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Protein ingredient quality and structure of infant formulas impact plasma amino acid kinetics in piglets

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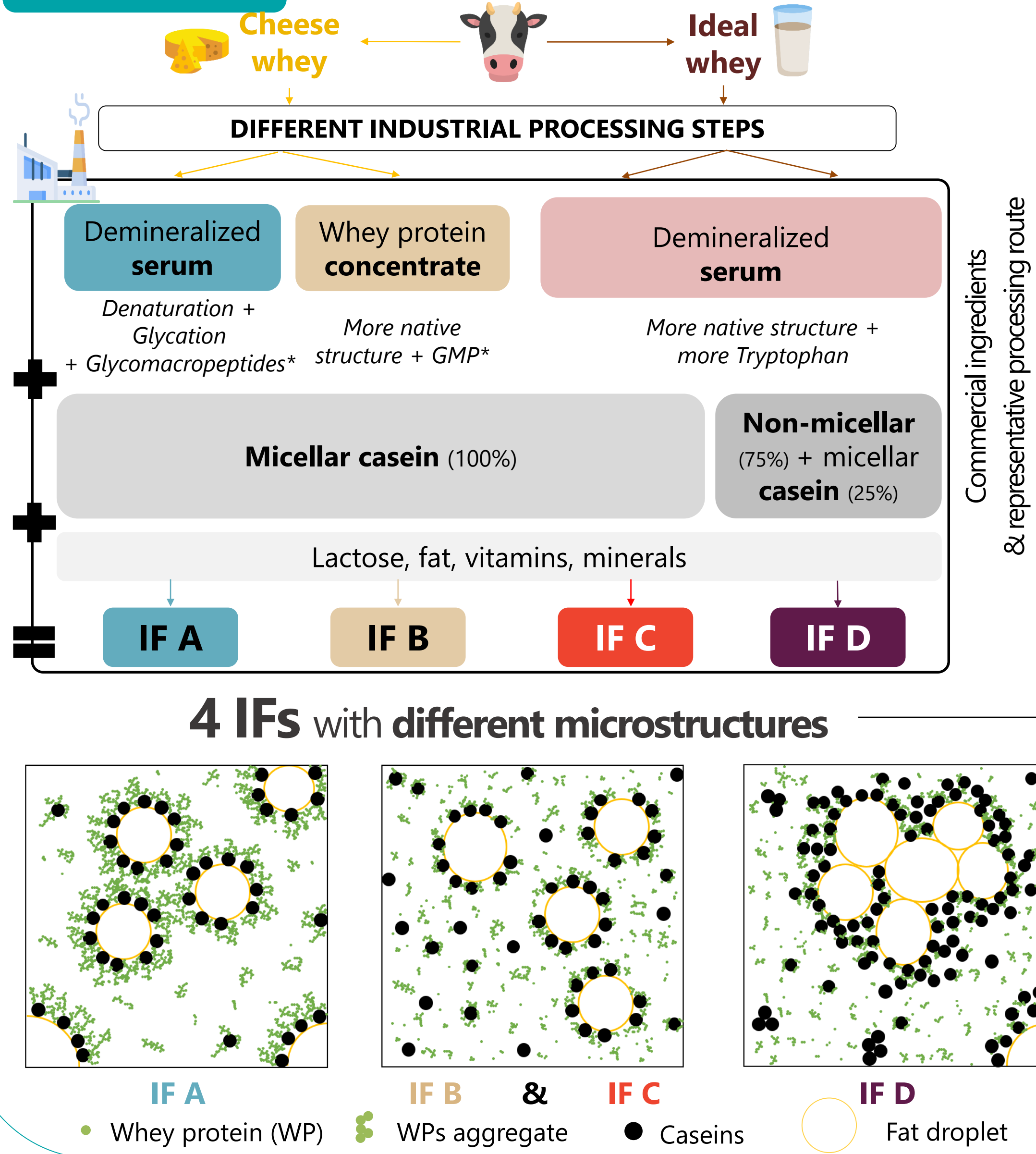
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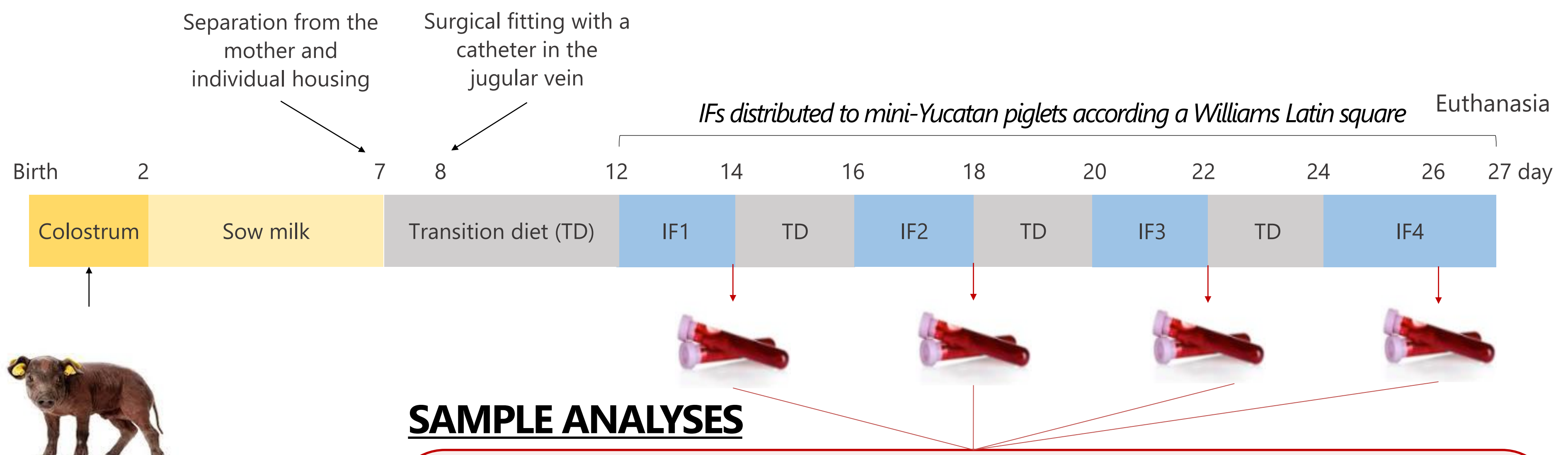
INTRODUCTION and OBJECTIVE

Infant formulas, the only adequate substitute to human milk, are complex matrices that require numerous ingredients and processing steps. The objective was to understand how protein ingredient quality (structure and composition) within Infant milk Formulas (IFs) impacts plasma amino acid (AA) kinetics.

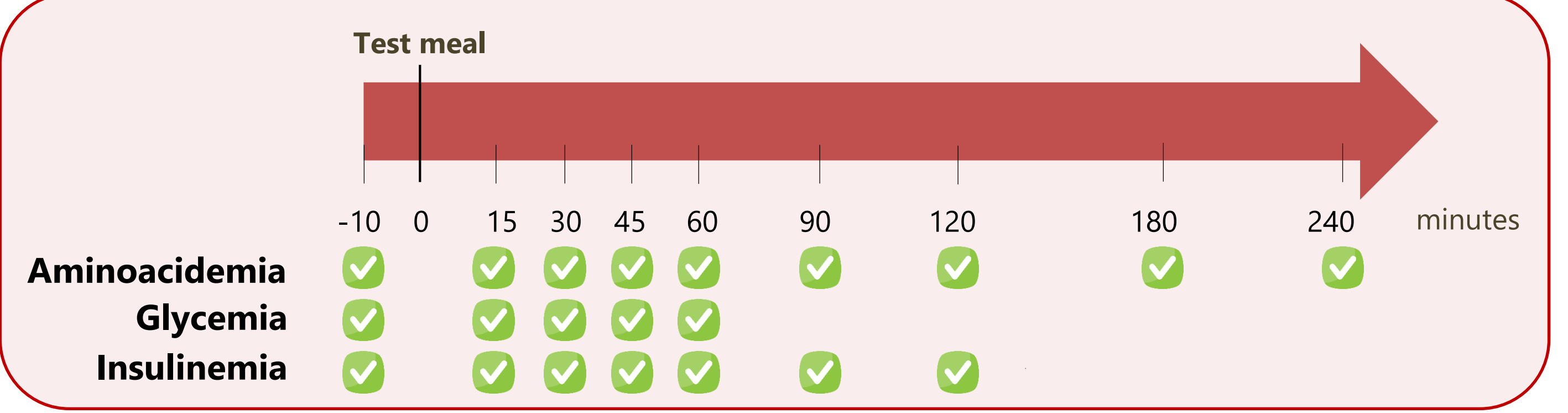
STRATEGY



EXPERIMENTAL PROTOCOL



SAMPLE ANALYSES



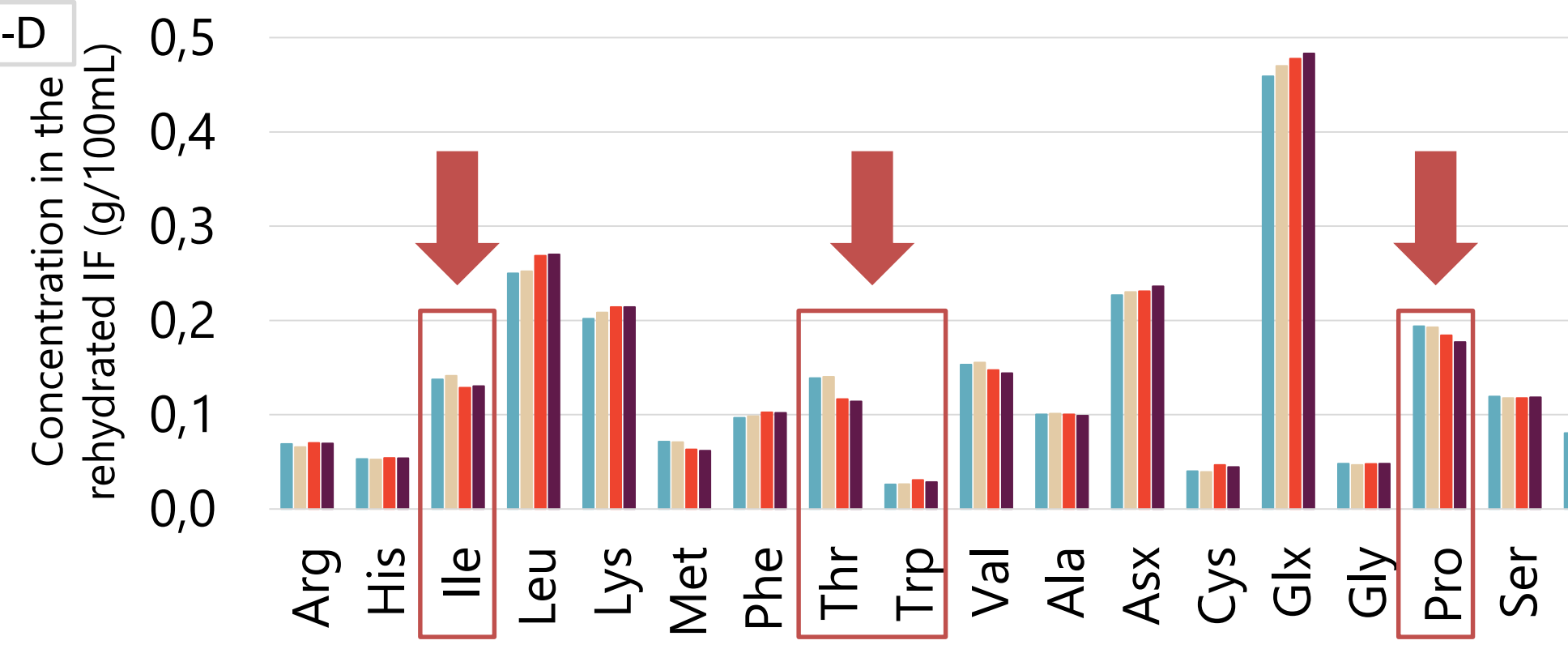
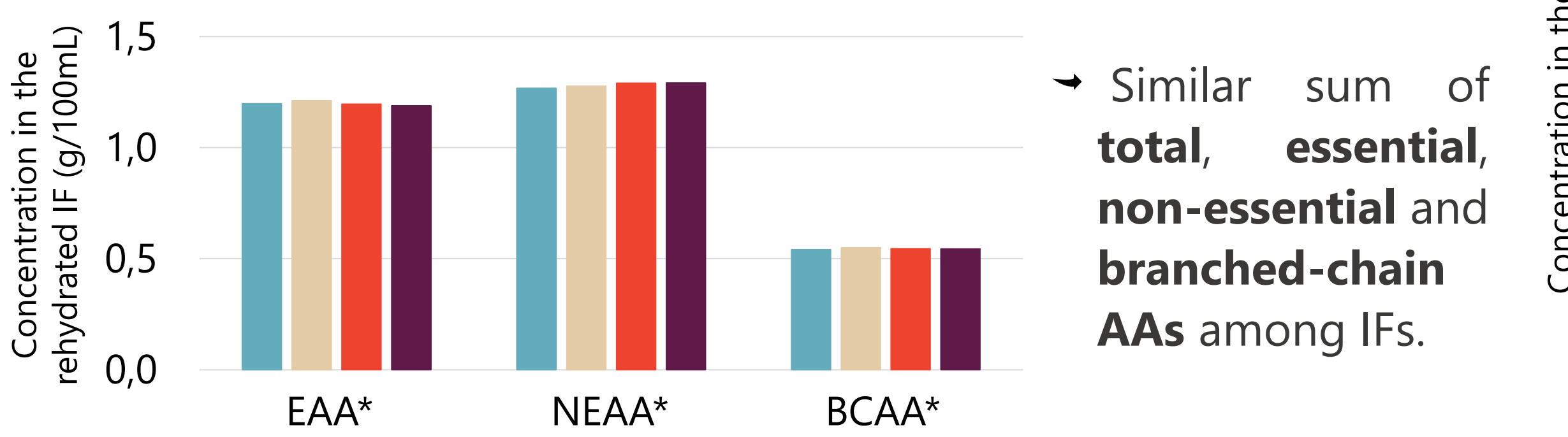
STATISTICAL ANALYSIS

Linear mixed model with diet, time and gender as fixed factors, and piglet as random factor. The interaction between diet and time was included in the model.

RESULTS

TAA : total amino acids, EAA : essential amino acids, NEAA : non-essential amino acids, BCAA : branched-chain amino acids, GMP : glycomacropeptide

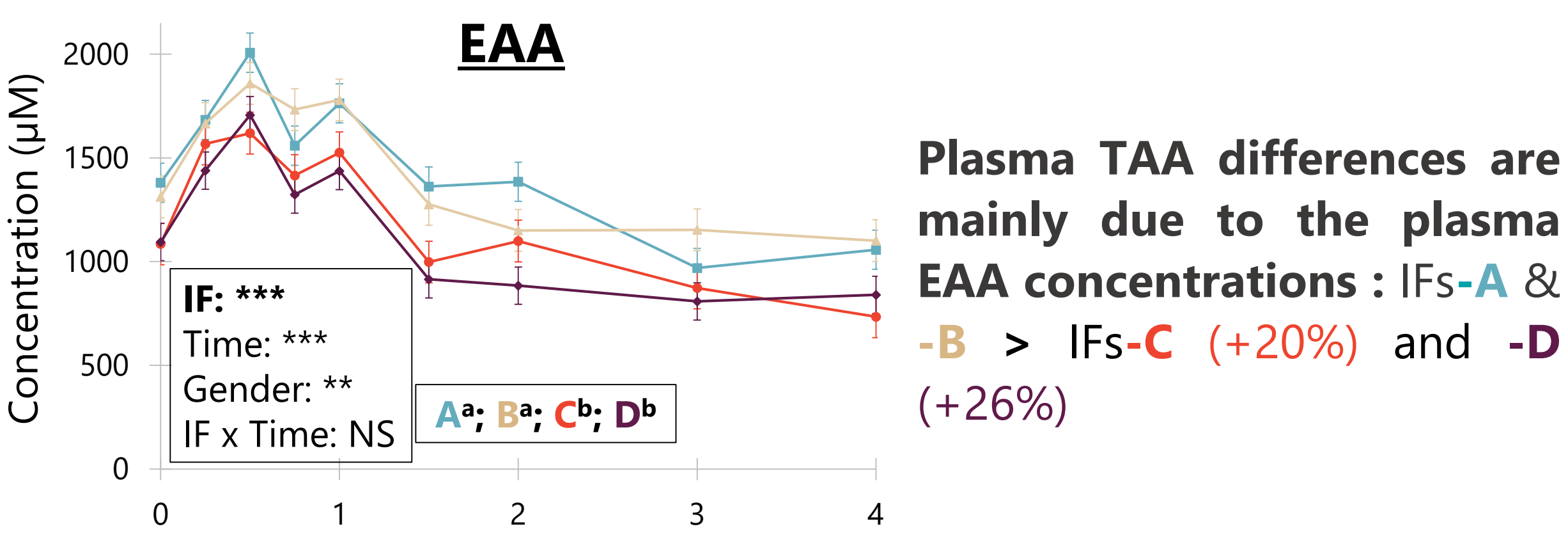
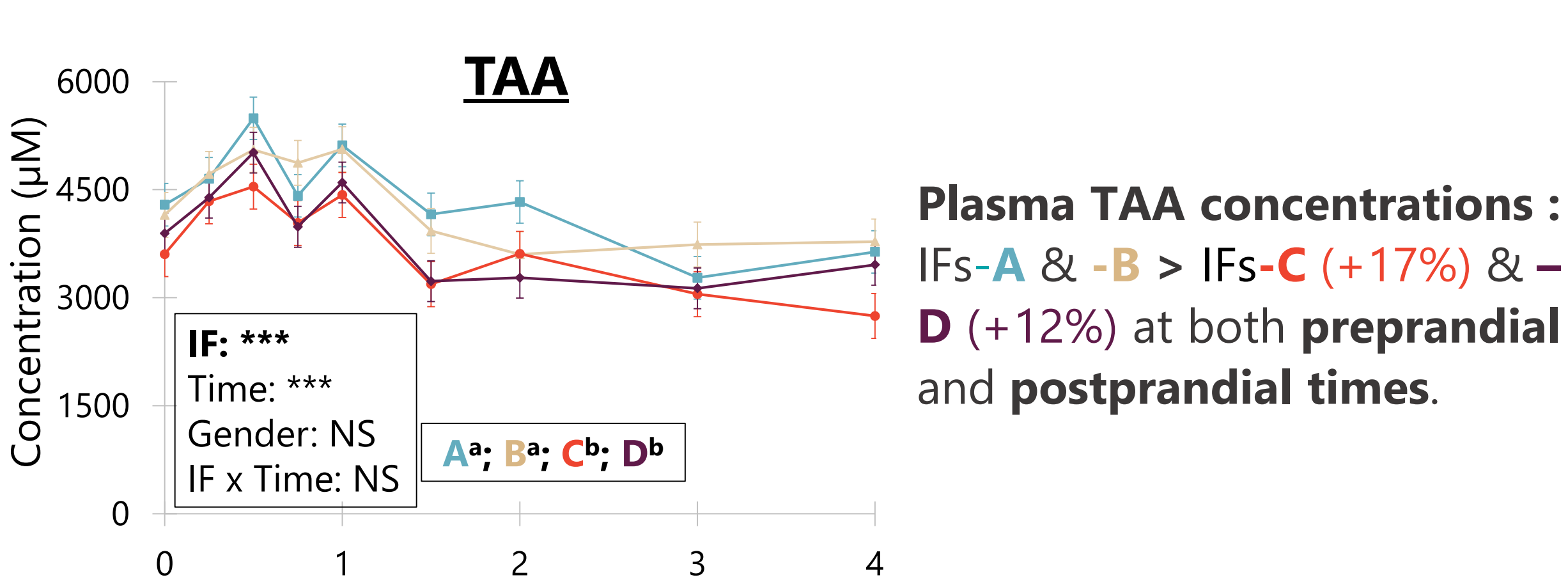
IF CHARACTERIZATION



Few individual differences related to the fine protein composition of IFs :

- IFs-A and -B = presence of GMP (cheese whey) = ↑ Thr, Pro and Ile contents
- IFs-C and -D = ↑ α-lactalbumin content = ↑ Trp content

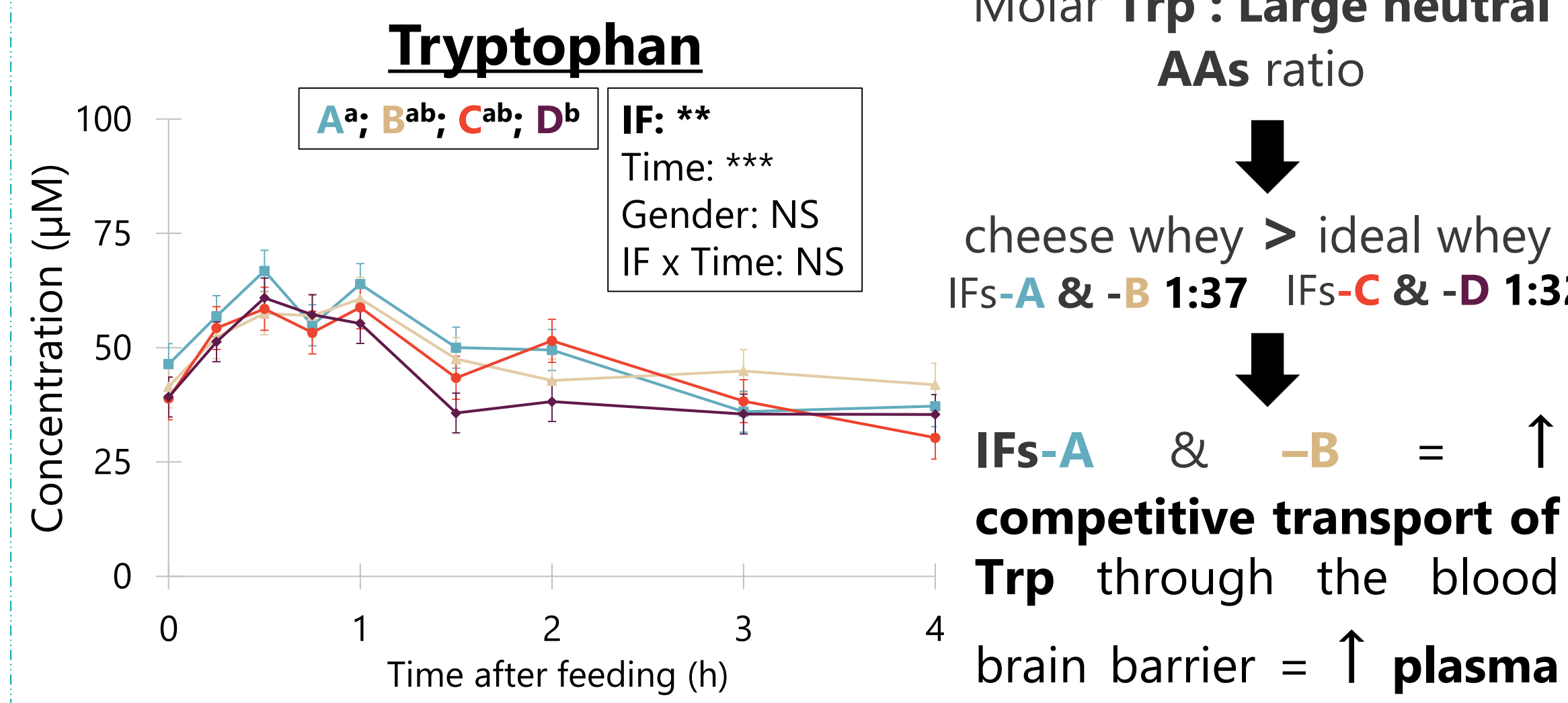
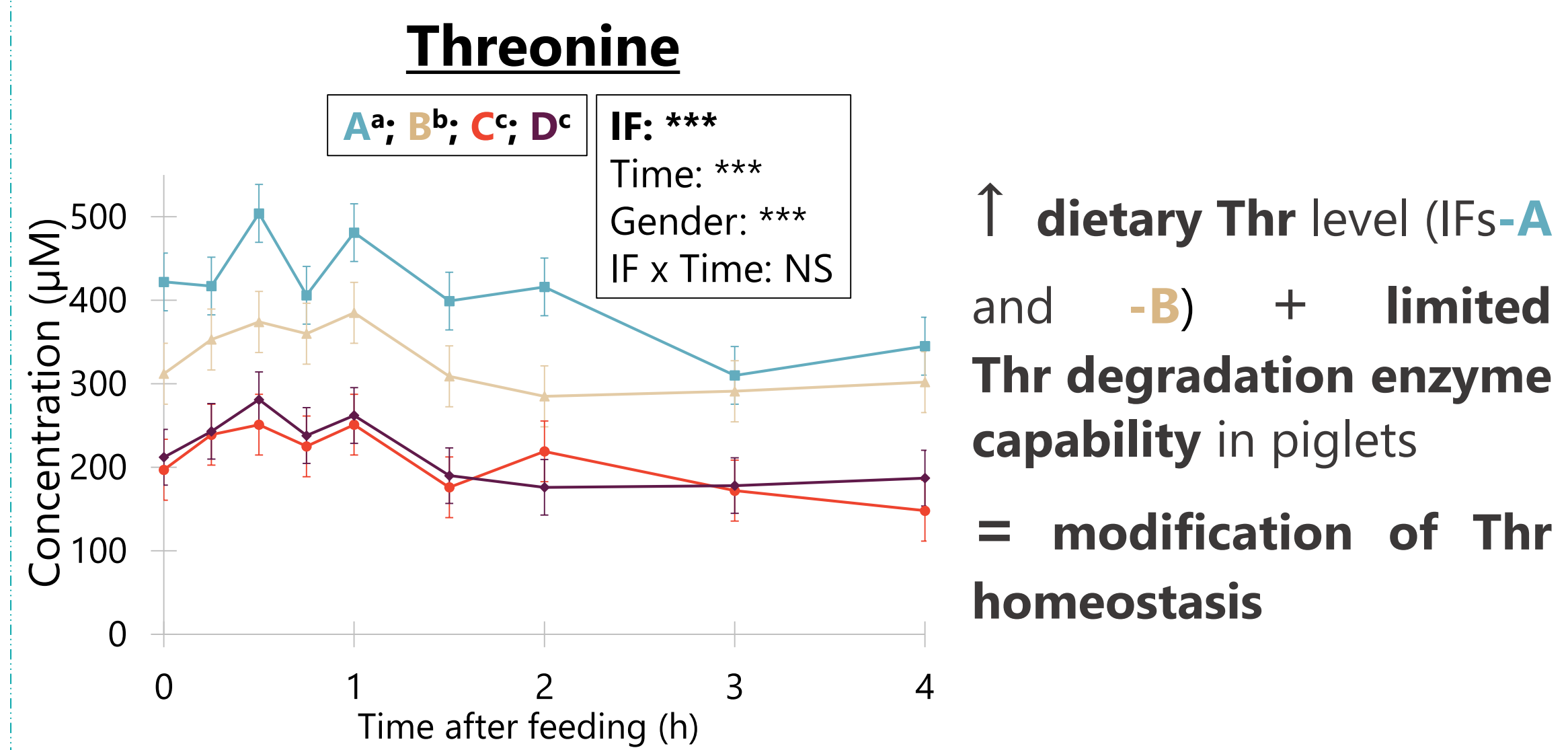
PLASMA AMINO ACIDS



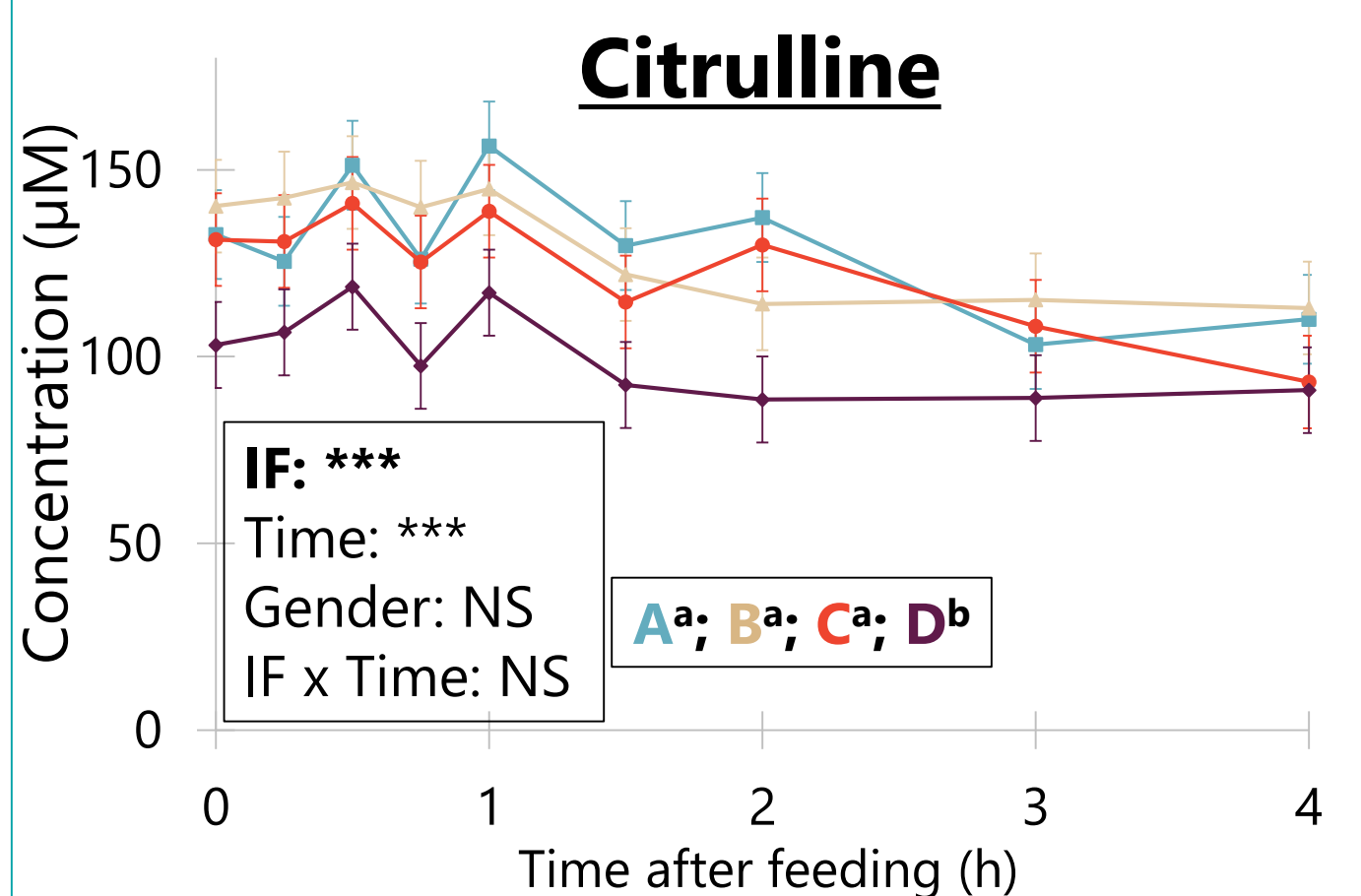
Modifications since preprandial time = Modification of AA homeostasis

Rapid metabolic adaptation after a 2-day period of IF consumption.

Major impact of the AA profile of IFs, related to the whey origin, on the plasma concentrations of individual AAs.



OXIDATION PARAMETERS



Oxidation seemed to be affected by IFs microstructure.

PLASMA GLUCOSE & INSULINE

No difference in plasma glucose and insulin levels

Could be explained by the similar levels in plasma BCAAs concentrations.

CONCLUSION and PERSPECTIVE

- The quality of protein ingredient, and particularly that of WPs, greatly influenced plasma AA patterns, at both preprandial and postprandial times.
- Homeostasis of many AAs was modified after a short adaptation period and most of the differences observed preprandially explained the differences observed postprandially.
- The origin of the WP ingredients (cheese vs. ideal whey) resulted in the main differences in plasma AA levels due to the presence or not of GMP.
- The modification of the casein supramolecular organization resulted in few modifications of AA metabolism, except for AA oxidation involved in the urea cycle.

Whether these differences, with a similar or longer adaptation period, impact the body protein metabolism remains to be investigated.