Afternoon Session B

Rumination & Activity Monitoring

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Sponsored by:
Rumination and Activity Monitors
Products and evidence

Alex Crosbie
The market

- Multiple technologies are marketed that provide cow-level electronic monitoring of dairy cattle.
- Manufacturers claim the ability to detect health disorders before they are clinically apparent or manifest as a production decline.
- Systems are expensive and lack validating research in pasture-based herds.
- Producers require sound scientific evidence to make informed choices on investing in these technologies.
What is available?

- Tags, collars and pedometers that collect information at a cow level on:
  - Temperature
  - Activity (walking, lying behaviour, mounting and standing)
  - Rumination
- Claim to provide:
  - Heat detection (activity devices)
  - Disease detection (rumination, activity and temperature devices)
  - Feeding activity (activity devices, and activity and temperature devices)
### Currently available devices

<table>
<thead>
<tr>
<th>Product</th>
<th>Manufacturer</th>
<th>Type</th>
<th>Activity</th>
<th>Heat Detection</th>
<th>Rumination</th>
<th>Temp</th>
<th>Calving</th>
<th>Feeding</th>
<th>PD</th>
<th>Device Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heatime HR-LD</td>
<td>SCR (Allflex)</td>
<td>Collar</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>Accelerometer, Microphone</td>
</tr>
<tr>
<td>CowManager</td>
<td>Agis</td>
<td>Ear Tag</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>Accelerometer</td>
</tr>
<tr>
<td>QWES-HR</td>
<td>Lely</td>
<td>Collar</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>Accelerometer, Microphone</td>
</tr>
<tr>
<td>CowScout S</td>
<td>GEA</td>
<td>Collar</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>Accelerometer</td>
</tr>
<tr>
<td>Cow Navigator/ALP RO</td>
<td>Delaval</td>
<td>Collar/Milk monitoring</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>Accelerometer</td>
</tr>
<tr>
<td>Moo Monitor</td>
<td>Dairymaster</td>
<td>Collar</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>Accelerometer</td>
</tr>
<tr>
<td>Rescounter III</td>
<td>GEA</td>
<td>Collar/Leg band</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>Accelerometer</td>
</tr>
<tr>
<td>Heatseeker II</td>
<td>Boumatic</td>
<td>Collar/Leg band</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>Accelerometer</td>
</tr>
</tbody>
</table>
How do they work?

Sensor
- Accelerometer based
- Microphone based

Data collection point
- Transmitted at set frequency
- Collected when cow passes an RFID scanner

Algorithm
- Cached data analysed by software
- Algorithm determines if cow sick, on heat, etc.
## Current research - validation

<table>
<thead>
<tr>
<th>Study</th>
<th>Device</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>J P Bikker and others, 'Technical Note: Evaluation of an Ear-Attached Movement Sensor to Record Cow Feeding Behavior and Activity.', Journal of Dairy Science, 97.5 (2014), 2974–79 <a href="http://dx.doi.org/10.3168/jds.2013-7560">http://dx.doi.org/10.3168/jds.2013-7560</a>.</td>
<td>CowManager Sensoor</td>
<td>Concluded that the device was accurate at measuring rumination and activity in freestall cattle, stated that further research necessary into pasture-applications.</td>
</tr>
<tr>
<td>M F Elischer and others, 'Validating the Accuracy of Activity and Rumination Monitor Data from Dairy Cows Housed in a Pasture-Based Automatic Milking System.', Journal of Dairy Science, 96.10 (2013), 6412–22<a href="http://dx.doi.org/10.3168/jds.2013-6790">http://dx.doi.org/10.3168/jds.2013-6790</a>.</td>
<td>IceQube Lely Qwes-HR (SCR HR-Tag)</td>
<td>Concluded that a combination of two rumination and activity monitors was an accurate reflection of activity in a pasture-based AMS, but that further research was needed into rumination monitors on pasture.</td>
</tr>
</tbody>
</table>
## Current research - validation

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<th>Research</th>
<th>Device</th>
<th>Conclusion</th>
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</thead>
<tbody>
<tr>
<td>O Burfeind and others, 'Evaluation of a System for Monitoring Rummation in Heifers and Calves.', Journal of Dairy Science, 94.1 (2011), 426–30 <a href="http://dx.doi.org/10.3168/jds.2010-3239">http://dx.doi.org/10.3168/jds.2010-3239</a>.</td>
<td>SCR-HI Tag</td>
<td>Concluded that Hi-Tag system is an accurate tool for monitoring rumination behavior in Holstein Friesian heifers from the age of 9 months</td>
</tr>
<tr>
<td>K Schirmann and others, 'Technical Note: Validation of a System for Monitoring Rummation in Dairy Cows.', Journal of Dairy Science, 92.12 (2009), 6052–55 <a href="http://dx.doi.org/10.3168/jds.2009-2361">http://dx.doi.org/10.3168/jds.2009-2361</a>.</td>
<td>SCR Hi-Tag</td>
<td>Confirmed that rumination as measured by the tag was correlated with direct visual observation.</td>
</tr>
<tr>
<td>B Wolfger and others, 'Technical Note: Accuracy of an Ear Tag-Attached Accelerometer to Monitor Rummation and Feeding Behavior in Feedlot Cattle.', Journal of Animal Science, 93.6 (2015), 3164–68 <a href="http://dx.doi.org/10.2527/jas.2014-8802">http://dx.doi.org/10.2527/jas.2014-8802</a>.</td>
<td>CowManager SensOor</td>
<td>“The ear-attached accelerometer is a promising tool to measure feeding behavior in beef cattle. Its associated algorithm, however, might need to be optimized to better differentiate rumination from feeding”</td>
</tr>
</tbody>
</table>
### Current research - applications

<table>
<thead>
<tr>
<th>Reference</th>
<th>Technology</th>
<th>Aim/Design/Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>S Talukder and others, ‘Rumination Patterns, Locomotion Activity and Milk Yield for a Dairy Cow Diagnosed with a Left Displaced Abomasum’, <em>New Zealand Veterinary Journal</em>, 63.3 (2015), 180–81 <a href="http://dx.doi.org/10.1080/00480169.2014.973462">http://dx.doi.org/10.1080/00480169.2014.973462</a>.</td>
<td>SCR HR-LD tag</td>
<td>Based on the changes in rumination level profiles and milk yield, it may be possible to detect LDA at least 5 days earlier than the actual date of the clinical diagnosis.</td>
</tr>
</tbody>
</table>
## Current research – applications

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<th>Device</th>
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<tr>
<td>Daniela N Liboreiro and others, ‘Characterization of Peripartum Rumination and Activity of Cows Diagnosed with Metabolic and Uterine Diseases.’, <em>Journal of Dairy Science</em>, 98.10 (2015), 6812–27 <a href="http://dx.doi.org/10.3168/jds.2014-8947">http://dx.doi.org/10.3168/jds.2014-8947</a>.</td>
<td>SCR-HRLD Tag</td>
<td>There was a possible application in using rumination monitoring in detecting post-partum disease, but further research was needed.</td>
</tr>
<tr>
<td>C Medrano-Galarza and others, ‘Behavioral Changes in Dairy Cows with Mastitis.’, <em>Journal of Dairy Science</em>, 95.12 (2012), 6994–7002 <a href="http://dx.doi.org/10.3168/jds.2011-5247">http://dx.doi.org/10.3168/jds.2011-5247</a>.</td>
<td>IceTag</td>
<td>Cows with mild mastitis had behavioural changes at milking time that were detected by the activity monitoring device.</td>
</tr>
</tbody>
</table>
Where might these devices be useful in Australia?

- Large farms with transient staff who are not experienced in diagnosis – corporate farms, farms that employ backpackers
- Farms looking to improve transition management and monitor the effects of management changes
- Producers looking to reduce labour inputs associated with heat and disease detection
- Stud and specialty operations closely monitoring high value animals
Summary of research

- We know these devices have been validated in confinement systems where cows are fed TMR.
- We know that the ability to detect the following has been demonstrated in confinement systems:
  - Heat
  - Lameness
  - Mastitis
  - Post-partum metabolic disease
- We know that research in pasture-based systems is limited.
…but which one is the best?

- We do not have enough data at present to demonstrate the superiority of any given system in Australian conditions
- There is considerable research validating systems that rely on the Ice Robotics technology for measuring activity, and the SCR technology for monitoring rumination
- The choice of device should be determined by the priorities of each farm, what they want to get out of the tag, and how well it integrates with existing systems
Case Study

- 250 cow Holstein herd located near Timboon
- Split autumn/spring calving pattern
- Pasture-based
- Full implementation of the SCR HR-Tag collar system two years ago
Case Study – Reasons for implementation

• Heat detection
• Better identification of sick cows
• Closer monitoring of high value animals
• Reduced time demands for health monitoring
Case Study – Perceived Benefits

- Accurate identification of sick cows
- Generally satisfied with heat detection, has reduced time required and has more cows presenting for service
- Uses rumination monitoring to determine response of cows to treatment
- Uses health alerts to closely monitor fresh cows; drenches, treats or calls the vet according to severity
Case Study - Problems

- Generally, function of the system has been trouble free
- IT issues have been frustrating – difficulties in getting the internet up and running at the dairy means that, at the moment, the system can’t be used in the office
Research project

“Assessing the relationship between rumination, activity and post-partum disease in pasture-based, post-partum transition dairy cattle in the Western District of Victoria”
Research aims

- To determine if a commercial rumination and activity meter can be used to determine the presence or absence of post-partum health disorders in dairy cattle 0-21 DIM
- To provide evidence on these devices relating to their efficacy in pasture-based systems
- Provide resources that can be used by producers prior to investing in this technology
Research Structure

- Collars fitted to cattle at dry off
- Activity and rumination data continuously logged from 2-10DIM
- Animals clinically assessed to determine the presence of post-partum health disorders including metritis, mastitis, lameness and metabolic conditions
- Data analysed to determine the relationship between rumination, activity post-partum disease
Questions we hope to answer

• Whether variations in rumination associated with pasture diets affect how well the tag works
• If activity associated with walking to the milking shed and while grazing affect the usefulness of the devices
• If these devices can supplement visual observation for detecting disease
Research Timeframe

- Pilot herd of 250 cows has been recruited
- Study will commence in August
- Two additional herds will be studied in autumn and spring of 2017
- Aim to have preliminary results from the first herd in Summer 2017
Questions?

- Does anybody here have a system implemented, what has your experience been?
References


