

ANIMAL WELFARE ACCORDING TO LAIRAGE TIME IN URUGUAY

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Abstract – The aim of this study was to evaluate the effect of pre slaughter lairage time on cattle welfare. Thirty Hereford steers were randomly grouped in two treatments according to lairage time in the abattoir pens: 12 hours (Treatment 1, n = 15) and 3 hours (Treatment 2, n = 15). The behavioral records were obtained through the identification of body posture (standing) and frequency of negative behaviors (mounts and fighting). Blood samples were taken from all animals searching for basal values in Creatine phosphokinase (CPK) as a welfare indicator and also its changes at different pre slaughter periods. Muscle samples were extracted from *Longissimus thoracis et lumborum* (LM) muscles 45 minutes *post mortem*, to determine glycogen concentration. Data was analyzed by SAS software applying GLM and GLIMMIX procedures. All animals were standing during the first 3 hours and negative behavior showed the highest frequency during the first 3 hours in both treatments. Animals in Treatment 2 showed an increase in CPK concentration after lairage. Additionally, Treatment 2 (3 hours) had lower values of muscle glycogen concentration. In conclusion, is possible to infer that the animals that remained in pens (Treatment 1) could rest and recover afterwards, being this not possible for animals in the shorter lairage group.

I. INTRODUCTION

In the phases before slaughter, the animals are exposed to different situations that cause stress, and these are generated in the physical and social environment as on management practices, due to the intensification of social disputes and greater contact with humans. For this reason, the slaughterhouse facilities and animal management should allow the animals to rest preventing this new environment to

become an additional stress factor. The study of the evolution of physiological indicators at different stages of pre slaughter management, combined with information about the behavior of animals in the slaughterhouse pens can provide valuable information about the effect of different lairage time, on the welfare of animals. As a meat exporter country and from an ethic perspective, Uruguay must consider not only meat quality but also the increasing public sensitivity to animal welfare (AW). Therefore, this study belongs to a serial of several experiments than begun in 2005, aiming to evaluate the effect of pre slaughter lairage time on cattle welfare coming from extensive systems and also on carcass and meat quality. Aim of this study was to evaluate the effect of two contrasting lairage times (3 and 12 hours) prior to slaughter on the behavior and physiological indicators of stress in beef cattle.

II. MATERIALS AND METHODS

The experiment was developed at "Instituto Nacional de Investigación Agropecuaria" - INIA, Uruguay. Thirty Hereford steers, three years old and kept on pasture were used. The animals were randomly assigned to two treatments according to lairage time in the slaughterhouse: 12 hours (Treatment 1, n = 15) and 3 hours (Treatment 2, n = 15). Animals were slaughtered with 500 kg of live weight, on the same day, in a commercial abattoir licensed to export meat and following animal welfare standard procedures. The journey lasted 5 hours, with a truck in good condition and a proper driving. Behavioral records were obtained with two different methods. The first

consisted in the observation of body posture (standing), adopting focal animal with instantaneous sampling records (sampling interval of 15 minutes). In the time available between each record samplings of behavior were conducted with continuous recording in periods of seven and a half minutes (7'30"), registering the behavioral categories of mounts (animal jump, removing the thoracic members off the ground, placing them on the body of another animal regardless if it remains immobile during this action) and fight (when two animals showed social interaction with physical contact involving subcategories hit and push vigorously with the head or horns, forcing the thoracic members on the ground) (adapted from Welfare Quality (1)). The methods of observation and measurement of behavior were defined according to Martin et al. (2). Blood samples were taken by jugular venipuncture at different stages pre slaughter, namely: Time A - before leaving the farm (basal values); Time B - immediately after arriving at the slaughterhouse (transport effect); Time C - after lairage (lairage effect); Time D - during bleeding (effect of the last handling procedures). Plasma was extracted following centrifugation at 3000 rpm for 15 minutes. The plasma fractions were frozen and immediately sent for analysis. Muscle samples were extracted from the *Longissimus thoracis et lumborum* (LM) muscles, 45 minutes *post mortem*, to determine glycogen concentration as an indicator of animal welfare. The samples were wrapped in aluminum foil and frozen at -80°C in nitrogen tank immediately after extraction. The glycogen content was measured on 2g of muscle, heated to 100°C in a test tube with 8 ml of 2 M HCl for 2 hours, then filtered and neutralized with 2 N NaOH (3). Measurements were taken using the glucose oxidase procedure, where the same residues were measured (4) and the result was expressed as milligrams of glucose residues per gram of muscle (mg/g). Data was analyzed by the SAS software applying GLM and GLIMMIX procedures using mixed models adjusted for repeated measures.

III. RESULTS AND DISCUSSION

The first hours in the slaughterhouse are important, because the animals are in a new environment rich in stimuli. Results from the focal sampling showed that animals from Treatment 2 (3 hours) remained standing all the time (100%) in pens. The same was observed in animals from Treatment 1, during the first three hours of lairage (100% of time standing). Only from the fifth hour, animals from Treatment 1 became to lie down. In T1, 25.53% of mounts and fights occurred in the first hour in lairage. This percentage decreased ($P<0.05$) in the second hour (7.45%), but increased again in the third and the fourth hour (20.21% and 21.28%, respectively). From the fifth hour of lairage, the percentage of mounts and fights decreased in T1 ($P<0.05$). In Treatment 2, 58.82% of mounts and fights happened in the first hour. There was a sharp decline in the second hour, with only 5.88% of the observations of this behavior and at third hour, the percentage increased and reached 35.30%. In a study conducted by Warriss et al. (5), after the mixture of animals when they arrive at slaughterhouse, the activity of mounts and fights appeared to increase slightly over the first eight hours and then began to decrease. Probably the longest time on execution of this activity observed in the work done by Warriss et al. (5) is due to the mixing of unknown animals, which did not happen in the present study. The creatine phosphokinase is a muscle specific enzyme and its activity in blood can be used as an indicator of muscular damage. Transportation was a factor in increased of creatine phosphokinase, as well as the final moments until bleeding. The concentrations of CPK increased ($P<0.05$) after transport compared with baseline values in both groups of slaughter. Other authors (6, 7, 8, 9) also observed an increase of this indicator after transport. The CPK activity may increase as a result of managements of loading, unloading and during the journey, when the animal needs to maintain balance within the moving truck. Although there was no difference between treatments in CPK concentration after lairage, between Treatments, is important to mention that this indicator did not increase after lairage

respect to values registered after transport in Treatment 1 (12 hours in lairage), but increased in Treatment 2 ($5,4 \pm 0,1$ after transport vs $5,7 \pm 0,1$ U/L after lairage; $P < 0.05$ ($\log \pm SE$)). A similar result was presented by Grigor et al. (7). However, opposes what was found in the work done by Tadich et al. (8), and del Campo (10), where the CPK did not increase after different lairage time in the slaughterhouse. Increasing concentrations of CPK in Treatment 2 could have been due to the high frequency of mounts and fights during the first hours in the slaughterhouse. Despite the high frequency of this behavior was observed also for the animals from Treatment 1, these animals had greater time to recover before slaughter. The management before slaughter had effect ($P < 0.05$) on CPK concentrations in both groups, in agreement with the result obtained by Cockram et al. (11). This effect can be explained by increased physical exercise during this phase, in which the animals are moved from the pens to the stunning and also due to body movements after stunning (tonic and clonic phases). The glycogen content found was different between the two treatments to which the animals were subjected ($P < 0.001$), showing averages ($\pm SE$) of 11.1 ± 0.47 mg/g in animals that remained for 12 hours in the slaughterhouse pens, and 3.58 ± 0.56 mg/g for animals that remained in pens for three hours. This difference could be explained by the higher frequency of mounts and fights registered in Treatment 2, and the shorter time these animals had to recover from the stress. Lairage time used in Treatment 1 (12 hours) was probably not enough to allow the recovery of muscle glycogen levels, but probably animals from this Treatment did have time to rest and control the possible energy consumption occasioned by the stress of the new environment.

IV. CONCLUSION

According to this experiment, the first hours at slaughter pens are a critical adaptation stage that happened for both groups. The animals that remained 12 hours could rest and recover afterwards, being

this not possible for animals that spent only 3 hours in lairage pens.

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