Animal welfare and different pre slaughter procedures in Uruguay

M. del Campo[a*], X. Manteca[b], G. Brito[a], J. Soares de Lima[a], P. Hernández[c], F. Montossi[a]

[a]Meat and Wool Production National Research Program, National Institute of Agricultural Research, INIA Tacuarembó, Ruta 5 Km. 386, Tacuarembó, 45000, Uruguay, [b]Universidad Autónoma de Barcelona, 08193 Bellaterra, Spain, [c]ICTA Universidad Politécnica de Valencia, UPV Camino de Vera s/n, 46022, Spain. *E-mail address: mdelcampo@tb.inia.org.uy

ABSTRACT

Sixty steers were finished on two different diets being slaughtered the same day in two groups (n=30) staying 15 (G1) and 3 hours (G2) in lairage pens. The aim of the study was to evaluate the effect of diet, temperament, transport and lairage time on animal welfare. Flight time was monthly registered. Stress was evaluated in blood by different indicators, after transport, after lairage and immediately pre slaughter. Behaviour was observed during lairage and carcass pH was registered at 24 hours *pm*. Data was analised by the SAS package. Calmer animals were less stressed at all pre slaughter stages. Transport did not imply psychological stress, but animals were physically affected. According to negative behaviour, the first hour in lairage was stressful, but animals became calmer afterwards. Noise at the abattoir was higher during the morning. Probably that, and the insufficient resting period in G2, remained animals excitable, contributing to glycogen depletion and a higher carcass pH. Animals from G1 had a higher metabolic stress response but steers had greater opportunities to rest/recovery showing a better carcass pH. Those results suggest that more than 3 hours pre-slaughter time should be necessary, depending on lairage conditions.

KEYWORDS. Lairage time, steers, temperament, pH

I. INTRODUCTION

Transport and handling of slaughter animals are associated with a series of events which cause stressful and unfavourable conditions, compromise animal welfare, increase the chance of spreading disease (1) and reduce meat quality (2). In many European countries, it is common to slaughter animals on the day of arrival to the slaughterhouse, whereas in others like Uruguay, animals are slaughtered the day after arrival, following safety regulations. Several authors sustain that lairage time potentially allows cattle to replenish muscle glycogen concentrations and to rest and recover from some of the effects of transport. Others support that the lairage environment itself may inhibit the ability of cattle to rest or recover from the effects of feed and water restriction (3). Excitable cattle have been reported to be more susceptible to stress also implying deleterious effects on carcass and meat quality, compared to their calmer pen mates (4). The objective of this experiment was to evaluate the effect of diet, temperament, transport and lairage time on animal welfare.

MATERIALS AND METHODS

Sixty Hereford and Braford steers 2.5 years old were finished on: D1) rangeland plus corn grain (1 % LW, Hereford n=15, Braford n=15) and D2) high quality pasture composed mainly by lotus (*Lotus corniculatus)* and white clover *(Trifolium repens)* (Hereford n=15, Braford n=15). Flight time was monthly registered (FT). Stress was evaluated previous and after transport, after lairage and immediately pre slaughter, by cortisol, creatin kinase and non esterified fatty acids concentration in blood. Animals were transported for 4 hours in a commercial truck, allowing 420 Kg/m^2 (1-1.2 m^2/head, based on international recommendations). Behaviour was observed during lairage by 8 trained observers using a scan sampling technique and negative behaviours were registered by the behavior sampling technique, between 2 scan periods. Animals were slaughtered the same day in two groups (n=30, 15 from D1 and 15 from D2), staying 15 (G1) and 3 hours (G2) in lairage pens. G1 waited during the night and G2, during the morning. Steers from different diets (and slaughter groups) were not mixed either in the truck or in the abattoir. Carcass pH was registered at 24 hours *pm* at the *Longissimus dorsi* (LD) muscle between 12-13th rib, using a pHmeter (Orion 210A) with gel device. *Statistical analysis.* Data was analised by the SAS package (SAS, 2007) using different procedures according to the variable type and distribution (PROC MIXED; PROC GLIMMIX; PROC LOGISTIC; and PROC REG). Means were compared by the LSMEANS procedure (SAS, 2007).

II. RESULTS AND DISCUSSION

Productivity and temperament

ADG did not differ between diets (0.63 ± 0.02 in D1, 0.64 ± 0.02 in D2; $p<0.05$). Grazing was not restricted in any diet, crude protein contents were above critical values (9.22% and 22% in D1 and D2, respectively) and energy restrictions in D1 were compensated by the energetic supplementation, providing the animals in this diet with adequate daily gains. Temperament did not differ between diets but Braford steers were more excitable than Hereford (62.10 ± 4.10 in Hereford and 50.90 ± 4.00 in Braford, $p<0.05$). Genetic differences in tameness are well known and many authors have reported that, *Bos indicus* and *Bos indicus* cross breeds (5) were more excitable than *Bos taurus* cattle. Calmer animals had higher ADG within both breeds ($p<0.05$) being also consistent to results from previous authors.

Stress indicators in blood

Figure 1 shows that each step (except transportation, Time B) involved higher stress in both slaughter groups. Similar results were reported by (6) who did not find differences in plasma cortisol concentration before and after travelling, suggesting that transport had no severe effects on cattle.

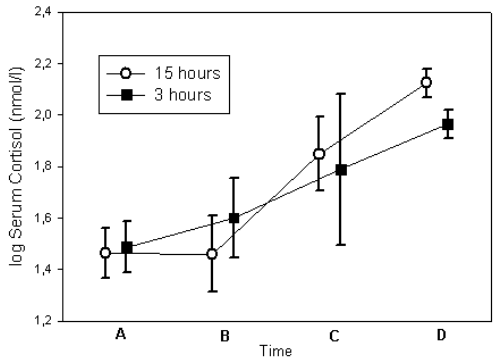

Figure 1. Serum cortisol (log) values at different times, within each slaughter group. Lines represent media and confidence interval. A: basal value in farm; B: after transport; C: after lairage; D: at slaughter.

Increases in energy demands are unavoidable in fasting animals, especially with longer lairage (Table 1), but adequate conditions and a calm environment may allow cattle to rest and recover while waiting in pens (Fig. 2)

Table 1. NEFA values at different times within each slaughter group.

NEFA (mmol/L)	Basal value	After transport	After lairage	At slaughter
3 h	$0.36^{d}\pm0.02$	$0.55^{b}\pm0.03$	$0.48^{bcd}\pm0.08$	$0.43^{cd}\pm0.03$
15 h	$0.37^{d}\pm0.02$	$0.49^{bc}\pm0.03$	$0.68^{a}\pm0.04$	$0.52^{b}\pm0.03$

Least square means ± Standard error.
Values with different letters differ $p< 0.05$

Calmer animals had lower cortisol, CPK and NEFA values in serum throughout the experiment ($p<0.05$).

Behaviour

No differences were found in fighting frequency during the first hour in lairage, between slaughter groups. Results from each Binomial proportion comparison showed that fighting frequency in the first hour in pens was significantly higher than the second, third, forth, fifth, sixth and seventh hour, respectively (Figure 2; $p<0,05$). From that we could infer that the first hour in pens was a critical adaptation stage for both groups. Animals that remained in pens became calmer afterwards. Temperament and breed did not have an effect on fighting frequency during the first hour in lairage ($p<0.05$)

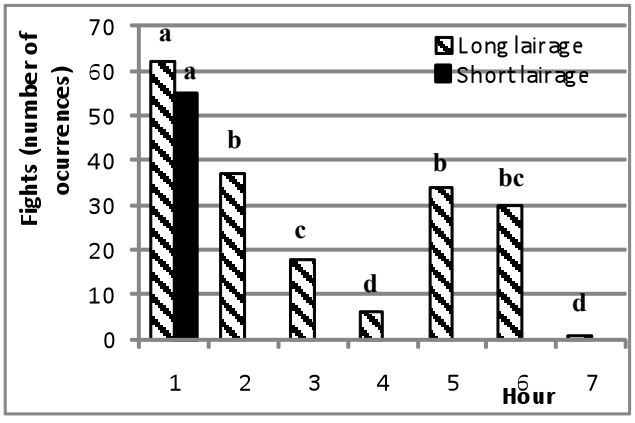

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Figure 2. Number of fights during consecutive hours for each slaughter group. Bars with different letter differ $p<0.05$

Lairage time and carcass pH.

No differences in pH decline were obtained between diets nor between breeds ($p<0.05$). In our study, 55% of animals from the short lairage group showed pH values higher than 5.8 (Table 2). Preslaughter stress is likely to reduce muscle glycogen level in vivo because of energy expenditure due to physical exercise or pshycological stress, which may in turn increase ultimate pH of muscles (7). Stressors appear to be additive and multiple stressors in the preslaughter period will result in a greater elevation of ultimate muscle pH than a single stressor alone
In this study, overnight animals were probably allowed to replenish muscle glycogen concentrations and to recover from some of the previous stressors. Glycogen resources can be restored at lairage, and cattle can recover from physical exhaustion even if they are not fed (8).

Table 2. pH at 24 hours *pm* by lairage group. Least square means ± SE

Lairage	**pH 24 hours**
3 hours	5.83 ± 0.04 a
15 hours	5.68 ± 0.04 b

Values with different letters differ $p< 0.05$

III. Conclusion

Animal welfare was not compromised in any of the evaluated diets. Negative effects of transportation may be minimised after short travels (< 4 hours) by proper handling, suitable equipment and facilities. Temperament affects productivity and the individual stress response at all pre slaughter stages. The first hour in lairage is a stressful period and when animals are stressed, less than 3 hours in lairage should affect their welfare and also carcass quality. Temperament appears to be an important tool regarding its effect on productivity, on the stress response at all pre slaughter stages, and also on carcass quality.

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