

## Third uruguayan national beef quality audit: bruises characterization

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### Introduction

The third Uruguayan National Beef Quality Audit (UNBQA) was held in a cooperative project among Colorado State University (CSU), INAC e INIA, assessing breed-type, brands, horns and mud/manure, bruises, offal condemnation and carcass quality. Bruises are a very good indicator of animal welfare and when a bruise affects muscle tissue, the affected area is trimmed, leading to economic losses. Many of the UNBQA-2002, 2007 and 2013 findings were used to implement training practices related with animal welfare and pre slaughter handling for all the stakeholders of the Uruguayan meat chain. However, bruising has been identified as one of the most important problems since the first UNBQA. Therefore, their deep characterization have paramount importance for the Uruguayan meat chain for contributing to identify causes and stages (at the farm, during transportation or at the slaughterhouse) where they are mainly produced.

### Materials and methods

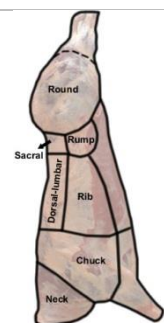
Ten packing plants were visited, sampling 7308 carcasses (33% of the cattle from each production lot, Total: 22145 animals). Bruise's evaluation followed a detailed protocol based on presence or absence, considering Quantity, Carcass location (round, rump, sacral area, dorsal-lumbar area, rib, neck, chuck), Severity (1: affecting subcutaneous tissue, 2: affecting muscle, 3: Type 2 and including broken bones) [3], Size (small: 2-8cm, medium: 8-16, large: 16-30, very large: >30, general area). Shape (lineal, circular, irregular, mottled, tram line) [3], and Color (new: bright red, old: dark red or yellow). Horn presence was registered and distance from the farm to the slaughterhouse was documented considering 3 classes: close (0-150 km), medium (151-350 km) and far (> 350 km). The slaughter type was registered: standard (with stunning) or ritual (without stunning). Bruise severity, size and shape were evaluated using the Freq procedure of SAS. Association between bruises incidence to horns presence, distance and type of slaughter, was assessed using the Regression and the Glimmix procedures from the SAS software, version 9.1 (SAS Institute Inc., Cary, NC, USA).

### Results and discussion

In the last Audit (2013-2015), 72.9% of the evaluated carcasses had at least one bruise, mainly located at the round and the rump, carcass areas of great economic value (Table 1). Regarding severity, 27.5% of the carcass had at least one bruise Type 2, implying muscle removal. The Round and the Rump were also the most affected areas with more than 25% of Type 2 bruises at both locations (Table 1). Type 2 bruises at the Round and the Rump areas were mainly small (Round: 39.8%, Rump: 45.4%) and medium size (Round: 39.3%, Rump 39.6%). Regarding shape, Type 2 bruises at the Round were mainly circular (50%) being probably inflicted against the truck during transportation, and irregular (49%).

Table 1. Bruises frequency and severity, considering carcass location.

Location	Total (%)	Severity (%)	
		Type 1	Type 2
Round (n=3935)	29.1		
Rump (n=3042)	22.5		
Sacral (n= 609)	4.5	73.2	26.8
Dorsal- lumbar (n= 1379)	10.2	66.2	33.8
Rib (n= 2312)	17.1	74.1	25.9
Neck (n= 41)	0.3	79.3	20.7
Chuck (n= 2204)	16.3	86.9	13.1
		75	25
		85.1	14.9



Total of bruises registered: n=13522. Type 1: n=10354, Type 2: n=3168

At the other carcass locations, Type 2 bruises were mostly irregular (Rump: 84.3%, Loin: 85.6%, Rib: 82.4%, Neck: 72.7%, Chuck: 90.0%). Even considering that the dorsal-lumbar area had a relative low incidence of bruises (10,2%), their severity (Table 1) and the size of Type 2 bruises (20.7% large and 16.5% very large) make them relevant, considering the economic importance of this region. Is very important to mention that 100% of all the registered bruises were bright red, implying that they were produced at any stage from the farm to the slaughterhouse, and not before.

The short time involved between loading and sacrifice (4 hours of transportation and 12 hours in lairage in average) puts Uruguay in a great challenge in trying to identify the precise phase where bruises are inflicted. Even considering that the dorsal-lumbar region had a relative low incidence of bruises (10,2%, Table 1), their severity (20.7% Type 2, Table 1) made them relevant, considering the economic importance of this region. In addition, more than 30% of Type 2 bruises at that carcass area, were large and very large (Table 2). Type 2 bruises at the Round and the Rump were mainly small (39.8) and medium size (39.3%). Type 2 bruises at the Round were mainly circular (50%) and irregular (49%) suggesting they were probably inflicted against the truck during transportation or against the facilities during loading or at the slaughterhouse. Type 2 bruises were mostly irregular at all the other areas (Rump: 84.3%, Loin: 85.6%, Rib: 82.4%, Neck: 72.7%, Chuck: 90.0%). Is also very important to mention that 100% of all the registered bruises were bright red, confirming that they were inflicted during the preslaughter period (from loading at the farm, to sacrifice) and not before. In the last Audit, 29.1% of the cattle had horns, but bruises incidence was not related to horns presence ( $p=0.07$ ). Bruises incidence was neither related to the Type of slaughter ( $p=0.21$ ) nor to the distance between the farm and the slaughterhouse ( $p=0.27$ ), the former probably explained by the short average distances implied in Uruguayan cattle transportation from the farms to the packing plants (250 km).

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= 1054	39.8	39.3	16.7	4.2	0.0
Rump n= 1028	45.4	39.6	11.9	2.6	0.4
Sacral n= 159	62.9	22.6	8.2	2.5	3.8
Dorsal-lumbar n= 285	37.9	24.9	20.7	13.3	3.2
Rib n=303	29.1	32.1	19.9	16.9	2.0
Neck n=11	63.6	27.3	9.1	0.0	0.0
Chuck n= 329	33.4	34.0	19.2	10.9	2.4

Type 2 n= 3168.

### **Conclusion**

In spite of the big efforts that the Uruguayan meat chain and specially the packing plants have been doing in order to improve animal welfare and its impact on meat quality, Uruguayan carcasses have an important incidence of recent bruises, suggesting that the pre-slaughter handling and/or certain facilities are still sub optimal. From the ethical and the economical point of view, Uruguay must identify causes and stages where bruises are provoked and strengthen corrective capacitation strategies to diminishing its incidence.

**Keywords:** bruises, animal welfare, preslaughter period stress.

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