FACTORS AFFECTING pHu IN BOVINE MEAT IN CHILE.

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Abstract—**A study was conducted in order to determine the influence of travel time, rest periods and sex on pHu of meat from bovines slaughtered in a slaughtering plant located in Chillán, Chile. Data from 8,738 bovines were used in this study: 8,621 steers and 117 heifers. Travel time, rest time and sex of each animal were determined and pHu measurements were made on each carcass. A variation in the pHu was observed, which was influenced by travel time (p<0.05), rest time (p<0.05) and sex (p<0.05). A variation of pHu was observed in response to an increase in travel time and rest time as well as sex. This variation was low since low standard deviations were determined. Results showed that long travel hours and long rest periods are harmful for animals, resulting in a significant increase in pHu. Sex also influenced pHu and a greater pHu was observed in steers (p<0.05) than in heifers.**

Index Terms—**bovines, animal welfare, pHu.**

I. INTRODUCTION

Chile has been gradually increasing meat exports to a number of foreign markets in the recent years. In order to export fresh meat, compliance with both health requirements and organoleptic quality has to be considered, as well as ethical quality issues related to animal welfare (Gallo, 1997; Warris, 1992).

At present, official certification programs are being carried out in Chile aimed to help ensure that requirements are dully met and bring more competitive products to the market.

Commercialization and slaughter of animals in Chile imply that animals usually travel several hours to the slaughterhouses, resulting on levels of stress that could affect both animal welfare and meat quality. In fact, ante mortem stress has a negative effect on both animal welfare and meat quality measured in terms of pHu that corresponds to meat pH 24 hours postmortem.

This study aims to determine the influence of practices used with animals for meat production in the central region of Chile. The Objective

Determine the influence of travel time, rest periods and sex on the pHu bovine meat slaughtered in a slaughter plant of Chillán, Chile.

II. MATERIALS AND METHODS

Records of 8,738 bovines slaughtered between June and December were studied. A number of 8,621 bovines were young castrated males (steers) and 117 were young females bovines (heifers) coming from cattle ranches for export.

A. Data Collection

Statistical data of travel time of animals to the slaughterhouse, rest periods, sex and pHu were collected in this study. A pH meter Model Orion 210A was used to obtain pHu and measurements were made 24 hours postmortem on the *Longissimus lumborum* muscle, at the level of the 13th rib.

B. Statistical analysis

Multiple linear regression methods were applied to analyze the data (Kazmier, 1998). Travel hours, rest hours in the slaughterhouse and animal sex were identified as independent variables and pHu was identified as the dependent variable.

III. RESULTS AND DISCUSSION

Table 1: Mean, standard deviation, mode, minimum and maximum pHu values of bovine meat and percentage of carcasses with pHu ≥ 5.9 for n = 8,738

|	Mean	Standard deviation	Mode	Minimum value	Maximum value	pHu ≥ 5.9
pHu	5.73	0.18	5.71	5.01	6.93	8.4%

The mean value of pHu was 5.73 ± 0.18 considered acceptable, and the 8.4% of bovines was pHu ≥ 5.9

**Figure 1:** Relationship between pHu and travel hours of bovines:
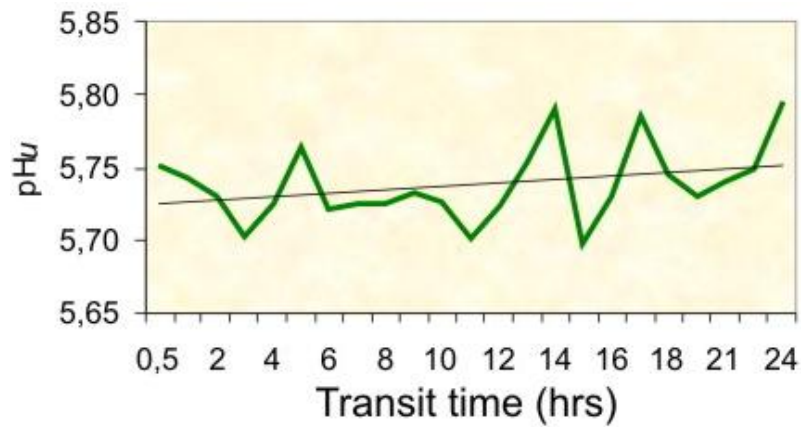
The average travel time was 6.5 ± 4.4 with a range of 0.5 to 24 hours and a mode of 1 hour. It was observed that as the travel time increased pHu remained high, especially after 14 hours.

Figure 2: Relationship between pHu and rest hours of bovines in the slaughter plant.
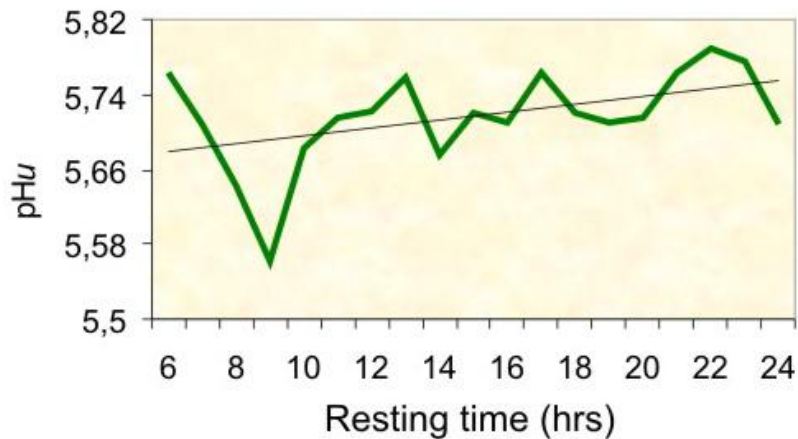
The average rest period was 14.6 ± 4.3 hours in a range of 6 to 24 hours with a mode of 12 hours. The lowest pHu value of 5.56 ± 0.16 was obtained after nine hours of rest and the highest value of 5.79 ± 0.22 was obtained after 22 hours of rest, showing that a longer rest time increases pHu on the meat.

Figure 3 : Relationship between pHu and periods of fasting in bovines.
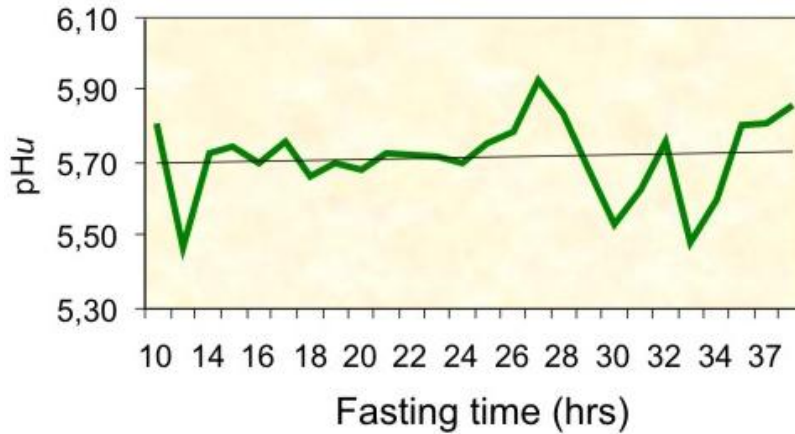
Average time of fasting was 21 ± 4.3 hours with a range of 10 to 39 hours, and a mode of 21 hours. As expected, animals that were submitted to longer periods of fasting showed higher pHu values.

Table 2. Frequency and average number of carcasses by sex.

Sex	Total	Mean pHu ± S.D.
Female bovines	117	5.68 ± 0.12
Male bovines	8,621	5.73 ± 0.18
Total	8,738	5.71 ± 0.15

Female and male carcasses showed an average pHu of 5.68 and 5.73, respectively. Therefore, significant differences between the sexes ($p<0.05$) were observed.

Table 3. Numeric frequency and percentage of carcasses with pHu values above 5.9 by sex for N=8,738

Sex	Total	pHu ≥ 5.9	
		N°	%
Female bovines	117	4	3.4
Male bovines	8,621	726	8.4
Total	8,738	730	8.4

Only 8.4% of animals had a pHu equal to or greater than 5.9, existing differences between male and female bovines (8.4% and 3.4%, respectively). Therefore, significant differences were found between the sexes ($p <0.05$).

According to expected results, this study showed that situations of stress increase the value of pHu, resulting in negative effects on the meat quality. In same cases this value is greater than 5.9 what prevents meat product exportation. Because of this, animal health authorities in Chile are trying to improve these rates by the implementation of good animal husbandry systems.

Although differences were found and higher values were reported in female bovines. Due to the fact that the number of observations was not the same for both male and female bovines, it is not possible to reach further conclusions regarding pHu values. Nevertheless, it is important to indicate that values obtained for both male and female bovines coincide with values reported by Knowles 2004.

IV. CONCLUSION

When increasing travel time, pHu values increase slightly.

Rest periods are not significantly relevant when pHu values are observed. These values increase as animals spend more time at the slaughterhouse.

Sex showed a very low influence on the variation of pHu, being steers more affected than heifers.

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