



## **The potential for use of activity measurement and rumen temperature for oestrus and calving prediction in beef herds**

Reproductive performance drives the success of the beef suckler herd. Minimising empty cows and maximising cows calving in the first few weeks of the calving pattern all help to maximise weaned calf weight produced per cow mated. Artificial insemination (AI) is an under-utilised opportunity to critically select appropriate bull genetics for maximal growth rates balanced by positive calving ease and negative gestation length EBVs. Currently, heifers are frequently naturally mated inappropriately by terminal sire bulls, at best selected for cow mating, with poor outcomes for future herd breeding potential. Calving represents a time of critical risk in delivering viable calves that will grow optimally to maximal weaning weight, and cows or heifers that get back in calf quickly. Furthermore, calving often imposes very high labour demands to provide adequate supervision.

Technologies which predict oestrus and calving have the potential to improve reproductive outcomes and significantly improve the ease of beef herd management.

It has been widely demonstrated that activity increases during oestrus in the dairy cow. It has therefore been suggested that devices measuring activity such as pedometers or collars could accurately detect oestrus. This technology has become widely adopted in the dairy sector, but there has been less uptake in the beef industry due to various barriers to use of the technology. However, new systems are now commercially available which have longer range signalling and within-collar data processing and storage. With opportunities for siting base station readers near water troughs or feeding areas, this offers a promising solution to these barriers.

Research has also shown that rumen temperature (RuT) of beef cows increases around oestrus and decreases around calving. RuT may therefore have potential to predict oestrus with sufficient accuracy to facilitate appropriate timing of insemination and to predict calving with sufficient accuracy to optimise labour inputs to supervise calvings. Measurement of rumen temperature with a bolus is minimally invasive, allows frequent records of real-time data to be obtained, requires minimal labour, and permits cows to be maintained in a natural environment.



## How the technology works

EBLEX have funded a project on two farms to explore the use of activity meters and rumen temperature boluses in beef herds. Findings from these projects have identified a number of points which any beef farmer looking to use these technologies should be aware of, and these are outlined below.

This report describes the specific make and model of technology used in this project. Other similar technologies exist but may vary from the description below.

## Activity meters

- Each cow is fitted with an adjustable collar, worn around the neck
- From the bottom of the collar 'necklace style' hangs a motion sensing tag
- The motion sensing tag transmits a signal to a control box, which is mounted on a building or other structure near the herd
- The system uses algorithms (complex mathematical calculations) to separate the cow's day to day normal activity baseline from changes in activity related to oestrus.
- The data can be viewed real time on a farm computer using the software supplied with the product.
- The user is provided with graphs and data for each collared cow/heifer. Alerts are sent for those animals requiring attention. These can also be transmitted to a mobile device (e.g. phone or tablet).
- The main claim is that the product can assist early detection of oestrus by detecting an increase in activity levels, but there is also growing reference to detection of illness in cattle, especially when a refinement of the collar which includes a method of measuring rumination is included.





## Activity meters – things to look out for



## Collars:

- For larger breed beef animals the standard collars provided by the manufacturer may be too short in some cases. There is a larger collar size which is 20cm longer than the standard size (155cm). It is important to assess what collar size would be needed for your particular herd.
- Collars must be fitted correctly according to the manufacturer recommendations. If the collars are too tight or too loose then reading quality may be affected.

## Readers and computers:

- A few days, and in some cases a few weeks, is required after fitting collars before accurate readings can be expected. This is because a baseline of average activity must be generated over several days to a week in order to determine future changes in activity.
- In systems where cows are moved frequently to pens of differing sizes or mixed with new herd mates there may be a disruption in activity leading to false positive and false negative results.



- If the computer is running other software it may not be possible to also run the activity software on the same computer. This requires prior checks to be made with the manufacturer.
- Where the system is used out in the field at grazing, sufficient power must be available from either batteries or solar panels. The manufacturer should be consulted on the power requirements of the particular system in question.

### Results of activity meter trials

- Current activity monitoring systems appear to be unable to predict calving, although this is a potential development for the future.
- When an alert is generated a 'Time to AI' is given, which counts down the time still left to inseminate the cow starting from 26 hours down to 0. Peak fertility is predicted to occur between 18 to 10 hours from the alert (with 14 hours being the ideal) and this is when insemination is recommended to take place.

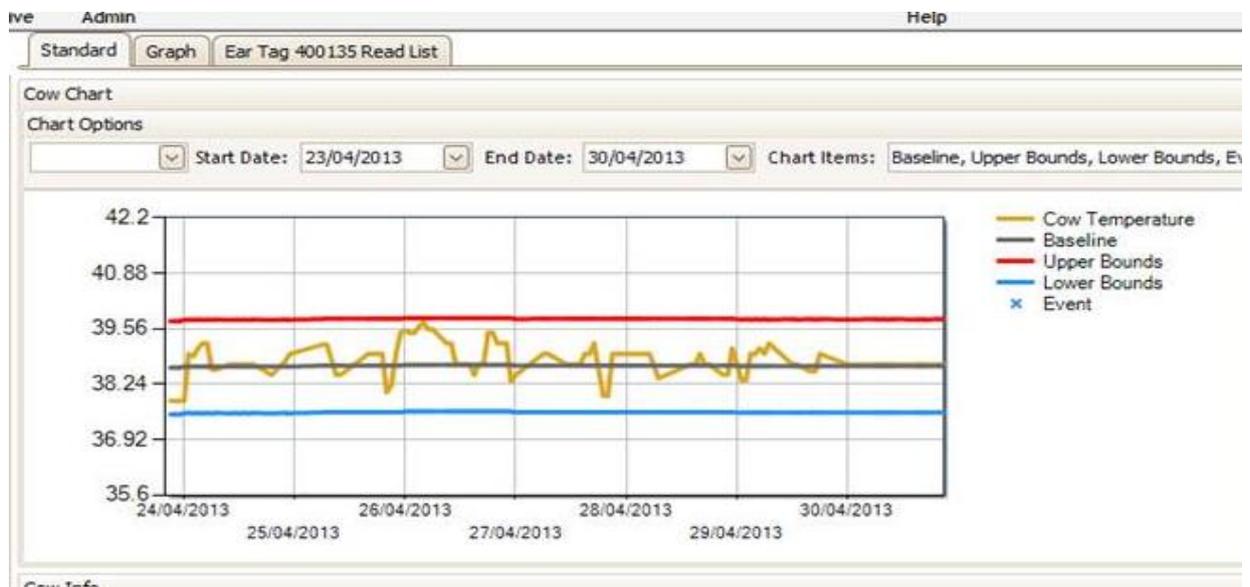
### Rumen temperature boluses

- The bolus is administered orally using a dedicated dosing gun.
- Boluses vary in materials, weight, length and diameter and importantly battery life
- Once ingested the bolus permanently settles to the bottom of the rumen/reticulum.
- The bolus transmits a signal to a reader (or readers depending on the size of the farm), which is a small metal box mounted on a building or other structure near the herd
- The data can be viewed real time on a farm computer using the software supplied as part of the product.
- The user is provided with graphs and data for each bolused cow/heifer. Alerts are sent for those animals requiring attention (these can also be transmitted to a mobile device, e.g. phone or tablet).





## Rumen temperature boluses – things to look out for



## Boluses

- Regurgitation of the boluses may occur shortly after dosing and at times of diet change- such as when cows go out to grass in spring. Ways to help combat this include dosing with a magnet bolus at the time as bolus administration. Withholding of forage for a period of time before bolus administration then feeding forage immediately after may also help to reduce regurgitation.

## Readers and computers

- The bolus-to-reader range should be carefully considered to ensure that cows are in range of a reader for at least the majority of the day. This is particularly significant in large buildings or outdoors. If readings are poor then it may be necessary to install additional readers.
- A suitable computer is required to run the software. Windows 7 or newer is required with 4GB of RAM and at least 250GB hard drive.
- A sufficient period of time is required after bolusing before accurate readings can be expected; this is because a baseline of average temperature must be generated in order to determine changes in temperature. It can take up to three weeks for boluses to start reading following bolusing, which is thought to be due to the bolus



becoming trapped within the fibre mat in the rumen and taking time to descend down into the reticulum.

- Building type may also be a factor determining read frequency, with large open metal framed buildings potentially producing more consistent readings than smaller masonry buildings, with thick walls. Older brick buildings can have very thick walls and it has been suggested that this may interfere with signal transmission.
- It is recommended to trial the boluses in a warm water bath on site before administering to all cows, to ensure all boluses read reliably and that there are not issues with local radio signal interference.

### Results of rumen bolus trials

- The temperature threshold at which alerts are generated can be altered. It is recommended to work with the supplier to find a threshold that correctly identifies as many cows in oestrus as possible whilst minimising false positives.
- A cow should be inseminated 12-15 hours after an oestrus alert using the commonly accepted AM-PM rule.
- Temperature monitoring is currently still in the development phase in terms of the reliable prediction of calving.

### Overall project lessons

These technologies represent an exciting opportunity in beef herds to unlock the genetic and technological advances that have made such an enormous impact on the dairy industry. However, whilst both activity collars and rumen boluses are becoming well established in dairy herds, there are still some challenges facing the use of these technologies in the beef herd. A thorough exploration with the manufacturers and herd advisors addressing the practicalities of using a system on any particular farm is advisable. This might include a demonstration on a small number of animals and a site specific pilot phase before purchasing the full system.