

Cow behavior predicts and monitors calving diseases.

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INTRODUCTION

Calving diseases are a major problem in most dairy herds, negatively influencing cow welfare and dairy economics. Rumination behavior proved to be a good predictor of some post-calving diseases.

New generation of monitoring sensors are now able to record and analyze the behavior of each cow in a more detailed way.

OBJECTIVE

The objective of this study was to characterize the cow's behavior and health status during the transition period in order to more precisely define the normal behavior and any deviations with health implications.

MATERIALS AND METHODS

- ▶ We analyzed the behavior of 1553 cows calving on 8 farms in Israel, between February 2019 and November 2019.
- ▶ Farms were similar in their feeding management (TMR) and cow housing (open, covered, dry compost barns).
- ▶ Calving events were recorded by the farmers and in addition, all cows were checked by a trained veterinarian at 6 to 12 days after calving.

- ▶ The records of cows' behavior (major activity/minute) were accumulated and expressed as a total of minutes per day.

See **Figure 1** below.

Early identification and treatment of cows developing post-calving or periparturient disorders should improve cow welfare and farm profitability. Identification and management of such cows is challenging for the veterinary practitioner but analyzing herd cow's behavior during the transition period, might provide insight into deficiencies and serve as a tool to monitor improvements.



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RESULTS

Last 10 days before calving (**Fig. 2**) Cows with milk fever or retained placenta had a significant reduction ($P < 0.01$) in the time spent ruminating days before the events happened. A significant reduction ($P < 0.01$) in eating time and high activity time was observed in cows suffering later from stillbirth or ketosis, these cows had also a significant increase ($P < 0.01$) in resting time in the last 10 days before calving.

First 10 days after calving: Cows with retained placenta, metritis or endometritis, ketosis, or with left displaced abomasum had a significant ($P < 0.001$) decrease in rumination, eating, and high activity time. These cows had also a significant ($P < 0.001$), substantial (~25%) increase in the time spent resting in the first 10 days after calving.

The algorithm alerts results are shown in **Fig. 4**.

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FIGURE 1. Statistical Analysis.

Dependent variables: Daily minutes ruminating, eating, resting, or expressing high activity in the last 10 days before calving or 10 days after calving.

Independent variables: Twin calving, dystocia, retained placenta, metritis or endometritis, ketosis, displaced abomasum, lactation number, days in milk.

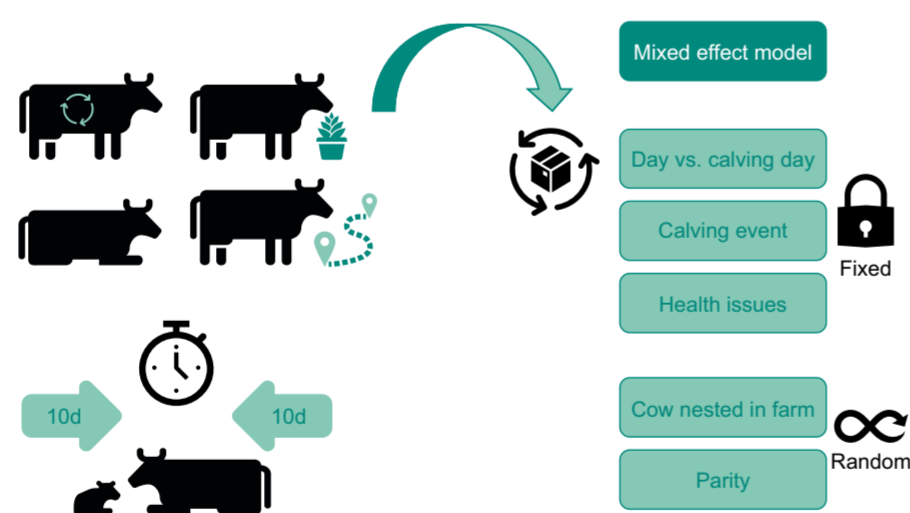


FIGURE 3. Significant fixed effects estimates (95% confidence interval), related to calving diseases on cow behavior (daily minutes) in the last 10 days after calving (*post partum*).

Parameter (cows)	Rumination	Eating	Rest	High Activity
Healthy (10 days p.p.)	536.7 (496.5,576.9)	204.2 (183.2,225.2)	339.9 (290.7,389.1)	30.4 (24.0,36.8)
Twins (137)	-17.4 (-8.2,-26.6)	-10.5 (-6.8,-14.3)	65.1 (44.4,85.9)	-4.5 (-3.2,-5.8)
Stillbirth (147)			45.5 (26.1,64.8)	-1.9 (-0.7,-3.0)
Milk fever (32)	-35.2 (-18.3,-52.1)	-13.6 (-6.7,-20.5)	80.9 (39.6,122.4)	-3.9 (-1.6,-6.3)
Retained Placenta (154)	-44 (-35.5,-52.5)	-14.8 (-11.3,-18.3)	54.1 (34.7,73.7)	-8.4 (-7.2,-9.6)
Metritis or endometritis (591)	-36.6 (-31.4,-41.7)	-18.8 (-16.7,-21.0)	72.5 (60.5,84.5)	-6.1 (-5.4,-8)
Ketosis (264)	-18.6 (-11.7,-25.5)	-15.9 (-13.1,-18.7)	36.1 (19.8,52.4)	-4.3 (-3.4,-5.3)
LDA (10)	-180 (-152.1,-209.2)	-48.7 (-36.9,-60.6)	283.4 (207.8,360.1)	-3.9 (-0.1,-7.8)

FIGURE 2. Significant fixed effects estimates (95% confidence interval), related to calving diseases on cow behavior (daily minutes) in the last 10 days before calving (*ante partum*).

Parameter	Rumination	Eating	Rest	High Activity
Healthy (10 days a.p.)	488.9 (463.7,516.1)	294.1 (269.5,318.7)	384.2 (346.0,422.4)	28.5 (25.5,31.5)
Twins				-4.7 (-2.2,-7.1)
Stillbirth		-13.2 (-3.7m,-12.7)	74.3 (57.1,91.5)	-2.9 (-5.3,-3.2)
Milk fever	-29.9 (-7.4,-52.6)			
Retained Placenta	-16.2 (-4.9,-27.4)			-3.9 (-1.6,-7.3)
Ketosis		-22.7 (-15.0,-30.4)	15 (0.6,29.6)	-3.9 (-1.9,-5.9)

FIGURE 4. Algorithm alerts and 305 days milk (Vet diagnosis as gold standard)

