Identification of behavioral patterns associated with acidosis in dairy cows

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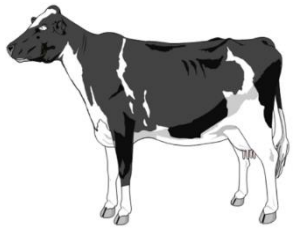
Context

Plaizier et al. (2009)
Abdela (2016)

Acidosis is a metabolic disease



characterized by intermittent falls of ruminal pH to non-physiological levels for several hours per day.

caused by an accumulation of organic acids which is not counterbalanced by a sufficient rumen buffering.

Clinical signs

- Lower and irregular feed intake
- Decreased feed efficiency
- Reduced time spent ruminating
- Lower milk production and milk fat content
- Diarrhoea
- Anorexia

Consequences

- Rumen mucosal damages
- Lameness
- Liver abscesses
- Dehydration
- Toxemia
- Death

Acidosis is a major health and welfare issue

Context

Some **management practices** and **animals** are considered as **risk factors for acidosis**

- Concentrate-rich diets
- Fibre-deficient diet Plaizier et al. (2009)
- Decreased number of concentrate distribution per day Yun and Han (1989)

- High-producing dairy cows
- Early lactation Penner et al. (2007)
- Primiparous cows Abdela (2016)
- Previous experience of acidosis

Beauchemin and Penner (2009)

Even if dairy cows are fed and managed similarly, **individuals can exhibit different degree of the disease** ➡ Individual variability

Behavioral factors :

- Level of feed intake
- Eating rate
- Sorting of feed
- Salivation rate

Behavioral patterns expressed weeks or months before the onset of acidosis, could be used as a risk factor for the disease

Beauchemin and Penner (2009)

Objective and Hypothesis

To compare the **time-budget** of dairy cows that will develop acidosis
and dairy cows that stay healthy during lactation **weeks or months before the onset of acidosis**

Time spent walking

Time spent standing

Time spent lying down

Time spent eating

Time spent ruminating

HYPOTHESIS = Dairy cows that will subsequently develop acidosis, show early distinctive behavioral patterns associated with the disease compared to healthy cows

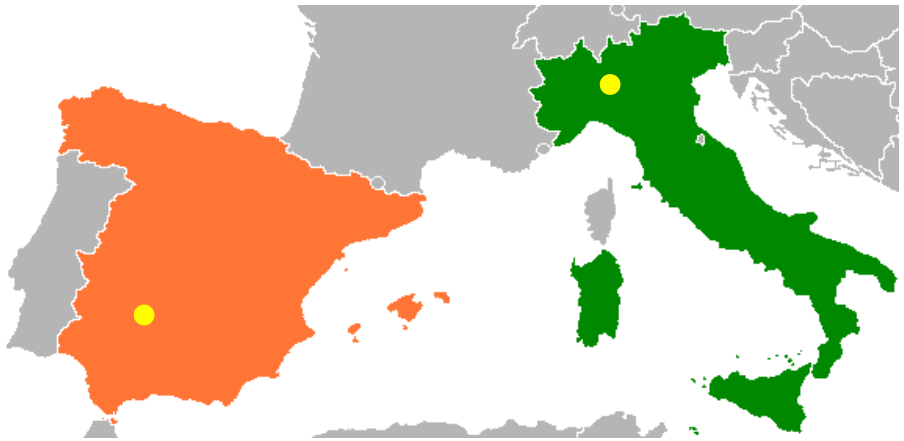
Material and methods

Data acquired from January 2021 to October 2022

Four free stall commercial conventional farms:

2 located in Lombardy, Italy

2 located in Andalusia, Spain



Holstein Fresian dairy cows

Material and methods

Animals were equipped with precision livestock farming (PLF) technologies to monitor physiological and behavioral parameters at the individual level

Accelorometry collars

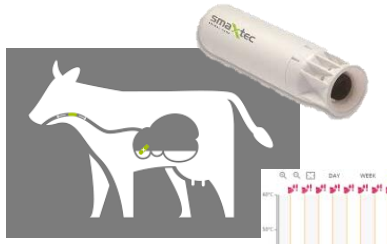
(Ida collars, Connecterra)

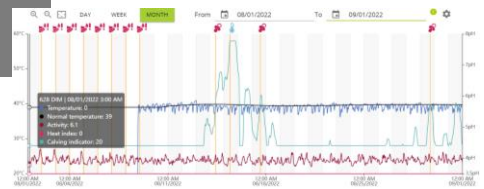
n = 155 and n = 82

n = 95 and n = 90

Rumen boluses

(smaXtec Animal Care GmBH)





n = 17 and n = 12

individual animal activities

individual rumen pH

Material and methods

Dataset : Individual data related to

Production

- Lactation rank
- Calving date
- Days in milk
- Daily milk production

Activities

Daily time spent

- Standing
- Walking
- Lying
- Eating
- Ruminating

Health

Acidosis cases
(veterinary records and pH data)

Material and methods

Group constitution :

ACIDOSIS GROUP
(n = 10)
Cows suffering from one acidosis during lactation

CONTROL GROUP
(n = 10)
Cows that stay healthy during the entire lactation

Balanced for parity and lactation stage
Time window : from calving to 15d prior acidosis

Statistical analyses :

- Modelling of the individual evolution of the time per day spent doing each behavior relative to the day before acidosis
- Group effect (Acidosis vs. Control) on the intercept and the slope of the regression curve analysed by ANOVA

Results

Effect of the group on the intercept of the regression curve

Time dedicated to each behavior in cows that will subsequently develop acidosis and cows that stay healthy during the entire lactation 85 days before acidosis (h/d)

	Group		
Behavior	Acidosis	Control	P-value
Standing	9.97	10.94	< 0.001
Lying	10.55	10.22	< 0.001
Walking	3.50	2.83	< 0.001
Ruminating	7.57	7.25	< 0.001
Eating	3.55	3.41	< 0.001

Cows from the Acidosis group spent less time standing and more time lying, walking, and eating 85 days before the onset of acidosis compared to Control cows

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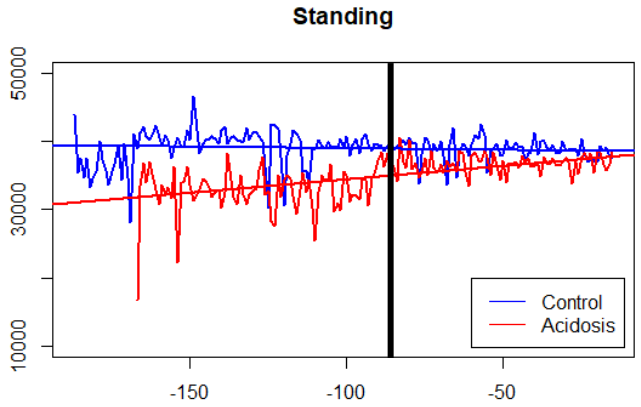

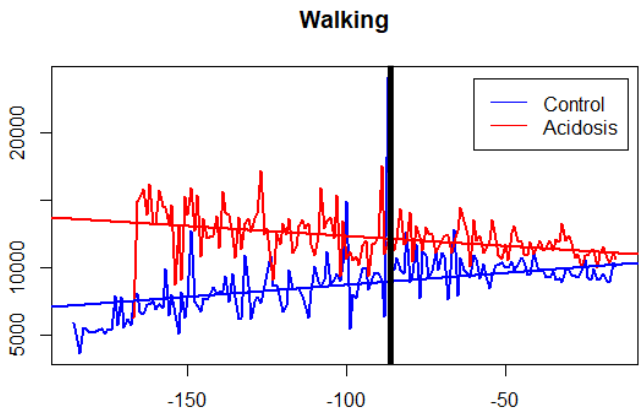

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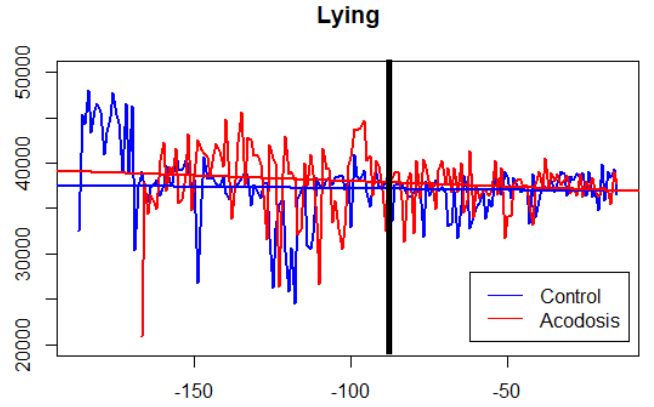

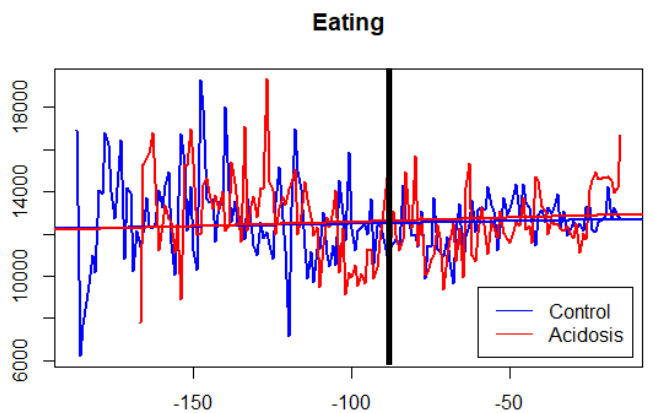

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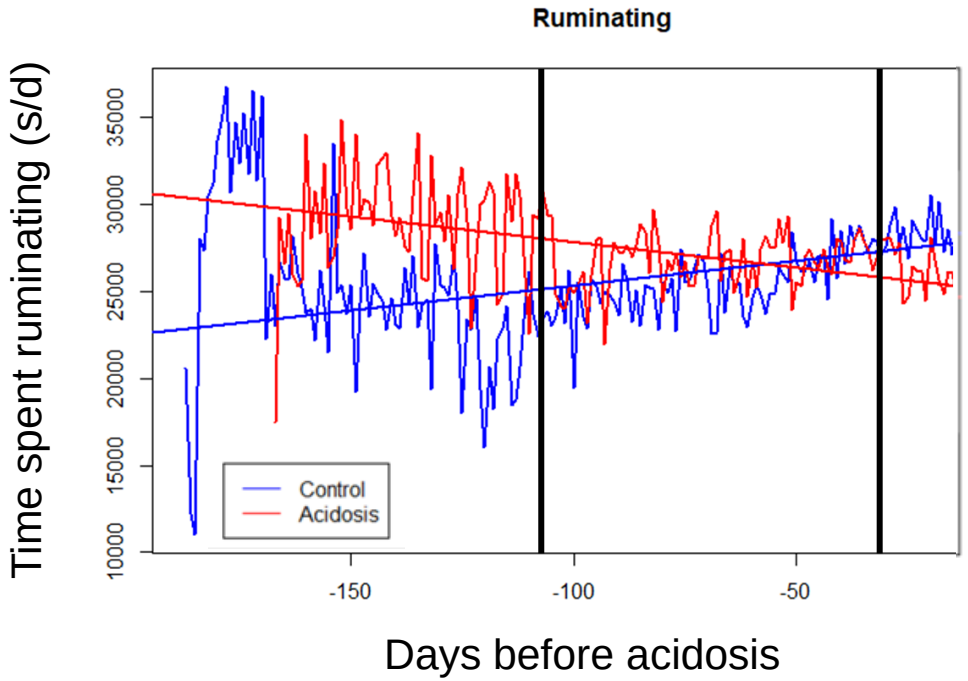
Cows from the Acidosis group spent more time ruminating 85 days before the onset of acidosis compared to Control cows

Results

Effect of the group on the intercept of the regression curve



Cows from the Acidosis group spent :

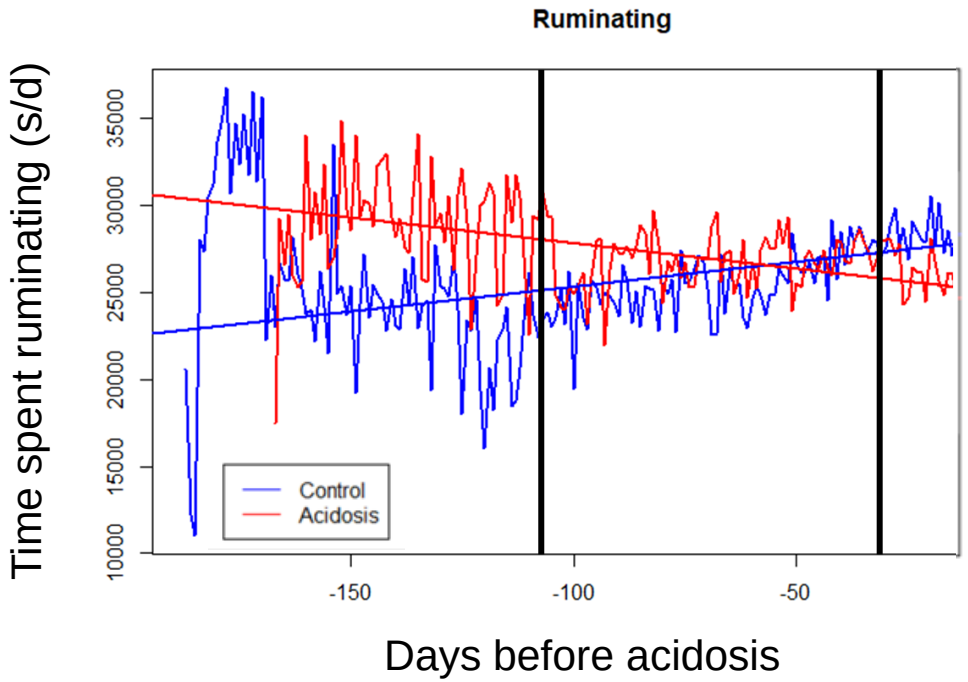
- more time ruminating (7.73 vs. 6.86 h/d) 115 d before the onset of acidosis
- less time ruminating (7.33 vs 7.81 h/d) 35 d before the onset of acidosis

Compared to the cows from the Control group

The time-budget of cows from the Acidosis and Control groups differed months before the onset of acidosis

Results

Effect of the group on the slope of the regression curve



The trend in the time spent lying, eating and ruminating over time prior acidosis differed between groups

→ Lower slope coefficients for the cows from the Acidosis group

→ The evolution of the time-budget prior acidosis of cows from the Acidosis and Control groups differed

Conclusions and perspectives

- Dairy cows that will subsequently suffer from acidosis during lactation might expressed different time-budget already few months prior to the onset of acidosis

  → Less time standing → More time lying, walking, and eating

  → More time and then less time ruminating

  → Difference in the evolution of the time-budget over time before acidosis

↳ The behavioral patterns/time-budget profiles observed weeks or months before acidosis could be considered as risk factor for acidosis

- Expanding the sample size may allow to explore better the potentiality of specific behavioural patterns in the time-budget as risks factors of acidosis.

Thank you
for your attention!

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