pH VARIATION IN BEEF FOR 90 DAYS

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Abstract – Meat pH impacts on the organoleptic features as it is related to color, taste, tenderness and it also affects the product preservation. The pH of three beef muscles was observed for 90 days. They were vacuum-packaged and stored at 4ºC ± 1ºC. The cuts were obtained from the muscles *Longissimus lumborum, Semitendinosus, y Quadriceps femoris*. These were studied in triplicate, so 9 cuts could be obtained, divided in 11 equal parts. During the first 30 days, they were analyzed every 5 days and during the remaining 60 days, they were analyzed every 15 days. In general, the pH showed similar values in the commercial meat. The differences observed individually per commercial cut were significant.

Keywords: ***Longissimus lumborum, Semitendinosus, Quadriceps femoris.***

INTRODUCTION

The muscle pH of living animals ranges from 7.08 to 7.30. When the animal is dead, this values decrease and range from 5.4 to 5.6, depending on the glycogen reserves.
The lactic acid inside the muscle delays the bacterial development that pollutes the carcass during the slaughtering process. These bacteria deteriorate meat during its storage, especially in warm environments. Meat produces unpleasant odors, color changes and rancidity. The pH variation is caused by different factors. Some of them are animal-intrinsic (genetics, metabolism, susceptibility to stress, etc.), but normally the most important factors are related to the environment in which the animal and its carcass were kept 24 hours before and after the slaughter [3].
The purpose is to determine the pH variation in the 3 commercial meat that were vacuum-packaged and stored at 4°C for 90 days.

I. MATERIALS AND METHODS

Bovine meat from young bovine carcasses was used. The muscles *Longissimus lumborum*, *Semitendinosus* and *Quadriceps femoris* were considered for the study. The three muscles were obtained from the same carcass. The study was carried out in triplicate, because three randomly chosen half-carcasses were used, which finally produced 9 cuts. Each cut was divided in 11 parts and these were vacuum-packaged. They were stored in refrigeration (4°C ± 1°C). In order to quantify the pH variation of the vacuum-packaged meat during storage, a piece of meat was taken from each cut and was measured with a HANNA INSTRUMENTS® pH meter with penetrating electrode, model HI 99162 (previously calibrated with buffer) in each sample described in the study design. 3 repetitions were carried out per piece of each muscle of fresh commercial beef in samples A, B and C. During the first 30 days, they were analyzed every 5 days and during the remaining 60 days, they were analyzed every 15 days.

II. RESULTS AND DISCUSSION

According to the pH averages observed in each muscle shown in Table 1, the highest pH value was 5.79 in *Quadriceps femoris* on the 25th day. In general, the pH values in the course of 90 days have the same behavior in the three muscles as on the 1st day they showed an average of pH 5.26, which increased gradually until the 15th day, when it reaches a value of pH 5.57 in the of *Semitendinosus*, 5.49 in *Longissimus lumborum* and 5.75 in *Quadriceps femoris*. Afterwards, a sharp drop can be seen on the 20th day, when it reached a pH value of 5.1 in the case of *Semitendinosus*. From the 25th day on, the pH value increased dramatically and reached a peak of 5.79 in the case of *Quadriceps femoris*, and finally drops progressively until the 60th day, when it reaches a pH value of 4.89 in the case of *Longissimus lumborum*. Then a slight increase was seen on the 75th day, on which *Quadriceps femoris* showed a pH value of 5.15 and decreased again on the 90th day, when it reached a pH value of 4.62 in the case of *Longissimus lumborum.*

Table 1. pH averages (n = 3) obtained in the course of the vacuum-packaged storage of 90 days at 4°C in the different bovine muscles

Day	*Semitendinosus,*	*Longissimus lumborum*	*Quadriceps femoris*
1	5.25^{bcdef}	5.26^{f}	5.27^{bcdef}
5	5.33^{cdefg}	5.36^{g}	5.52^{g}
10	5.40^{efghi}	5.47^{i}	5.66^{gh}
15	5.57^{hi}	5.49^{ij}	5.75^{gh}
20	5.10^{bc}	5.14^{cde}	5.25^{bcde}
25	5.64^{i}	5.66^{k}	5.79^{h}
30	5.51^{hi}	5.36^{gh}	5.51^{gh}
45	5.14^{bcde}	5.09^{c}	5.13^{abc}
60	4.94^{ab}	4.89^{ab}	4.96^{a}
75	5.05^{bcd}	5.04^{cd}	5.15^{abcd}
90	4.77^{a}	4.62^{a}	5.08^{ab}

Different letters are valid for the same column.

$p < 0.0001$ in the three muscle

In general, the pH shows similar values in the commercial cuts. The differences observed individually per commercial cut were significant ($p < 0.0001$). This can be graphically observed in Figure 1.

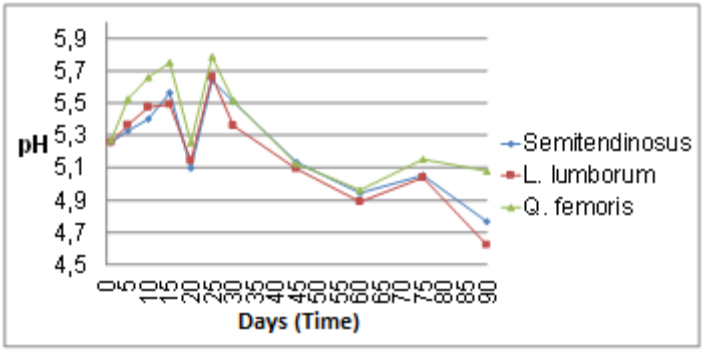

Figure 1. pH averages (n = 3) obtained in the course of the vacuum-packaged storage of 90 days at 4°C in the 3 different bovine muscles

On the 20th day, a sharp drop in pH was observed (Figure 1), explained by the fact that the vacuum-packaged cuts can develop different microorganisms such as lactic acid bacteria (LAB), which produce lactic acid and lead to a new pH fall [4].

III. CONCLUSION

From the 30th day on, the pH begins to decrease gradually. This is caused by the development of different microorganisms such as lactic acid bacteria (LAB), which produce lactic acid.

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