# INTERACTIVE EFFECTS OF THE HAL AND RN GENES IN CROSSBREEDING

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## BACKGROUND

In the last three decades of this century a many researches was realised for identifications of factors influenced on pork meat quality and among them of the genetics. Actually were identified the two major genes that affected pork quality. The first $HAL^n$, stress susceptibility gene that induced the PSE meat and also decreased the reproduction traits but increased meatiness. This gene initially was received as recessive but on the basis of recently studies rather as additive for quantity and quality of meat. The second, $RN^-$ gene discovered in 1986 year, is unfavourable for meat quality traits connected with yield in curing and cooking processing but with positive effect for raw meat products. Their effect on carcass composition and growth rate is not clear and is studied. In many countries these both genes are specially introducing to crossbreeding programs for utilisation its positive effects or elimination of unfavourable. For this reasons important is recognise interactive effect of both genes in crossbreeding for productive traits and also by fact that this effect is not well known.

## OBJECTIVES

The aim of the present study was to analyse of interactive effects of $HAL^n$ and $RN^-$ genes in crossbreeding of different breeds on fresh meat quality traits and its technological yield.

## MATERIAL AND METHODS

The investigations were carried out on 71 animals originated from crossing of pure breed large white sows (50 pigs) and crossbreed polish large white x polish landrace (21 pigs) with 3 crossbreed boars (hampshire x pietrain). The genotypes of boars as follows $HAL^NHAL^NRN^-rn^+$, $HAL^NHAL^nrn^+rn^+$, $HAL^NHAL^nRN^-rn^+$ were identified early on the basis of their individual test and on their progeny testing. The RN- genotypes were identyfied using of glycolytic potential (Monin and Sellier 1985) and also verified by the "Napole yield" (Naveau et al. 1985). The $HAL^n$ genotypes were defined by PCR/RFLP method according to Kurył and Korwin-Kossakowska (1993).

Fattener were slaughtered at 100 kg liveweight in the same slaughterhouse by electrical stunning (180-220 V; 0,5-0,8 A; 8 s). In the *Longissimus dorsi* muscle (at the last rib) were evaluated $pH_1$ and $R_1$ (IMP/ATP ratio) at 45 min after slaughter. In 24 hours after slaughter the $pH_{24}$ and muscle lightness were measured. Muscle lightness was determined using an apparatus Momcolor-D 3098 with white standard. The value R was determined according to the method of Honikel and Fischer (1977) as ATP breakdown indicator. The pH values was recorded using microcomputer pH meter with combined glass electrode in muscle homogenates. The technological yield of meat in curing and cooking processing ("Napole yield" – RTN) was evaluated according to the method of Naveau et al. (1985). Obtained data were analysed using a multifactor analysis of variance.

## RESULTS AND DISCUSSIONS

The obtained results showed significant differences between groups only for technological yield of meat in curing and cooking processing (RTN) (tab. 1). Small visible differences between some groups in $pH_1$, $pH_{24}$ and muscle lightness was not significant. It is necessary to remark here, that in some groups the number of animals is a little and those are preliminary results. Comparison between analysed groups for "Napole yield" (RTN) showed the best results in type of mating when the $RN^-$ allele is absent (tab. 1, fig. 1). For other groups, when the $RN^-$ allele is segregating the "Napole yield" was lower about 5-7%. In the cases when the both unfavourable alleles are present in genotypes of boars the RTN is lower. In these results it is visible that for technological yield of meat the $HAL^n$ allele deepen and intensified effect of $RN^-$ allele (fig. 1, 2). Ellis and McKeith (1996) received significant interaction between halothane genotypes and glycolytic potential (high and low) for $pH_{24}$ and Minolta L* values. Differences observed between halothane carrier and negative animals (also for Napole yield in spite of lack significance) were much greater for the high glycolytic potential pigs. Le Roy et al. (1999) received significant interaction effects between HAL and RN genes for many meat quality traits and showed two situations: 1."Snowball" effect when one mutation is increased by the other one, 2."Lessening" effect when the effect of one mutation is decreased by the other one. On Napole technological yield these authors shown that effect of $RN^-$ allele was smaller in nn than in NN pigs.

## CONCLUSIONS

The obtained results showed significant differences between groups only for technological yield of meat in curing and cooking processing (RTN). In type of mating when the $RN^-$ allele is segregating the "Napole yield" was lower about 5-7%. In the cases when the both unfavourable alleles are present in genotypes of boars the RTN is the lower and the $HAL^n$ allele deepen and intensified effect of $RN^-$ allele.

## PERTINENT LITERATURE

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Table 1
Interactive effect of the $HAL^n$ and $RN^-$ genes in crossbreeding for fresh meat quality traits and their technological yield

| Traits | Genotypes of boars for $HAL^n$ and $RN^-$ genes | | | | |
|---|---|---|---|---|---|
| | $Nn / RN^-rn^+$ | $Nn / rn^+rn^+$ | $NN / RN^-rn^+$ | $Nn / RN^-rn^+$ | $NN / RN^-rn^+$ |
| | Genotypes of sows for $HAL^n$ and $RN^-$ genes | | | | |
| | Large white - $NN / rn^+rn^+$ | | | Crossing sows - large white x landrace N? / rn+rn+ | |
| Number of animals | 8 | 12 | 30 | 13 | 8 |
| $pH_1$ | 6.26±0.30 | 6.26±0.19 | 6.33±0.25 | 6.25±0.23 | 6.40±0.23 |
| $pH_{24}$ | 5.37±0.06 | 5.51±0.13 | 5.50±0.16 | 5.44±0.12 | 5.47±0.07 |
| $R_1$ (IMP/ATP) | 0.92±0.11 | 0.97±0.11 | 0.98±0.19 | 0.94±0.10 | 0.91±0.11 |
| Muscle lightness | 18.52±1.52 | 17.85±2.50 | 18.06±2.40 | 17.01±1.83 | 18.32±1.36 |
| RTN (%) | a 87.73±6.70 | b 94.65±3.39 | a 89.55±6.79 | a 86.34±6.21 | a 86.79±5.50 |

RTN – "Napole yield" – technological yield of meat in curing and cooking processing;
a, b – the means signed by different letter are different at the P<0,05 level.

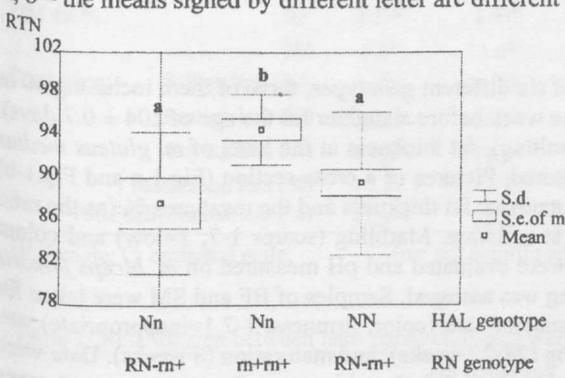


Fig. 1 Interactive effect of both genes in dependency on boars genotype which were crossing with polish large white sows

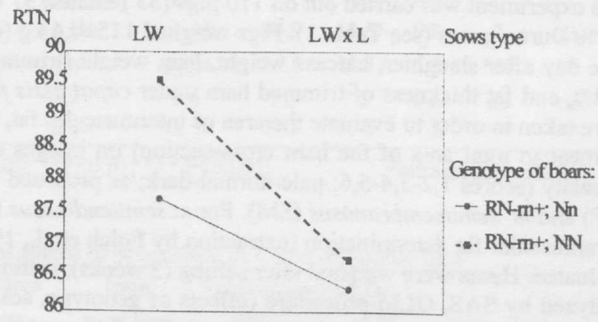


Fig. 2 Interactive effect of both genes in dependency on genetic type of sows