EFFECT OF WAY OF TRANSPORT AND LAIRAGE TIME UPON PORK QUALITY

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Background

Meat quality refers to consumers' acceptance and technological properties during processing. Until meat shall have reached the consumer quite a lot of effect may influence quality characteristics of meat. Among other major effects are environmental conditions during transport and lairage of live animals upon arrival at the slaughterhouse. Range of transport losses depends on distance, road quality, weather (*Grandin*,1982)and first of all the type of lorry. Losses involve decrease of live weight, increased mortality rate and low meat quality. Similar effects might be due to time spent and conditions in lairage before slaughter.

Objective

The aim of this study was to establish the effects of two different lorry types and different lairage times on meat quality traits in order to be able to reduce damage and adverse effects. In addition, the objective of this study was to establish relationships between meat quality traits measured. Further question was if there are differences in various parts of the same muscle between meat quality traits (In this case at fresh cut surface of the medial and lateral sides of *M. longissimus dorsi*).

Materials and methods

The present study was conducted at the *Gyula Packing Plant* (Hungary) during the summer in 2000. Two different lorry types for transport of slaughter pigs (a) in *single-decker lorry* (IFA) and (b) *double-decker* one *designed for animal transport* and the effect of lairage time (a) for 24 hours according to common practice and (b) for 30 hours were compared. 101 (*Large white x Landrace*) x *Hybrid* terminal slaughter pigs were transported 130 km distance from the piggery to the slaughterhouse. The animals were slaughtered according to commercial procedure. The carcass quality including surface reflectance was determined by *Fat-O-Meater* according to the EUROP system. Meat quality traits recorded are listed as follows: pH_{45} and temperature was measured in *M. longissimus dorsi* (LD), as well as pH_u after chilling for 24 hours. Meat colour was measured using *MINOLTA CR 300 Chromameter* at two anatomical (medial and lateral) parts of fresh cut surfaces of *M. longissimus dorsi*.

Findings were processed Program Package Statistica for Windows 4.O Statistical procedures were as follows: frequency distribution, χ-Test, basic statistics, t-Test, as well as bivariate regression and correlation analysis.

Results and discussion

Comparing the effect of both treatments significant differences were established between distributions of meat quality traits which were assigned to PSE, normal and DFD categories where the ranged of them were determined using generally accepted limits (*Vadáné*, 1996). Figures are summarised in *Table 1*. Single-decker lorry (IFA) proved to be superior to double-decker one designed for animal transport showing lower share of PSE producing animals (18 vs. 34 %). The reason of the adverse phenomenon might be because in case of the latter one loading and unloading is rather complicated and frequent use different tools for driving of animals was needed resulting in high level of stress.

Prolonged lairage time for 30 h resulted in decrease of frequency of PSE (18 vs. 34 %). It has to be mentioned that frequency of DFD meat was much lower than anticipated. Previous studies (*Bendall and Swatland*, 1988; *Wittmann et al. 1999*) prolonged lairage time would result in higher incidence of DFD character. This phenomenon can be explained in part by the high stress susceptibility of animals due to the genetic background of pigs and extreme hot spell and dry weather conditions during transport.

In the subsequent step medial and lateral side of *M. longissimus dorsi* was compared in terms of L^* and a^* value of colour which was not the case for b^* value. In *Table 2* means and standard deviations for meat colour characteristics as well as levels of probability are summarised.

Coefficients of correlation estimates between meat quality traits influencing colour in LD are presented in *Table 3*. Findings reveal close, negative relationship of L^* lightness with pH_{24} ($r = -0.76$). No association was established between L^* and LD *temperature* and/or *surface reflectance*. Relatively low coefficients of correlation were calculated for the relationship of LD *temperature* with *surface reflectance*. Tendencies of relationships are demonstrated in *Fig. 1* using bivariate regression analysis.

Conclusions

In order to be able to improve meat quality conditions during transport has to be modified. Use of double-decker lorry should be avoided due to detrimental effect on loading and unloading practice and harmful overall conditions during transport. Single-decker lorries seem to be advantageous. Multi-decker lorries equipped with hydraulic lifts may also be suitable for transportation of slaughter pigs since loading space can be brought to the same level of the loading surfaces of the lorry. On the other hand, lairage time is determined first by the capacity of space and vehicles available for transport.

Within same muscle, different meat quality could be detected in this study. For this reason in evaluation of meat quality and/or in assorting meat for processing repeated measurements are needed.

References

Bendall, J. R. and Swatland, H. J. (1988): A review of relationship of pH with physical aspect of pork quality. Meat Science, 24. *85-126. p.*

Grandin, T. (1982): Pig behaviour studies applied to slaughter plant design. Applied Animal Ethology, 9. *141-151. p.*

Vadáné, Kovács M. (1996): Az állatvágás és a hűtés fiziológiája, a hús fizikai tulajdonságai, a húsminőség előrejelzésének lehetőségei. Húsipari Továbbképző Napok, Budapest *103-124. p.*

Wittmann, M., Laky, Gy., Radnai L., Kozma, O. and Guba, F. (1991): A sertések beszállításának és pihentetésének szervezése nagy vágóhídon a húsminőség szempontjából. Állattenyésztés és Takarmányozás. 4. *329-340. p.*

Table 1 Distribution of meat quality categories across treatments

Treatments	PSE		normal		DFD	
	piece	%	Piece	%	piece	%
Vehicle type						
Single decker lorry	9	18	40	80	1	2
Double decker lorry	17	34	31	62	1	2
Lairage time						
24 h	17	34	31	62	2	4
30 h	9	18	40	81	0	0

Table 2 Change of meat colour characteristics within M. longissimus dorsi

	LD_{med}		LD_{lat}		Level of probability
	mean	SD	Mean	SD	
L^*	48.58	5,49	45,53	5,57	***
a^*	9.01	2,14	9,84	2,49	**
b^*	4.39	2,36	4,32	2,47	NS

***=P<0.001, **=P<0.01, *=P<0.05, NS=P>0.05

Table 3 Matrix of coefficients of correlation of meat quality traits (LD_{med})

Item	LD temperature	LD pH_u	Surface reflectance	L^*
LD temperature	1	0.046	0.362***	0.066
LD pH_u	-	1	0.010	-0.760***
Surface reflectance	-	-	1	0.063
L^*	-	-	-	1

***=P<0.001

Fig. 1 Regression of L lightness on meat quality traits recorded*