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Dynamic response to weaning of two lines of pigs divergently selected on residual feed intake

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Major today's goals in pig production

To improve feed efficiency

Rate of conversion of feed in body weight / meat

→ Reduce feed costs

→ Decrease environmental impact

To increase pig robustness

"Ability to combine a high production potential with resilience to stressors, allowing for expression of a high production potential in a wide variety of environmental conditions" (Knap 2005)

→ Health and animal welfare

→ Decrease the use of medication and antibiotic

Focus on robustness at weaning : the most critical period for the pig

Responsible of 50% of the use of antibiotics in pig production

Dynamic of the response of the animal after the weaning

Weaning

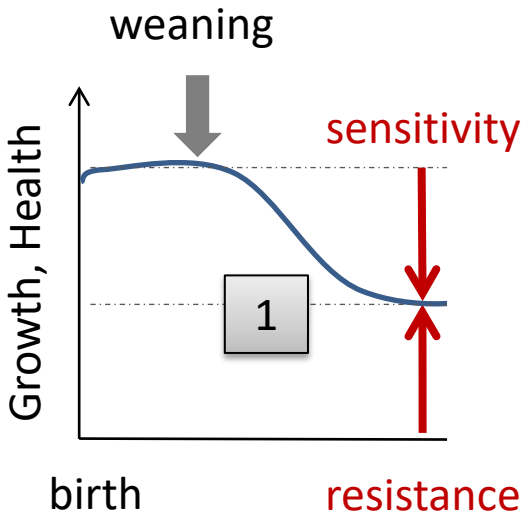
Dietary, psychological, and environmental stresses

Lallès et al. (2007), Sauvant and Martin, (2010)

Dynamic of the response of the animal after the weaning

Weaning

Dietary, psychological, and environmental stresses



1 **Low / varying feed intake**

Epithelial damage
Reduction digestive capacity
Microbial dysbiosis

→ **Growth check, digestive disorders**
→ **High sensitivity to enteric pathogens**
→ **Post-weaning diarrhoea**

Lallès et al. (2007), Sauvant and Martin (2010)

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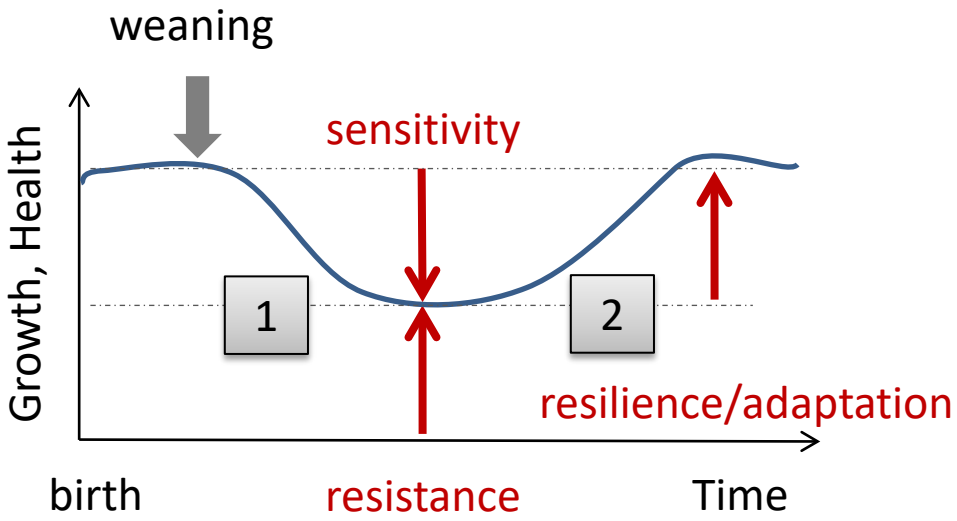

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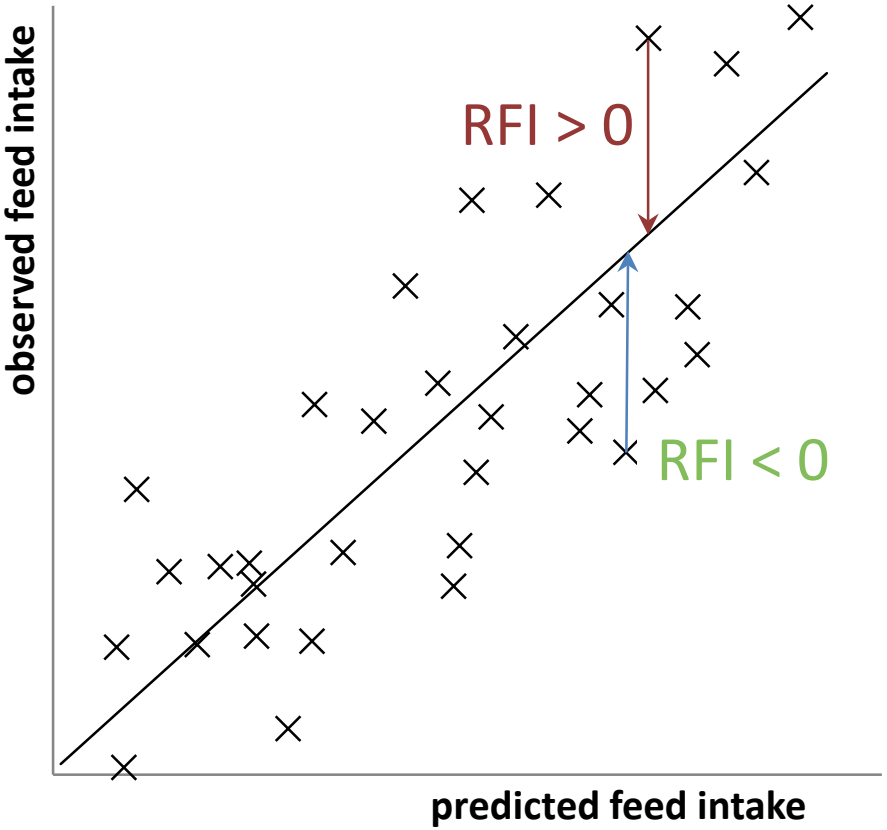
2 **Adaptation to the new conditions**

Lallès et al. (2007), Sauvant and Martin, (2010)

Residual Feed Intake (RFI): a criteria to select pig for feed efficiency

RFI= measured FI – predicted FI for maintenance and growth
f(BW, ADG, BFT 35-95 kg of BW)



High RFI (HRFI) → low efficiency
Animals eat more than predicted

Low RFI (LRFI) → « high » efficiency
Animals eat less than predicted

Gilbert et al. (2015)

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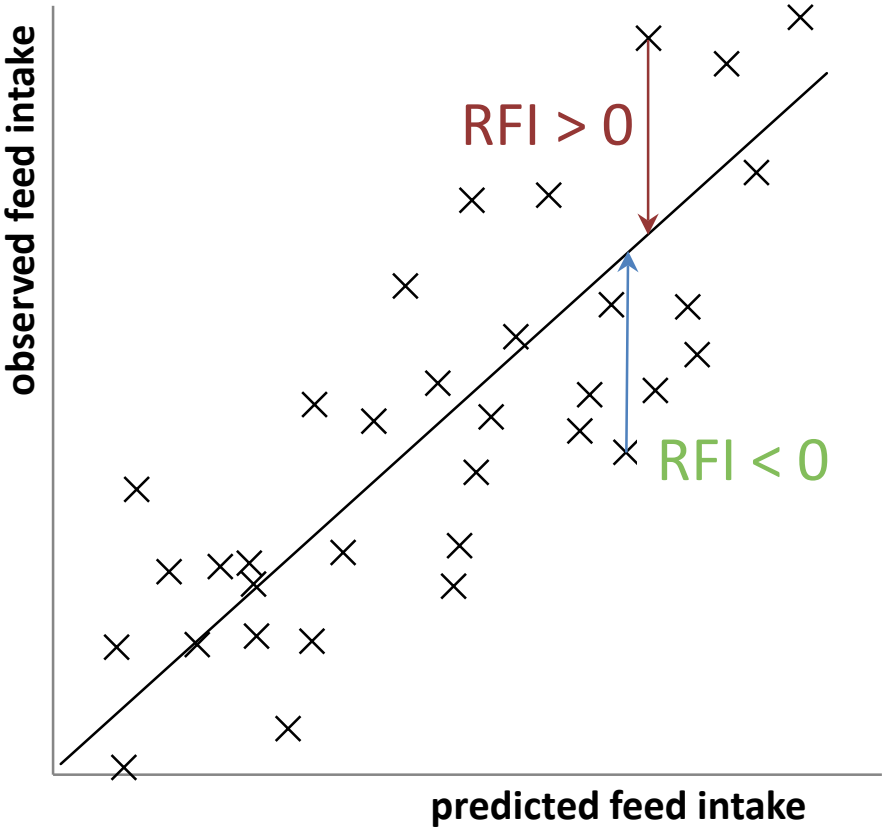


High RFI (HRFI) → low efficiency
Animals eat more than predicted

Reduced heat production
physical activity
basal metabolic need
≠ nutrients partitioning between growth and non productive functions

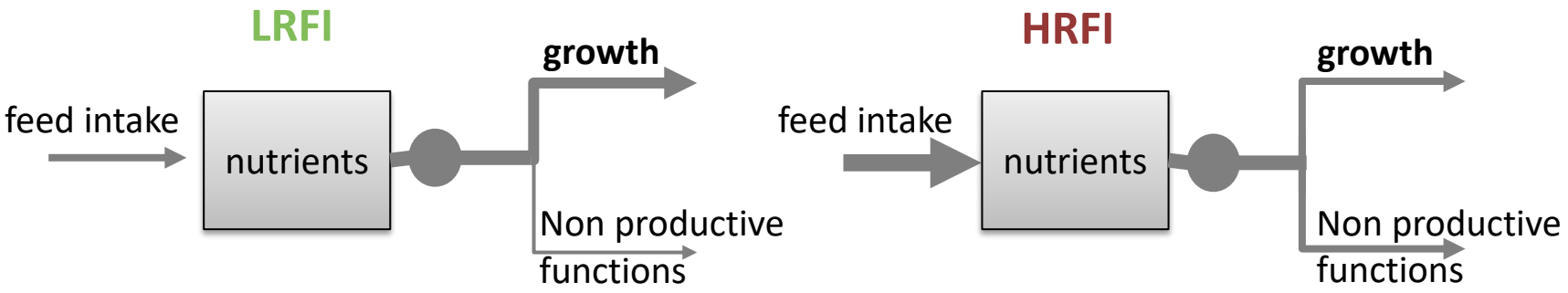
Low RFI (LRFI) → « high » efficiency
Animals eat less than predicted

Gilbert et al. (2015)

Does the selection of pigs for low RFI impacts their ability to cope with the weaning challenge?

Hypothesis

Pigs selected for high productive trait (LRFI) would have more risk to develop post-weaning disorders in relation with more competition for nutrients partitioning between growth and defence (non productive function)



72 piglets from the 2 lines divergently selected for RFI

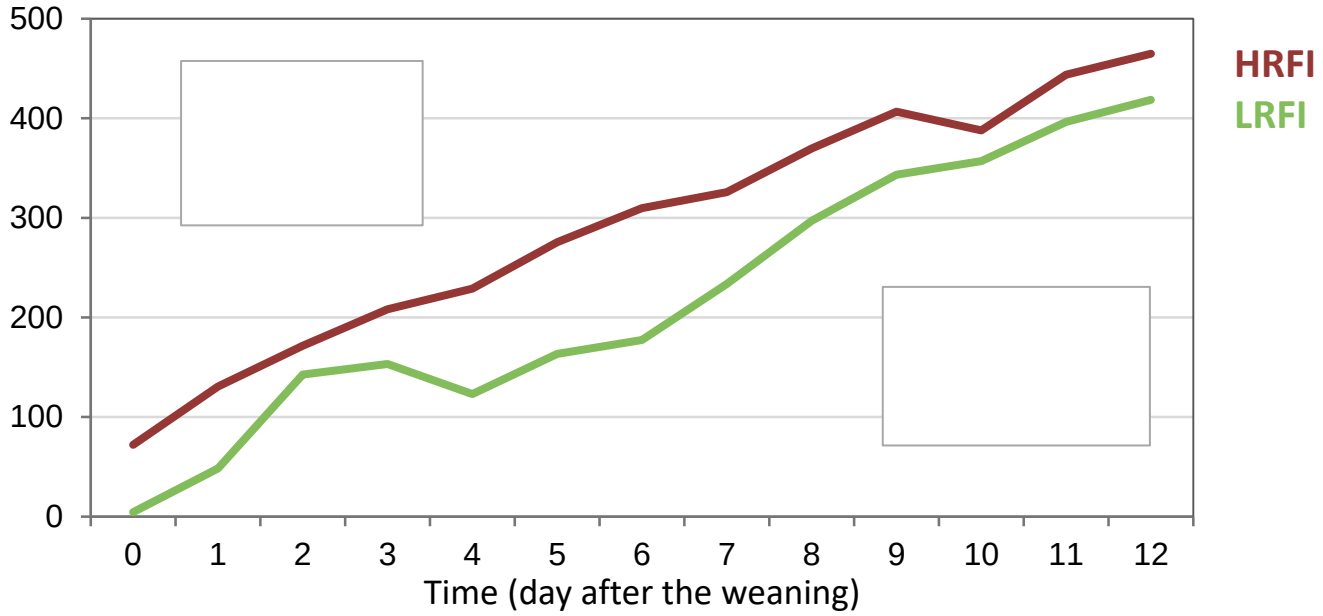
LRFI and **HRFI** (9th generation)

n = 32

Feed intake and growth

Piglets from the low RFI line: heavier at weaning 9.1 kg vs 8.0 kg ($P < 0.05$)

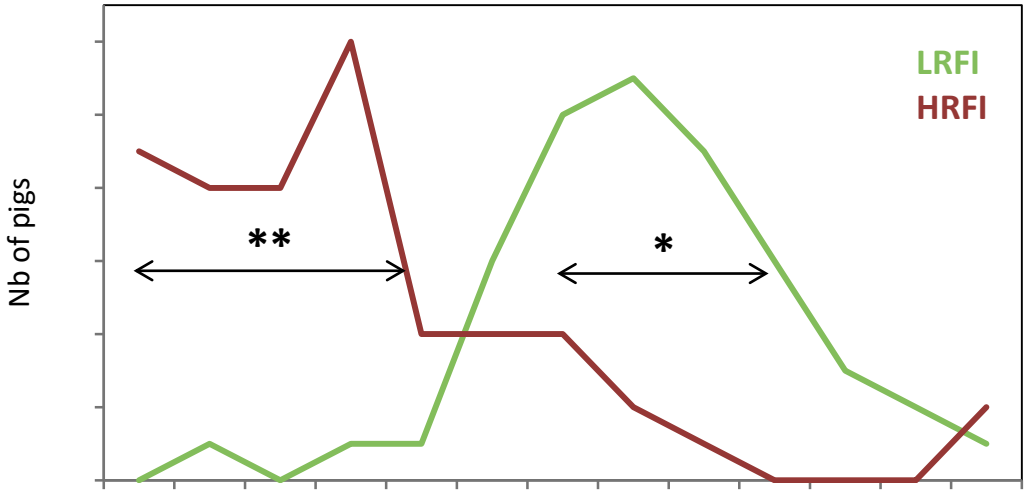
First week after weaning : voluntary feed intake and growth rate lower for the low RFI line ($P < 0.05$)



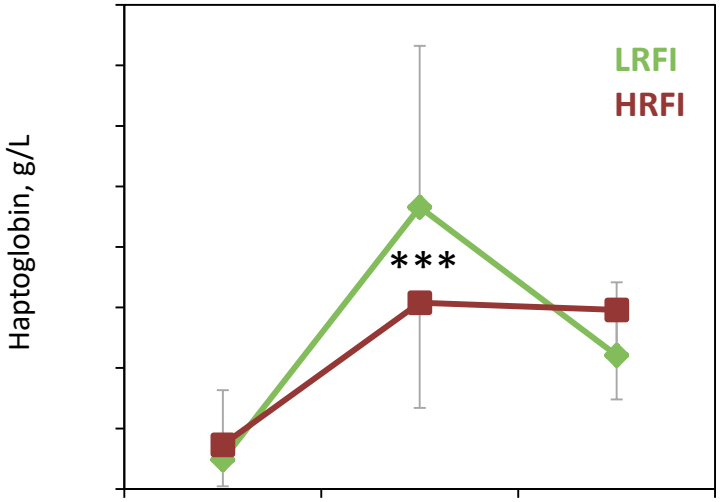
Afterward, no difference in DFI (870 g) and ADG (460 g) between lines
No line effect on BW at the end of the post weaning period ($P=0.17$)
LRFI : 21.4 kg , HRFI : 20.7 kg

Diarrhea and inflammation

Number of pigs with diarrhea

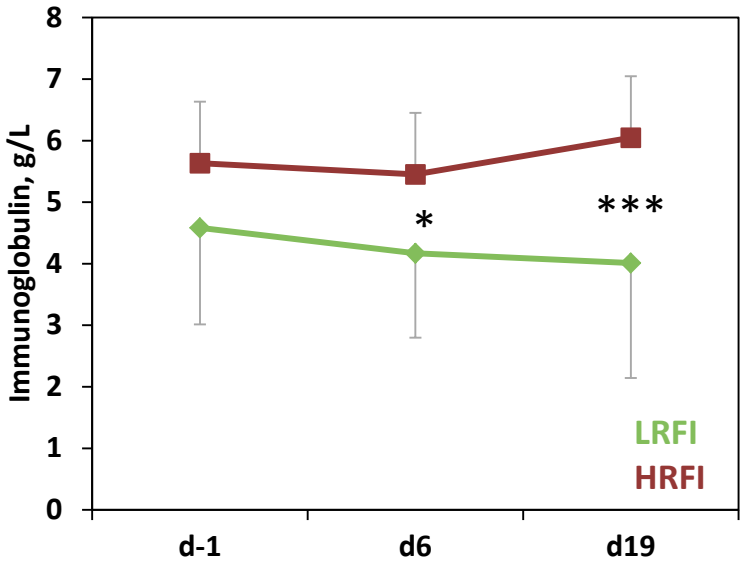


Haptoglobin

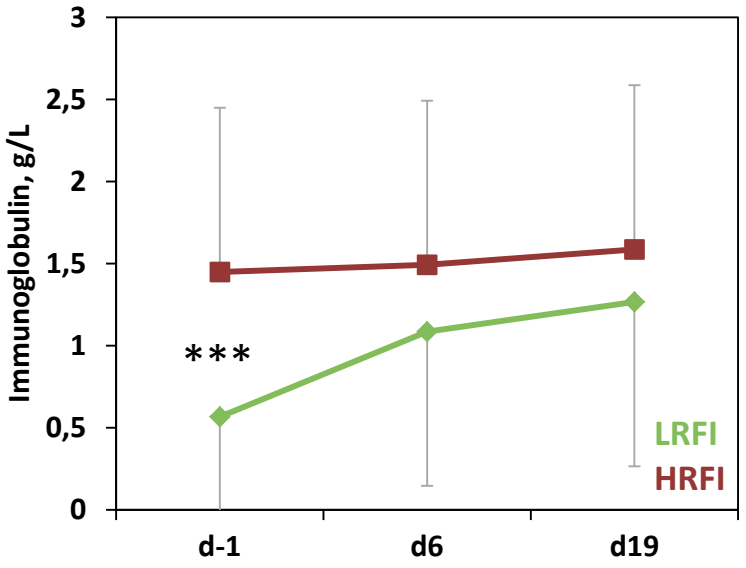


More diarrhea and inflammation for LRFI pigs at the end of the first week after the weaning
No fever period

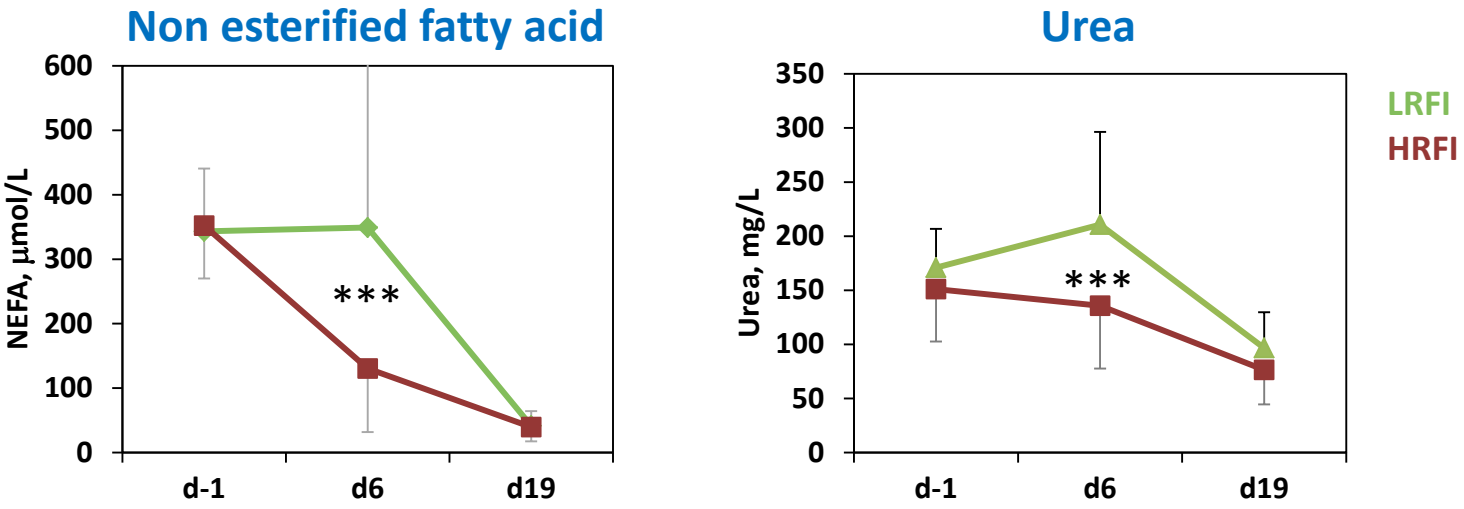
Immunoglobulins G



Immunoglobulins M



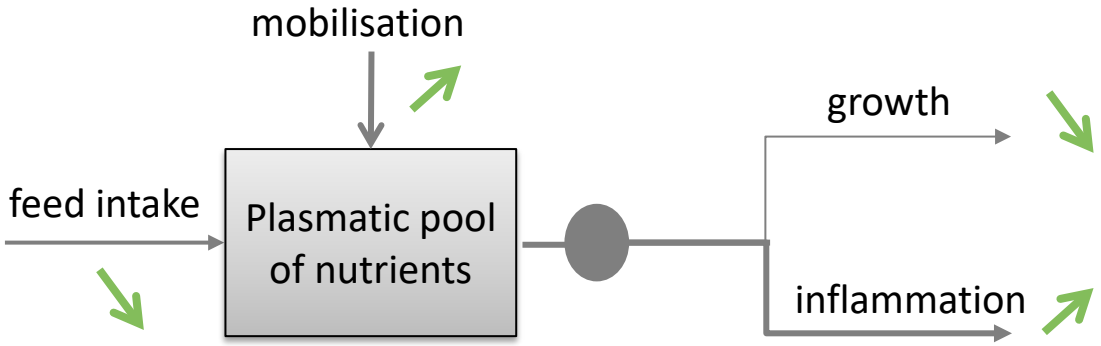
Development of the immune system delayed in LRFI pigs compared to HRFI?



Under-nutrition more important for pigs from the LRFI line at day 6
No difference between lines at d-1 and d19

Comparison of the response of the two lines at day 6 after the weaning

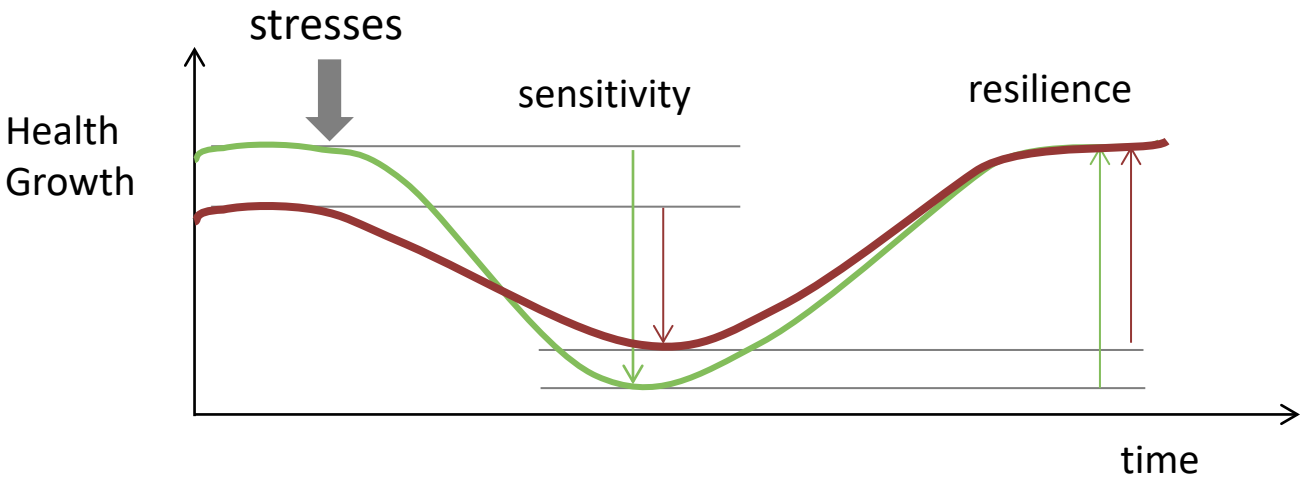
LRFI / HRFI



No difference in feed intake, BW, physiological parameters at day 19

Dynamic of the response of the two lines after the weaning

LRFI HRFI



Conclusions

Does the selection of pigs for low RFI impact their ability to cope with the weaning challenge?

Both lines cope with the weaning challenge but with different dynamics

Pigs from the low RFI line (more efficient) seem more sensible but also more resilient

Perspectives

Are the differences in the dynamic of the response associated with difference in gut microbiota profiles ?

Can we limit the sensibility (especially of the LRFI) with securing diet?

See Gilbert et al