



**Final Report to the
Agricultural Produce Commission
Pork Producers Committee**

**Inclusion of electrolytes and glucose in water and/or ConverMax® in feed
prior to transport to reduce stress, improve carcass quality and performance
in finisher pigs**

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June 2022



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Background to Research

It has been well documented that pigs experience stress during transport (Mota-Rojas et al., 2006); however, little has been done to mitigate this stress and limit the consequences on the carcass quality at the abattoir. Losses such as dead on arrival, non-ambulatory and injured pigs are often observed at the processing plant. These losses not only cause a financial loss to the farmer but they also create an ethical issue. Numerous factors associated with transport such as high stocking density, fasting, thirst, contact with strangers and temperature, illicit a stress response in pigs (Mota-Rojas et al., 2006). As the pigs become stressed, hormones such as cortisol and adrenaline are released, increasing heart rate, respiratory rate and blood pressure (Knowles et al., 2014). These changes can lead to breakdown of glucose from the liver and muscles resulting in not only a decrease in production performance but also reduced muscle pH and increased chiller loss. A reduction in muscle pH is associated with pale, soft exudative meat (PSE) which is undesirable to the consumer (Mota-Rojas et al., 2006; Marchant-Forde and Marchant-Forde, 2009).

Post transport pigs are often dehydrated and research has shown that even if water was provided during transport the pigs would still remain in a dehydrated state (Piñeiro et al., 2007a; Piñeiro et al., 2007b). This will create an electrolyte imbalance and tissue energy depletion resulting in carcass weight loss, depletion of intramuscular fat, muscle glycogen and PSE (Schaefer et al., 2001). Electrolyte and mineral supplementation has shown to improve carcass weights (less chiller loss) and reduction in meat quality degradation in cattle (Schaefer et al., 1997). In live export cattle, steers provided electrolytes in water had a live weight advantage compared to control steers and maintained a higher urine pH (Beatty et al., 2007). These benefits not only improve regulation of acid-base balance but they also provide a welfare benefit to the animal (Beatty et al., 2007). Similarly in dairy cattle, cows given electrolyte supplementation prior to transport in hot weather, attenuated the negative effects of stress on meat quality (Arp et al., 2011). Therefore the use of an electrolyte and energy source prior to transportation should be investigated.

A commercial in-feed product (ConverMax®) has been developed containing botanical extracts and minerals that reduce the initiation of stress, reduce anxious behaviour and carcass drip loss. In Europe, it has shown to improve energy efficiency, improve feed conversion by 0.1 and reduce the severity of skin lesions in finisher pigs (unpublished data). ConverMax® improves GABA receiver activity which in turn increases production of melatonin and dopamine and reduces adrenaline. These changes in hormone production has shown to decrease nervousness and negative reactive behaviour. Furthermore ConverMax® can reduce the production of hepatic free radical, maintaining liver function and improving energy utilisation (ConverMax®, Technical bulletin).

This project aims to develop a supplement strategy to reduce transport stress and improve carcass quality in pigs. The inclusion of electrolytes two days prior to transport in the water should minimise the stress response by reducing dehydration and hunger. The inclusion of ConverMax® in the diet aims to improve performance, minimise stress during transport and improve carcass quality.

Expected Outcome

Develop an in-feed and/or water supplement strategy that can improve performance and minimise stress response associated with transport in finisher pigs.

Aims

1. Determine the effect of an electrolyte and glucose supplement in water on carcass quality and stress response post transport.
2. Determine the effect of ConverMax® supplementation in the last four weeks of the finisher phase on performance and carcass quality.
3. Determine the effect of a combination of in-feed and water supplementation on carcass quality and stress response post transport.

Hypothesis

Inclusion of ConverMax® in diet and electrolytes in water will minimise stress response associated with transport in finisher pigs.

Methodology

This experiment was conducted at a commercial grower to finisher piggery and the experimental protocol used in this study was approved by the Murdoch University Animal Ethics Committee (R3293/20). The animals were handled according to the Australian code of practice for the care and use of animals for scientific purposes (NHMRC, 2013).

Animals, housing and diets

Approximately ~1200 male and female finisher pigs (approx. 17 weeks of age) were housed in pens of 40 and allocated to 4 treatment groups; (1) Control - standard farm diet and no additives in water, (2) Electrolytes in water 2 days prior to transport, (3) ConverMax® (2kg/t) in diet 4 weeks prior to transport, and (4) Electrolytes in water for 2 days prior to transport + ConverMax® (2kg/t) in diet for 4 weeks prior to transport. The number of deaths, treatments and removals was recorded daily.

Growth performance

Pigs weights were recorded at the commencement of feed supplementation and 1-2 days prior to transport to the abattoir to determine average daily gain (ADG). Feed intake was measured during the four weeks of the feed supplement to measure daily intake and feed conversion ratio.

Meat science - carcass measures

At the abattoir carcass measures were taken to determine pH and chiller loss from 136 pigs.

Statistics

All performance indicators and carcass quality measures were analysed using a one-way analysis of variance using SPSS v. 24 (IBM SPSS, USA).

Results

Table 1. Effects of dietary and water treatments on average daily gain (ADG), total pen weight gain, fat depth, hot carcass weight (HCWS), colour (L, a and b) and pH decline

	Control	Electrolyte	ConverMax [®]	ConverMax [®] + Electrolyte	SEM	P-value
Performance						
ADG (g)	913	1014	939	840	65.7	0.334
Total pen gain (kg)	1086	1185	1093	938	84.4	0.250
Carcass measures						
Fat depth (mm)	10.9	10.1	10.3	10.4	0.16	0.305
HCWS (kg)	72.6	70.7	71.4	73.6	0.44	0.137
Colour						
L*	37.7	37.7	38.2	38.6	0.28	0.691
a*	12.8	13.0	12.2	12.6	0.19	0.423
b*	11.2	11.4	11.1	11.3	0.13	0.856
pH decline						
pH 45min	6.51	6.49	6.45	6.51	0.021	0.708
pH 6hrs	5.86	5.80	5.81	5.85	0.021	0.658
pH 20hrs	5.78	5.74	5.72	5.76	0.012	0.229

Discussion and Conclusions

Average daily gain and total pen weight gain, measures of pig performance, were not significantly different between the four treatment groups. This suggests that ConverMax[®] in feed and electrolytes in water had no significant effect on performance in finisher pigs. The shed that housed the pigs varied from 21 to 28°C and 33 to 81% humidity throughout the duration of the trial. Although the humidity variation was high, the shed temperature remained stable which did not illicit a significant heat stress

response in the pigs. Therefore due to the mild temperatures the efficacy of these products to mitigate heat stress response could not be evaluated.

Carcass measures such as fat depth, hot carcass weight, colour and pH were not significantly different between the four treatment groups. As mentioned above the approximate temperature at transport to the abattoir was 25°C which was likely too low to illicit a heat stress response.

In conclusion this project needs to be repeated in a hot summer and on a farm that does not regulate shed temperatures as precisely, to properly evaluate the efficacy of the products.

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