# Use of advanced technologies on dairy farms

## Alastair Macrae

Dairy Herd Health & Productivity Service

RDSVS

University of Edinburgh

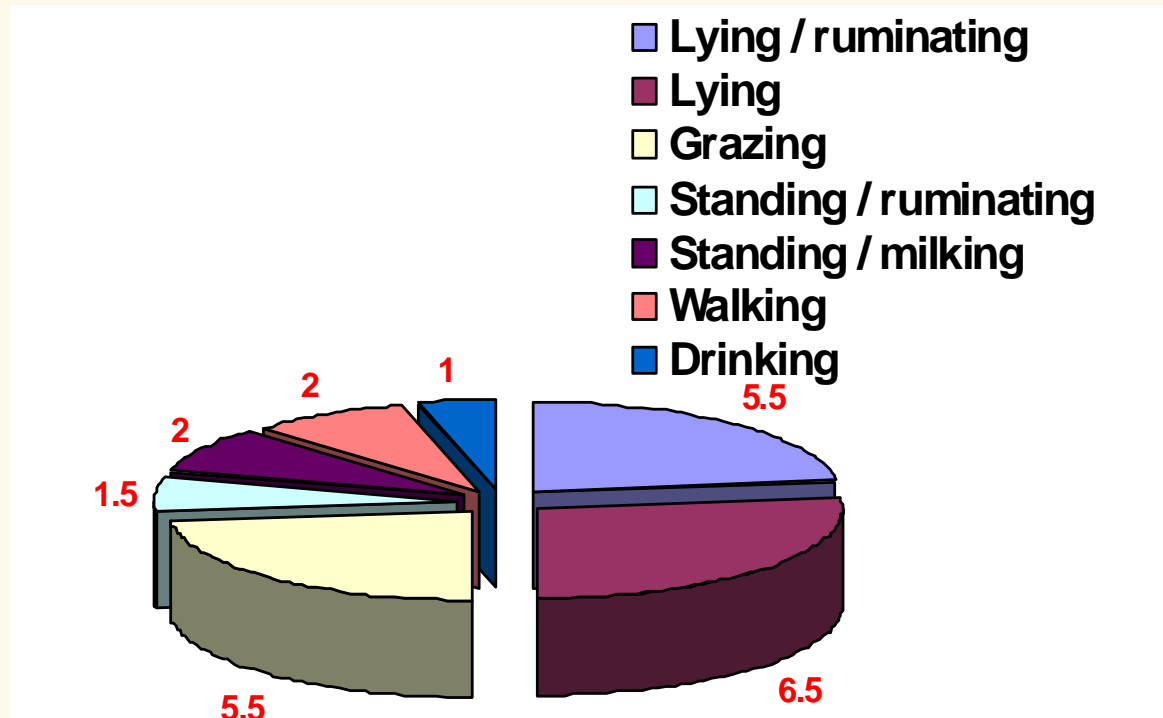www.ed.ac.uk/vet/dhhps

A.I.Macrae@ed.ac.uk

# It's a cow's life

# Using cow behaviour to monitor nutrition and health

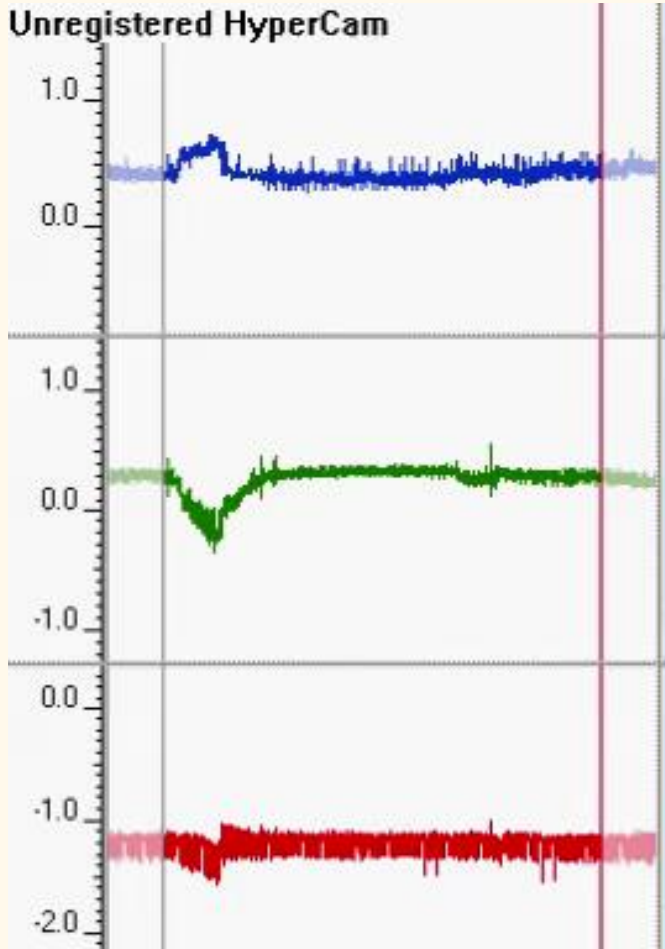## Aspects of cow behaviour critical to health

- Feeding

- Drinking

- Rumination

- Lying time

- Standing time

- Other aspects – temperature etc.

# Monitoring cow behaviour

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

# 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
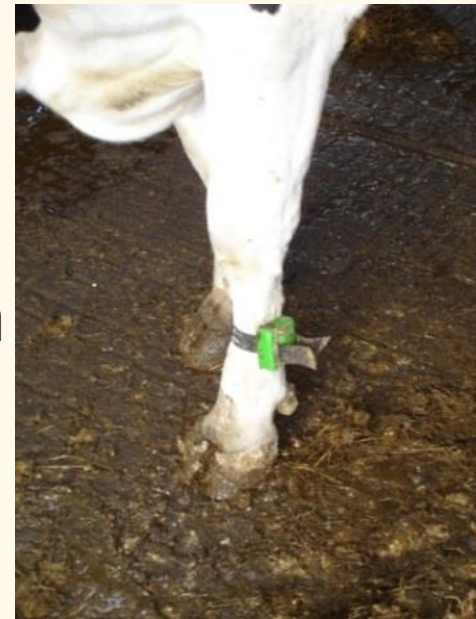
# So what cow behaviours are we interested in?

## 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?
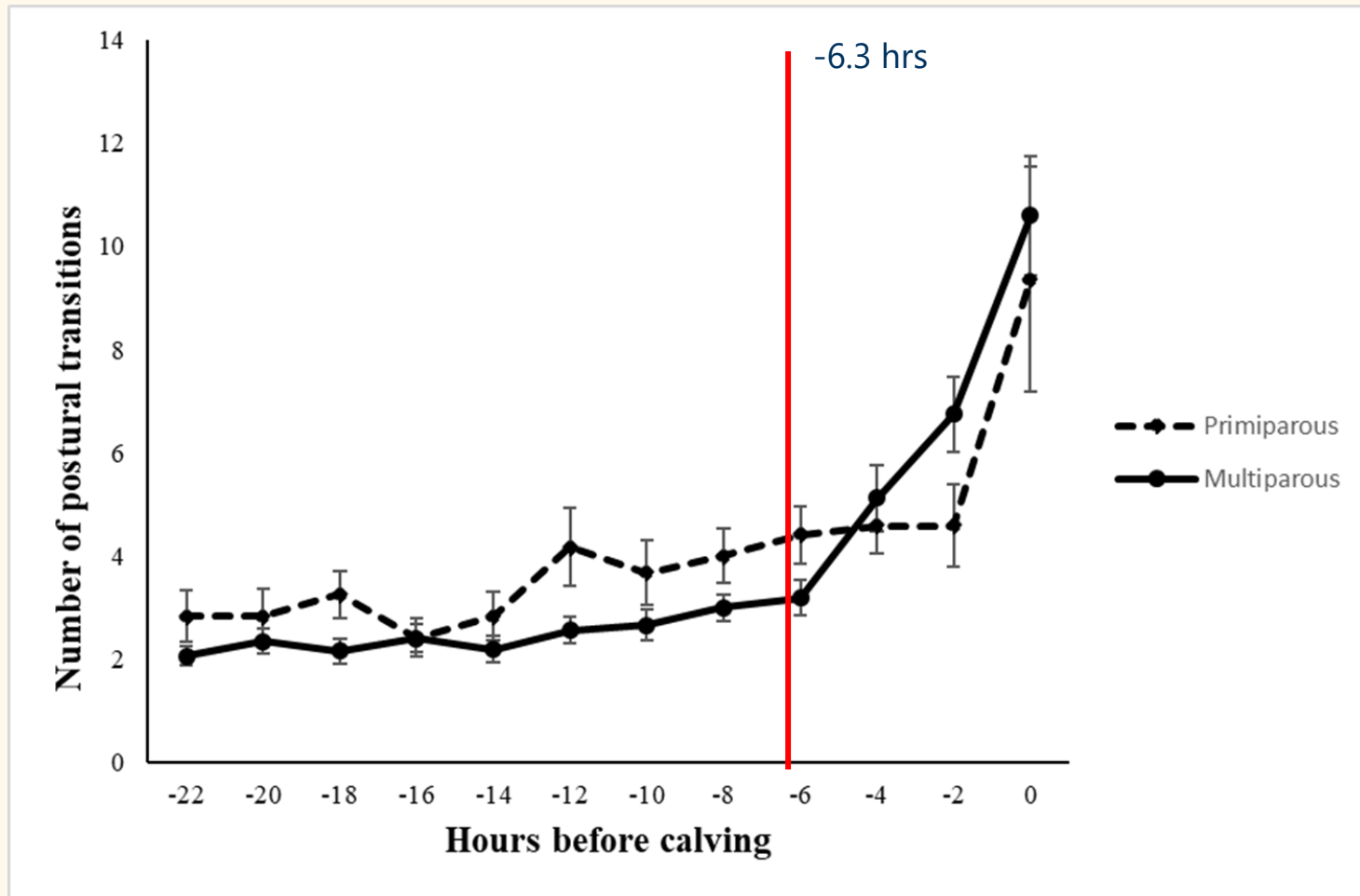


Barraclough et al. (2020) Journal of Dairy Science 103:714–722
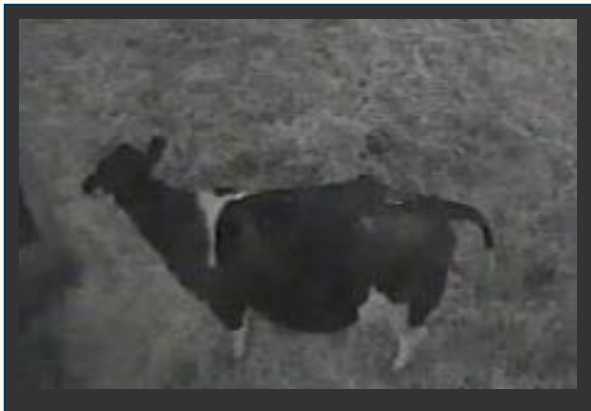
# Assessment of calving behaviour

- 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
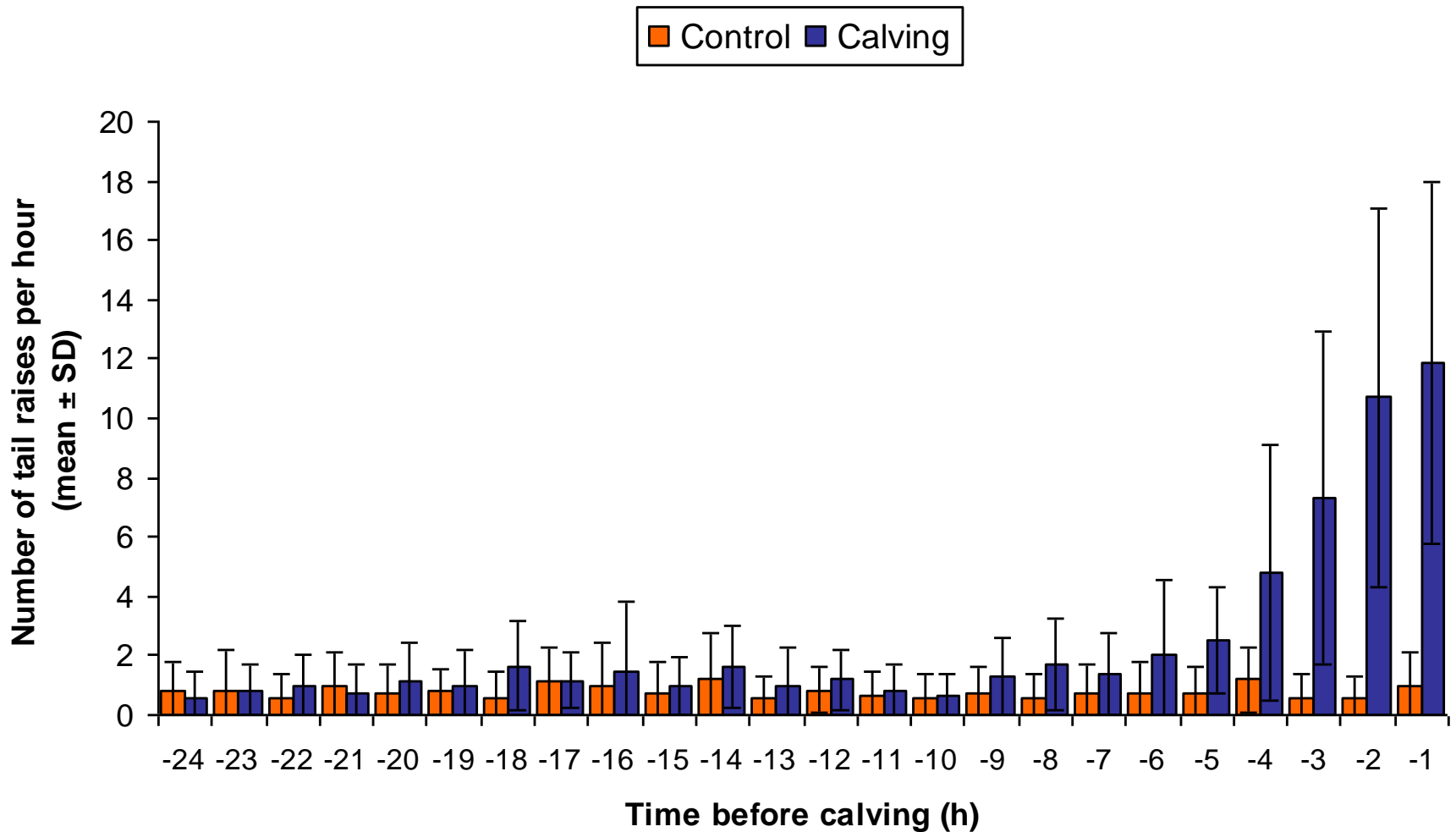
# Not all behaviours are obvious….

## 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

# 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)
  - 1$^{st}$ 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

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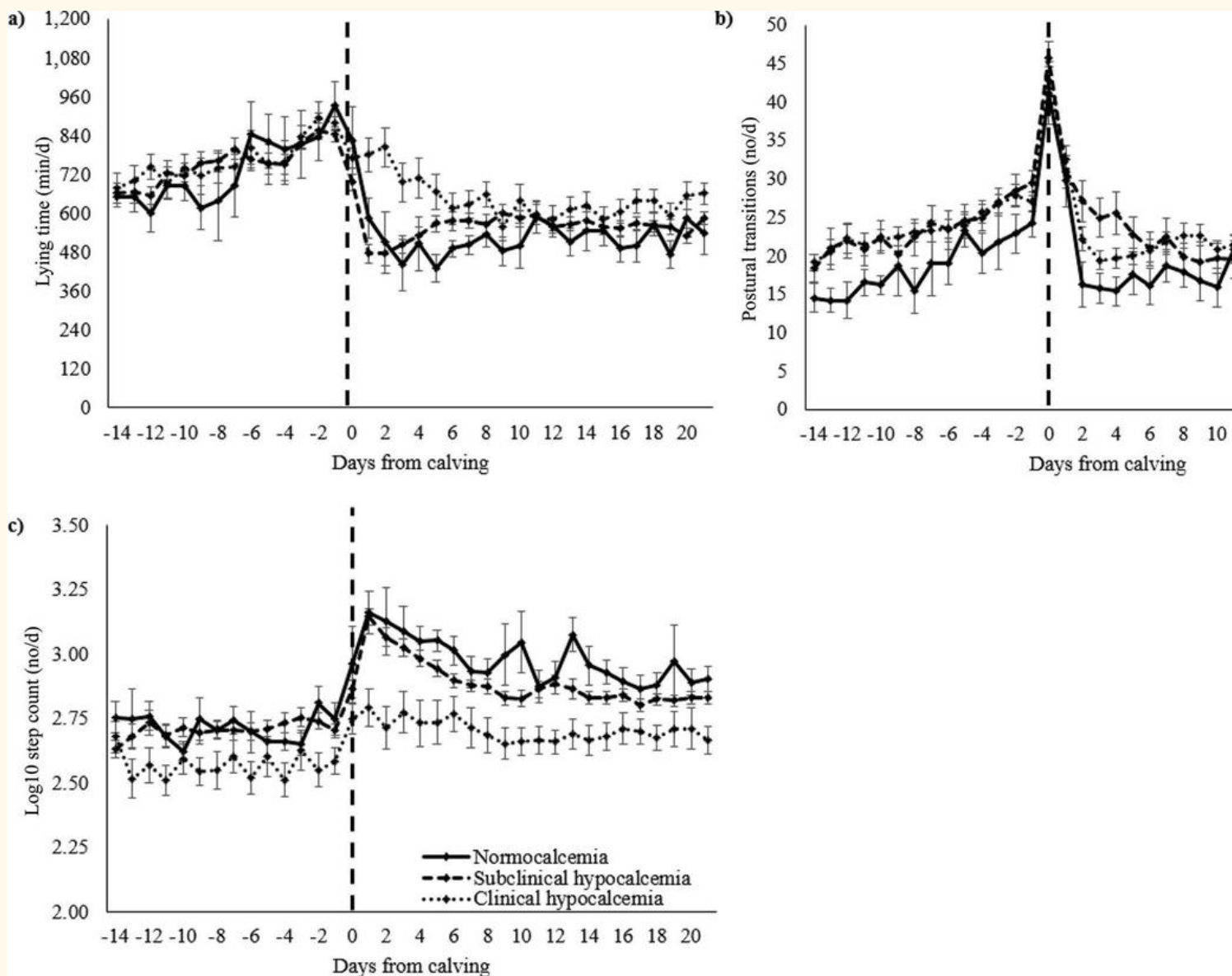
# Summary

- 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)

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