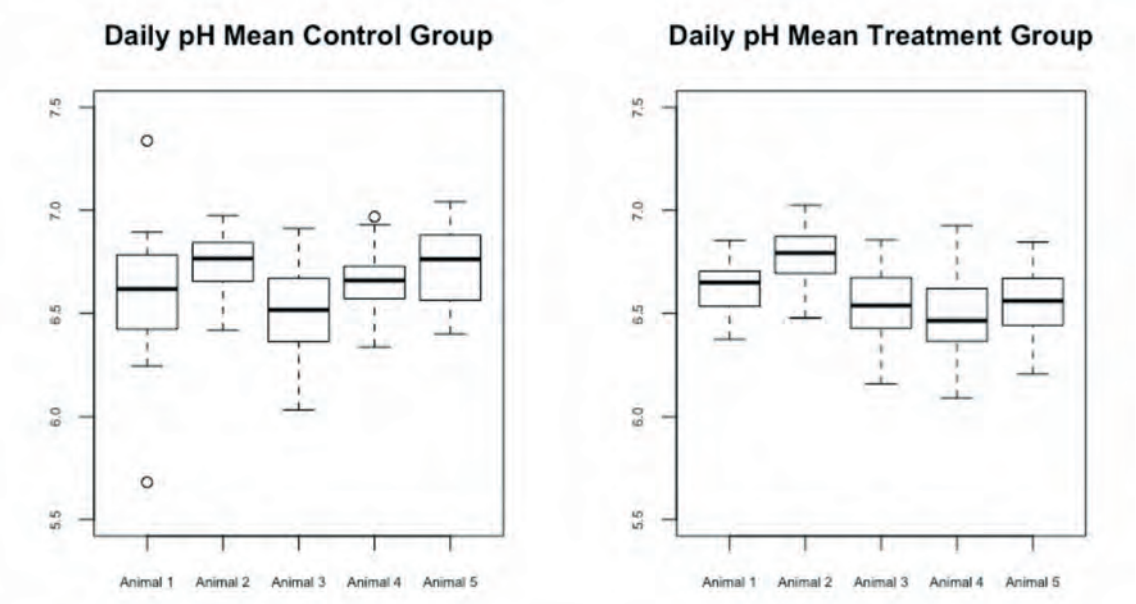
Below 6 pH	Control	Protect C	P - Value
Week 1	455	299	2.199e-09
Week 2	258	147	1.208e-08
Week 3	509	641	1
Week 4	693	316	2.2e-16
Week 5	567	308	2.2e-16
TOTAL	**2482**	**1711**	**2.2e-16**

Above 7 pH	Control	Protect C	P - Value
Week 1	738	147	2.2e-16
Week 2	1272	914	2.2e-16
Week 3	1353	891	2.2e-16
Week 4	1252	616	2.2e-16
Week 5	1878	1289	2.2e-16
TOTAL	**6493**	**4129**	**2.2e-16**

Time spent outside optimal pH range by week



Rumen pH variability by animal



Frequency of time outside optimal pH range by day of study

Below 6 pH	Control	Protect C	P - Value	C5.5	T5.5	C7	T7
Day 1	0	0	NA	0	0	103	46
Day 2	1	11	0.99	0	0	0	0
Day 3	27	6	<0.05	7	0	94	42
Day 4	99	2	<0.05	6	0	174	149
Day 5	176	107	<0.05	105	11	30	34
Day 6	103	70	<0.05	24	5	84	68
Day 7	49	103	1.00	0	5	253	80
Day 8	46	11	<0.05	0	0	133	109
Day 9	54	10	<0.05	11	0	145	126
Day 10	18	16	0.43	0	0	112	110
Day 11	55	22	<0.05	2	0	134	170
Day 12	16	11	0.21	0	0	233	183
Day 13	30	50	0.98	0	0	245	99
Day 14	39	27	0.08	0	0	270	117
Day 15	38	66	0.99	0	19	352	189
Day 16	122	89	<0.05	43	3	183	69
Day 17	114	84	<0.05	5	0	94	111
Day 18	79	151	1.00	0	11	121	109
Day 19	35	111	1.00	0	4	217	181
Day 20	45	78	0.99	3	13	132	77
Day 21	76	71	0.36	0	0	254	155
Day 22	96	53	<0.05	23	0	238	193
Day 23	107	119	0.78	10	0	180	40
Day 24	96	30	<0.05	3	0	120	22
Day 25	91	12	<0.05	0	0	158	98
Day 26	125	60	<0.05	28	0	254	117
Day 27	91	21	<0.05	2	0	115	32
Day 28	87	20	<0.05	23	0	187	114
Day 29	91	66	<0.05	0	0	202	204
Day 30	54	39	0.34	0	0	245	130
Day 31	50	56	0.69	0	2	259	166
Day 32	48	66	0.95	0	0	301	199
Day 33	25	54	0.99	3	0	304	188
Day 34	140	4	<0.05	0	0	218	130
Day 35	67	5	<0.05	0	0	181	120
Day 36	92	8	<0.05	2	0	168	152