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Abstract Submission Form

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Preferred presentation Oral

Preferred session Session 2: SC Milk Analysis – New tools to extend the horizon of milk mid-infrared spectrometry

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Title of your paper Predicting the likelihood of conception to first insemination using milk mid-infrared spectroscopy: a model for FOSS instrument

Insert ABSTRACT text

An ability to predict the likelihood of conception of dairy cows in early lactation would help farmers make informed breeding decisions. Cows predicted to be most fertile, for instance, could be inseminated with sexed or high premium semen while those predicted to be least fertile could be mated with beef semen. Previously, we developed such a model using data from commercial milk testing, which included milk yield, milk composition (fat, protein, and lactose percentages), somatic cell count, calving age, days in milk, days from calving to first insemination, and milk mid-infrared (MIR) spectra generated from a Bentley instrument. The model shows a good prediction accuracy and has been implemented by Australian herd-test centres who provide reports to farmers. This study extended the analysis to FOSS instrument, which is the other major instrument used for MIR in Australia. Firstly, we tested if the previously developed Bentley model would be applied directly to spectral data obtained from a FOSS machine. Secondly, a new model trained specifically using FOSS MIR data was developed and evaluated. Finally, various genomic and phenotypic measures were compared for cows predicted to have most and least likelihood of conception compared to herd average. A total of 7,951 records of milk MIR spectra, milk yield, milk composition, somatic cell count, calving age, days in milk and days from calving to first insemination of 2,895 cows from 30 dairy herds were used. The new model was developed in the same way as the Bentley model which included initial training on “extreme data” and then validating against field data. Specifically, the “extreme data” only include cows that conceived to first insemination (“good”) and cows with no

conception event recorded and had only one insemination (“poor”), whereas field data include all cows in the herd. The model performance was evaluated by first ranking the cows within a herd for their predicted likelihood of conception and then selecting the top and bottom 10% of records and compared to actual values. The accuracy was measured as the proportion of selected records being correct. When applying the Bentley model to FOSS data, the prediction accuracies of identifying the top and bottom 10% of cows were around 0.37 and 0.62, respectively. Such a poor prediction accuracy using the Bentley model implies the need to develop a separate model for FOSS. The new model was able to achieve an accuracy of around 0.53 and 0.77 when used to identify the top and bottom 10%, respectively, which is comparable to the published Bentley model. It could also correctly identify the top 10% of cows conceiving following two inseminations with an accuracy of 0.70. Compared to herd average, the top 10% of cows ranked by the model were significantly younger and had lower somatic cell cows while the opposite pattern was observed for cows in the bottom 10%. Interestingly, there was no significant differences in 305-day milk yield, milk composition, days from calving to first insemination, days in milk, and other breeding values and national selection indices. In conclusion, a model for predicting the likelihood of conception to first insemination of Australian dairy cows using milk MIR spectra and other on-farm data has been developed and validated for further implementation for farmers who use FOSS instrument.

Enter keywords likelihood of conception, mid-infrared spectroscopy, cows