

CUTTING AND BONING BEFORE TEMPERATURE EQUALISATION – WOULD ELECTRICAL STIMULATION IMPROVE THE MEAT QUALITY?

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I. INTRODUCTION

The chilling process is the most time-consuming part of the slaughter process and is known to influence the meat quality, e.g., tenderness and drip loss. Slaughterhouses in Denmark use blast chilling tunnels (air temperature between -22°C and -18°C) followed by equalisation until the core temperature is below 7°C [1]. Electrical stimulation of the carcass reduced WBSF (Warner-Bratzler Shear Force) in partially hot boned filet from *M. longissimus lumborum* from *Bos Indicus* [2] at all storage periods (5, 14, 28 d) and is used to accelerate the glycolysis during the rigor processes when slaughtering cattle. The aim of this study was to investigate the influence on meat quality parameters of electrical stimulation at the pig slaughter line in combination with cutting before complete temperature equalisation.

II. MATERIALS AND METHODS

The investigation was performed at a commercial slaughterhouse with a very effective blast chilling tunnel. 78 carcasses (91 kg slaughter weight, 63% lean meat) were divided into 4 groups, with or without electrical stimulation (“ES” vs “non ES”) (15s, pulse/pause 5/65 ms, 280 mA) 14 minutes after sticking and cut into the three main cuts either 12 or 22 hours *post-mortem* (pm). The core temperature in the middle and in the ham was measured with Testo 134T, pH was measured with a glass electrode in *M. longissimus dorsi* (LD) and *M. semimembranosus* (SM), drip loss was assessed using the EZ drip loss method, and colour was measured with Minolta 400CR after 1 hour of blooming on 2x2 cm slices from *M. longissimus thoracis*. Another sample from the *M. longissimus thoracis* (60 mm long) was used for texture analyses (WBSF). All WBSF samples were vacuum-packed and aged for 72 hours at 5°C before freezing. The length (cm) of *M. psoas major* (PM) was measured with a ruler at cutting. For the early cutting, this measuring was repeated after 22 hours. After 22 hours, all 78 left hams were opened and evaluated for PSE (pale, soft, exudative) spots along the femur bone. The effect of ES/non ES and cutting time (12/22 hours) was analysed with an ANOVA model using R.

III. RESULTS AND DISCUSSION

The temperature was 5.0°C in LD and 10°C in SM 12 hours pm, which means that the temperature equalisation was finalised in the middles, but not in the ham part of the carcass. Electrical stimulation accelerated the pH drop and lowered the pH by 0.3 units in LD (Figure 1) measured 3 hours pm and caused an early start of the rigor processes, the same result as found in [3]. For the LD there could be a risk of cold shortening due to fast chilling and high pH [4]. 22 hours pm, pH was the same in both muscles at all treatments. Previous investigations [3] found no difference between ES and control carcasses regarding drip loss in LD neither after 24 h, 5 days storage at 4°C nor after freezing (-20°C for 5 days) and thawing. However, a higher frequency of PSE spots in the ham was observed. This investigation found that the EZ drip loss and the shear force in LD was lowered by 22 hours of equalisation before cutting for non ES carcasses, but no effect was determined in ES carcasses (Table 1). Lightness (L^*) in LD was higher after ES and after equalisation. Equalisation caused a higher a -value (more red meat). There was no ham with PSE spots neither from ES nor from early cutting.

Shrinkage of the main cuts like belly and tenderloin lowered the yield, and more shrinkage in PM due to early cutting was observed [5]. This investigation demonstrates that the shrinkage in PM can be reduced by electrical stimulation.

Table 1. Electrical stimulation and cutting time – effect on meat quality.

	ES		non ES		Sign. Elec.	Sign. Cutting
	12 hours	22 hours	12 hours	22 hours		
Cutting time (pm)						
EZ drip loss % (LD)	3.28	3.19	3.64	2.44	NS	0.05
L^* (LD)	46.22	52.39	43.79	49.15	0.001	0.001
a^* (LD)	4.27	4.89	4.27	4.58	NS	0.05
WBCF N (LD)	66.6	56.07	68.95	60.54	NS	0.01
Shortening mm (PM)	7	0	11	0	0.001	-

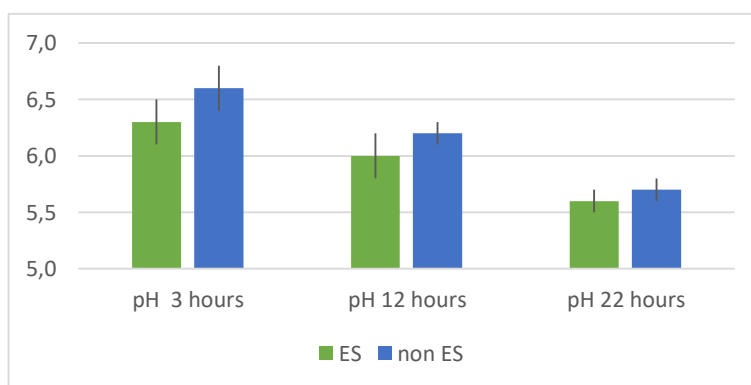


Figure 1. pH in loin during temperature equalisation

IV. CONCLUSION

The time of cutting is still important for the final meat quality in *M. longissimus dorsi*. In this investigation, electrical stimulation reduced the quality difference between cutting 12 hours pm and cutting 22 hours pm, thus, electrical stimulation can be a tool to reduce the equalisation time.

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