Improving Cow/Calf Production

Study Hopes To Find Trigger For Summer Slump, Improve Production In Older Cows

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Trials under study by Dr. James Matthews of the UK Department of Animal and Food Sciences beef group may help cattlemen render endophyte toxicity a manageable problem. His collaborators are Drs. James Boling and Roy Burris, also of UK's beef group.

"At our lab we are interested in improving the cow-calf production systems in the state of Kentucky," he said. "We are interested in understanding how calves grow well and, more importantly, why they don't when they don't. We are also very much interested in increasing the productivity span or lifespan of the old cow."

Matthews presented data from two experiments, one looking at endophyte toxicity in cattle, the other looking at old cows. For endophyte toxicity, he is studying steers that have been grazing tall fescue (Festuca arundinacea) that is infected with endophyte (Neotyphodium coenophialum), which produces alkaloids that cause the classic summer slump syndrome.

"We have generated a set of cattle t-hat sh-ow th-e cl-assic signs of endophyte toxicity," Matthews said. "Having established the model, we are dissecting the animals to characterize their molecular profiles, the genetic profiles, to understand the difference between steers that perform better on the non-infected pastures versus those that perform poorly on the infected pastures."

His group has identified one protein so far whose expression is sensitive to endophyte exposure.

"We believe that is indicative of decreased energy protein metabolism capacity in the endophyte animals," Matthews said. "This understanding gives us a target to begin to look at to see if we can reverse the effects of toxicity on that particular protein. It also validates our model and justifies the analysis of these tissues by microarray and proteomic analysis. These are two approaches, methodologies if you will, that allow us to study many genes (microarray), many proteins (proteomics) at the same time out of these same animals which we have shown to be exhibiting classic signs of fescue toxicity."

In another study, the metabolic capacity of young (3-5 years old) versus old (greater than 10 years old) mature cows is being compared. One problem with old cows is they wean lower weight calves.

"This reduced weaning weight does not simply result from the old cows losing their teeth and, therefore, having a decreased amount of nutrient intake, which results in less milk," he said. "There is a metabolic basis. For example, I am about 50 so my liver does not function as well as a 20-year-old farmer. A 70-year-old farmer is in even worse shape than me. The cow likely experiences a similar decline.

"So we are looking at several proteins that are absolutely critical for nitrogen retention and recycling in the animals, therefore absolutely critical for milk production," he continued. "We have identified two to them that are reduced about 60 percent to 70 percent in old cows, whether the cows are grazing grass or are fed corn silage We used the grass model because Kentucky's cow-calf production regimens are forage-based. We used the corn silage model because that allowed us to know how much the cows ate, thereby allowing us to demonstrate that the reduced enzyme expression was due to age and not due to differences in feed intake."

These findings led to an interest in whether the reduced expression of these enzymes in old cows could be increased (recovered).

"Previously, in growing steers, we observed that steers receiving estrogen supplementation had increased amounts of one of the enzymes that are reduced in old cows," Matthews said. "So we married the two observations and asked the question: If we give this estrogen supplementation to old cows, would it increase these two enzymes that are down in old cows? The answer was yes it did, for one of the two enzymes."

The next step will be to conduct a whole-animal nitrogen retention trial to see if the increased expression of this enzyme translates to an increased functional capacity, Matthews said. If so, then the third trial will be a lactation trial to determine if an increase in nitrogen retention results in increased milk production and increased weaning weight of the calves. Δ