

Effect of selection for *E. coli* F4ab/ac resistance in pigs

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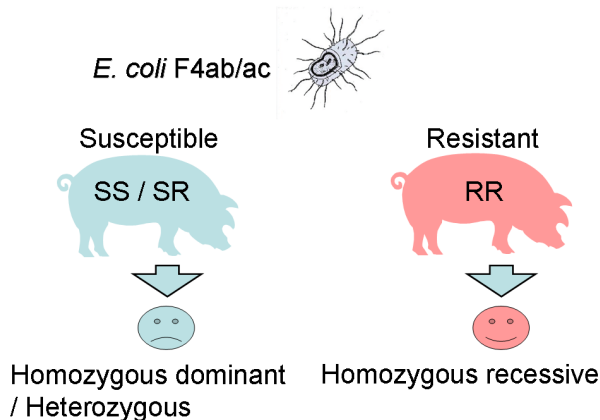
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Infection by *E. coli* F4ab/ac



Introduction

- Infection by *E. coli* F4ab/ac is responsible for more than 30% of coli diarrhoea in piglets
- Infection by *E. coli* F4ab/ac is linked to a single gene
- A selection programme for resistant animals was started in 2003

Objective

- To estimate the association between the F4ab/ac genotypes and the production traits in the breeding goal
- To predict the cost of the elimination of the resistant allele
- To indicate the effect in the production herds



Frequencies of resistant animals in three breeds 2003

Landrace	0.01
Large White	0.19
Duroc	0.88

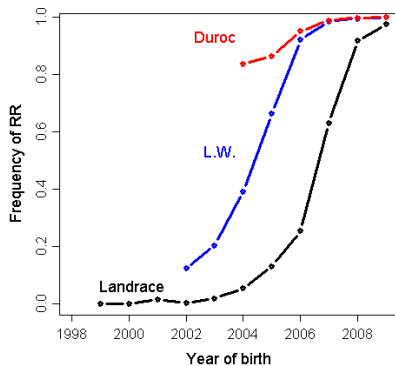
- In 2003 all Landrace and Large White boars used in the nucleus herds were tested
- Few Duroc boars was tested

Selection strategy for the recessive F4ab/ac allele

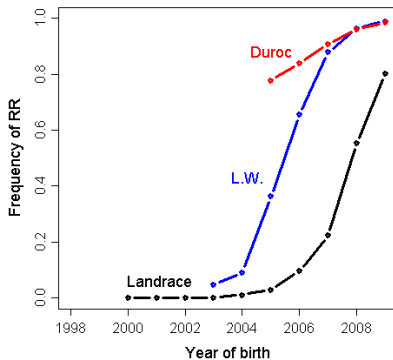
- September 2003
- Landrace: Exclusion of homozygous dominant boars from the nucleus population
 - Large White: Only use of resistant boars in the nucleus herds
- March 2005 Landrace: Only use of resistant boars in the nucleus herds
- March 2006 Duroc: Only use of resistant boars in the nucleus herds
- April 2007 Landrace: Only use of resistant boars in the multiplying herds

Frequency of RR

Performance tested animals



Sow population



Statistical model to estimate the effect of the F4ab/ac genotypes

Linear mixed animal models

$$y_i = \mathbf{X}_i\boldsymbol{\beta} + \mathbf{x}_i\mathbf{b} + \mathbf{G}_i\mathbf{u} + a_i + \varepsilon_i$$

- Fixed effects:
 - $\mathbf{X}_i\boldsymbol{\beta}$ cover the effect of gender, herd, year, month, and regression coefficient of weights
 - $\mathbf{x}_i\mathbf{b}$ cover the effect of F4ab/ac genotypes and the levels in $\mathbf{b}$ are $\{RR, RS, SS, 2009, 2008, 2007, \dots\}$
- Random effects: $\mathbf{G}_i\mathbf{u}$ cover the effect of pen, litter within sow, $a_i \in N(0, A\sigma_a^2)$ is the genetic effect, and $\varepsilon_i \in N(0, \sigma_e^2)$ is the residual.

Effects of F4

Genotype	Growth 1	Growth 2	TNB	Cost (€)
<i>Landrace</i>				
RR	1.6	-8.9	-0.700	2.78
SR	3.5	-4.9	-0.417	1.64
SS	0.0	0.0	0.000	0.00
<i>Large White</i>				
RR	2.9	-12.2	-0.290	1.78
SR	3.3	-5.5	-0.021	0.32
SS	0.0	0.0	0.000	0.00
<i>Duroc</i>				
RR	-3.3	-19.5	-0.058	2.67
SR	0.0	0.0	0.000	0.00

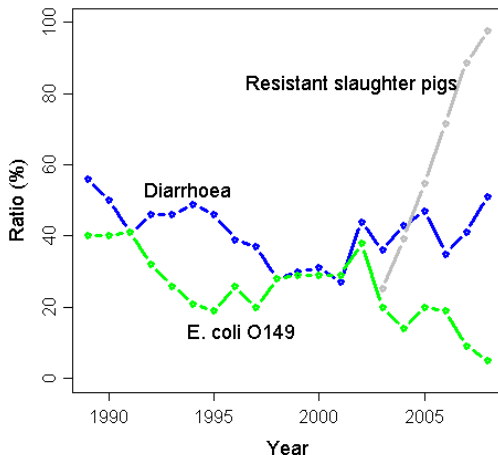
Unaffected traits: Back fat, feed efficiency, fitness score, killing out, survival until day 5



Cost of the F4 selection

- The cost of the F4 selection strategy is €1.10 on each cross breed slaughter pig, $D \times (L \times LW)$.

Cause of death in piglets 1 to 21 days of age



Conclusion

- The F4ab/ac allele was unfavourably associated to growth rate from 30 kg to 100 kg and to litter size (TNB)
- Breeding for increased litter size (TNB) has decreased the number of the resistant F4ab/ac animals
- Mortality rate caused by *E. coli* O149 diarrhoea in piglets from production herds has decreased



Thank you !

