ADDITION OF LIQUID FLAVOUR VITAMIN D_3 IN DRINKING WATER BEFORE PIG TRANSPORT: QUALITY CARCASS MENSURATIONS

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Introduction

Pre-slaughter operations are recognised worldwide as a key animal welfare issue. The pig meat production chain is investing in new technologies in order to minimise economic losses due to stress, injury and mortality. In this way, levels of blood splashed, skin damage, bone fractures and meat quality traits have been considered to better understand their interactions with handling before slaughter, pig welfare and meat quality. Levels of skin damage are also associated with plasmatic levels of cortisol and creatine phosphokinase, two important blood indices of stress, and the DFD condition. Scores of skin damage seem to be more associated with the conditions of psychological stress and physical efforts in relation to a short period of stress (Warris *et al.*, 1998).

This study was conducted to evaluate the efficiency of liquid flavour vitamin D_3 in the drink water of pigs for seven days before slaughtering and its effects on carcass (bruise, broken bones and skin damage) and the meat (pH, colour, water holding capacity and tenderness) quality.

Materials and Methods

Animals. A total of 522 pigs from the same farm and genetic origin were allocated systematically according to presentation order into three experimental groups (T01, control, n=174, T02, 1.5 ppm, n=174 and T03, 3.0 ppm, n=174). Liquid flavour vitamin D_3 was administered into the drinking water for 7 days before slaughter.

Slaughter. The animals were transported at night for 1 hour and slaughtered in a commercial abattoir. Water was available to the animals during the fasting period in the farm (12h) and lairage time (6h).

Measurements. The skin damage levels were obtained visually in the ham, shoulder and body of the carcasses in the slaughter line using standard pictures with a scale from 0 to 3 (0 = absence, 1 = light, 2 = moderate and 3 = severe) as described by Barton Gade (1993). Rate of pH decline in *Semimembranosus* muscle measured at 1 and 24h after bleeding; colour evaluation in *M.longíssimus dorsi* at 24h postmortem using Minolta colourimeter (CR300); water-holding capacity (WHC) in *Semimembranosus* evaluated at 24h postmortem according to the pressing method described by Hoffmann *et al.*, (1982), drip loss in *M.longíssimus dorsi* using the methodology reported by Honikel, (1998) and Warner Bratzler shear force (WBS) of 1.27x1.27x2.54 cm core samples sheared perpendicular to the fibre direction in three steaks of *M.longíssimus dorsi* were determined with a TAXT2i Texture Analyzer (full scale load 5kg/crosshead speed 200mm/min) attached to a Warner Bratzler accessory. The statistical design was based on randomised block design blocked on pen location. Mean of skin damage, pH, colour, WHC, drip loss, tenderness were analysed using general linear models with terms including the fixed effect of treatment group and the random effect of block, assessed at 5% significance level.

Results and Discussion

Table 1 contains the results of the skin damage for the treatments studied. Larger levels of skin damage in the areas of the shoulder ($p < 0.0001$), body ($p < 0.0332$) and ham ($p < 0.0011$) were obtained for the group control (T0) when compared to the liquid flavour vitamin D_3 (T1=1.5 ppm; T2=3.0 ppm) groups. This represents a good profit to the pig abattoir because these carcasses are normally transported to the export market. Pereira *et al.* (2005) developed similar experimental work with chicken and concluded that the carcasses from the control group were downgraded significantly (51.23%, $p = 0.03$) compared to the group treated with liquid flavour vitamin D_3 (T1=2.0 ppm). Warris *et al.* (1998) reported that elevated levels of skin damage are associated with animal welfare, levels of CPK, lactate, cortisol and incidence of the DFD condition.

Table 1: Skin damage values.

Variable	T0 n=150	T1 n=150	T2 n=150	*P* Values
Shoulder	1,399	0,792	0.745	<0.0001
Body	1.145	0.825	0,815	0,0332
Ham	0,889	0,642	0.602	0.0011

T0. Control; T1. Liquid flavour vitamin D3 (1,5ppm); T2. Liquid flavour vitamin D3 (3,0ppm)

Considering the pH values (1 and 24h *postmortem*), drip loss, WHC and tenderness, there was no significant difference in relation to the treatments studied. The ultimate pH found in this study is in the range (5.49 to 5.78) classified as normal meat. The colour (L* values, 43.55 to 45,10) and drip loss (4.98 to 5.48%) obtained in this experiment can be classified from reddish-pink, soft, exudative (RSE, L* values 52 to 58 and drip loss > 5%) to reddish-pink, firm, non-exudative (RFN, L* values 45 to 52 and drip loss < 5%), as proposed by Silveira (1997). Water holding capacity values (0,33 to 0,37) obtained in this work falls in a range considered RFN (WHC values, 0.36 ± 0.04) meat according to Silveira (1997).

Table 2: Quality characteristics evaluated in *Longissimus dorsi* (LD); *Semimembranosus* (SM) pig muscles according to the treatments studied.

Meat Quality Traits	T0 N=40	T1 n=40	T2 n=40	*P* Values
pH_1 (SM)	6,03	6,10	5.90	0.289
pH_{24} (SM)	5.64	5,65	5,69	0,270
L* (LD)	44.80	43,55	45,10	0,032
a* (LD)	11.44	11,72	11,24	0,255
b* (LD)	-2,14	-2.00	-1.09	0.268
Drip Loss (LD, %)	4.98	5,11	5,48	0,229
Water Holding Capacity (SM)	0.30	0,31	0,30	0,371
Tenderness (LD) kgf	5,86	5,87	5.64	0.326

T0. Control; T1. Liquid flavour vitamin D_3 (1.5 ppm); T2. Liquid flavour vitamin D_3 (3.0ppm)
L*. Luminosity; a*. Redness; b*. Yellowness.

Conclusions

The efficiency of liquid flavour vitamin D_3 has been proven in this study since there was a reduction in carcass damage and no negative influence on meat quality characteristics. It is important to point out that it was observed that the pigs were less agitated during the loading/unloading operations, which contributed positively to this fact. When the production of pig meat in Brazil (3.140.000 tones of meat) is considered, the use of liquid flavour vitamin D_3 will provide more pig carcasses which could be exported. Moreover, this represents economical advantages for the pork industry since both markets, fresh and processed products, are reached simultaneously.

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