

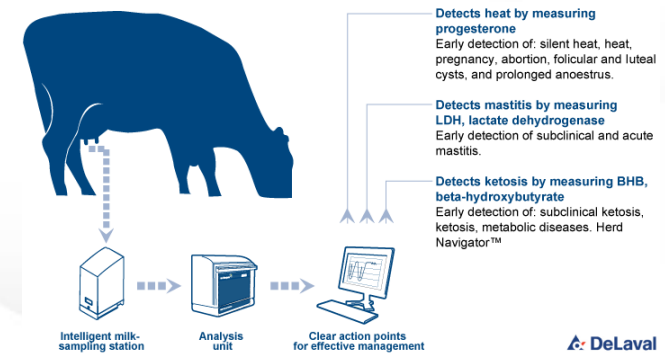
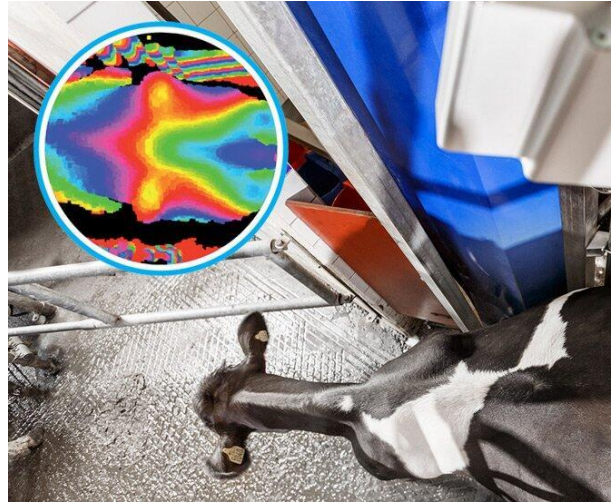


**Using sensor data for animal health
and welfare - ICAR IDF Workshop**

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May 25th 2023

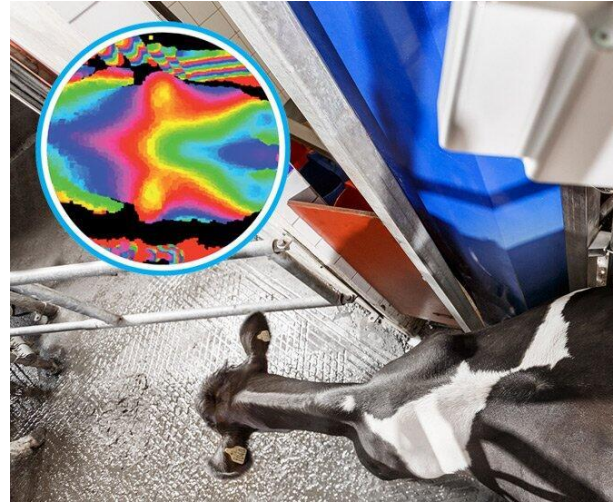
Sensor Data Advantages



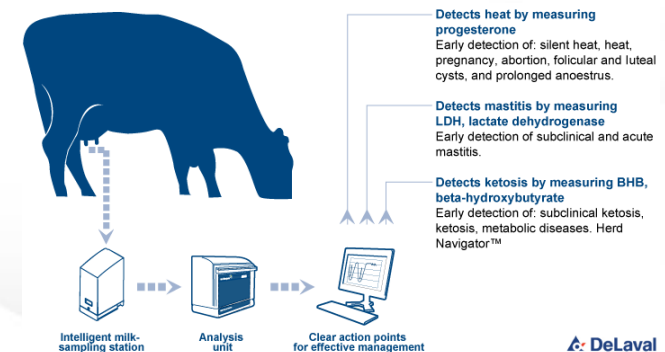
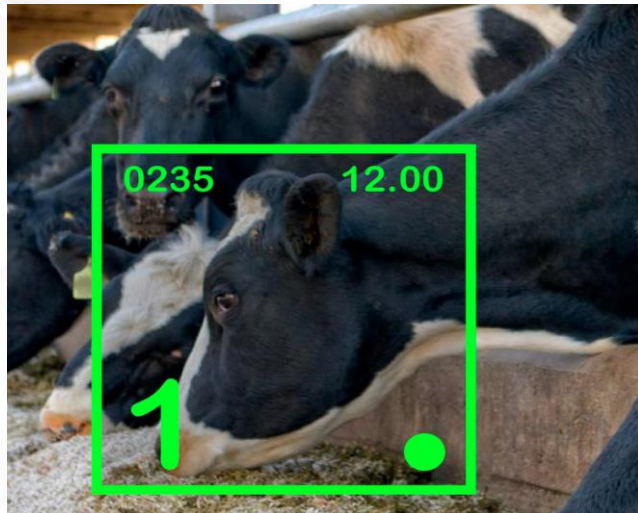
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Sensor Data Advantages



- Convenient
- Cost effective
- Already use in several commercial herds
- Measure a large number of animals



DeLaval



Sensor Data and Herd Management

HEALTH

- Identify sick cows 1-3 days sooner than a physical evaluation
- Minimize time spent watching for sick cows
- Reduce cow stress by lowering lock-up times

NUTRITION

- Monitor response to nutrition and ration changes, within and across groups
- Identify concerns regarding mixing and feed delivery

BREEDING

- Counts down to ovulation for optimum breeding time
- Easy to use breeding lists
- Reports for cystic, anestrus and suspect abortion



A close-up, artistic photograph of a horse's eye, showing the eyelashes and the iris. The lighting is warm and golden, creating a bokeh effect in the background. The text is overlaid on the right side of the image.

**Can we use
sensor data for
genetic
evaluations?**

The SEMEX logo is a maroon diamond shape containing a white maple leaf icon above the word "SEMEX" in white, uppercase letters with a registered trademark symbol.

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Sensor Data and Genetic Evolutions

- Novel sensor technologies in livestock cost-effective system to collect data
- Genomic analyses are developing rapidly and are continuously improving in accuracy
- The application of genomic selection reduction of costs for farmers:
 - Decreased usage of reproductive hormones
 - Improved animal welfare due to increased resistance to diseases
 - Reduced cost of fertility management through improved estrus
- Socio-economic advantages of less intensive management practices enabled through improved genetics





Fertility: expressed through traits measuring conception success following artificial insemination and intervals

- Influenced by multiple factors
- On-farm management technologies are promising sources of data for the collection of novel phenotypes
- More closely describing the elements of successful reproduction (i.e. endocrine-derived phenotypes, animal activity)
- Interval calving to first high activity/
first heat identified: h^2 0.16-0.27



To develop and implement a genomic selection program for environmentally robust and fertile dairy cows based on the use of automated precision sensor technologies



Dr. Christine Full (Professor, Canada Research Chair in Livestock Genomics)



Dr. Diercles Cardoso (PDF)



Dr. Christina Rochus (PDF)



Camila Rosenberg (MSc)

UNIVERSITY
of GUELPH



What did we learn?

- Activity related indexes can be used to define and evaluate heritable estrous-related fertility traits in dairy cattle
- Heritability of activity-derived traits (0.07 to 0.16)
- Genetic correlation with “classic” fertility traits suggest their suitability as indicator traits that could contribute to the improvement of reproductive performance



Considerations

- Very important to find the best definition of estrus
 - Management vs. genetic
 - Activity change index had highest overlap with breeding records
- Need to establish best editing procedure
 - Animals needs to have the tag on for enough time
- Proportion of AI not linked with an estrus (7%)
- How does timed AI affect estrus related traits?





Health

- Difficulties in obtaining reliable health data and management might contribute to low heritability estimates
- Reduced rumination during the transition period can be used to indicate the health status



Sensor data and health status

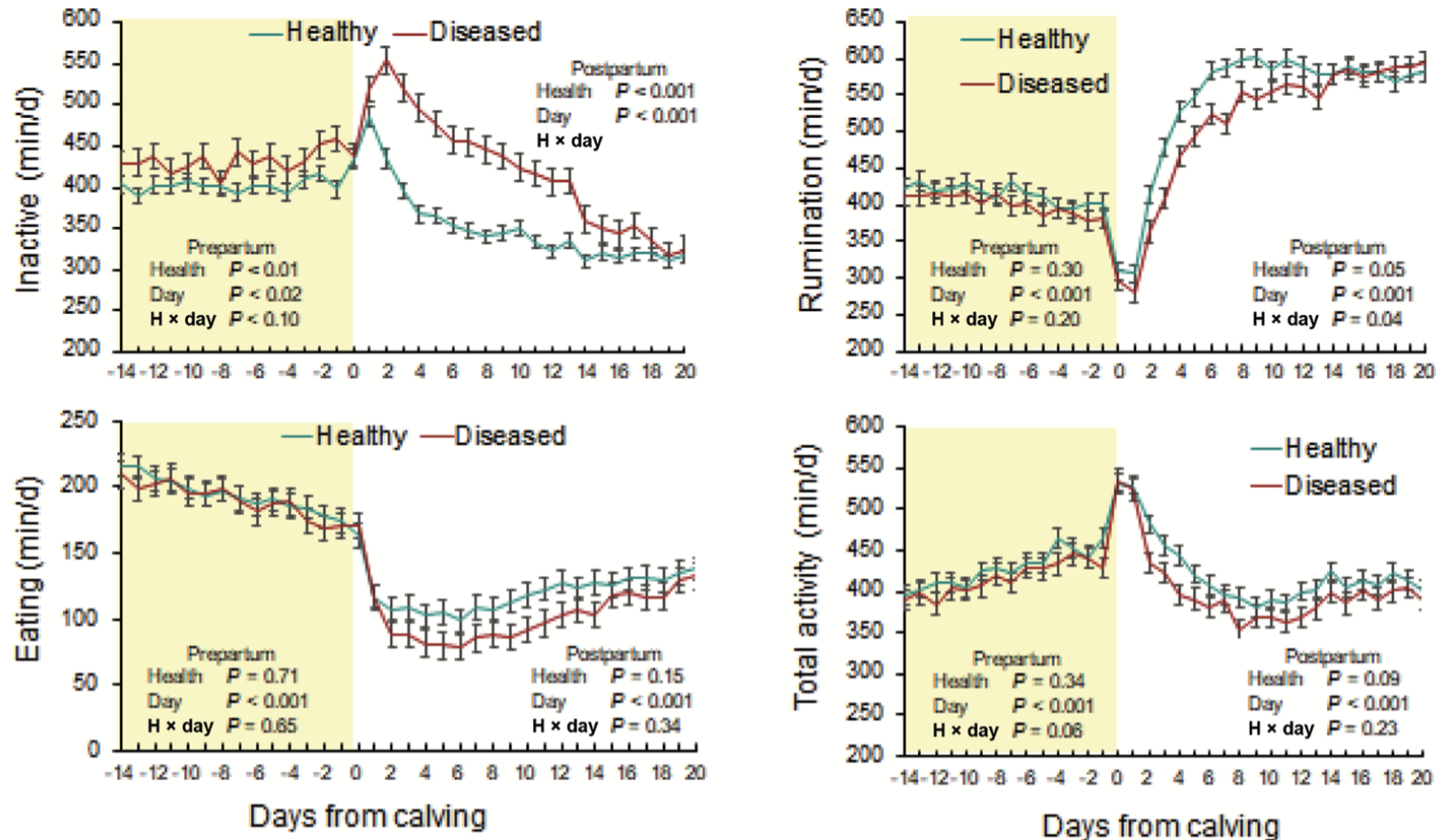


Figure. Least squares means (\pm SEM) of inactive time, eating time, rumination time, and total activity during 14 d before calving and 20 d postcalving for healthy ($n = 92$) and diseased ($n = 68$) dairy cows. Diseased cows included any case of defined metritis, digestive disorders, ketosis, hypocalcemia, calving problems, mastitis, or lameness during the first 60 DIM.

(Stevenson et al., 2020)



Genetic Parameters – Rumination

- Ruminations has moderate heritability
 - 0.14 ± 0.27 to 0.44 ± 0.34 Byskov et al., 2017
 - 0.41 ± 0.15 Lopes et al., 2022
 - 0.31 ± 0.05 to 0.36 ± 0.05 Moretti et al., 2018
- Definition that best correlated with the health events



Conclusions

- Sensor monitors are useful tools helping on better monitoring the animals and contributing to enhance health and welfare
- Sensor data have a great potential to be used also for genomic evaluations
- Very important to implement correct editing procedures and to assess the best trait definition



