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### Influence of Cow Parity on

## the Precision of Near-infrared Spectroscopic Sensing System for Assessing Milk Quality During Milking

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used as calibration and

Parity data set

validation data set and the

same condition was used for 2<sup>nd</sup>

1<sup>st</sup> vs 2<sup>nd</sup> = 1<sup>st</sup> Parity data set

data set as validation set

data set as validation set

used as calibration and

validation set

Laptop

computer

NIR

spectrum

sensor

**1<sup>st</sup> & 2<sup>nd</sup>** = 1<sup>st</sup> and 2<sup>nd</sup> Parity data set was combined and

as calibration set and 2<sup>nd</sup> Parity

2<sup>nd</sup> vs 1<sup>st</sup> = 2<sup>nd</sup> Parity data set

as calibration set and 1st Parity

#### INTRODUCTION & AIM

- □ Raw milk constituents such as milk fat, lactose and somatic cell count (SCC) are great determinant factors for milk quality **Conditions Considered** 1<sup>st</sup>/2<sup>nd</sup> = 1<sup>st</sup> Parity data set was
- □ An online real-time near-infrared (NIR) spectroscopic sensing system has been developed for milk quality assessment

#### However...

- □ Various cow parity have probably been one of the major hindering factors to obtaining excellent calibration performances
- □ Aim... to investigate the influence of cow parity on the precision and accuracy of calibration models

#### MATERIALS AND METHOD

- ☐ Cow information: Two Holstein cows in their first and second calving phase were used
- **□** Reference analyses: MikoScan and Fossomatic device
- ☐ Online NIR spectroscopic sensing system was designed & constructed
- **☐** Wavelength range: 700 to 1050 nm (1 nm intervals)

partial least squares

regression (PLSR)

#### **Chemometric Analyses**

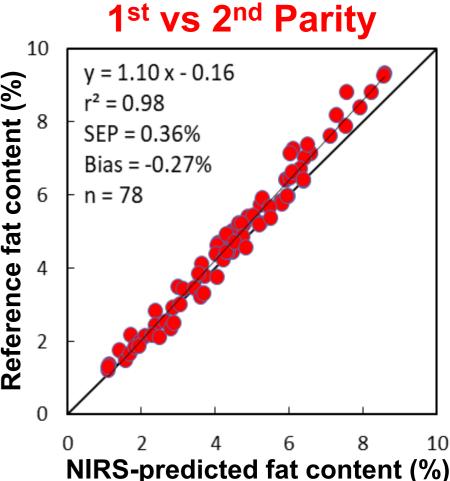
sampler NIR spectra data Reference data ☐ Calibration set: 1<sup>st</sup> & 2<sup>nd</sup> sample data set ☐ Validation set: 1<sup>st</sup> & 2<sup>nd</sup> sample data set **Partial least squares** regression (PLSR) Cross validation method was used Develop **Calibration Model** ☐ Statistical method:

Validate the precision and accuracy

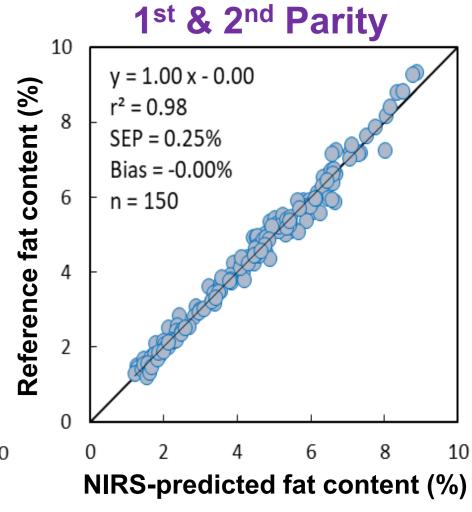
Flow chart for developing calibration model

#### **RESULTS & DISCUSSION**

### 1<sup>st</sup> / 2<sup>nd</sup> Parity y = 1.00 x - 0.00 $r^2 = 0.99$ SEP = 0.14%Bias = -0.00%n = 72NIRS-predicted fat content (%)



2<sup>nd</sup> vs 1<sup>st</sup> Parity y = 0.87 x + 0.51 $r^2 = 0.95$ SEP = 0.44%Bias = 0.04%n = 72NIRS-predicted fat content (%)



☐ The precision and accuracy of the calibration models of milk fat was very high and similar but different for milk lactose and SCC for 1st and 2nd cow parity

NIR validation statistics for milk quality determination using near-infrared spectroscopy

	indicators	1 <sup>st</sup> Parity	2 <sup>nd</sup> Parity	1 <sup>st</sup> vs 2 <sup>nd</sup>	2 <sup>nd</sup> vs 1 <sup>st</sup>	1st & 2nd
	Fat (%)	0.99	0.99	0.98	0.95	0.98
	Lactose (%)	0.87	0.78	0.43	0.41	0.59
	SCC (log SCC/mL)	0.90	0.87	0.71	0.52	0.79
Coefficient of Determination (r <sup>2</sup> ) values						

The NIR spectroscopic sensing system developed in this study could be used for online real-time assessment of milk constituents and SCC during milking

#### CONCLUSION

- ☐ The precision and accuracy of calibration model for milk fat was excellent and similar for all the five conditions
- ☐ The accuracy of calibration model for milk lactose and SCC varied for all the five conditions considered in this study. Thus;
- ☐ It was suggested that cow parity could affect the accuracy of calibration models

### FUTURE WORK / ACKNOWLEDGEMENT

☐ To explore other limiting factors (cow lactation stages and feeds) ☐ To develop a model that would compensate for these factors and

improve the calibration models for each milk constituents and SCC

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