



THE UNIVERSITY of EDINBURGH
Royal (Dick) School of
Veterinary Studies



Use of advanced technologies on dairy farms



Alastair Macrae

Dairy Herd Health &
Productivity Service

RDSVS

University of Edinburgh

www.ed.ac.uk/vet/dhhps

A.I.Macrae@ed.ac.uk

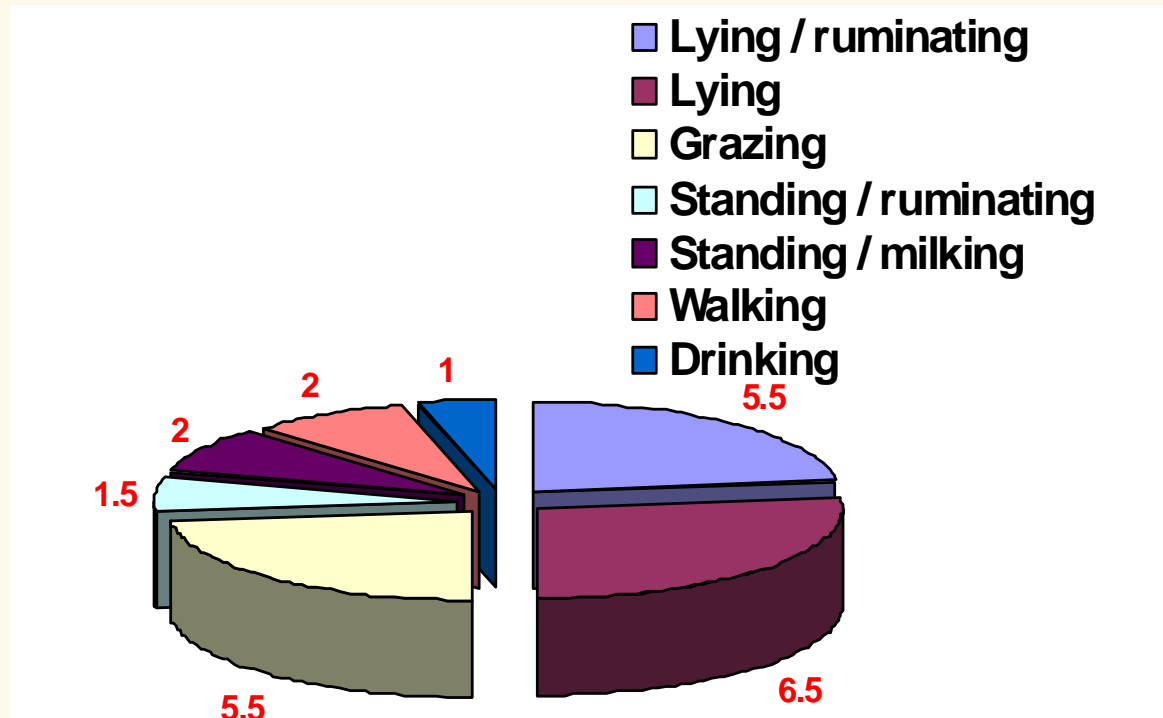
It's a cow's life



Using cow behaviour to monitor nutrition and health

Aspects of cow behaviour critical to health

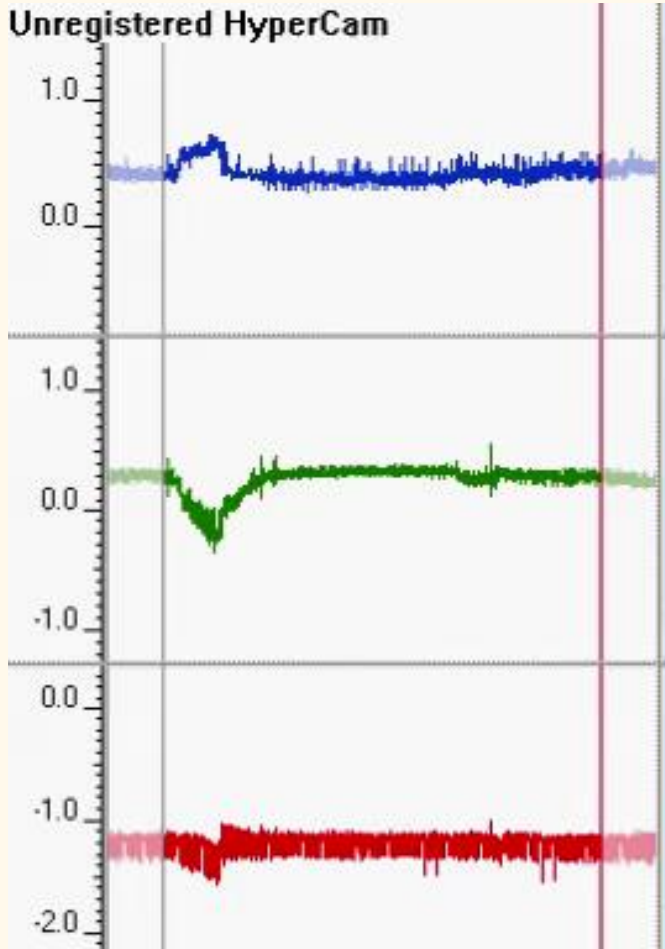
- Feeding
- Drinking
- Ruminating
- Lying time
- Standing time
- Other aspects – temperature etc.



Monitoring cow behaviour

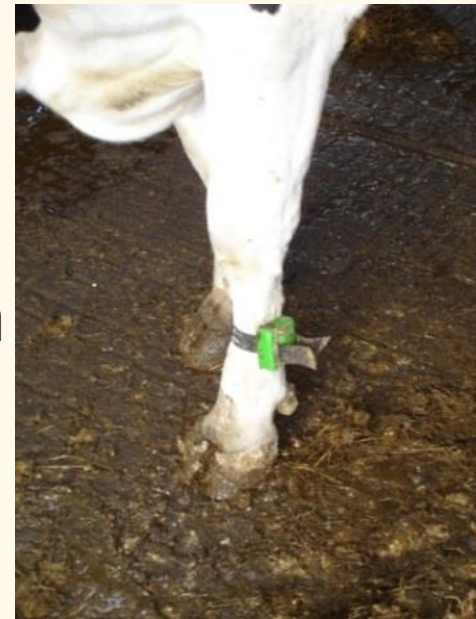
Using accelerometers to record changes in behaviour so that monitoring can be automated

Unregistered HyperCam



Automated monitoring of cow behaviour

- Use of 3-axis accelerometers on neck or leg
- Need to be able to correlate measurements with cow behaviours
- Main issues to their use on farms:
 - Reliability of equipment
 - Accuracy of data and interpretation
 - Volume of data and processing
 - Ease of use by farmer



So what cow behaviours are we interested in?

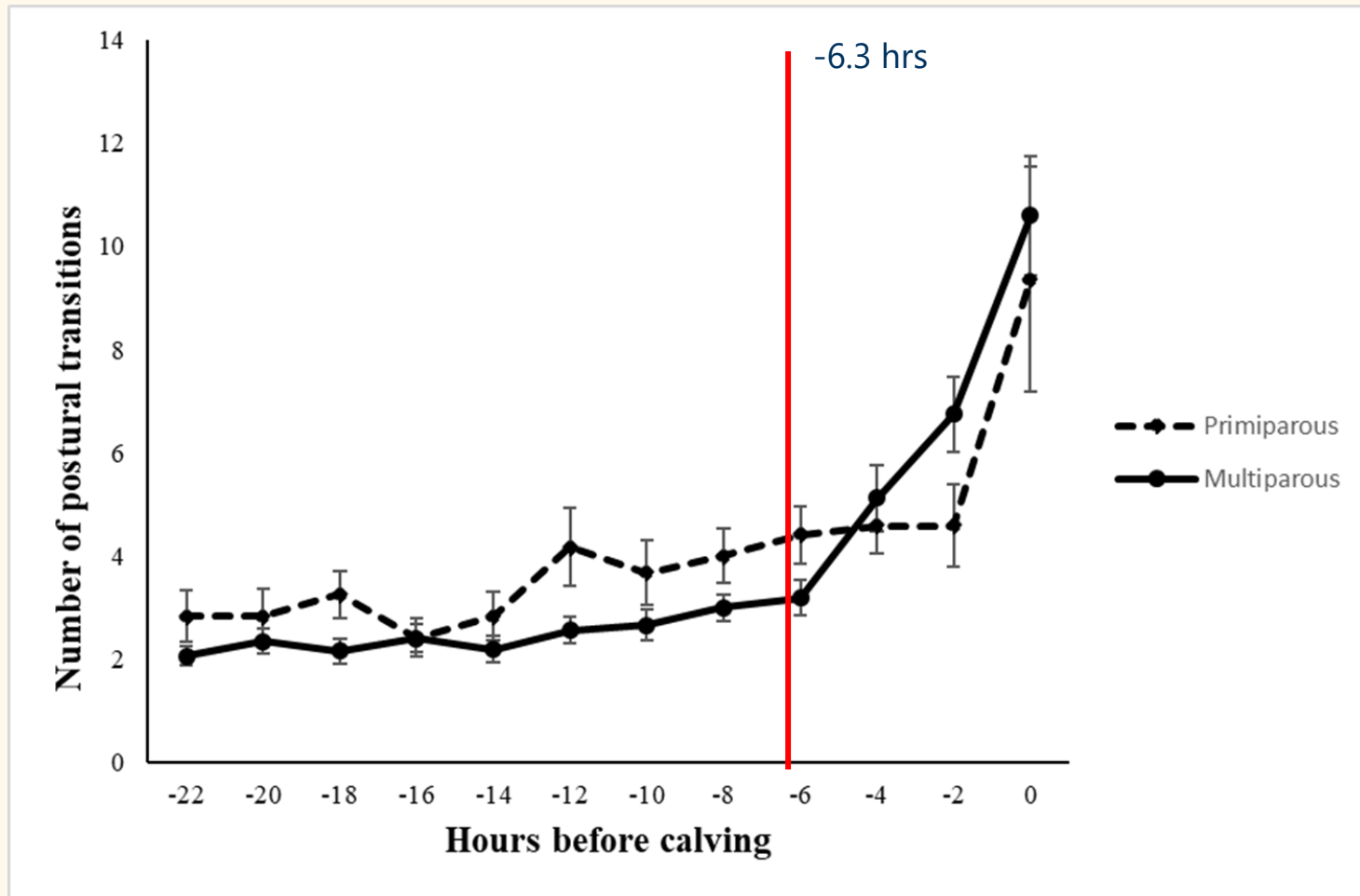
Heat detection in dairy cows

- Why?
 - Dairy cows need to calve to produce milk
 - Most dairy cows bred using Artificial Insemination
 - Oestrus detection on farms poor (UK: 40%)
- During oestrus, cow activity will increase 4 fold
- Large number of products available commercially
- Cost around £100 per cow for installation

Can we move beyond heat detection?

- Are there other health events that we could monitor automatically or remotely?
- **Calving**
 - Essential for farm productivity
 - High risk time for cow, calf and human
 - Estimated that 8 – 10% of cows require human assistance at calving
 - Assistance at calving associated with increased calf mortality, poor cow fertility

Can we use cow behaviour to determine when a cow will calve?



Barraclough et al. (2020) Journal of Dairy Science 103:714–722

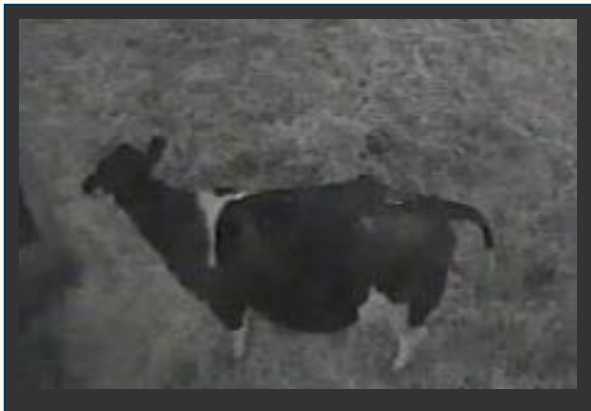
Assessment of calving behaviour

- There are behavioural differences in cows in both the day of calving and hours before calving
 - Increase in postural transitions
 - Lying and standing bouts increase
 - Step count increases
- Heifers are different to cows
- Not an accurate predictor of calving
- Not an accurate predictor of assistance required

Not all behaviours are obvious....

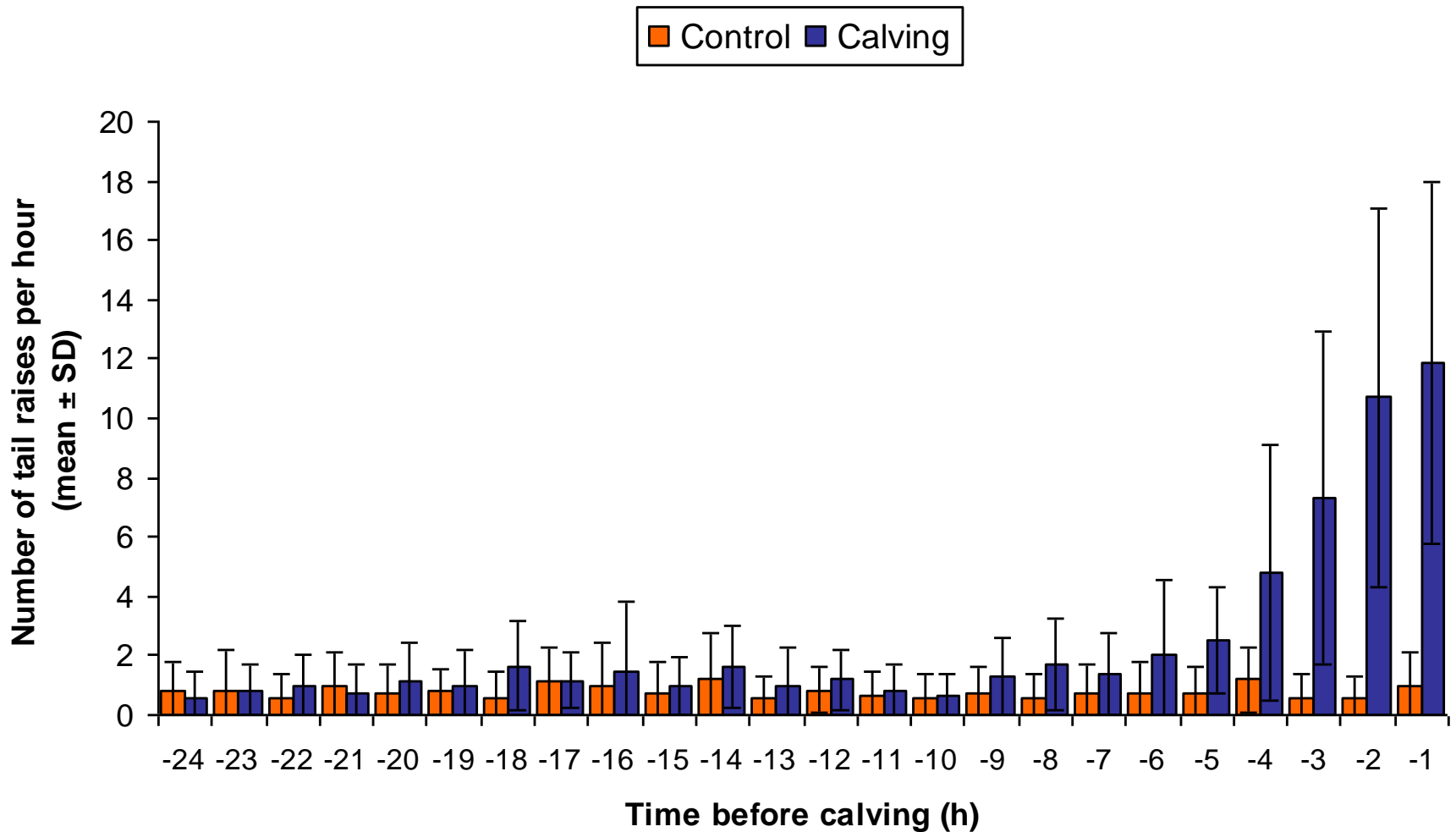
Prediction of calving

- Tail raising
- Scored as an event; each one separated by tail returning to a normal, relaxed position



Results

Focus on last 6 hours



Practical application



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- No additional hardware required
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- Suits all cattle breeds
- Tail-mounted, non-invasive, safe and secure design
- After calving, just move to the next cow due to calve
- Texts up to two phone numbers
- Emails up to three email addresses
- Unlimited notifications via companion app

Disease around calving

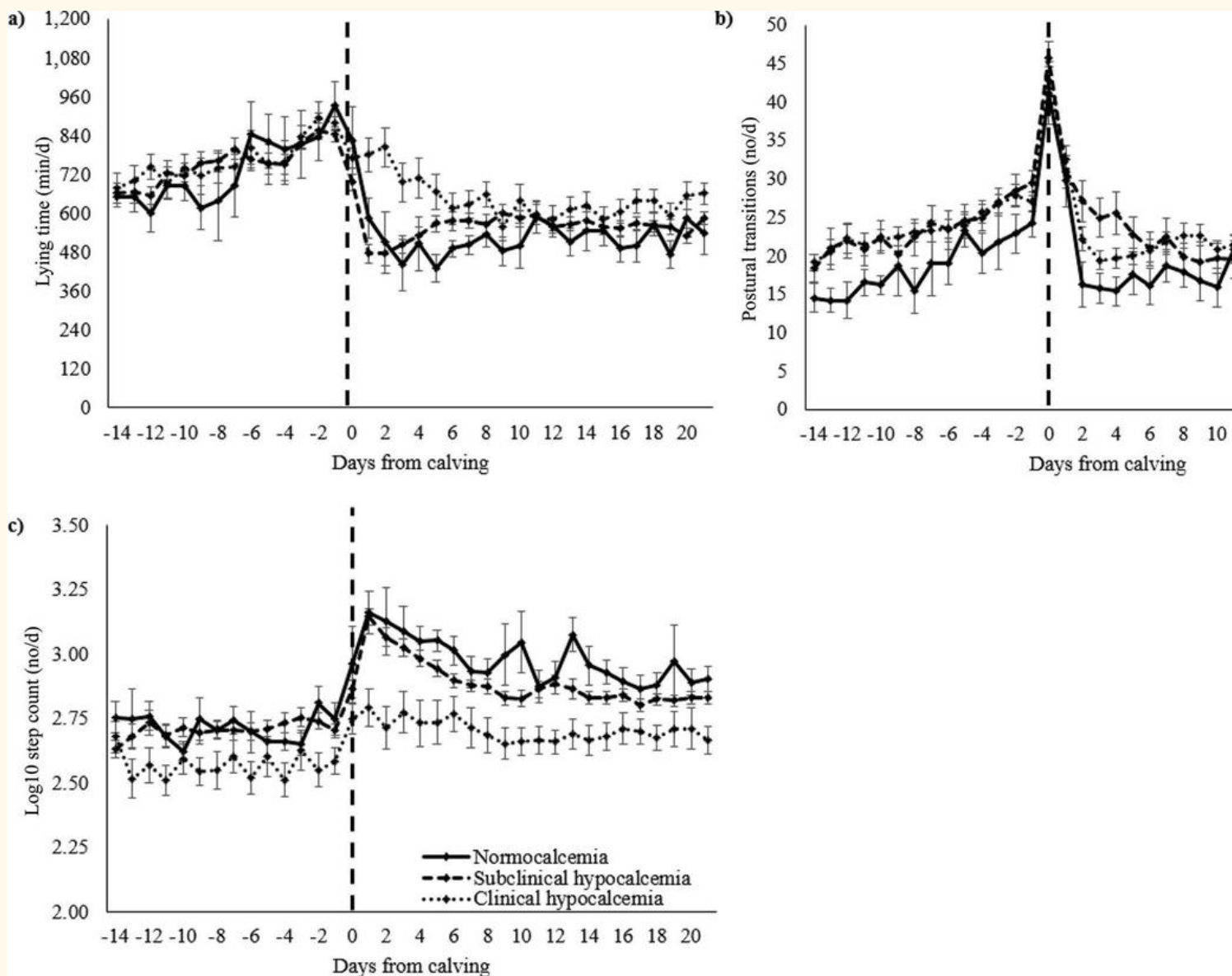
- What about other health events?
- **Hypocalcaemia** (milk fever)
 - Affects **5% of cows** around calving
 - Most cows recover quickly
 - However up to **50% of cows suffer from subclinical hypocalcaemia**
 - Consequences: downer cows, calving difficulty, retained foetal membranes
 - Cost of an average case: **£420.63**
- Could we use automated cow behaviour monitoring to detect milk fever?



Effect of blood calcium status on cow behaviour

- Monitoring dairy cow behaviour around calving (3 weeks precalving to 3 weeks post-calving)
 - 1st lactation heifers (n = 21)
 - lactation 2+ (n = 51)
- Blood sampled at calving to determine blood calcium levels
 - Normal blood calcium (10 heifers, 6 cows)
 - Subclinical hypocalcaemia (11 heifers, 30 cows)
 - Clinical hypocalcaemia (No heifers, 15 cows)

Alterations in cow behaviour during hypocalcaemia



Summary

- Challenge of increasing dairy farm sizes with more cows, less staff and less time
- Modern technology allows us to remotely monitor cow behaviour
- How can we use this to aid farm management?
 - Heat detection
 - Calving
 - Hypocalcaemia (milk fever)

Acknowledgements



- Alex Corbishley
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