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# Behavioral And Productive Parameters Of Lactating Dairy Cows As Indicators Of The Early Detection Of Metabolic And Digestive Diseases

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# Behavioral and productive parameters of lactating dairy cows as indicators of the early detection of metabolic and digestive diseases.

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## HYPOTHESES

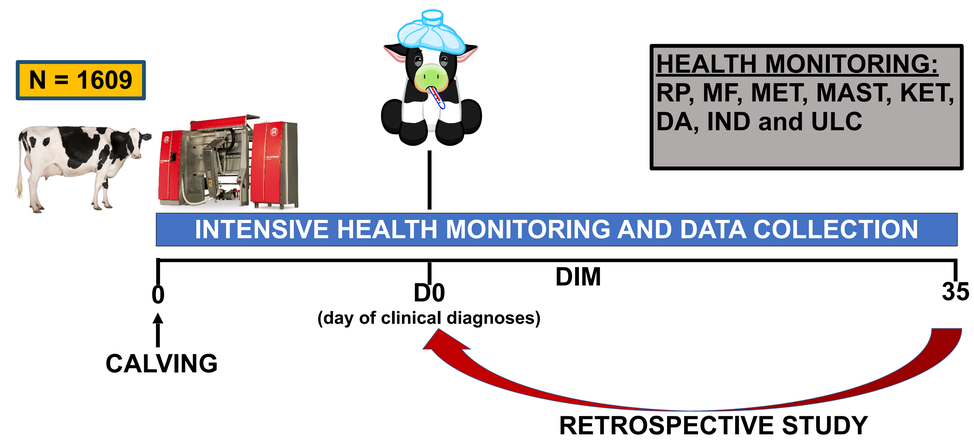
- We hypothesized that a cow diagnosed with a metabolic or digestive disorder up to 35 DIM has significantly deviated from its herd normal behavioral and/or productive values, early enough from the diagnoses day, to justify an intervention in order to preserve animal welfare.

## OBJECTIVES

- Compare lactating dairy cows that developed metabolic and digestive disorders (MDD; displaced abomasum, ketosis, indigestion and abomasal ulcers) versus cows that did not develop health disorders up to 35 DIM based on:
  - Productive parameters: milk yield, fat percentage, protein percentage, fat to protein ratio.
  - Behavior parameters: rumination, activity, milking times.

## MATERIALS AND METHODS

**Figure 1:** schematic representation of study procedure.

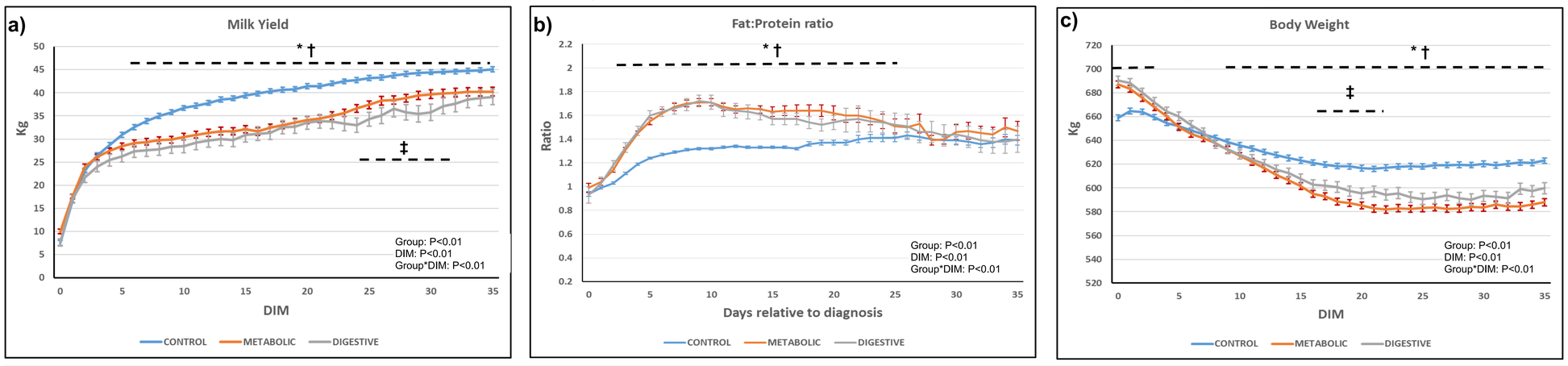



- Records were retrieved from 1,609 completed lactations from cows at a commercial farm in central NY collected by an automatic milking system (Lely Astronaut) software (Lely T4C) from January 2014 to May 2016. Health event data were collected from DairyComp 305.
- Data collected up to 35 DIM by the milking unit of the AMS and neck-mounted electronic tags for automated rumination and activity monitoring was summarized daily and included: milk yield (MY), milk fat and protein percentage, milk fat:protein ratio (F:P ratio), body weight (BW), rumination time (RT), physical activity (ACT), and number of milking per day (NM).
- Cows that did not develop any metabolic or health disorder up to 35 DIM were grouped into the Healthy Control (HC) group; while cows that did develop, were grouped into the MDD group.
- Data was analyzed by ANOVA with repeated measurements using PROC MIXED of SAS.
- Behavioral parameters collected by the AMS (explanatory variables) were evaluated from 5 d before to 5 d after diagnosis of MDD (Day of diagnosis = D0). For cows in the healthy group, average DIM at clinical diagnoses was assumed as D0. Instead, productive parameters were evaluated in a daily basis because of the effect of time on it, that makes MDD hard to compare within they in a fixed moment of time.
- For cows in the HC group (N=1347), average DIM at MDD diagnosis was considered as D0.

## RESULTS

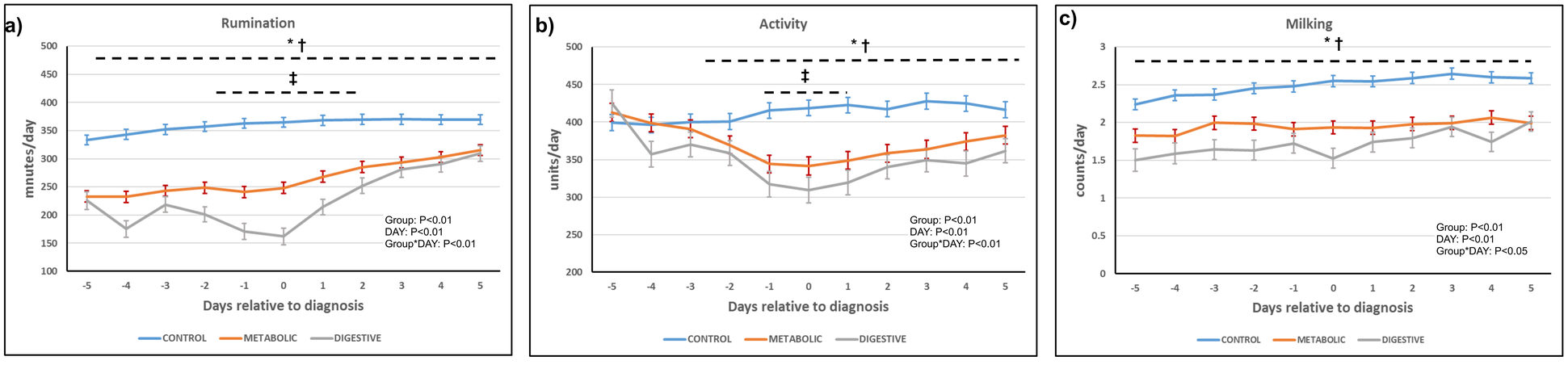
### PRODUCTIVE

**Figure 2:** **a)** milk yield; **b)** fat to protein ratio; **c)** body weight loss patterns, in a daily basis, for the healthy control group (n=1347) and cows that developed metabolic (n=200) and digestive (n=62) disorders up to 35 DIM. Within a day, pairwise comparisons that were statistically different ($P \leq 0.05$) based on LSD are represented as follows: *control vs. Metabolic; †control vs. Digestive; ‡Digestive vs. Metabolic.




### BEHAVIOR

**Figure 3:** **a)** daily rumination time; **b)** daily activity; **c)** daily milking times, patterns from 5 days previous to 5 days after clinical diagnosis, for healthy control (n=1347) vs cows that developed metabolic (n=200) and digestive (n=62) diseases. Within a day, pairwise comparisons that were statistically different ($P \leq 0.05$) based on LSD are represented as follows: *control vs. Metabolic; †control vs. Digestive; ‡Digestive vs. Metabolic.




## SUMMARY

- Cows that did not develop any health disorder up to 35 DIM produced between 179 kg (13.2%) to 247 kg (18.2%) more of milk than cows that developed metabolic or digestive diseases respectively.
- Cows that developed metabolic or digestive diseases have a significantly (P<0.01) greater body weight at calving and a bigger relative body weight loss (13.5% vs 6.15%) than healthy control group. It was correlated with a higher F:P ratio during first 25 DIM, due to a bigger remobilization of energy from adipose tissue.
- 5 days previous to clinical diagnosis, sick cows daily rumination pattern had significantly (P<0.01) deviated from the healthy control pattern (~30%) . Differences within sick groups can be observed 3 days before diagnosis.
- Daily activity time found significant differences among patterns within groups as cows get closer to clinical diagnosis.

## ACKNOWLEDGMENTS

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