

COW ACTIVITY MONITORS

John McBride & Matt Brady, DVM

VES Environmental Solutions

Types of monitors



Types of monitors



Leg Monitors

- Attach to lower leg
- Measure lying time and activity
 - Heat detection
 - Possible lameness or sick cow detection
- Possible to measure time at feedline
- Fitting to cow is difficult
 - Incorrect fit will give poor quality information and detection
- Can be somewhat dangerous to attach
 - Really should be put in squeeze chute
- Need to be cut off of cow to be removed
- Can cause comfort issues



Neck collars

- Hang around neck
- Multiple types of measurements
 - Activity
 - Rumination
 - using microphone on sensor
 - Respiration
 - Using microphone
 - Lying time
 - Not all types of collars measure all these
- Easy to tell if a cow lost their monitor
- Easily reused



Fit is important with leg & neck monitors. They need to be able to accommodate for changes in body condition through lactation, but can't be too loose. Too loose a fit will give variation in data as shown below.



Proper Placement



Poor Placement

Ear tags

- Easily applied
 - Put in like regular ear tag
- Position in ear is important, but once in place does not need to be adjusted
- Can be removed and reused
- Some issue with battery life currently, but can change battery
 - Increased labor and possible missed animals if battery dies
- Measurements
 - Activity
 - Lying time
 - Rumination
 - Ear temperature



Rumen boluses

- Put in cow with balling gun
- Once in cow, cannot really be retrieved or reused easily (some companies have advocated retrieving from packing plants)
- Measurements
 - Rumen Temperature
 - Only proven long term measurement, provided bolus stays in rumen
 - pH
 - Does degrade over a few months
 - Need to calibrate to be accurate, which requires retrieving bolus
 - Some do heat detection
- Working on activity function
- Possible future developments
 - Calving detection by temperature drop

Facial recognition

- New type of monitoring
- Closed circuit video with program learns animals based on facial recognition
- Measurements
 - Body condition score
 - Locomotion score
 - Activity
 - Feed sorting
 - Identification of dominant animals
- Possible to do all that other sensors can do and more
- Ability to work in grazing herds?
- Not currently commercially available

Monitor Development

- Animal welfare is #1 concern
 - Device must not harm animal
 - Eg, should break away if snagged
 - At same time, they must be tough enough to withstand a 1600 lb cow's daily activities
- Originally, only neck and leg monitors used
 - Battery limitations and inefficient electronics necessitated a large battery
 - Only feasible on neck or leg
- As battery technology has advanced, so has electronic design with more efficient transmission protocols, enabling the development and deployment of a smaller device
- Most monitors store data for a given period of time, then transmit to receiver for download

What to know before using

- Cost
- Potential ROI
- Training for using system
 - Absolutely vital for success
- System support
- Compatible with current herd management software?
- How will this all be implemented and interface with computer?
- Will you use?
- How far can tags transmit?
 - Sources of potential interference on transmission?
 - Will multiple readers be needed?
 - Grazing herds?

Why use cow monitors?

PROS:

- You can't be there all the time!
 - Can look at cow information remotely
- Monitoring data for the entire herd that would be difficult or labor intensive for humans
 - Rumination
 - Temperature
 - Respiratory rate
- Information is stored for retrospective analysis
- Different allocation of labor
 - Monitor alerts and cow information on computer, smart phone, tablet
- Removes some aspect of human error
 - Reading tail paint for heats
 - Picking out sick or lame cows

Why use activity monitors?

PROS:

- Early detection of transition diseases²
 - 4x higher mortality during first 30 DIM compared to later lactation
 - Early research shows significant associations between rumination and/or activity during the transition period and transition cow disorders
 - Further research is still needed on how to use this information effectively on farm
 - Shows something not right with cow, still need to diagnose correctly
- Heat Detection and timing of AI¹
 - Can reduce amount of synch hormones used
 - Can reduce labor needed for heat detection (tail paint)
 - Ideal insemination time for conventional semen from first mount is 4-12 hours for mature cows and 4-16 hours for heifers
 - Knowing time when increased activity started can help ensure insemination within these windows
 - Ideal insemination time for sexed semen is 20-28 hours from first mount

Why use activity monitors?

PROS:

- Ruminations
 - Can look at herd level rumination data
 - Analyze mix consistency
 - Look for changes in rumination after a feed change
 - As stated previously, can help with detection of individual sick cows
 - When used properly, can see how efficacious treatment has been (how quickly rumination recovers)
- Respiration
 - Respiration rate is highly correlated with heat stress, and may be a better indication than rumen temperature
 - Monitoring whole herd respiration can indicate how well heat abatement strategies are working
 - May be able to point to locations that need improvement in heat abatement
 - Future interface with cooling systems?

Are there negatives to activity monitors?

CONS:

- Computers are not foolproof
 - Still need monitoring of system to ensure working correctly
 - Alerts for sick or lame cows still need to be verified by human
 - Most alerts are based on a cow's baseline behavior, tailored to that individual
 - Different skillset needed than traditionally
 - Need to be able to diagnose system and hardware issues (failing sensors, lost sensors)
- Monitors need to be applied correctly or the data may not be correct
- Monitors can be lost
- Upfront expense
 - A dairy that has great heat detection and reproduction, great sick cow monitoring, and an attentive staff may not see a return from activity monitors

Just lactating animals?

- Recommend that all adult animals and breeding age heifers have activity monitors
- Monitoring in transition period can help with disease detection post calving
- Prediction of calving
 - Reliable drops in rumination 6 hrs prior to calving
- Monitoring heat stress in dry animals is just as important as in lactating animals
- Dry animals can sometimes be “forgotten”
 - Easy to check up on animals that may be on another site

Possible future developments

- Machine Learning
 - Evaluation of quality of life
 - Comfort and stress correlation with monitored parameters
 - Would need human intervention to aid in learned and confirm machine's evaluation of animals
 - Earlier and accurate detection of disease
 - Identify before intense interventions (antibiotics) are needed
 - Identification of genomic traits in animals with genomic testing done that correlate to positive performance on farm
 - Allow to tailor herd to market

Possible future developments

- Interface with other on-farm systems
 - Possible ability to use cow data to drive ventilation system
 - If cows are not in heat stress, can back off on aggressiveness, saving \$
 - If cows are in heat stress even if environmental temperature says they shouldn't be, can increase ventilation rate
- Using ventilation controls throughout barn as access points for activity monitor data uploads
- New wireless VFD's can be used as transmitters and receivers for wireless monitors to increase accuracy with those companies willing to share technology.
- Not just animal monitoring but animal environment monitoring and having the environment respond and change depending on the animal requirements.

VES ENVIRONMENTAL SYSTEMS
MONITOR AND CONTROL
INTERNAL AIR QUALITY
FOR **OPTIMAL ENVIRONMENTS.**



WWW.VESENVIRO.COM
Chippewa Falls, WI, USA
715.720.0800 | 1.888.622.2999

Say Yes to **VES.**

References

1. <https://www.extension.umn.edu/agriculture/dairy/reproduction-and-genetics/timing-of-ai/index.html>
2. <https://www.extension.umn.edu/agriculture/dairy/health-and-comfort/cow-sensor-technologies/index.html>