

Predicting bovine milk urea concentrations for future Test-Day Records in a management perspective

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Global objective

Use of milk recording data could be extended to **practical management tools** for all dairy farmers.



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- **dietary crude protein** (Broderick and Clayton, 1997. JDS.80:2964-2971)
- surplus of nitrogen available for microbial growth compared with the available energy or **OEB** (Hof *et al.*, 1997. JDS.80:3333-3340; Schepers and Meijer, 1998. JDS.81:579-584)

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By **modeling** milk urea, the global aim is to **advise on feeding management** based on the detection of "abnormal" values.

Approach

Predict future milk urea test-day records



Detect "abnormal" values by **comparing expected and observed** milk urea values



1st step: define a **model adapted for prediction**

Models used

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- Random regression effects
 - Common environment (Herd - period of calving)
 - Permanent environment
 - Genetic effect

Regression curves modelled with 2nd order Legendre polynomials

Data

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1,749,257 milk urea records of 1st lactation Walloon cows from January 1998 to June 2007

17,100 records from **June 2007** were considered as unknown and **used to test the prediction ability** of the model.

Adjustment of the models



→ On data **used for the solutions estimation** (from January 1998 to May 2007)

	Observation (mg/L of milk)	Prediction Error (mg/L of milk) = (observed – predicted)	Correlation Observed/Predicted
Model 1	270.7	0.0 ± 41.1	0.95
Model 2	270.7	0.0 ± 41.1	0.95

Overall fit was **excellent** and **equivalent** for both models

Prediction of Future Test-day Milk Urea Concentrations



→ On data **not used for the solutions estimation** (June 2007)

	Observation (mg/L of milk)	Prediction Error (mg/L of milk) = (observed – predicted)	Correlation Observed/Predicted
Model 1	286.4	14.3 ± 87.4	0.51
Model 2	286.4	10.7 ± 85.9	0.53

Autoregression limited the prediction error and improved the correlation

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Milk urea concentration was **underestimated**

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Large range of Prediction Error standard deviation

Adjustment and predictability



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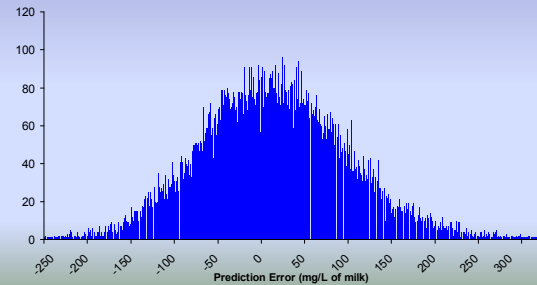


And **practical implications** for dairy farmers would be possible.

→ Examples

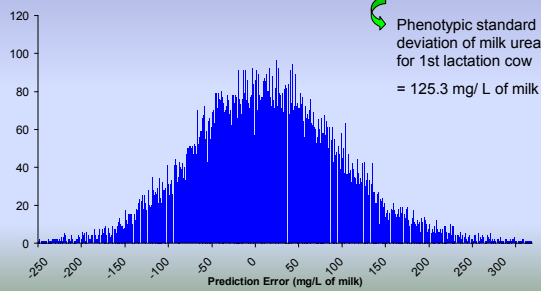
Potential practical implication: detection of "abnormal" values

Distribution of prediction errors for model 2



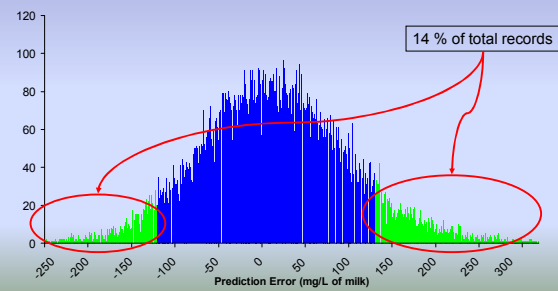
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"Abnormal values" if absolute prediction error > average deviation



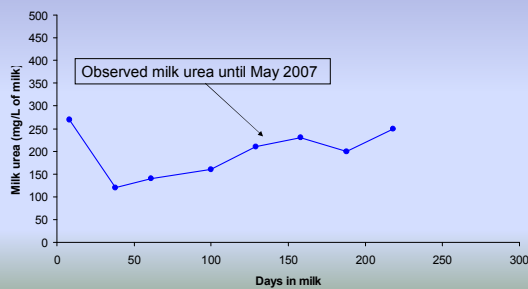
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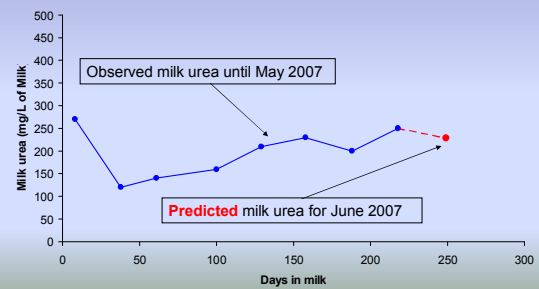
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Example of a given 1st lactation cow in a given herd

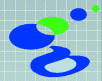


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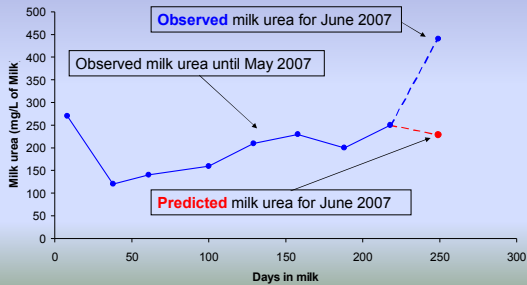
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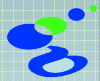
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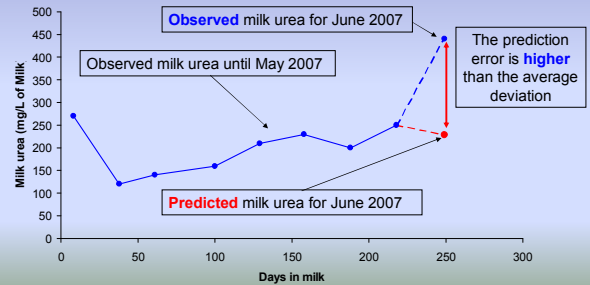
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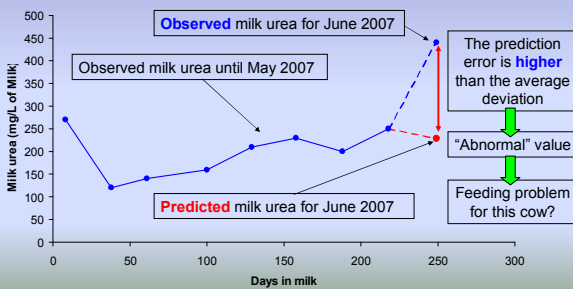
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Conclusions and perspectives



- **Adjustment** of the model was excellent.
- Interest in autoregressive covariance structure but modeling improvement are needed for the **predictive ability** of the model.
- **Practical implications** for dairy farmers would be possible.

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Thank you for your attention

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