Precision dairy technology

Heat detection activity meters

Fact sheet:

What is the technology?

The majority of automated heat detection systems in Australia work by monitoring cow activity. These automated systems have been developed to detect increased activity either as steps or neck movements. Initially systems were developed for heat detection, but today associated systems are available to also monitor rumination and lying behaviour.

How does it work?

Increased physical activity is associated with the exhibition of oestrus or heat. The basic principle is that when a cow is on heat, she becomes increasingly restless. This change in relative activity can be monitored by a motion sensor attached to the cow.

All systems include three basic components:

- the sensor on each cow
- the hardware receiver to collect the data from the sensor
- the computer software.

Sensors are usually either an ankle-mounted pedometer or a collar-mounted monitor. The basic pedometer estimates the cow's activity by measuring the number of steps she takes within a certain period of time. Accelerometers on neck collars often measure head movement intensity and duration. Some activity monitors can also provide additional functionality by measuring the rumination activity of a cow to provide an early indication of cow health.

What data does it provide?

Proprietary complex algorithms are used to compare activity meter data to the cow's baseline activity to identify individuals that deviate from the normal or expected level of activity. These animals are suspected as being on heat. The data can also help identify cows not in oestrus and those that need further examination.

How can you use this information?

Pedometers and accelerometers are useful aids for heat detection in dairy cows, particularly in the immediate post-calving period.

Two useful measures of the performance of any heat detection system is the heat detection rate (the proportion of cow heats the system detects) and the heat detection accuracy (the proportion of cow activity alerts occurring in cows truly on heat). Reported values of heat detection rates range from 80 to 95 per cent with accuracy ranging between 70 and 95 per cent.

The performance achieved in all circumstances can be substantially affected by the algorithm used to calculate an alert. Setting an appropriate activity threshold for an alert algorithm is a balancing act. Raising the activity threshold required for an alert will decrease the heat detection rate but improve the accuracy. Conversely, reducing the threshold will increase the heat detection rate but decrease the accuracy. In general, activity meter systems can detect a high proportion of cows on heat, but in doing so can sometimes select cows not on heat.

Combining activity alerts with other information about the cow such as the last time she was recorded on heat and observations by experienced stockpeople can substantially improve heat detection accuracy.

Potential issues

Deciding whether to implement an activity monitoring system and what type of system depends upon several factors:

- The type and level of activity included in the algorithms used to determine detection and accuracy rates can limit accuracy.

- Including rumination information in a combined activity-rumination algorithm may improve the performance of an activity-based heat detection system.

- Farmers already achieving a high heat detection rate through visual detection or tail paint may have more difficulty in justifying the investment in an automated heat detection system.

Suppliers and cost

There are many commercially available pedometers, accelerometers and rumination activity instruments. The cost can vary widely depending upon the system's functionality. There is usually a start-up cost of between $5000 and $10,000, plus a per unit cost of $110 to $180. The total setup costs for a 200-cow dairy can range from $30,000 to $50,000.

Commercially available heat detection systems include, but are not limited to:

- AfiMilk, AfiTag.
  www.afimilk.com/products/cows/sensors/afitag-pedometers

- Lely Qwes-H tag system.
  www.lely.com/en/milking/detection-system/qwes-h--hr

- IceRobotics Cow Alert.
  www.icerobotics.com/products-for-farmers

- Heatime systems.
  www.semex.com.au/i?lang=en&page=ai24.shtml

  www.gea-farmtechnologies.com/nz//en/bu/milking_cooling/farm_management/milfos-activity/default.aspx

- DeLaval ALPRO.
  www.delaval.com.au/en/-/Product-Information1/Management/Systems/Activity-meter-system/

- Moo Monitor.
  www.dairymaster.com/heat-detection

- CowScout S.
  www.gea-farmtechnologies.com/au/en/bu/milking_cooling/farm_management/id_systems/cowscouts/default.aspx

- Rescounter 11.
  www.gea-farmtechnologies.com/au/en/bu/milking_cooling/farm_management/id_systems/rescounter_ii/default.aspx

- Heat Seeker systems.
  www.boumatic.com/assets/files/us/brochures/SD_Actv_LIT00317EN-1203_v6_EN.pdf

  www.boumatic.com/us-en/products/realtime-activity

Further information

More detailed information on the use of activity meters in the Australian dairy industry is available on the Dairy Australia website and in the following publications and websites.

"Automation of oestrus detection," by Dr Jenny Jago, DairyNZ (www.dairynz.co.nz/publications/technical-series/?year=5041&month=5059).

If you want a copy of any of these publications, they can be obtained through the link "request article" from the DA library webpage.

www.dairyaustralia.com.au/Industry-information/library.aspx