Association between metabolic status and methane production in dairy cows
Milk fat synthesis

Short and Medium-chain (C 4-14), and C16 triglycerides

Long-chain triglycerides (C16, C18)

Rumen

SCFA

de novo milk fat synthesis

Adipose tissue

LCFA

milk fat synthesis from absorbed FA
Correlation: Milk fat constitutes – CH$_4$

Synthesized from SCFA: positive (Ac and But originate in the same pathway as CH$_4$)  
Synthesized from LCFA: negative

Research question

Does the extent of fat mobilization
(increases plasma LCFA and milk LCFA-TG concentration in early lactation)

(a) affect the utilization of acetate (for de novo milk fat synthesis),

(b) and consequently ruminal methane production?
Dairy cows in early lactation

Experimental design

Calving

-4

-4

Far-off

Close-up

Lactation

n=20

Week relative to parturition

4

8

12

16

20

24

28

32

36

40

TiO₂

Respiration Chamber

Feaces

Milk

Blood

Rumen fluid
Dairy cows in early lactation

Plasma NEFA, µM

-4 5 13 42

0 100 200 300 400 500 600 700 800 900 1000

Plasma NEFA

High mobilizing
Low mobilizing

DMI, kg

-4 5 13 42

0 2 4 6 8 10 12 14 16 18

DMI

ECM, kg

5 10 15 20 25 30 35

ECM

Plasma Acetate, mmol/L

-4 5 13 42

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4

Plasma Acetate

High mobilizing
Low mobilizing

week relative to parturition

wrp

Dairy cows in early lactation

Plasma NEFA

High mobilizing
Low mobilizing

DMI

ECM

Plasma Acetate

High mobilizing
Low mobilizing

week relative to parturition

wrp

Dairy cows in early lactation

Plasma NEFA

High mobilizing
Low mobilizing

DMI

ECM

Plasma Acetate

High mobilizing
Low mobilizing

week relative to parturition

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week relative to parturition

wrp

Dairy cows in early lactation

Plasma NEFA

High mobilizing
Low mobilizing

DMI

ECM

Plasma Acetate

High mobilizing
Low mobilizing

week relative to parturition

wrp
Dairy cows in early lactation

Week 6 post partum

![Graph showing Digestibility (%) and Mean Retention Time (h) for high and low mobilizing cows.](Graph.png)
Dairy cows in early lactation

High mobilizing
Low mobilizing

P=0.1
**Dairy cows in early lactation**

**Week 5 post partum**

![Graph 1](image1.png)  
**Equation 1:**  
\[ y = -0.0093x + 36.78 \]  
\[ R^2 = 0.42; P<0.05 \]

![Graph 2](image2.png)  
**Equation 2:**  
\[ y = -0.024x + 105.06 \]  
\[ R^2 = 0.61; P = 0.005 \]
Dairy cows in early lactation

Ruminal Acetate (mmol/L) vs. week relative to parturition:
- Red line: High mobilizing
- Blue line: Low mobilizing

Ruminal Butyrate (mmol/L) vs. week relative to parturition:
- Red line: High mobilizing
- Blue line: Low mobilizing
Dairy cows in early lactation

Fat oxidation (FOX)

FOX (g) = 1.69 V_{O2} (L) – 1.69 V_{CO2 metab.} (L)

Lipoplysis and Fat metabolism of the host clearly associated with ruminal CH$_4$!
Leibniz Institute for Farm Animal Biology (FBN)

Wilhelm-Stahl-Allee 2
18196 Dummerstorf

Contact

PD Dr. Björn Kuhla
Phone: +49 38208 68 695
Fax: +49 38208 68 652
E-Mail: b.kuhla@fbn-dummerstorf.de
Internet: www.fbn-dummerstorf.de