EVALUATION OF THREE PIG BREEDS IN TERMS OF WATER HOLDING CAPACITY AND THE EFFECTIVENESS OF POST-SLAUGHTER STRATEGIES TO REDUCE DRIP LOSS

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Introduction

The attractiveness of pork to consumers is largely determined by appearance, i.e. colour, amount of marbling, and drip loss (Brewer and McKeith, 1999; Ngapo *et al.*, 2007). The visual appearance is becoming even more important due to the increasing share of pre-packed meat for self-service. Currently, polarisation between discount and premium segments has been observed. Thus, in order to satisfy the premium consumer's need for constant and guaranteed quality it is necessary to select carcasses with quality beyond the standard. This research focuses on strategies to reduce drip loss of pork. We therefore evaluated meat quality characteristics of pig carcasses of three commercially available breed types. Also considering the MHS-genotype (malignant hyperthermia syndrome), we further simulated post slaughter discrimination of superior carcasses where we especially focussed on reduction of drip loss.

Animals, Materials and Methods

This research included in total 534 pigs of three crossbreeds (G, H, and S). Crossbreeds G and H were German Large White (LW) x German Landrace (LR) sows sired with Pietrain (PI) boars, i.e. PI x (LW x LR). Crossbreed S was 25 % Duroc (DU), i.e. PI x (DU x LR). The pigs were raised at several commercial farms, fed with standard pig diets, and they were slaughtered in a commercial abattoir using electric stunning at 6 dates distributed within one year. Carcass data were provided by the slaughter company using a SFK Fat-O-Meat'er grading probe. Early post mortal pH-value of *M. longissimus* was measured at suspended carcasses in the region of the 2nd/3rd last rib 45 min post mortem (pH45) prior to entering the chilling room without prior shock cooling. The next day the chilled carcasses were transported to the packing plant. There, electrical conductivity and pH were measured 24 hours post mortem at suspended carcasses (EC24, pH24) with LF-star and pH-star instruments, respectively (Matthäus, Germany). Loins were then detached from the carcass and cut across at the position of the 2nd/3rd last rib. At the chop surface that was allowed to bloom for 10 minutes CIE-Lab colour values were recorded in triplicate on non overlapping sites with a Minolta CR-300. The loins were then transported on ice to the lab for further analysis. Drip loss of samples taken approximately 30 hours post mortem was measured according to the bag-method (Honikel, 1998) after 48 hours storage time at 4 °C.

Results and Discussion

Descriptive statistics of the evaluated parameters are presented in Table 1. We observed a large variation of drip loss values. The incidence of MHS frequencies is given in Table 2. Though it is well known that the MHS status largely affects the water holding capacities of pork, we found surprisingly high frequencies of heterozygote animals. Correlations between meat quality attributes and drip loss with respect to MHS-genotype are given in Table 3. EC24 and colour values are closer related to drip than is pH45. As for breed differences in the relationship between EC and drip loss, see Mörlein *et al.* (in press).

Table 1: Descriptive statistics of carcass and meat quality characteristics (n=534)

	Mean	Min	Max	S.D.
Carcass weight	95.07	77.00	113.40	5.91
Lean meat [%]	57.55	50.10	64.20	2.70
pH45	6.41	5.70	7.00	0.22
pH24	5.53	4.73	6.28	0.15
EC 24	6.24	2.40	14.10	2.33
L*	47.34	38.76	59.51	2.76
a*	8.07	4.73	11.28	1.08
b*	0.14	-3.05	5.05	1.02
Drip loss [%]	6.41	1.28	16.08	2.55

Table 2: Frequency of MHS-genotypes within breeds (n=534); NN = homozygote MHS negative; NP = heterozygote MHS positive

	MHS genotype	
breed	NN	NP
G (n = 178)	84.8 %	15.2 %
H (n = 179)	84.4 %	15.6 %
S (n = 177)	49.7 %	50.3 %
	73.0 %	27.0 %

Table 3: Correlations between meat quality attributes and drip loss with respect to MHS-genotype ($p < 0.01$)

MHS-genotype	L*	a*	b*	pH45	EC24
NN	0.31	0.23	0.33	-0.24	0.53
NP	0.50	0.23	0.56	-0.22	0.39

As for the incidence of pale, soft, exudative meat (PSE), obviously EC24 is more indicative than pH45 (Table 4). Applying the threshold of EC24 above 7 mS/cm, we conclude around 30 % of the carcasses to show PSE - that is in good accordance with Altmann *et al.* (2005) and Warriss *et al.* (1998).

Table 4: Comparison of PSE incidence in percent with relation to the indicating parameter, its threshold value, and breed

	Conductivity 24 h p.m.		Drip loss 30-78 h p.m.			pH value 45 min p.m.	
	> 7 mS/cm	> 9 mS/cm	> 5 %	> 7 %	> 9 %	< 5.8	< 6.0
G: PI x (LW x LR)	31.5	11.2	70.2	37.0	16.8	0.6	1.1
H: PI x (LW x LR)	25.7	10.6	73.7	40.8	17.9	1.1	2.2
S: PI x (DU x LR)	40.1	23.2	57.6	31.0	10.7	0.6	5.1
total	32.4	15.0	67.2	36.0	15.2	0.8	2.8

In Figure 1 the effectiveness of discriminating carcasses with superior water holding either by selecting MHS negative animals or applying EC threshold level is shown. Thus, mean drip loss and its variation can effectively be decreased while lean meat percentage is only slightly affected (data not shown). Breed S with 25 % Duroc was superior in terms of water holding as well as intramuscular fat and eating quality (Mörlein *et al.*, in press).

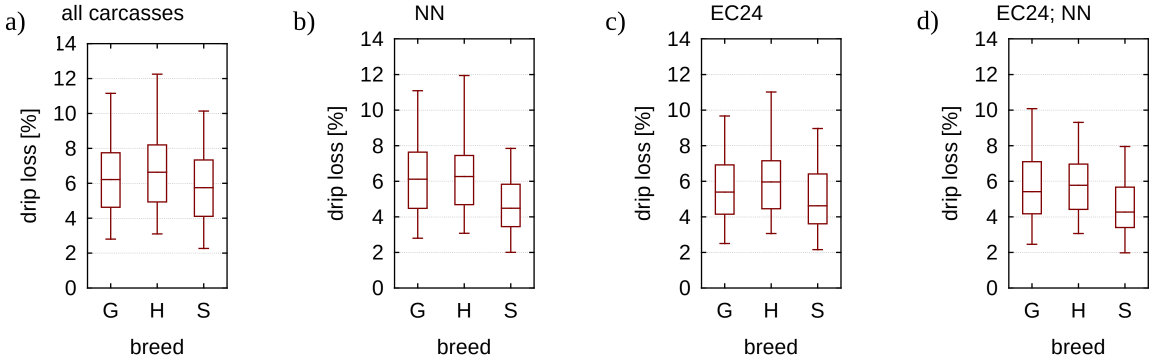

Figure 1: Variability of drip loss with respect to MHS genotype and sorting criteria; a) all carcasses; b) NN-carcasses, no sorting; c) all carcasses with EC24 <= 7 mS/cm; d) NN-carcasses with EC24 <= 7 mS/cm (line = median, box = 25 and 75 percentiles; whiskers = 5 and 95 percentiles)

Conclusion

Planning meat quality has to start with planning of the genetic quality. Most effectively, drip loss can be reduced by selecting MHS-negative animals and certain breed types. At slaughter, discrimination of carcasses with improved water holding capacity may most effectively be realised using conductivity measurements 24 hours p.m., i.e. when the cooling process is done. However, elimination of the MHS-allele will decrease the drip loss to the largest extend.

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