

## A SURVEY ABOUT THE NUMBER AND AGE OF BRUISES IN BOVINE CARCASSES: EFFECT OF ANIMAL CATEGORY

Arquimedes J. R. Pellecchia<sup>1\*</sup>, Janaina S. Braga<sup>1</sup>, Tâmara D. Borges<sup>1</sup>, Adriano G. Páscoa<sup>2</sup>,  
Mateus J. R. Paranhos da Costa<sup>3</sup> and Marcia del Campo Gigena<sup>4</sup>

<sup>1</sup> Programa de Pós-Graduação em Zootecnia, Faculdade de Ciências Agrárias e Veterinárias, UNESP, 14.884-900, Jaboticabal-SP, Brasil

<sup>2</sup> BEA Consultoria e Treinamento Ltda, Jaboticabal-SP, Brasil

<sup>3</sup> Departamento de Zootecnia, Faculdade de Ciências Agrárias e Veterinárias, UNESP, 14.884-900, Jaboticabal-SP, Brasil

<sup>4</sup> INIA, Program of Meat Science and Technology, Tacuarembó, Uruguay

\*arqui\_riope@yahoo.com.br

**Abstract – The aim of this study was to assess the number of bruises per beef carcass and determine the age of each one considering the animal categories as underlying factor. Data were collected between January 2011 and January 2012, assessing 22234 beef carcasses. Five cattle categories were assessed: young bulls, steers, old bulls, heifers and cows. It was used the Australian Carcass Bruise Score System (with adaptations) in order to characterize the bruises. Data were analyzed by Generalized Linear Models using the GLIMMIX procedure of SAS 9.2 program. The results show high incidence of bruises on female carcasses, mostly explained by the presence of new bruises. This may be an indicator of females increased susceptibility to problems during loading, transport, unloading and handling in slaughterhouses. We conclude from the present study that there are low levels of animal welfare during pre-slaughter handling and economic losses. It should be stated that companies that are able to fulfill animal welfare demands and that ensure the final quality of their products, remain in a leading position in the market, adding ethical value to this products with consequent reduction of economical losses.**

### I. INTRODUCTION

The assessment of bruise occurrence in cattle carcasses can be a useful indicator of cattle welfare during pre-slaughter handling besides providing additional information on carcass and meat quality. There are some studies addressing bruise occurrence in beef cattle carcasses in Brazil, and most of them found a high percentage of carcasses with at least one bruise. However, these studies were carried out with a small number of animals or under specific situations (1, 2) which did not represent the reality of cattle pre-slaughter handling in Brazil. The aim of this study was to assess the number of bruises per beef carcass and determine the age

of each, considering the animal categories as underlying factor.

### II. MATERIALS AND METHODS

The study was conducted in a slaughterhouse plant, under the inspection of the Federal Veterinary Service, located in São Paulo state, Brazil. Data collection was carried out during one year (from January 2011 to January 2012), assessing 22234 cattle carcasses, being 14243 young bulls (YB), 4379 steers (ST), 116 old bulls (OB), 1199 heifers (HE), and 2297 cows (CW). The bruises were characterized according to the Australian Carcass Bruise Scoring System, which consists in a visual assessment of bruises considering the local of occurrence, lesions color and severity (3). The number and color of the bruises were recorded in each carcass assessed. The color injury was evaluated by a trained person previously considering two kinds of colors; red (and its variations), assumed to characterize new bruises (NB), and yellow (and its variations) assumed to be old bruises (OB). The number of total bruises (TB) per carcass was analyzed by Generalized Linear Models by using the GLIMMIX procedure of SAS 9.2 program, assuming Poisson distribution, and considering the animal category as a fixed effect in the model. Means were compared using the post hoc Tukey test.

### III. RESULTS AND DISCUSSION

The percentages of carcasses with at least one bruise were high in all animal categories; and there was a significant variation of TB among those categories, with a higher occurrence of bruise in females (cows and heifers) than in males (young bulls, steers and old bulls), as shown in Fig. 1. This tendency was also found also for NB (Fig. 2),

but was not found for OB, which was observed in around 40% of carcasses, regardless animal categories (Fig. 3).

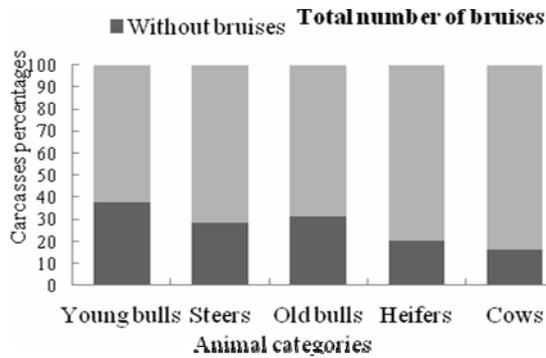


Fig. 1. Percentage of carcasses with and without bruises according to animal categories in a slaughterhouse plant, São Paulo state, Brazil, 2011 and 2012.

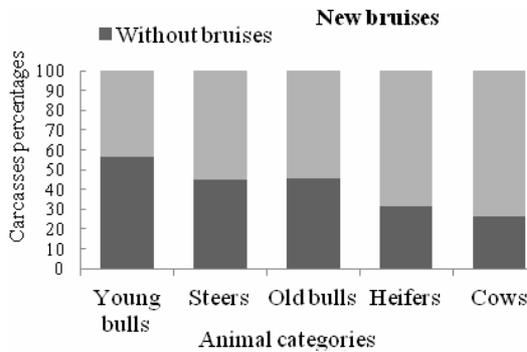


Fig. 2. Percentages of carcasses with and without new bruises according to animal categories in a slaughterhouse plant, São Paulo state, Brazil, 2011 and 2012.

These results show that the high incidence of bruises on female carcasses, mostly explained by the presence of new bruises, may indicate that females have a higher susceptibility to handling problems during pre-slaughter.

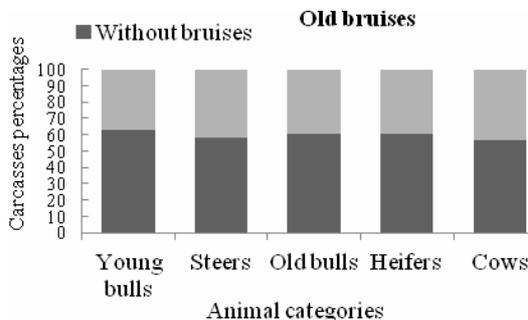


Fig. 3. Percentage of carcasses with and without old bruises according to animal categories in a slaughterhouse plant, São Paulo state, Brazil, 2011 and 2012.

A representative number of carcasses (18.0, 25.2, 25.0, 27.9 and 33.7%, for YB, ST, OB, HE and CW, respectively), had the two types of bruises (new and old). There was a significant effect of animal category on the total number of bruises per carcass ( $F = 615.19, P < 0.001$ , Table 1).

Table 1. Arithmetic (X) and adjusted means (and respective standard errors) ( $X_a \pm SE$ ) of the total number of bruises on cattle carcasses according to animal categories.

Animal categories	Total number of bruises	
	X	$X_a \pm EP$
YB	1.67 <sup>a</sup>	0.51 $\pm$ 0.008
ST	2.27 <sup>b</sup>	0.82 $\pm$ 0.011
OB	2.50 <sup>bc</sup>	0.92 $\pm$ 0.060
HE	2.64 <sup>c</sup>	0.97 $\pm$ 0.018
CW	3.17 <sup>d</sup>	1.15 $\pm$ 0.012

Values followed by different letters differ,  $P < 0.001$ . YB = young bulls, ST = steers, OB = old bulls, HE = heifers; CW = cows

YB and CW were the extremes, with the lowest and highest means of total bruises, respectively; which differs statistically from the other categories of cattle (Table 1).

These results indicate that males (YB, ST and OB) were less prone to having carcass bruises when compared to females (HE and CW). This variation may be assigned to the greater reactivity of female cattle, besides being usually submitted to a larger number of handling procedures when compared to males (4). These results are extremely relevant to Brazilian beef market, considering that in 2013, 43.8% of cattle slaughtered in Brazil were females (5).

In Brazil, females are usually culled due to reproductive disorders, old age or as a result of strategic and commercial decisions. These factors may aggravate bruise occurrence in cows. Besides, there are some studies reporting physical differences between male and female cattle, such as lower percentage of muscle tissue and low fat coverage in females when compared to males. These are important factors in predisposing the bruise occurrence on female carcasses (6, 7).

Regardless cattle categories assessed in this study, it was found that the percentages of carcasses with bruises were similar to those reported in previous studies and conducted in other countries. For instance, in a study carried out in Chile with cull cows, Strappini et al. (8) reported a high occurrence of bruises in the carcasses (71.2%); whereas in the study conducted by Romero et al., (9), in Colombia, the authors reported bruises occurrences in 41.2% of male and 26.5% of female carcasses. In Uruguay, according to the last Beef Quality National Audit, 39 % of the carcasses that are slaughtered each year, have at least one bruise (10). High percentages of cattle carcasses affected by bruises were also reported in Brazil, ranging from 83.4 (1) o 92.1% (2); however, these results should not be generalized since they were obtained in very specific situations and in a limited number of carcasses.

#### IV. CONCLUSIONS

Our results suggest a low level of animal welfare during cattle pre-slaughter handling, mainly for female cattle. It should be stated that companies that are able to reach animal welfare demands and that ensure their final products quality, remain in a leading position in the market, adding ethical value to their products. The identification of causal factors in bruises occurrence and taking corrective actions for identified problems, may represent major differences in the economical equation, by reducing loses associated to bad handling procedures.

#### REFERENCES

1. Andrade, E. N., Silva, R. A. M. S., Roça, R. O., Silva, L. A. C., Gonçalves, H. C., & Pinheiro, R. S. B. (2008) Ocorrência de lesões em carcaças de bovinos de corte no Pantanal em função do transporte. *Ciência Rural* 38, 7: 1991-1996.
2. Andrade, J., & Coelho, H. E. (2010). Ocorrência de contusões em carcaças bovinas e suas perdas econômicas. In *Cadernos de Pós-Graduação da FAZU* (pp.1) 2010, Uberaba-MG, Brasil. Available in: <http://www.fazu.br/ojs/index.php/posf>
3. Anderson, B., & Horder, J. C. (1979) The Australian carcass bruises scoring system. *Queensland Agricultural Journal* 105: 281-287.
4. Strappini A. C. (2010) Problemas y errores más comunes encontrados en Chile durante el manejo del ganado. In: D. Mota-Rojas, I. Guerrero-Legarreta, & M. E. Trujillo-Ortega, *Bienestar animal y calidad de la carne* (pp 157-169). México: Editorial B. M.
5. Scot - Consultoria. Boi & Companhia: Seu melhor parceiro para bons negócios, Bebedouro. n. 19. Jan., 2014. Available in: [http://www.scotconsultoria.com.br/bc/BC\\_1059\\_def\\_269.pdf](http://www.scotconsultoria.com.br/bc/BC_1059_def_269.pdf). Access: March, 2014.
6. Grandin, T. (1998) Objective scoring of animal handling and stunning practices at slaughter plants. *Journal American Veterinary Medical Association* 212, 1: 36-39.
7. Strappini, A. C., Metz J. H. M.; Gallo, C. B., & Kemp, B. (2009) Origin and assessment of bruises in beef cattle at slaughter. *Animal* 3: 728-736.
8. Strappini, A. C., Metz, J. H. M., Gallo, C., Frankena, K., Vargas, R., Reslon, I., & Kemp, B. (2013) Bruises in culled cows: when, where and how are they inflicted? *Animal* 7, 3: 485-491.
9. Romero, M. H., Uribe-Velásquez, L. F., Sánchez, J. A., & Miranda-De La Lama, G. C. (2013) Risk factors influencing bruising and high muscle pH in Colombian cattle carcasses due to transport and pre-slaughter operations. *Meat Science* 95: 256-263.
10. Brito, G.; San Julián, R. Lagomarsino, X. (Editores). 2008. *SEGUNDA AUDITORÍA DE CALIDAD DE CARNE VACUNA DEL URUGUAY*. Serie Técnica INIA N° 185. Available at [www.inia.org.uy](http://www.inia.org.uy)

