**PE4.28 Variation of temperature and pH of triceps brachii and semitendineo muscles in lambs 110.00**

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**Abstract—this study aims to determine the pH value and temperature of Triceps brachii and Semitendineo muscles in lambs carcasses. The initial temperature in the cold room was 12.2 °C and is reduced to approximately 2 °C, until the 12th hour, reaching 0.5 °C at the 24th hour of storage. The decline in temperature and pH of the carcasses of lamb during cooling occurred within the industry standards that allowed the installation and resolution of the process of rigor mortis. The value of pH of Triceps brachii and Semitendineo muscles showed a gradual decrease in establishing themselves in 10 hours after bleeding up to 24 hours.**

**key words: lamb meat, pH, temperature, rigor mortis.**

## I. INTRODUCTION

In Brazil, the lamb is considered an article of luxury, being mainly consumed in restaurants of high standard or commemorative dates, hindering access to low-income population [12]. However, we have observed a significant increase in demand of meat, especially in large urban centers, reflecting the changes in dietary habits of consumers, which has sought quality, flavor, tenderness and lower fat levels [13]. This fact has contributed to the expansion of production of sheep, providing thus an increase in the provision of high quality protein [16]. The speed of development of rigor mortis is controlled, mainly by the level of glycogen, pH and temperature of the muscle [11]. During the slaughter, more precisely after the bleeding, the period covering the first 24 hours, is a series of biochemical and structural changes in muscle tissue, the conversion of muscle into meat. During this period several factors can affect the process of rigor mortis, reflecting the final quality of meat [1]. The fall of pH is one of the most significant changes post mortem in the period that includes the transformation of muscle into meat. This study aims to determine the pH value and temperature of Triceps brachii and Semitendineo muscles in lamb chilled carcasses.

## II. MATERIALS AND METHODS

Animals Were chosen at random, 10 intact male sheep, five belonging to the Santa Inês breed and five ½ blood Dorper x ½ blood Santa Inês. Slaughter and characterization of the process of rigor mortis Lambs were slaughtered after the ante-mortem care that in this case included the period of rest, fasting diet and water for twenty-four hours before slaughter. The onset of bleeding was considered as time zero for all animals. After the bleeding was performed skinning (removal of the head, feet and skin), gutting, cutting and washing the carcass. Measuring the temperature of the chamber and a cooling of the muscles The carcasses, appropriately identified, were conducted in the cold room and time of 4h, 6h, 8h, 10h, 12h and 24h after bleeding were taken the temperature of the room and carcasses. For the measurement, was introduced to stem from a digital thermometer at a depth of 3 cm in muscle mass at the ischium. Determination of pH In the same moment said, were collected and weighed samples of 10g of Triceps brachii and Semitendineo muscles, which were homogenized with 100mL of distilled water, as recommended by Normative Instruction number 20 of 21/07/99 [3], and pHmeter the previously calibrated with standard solutions of pH 4.0 and 7.0. Form of analysis of results The statistical analyses regarding the process of rigor mortis, the behavior of the temperature of the cooling chamber, pH and temperature of Triceps brachii and Semitendineo muscles, was performed by analyses of variance for repeated measures with significance level of 5% and comparison of means by Tukey test [17].

## III. RESULTS AND DISCUSSION

Noting the average temperature (°C), according to the time post mortem (4h, 6h, 8h, 10h, 12h and 24h) (Table 1), the temperatures of the chambers were 12.2 °C (4h), 10.5 °C (6h), 7.3 °C (8h), 5.6 °C (10h), 2.8 °C (12h), -0.5 °C (24) and carcasses were 26.8 °C (4h), 7.3 °C (12h) and -0.2 °C (24h). Statistical analysis showed significant difference ($p < 0.05$) on the values of temperature at all time intervals. The average values found in the determination of pH of Triceps brachii and Semitendineo muscles were 6.4 ± 0.1 and 6.3 ± 0.1 in the 4th hour, 6.2 ± 0.1 and 5.9 ± 0.1 the 6th hour, 6.1 ± 0.1 and 5.8 ± 0.1 in the 8th hour, 5.7 ± 0.1 and 5.6 ± 0.1 in the 10th hour, 5.6 ± 0.1 and 5.6 ± 0.1 in the 12th hour and 5.4 ± 0.1 and 5.4 ± 0.1 in the 24th hour,

respectively. The comparisons made by Tukey test revealed no significant difference ($p > 0.05$) between mean values of pH in both muscles in a time interval of 10 and 12 hours and within 12 and 24 hours (Table 1).

The values of temperature in the cold room led to the development of the process of rigor mortis in the carcass cooled the same way as observed by Costa et al. (2006) [6]. A significant difference ($p < 0.05$) observed between the average temperatures of carcasses in different intervals of time studied (Table 1) showed that there was loss of heat to the environment gradually and, consequently, a gradual decrease of temperature the muscles.

Therefore, the proteolytic enzymes, possibly, acted without the delay that was observed in the process of rigor mortis with the decrease of enzyme activity, which could lead to the emergence of technological characteristics undesirable in frozen immediately, and the hardness of the meat after the preparation, due to shortened by the cold, changes in color and microbial growth [10]. In a similar study, Oliveira et al. (2004) [14] observed that in 8, 10 and 12h post mortem, the average temperatures of carcasses of 12 lambs were 6.3 °C (± 1.0), 3.5 °C (± 0.9) and 0.6 °C (± 0.3) respectively, with the cold temperatures of 4.3 °C, 0.9 °C and 0 °C, respectively. The values for higher temperatures of carcasses obtained in this study, for those times above (Table 1), probably due to higher temperatures in the cold room.

However, the final average temperature of the carcasses, obtained at the 24th hour, when in similar temperatures in cold rooms (-0.5 °C) were similar, and these researchers found an average temperature of 0.3 °C (± 0.1). Geesink et al. (2001) [9] found results of the carcass temperature (1.0 °C), which corroborate with those obtained in this work 24 hours post mortem. Due to the fact that lamb carcass be lower than that of many species and, consequently, the cooling occurs more rapidly, a strict monitoring of the temperature of cooling of carcasses should be performed [14]. One of the factors that influence the pH is the temperature of cooling. It is observed that higher temperatures in the decline of pH is higher, since glycolysis occurs faster [14].

The results found in this study are in agreement with this, since there was a sharp fall in pH up to 10 hours post-mortem and no significant differences between the 10th and 12th hours and 12th and 24th hour in both muscle groups studied, indicating that there was a tendency to stabilize with time. Oliveira et al. (2004) [14], however, no significant differences between mean values of pH in muscle TB in all time intervals studied. The pH range considered normal 24 hours after slaughter is between 5.5 to 5.8 [15].

Since the lambs show little susceptibility to stress, the drop in pH usually occurs within values considered normal [18]. In this study, both the TB and the ST muscle had pH values close to the expected 24 hours post mortem (Table 1). The fact of mean final pH had fallen below the lower limit of the range of variation of the values cited in the literature indicates that glycolysis occurred in a more accelerated, probably because the animals were not case-hardened before slaughter.

According to Bressan et al. (2001) [4], lambs do not have a case-hardened muscle temperature increased due to greater muscle activity moments before the killing, causing metabolic changes in the muscle and, consequently, lower values of pH. Furthermore, there was an interval of approximately three hours between the beginning of the evisceration and chilling of carcasses, and it is known that the reactions of glycolysis are accelerated at high temperatures in the post-mortem [11]. Bressan et al. (2001) [4], studying the physical and chemical characteristics of Santa Inês lambs for meat and Bergamacia, also observed the same effects of non-stunned animals of the Longissimus dorsi and semimembranosus muscles within the time studied, however, at the 24th h, the pH remained within acceptable values. In the TB muscle, Oliveira et al. (2004) [14] found a pH value at 24h post mortem (5.7 ± 0.0), similar to that found in this study at 10 hours after bleeding (Table 1). Zeola et al. (2006) [18], however, studying the parameters of meat quality of lambs subjected to the process of maturation and injection of calcium chloride, obtained a result of higher final pH (5.9 ± 0.6).

Lambs that have suffered some kind of stress before slaughter have a lower muscle glycogen reserves and consequently pH values above 5.8 [2], as was also observed by Maturano (2003) [12], who found ST muscle of animals in the Australian Merino and Ile de France x crossing Merino undergo situations of stress

in the ante mortem period, average values of final pH of 6.4 and 6.2, respectively. The situations presented are associated with changes in color, water holding capacity and tinsel, featuring in most cases, anomalous or meat from animals fed or dark cutting [2]. Ferrão (2006) [7], to study the meat quality of lambs of the Santa Inês breed, found pH values for the semimembranosus muscle, at the 24th h (5.5, 5.5 and 5.6), which are found in accordance with the in ST muscle in this work. Maturana (2003) [12] also observed final pH values in muscle semimembranosus similar to this study, which were 5.5, 5.6 and 5.5 for animals of the breed Merino, 25, 35 and 45kg respectively, and 5.6, 5.7 and 5.6 for animals crossing from the Ile de France x Merino said the same weights, respectively. Bonagurio (2001) [5], was a final pH of 5.7 in the muscle above.

## IV. CONCLUSION

The initial temperature in the cold room was 12.2 °C and is reduced to approximately 2 °C, until the 12th h, reaching 0.5 °C at the 24th h of storage. The decline in temperature and pH of the carcasses of lambs during cooling occurred within the industry standards that allowed the installation and proper resolution of the process of rigor mortis. The value of pH of Triceps brachii and Semitendineo muscles showed a gradual decrease in establishing themselves in 10 hours after bleeding up to 24 hours.

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