

Effects of postmortem temperature on color and water-holding capacity of pork loin

Byoung-Wha Ye, Seok Lee*, Byoung-Chul Kim*, Seon-Tea Joo and Gu-Boo Park

Meat Science Laboratory, Dept. of Animal Science, Gyeongsang National University, Chinju, 660-701, Korea

* Dept. of Animal Science, Korea University, Seoul 136-701, Korea

Key words : pork quality, water-holding capacity, meat temperature.

Introduction

It has been recommended that pork carcasses should be held at 0°C immediately after slaughter to produce acceptable quality pork. Borchert and Briskey (1964) reported that rapid chilling reduced the incidence of PSE meat. Recently, in Korea meat industry, ultra rapid chilling (URC) of pork carcasses has been adopted to reduce the poor quality pork. Tarrant (1989) reported that URC had a variable effect on drip loss from pork carcass.

A new term 'RSE (reddish-pink, soft, exudative) pork' has been suggested for describing a quality which is normal in color but still soft and exudative (Kauffman et al. 1992). Warner et al. (1997) reported that muscle protein denaturation of RSE pork was minimal, and Joo et al. (1999) showed no significant difference of color between RSE and RFN (reddish-pink, firm, non-exudative) in relation to sarcoplasmic protein denaturation. A number of researchers have reported that color and water-holding capacity (WHC) of pork is influenced by a various factors. If the temperature of a pork carcass is decreased rapidly and frozen slightly by URC, the muscle could have a high drip loss without protein denaturation or changes of color. Two trials were conducted in the present study to determine the effects of temperature and storage condition on color and WHC of pork loin.

Material and Methods

Trial 1: A total of 60 pigs from one farm were selected and killed at a commercial slaughter house. Immediately after slaughter, the left side of the carcass was chilled in a URC (-30°C) tunnel for 2 hours and then moved to a chilling room (0°C), whereas the right side was chilled by conventional chilling (CC) at 0°C. Changes of temperature, muscle pH, chill loss of the carcasses were recorded for 24 hrs. Also drip loss % and CIE L*a*b* of longissimus muscle were measured at 24 hr postmortem.

Trial 2: A total of six boneless pork loins that seem to be normal were selected at 12 hr postmortem from a commercial pork plant and transported to the laboratory. Chops (3 cm thickness) were made and divided into 3 groups randomly. The first group samples (WP) were wrapped with oxygen permeable film and the second group samples (VP) were vacuum packed. The samples of WP and VP were located in a refrigerator at 4 °C and stored for 48 hrs. The last group samples (TRT) were wrapped and located in a freezer (-30°C), and moved to the refrigerator when the internal temperature of samples reached -5°C. The changes of purge loss %, drip loss % and CIE L*a*b* were investigated.

Results and Discussion

The temperature of the URC carcass decreased sharply, as expected, but the pH of muscle decreased slowly compared to the CC (Table 1). The pH of URC was significantly ($p < 0.05$) higher than that of CC during postmortem 24 hr. There was no significant difference of muscle lightness between URC and CC. However, drip loss % of URC was significantly lower than that of CC (Table 2). It is generally accepted that muscle pH has an influence on the WHC in the pH range of 5.0 to 6.5. Therefore it could be possible that lower drip loss of URC is due to the higher pH. These results suggest that muscle temperature could be affected on WHC without any change

of color. In trial 2, TRT samples showed higher drip loss and lower L* value than those of WP or VP (Figure 1). However, VP showed the highest purge loss compare to others. It was assumed that the high drip loss of TRT could be due to the destruction of cell membranes by freezing and thawing of muscle tissue as it had with URC. With the results of L* value of TRT, it was also suggested that RFN pork could be changed to RSE meat when muscle is frozen slightly by inappropriate temperature control during chill storage. Generally the fresh pork is consumed within a week in small countries such as South Korea or Japan. Because high purge loss in VP is a negative factor for sale, WP is recommended if fresh pork could be sold within a week.

Conclusion

These results confirmed that URC could prevent change in color of meat but also could affect WHC due to being frozen slightly, so that RSE meat could occur from RFN. If muscle temperature goes down below freezing point, WHC of fresh meat is decreased without changes in color. Because high purge loss of fresh pork could occur by VP, WP is recommended if it can be consumed within a week.

References

- Borchert, L.L. and Briskey, E.J. (1964) *J. Food Sci.*, 29; 203-209.
 Joo, S.T., Kauffman, R.G., Kim, B.C. and Park, G.B. (1999) *Meat Sci.*, (in press)
 Kauffman, R.G., Cassens, R.G., Scherer, A. and Meeker, D.L. (1992) NPPC, Des Moines, IA, USA.
 Tarrant, P.V. (1989) In *Manipulating Pig Production II*, APSA, ARI, Werribee, Victoria, Australia.
 Warner, R.D., Kauffman, R.G. and Greaser, M.L. (1997) *Meat Sci.*, 45(3); 339-352.

Table 1. Effect of ultra rapid chilling (URC) on temperature and pork loin.

Treatments		Postmortem time (hr)				
		3	6	9	12	24
°C	Convention	28.5 ^a	17.3 ^a	13.6 ^a	2.8	.
	URC	12.1 ^b	6.7 ^b	4.1 ^b	2.2	.
pH	Convention	6.13 ^a	5.89 ^a	5.74 ^a	.	5.50 ^a
	URC	6.48 ^b	6.15 ^b	6.03 ^b	.	5.62 ^b

Different superscripts denote a significant difference between treatments ($p < 0.05$)

Table 2. Effect of ultra rapid chilling (URC) on drip loss % and lightness(L*) in pork loin.

Treatments	Drip loss %	Lightness(L*)
Convention	3.97 ^a	48.0
URC	2.65 ^b	48.1

Different superscripts denote a significant difference ($p < 0.05$)

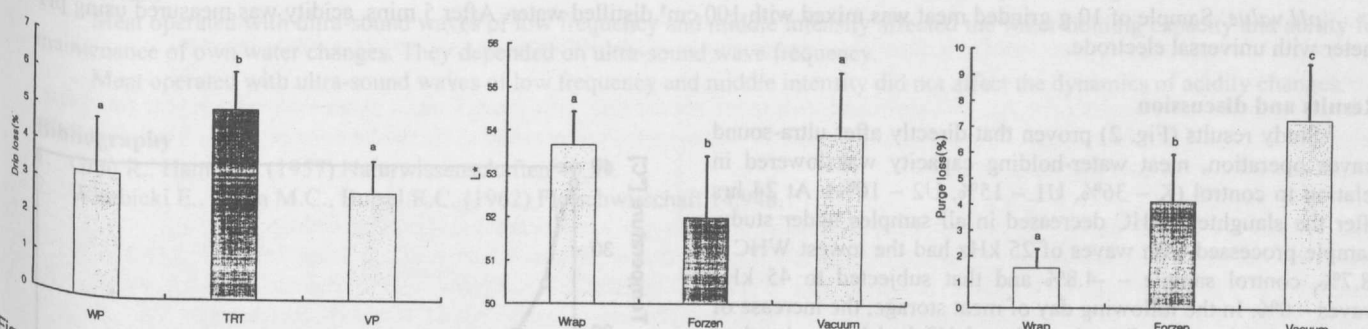


Figure 1. Changes in drip loss % and lightness(L*) by muscle temperature and packing methods. (WP : Wrap packed - chill room, VP ; vacuum packed - chill room, TRT ; wrap packed - slightly frozen - chill room). Different superscripts denote a difference($p < 0.05$).