EAAP Annual Meeting 2013 • Nantes • 26th - 30th August 2013

RN gene polymorphism effects in a family-based scheme in French purebred pig populations

Marie-josé Mercat[1], Katia Feve[2], Nelly Muller[3], Catherine Larzul[4], Juliette Riquet[2]

[1]Ifip-Institut du porc, La Motte au Vicomte, BP 35104, 35651 Le Rheu Cedex - France
[2]INRA LGC, Castanet-Tolosan ; [3]INRA UETP, Le Rheu ; [4]INRA GABI, Jouy-en-Josas - France
Contact: marie-jose.mercat@ifip.asso.fr

Objective

To estimate the effect of RN gene haplotypes on meat quality traits with progeny testing data of French purebred pig populations

Methods

Animals and performances

- Half-sib families: 50 castrate and female offspring /purebred sire
- 5 breed groups: LW (3 Large-White type lines), LF (French Landrace), P (3 Pietrain lines), D (3 Duroc lines) and CH (4 Chinese-European lines)
- Performance recording at INRA UETP test station: growth, carcass composition, meat quality traits (23 meat quality traits)
  - Meat Quality Index (MQI): combining semi-membraneous pH 24h post mortem (pH_{SM}), Minolta L* and water holding capacity both measured on gluteus medius a few minutes after cutting
  - Drip loss measured in a tray (13th thoracic vertebra sample)

Polymorphisms and statistical analyses

- 8 polymorphisms in RN (PRKAG3) gene: R200Q, V199I, G52S, K131R, P134L, T30N, V41I, L53P + Halothane mutation (Hal)
- Haplotypes (number 1 to 6) defined with the segregating RN mutations
  - No polymorphism found for R200Q and L53P
- Effect of haplotypes estimated with the MIXED procedure (SAS software) with sex, slaughter date and, in P Hal, as fixed effects, dam and sire as random effects and carcass weight as covariate

Table 1 - Haplotypic frequencies estimated on parents, total size of the breed groups and number of animals per haplotype-based genotype

Breed group	D	LF	LW	P	CH
Haplotype 1	40%	64%	34%	35%	12%
Haplotype 6	47%	20%	10%	7%	21%
Total	**341**	**328**	**526**	**446**	**546**
1/1 offspring	35	181	45	61	2
1/6 offspring	128	100	22	24	12
6/6 offspring	92	6	0	18	17

Results *Focus on haplotypes 1 and 6*

Haplotypic frequencies

- Frequencies of haplotype 1 and 6 were estimated on parents
- No estimation for 1/1-carriers (i.e. haplotype-based genotypes) in CH and for 6/6-carriers in LW because of insufficient data

Most significant results

- Observed for MQI (Fig 1-A) and pH_{SM}: haplotype 1 is favorable on both traits in LW, LF, D and only on MQI in P
  - Large substitution effect between 1/1- and 1/6- or 6/6-carriers: between 0.7 to 0.9 standard deviation for MQI

Overall trend

- In LW, LF, D and P, although not significant for all traits/breed groups: 1/1-carriers have higher pH (semi-membraneous and longissimus), lower L*, a*, b* (gluteus medius, longissimus) and drip loss (Fig 1-B) than 1/6- or 6/6 -carriers
- In CH, substitution effect between 1/6- and 6/6-carriers were not significant except on color traits (but few animals)
- None of the segregating RN polymorphisms alone had similar substitution effect

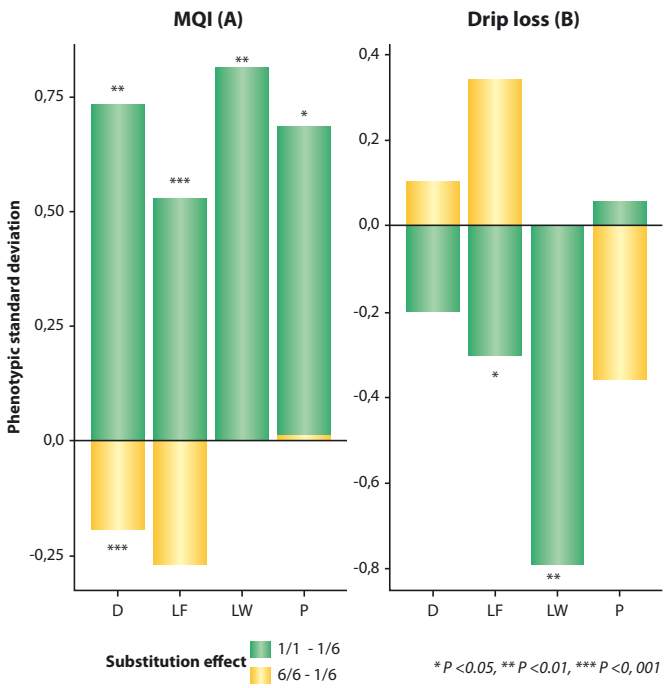

Fig 1 – Substitution effect between 1/1- and 1/6-carriers (in green) and 6/6- and 1/6-carriers (in yellow) on Meat Quality Index and drip loss

Conclusions

R200Q polymorphism (named RN- mutation) has not been found in French purebred pig populations. Haplotypes defined by 6 other RN gene polymorphisms have quite important effects on quality traits. Haplotype 1 appears favorable; similar trends have been found in different groups of breeds.

Project funded by the French Ministry of Agriculture and BIOPORC