EFFECT OF TRANSPORT ON PORK QUALITY

Silveira, N.F.A.; Silveira, E.T.F[*].; Ludtke, C.B[**].; Roça, R.de O.[***]; Andrade, J.C.de[**]; Buzelli, M.L.[**]; Soares, G.J.D[***]

[*]*Instituto de Tecnologia de Alimentos / ITAL / Campinas- e-mai:tadeu.s@uol.com.br;*
[**] *Universidade Estadual Paulista / UNESP / FCA / Botucatu-*
e-mail:lcharli@fmvz.unesp.br;
[***] *Universidade Federal de Pelotas / FAEM / DCTA- e-mail:germojds@ufpel.tche.br*

Key Words: pork, transport, handling, meat quality.

Introduction

There are some stressor factors during pre-slaughter handling which, depending on their length of time or severity, may affect pork quality. Pig transport from the farm to the slaughterhouse has been considered a major factor related to welfare. Therefore, according to the vehicle (fixed or mobile floor) and the way the animals are moved (electrical goads or pig boards), it can be observed that poor handling, fear and effort, may reduced meat quality. The difficulties while loading and unloading the animals at farms and abattoirs, which do not have ramps with appropriate slope (more than 15 º), increase the stress level due to, fear shown by the animals being moved through sloping places. Another effect that impairs the animal handling is the low height between the vehicle decks which prevents people with boards, from better accommodating the animals in the compartments. The use of vehicles with mobile floor or hydraulic elevator leads to an easy loading and unloading, minimizing the animal efforts and the need of suitable ramps in the farms. It also allows the replacement of electrical goads by boards. This practice proves to be a method to improve animal welfare and reduce economical losses resulted from poor handling. Good pre-slaughter handling conditions are of great importance to meet the welfare international requirements. Therefore, proposals to investigate the stress level on pork quality are highly important to improve the competitiveness requested by the international market.

Objectives

The aim of this work was to evaluate the influence of transport vehicles (fixed and mobile floor) and the system to move the pigs (board and/or electrical goads) on pork quality (pH, color, water holding capacity and drip loss).

Methodology

Animals. Four hundred and eighty pigs from a commercial farm located in southern part of Brazil were used in the experiment. The animals had the same genetic line, sex and slaughter age and they were allocated in four groups (n = 120).

Treatments. Groups 1 and 2, animals were transported in vehicles which met the requirements of animal welfare (mobile floor, water sprinkling system, excrement collection). Groups 3 and 4, animals were transported in conventional vehicle (fixed floor, adjustable ramp, without water sprinkling system). Two handling systems were applied in this experiment, boards (G1 and G3) and electrical goads (G2 and G4).

Slaughter. The pigs were transported at night for about 215 km. The stock density in the truck was 0.5m2/100Kg and the slaughter was performed in July, 2004 at a commercial abattoir. Water was available to the animals during the fasting period in the farm (12h) and lairage time (4h). The animals were electrically stunned and submitted to commercial slaughter procedures normally applied by the company.

Measurements. Rate of pH decline in Semimembranosus muscle measured at 4, 6, 8, 12 and 24h after bleeding; color evaluation in Longíssimus dorsi at 24h postmortem using Minolta colorimeter (CR300); water-holding capacity (WHC) in Semimembranosus evaluated at 24h postmortem according to the pressing method described by Hoffmann et al., (1982) and drip loss in Longíssimus dorsi using the methodoly reported by Honikel, (1998). The statistic design was randomized blocks and means were submitted to 5% significance on the Tukey test (Statistic Analysis System, 2000).

Results & Discussion

The statistic results from the quality traits evaluated on this work are shown in Table 1.

Considering the pH values (4, 6, 8, 12 and 24 h *postmortem*), (L*, a*, b*) color, drip loss and WHC, there was no significant difference in relation to pigs transported in different vehicles and moving system. Guise & Penny (1989), Barton Gade & Christensen (1998) and Warriss *et al.* (1998) evaluated other forms of stress originated from pig transport, and no statistic difference was found on meat physic-chemical traits. According to Warriss, *et al*. (1998) animals can be recovered from transport stress using a proper rest time and handling in the slaughter house. However, for Grandin (1998), the transport stress influences the pork quality, and the use of vehicles aiming at providing better animal welfare conditions are of great importance.

The color (L* values, 50.30 to 51.35) and drip loss (6.42 to 7.30%) obtained in this experiment are quite similar to those found by Warriss *et al.* (1998). According to the classification proposed by Kauffman *et al.* (1993) and Van Laack *et al.* (1994) the samples can be classified from reddish-pink, soft, exudative (RSE, L* values 52 to 58 and drip loss > 5%) to reddish-pink, firm, non-exudative (RFN, L* values 50 to 52 and drip loss < 5%).

Water holding capacity values (0.33 to 0.37) obtained in this work falls in a range considered RSE (WHC values, 0.30 to 0.40) meat according to the Hoffmann *et al.*, (1982).

Conclusions

The treatments which were evaluated on this experiment were not enough to provoke alterations on pork meat quality.

The meat qualities traits evaluated in this experiment suggested that genotype or any other stressor factor which along with the transport had its contribution to classify the meat between RFN and RSE.

It is necessary to point out that the use of methods to improve animal welfare through the reduction of stress and discomfort along transport is crucial, since it contributes to decrease economical losses from an inadequate pre-slaughter handling, as well as it offers support to the already established requirements from the import countries of Brazilian pork meat.

References

Barton Gade, P. & Christensen, L. Effect of different stocking densities during transport on welfare and meat quality in Danish slaughter pigs. Meat Science, v.48, p.237–247, 1998.

Bendall, J.R. Post mortem change in muscle. In: The structure and function of muscle. New York., Academic Press., p.242–309, 1973.

Guise, H.J.; Penny, R.H.C. Factors influencing the welfare and carcass and meat quality of pigs. The effects of density in transport and the use of electric goads. Animal Production, v.49, p.511–515, 1989.

Grandin, T. Recommended trucking practices, 1998. T. Disponível em: www.grandin.com/behaviour/rec.truck. Acesso em ago.2004.

Hofmann, K.; Hamm, R.; Bluchel, E. Neus über die bertimung der wasserbindung in fleisch. Fleischwirtschaft, v.62, p.87–92, 1982.

Honikel, K.O. Reference methods for the assessment of physical characteristics of meat. Meat Science, v.49, p.447–457, 1998.

Kauffmann, R.G.; Sybesma, W.; Smulders, F.J.M.; Eikelenboom, G.; Engel, B.; Van Laack, R.L.J.M.; Hoving-Bolink, A.H.; Sterrenburg, P.; Nordheim, E.V.; Walstra, P.; Van Der Wal, P.G. The effectiveness of examining early post-mortem musculature to predict ultimate pork quality. Meat Science, v.34, p.283–300, 1993.

Statistics Analysis System. User's procedures guide, versão 8, 2000.

Van Laack, R.L.J.M. & Kauffman, R.G. Glicolityc potential of read, soft, exudative pork longissimus muscle. Journal Animal Science, v.77, p.2971–2973, 1999.

Warriss, P.D.; Brow, S.N.; Knowles, T.G.; Edwards, J.E.; Kettlewell, P.J.; Guise, H.J. The effect of stocking density in transit on the carcassas quality and welfare of slaughter pigs: 2 Results from the analysis of blood and meat samples. Meat Science, v.50, p.447–456, 1998.

Table 1. Means and standard deviations for pH, color (L*,a*, b*), drip loss (DL) and water-holding capacity (WHC) parameters in pig muscles under different means of transportation and handling system

Analyses	Muscle	G 1	G 2	G 3	G 4
pH_{4h}	*Semimenbranosus*	6,25±0,15	6,25±0,16	6,26±0,17	6,20±0,20
pH_{6h}	*Semimenbranosus*	6,21±0,13	6,29±0,11	6,25±0,14	6,22±0,16
pH_{8h}	*Semimenbranosus*	6,11±0,16	6,11±0,15	6,11±0,14	6,10±0,20
pH_{12h}	*Semimenbranosus*	6,09±0,11	6,06±0,18	5,97±0,14	5,91±0,11
pH_{24h}	*Semimenbranosus*	5,68±0,16	5,81±0,21	5,83±0,16	5,68±0,14
L*	*Longissimus dorsi*	51,35±1,54	50,30±2,49	51,28±1,80	50,91±1,95
a*	*Longissimus dorsi*	14,17±0,88	15,83±3,66	14,35±0,87	14,65±0,86
b*	*Longissimus dorsi*	1,97±0,42	2,24±1,83	2,25±0,94	1,88±0,64
DL (%)	*Longissimus dorsi*	6,42±0,89	7,30±1,51	6,73±1,67	6,93±1,14
WHC	*Semimenbranosus*	0,37±0,12	0,34±0,09	0,33±0,059	0,34±0,08

G1. Vehicle with mobile floor and handling system with boards**;**
G2. Vehicle with mobile floor and the use of electrical goads;
G3. Vehicle with fixed floor and handling system with boards;
G4. Vehicle with fixed floor and the use of electrical goads.