

INRAE

➤ Plasmatic and ruminal metabolomes of lambs divergently selected on residual feed intake

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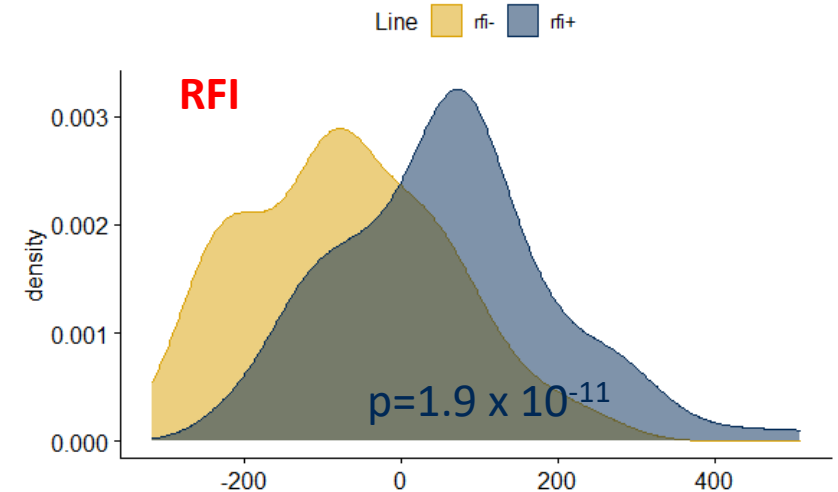
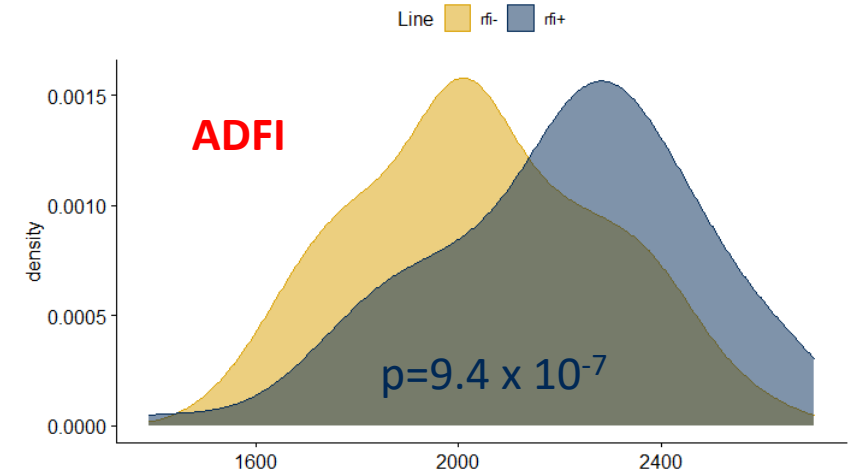
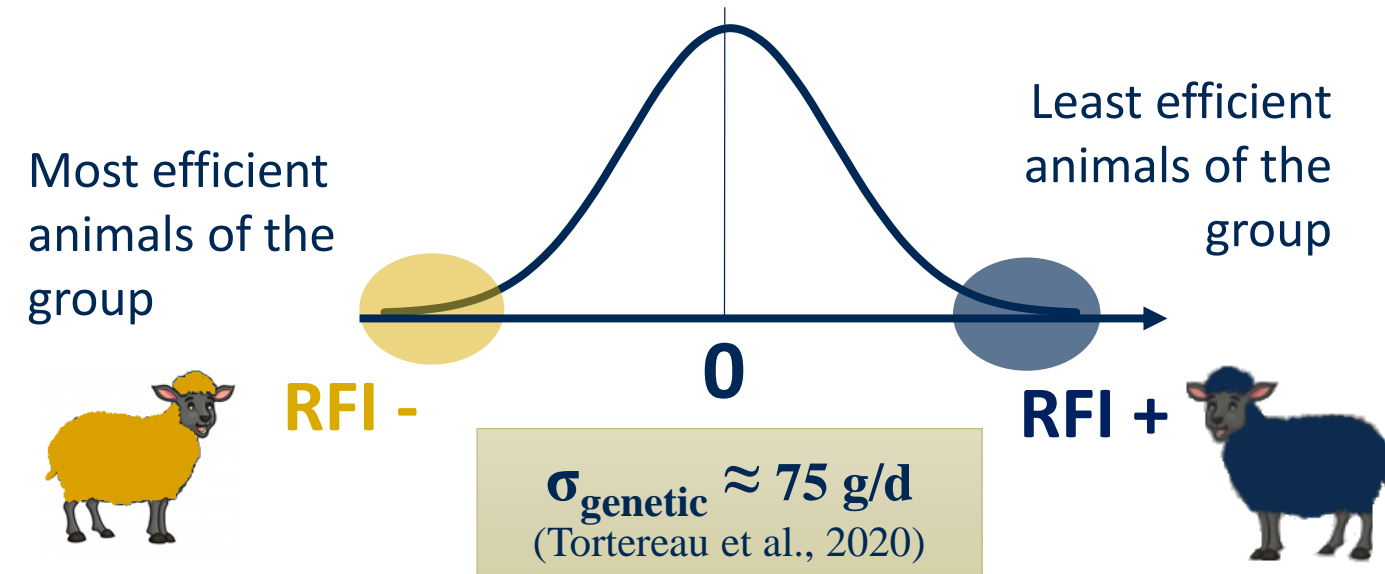
¹: INRAE, INPT-ENVT, INPT-ENSAT, GenPhySE – Castanet-Tolosan, France

²: INRAE, UR875 MIA-T – Castanet-Tolosan, France

➤ Divergent selection on residual feed intake

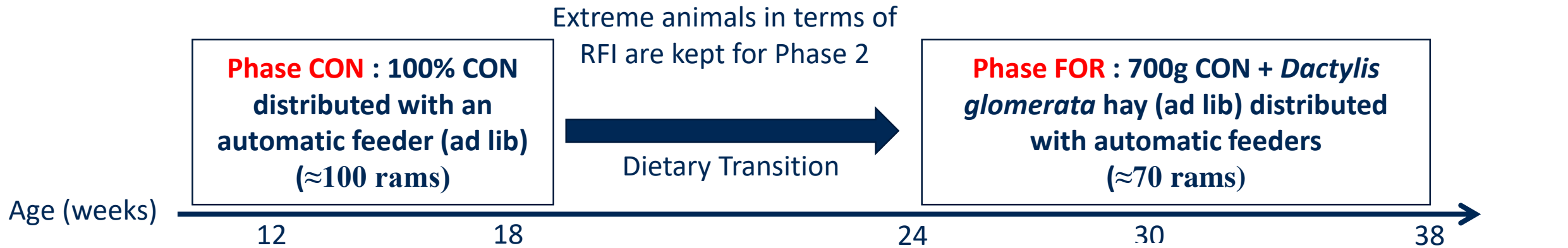
Heritability = $0,45 \pm 0,08$ in Romane Sheep (Tortereau et al., 2020)

➔ Divergent genetic selection for feed efficiency under a **100% concentrate diet**



- Are RFI differences linked with different plasmatic and/or ruminal metabolomes?
- What happens at the metabolomic level when animals are fed with a diet enriched in forage?

➤ Experimental protocol

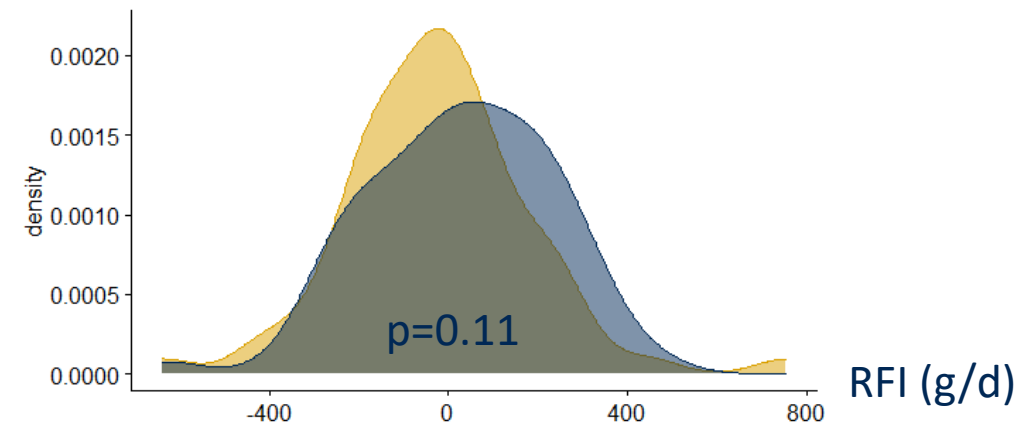
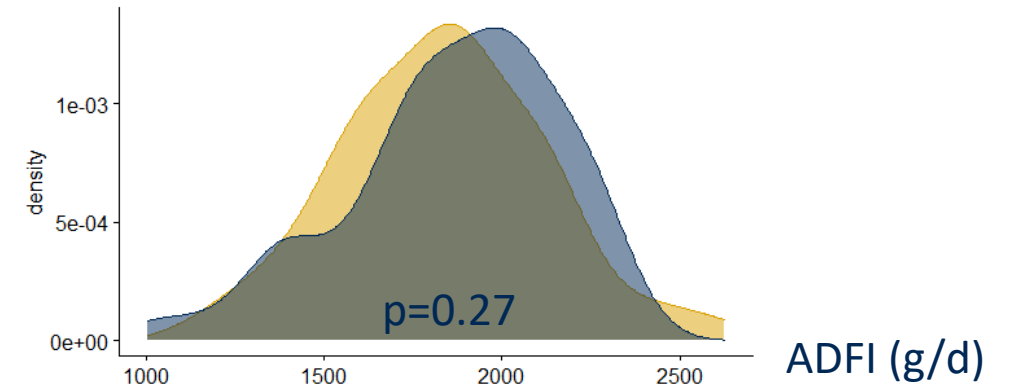


Zootechnics

- Mean ADFI
- Back Fat Thickness and Muscle Depth
- Body Weight

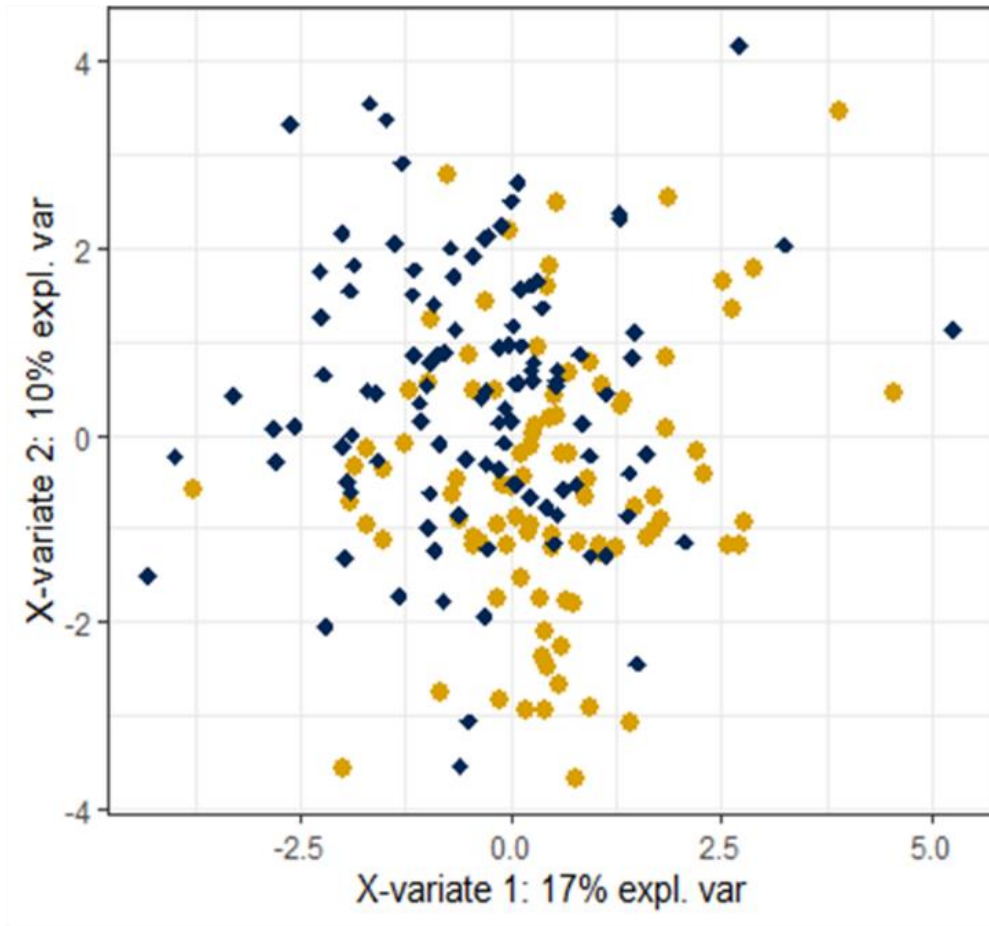
Metabolomics

- NMR spectroscopy of rumen fluid
- NMR spectroscopy of blood plasma



➤ Plasma metabolites (Phase CON)

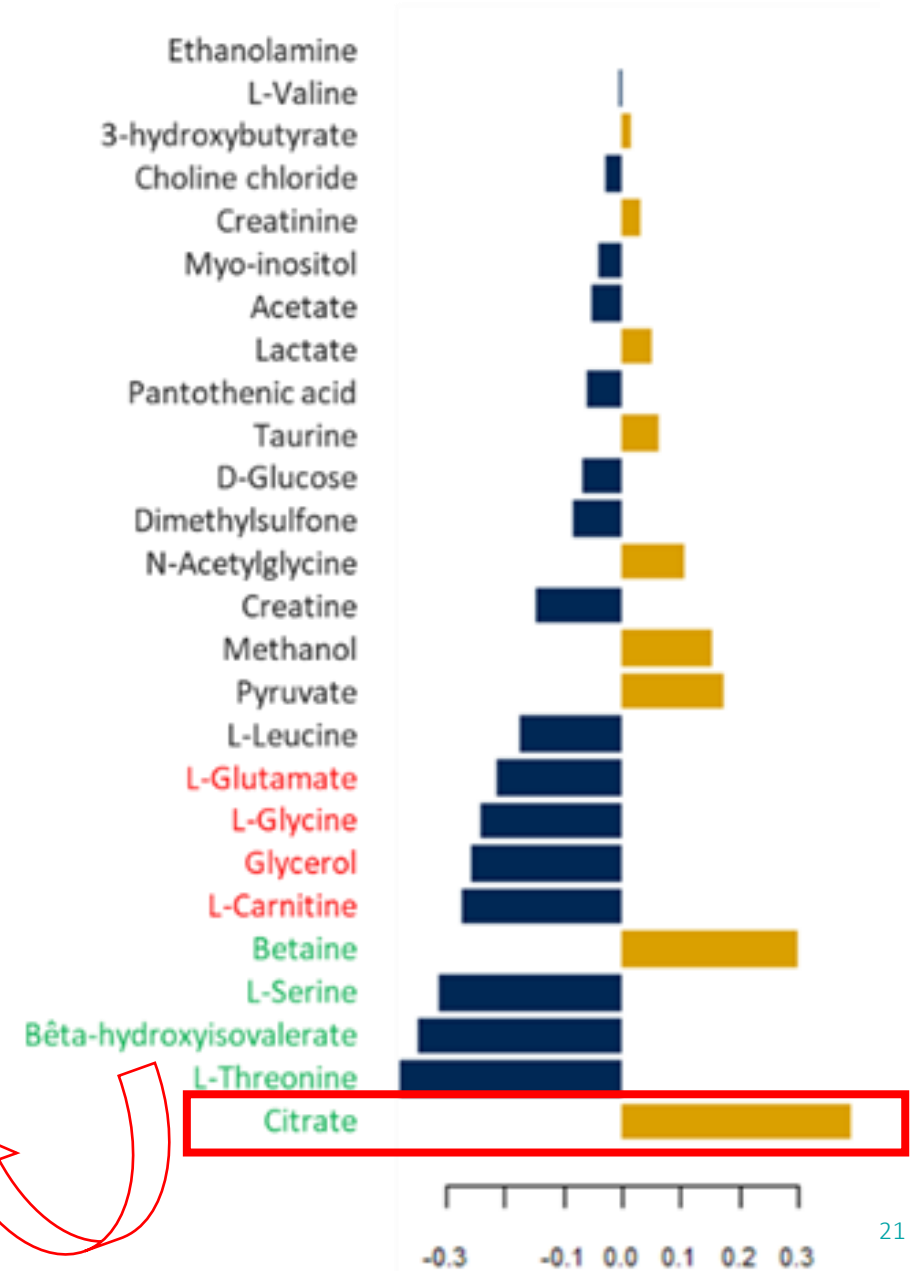
PLS-DA on Plasma Metabolites Phase CON



Legend
 ● rfi-
 ◆ rfi+

VIP values :
 ■ < 1
 ■ < 1,5
 ■ > 1,5

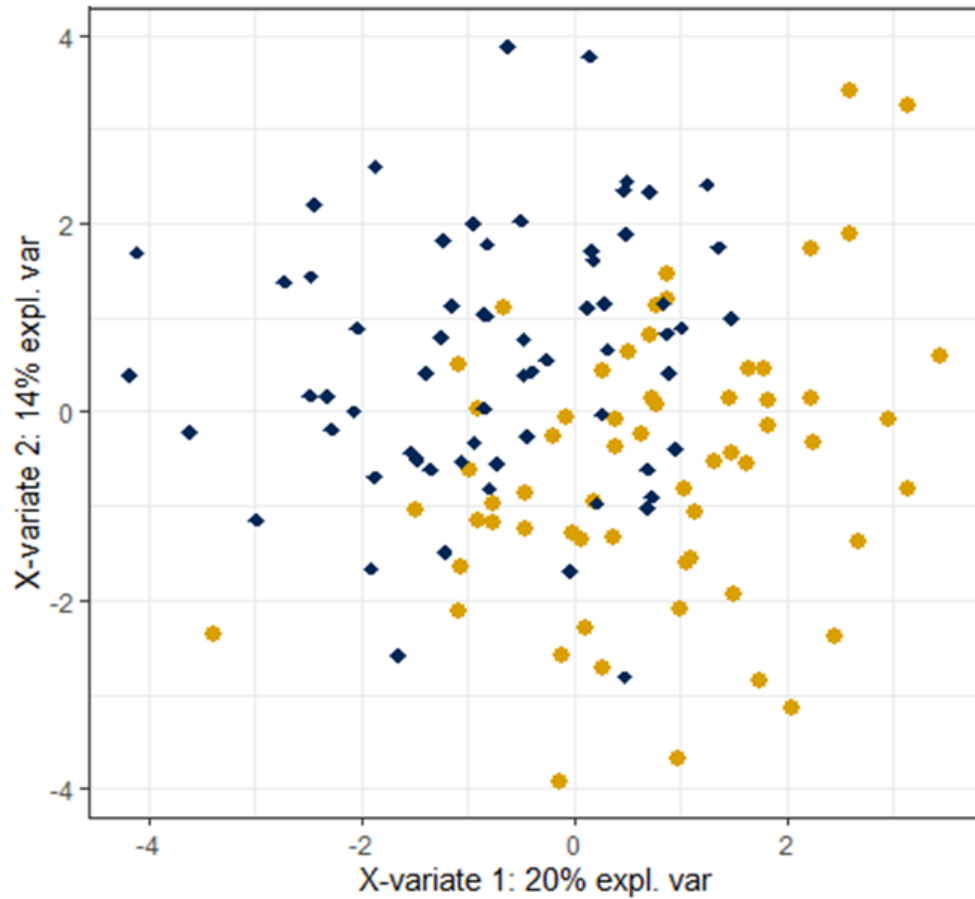
Loadings on Comp 1



> 1,5 when optimal number of components was taken into account

➤ Plasma metabolites (Phase FOR)

PLS-DA on Plasma Metabolites Phase FOR



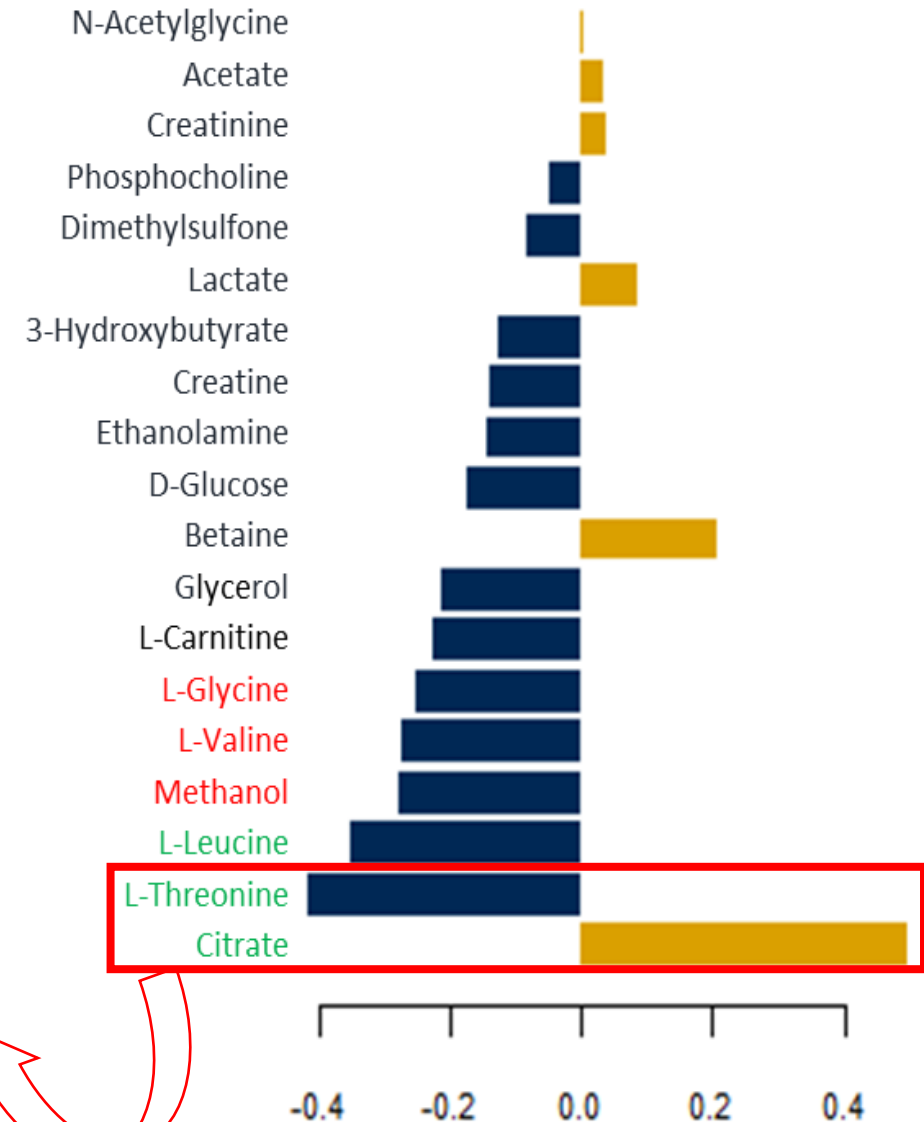
Legend

- rfi-
- ◆ rfi+

VIP values :

- ▬ < 1
- ▬ < 1,5
- ▬ > 1,5

Loadings on Comp 1



> 1,5 when optimal number of components was taken into account

➤ Plasma metabolites

RFI - (more efficient)

Citrate
Betaine

RFI + (less efficient)

L-Threonine
L-Serine
L-Glycine
L-Leucine
L-Valine
Beta-Hydroxyisovalerate

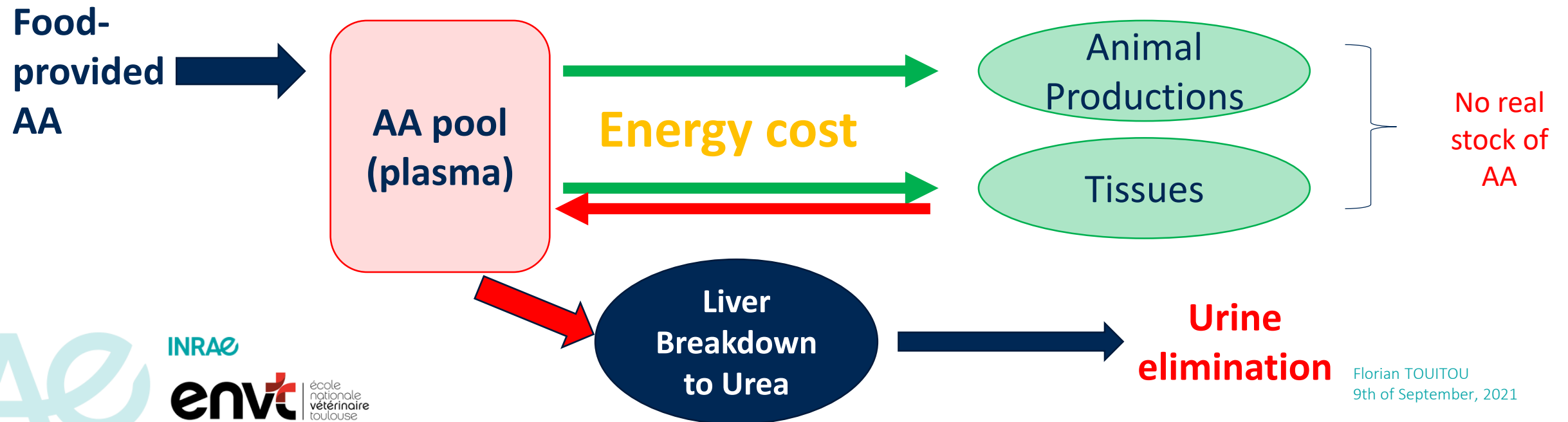
➔ Very weak correlations between Genetic or Phenotypic RFI and metabolites identified by PLS-DA except for beta-Hydroxyisovalerate and phenotypic RFI ($r = 0.35$)

➔ Strong positive correlations (> 0.5) between aminoacids

➤ Plasma metabolites

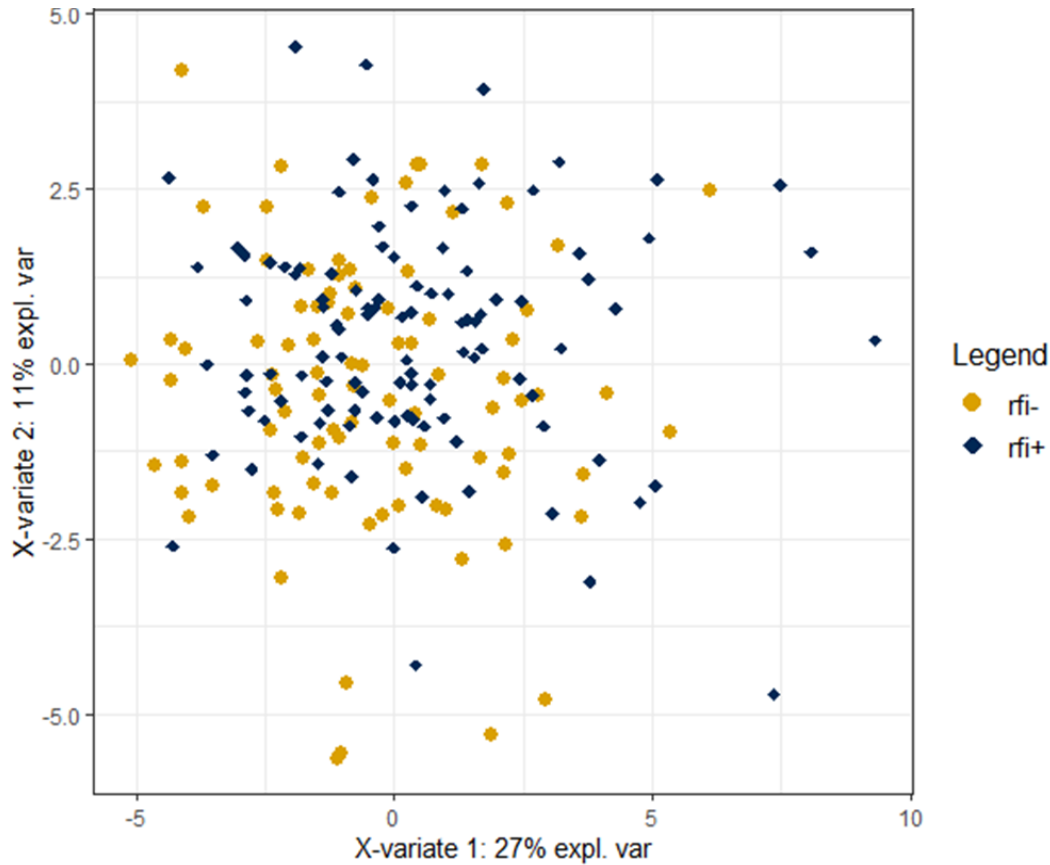
Hypothesis :

- Less protein degradation/turnover in animals from line **RFI -** than RFI +
- * Already identified in cattle : Herd et al. 2004, Richardson et al. 2004.
- * Compatible with the release of amino acids in the plasma
- * Less consumption of betaine for methionine production ?

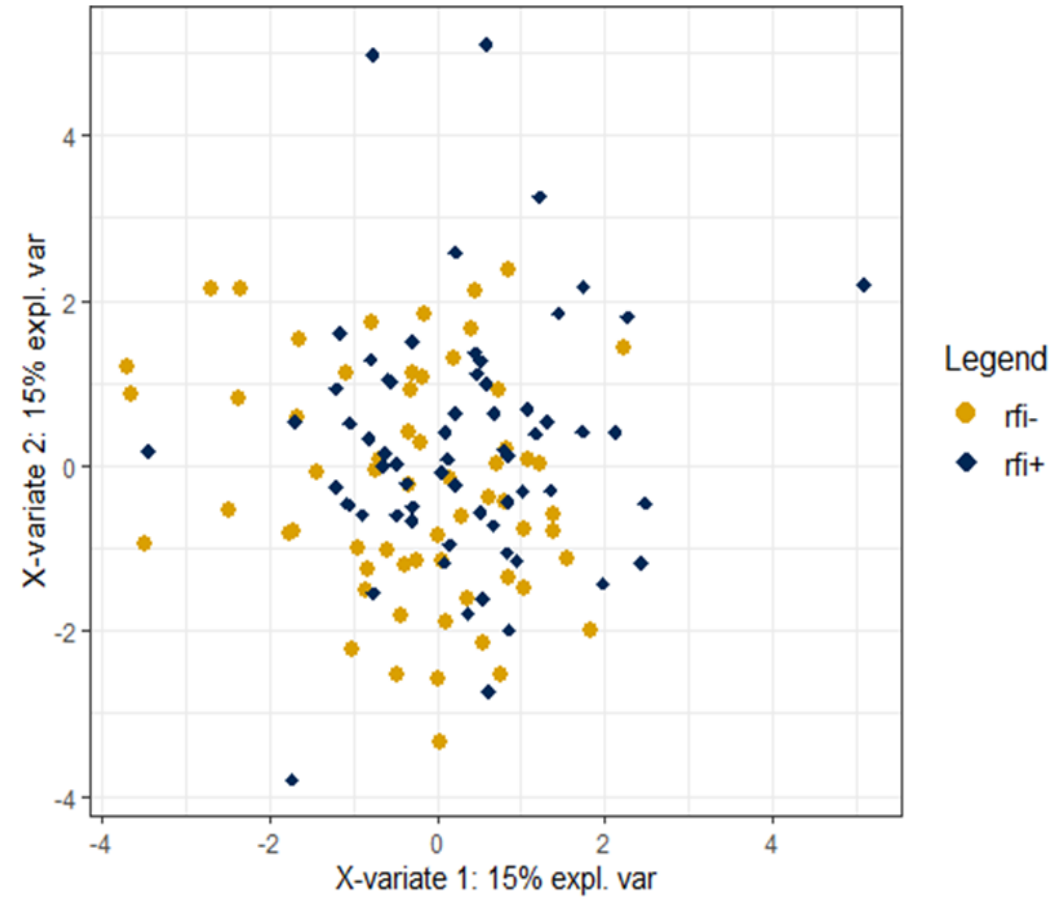


➤ Rumen fluid metabolites

PLS-DA on Rumen Metabolites Phase CON



PLS-DA on Rumen Metabolites Phase FOR



No VIP values higher than 1.5 when optimal number of components was taken into account.

Poor discrimination

➤ Conclusion

→ Plasma metabolites seem to be more discriminant than rumen fluid metabolites

- Difference in feed efficiency is more likely to stem from host metabolism than from ruminal digestion
- Microbial population (see *Le Graverand et al. Session 66*)
- Other metabolites unidentified with NMR could be involved in the difference.

→ **Protein turnover seems to be involved in the difference**

Thank you very much for your attention !

Questions ?



➤ Acknowledgements

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