

Responses to divergent selection for residual feed intake in growing pigs, consequences on pork

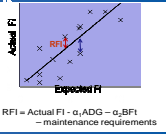
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Objectives

Hypothesis: Residual feed intake (RFI) quantifies the excess / default of feed intake of the animal compared to feed intake predicted from its performance level.

→ What impact of a selection on RFI on production traits, muscle characteristics and subsequent pork quality?



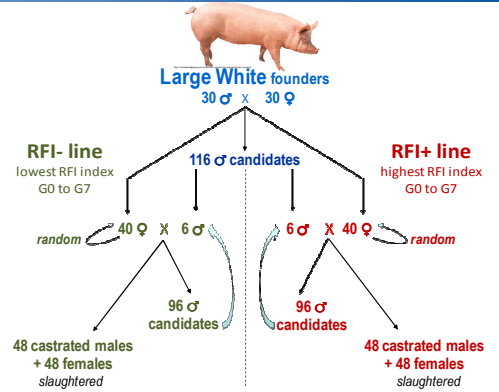
Material and Methods

DATA

Divergent Large White lines selected on RFI index = $DFI1 - (1.24 \times ADG) - (31.9 \times BFT)$
1288 candidates to selection tested between 35 and 95 kg BW
1895 phenotypes recorded on castrates and females between 70 d and 110 kg BW
60 RFI⁻ + 57 RFI⁺ in G6 : *longissimus* collected for meat quality tests

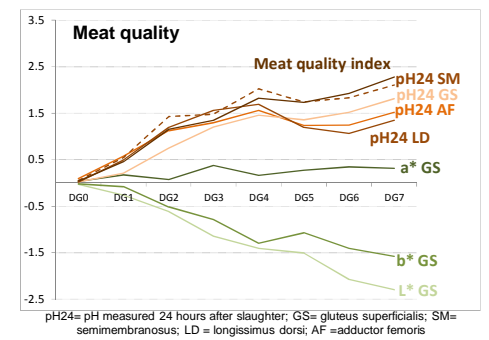
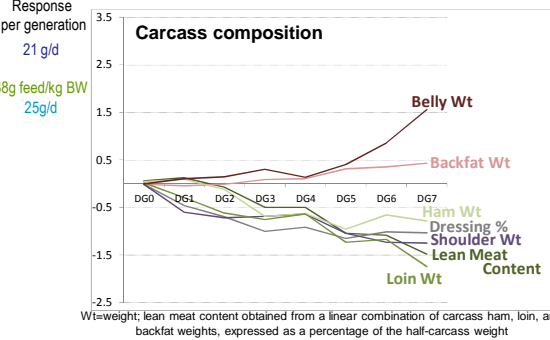
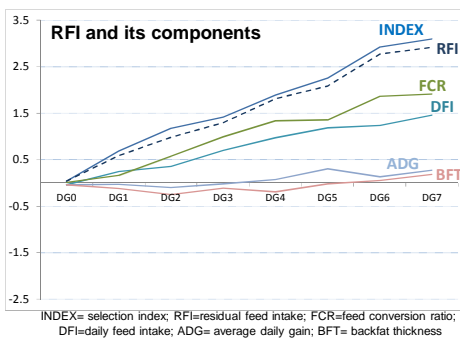
METHODS

- 1) Animal mixed model to evaluate direct and correlated responses to selection on traits on all generations. Note: Variance due to drift is estimated to 0.31 genetic standard deviation.
- 2) Analysis of variance to evaluate line differences for muscle characteristics and subsequent pork quality recorded in G6 only .



RESPONSES TO SELECTION

Difference between least square means of breeding values for the RFI⁺ line and the RFI⁻ line within generations (proportion of genetic standard deviation)



- **Better feed efficiency** in RFI⁻ line
- **Lower feed intake** in the RFI⁻ line
- No response on growth rate and backfat thickness

- **Higher leanness** in RFI⁻ line, essentially related to greater loin weights

- Lower ultimate pH in RFI⁻ line
- Higher L* in RFI⁻ line
- **Lower technological meat quality** in RFI⁻ line

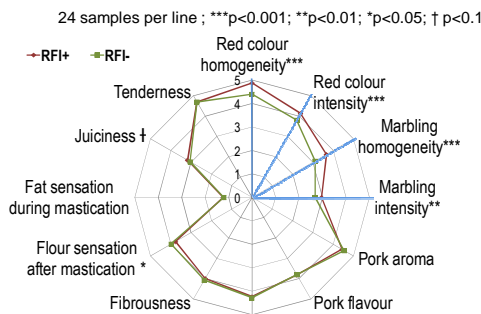
MUSCLE CHARACTERISTICS and PORK QUALITY

Longissimus muscle energy substrates at 30 min p.m (least square means)

	RFI ⁺	RFI ⁻	Rsd ¹	Line difference
Lactate, μmol/g	52.8	50.9	9	ns
Free glucose+G-6-P ² , μmol/g	5.3	5.9	1.9	ns
Glucose (glycogen) ³ , μmol/g	28.2	33.9	9.6	*
Glycolytic Potential ⁴ , μmol/g	132	143.9	17.8	**
Intramuscular fat Content, %	1.39	1.17	0.34	**

¹ Residual deviation = root of error mean square of the full ANOVA model; ² Glucose-6-phosphate; ³ Glucose issued from glycogen hydrolysis; ⁴ Micromoles of equivalent lactate per gram of fresh muscle
**p<0.01; *p<0.05; ns p>0.1

Sensory analyses of loin (score 0 to 10, least square means)



- **Worse visual indicators on raw meat** in RFI⁻ line
- **Slightly deteriorated** sensory traits in RFI⁻ line

Protein (carbonyl groups) and lipid (TBARS) oxydations during raw meat ageing and cooking⁴

	RFI ⁺	RFI ⁻	Rsd ¹	Line difference	
Carbonyl groups nmol DNP ² fixed/mg prot	ageing D1	1.43	1.25	0.33	**
	ageing D4	1.32	1.30	0.27	ns
	cooking T10min	1.73	1.81	0.38	ns
	cooking T30min	2.05	2.04	0.41	ns
TBARS mg MDA ³ / kg meat	ageing D1	0.091	0.073	0.054	†
	ageing D4	0.214	0.175	0.170	ns
	cooking T10min	0.291	0.267	0.106	ns
	cooking T30min	0.216	0.214	0.096	ns

¹ Residual deviation = root of error mean square of the full ANOVA model; ² dinitrophenylhydrazine; ³ malondialdehyde; ⁴ D1= 24h after slaughter; D4=96h after slaughter; T10 min=10 min heating at 100°C; T30 min=130 min heating at 100°C
**p<0.01; † p<0.1; ns p>0.1 ;

- **Lower protein and lipid oxydations 24h after slaughter** in RFI⁻ line, consistent with lower intramuscular fat content
- No difference after ageing or heating

Conclusion

Responses to selection are large on RFI, with favorable correlated responses on DFI and FCR .

Despite no correlated response on BFT, carcass leanness is increased, energy substrates are more glycolytic and meat quality is decreased in the low RFI line.

However, **only marginal impact on sensory traits** was observed, hypothesised not to be discernible by consumers.

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