DIET SUPPLEMENTATION WITH 18:0 DOES NOT PROVE USEFUL TO ALLEVIATE FISH-OIL INDUCED MILK FAT DEPRESSION IN DAIRY EWES

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PRACTICAL APPLICATION

~~Addition of **marine lipids** to dairy ewe diet~~

↓

Potentially positive effects on the **nutritional value of milk fat**

(n-3 PUFA, CLA, *t*11-18:1…)

↓

Negative effects on <u>animal performance</u>

Milk fat depression (MFD)

BIOHYDROGENATION (BH) THEORY

(Bauman and Griinari, 2001)

Under certain dietary conditions, the pathways of rumen BH are altered, producing unique **fatty acid intermediates** that are potent inhibitors of milk fat synthesis

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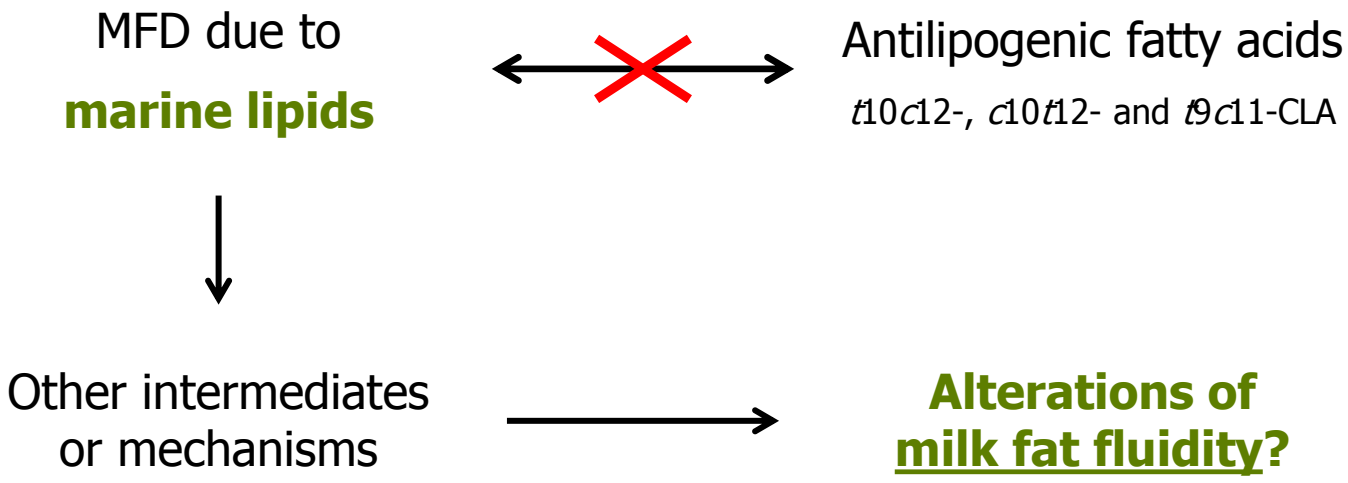
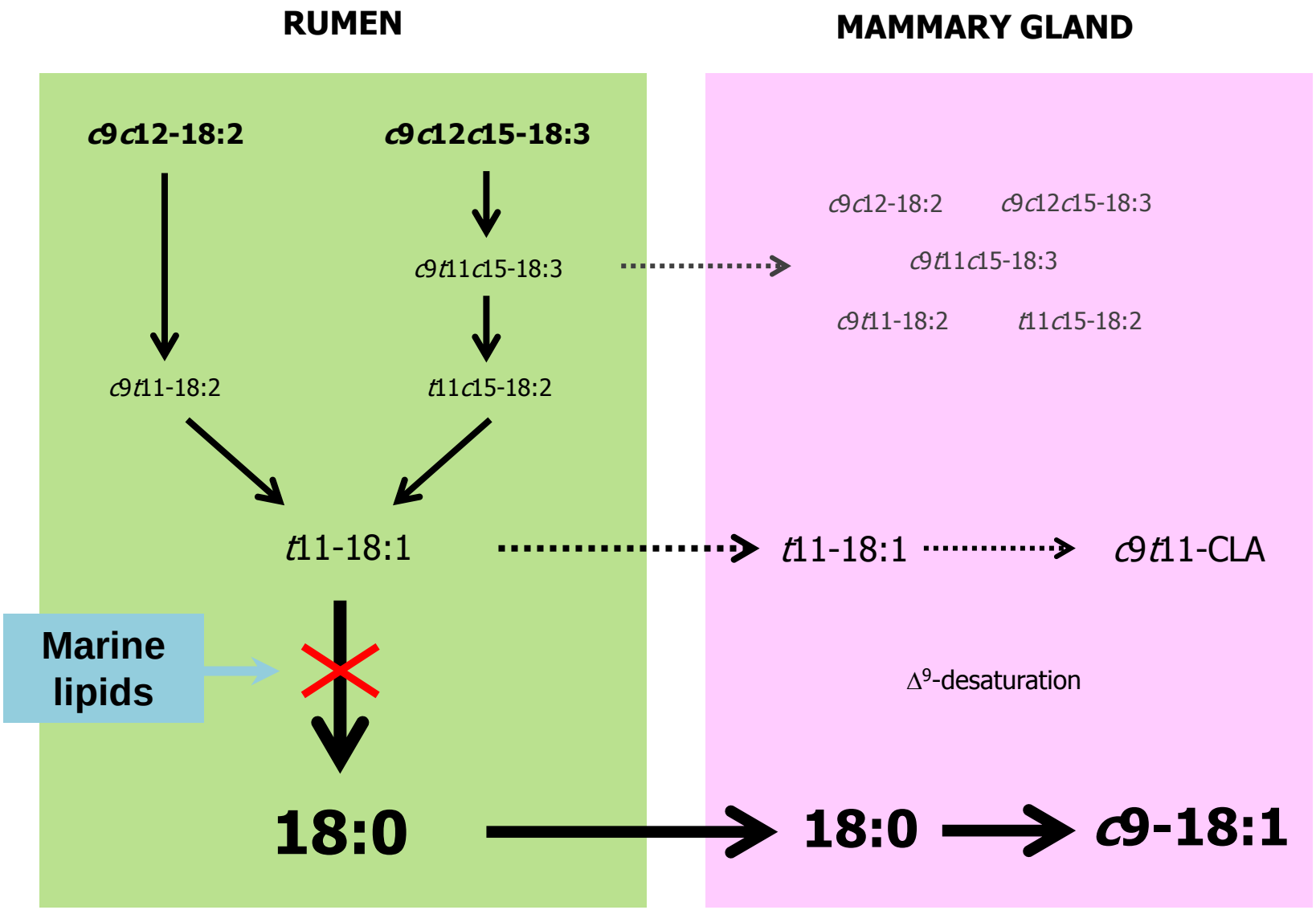
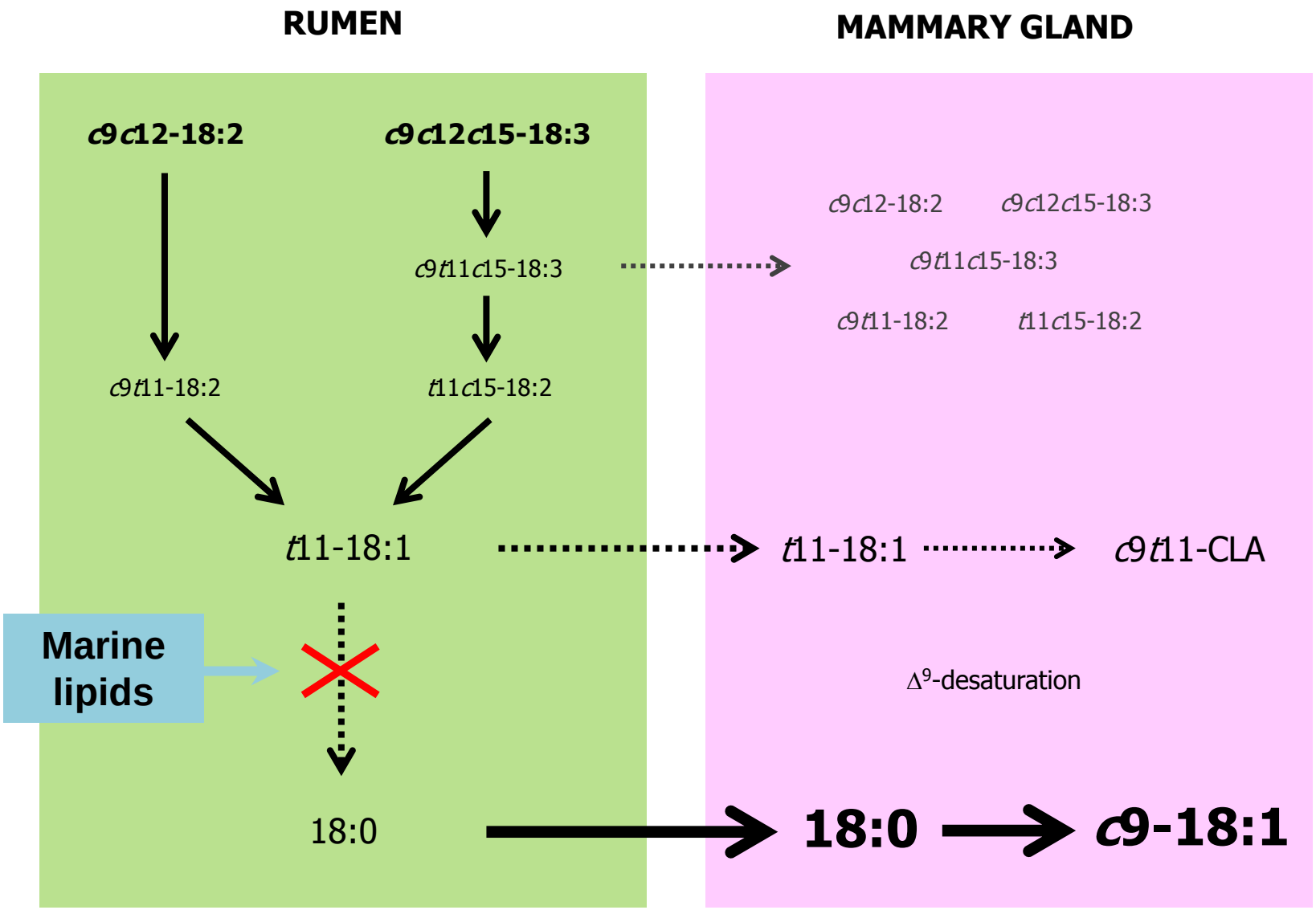
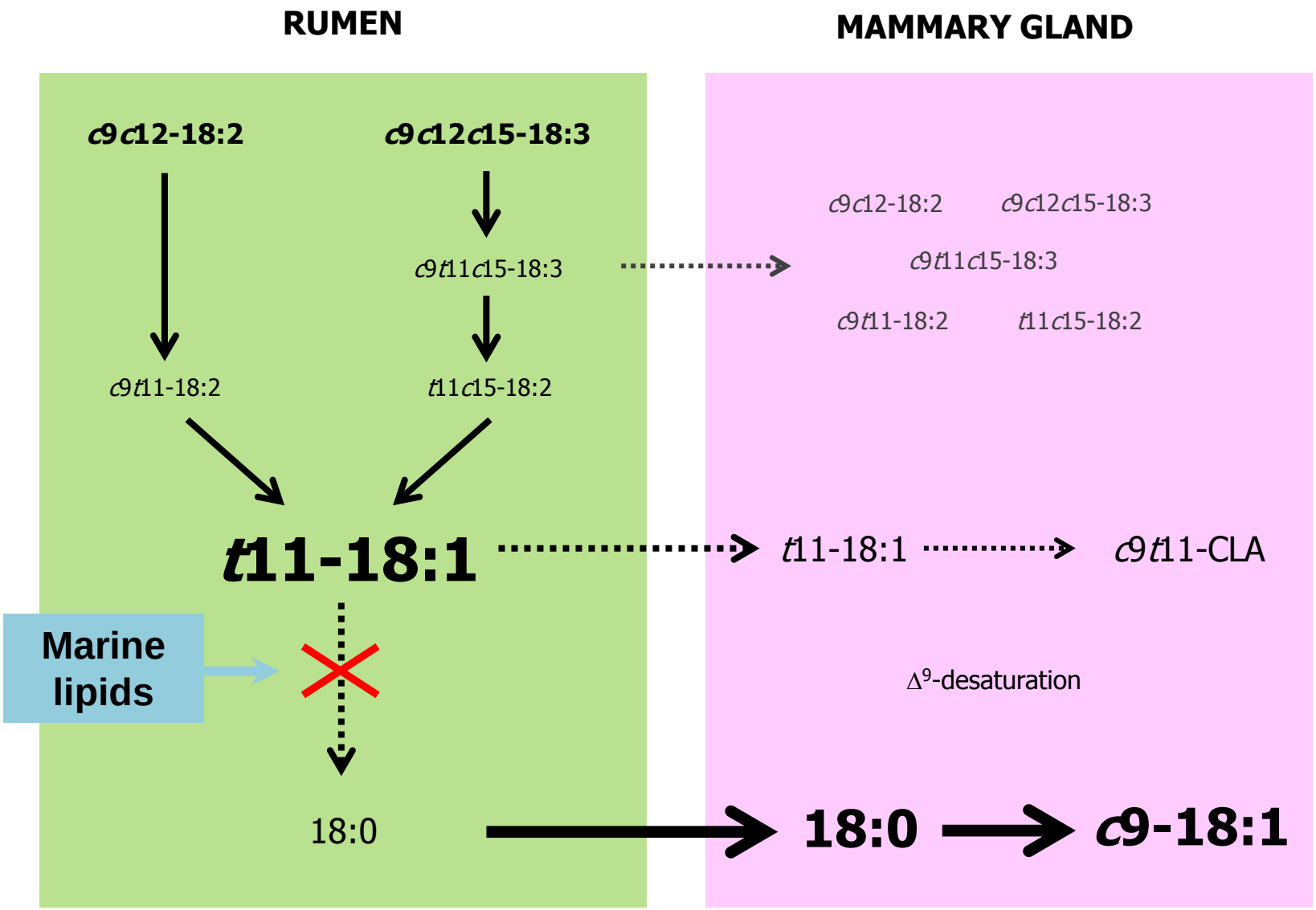



RUMEN
MAMMARY GLAND
c9c12-18:2
c9c12c15-18:3
c9t11c15-18:3
c9t11-18:2
t11c15-18:2
t11-18:1
Marine lipids
18:0
c9c12-18:2
c9c12c15-18:3
c9t11c15-18:3
c9t11-18:2
t11c15-18:2
t11-18:1
c9t11-CLA
Δ9-desaturation
18:0
c9-18:1


RUMEN
MAMMARY GLAND
c9c12-18:2
c9c12c15-18:3
c9t11c15-18:3
c9t11-18:2
t11c15-18:2
t11-18:1
18:0
Marine lipids
c9c12-18:2
c9c12c15-18:3
c9t11c15-18:3
c9t11-18:2
t11c15-18:2
t11-18:1
c9t11-CLA
Δ9-desaturation
18:0
c9-18:1


RUMEN
MAMMARY GLAND
c9c12-18:2
c9c12c15-18:3
c9t11c15-18:3
c9t11-18:2
t11c15-18:2
t11-18:1
Marine lipids
18:0
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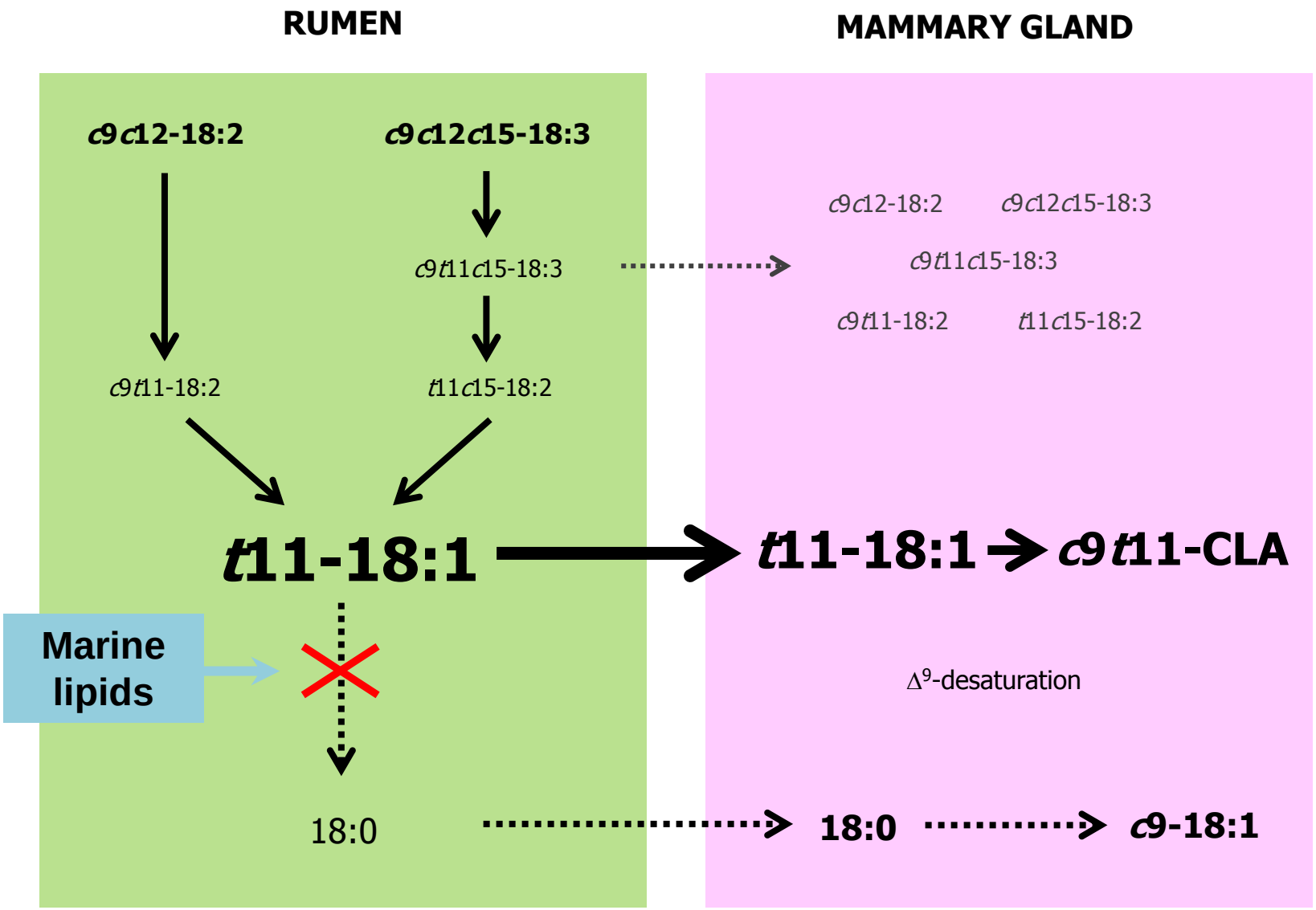
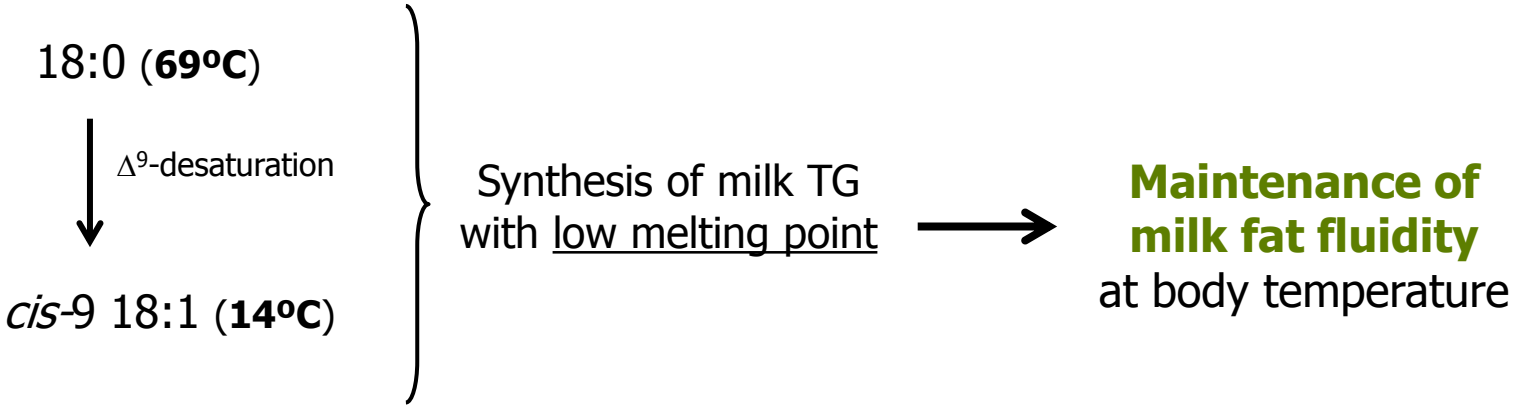
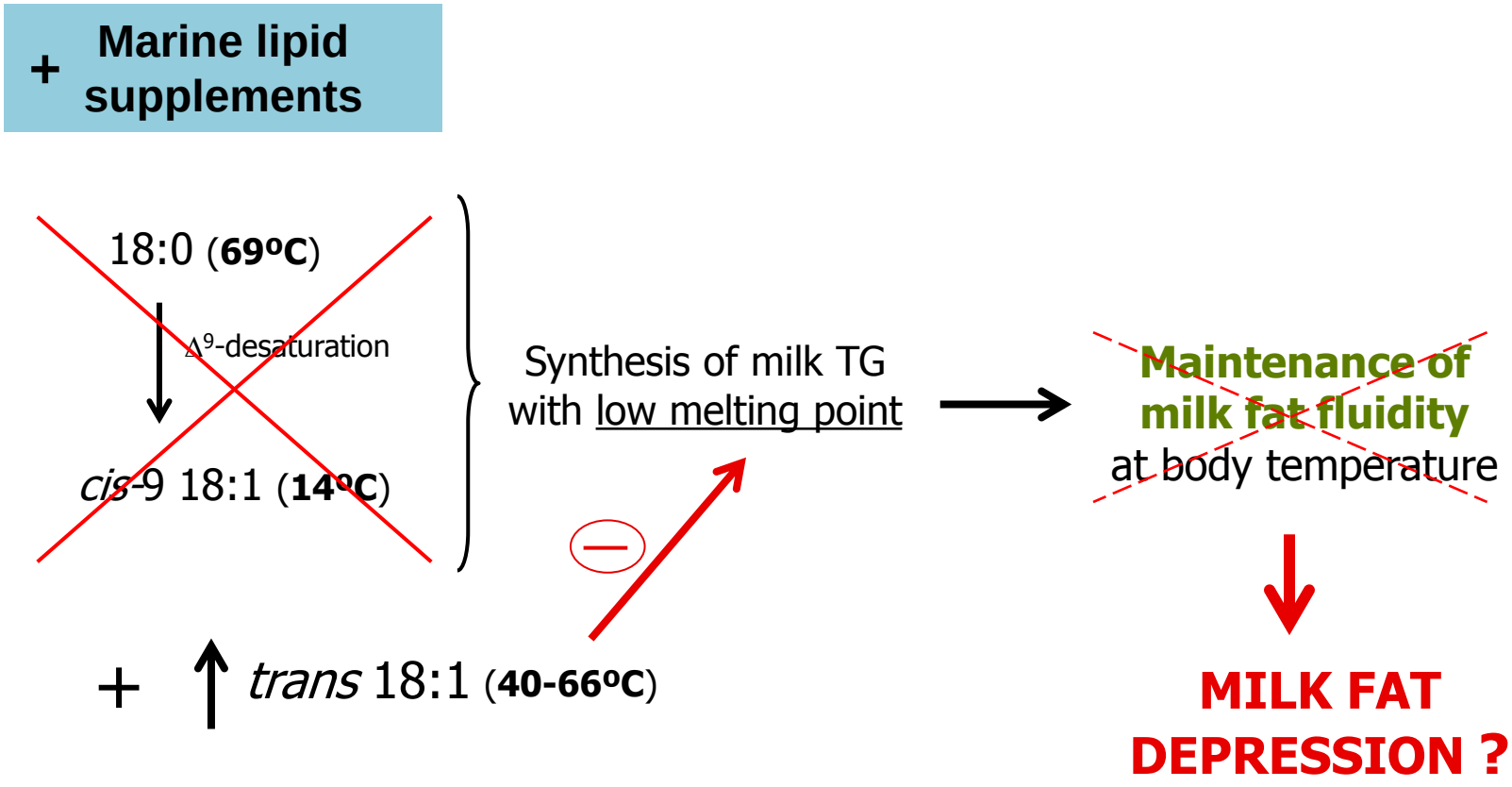
c9c12c15-18:3
c9t11c15-18:3
c9t11-18:2
t11c15-18:2
t11-18:1
c9t11-CLA
Δ9-desaturation
18:0
c9-18:1


RUMEN
MAMMARY GLAND
c9c12-18:2
c9c12c15-18:3
c9t11c15-18:3
c9t11-18:2
t11c15-18:2
t11-18:1
Marine lipids
18:0
c9c12-18:2
c9c12c15-18:3
c9t11c15-18:3
c9t11-18:2
t11c15-18:2
t11-18:1
c9t11-CLA
Δ9-desaturation
18:0
c9-18:1


18:0 (**69°C**)
Δ^9-desaturation
cis-9 18:1 (**14°C**)
Synthesis of milk TG
with low melting point
Maintenance of milk fat fluidity
at body temperature


+ Marine lipid supplements
18:0 (69°C)
Δ9-desaturation
cis-9 18:1 (14°C)
Synthesis of milk TG with low melting point
Maintenance of milk fat fluidity at body temperature
+
trans 18:1 (40-66°C)
MILK FAT DEPRESSION ?

OBJECTIVE

To test the hypothesis that **supplemental 18:0** could contribute to **alleviate fish oil-induced MFD** in dairy sheep

12 Assaf ewes ⟶ **3 lots** (n = 4)

3 x 3 Latin square design

3 experimental diets

TMR (F:C ratio 40:60)

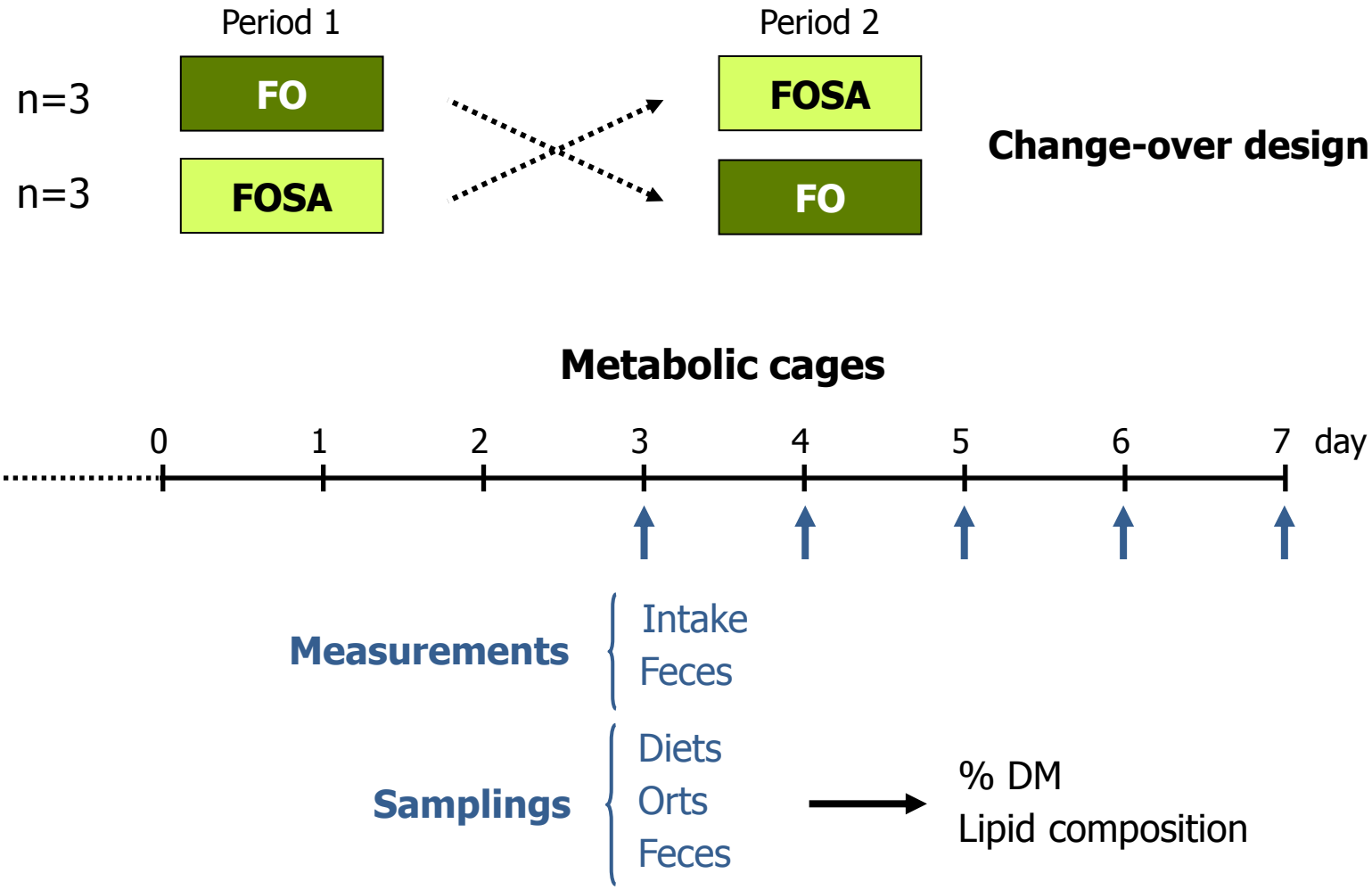
- Non supplemented → **Control**
- +2% fish oil → **FO**
- +2% fish oil +2% 18:0 → **FOSA**

3 periods (28 d/period)

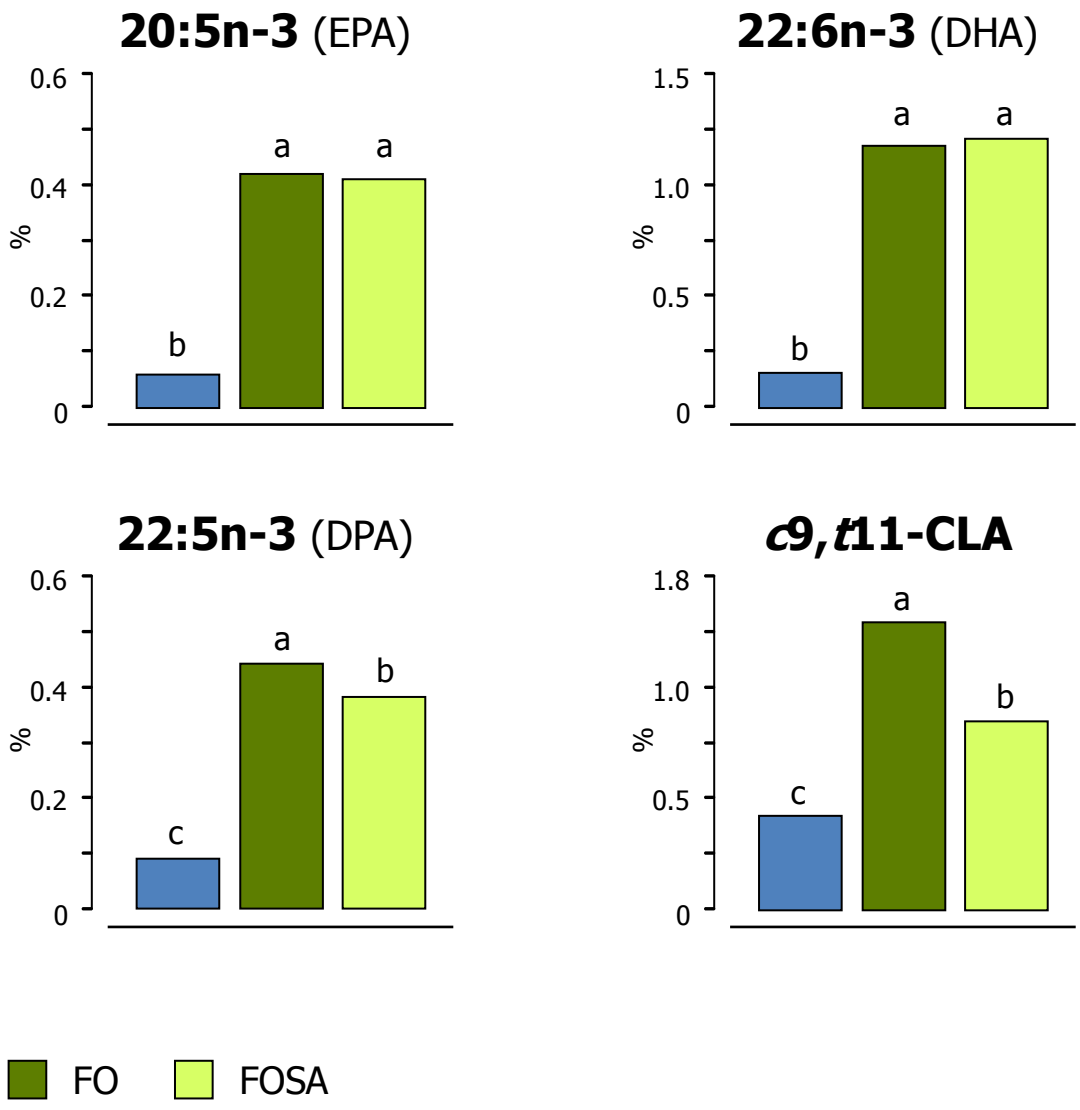
Measurements and samplings (days 25-27)

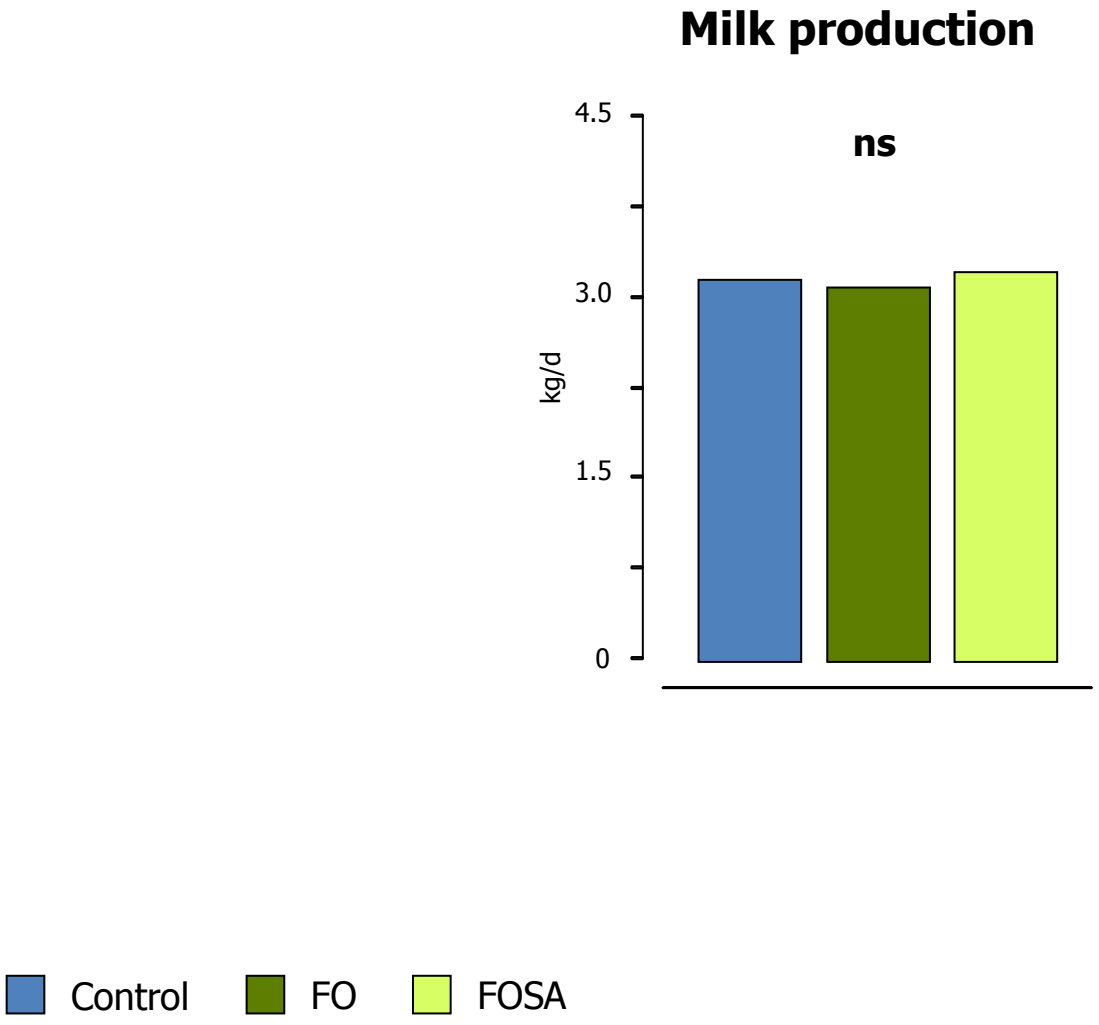
- DM intake (lot)
- Milk production (individual)
- Milk fat, protein and lactose % (individual)
- Milk fatty acid profile (lot)

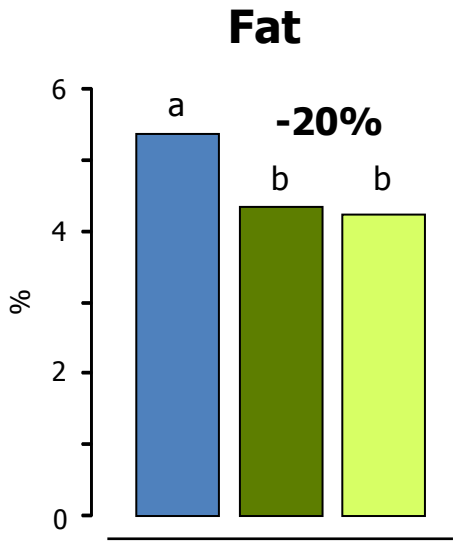
Digestibility of the 18:0 supplement

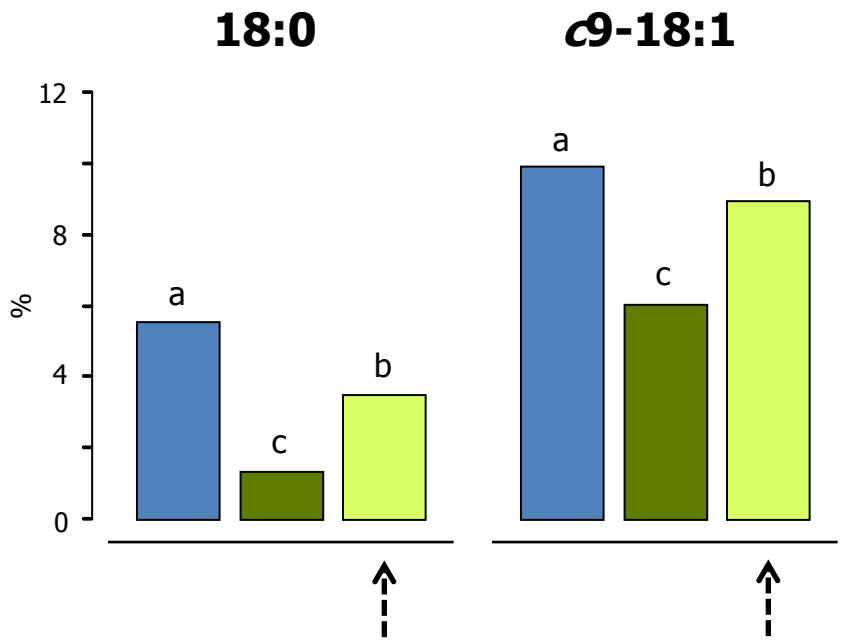


Milk fatty acid profile




Milk production
ns
4.5
3.0
1.5
0
kg/d
Control
FO
FOSA





↑ **18:0 availability**

did not prove useful to alleviate MFD

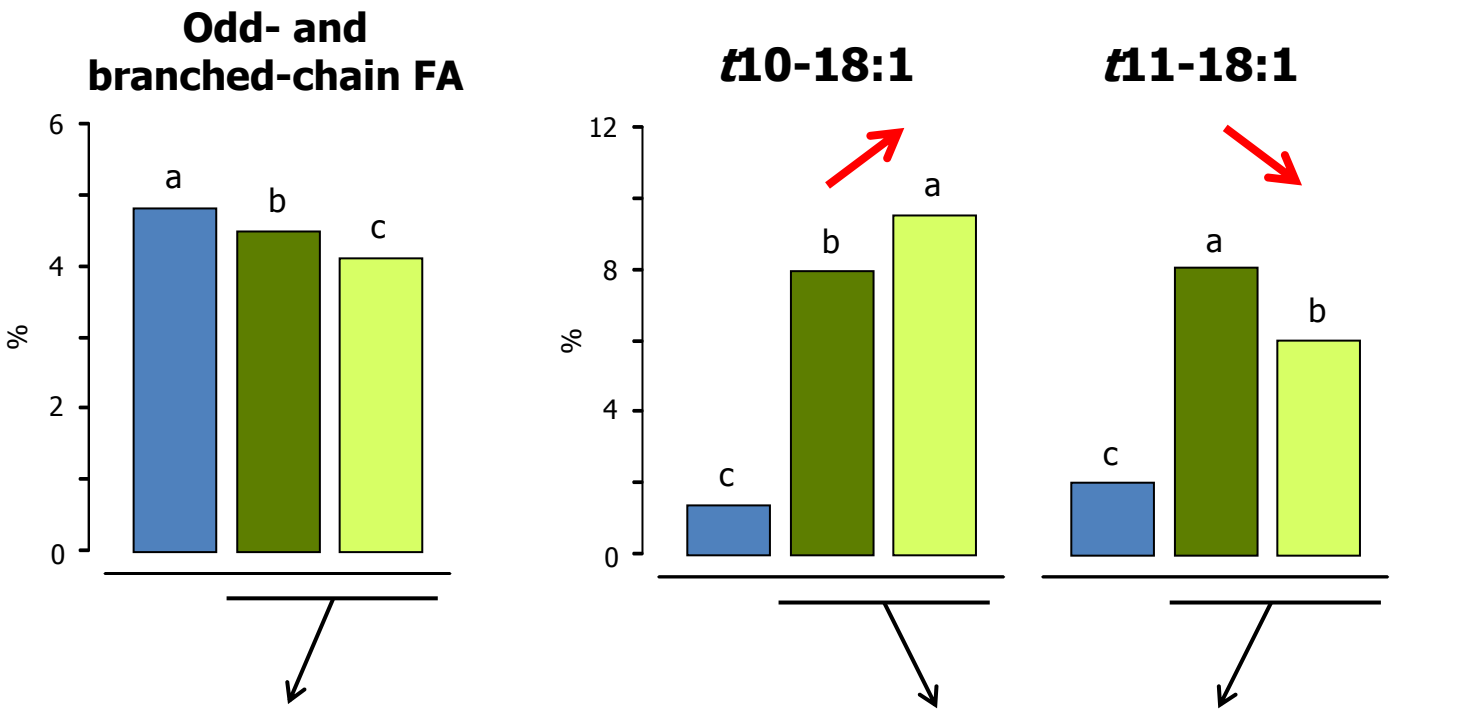
Control values could not be attained

- **Digestibility** coefficient of 18:0 = **48%**
- Low **mammary uptake ?**
- **Other factors** that counteract 18:0 supplementation?

Control FO FOSA

Milk fatty acid profile

Ruminal alterations?



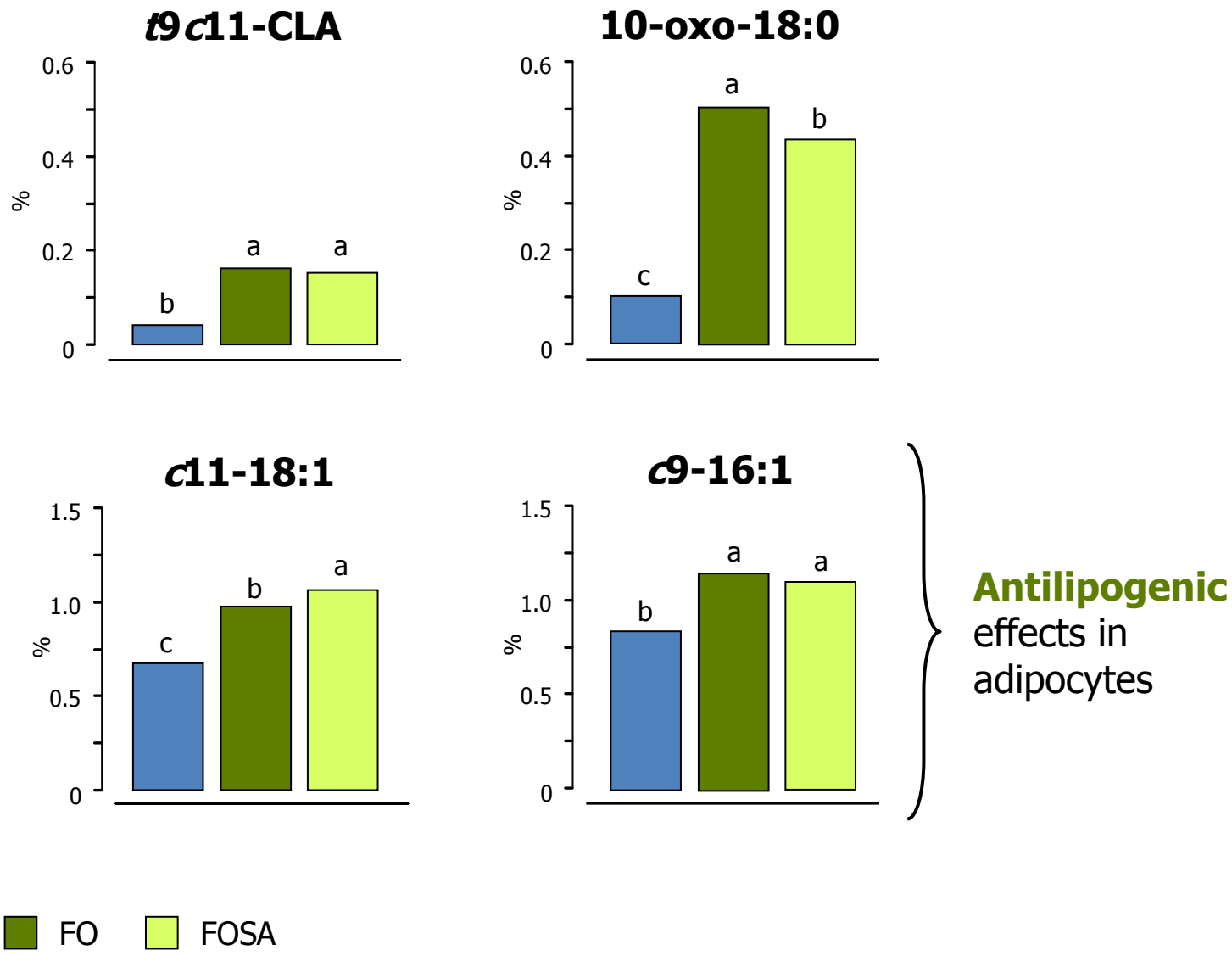
Differences in microbial **diversity** and **activity**?

Shift in **ruminal biohydrogenation** pathways?

MFD?

Control FO FOSA

Candidate milk fat inhibitors



CONCLUSIONS

Diet supplementation with **18:0 does not prove useful to alleviate FO-induced MFD** in dairy ewes. This result cannot be fully accounted for by the low digestibility coefficient of supplemental 18:0 and challenges the theory of a shortage of this FA as a mechanism to explain fish oil-induced MFD in sheep.

It is therefore hypothesised that increases in the concentration of some **candidate milk fat inhibitors** might play a more relevant role in this type of MFD.

THANK YOU VERY MUCH FOR YOUR ATTENTION!