PROTEIN INGREDIENT QUALITY AND STRUCTURE OF INFANT FORMULAS IMPACT PLASMA AMINO ACID KINETICS IN PIGLETS

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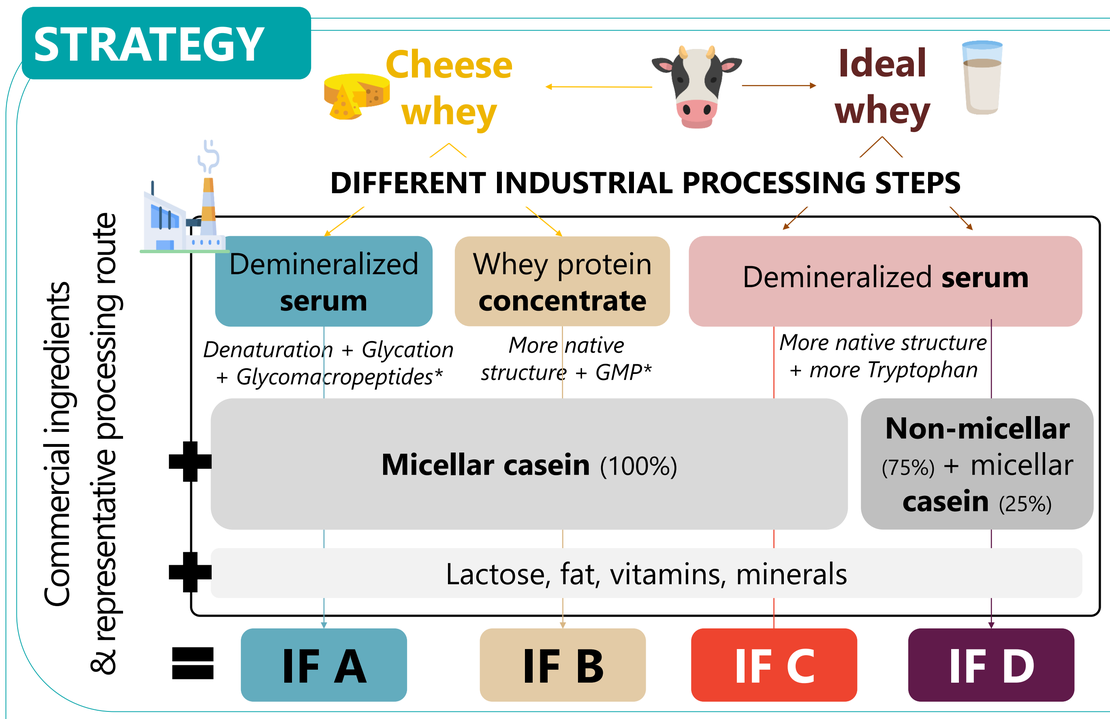
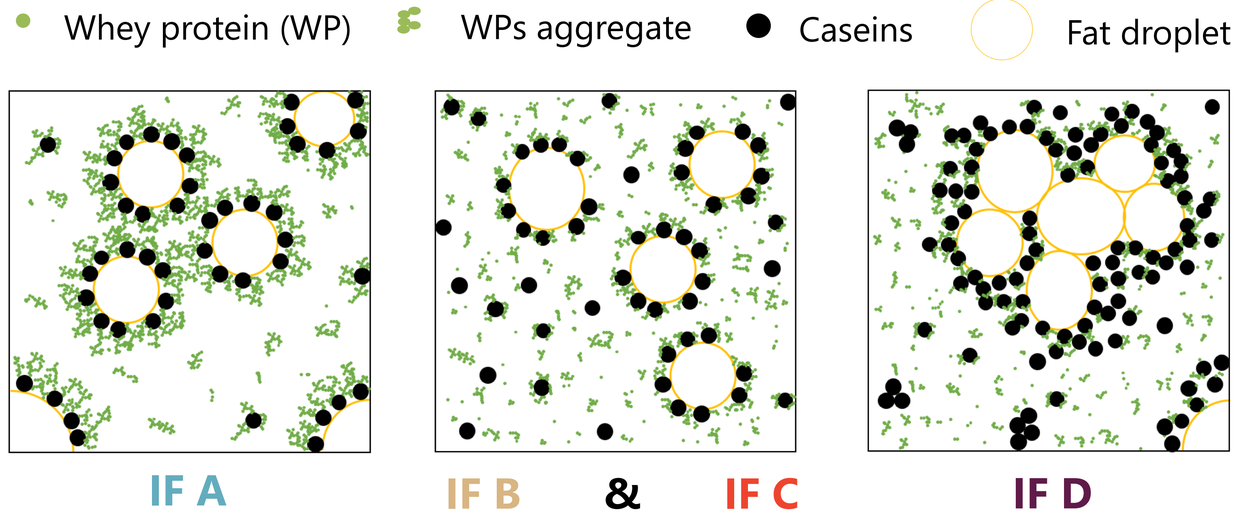
INTRODUCTION and OBJECTIVE

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**.

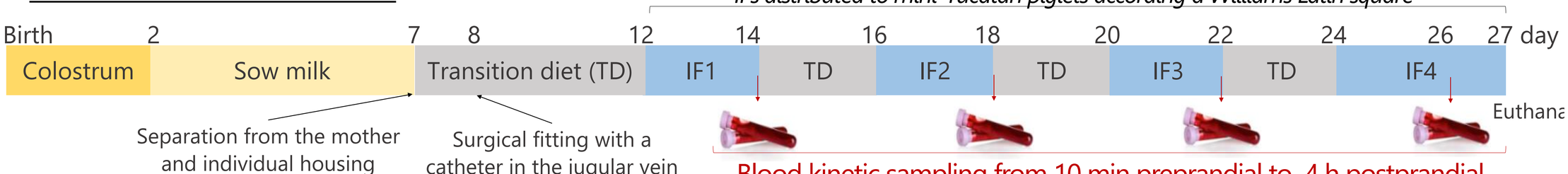
STRATEGY





4 IFs with **different microstructures**

EXPERIMENTAL PROTOCOL



n = 10

RESULTS

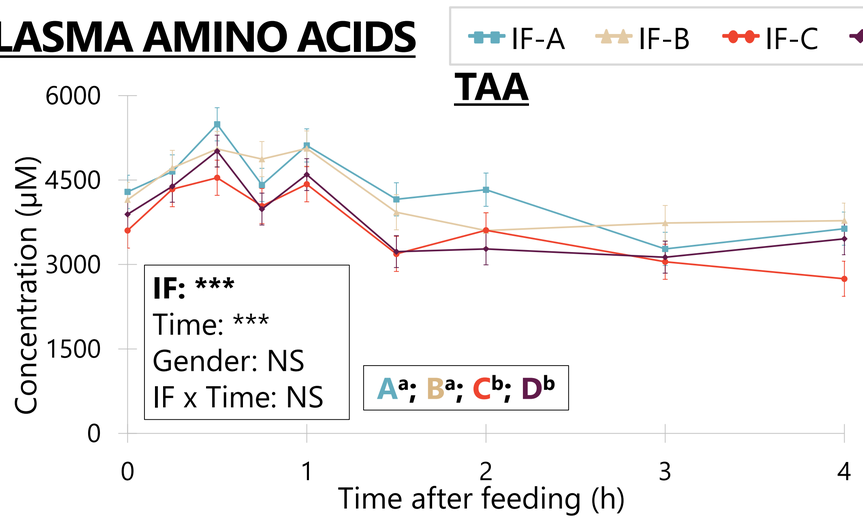
IF CHARACTERIZATION

Similar sum of **total**, **essential**, **non-essential** and **branched-chain AAs** among IFs.

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



Plasma TAA concentrations : IFs-**A** & **-B** > IFs-**C** (+17%) & **–D** (+12%) at both **pre-** and **post-prandial times**.

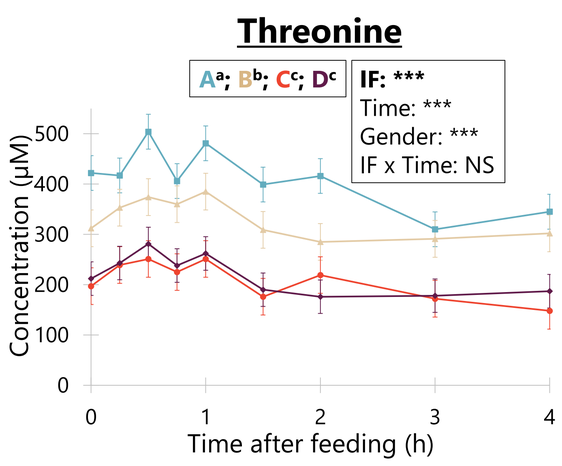
Plasma TAA differences are mainly due to the plasma EAA concentrations : IFs-**A** & **-B** > IFs-**C** (+20%) and **-D** (+26%)

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.



↑ **dietary Thr** level (IFs-**A** and **-B**) + **limited Thr degradation enzyme capability** in piglets = **modification of Thr homeostasis**

Molar **Trp : Large neutral AAs** ratio ➡ cheese whey ≠ ideal whey

IFs-**A** & **-B** **1:37** IFs-**C** & **-D** **1:32**

IFs-**A** & **–B** = ↑ **competitive transport of Trp** through the blood brain barrier = ↑ **plasma Trp content**

OXIDATION PARAMETERS

- **Plasma AAs involved** in the **urea cycle** (Orn, Citr, Arg) : **IF-D** < IFs-**A**, **-B** & **-C**
- **Plasma 3-Mhis and urea** : IFs-**A** & **-D** < IFs-**B** & **-C** = in line with ↓ **endogenous proteolysis**

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 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.**

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