

Evaluation of a protection system for livestock during transport: PROGAT[®] from the animal welfare point of view





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Abstract

Transport of livestock constitute a large welfare problem in most of South American countries. With the aim to provide a solution and applying the knowledge of the automotive and metal-mechanic industry, a device was designed and constructed in Uruguay that consists of an elastic strip placed inside the cage of a truck and a pneumatically activated steel fins that act as “funnel” to cover the door frames, both inside the trailer and in the main door of the truck. Validation consisted in comparing 19 pairs of identical trucks (brand-model-year-maintenance), one vehicle with PROGAT[®] and another without it. Both leaving the same farm, day, time and route, arriving together to the same slaughter plant. Trained observers recorded the loading/unloading of 1,177 animals and the presence of carcass bruises, their location and depth. Results showed that carcasses of animals transported in a PROGAT[®] vehicle had a significantly lower proportion of bruises than those of a common vehicle. In the truck with the device, no bruises degree 3 (the deepest, with significant muscle loss) was recorded. Data showed that animals transported in a conventional vehicle had 1.6 more probability of presenting at least one bruise ($p < 0.001$). It is concluded that PROGAT[®] device installed in a vehicle transporting cattle constitutes a protection factor against potential impacts during transport by land and related maneuvers.

Keywords: PROGAT[®]; Cattle Transport; Carcass Bruises; Animal Welfare

Introduction

In South America, the great majority of the animals destined for slaughter are transported by road, in different types of trucks. Transportation and livestock management are generally considered stressful practices for animals. The use of electric prods sticks or aggressive handling of cattle during loading, transport and unloading are common, as well as overstocking the trucks [1,2]. The age of the animals, the mix of categories, the presence of horned animals, the distance traveled and, the type and state of vehicle maintenance among other factors are crucial in the welfare of animals [3,4]. The effects of these actions are observed as carcasses bruising [5-8], and several economic losses to the whole meat chain [9]. Therefore, it was not possible to distinguish if bruises had occurred on farm, during transport or at the slaughterhouse [10,11]. Another negative consequence of transportation to the slaughterhouse are fallen animals, dead on arrival or dying after arrival [12]. Different approaches have been attempted to reduce the consequences of transport stress for animals. These include pre-conditioning, administration of vitamins, vaccines, feeding with high-energy diets and electrolyte therapy, but with little success [13]. In the last decades, several initiatives, including research and development, increasing stakeholders' awareness and application of legislation and recommendations, have been carried out in Latin

America to promote animal welfare and meat quality [14]. As well as training courses to stakeholders on good handling practices and emphasizing the prevalence of carcass bruises as a strong indicator of poor welfare and significant economic losses [9,15].

In countries like Uruguay, a large beef producer and the sixth largest exporter in the world, cattle were transported in different types of trucks such as; simple trucks of 12 to 18 meters long by 2.40 meters wide, with or without a trailer, the 99% of doors were “guillotine” type, that rise vertically and 53% have “roller” bars on one or both sides of the door. The average distance traveled by transported animals was 240 (± 9) km in approximately 5 hours [3,16]. However, the first national meat quality audit [17] performed in the country, reported a prevalence of carcass bruises of 60% in slaughtered cattle in the country yearly, as well as other authors findings [3]. The training programs developed throughout the country promoted a significant decrease in the prevalence of bruising and economic losses [18-20]. Unfortunately, in recent years there has been a certain increase in the prevalence of carcass bruises, although most of them are superficial, no bruises grade 3 was found, that implies a great damage [21,22]. Since it is a cultural issue and of continuous education, it is necessary to act soon with other strategies to avoid further damage. With the aim of providing

a solution to this global problem and applying the knowledge of the automotive and metal-mechanic industry, an original device was designed and constructed in the country, to be placed inside the truck and at the main door to protect animals against sharp edges and/or protrusions that could harm them. This device has been called PROGAT® and there are none with these characteristics in the country or in the region. The objective of the present study was to evaluate this device located inside the transport vehicles, from the animal welfare point of view, through the effect on the reduction of carcass bruises.

Materials & Methods

The study was conducted in Uruguay, South American country during the last months of 2017. Uruguayan livestock is around 12 million beef cattle heads, mainly of European breeds (Hereford and Angus and their crosses). The PROGAT® consisted of an elastic band placed inside the truck's cage and steel fins that function as "funnel" that are activated pneumatically to cover the door frames, both inside the cage as in the main door of a truck. The system is operated by the truck driver and easily washable with water under pressure. For the purposes of the evaluation, two identical vehicles were arranged for cattle transport (truck brand Mercedes Benz, model L 1621/59 of year 1996. Semi-trailer of two axes, brand WFA, internal measures of 14.92 and by 2.49 meters, internal surface of 37.20m², with a fixed panel with a door of 6.53 meters guillotine type and, year of manufacture of 1995), one with the PROGAT® device installed inside it and the other truck without it. Beef cattle with similar characteristics (breed, age and, weight) were transported in the pairs of trucks from different farms, the same day, time and route, to 4 slaughterhouses throughout the country.

Sample size and statistical analysis

The estimated sample size was at least 15 trips composed of 2 trucks each (control and treated) with 35 animals each truck (although this depends on the weight of the animals), with a significance level of 0.05 (5%). For the statistical analysis of the data, the truck will be considered the primary unit of sampling and a model with a conditional logistic regression routine for paired data will be used. All data will be analyzed using the statistical package STATA version 14. All observations of the loading and unloading characteristics and bruises at the slaughter plant were performed by pairs of observers previously trained, according to Huertas [3,10]. Observations to record carcass bruises were blind (without knowing to which truck the animals belonged) to keep impartiality.

Results & Discussion

During October to December of 2017; 19 pairs of loads were delivered (n=38) from different farms, one with the PROGAT® device installed and one without it. The average distance traveled was 256,6 km (from 30 to 645 km), that matches with previous findings in the country [3,17,24]. At the unloading at the slaughterhouse, the device most used to move animals was the flag in almost all cases (94.44%), only in two trips a stick were used as a secondary device, and in one case an electric prod was used. It should be noted that the same two drivers, already trained, were the ones who unload

animals at the plants. These results are in the line of those found by Huertas [24] where more flags are used in comparison with 2010 [3]. While, in the loading at the farms, the flag was used in 50% of the cases followed by electric cattle prods 11%, sticks 5.6% and, shouts 5.6%, there was also an increase in the use of the flag in comparison with previous years [3].

The transported categories were mostly steers in 72.7% (856), cows in 14.6% (172) and the other categories in 12.7% (149); finding mixtures of categories in 3% of trips. According to Broom [5], mixing animals of different origins promotes fighting and increases bruising due to the resultant social interaction, at this point an improvement was observed in the present study, maybe due to the training programs and more awareness of animal welfare. As expected, the main breeds were the British (Hereford, Angus and their crosses) in 89% of the cases, followed in much smaller proportion by the zebu like breeds (5.8%) and dairy cattle (5.4%). At least one animal with horns was found in 88.4% of the loads evaluated, something more than previous results [3].

Carcass bruising

From 2,354 half beef cattle carcasses observed, 60.0% (1,412) had at least one injury, considering here those who had two, three, four and more injuries, these results match with those found previously (3,22,23,24).

Of the injured half carcasses, those transported in PROGAT® vehicle presented 8,2% less bruises than the ones transported in conventional truck, being differences statistically significant ($p < 0.001$). Bruises located at the butt zone (the most commercial valued cuts) were 5% less and those at the rib zone were 6% less in animal carcasses of transported by truck with PROGAT® than in the other. These results imply an improvement in the welfare of animals and a potential saving of money according findings reported by INIA [23].

Localization and depth of bruises

As for the depth of bruises, there were fewer grade 2 and no grade 3 bruises in carcasses of animals transported in a vehicle with PROGAT® compared to the common one ($p < 0.05$). This fact is important since these bruises imply a great carcass damage (muscle and bone), meaning a bad animal welfare and great economic losses [10].

Although the proportion of degree 1 bruises (superficial, eliminated with the carcass dressing) was high in both treatments (90%), there may have been some overvaluation by the observers, as found by Strappini [25]. A Student t test was performed for paired data comparing the average number of injuries per animal according to the type of truck. The average of injuries/animal/trip was for the common truck of 1.1, while for the truck PROGAT® of 0.88, these differences being statistically significant ($p = 0.0041$).

Conclusion

Animals transported in conventional vehicles have 1.62 more probability of result with at least one traumatic lesion (contusion, bruising) compared to those transported by truck with PROGAT® ($p < 0.001$). Despite carcass bruising might be diminished by

good handling practices which include transport conditions and distances travelled, the PROGAT® device constitutes real protection factor against bruises, improving animal welfare. The reduction in bruising would also prevent economic losses contributing to social developing of the meat chain.

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