



Incorporation of butyric and caproic acids into milk replacers fed to newborn calves

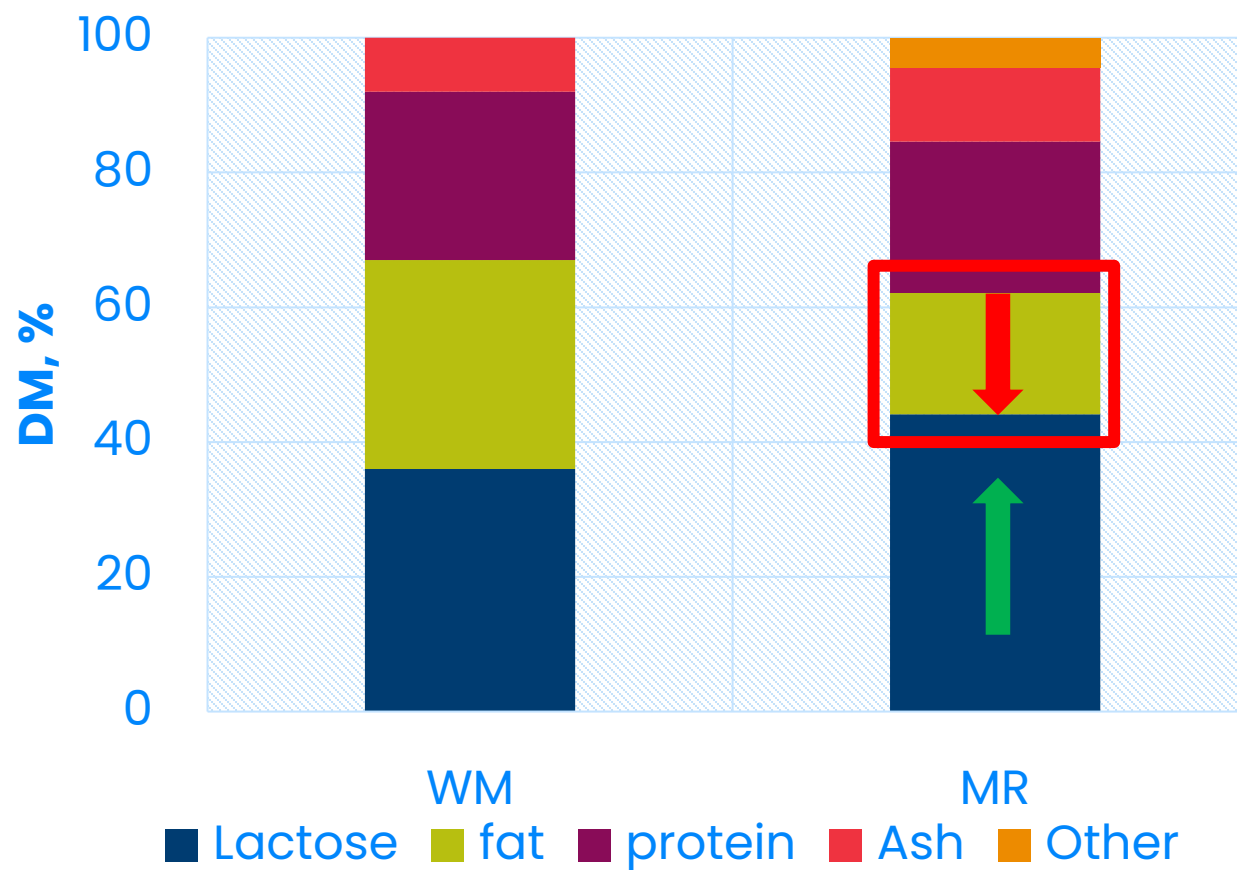
New trends in calf nutrition and more specifically in milk replacer composition.

This is especially important in a context where we are recommending to move towards higher planes of nutrition for calves.

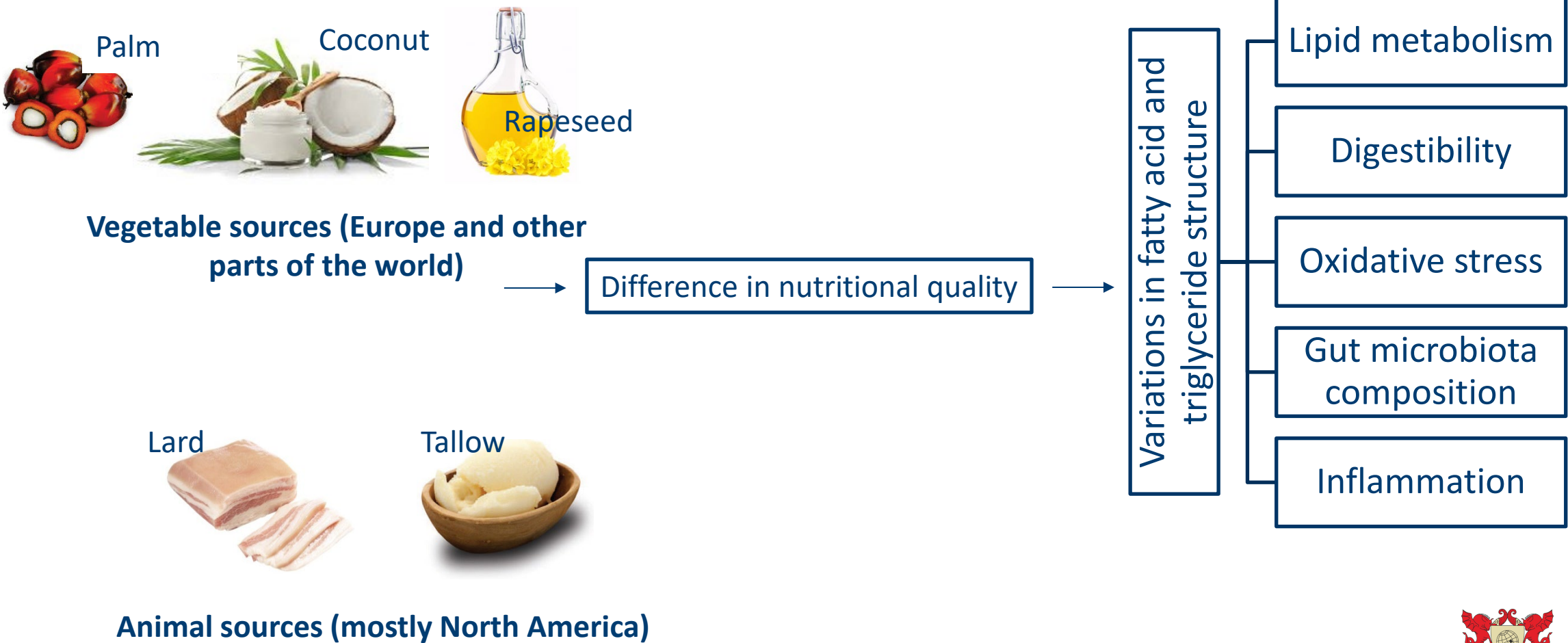
We therefore need to better understand what macronutrient profile is adequate for feeding calves.



Macronutrient profile of milk replacers for calves



Fat composition in milk replacers for calves

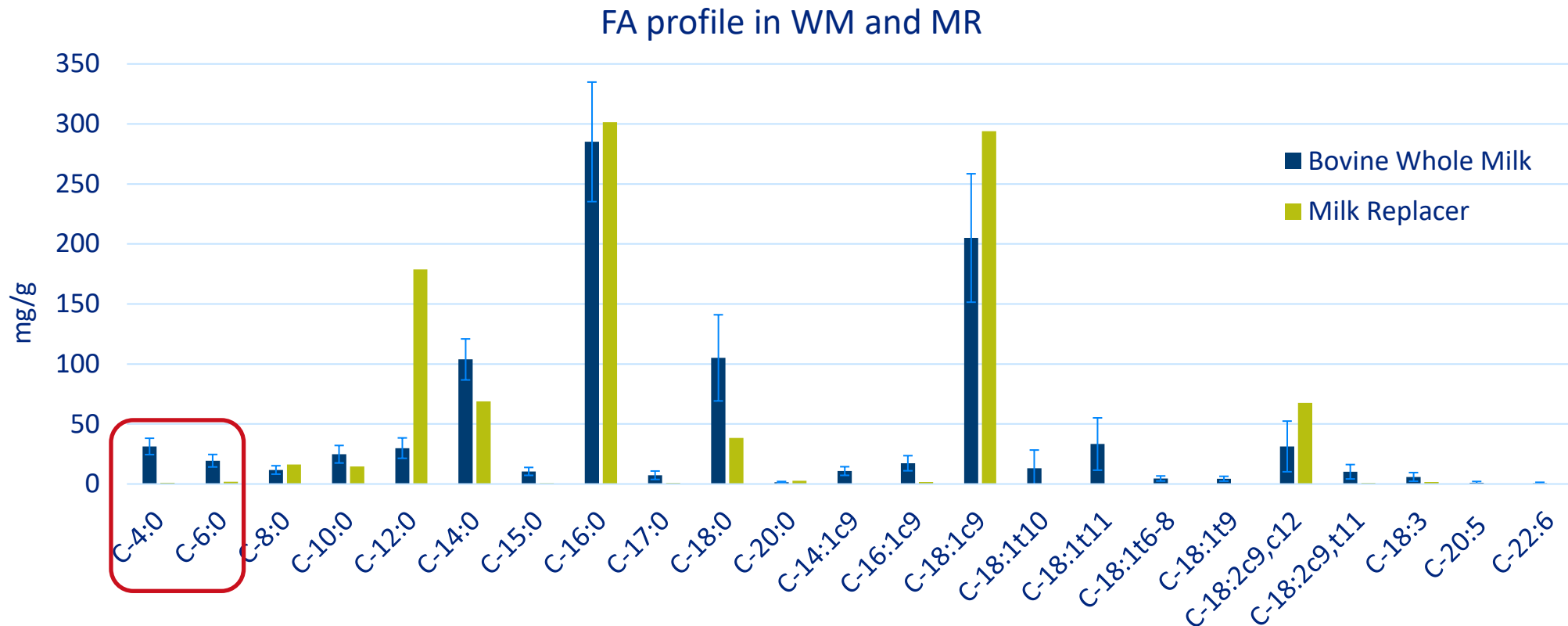


Divergent fatty acid (FA) profile

Palm fat – 65%



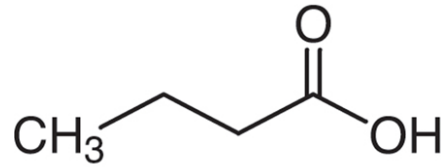
Coconut fat – 35%



Biological relevance of C4:0 and C6:0

Butyric (C4:0)

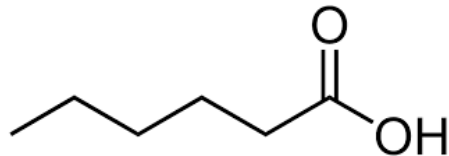
3.1 – 5.6% total FA



- Lower diarrhea frequencies
- Enhancement in:
 - Rumen papillae development
 - Intestinal development and barrier function
 - Digestive secretions
- Improved insulin sensitivity
- Immune response and anti-inflammatory effect
- More efficient use of energy
- Higher ADG

Caproic (C6:0)

2.2 – 2.8% total FA



- Higher ADG
- Antibiotic effect across species

Essential for neonatal development

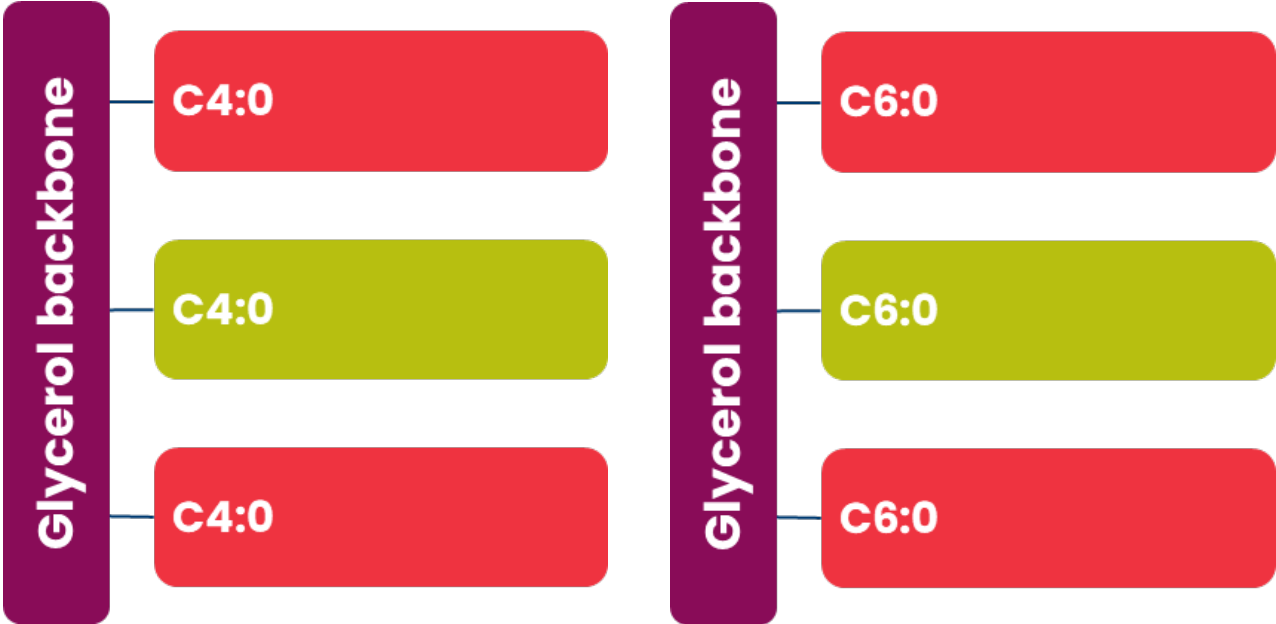
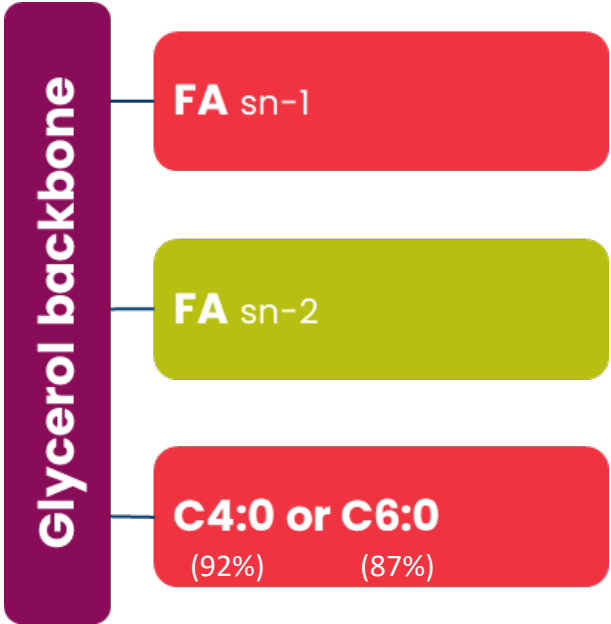


Incorporation of C4:0 and C6:0 into milk replacer

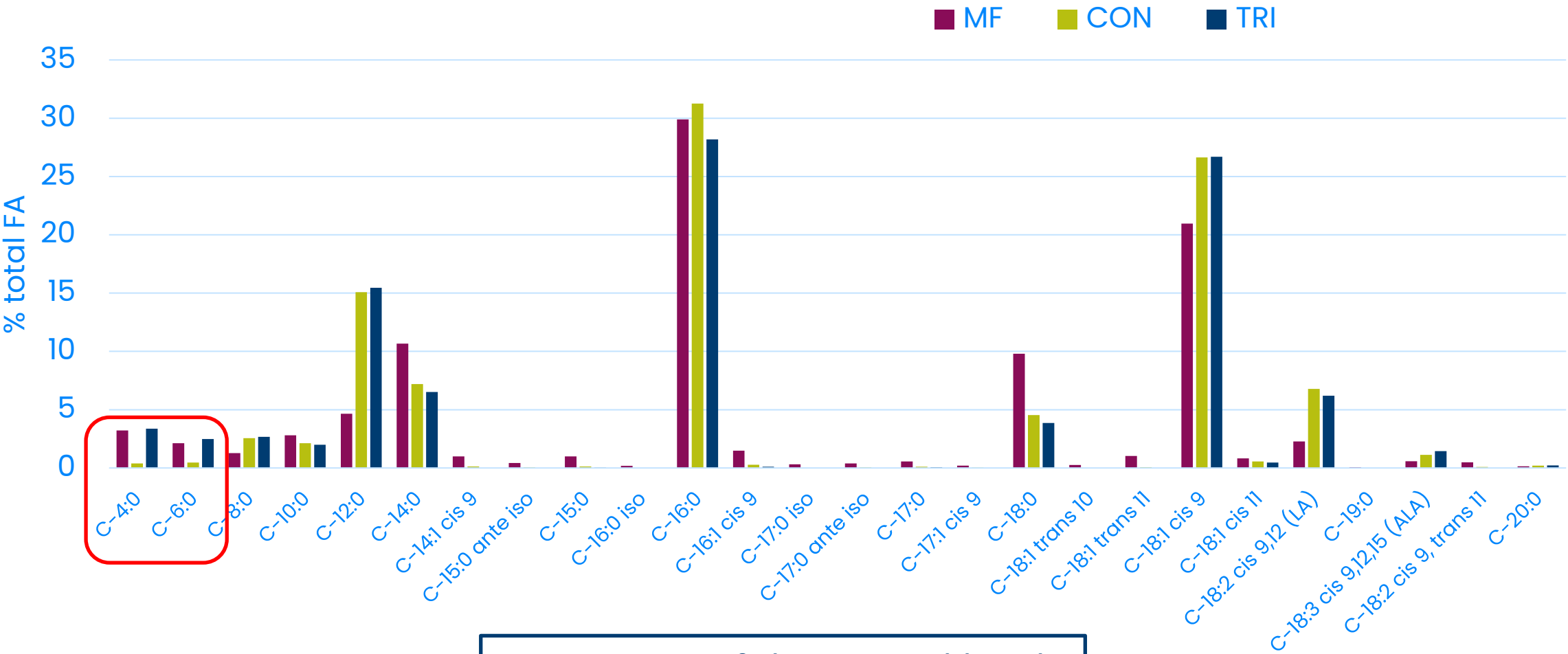
Natural C4:0 / C6:0

Tributyrin / Tricaproin

Often LCFA



C4:0 and C6:0 successfully incorporated!



Restoration of the natural levels

Objective

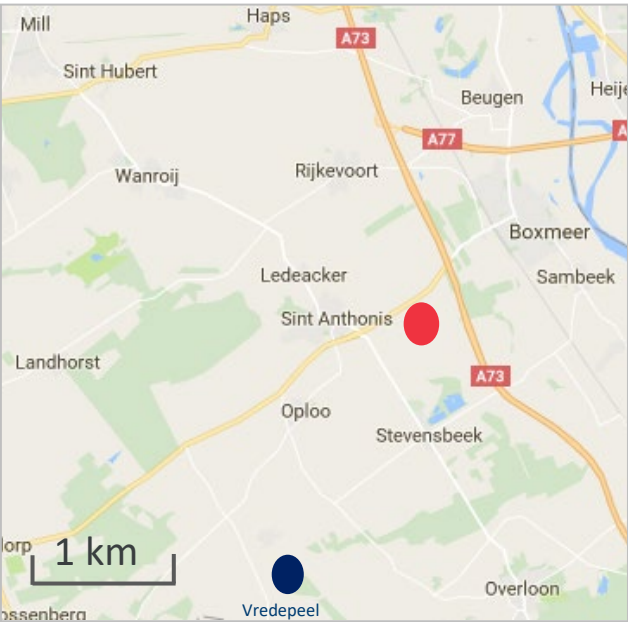
To investigate how the incorporation of Tributyrin (**TB**) and Tricaproin (**TC**) into milk replacer (**MR**) affects the **MR** intake, growth, and health of newborn Holstein male calves.

Hypothesis

1. Feeding **MR** containing **TB** and **TC** would not negatively affect the **MR intake and acceptance** in newborn calves.
2. Incorporating **TB** and **TC** into **MR** would reduce the incidence of diarrhea and the number of calves treated for diseases.



Experimental design: Calf sourcing



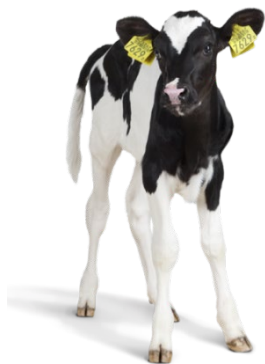
- Calf & Beef research facility
- Neighboring dairy farm

ORIGIN	Neighboring dairy farm
SEX/BREED	100% male/Holstein
AGE	0.90 ± 0.35d old
COLOSTRUM QUALITY	≥ 22% BRIX (50 mg/L of IgG)
COLOSTRUM VOLUME	3.0 to 4.0 L within the first 3 h after birth, followed by 2 feedings of 2.0 L
BODY WEIGHT	38 to 55 kg
BLOCKING	Arrival day and age
HOUSING	Individually housed



Experimental design: Treatments and measurements

- 6 calves per treatment
- Monitored for 21 days
- Fed 3.5 L of MR – 2x/day
- At 15.0 % solids



3.75% TB and 2.5% TC of total FA
To mimic the amount of C4:0 and C6:0 in milk fat

Replacement level:

0% TB + TC – TRI0

33% TB + TC – TRI33

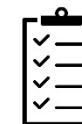
67% TB + TC – TRI67

100% TB + TC – TRI100

Measurements



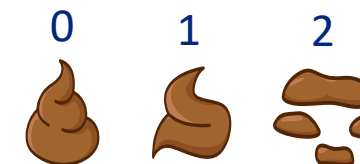
MR intake (at 10 min post meal and total)
+ water and straw intakes



Drinking assistance



Body weight



Fecal Scores

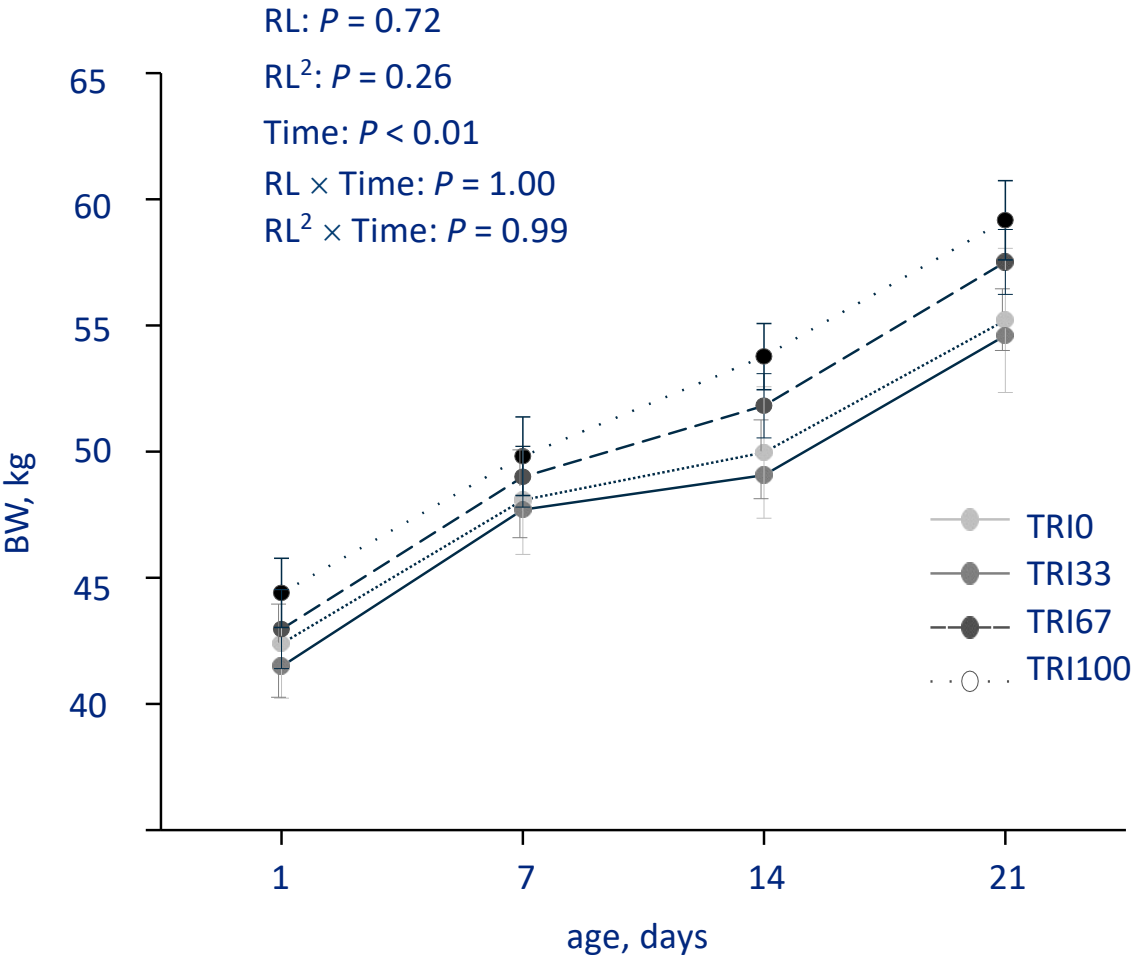
Isoenergetic and isonitrogenous

Macronutrient	DM, %
Crude protein	23.7
Fat	25.8
Lactose	37.5

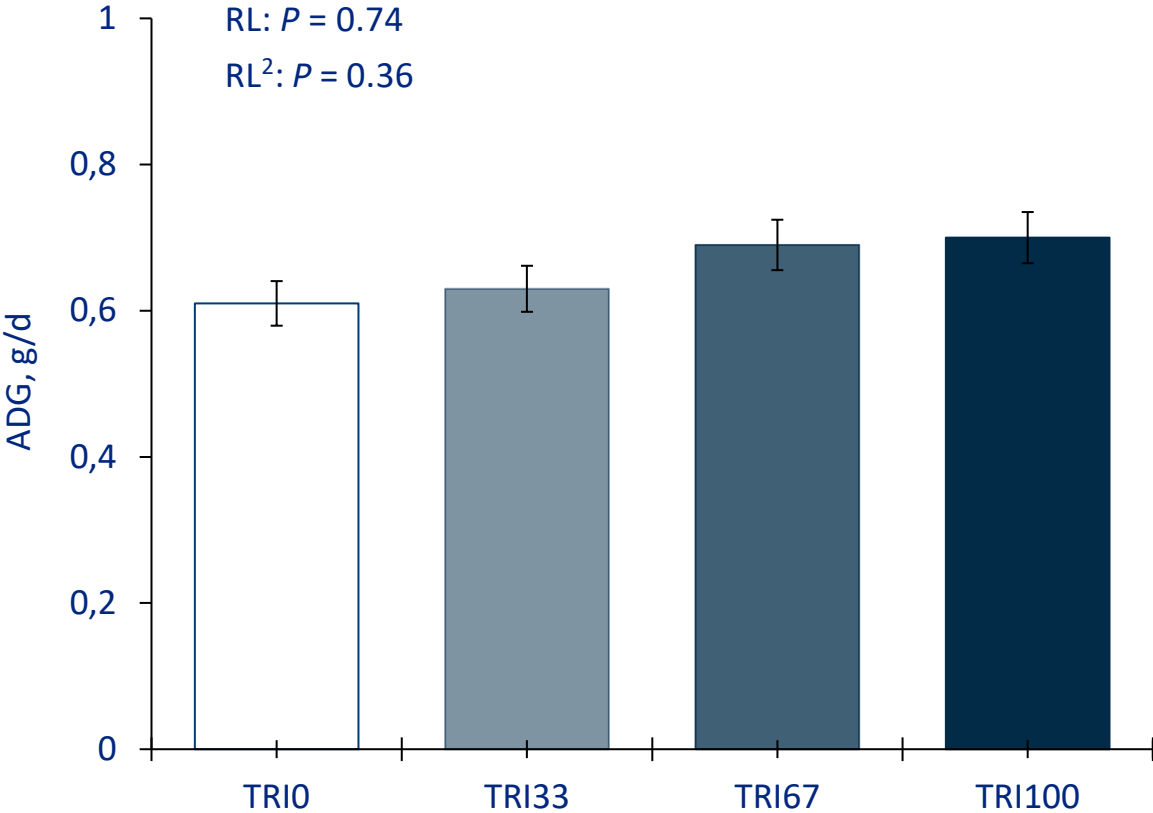


Results – Growth was not affected by dietary treatments

BW



ADG



No differences in milk replacer intake

RL: $P = 0.56$

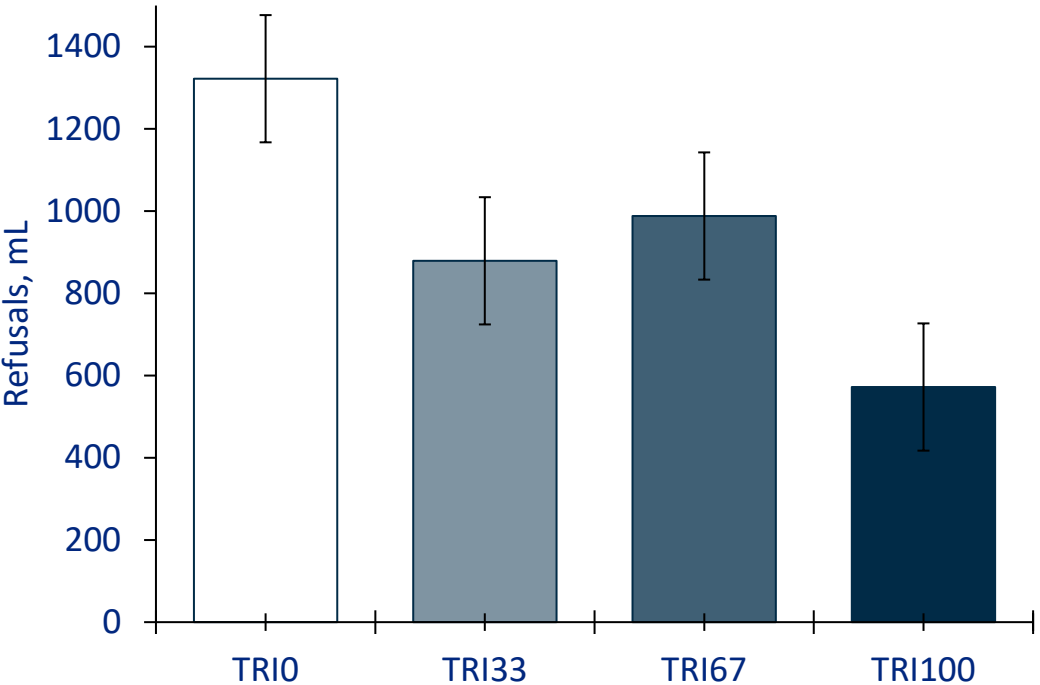
RL²: $P = 0.96$

Time: $P < 0.04$

RL $\times$ Time: $P = 0.99$

RL² $\times$ Time: $P = 0.85$

After 10 min



RL: $P = 0.38$

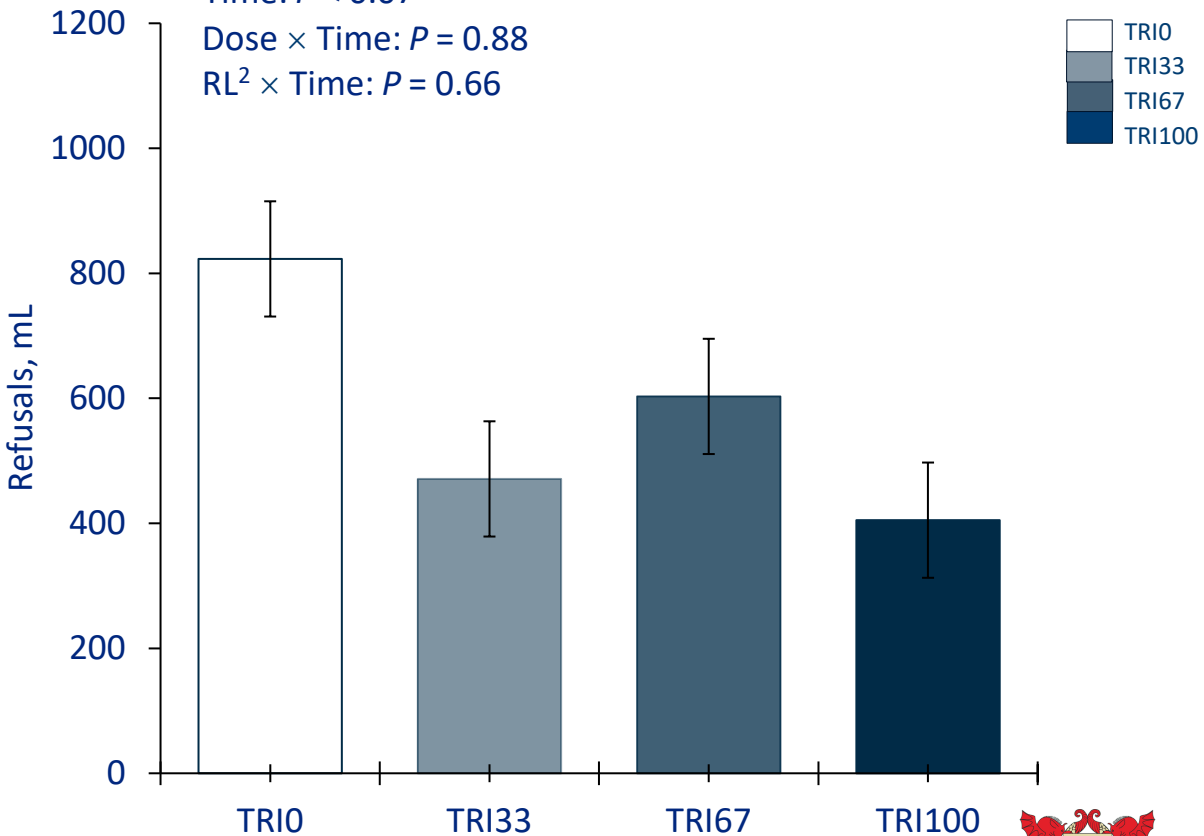
RL²: $P = 0.64$

Time: $P < 0.07$

Dose $\times$ Time: $P = 0.88$

RL² $\times$ Time: $P = 0.66$

Total



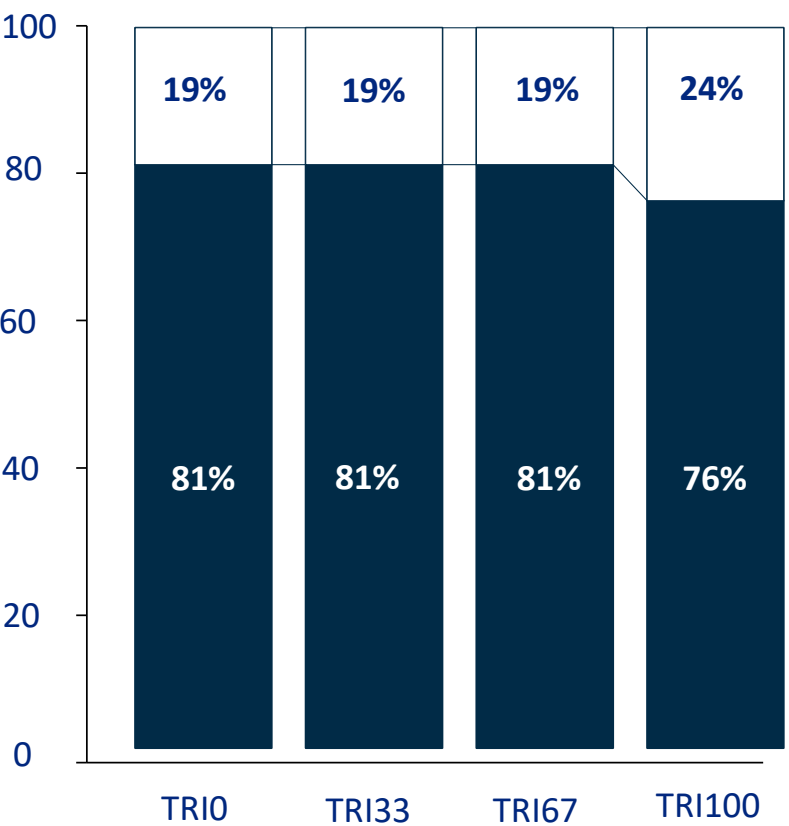
No alterations in drinking behavior



Differences in fecal scores in wk 2 and 3 after arrival

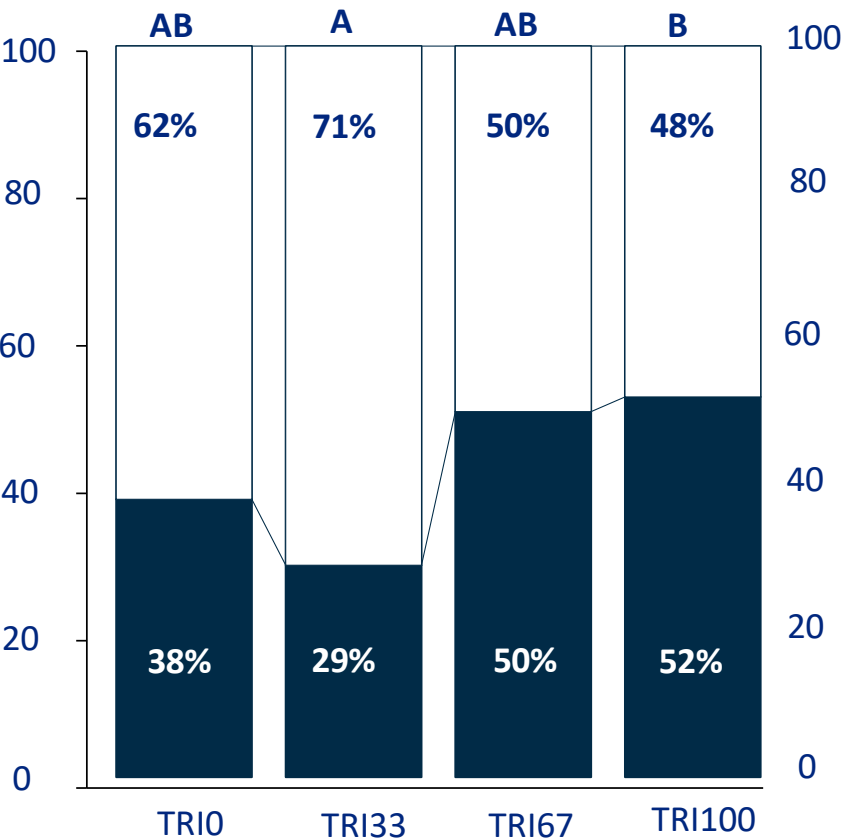
Week 1

P = 0.60



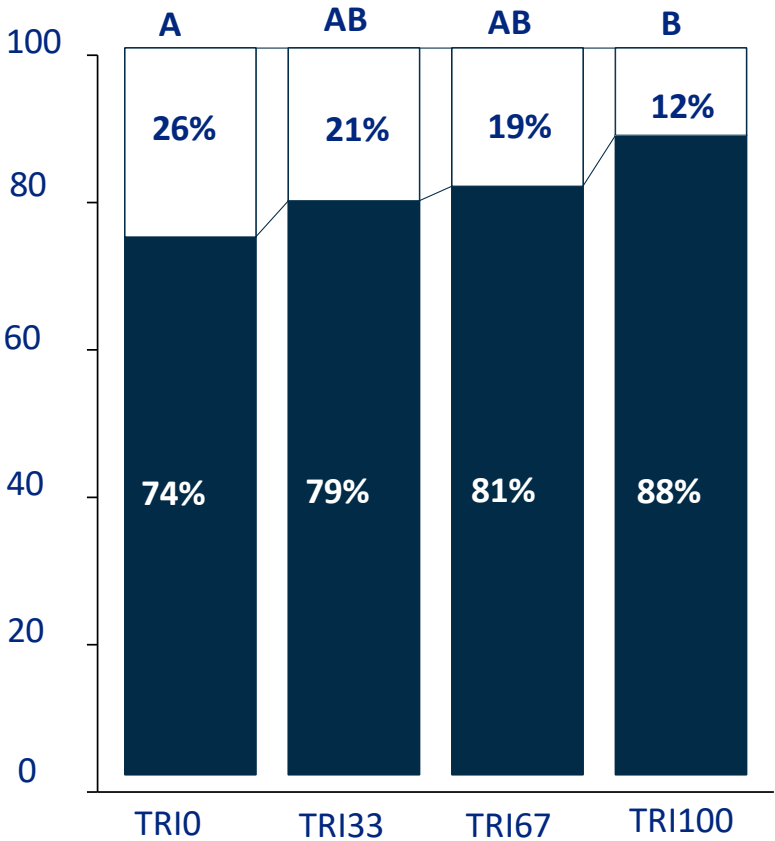
Week 2

P = 0.06



Week 3

P = 0.10



 Abnormal fecal scores
 Normal consistency

Drinking assistance

High assistance

A high level of assistance was required, and the calf was guided to the bucket by the caretaker multiple times.

Low assistance

Small assistance was provided by guiding the calf to the bucket only once

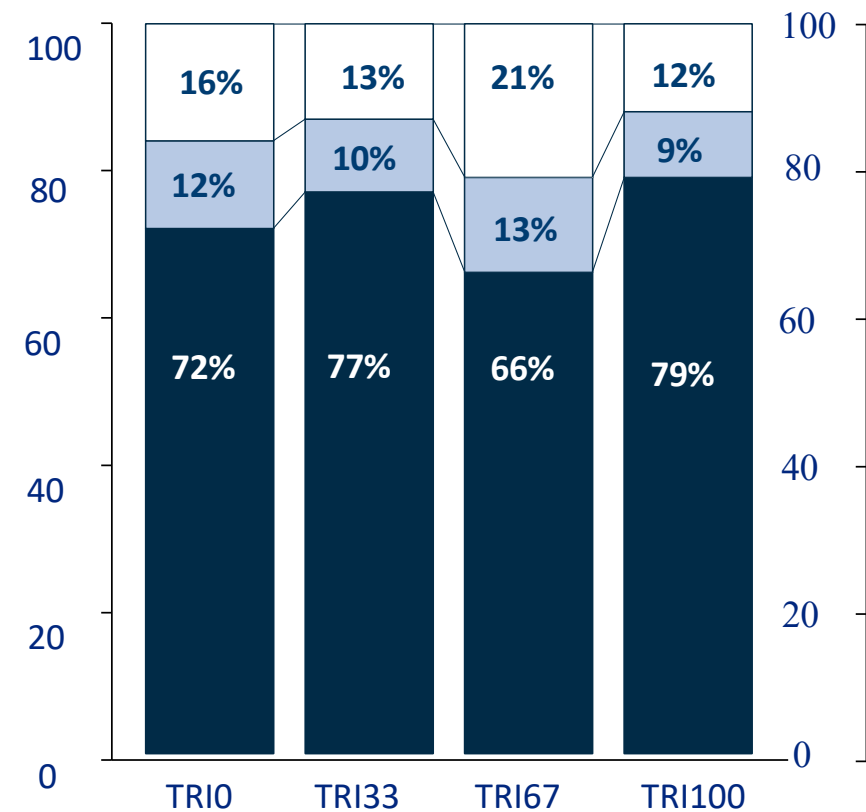
No assistance

Calves did not need assistance

Calves needed less drinking assistance with TB and TC in wk 2

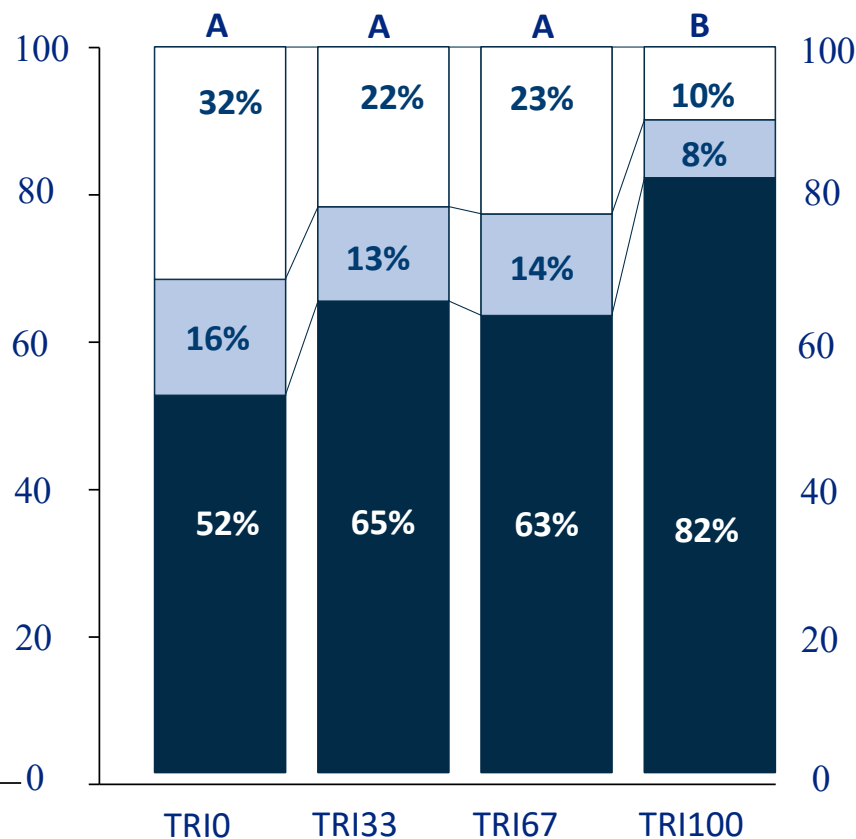
Week 1

$P = 0.37$



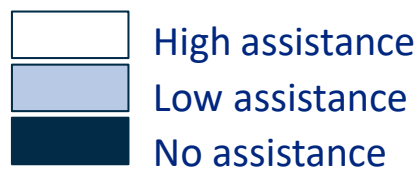
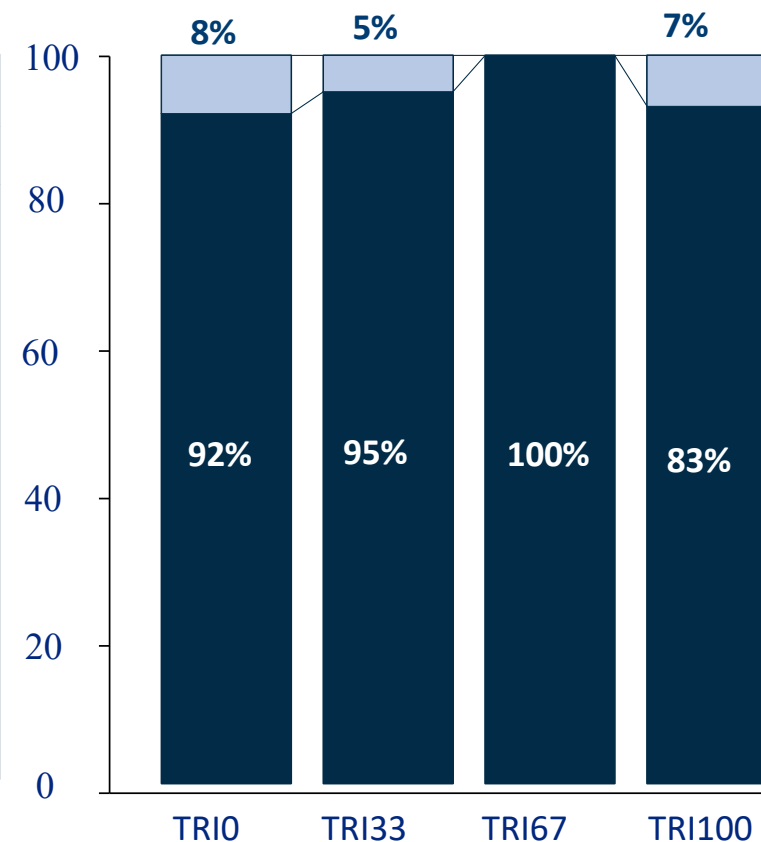
Week 2

$P < 0.01$



Week 3

$P = 0.45$



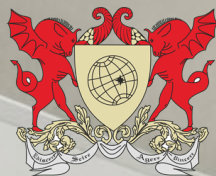
Conclusions

Feeding TB and TC to newborn calves **did not adversely affect** MR acceptance.

Higher incidences of abnormal fecal scores were observed in the control (0% TRI) and 33% TRI groups.

The **control group required the most assistance for drinking** milk replacer, likely due to **increased digestive disorders**. Increasing TB and TC levels reduced this need.





Thank you!!!



icaro.castro@ufv.br