



Evaluating differences in the metabolic profiles of lame and non-lame dairy cows using liquid chromatography-mass spectrometry and machine learning

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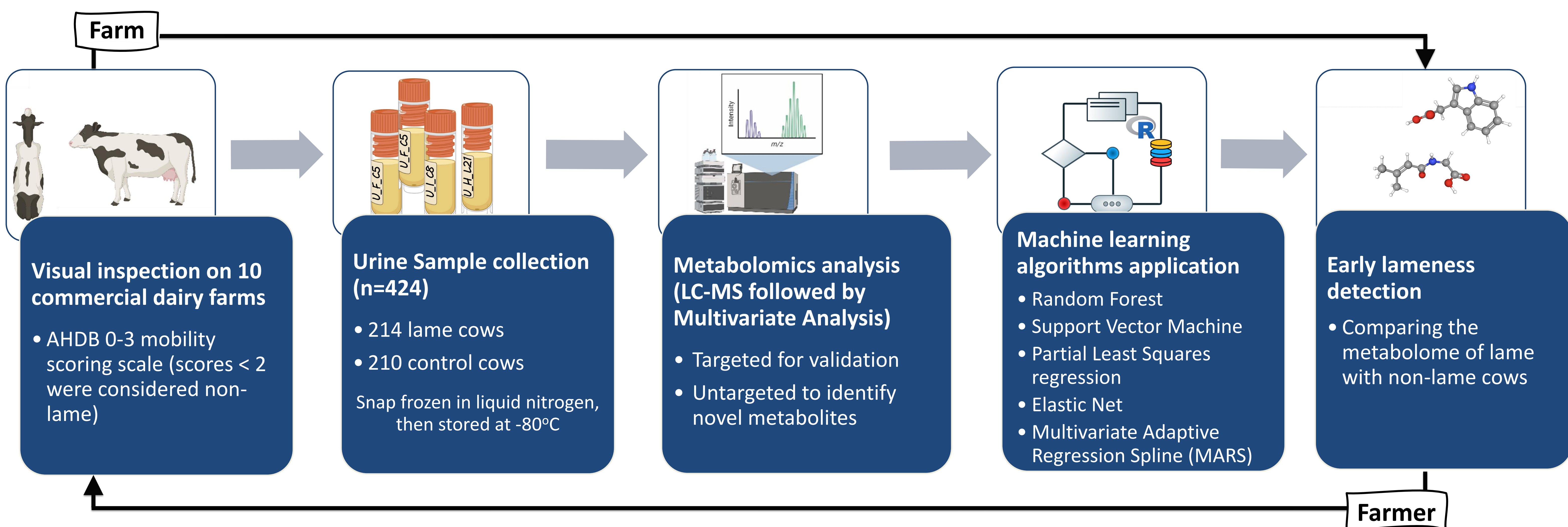
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Introduction

Lameness is a painful condition for dairy cows. The demand for improved health and welfare calls for early detection to optimise its management. The detection and quantification of metabolites in biofluids such as urine provide a time-sensitive phenotypic description to better understand the cow's health status and provide information about the animal's immune response.

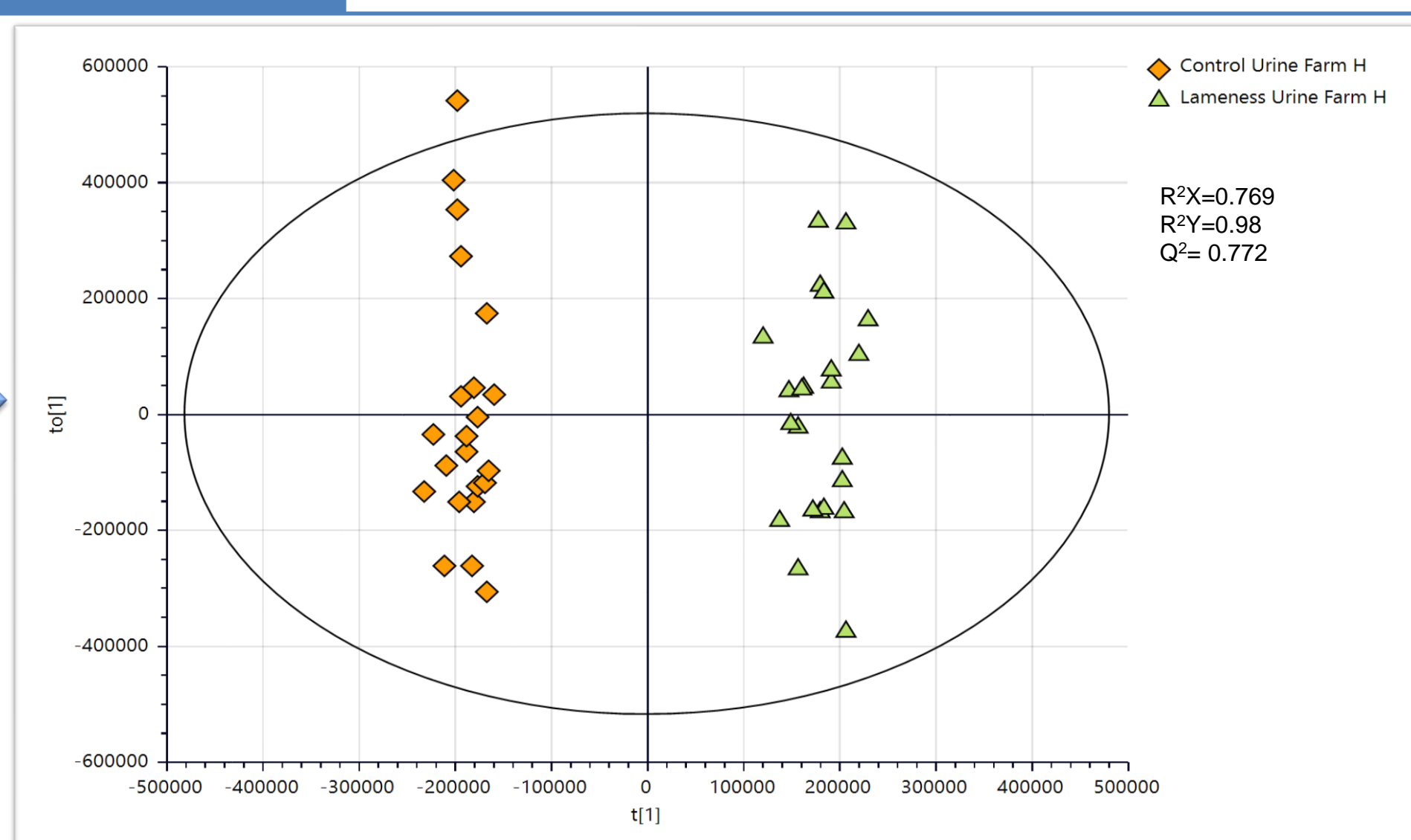
Aims

To develop an accurate and unbiased way of predicting lameness using liquid chromatography-mass spectrometry (LC-MS) to identify differences in the metabolic profiles of lame and non-lame cows.



Results

The metabolic profile was found to clearly differentiate lame cows from control (non-lame) cows in 3 of the farms using orthogonal partial least squares - discriminant analysis (OPLS-DA)



10 metabolites were identified compared to a previous study (Randall et al. - unpublished work), of which 2 were predictive of lameness

MARS best performed when including all farms, with a prediction accuracy of 69%. At the farm level, combining the top 3 farms, overall prediction accuracy was 74%

Conclusion and Future Work

New knowledge was acquired about metabolic differences between lame and non-lame dairy cows from commercial herds. A small number of metabolites were externally validated demonstrating the potential to identify metabolites predictive of lameness across herds. Different time points prior to lameness and the underlying reasons found for the differences should be investigated to assess the methodology's accuracy in predicting early-stage lameness. Further MS/MS work is required to confirm the identification of metabolites.



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Conceptualization: A.S.C and L.R.
Methodology: A.S.C., L.R, M.G, R.H and D-H.K
Investigation: A.S.C., L.R, and H.H-A
Resources, D-H.K
Formal Analysis, A.S.C, L.R, B.F. and S.A

Supported by the Biotechnology and Biological Sciences Research Council's Doctoral Training Programme (BBSRC DTP) (grant number BB/T0083690/1) – Industrial Cooperative Awards in Science & Technology (iCASE) and Agriculture and Horticulture Development Board (AHDB). We also acknowledge Vet Partners Ltd and QMMS Ltd.