EFFECT OF TIME BETWEEN BLEEDING AND THE ENTRY OF CARCASSES IN CHILLING CHAMBER AND CHILLING RATES ON PORK QUALITY

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SUMMARY

The present study aimed to evaluate the effect of three time intervals (TI), 30, 0 and 50 minutes, between bleeding and the entry of carcasses in the chilling chamber d three chilling rates (CR), in wich the chilling chamber temperature of 2°C was tained 2:30 h, 4:30 h and 6:30 h after the entry of the carcasses in the chilling amber. Three hundred and sixty carcasses of crossbred Landrace, Large White and Duroc wine, weighing 85 to 95 Kg body weight were used. Each right half carcass was an perimental unit. All carcasses were subjected to nine treatments of 40 replicates ch, distributed in a 3x3 factorial arrangement in a completely randomized design. The sponses were pH1 (pH measured 60 minutes post mortem) and temperature, wich were bjected to three treatments of 120 replicates each. Results showed that pH1 averages .24, 6.15 and 6.12 were significantly different ($P < 0.05$) for TI of 30, 40 and 50 inutes, respectivly . There was a significant interaction ($P < 0.01$) on pH2, in wich ong TI associated with a slow chilling rate result in a pH2 (pH measured 18 h post rtem) elevation. The meat colour was not affected by treatments. Semimembranosus uscle subjected to TI and CR treatments was more sensitive than longissimus dorsi uscle in respect to water holding capacity. A significant interation ($P < 0.01$) between I and CR was observed in thaw and heat loss. More thaw drip occurred when TI was the ngest and CR the slowest.

INTRODUCTION

In addition to the genetic factors that are responsible for a greater susceptibility to stress, there are other factors wich influence and determine the incidence of P.S.E. meat, such as the distance from the farm to the abbatoirs, lairage time (CULAU et al., 1991), the methods of stunning, the laps of time between the bleeding and the entry of the carcasses in the chilling chamber and handling processes used during pre-slaughter time (WOLTERSDORF & TROEGER, 1988).

Pre-slaughter stress influenced by conditions of fear, agitation or fights can influence the occurrence of PSE muscle 30 and 60 minutes after bleeding. In those cases a rapid decrease in the inicial pH (pH 6.0) occurs, associated with high carcass-temperatures, higher or equal to 36°C after 60 minutes of slaughtering (DISTRE ,1986). The combination of a low pH and high temperature of the carcasses determines the potential in respect to the development of PSE characteristics.

The PSE condition, even so, manifest in the period between 30 and 60 minutes after the slaugther, the loss of the water holding capacity as well as the colour, occurs slowly, in the hours following the slaughter, due to the fact that the interchanges are slow, in the processes of the rigor mortis (ARBOIX, 1986). These facts enable the control of the development of PSE characteristics, trough rapid diminishing of muscle temperature, auspiciously of the rapid glycolysis and the faster drop in pH. These cases, represent a limitation in terms of time. (VADA, 1977; HONIKEL, 1986 quoted by WOLTERSDORF & TROEGER, 1988).

MATERIAL AND METHODS

In the experiment three hundred and sixty right half carcasses of castrated crossbred commercial male swines (Landrace, Large White and Duroc) with an average live weight of 85 to 95 Kg were used. The trial was conducted during june 1991 at a Santa Cruz do Sul, Rio Grande do Sul-Brazil, abbatoir. Three time intervals (30, 40 and 50 minutes) between the bleeding and the entry of the carcasses in the chilling chamber and three chilling rates in wich a temperature of 2°C was attained (after 2 h and 30 min., 4 h and 30 min. and 6h and 30 min.) were analised using a factorial arrangement of 3x3. The variables using the semimembranosus muscle were the pH and temperature of the carcasses measured 30, 40 and 50 minutes after the slaughter, the pH and the colour using a photographic standard 18 hours after slaughter and water holding capacity by unfreezing and by boiling the longissimus dorsi and semimembranosus muscles using the modified technique of JEREMIAH (1984). To determine the pH the portable equipment was used introducing a glass electrode type Analion V-627-C.

RESULTS AND DISCUSSION

The averages of the pH values (Tab.1) for the different time intervals showed a significant effect ($P < 0.05$) of these treatments on the initial pH, the averages of the treatment, 30 min., was different from the one met at 40 and 50 min.. The time interval effects are in agreement with VADA (1977) e ARBOIX (1986) who proved that how much smaller the time interval between the bleeding and the entry of the carcasses in the chilling chamber so much higher pH1.

TABLE 1 - Means, standard deviation, pH1 range, temperature means and frequence of PSE

	Time Intervals		
Variables	30	40	50
pH1 means	6.26[a]	6.15[b]	6.12[b]
standard deviation	0.30	0.31	0.31
largest	7.03	6.38	7.10
minimum	5.48	5.39	5.23
Temperature (°C)	40.34[c]	40.30[c]	39.65[d]
Number of PSE (pH 5.9)	23.00	41.00	45.00
Percent of PSE (%)	19.19	34.16	37.50
Number of carcasses	120.00	120.00	120.00

a,b mean values within a commom superscript letter no differ($P < .05$), by Tukey test.
c,d mean values within a commom superscript letter no differ($P < .01$), by Tukey test.

The number of PSE (pH < 5.9) carcasses statistically showed not to be influenced by the ifferent time interval, apart from the fact that the PSE incidence increased from 71.8% to .4% when, respectively, the time intervals passed from 30 to 40 min. and 50 min.

There was a significant difference in the temperature of the carcasses ($P < 0.01$). e 30 and 40 min. treatments showed no difference between them, however , the 50 min. eatment did. The results of the final pH (Table 2) showed that there was a significant teraction ($P < 0.01$) between the time interval and the chilling velocity. These values are agreement with VADA (1977) results who find improvment on water holding capacity and PSE muscle samples submited to a fast chilling process. The pH value also showed to be gher with longer time intervals (50 min) associated with slower chilling velocity (6 h and min.). In those cases this treatment seemed to favour the glycolytic process. They celerate in such a way that the pH wich was the lowest at 50 min. developed more rapidly maybe a limit was reached of the pH that was capable of unchaining the enzimatic pro- sses responsible for the reduction of the rigor mortis intervals so that a curve of the rmal evolution of the pH reached in less time. This implied that the pH value 18 hours ter the slaughter is high.

Treatments did not affect the colour variable. As far as the water holding capacity concerned there was a sensible improvment ($P < 0.01$) when the time interval was equal or ferior to 40 min. and the chilling velocity equal or inferior to 4 h and 30 min. by aking in semimembranosus muscles. Those results are in agreement with HONIKEL, (1988) and LTERSDORF & TROEGER (1990), whereas on the longissimus dorsi muscle those treatments did t have a significant effect. According to LAWRIE (1974), the longissimus dorsi muscle had inferior water holding capacity in comparison with other muscle. For the water holding pacity measured through boiling of samples of semimembranosus muscles it appeared that ere was a significant interaction ($P < 0.01$), and an improvment in relation with the time tervals wich were smaller and the chilling velocity higher. These data are in agreement th HONIKEL (1988) e WOLTERSDORF & TROEGER (1990). However, the longissimus dorsi muscle as not affected by the treatments.

TABLE 2 - Means value for pH2, colour, thaw loss and cook loss of the semimembranosus (m.s.) and longissimus dorsi muscles (m.l.).

CR			thaw loss		cook loss	
	pH2	Colour	m.s.	m.l.	m.s.	m.l.
2:30	5.96	3.1	2.77	4.25	16.39	29.73
4:30	5.61	3.0	4.61	4.95	13.22	29.73
6:30	5.93	3.0	3.78	4.41	15.30	29.28
2:30	5.94	2.9	3.68	5.32	19.19	29.71
4:30	5.73	2.8	5.84	6.00	11.18	30.79
6:30	5.82	2.9	7.41	5.61	17.51	27.66
2:30	5.68	2.7	5.50	5.40	21.53	33.17
4:30	5.75	2.8	5.63	4.51	15.78	29.82
6:30	6.00	3.0	5.30	4.96	21.88	25.89
Interation ($P < 0.01$)	**	ns	**	ns	**	ns

ore: 5 = extremely dark. ns = not significant
otal number of carcasses = 360 1 = extremely pale
Number of replicates by treatment = 40

CONCLUSIONS

The results of the present experiment indicate that:

Increasing the time interval between the bleeding and the entry of the carcasses in the chilling chamber leeds to a significant reduction of the initial pH with subsequent increase in frequence of PSE carcasses.

The semimembranosus muscle water holding capacity showed to be more sensitive to the time interval effects and the chilling velocity than of longissimus dorsi muscle.

The loss of water trough thawing becomes higher when the time interval between the bleeding and the entry of the carcasses in the chilling chamber is increased and the chilling velocity is slower.

The loss of water by thawing or boiling was higher in the longissimus dorsi muscle than in the semimembranosus muscle.

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