The School of Veterinary Medicine and Science

Individual Cow Somatic Cell Count Patterns and their Contribution to Bulk Milk Somatic Cell Count

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Introduction

Bulk Milk Somatic Cell Count (**BMSCC**) results from the contribution of individual cows with different milk production and levels of Somatic Cell Count (**SCC**). In the UK, farmers have to pay a penalty when BMSCC is above a certain threshold, typically 200,000 cells/mL. In the European Union, milk is not saleable if BMSCC exceeds 400,000 cells/mL for more than 3 months. The main factor increasing SCC is infection (Schepers et al., 1997) and BMSCC can be used to estimate herd mastitis prevalence (Emanuelson and Funke, 1991). A threshold of 200,000 cells/mL is commonly used to analyse and resolve mastitis problems in the UK (Bradley and Green, 2005).

Aims: ➢ To describe the between-herd variability in the percentage of cows moving across a threshold of 200,000 cells/mL between consecutive recordings
➢ To quantify the contribution of each pattern to BMSCC

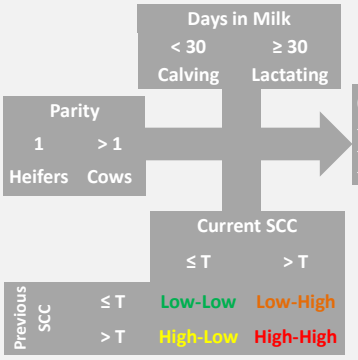
Materials and Methods

Data

- Monthly collected milk recording data
- 7,770,956 milk recordings
- 2,128 dairy herds in England and Wales
- January 2004 to December 2006

Cow categories

- Transitions in individual cow SCC categorised on **two consecutive** milk recordings based on:
  1. A threshold **T** of **200,000 cells/mL**
     - **Low** when **≤ T**
     - **High** when **> T**.
  2. Lactation Stage
  3. Number of lactations



Seasonal variations in SCC

Data aggregated at the herd-year level (Dohoo and Morris, 1993)

BMSCC

- Estimated at the herd-year level
- From individual cow SCC and milk yield.

Models

- Association between a given category modelled either:
  - As a percentage of the number of cows
  - As a percentage of the number of cows eligible for a transition
- Multilevel linear models.
- Bayesian framework in WinBUGS
- 1,500 herds for parameter
- 628 herds for prediction.

Results

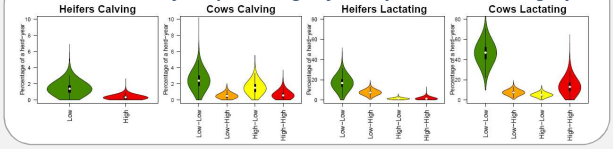
Herd Structure

Percentage of herd-years in the 14 categories

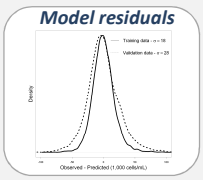
Median % of herd-year	
Heifers Calving:	1.8
Cows Calving:	5.1
Heifers Lactating:	21.3
Cows Lactating:	71.8

Differences primiparous/multiparous cows	
Low-Low Heifers:	16.7 % of Herd-Years
	82.5% of Lactating Heifers
Low-Low Lactating cows:	46.6 % of herd-years
	64.9 % of Lactating cows

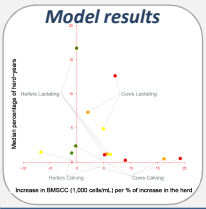
Distribution of the percentage of herd-years in each category



Model residuals



Model results



Model

Association between BMSCC in 1,000 cells/mL and the herd-year percentage of cows in each category

Intercept:	Cows Lactating Low-Low
	Mean = 39.2
	Variance = 18.8
Residual variance:	20.9

- Highest coefficients: **Cows Calving High-High** and **Cows Calving Low-High**, but on average these cows represented around 0.5 % of herd-years.
- Each increase of 1 % in **Cows Lactating High-High** associated with an increase of 7,000 cells/mL when this category of cows represented 12.7 % of herd-years on average.

Risk of rise or decrease

Rais = Low-High / (Low-L ow+ Low-High) x 100
Dimin = High-Low / (High-Low + High-High) x 100

Rais

Number of cows High on a test-day as a percentage of the number of cows Low on the previous test-day

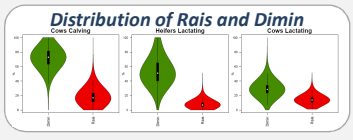
Highest during the dry period (16.7 %)
Lowest in Lactating Heifers (6.8 %)

Dimin

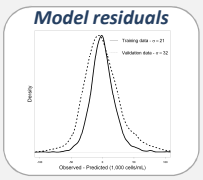
Number of cows Low on a test-day as a percentage of the number of cows High on the previous test-day

Highest during the dry period (72.7 %)
Lowest in Lactating Cows (28.2 %).

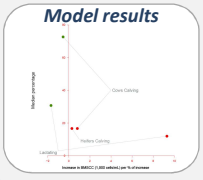
Distribution of Rais and Dimin



Model residuals



Model results



Model

Association between BMSCC in 1,000 cells/mL and Rais and Dimin

Intercept:	Mean = 161.5
	Variance = 24.1
Residual variance:	24.1

- Highest coefficients: Rais for the lactating period

Conclusion

This research was the first to use a nationwide milk recording dataset in the UK. The contribution of various categories of cows to BMSCC was quantified and can be used on farm. Cows in their first lactation were less likely to move from below to above 200,000 cells/mL and tended to return more frequently below this threshold. This should be taken into account when analysing herd SCC data.

References

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Acknowledgments

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