EFFECT OF RESIDUAL GLYCOGEN ON TECHNOLOGICAL AND SENSORY QUALITY OF PORK

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Introduction

The variability of many meat quality traits is determined by the ultimate pH, which depends essentially on the glycogen content at the time of slaughter. The glycogen level in pig muscle depends of its type, breeds, and rearing conditions before slaughter. Even with a low ultimate pH, a certain amount of non hydrolysed glycogen in meat remains. This glycogen called residual glycogen has been found in pigs (Estrade et al. 1992; Fernandez et al. 1991; Przybylski et al. 2006) and in cattle (Immonen and Puolanne 2000; Immonen et al. 2000). Its effect on meat quality was studied by Monin et al. (1987), Fernandez et al. (1991, Immonen et at. (2000) and Przybylski et al. (2006) but its possible role in meat quality has not been studied completely.

The aim of the present study was to analyze the effect of residual glycogen level on technological and sensory quality of pork meat.

Material and Methods

60 pigs, 110 kg live weight, (Naïma sows X hybrids P76-PenArLan boars) were slaughtered at. the abattoir (5 km transportation from the farm) and the carcasses were chilled in fast cooling system. The percentage of lean meat in carcass was determined by CGM apparatus. Meat quality parameters were evaluated in *Longissimus* muscle taken behind the last rib. The pH value was measured at 1, 24 and 48 h after slaughter. The meat color was evaluated at 48 h using a chromameter Minolta CR310 (CIE L*a*b* system). The drip loss was determined according to Prange (1977) methods. The RTN index of cured and cooked meat was determined according to Naveau et al. (1985). The meat cooking yield was determined by subjecting 500 g meat samples to heat treatment by cooking in salt solution (0,8%) until reaching the temperature of 72°C in the sample epicenter. Intramuscular fat was determined according to Polish Norm. The glycogen potential in M. *Longissimus* was determined at 45 min and 24 h post mortem. About 1g of muscle was homogenised in 10 ml of 0.5 M perchloric acid. Glycogen, glucose and glucose-6-phosphate were determined on the homogenate according to Dalrymple & Hamm (1973), after hydrolysis of glycogen with amyloglucosidase. Lactate was determined according to Bergmeyer (1974). Concentrations were expressed as mmol / g fresh tissue. Glycolytic potential (GP), i.e. the potential of lactate production, was estimated according to the formula proposed by Monin & Sellier (1985): GP = 2 ([glycogen] + [glucose] + [glucose-6-P]) + [lactate], expressed as meq lactate / g of fresh muscle. Residual glycogen was expressed as sum of glycogen, glucose and glucose-6-phosphate at 24h post mortem. On the basis of distribution of residual glycogen the animals were divided in 3 groups. Meat sensory analysis was performed at 48h post mortem. Both, raw and cooked meat were evaluated in terms of intensity and homogenity of colour, and also in raw meat marbling and sensory acceptability were evaluated; in cooked meat: odour, meat tenderness, juiciness, meat flavour and overall quality by using sensory scaling method [0-10 c.u.] conventional unit scale. The results were elaborated by using one way analysis of variance.

Results and Discussion

Table 1 presents the carcass and meat traits for the 3 groups. The carcasses of the 3 groups did not differ in weight. The content of residual glycogen was closed to values reported in pigs (Fernandez et al. 1991, Enfält et al. 1997, Przybylski et al. 2006) or cattle (Immonen et al. 2000). The presence of non degraded glycogen in pigs muscle tissue is probably as effect of short transportations and fast chilling system of carcass at the slaughterhouse. Apparently the level of glycogen before slaughter influenced the level of residual glycogen.. A significant correlation was found between PG and residual glycogen (r=0,93) These groups differs significantly also in pH values measured in 24 and 48 h, in L and b color values and also in drip loss. The group with highest level of residual glycogen was characterized by low ultimate pH, paler and more exudative meat. Negative effect of residual glycogen on RTN and cooking loss also has been confirmed as shown by Monin et al (1987), Fernandez et al. (1991), Przybylski et al (2006) or for total water losses during thawing and frying by Immonen et al. (2000). The sensory qualities were also affected: principally a meat more pale and less flavour (Figure 1). However the tenderness was not affected although the drip loss was higher in this group. A negative effect of high residual glycogen on beef juiciness was reported by Immonen et al. (2000).

Table 1. Characteristics of carcass, technological and sensory pork quality for studied group of pigs

Traits	Level of residual glycogen			Total
	<10	10-20	>20	SEM
Number of animals	10	24	18	
Hot carcass weight (HCW)(kg)	87,86	87,98	86,36	0,95
lean (%)	57,66	57,06	57,35	0,32
pH_1	6,44	6,44	6,34	0,03
pH_{24}	5,68^a	5,56^b	5,47^c	0,02
pH_{48}	5,67^a	5,49^b	5,40^c	0,02
Color at 48 h L*	53,31^a	55,14^b	56,54^c	0,30
a*	14,88	14,89	14,72	0,14
b*	4,50^a	5,54^b	6,74^c	0,17
Drip loss (DL) (%)	3,05^a	4,92^b	6,09^b	0,26
Cooking loss (%)	24,78^a	27,23^b	27,87^b	0,51
RTN (%)	97,36^a	93,85^b	92,78^b	0,94
IMF (%)	1,28	1,19	1,15	0,20
Glycolytic potential (µmol/g)	119,57^a	143,50^b	167,44^c	2,92
Residual glycogen (µmol/g)	7,73^a	15,96^b	23,75^c	0,79

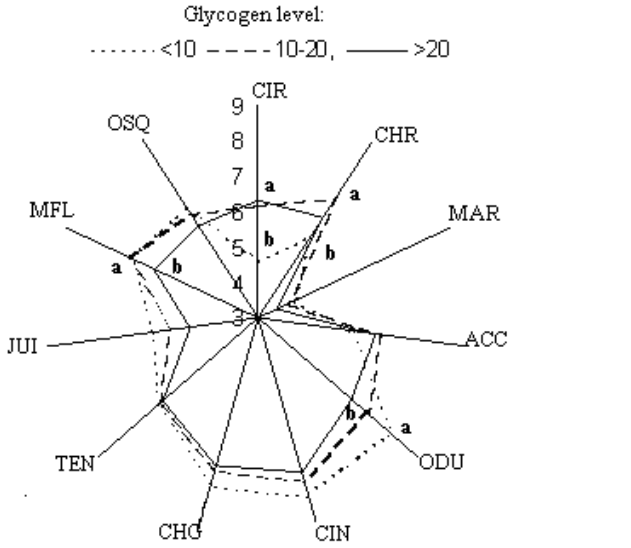

Figure 1. Effect of residual glycogen on sensory quality of raw and cooked pork (raw meat: CIR-color intensity, CHR-color homogeneity, MAR-marbling, ACC-acceptability; cooked meat: ODU-odour, CIN-color intensity, CHG-color homogeneity, TEN-tenderness, JUI-juiciness, MFL-flavour, OSQ-overall quality; a,b - differencess significant at P<0,05)

Conclusions

The results showed a significant and negative effect of residual glycogen on technological meat quality. The meat with higher level of residual glycogen was characterized by low ultimate pH, paler, more exudative meat with higher cooking loss. The effect on sensory meat quality was mainly a lower flavour and tenderness was not affected.

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