Exploring Differences in Total Digestible Dry Matter (TDDM) and Intestinal Protein Digestion (IDP) of Canola Seeds and Canola Processing Co-Products (Meals, Pellets) from Different Companies in Canada and China for Dairy Cattle

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Canola was created in the 70s as a low erucic acid and low glucosinolate seed, to produce high quality oil for human consumption and meal for use in livestock feed. China is an important user of Canadian canola products (seeds, oil, and meal). The extraction of the oil from the seed produces a co-product called canola meal. This meal is rich in protein and is used as a protein source in animal diets. However, differences in the characteristics of the seeds, or processing methods during oil extraction may affect the quality of this co-product. Plus, the synthesis of tissues and milk is related to the amino acids available to the animal for absorption in the small intestine. This study aimed to determine if there are significant differences in the intestinal digestibility (*in vitro)* of CP and DM between canola seeds and meals from different companies in Canada and to determine if there are significant differences between them in Canada and China. The three-step procedure was applied on residues from a 12-hour rumen incubation in fistulated dairy cows to estimate the intestinal digestibility of CP and DM. There were significant differences ($P<0.05$) for TDDM (Total digestible dry matter) and IDP (intestinal digestibility of protein) of the meals between countries. The samples from China had higher TDDM (83.76% versus 81.53%, $P=0.018$), while Canada's had higher IDP (68.51% versus 65.28%, $P=0.016$). No significant differences were observed within countries. Based on the material analyzed during this study, it is safe to affirm that there are no significant differences in the digestibility of DM and CP between Canada and China. It was concluded that the quality of the canola seeds or meals produced in both Canada and China were similar when used in dairy rations.

Deep learning for mastitis detection and development of farm-specific detection methods

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Automated milking systems (AMS) are used in 12% of Canadian dairy farms and >20% of dairy farms in Western Canada, with indications of increasing adoption. Therefore, a need exists for accurate, early automated disease detection. AMS generate much more data than milk characteristics, and animal behavior data may offer novel indicators for disease onset, with great potential to improve mastitis detection when analyzed with state-of-the-art machine learning methods. Deep learning models were developed using data from 89 farms from across Canada using Lely AMS, of which 23 were used to validate model performance. The models were used to predict daily probability of an animal being diagnosed with clinical mastitis. Deep learning models use a series of connected neurons to identify relationships between variables, and recurrent networks capture time-dependent relationships and base predictions on individual animal patterns. Using a prediction window of 3 days, accuracy was 80% (19.6% false-positive/day and 16.5% missed cases). Furthermore, a combination of milk characteristics and behavioral traits resulted in prediction accuracy very similar to milk characteristics alone but resulted in a decrease of 5% in missed cases. Model performance was worse on farms that were not used for model training, and model performance differed considerably between the 23 validation farms. The developed model can serve as a good starting point, but farm-specific tuning would be required to reach optimal performance. The next step is going to be tuning models incrementally as new data is collected from farms and determine how much new data is needed before optimal performance is reached.
Impact. AMS data bring novel opportunities for mastitis detection. Developed models should be further tuned once implemented on new farms to optimize performance for the individual farm.