NIRS scanning of manure brings efficiency insights to feedlots

By Kieran Brett

With funding from ACIDF and ALMA, this researcher found practical ways for producers to use NIRS technology to characterize feces and improve feed efficiency.

Alberta's 151 cattle feeding operations finish a total 1.8 million head annually. Naturally, these producers take great care about the quality and composition of what their cattle eat.

While what goes *into* the animal has long been a matter of study and refinement, researchers are now beginning to look at the *back* end for signals about feed efficiency.

"Some producers are doing visual inspection to see if there is grain in an animal's feces," says Larisa Jancewicz, (pictured left), Ph.D. candidate at the University of Saskatchewan. "However, it's actually very difficult to see if those grains are partly digested, or if they are the whole grain. NIRS [Near Infrared Spectroscopy] technology is a rapid alternative to using wet chemistry for this purpose."

Between 2014 and 2016, Jancewicz conducted a research project to explore how NIRS could be used to scan fecal samples for information on digestibility of feed materials and feed efficiency. This project was supported by the Alberta Crop Industry Development Fund (ACIDF) under the $8 million Feeding Initiative funded by the Alberta Livestock and Meat Agency (ALMA).

Would spot-sampling yield valid data?

As Jancewicz explains, an ideal scenario would be to analyze the feces of multiple animals several times each day on an ongoing basis. Since this is impractical, she wondered whether a different method might yield comparable insight. NIRS technology could make this possible.

The first part of Jancewicz's project examined whether spot-sampling the feces of a small group of animals would be reflective of the same values for the cattle population as a whole. She isolated a group of animals, and did NIRS readings on fecal material gathered at various points throughout the day.

Since fresh, wet feces don't scan well, Jancewicz dried and ground the feces before doing the NIRS reading. For comparison, these same samples were sent off for wet chemistry analysis.

Over time, and with the different diets tested, Jancewicz saw that her group of animals showed consistent NIRS readings. This gave her confidence that within the larger pen, spot-sampling and NIRS analysis would be valid in representing the pen as a whole.

"Since all animals were eating the same diet, and we knew the digestibility of the diet, we sampled certain animals at certain times of day to see how close to that value we were," Jancewicz says. "When we sampled within four hours of the first feeding, we got very accurate estimations. Sampling several animals removed the variation enough that we could reach that average value that we were looking for."

Small processing changes can net big results

In the next phase of her project, Jancewicz developed NIRS calibrations that could predict fecal composition and digestibility of nutrients, based on the type of grain in the ration and how it was processed.

"Over the two years that I was sampling, we noticed that the fecal starch levels, for example, were directly related to the processing index of the grain," says Jancewicz. "With fecal monitoring, the feedlot is looking at not only the feeding but the processing as well. It links some of the steps in management."

On an academic level, Larisa Jancewicz significantly added to available knowledge on how information from feedlot fecal samples can be used to improve cattle performance. On a personal level, she's delighted that her work has already begun to pay dividends for Alberta feedlot operators.

"It was really amazing getting to work with the science, and then apply it to an industrial level," Jancewicz says. "I worked with several feedlot producers in the Lethbridge area, and was able to improve some of their management strategies. After working with me on this, they made changes to how they processed, and ended up being more profitable in the end."

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