PALE, SOFT, AND EXUDATIVE (PSE) LIKE ZONES IN PORK: A PILOT STUDY ON HOW TO HANDLE THIS NEW MEAT QUALITY PROBLEM

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I. INTRODUCTION

PSE (pale, soft and exudative) like zones in pork are of major concern due to economic losses and appear to increase across the pork industry globally. PSE like zones are in many aspects comparable to classic PSE. Previous studies found high slaughter weight positively and low ultimate pH value negatively correlated with PSE like zones [1,2]. Biochemical studies revealed a strong correlation between PSE like zones and glycolytic potential [3,4], while mass spectrometry analysis displayed indications of biological pathways including abnormally fast post-mortem glycogenolysis related to development of PSE like zones [4]. Moreover, potential protein markers related to oxidation-reduction processes and apoptosis were identified as important for development of PSE like zones in the internal part of ham muscles [5]. The aim of this pilot study was to compare blood parameters and technological meat traits of slaughter pigs after inducing PSE like zones in one half at room temperature with other half in normal chilling temperature.

II. MATERIALS AND METHODS

A total of 10 pigs including 5 pure-bred Yorkshire (Y × Y) and 5 cross-bred (Yorkshire × Hampshire, Y × H) from the SLU experimental station were used. Each carcass was divided into equal halves, so each pig was its own control. One of the halves was chilled at normal chilling temperature, and other half was hanged at room temperature. Blood samples were taken at the time of bleeding to measure lactate, glucose and cortisol. Before dividing the carcass into equal halves, early pH (pH_1) and temperature ($Temp_1$) were measured, while other technological meat quality traits, including ultimate pH (pH_u), ultimate temperature ($Temp_u$), colour (*L*, a*, b**), shear force (Warner-Bretzler share force; WBSF) and fluid losses were measured on both halves of the carcasses at 24h post-mortem. Data were statistically analysed using the Proc. Mixed in SAS 9.4.

III. RESULTS AND DISCUSSION

PSE like zones were developed in all non-chilled and in some of chilled carcass halves (Figure 1). This indicates that presence of these zones is most likely linked to the chilling procedure. Carcasses with PSE like zones during normal chilling showed higher values of lactate (Table 1) which may result in more rapid pH-decline in these pigs. However, pH_1, pH_U, glucose and cortisol showed no significant difference. Technological meat quality traits are presented in Table 2.

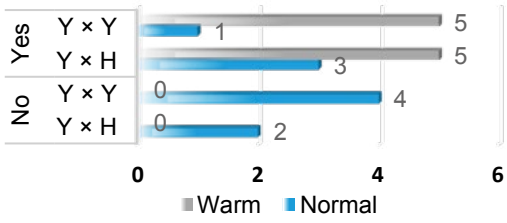

Figure 1. Number of animals of both breeds (Y×Y and Y×H) showing PSE like zones or not during normal chilling and warm room temperature.
Y x Y = Pure-bred Yorkshire;
Y x H = Cross-bred of Yorkshire and Hampshire.

Table 1. Stress related parameters in relation to chilling procedure and genotype (N=10).

Variable	PSE like zones					Genotype				
	Yes (n=4)	SE	No (n=6)	SE	P-value	Y × Y (n=5)	SE	Y × H (n=5)	SE	P-value
Lactate	4.25[a]	0.28	3.20[b]	0.21	0.03	3.60	0.27	3.85	0.22	0.51
Glucose	8.66	0.62	7.71	0.47	0.27	8.45	0.60	7.92	0.49	0.52
Cortisol	198	23.5	176	17.6	0.49	199	22.7	175	17.6	0.45
pH_1	6.49	0.08	6.60	0.06	0.35	6.62	0.08	6.48	0.07	0.22
pH_U	5.51	0.07	5.36	0.05	0.14	5.55[a]	0.07	5.32[b]	0.06	0.04

Different superscript letters between classes of each factor in a row indicate significant difference (P≤0.05).

Cross-bred (Y × H) pigs had higher fluid losses (cooking + thawing), lower pH_u, lower WBSF and higher incidence of PSE like zones (chilled halves) than pure-bred Yorkshire. These results also raise an important question about the ultimate pH as an indicator of PSE like zones. Finally, incidence of PSE like zones was more common in females and their slaughter weight was comparatively heavier (3.1 kg) than males in this pilot study.

Table 2. Technological meat quality traits in relation to chilling procedure and genotype (N=20).

Variable	Chilling				Genotype			
	Normal (n=10)	Warm (n=10)	SE	P-value	Y × Y (n=10)	Y × H (n=10)	SE	P-value
Total fluid loss	23.2[a]	25.7[b]	0.53	0.01	22.8[a]	26.1[b]	0.57	0.00
pH_u	5.40	5.39	0.03	0.84	5.49[a]	5.31[b]	0.02	0.00
$Temp_u$	5.20[a]	18.9[b]	0.21	0.00	12.1	11.9	0.21	0.62
Warner-bratzler share force	23.8	24.3	1.56	0.81	28.3[a]	19.8[b]	1.56	0.00
Lightness (*L**)	44.6	45.9	0.81	0.27	45.6	45.0	0.81	0.61
Redness (*a**)	3.10	3.90	0.29	0.07	3.30	3.60	0.29	0.50
Yellowness (*b**)	13.3	13.6	0.33	0.49	13.6	13.4	0.35	0.72

Different superscript letters between classes of each factor in a row indicate significant difference (P≤0.05).

IV. CONCLUSION

These results indicate a clear effect of chilling on the presence of PSE like zones. Higher values of lactate were also associated with the occurrence of PSE like zones. Cross-bred and female pigs showed higher prevalence of these PSE like zones, resulting in inferior meat quality characteristics.

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