# DEVELOPMENT AND VALIDATION OF A VISUAL SUBJECTIVE SCORING METHOD (VSSM) FOR CARCASS BRUISES IN URUGUAY.

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## Abstract

Some of the slaughtered animals in Uruguay have some degree of bruises that produce total or partial condemnations or changes in meat destination. The objective of this work was to develop a visual subjective scoring method (VSSM) to record carcass bruises in cattle and to quantify traumatic lesions by visual appraisal. A two step work was developed and a special diagram was designed to register injures localization and the degree of muscle tissue damaged as well as to measure the couples of observers concordance. More than 300 carcasses were observed.. In the second step, approximate weight and size of each trimmed piece was properly registered. Observers were placed at one point on the slaughter line flow but without interfering on the process. A repeatable, easy to implement and low cost system was en developed trying to homogenize slaughter plants information about bruising and to estimate loses by condemnations. It could be a very good tool to audit this step on the meat chain.

## Introduction

All over the world, bruises on carcasses are very common, lowering meat quality, producing huge economic loses and occasionally changing the potential destiny of the final product[1,2,11,12,17]
In Uruguay animals to be slaughter are transported by road mostly by truck through all the market chain. Once in the slaughter houses the unloading and weighting of the animals begins, they are then placed in restraint layers previous to the slaughtering. In addition, when the commercialization adds new steps animals suffer several loadings and unloadings, that together with long distances and difficult transportation affect the animal and its meat products in different ways.[13,18,19,20] The immediate consequences are the loses due to "dark cuts", condemned zones and low quality from the organoleptic point of view[3,14,15,15]
Since the 90' decade, many Meat Quality Audits have taken place in the US and in Canada, in order to document beef cattle defects. From the total cattle surveyed, approximately 50% had no brands, 30% had butt bruises, between 15 and 20% had side bruises and less than 10% had shoulder brands[5,8,22,23,24,25] . Many subjective scoring methods have been developed in the world to record bruises in the carcass by visual appraisal, with uncertain results. The Australian Carcass Bruise Scoring System was first used in Queensland in 1973, then adopted in each trial run by the Australian Meat and Livestock Corporation[10].
There is no standard method to record bruises that enables to compare the results with the work done by others researchers, not only in the country but in the region.
The objective of this work was to develop a visual subjective scoring method (VSSM) to record carcass bruises in cattle and to quantify traumatic lesions by visual appraisal.

## Materials y Methods

The study was based on a licensed and inspected abattoir, from where almost of the final product is exported.
Abattoir were visited periodically while observers were trained during several slaughters. The couples of observers were placed in the same site in order to register the same carcass. Before the samples were taken observers were trained and in order to validate the concordance level the observations were done by couples of observers. The couple was strategically located in the slaughter plant taking special care of not interfering either with the carcass or the flow of the meat works slaughter chain.
Data of 300 carcasses presented in this study were collected in Las Piedras abattoir (Urugauy) during a whole slaughter day with a speed of 100carcass/hour by two different couples at the same time.

A score-sheet was created where the location of the injuries, the characteristic (bruise, abbesses), the severity and the surface of each were stated, together with the identification of both carcasses (left or right).

The lesions detected during the slaughter procedure were registered and codified according to a specifically designed sheet based on the INAC catalog (Uruguayan meat board)[4].

The Carcasses were divided into three zones:1) the butt, including the silverside, rump, sirloin, and eye round cuts, involving the *M.tensor fasciae latae, M.gluteus bíceps, M.sacrocaudalis, M.gluteus medius,* and *M. semitendinosus* 2) the rib zone, including rib plate, strip loin, Spencer roll cuts, hindquarter and thin flank, involving the cranial part of *M.longissimus dorsi* and the intercostal muscles; 3) chuck and brisket zone, including shoulder clod, blade clod, chuck tender, blade roll, neck and scapular muscles [4,26].

Each zone was divided in sub zones, which were then given a different number, as shown in figure 1.

Bruises severity was then classified according to muscular layers:

Degree 1, Superficial. Involving only subcutaneous tissue.

Degree 2, Medium. Involving muscular layers without reaching bone tissue.

Degree 3, Deep. Showing the bone tissue.

Data was registered with an Olympus digital camera and with a Sony Digital 8 Video Camera Recorder (DCR-TRV230/TRV330/TRV539).

From the statistical point of view, data were analyzed by the software Intercooled Stata v.7.0

**Results and Discussion**

To validated the method comparing two different couples of observers a concordance Kappa test was used. Table 1 shows lesions registered by each couple of observers in a total of 768 carcasses. Table 2, 3,and 4 show each couple behavior according to the affected zone. Data from 0, 1 and 5.1 zones are showed due that are the only that account more than 10% lesions.

Fisher test was applied to each region so that the nule hypothesis that both couples classified independently lesions was rejected.

The concordance percentage to the regions was almost 80% and Kappa value was 0.5. The severity of 13824 lesions studied in 384 carcasses are showing in table 5, concordance percentage was 93.11% and Kappa value was 0.48

In addition , concordance levels found between the two couples of observers were acceptable for a subjective method. However, in a slaughter flow there are many factors that can affect this result such as individual factors, the slaughter speed, operator stress, distance between the observer and the carcass, light, place when the observers are stand inside the slaughter plant. Among these factors, the carcass speed are considered the most important one because it is very difficult for the human eye to register all the possible lesions presented in the whole carcass in a few seconds.

In spite of this work is consider as a previous step in order to standardize the technique to all the slaughter plants in the country.

In conclusion, this scoring system could provide a relatively accurate and quick way of estimating the extent of bruising in carcasses, homogenizing slaughter plants information about bruising and allowing the estimation of loses by condemnations.

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