



HAL
open science

Nutritional quality of proteins from two beef co-products as determined in the growing pig

Rozenn Le Foll, Françoise Nau, Yann Le Gouar, Gwenaëlle Henry, Severine Chevalier, Arlette Leduc, Pascaline Hamon, Catherine Guérin-Dubiard, Xavier Lambert, Valérie Lechevalier-Datin, et al.

► To cite this version:

Rozenn Le Foll, Françoise Nau, Yann Le Gouar, Gwenaëlle Henry, Severine Chevalier, et al.. Nutritional quality of proteins from two beef co-products as determined in the growing pig. <https://web.cvent.com/event/1783d29e-b98f-4342-b4a1-30dbaf3fc357/summary>. The International Symposium: Dietary Protein for Human Health, Sep 2023, Utrecht (Netherlands), Netherlands. , 2023. hal-04279361

HAL Id: hal-04279361

<https://hal.inrae.fr/hal-04279361v1>

Submitted on 10 Nov 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License

INTRODUCTION and OBJECTIVE

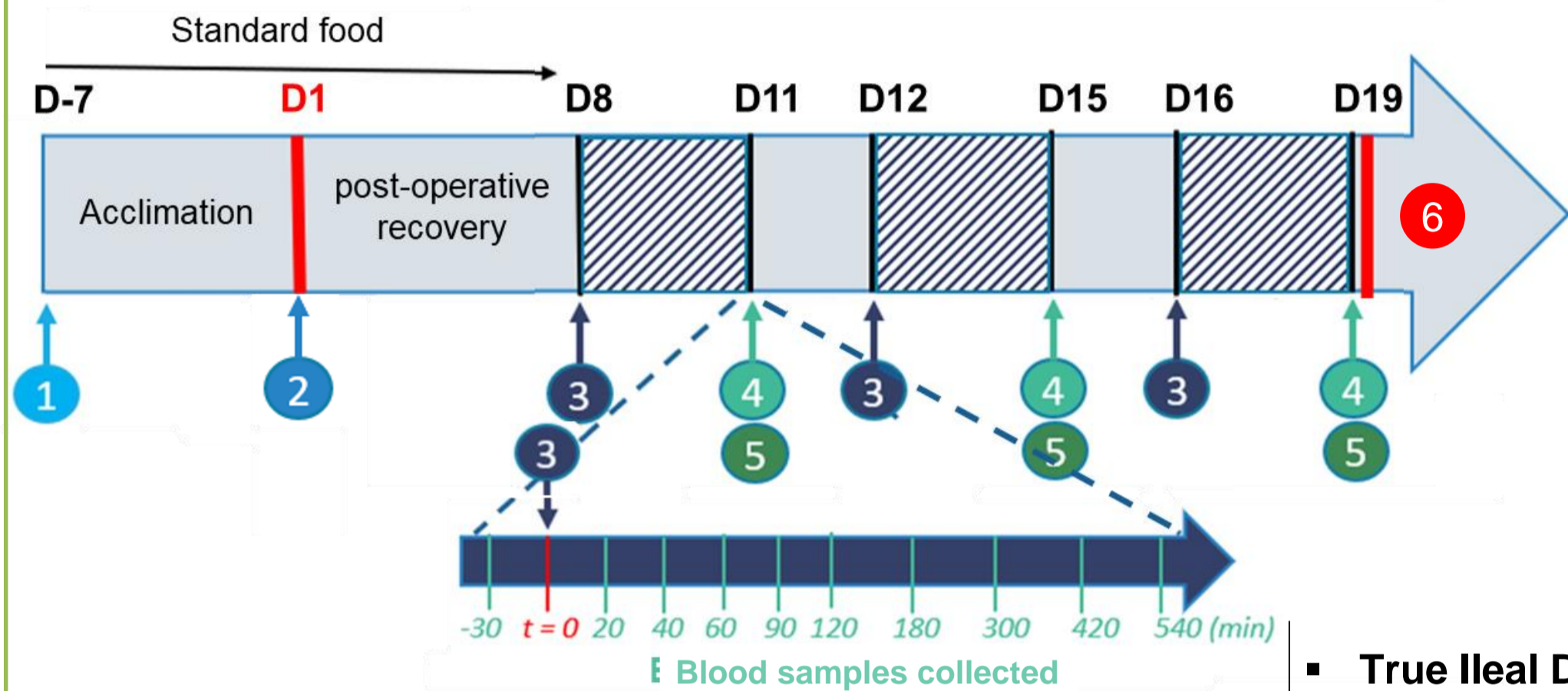
- The increasing demand for food and especially for protein, intensifies the search for **alternative protein sources**.
- The valorization of **co-products** not yet used as human foods, such as from meat production, is from this point of view promising.
- The present study aimed to evaluate the **nutritional quality** of two protein ingredients extracted from **the beef fat rendering process**.

METHODOLOGY

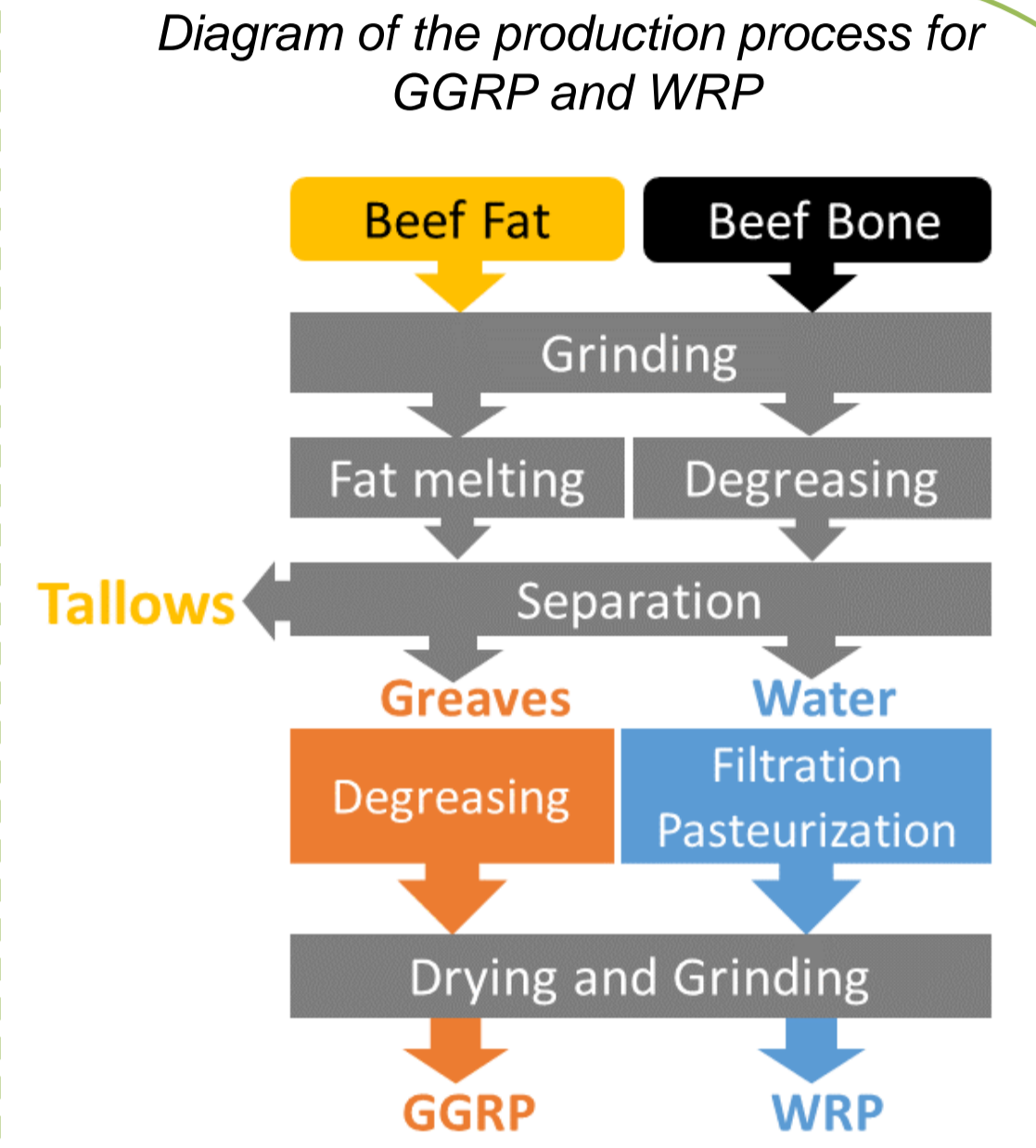
Diets :

- Two diets (iso-proteic) based on 10% protein :
 - Water Recovered Protein (WRP)**
 - Greasy Greaves Recovered Protein (GGRP)**
- Protein-Free (PF) diets : for endogenous N and AA flow determination

Experimental design : as recommended by FAO (2014)



10 growing pigs
(Large White x Land Race x Pietrain)
♂, three-months old, 2 blocks



- Isolation in individual cages
- Surgery - ileal cannula and catheter (jugular vein)
- Meal habituation, 2.5 days, cross-over
- Collection of ileal digesta (for 9 hours)
- Blood collection (10 samples for 9 hours)
- Sample analyse; Total nitrogen (N, Dumas), Amino acid (acid hydrolysis & Cation exchange chromatography) and Tryptophan content (basic hydrolysis & HPLC, fluorimetry), Marker (TiO₂, ICP-OES)

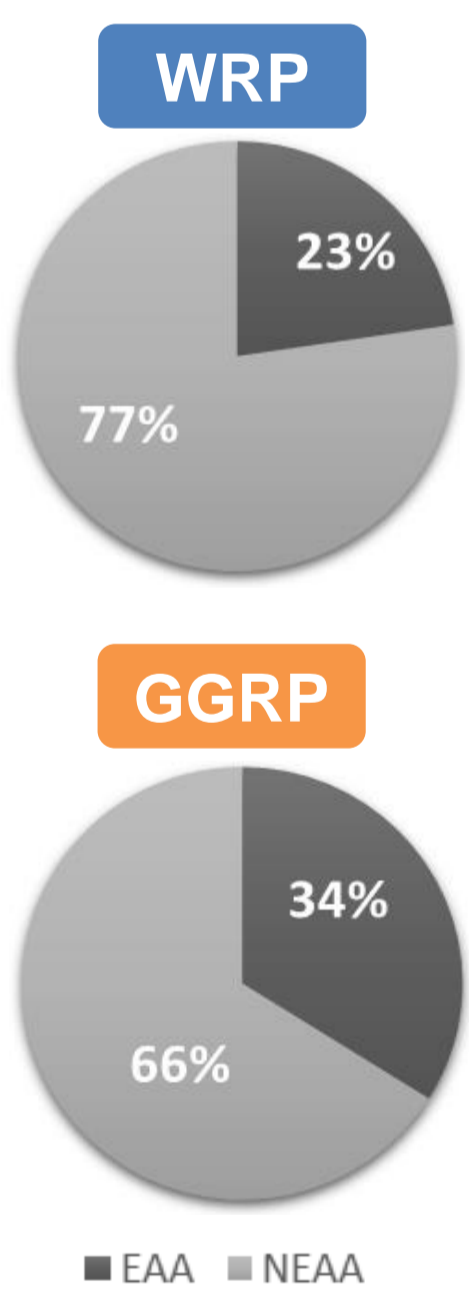
$$\text{True Ileal Digestibility (TID \%)} = 100 \times \frac{\text{dietary AA intake} - (\text{AAFI}_{\text{digesta}} - \text{AAFI}_{\text{endogenous}})}{\text{dietary AA intake}}$$

$$\text{Amino Acid Flow (AAFI)}_{\text{endogenous}} = \frac{\text{AA}_{\text{PF digesta}} \times \text{Marker}_{\text{PF diet}}}{\text{Marker}_{\text{PF digesta}}}; \text{AAFI}_{\text{digesta}} = \frac{\text{AA}_{\text{digesta}} \times \text{Marker}_{\text{diet}}}{\text{Marker}_{\text{digesta}}}$$

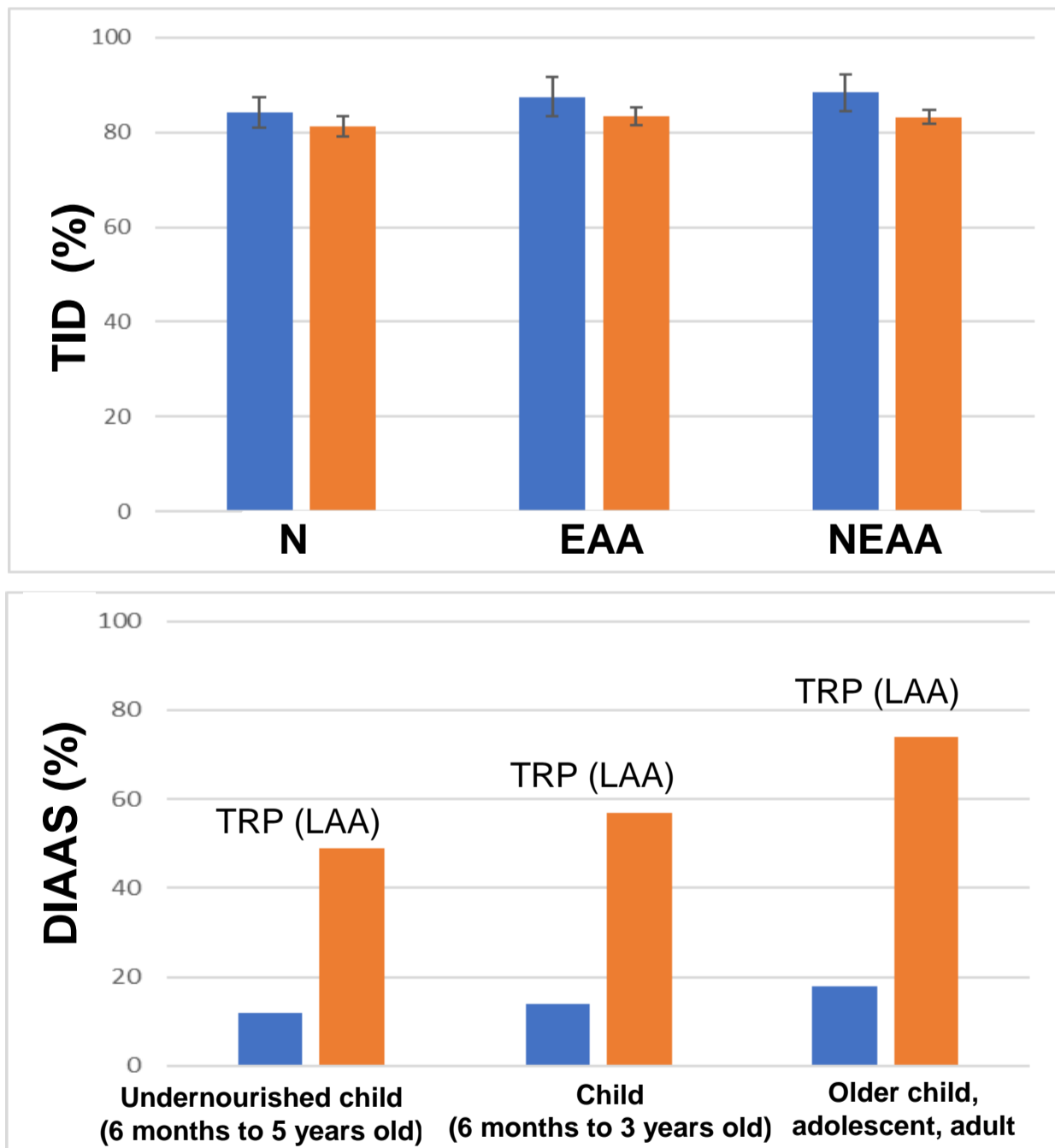
$$\text{Digestibility Ileal Amino Acid Score (DIAAS \%)} = \text{MIN} \left[100 \times \frac{\text{mg of the digestible dietary EAA in 1 g of the test protein}}{\text{mg of the dietary EAA in 1 g of the reference protein}} \right]$$

RESULTS

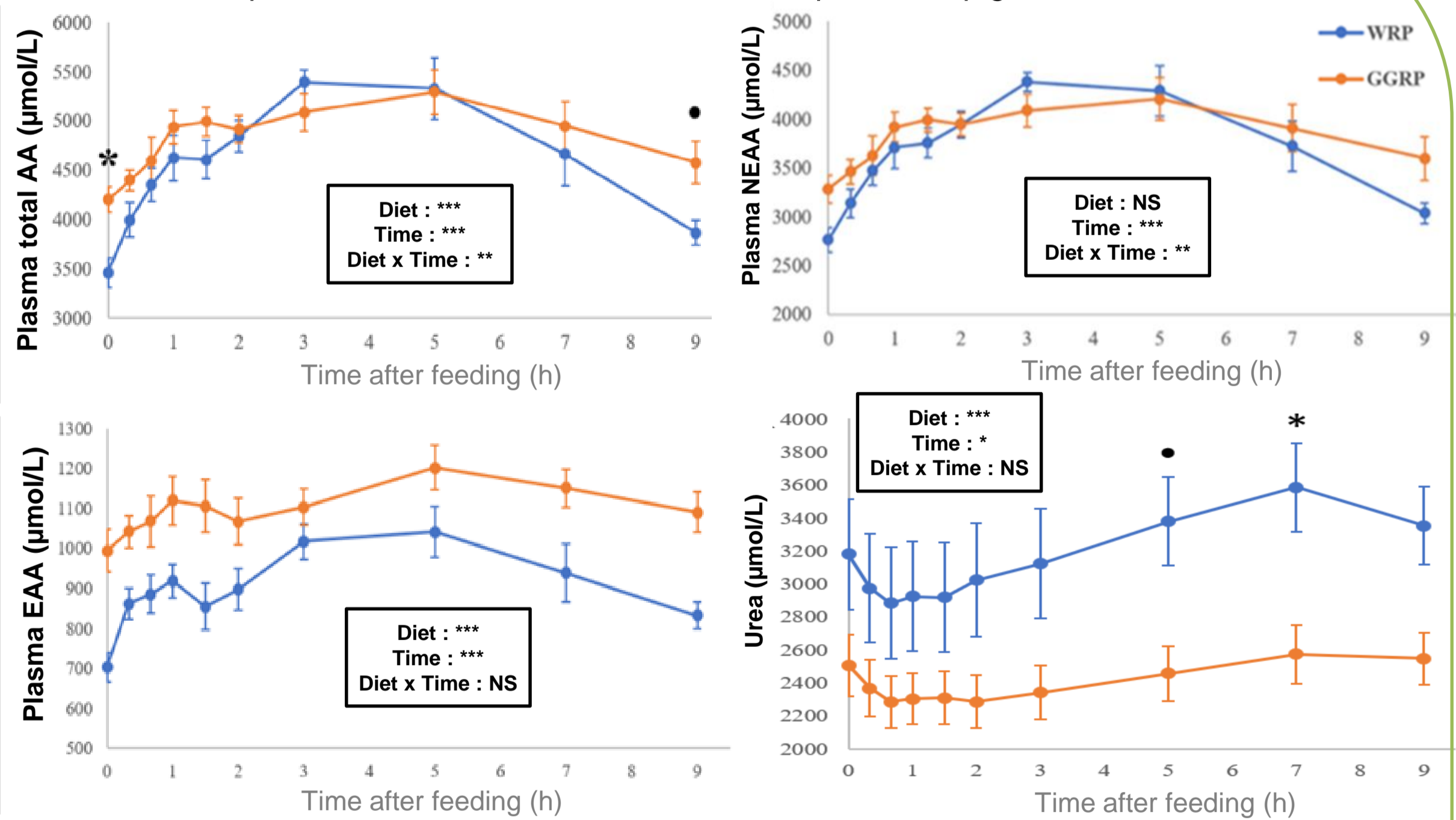
AA distribution of the diets



TID and DIAAS of WRP and GGRP



Postprandial AAs and Urea concentration in plasma of pigs fed WRP and GGRP



N : Nitrogen; EAA : Essential Amino Acids; NEAA : Non-essential Amino Acids; AA : Amino Acids; LAA : limiting amino acid; TRP: Tryptophan p < 0.001 (***), p < 0.01 (**), p < 0.05 (*) and p > 0.05 (NS) or p < 0.1 (*).

WRP is made up of less EAA than GGRP.
WRP and GGRP proteins are **moderately digestible** (TID ~ 80%).
The first limiting AA is tryptophan (TRP) for both protein ingredients.
The DIAAS measurement classifies GGRP as a **good quality protein** but solely for older children, adolescents and adults population.

The **kinetics of AA** release differs between proteins, with postprandial plasma AA concentration reaching its maximal value earlier for WRP (3 hours) than for GGRP (5 hours).
The difference in plasma urea concentration, indicates a greater level of **hepatic AA catabolism** and an **EAA deficits** for WRP than GGRP, in line with the greater imbalance in terms of EAA profile for WRP than GGRP.

CONCLUSION

- GGRP has a nutritional quality suitable to meet the needs of older children, adolescents and adults, while WRP should be supplemented with other protein sources rich in EAAs to fulfill the AA requirements.
- Postprandial kinetics of plasma AA and urea highlighted the higher efficiency of GGRP for protein muscle synthesis.