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FOURTH URUGUAYAN NATIONAL BEEF QUALITY AUDIT 2022: BRUISES CHARACTERIZATION

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I. INTRODUCTION

The Uruguayan National Beef Quality Audit (UNBQA) takes place every five years as part of a collaborative project involving the National Institute of Agricultural Research (INIA), the National Meat Institute (INAC), and Colorado State University (2002, 2007, 2013). The fourth audit, conducted in 2022, followed a nine-year interval since the last one (2013). Each UNBQA serves as a vital benchmark for identifying challenges within the beef industry. It evaluates whether the changes implemented have improved the welfare, quality and consistency of Uruguayan cattle, compared to previous audits. Additionally, it aims to introduce new research and training initiatives to enhance animal welfare and quality issues. Since the first UNBQA, bruising has been identified as one of the main problems, being a very good indicator of animal welfare during pre-slaughter stages. In addition when muscle tissue is affected, the bruised area is trimmed, leading to economic losses [1]. Therefore, accurate quantification and description of bruises on the carcass are crucial for assessing animal welfare before slaughter, understanding their impact on carcass and meat quality, and helping to identify the cause and timing of bruise occurrence [2].

II. MATERIALS AND METHODS

Seven packing plants were visited one day in two seasons, Spring (October-December 2022) and Fall (April-June 2023). A sample of 33% of the cattle was taken from each production lot (n=3207). Bruise characterization underwent a training period to ensure uniformity and measurement consistency, utilizing a detailed characterization process (Table 1).

Table 1. Bruises characteristics description.

Characteristic	Description						
Severity [1]	1: affecting subcutaneous tissue			2: affecting muscle		3: Type 2 and including broken bones	
Location	Round	Rump	Sacral area	Dorsal-lumbar area	Rib	Neck	Chuck
Size [2]	Small: 2-8		Medium: 8-16	Large: 16-30	Very large: >30		General area
Shape [3]	Lineal		Circular	Irregular	Mottled		Tram line

[1] [3] [2] Adapted from [4] [3] [2]

Horns, if present, were visually assessed for their approximate length, categorized as none, 10 cm or less, or greater than 10 cm. The severity, size, and shape of bruises were evaluated at each location on the carcass using the Freq procedure in SAS. The association between the incidence of bruising and the presence of horns was examined using the Regression and Glimmix procedures from the SAS software, version 9.1 (SAS Institute Inc., Cary, NC, USA).

III. RESULTS AND DISCUSSION

In 2022, 76.5% of the evaluated carcasses showed at least one bruise (n=7045), which is similar to the incidence reported in the previous UNBQA study (73%) [1]. The most affected areas of the carcasses were the Rump, Round, and Dorsal-lumbar regions (see Figure 1). Type 2 bruises were also more frequent in these locations, as well as in the sacral area (see Figure 2), making them significant due to their economic impact.

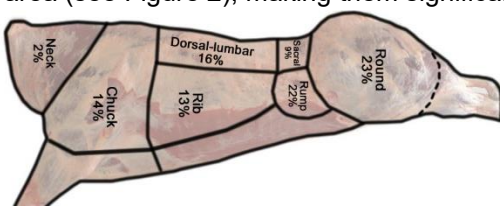


Figure 1. Bruises frequency considering carcass location.

Regarding severity and considering all registered bruises, in 2022, 74,1% were Type 1 and 25,9% Type 2.

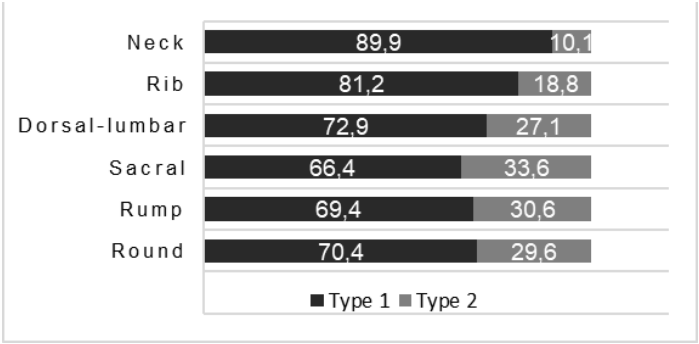


Figure 2. Bruises frequency at each location, considering Severity. Type 1(n=5220). Type 2 (n=1825).

Additionally, over 44% of Type 2 bruises located on the rump and dorsal-lumbar areas were classified as medium size (see Table 2). Although the sacral region had a relatively low incidence of bruises (refer to Figure 1), more than 33% of the bruises in this area were categorized as Type 2 (see Figure 2), with 54.5% of those being medium-sized (Table 2). The round location was the only area to present large and very large bruises, accounting for 2.6%.

Table 2. Type 2 bruises frequency within each region, considering Size.

Location	Small - 2-8 cm Type 2	Medium - 8-16 cm Type 2	Large - 16-30 cm Type 2	Very large >30 cm Type 2	General Area Type 2
Round n= 1630	75.4	22.1	2.3	0.3	0.0
Rump n= 1558	53.3	46.5	0.0	0.0	0.0
Sacral n= 610	45.5	54.5	0.0	0.0	0.0
Dorsal-lumbar n= 1161	55.7	44.3	0.0	0.0	0.0
Rib n= 914	63.6	36.4	0.0	0.0	0.0
Neck n= 159	63.6	27.3	0.0	0.0	0.0
Chuck n= 159	75.4	24.6	0.0	0.0	0.0

Bruises were predominantly irregular in shape, with over 87% of cases showing this pattern, except for the dorsal-lumbar area, which had a lower rate of 75.9%. The irregular shapes suggest these bruises were likely caused by impacts during transportation in the truck, while loading at the facilities, or at the slaughterhouse. In the dorsal-lumbar region, 21.44% of the bruises were linear, indicating improper use of sticks. Bruises were predominantly irregular, occurring in 90% of Type 1 and 92.4% of Type 2 cases, regardless of severity. Although only 18% of the animals evaluated had horns, the incidence of bruises was associated with the presence of horns ($p<0.01$). This suggests that the issue may be partially related to this factor.

CONCLUSION

Carcasses exhibited a significant number of bruises, indicating that pre-slaughter handling and certain facilities are not operating at optimal levels. From both ethical and economic perspectives, Uruguay needs to improve educational and capacity-building initiatives to reduce their occurrence. As a direct consequence of this study, INIA and the industry are collaborating on a research project to identify the phases, stakeholders, or procedures that primarily contribute to bruise incidence.

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