Cooling Down a Hot Problem

Fescue toxicity has long been a problem for producers who graze endophyte-infected fescue.

by ***Stephanie Veldman***

A seaweed plant found off the coast of Nova Scotia, say researchers, may play a role in reducing endophyte's harmful effects on cattle grazing fescue pastures infected with the fungus.

Since the 1950s, tall fescue has been one of the most widely adapted cool-season pasture grasses in the United States, covering more than 35 million acres. Because it is the only cool-season grass that can persist in many parts of the South, it is heavily used in the southeastern and central United States.

The biggest drawback of grazing tall fescue, especially in the summer when the weather is the hottest, is fescue toxicity, which is caused by an endophyte fungus living in the fescue. Previously, researchers thought that the symptoms associated with infected fescue didn't last long after they were taken off of the pasture, but a Texas Tech professor says that researchers have now discovered otherwise.

"We now have evidence that the length of time those animals express the impact of having been on the infected fescue is longer than we originally thought," says Vivien Allen, Thornton distinguished professor, Texas Tech University.

Know the signs

Researchers estimate that 90%-95% of tall fescue pastures are infected with the endophyte *Neotyphodium coenophialum.* The endophyte, a fungus that lives within the grass, has a symbiotic relationship with the fescue. Although it doesn't harm the grass, it produces toxins harmful to livestock.

Signs of fescue toxicity usually appear more prominently in the summer when the weather is hot, but can be displayed at any time of the year. Allen says that clinical signs can include hyperthermia (elevated body temperature), lower feed intake, rapid breathing, roughened hair coat, weight loss, lower pregnancy rates and decreased milk production.

"Based on research we have done, we have also shown that their innate immune response is definitely affected in a negative way. That is, they have a depressed ability for their phagocytic cells to respond to disease challenges while grazing," says Korinn Saker, assistant professor of large animal clinical sciences at the VA-MD Regional College of Veterinary Medicine, Virginia Tech.

Allen adds that research shows the effects of the fescue toxicity on the cattle's ability to maintain an appropriate body temperature lasted from the pasture phase, all the way through the feedlot, until the cattle were harvested.

"It is restricting their ability to thermoregulate appropriately. Whether their temperature is too high or too low, they can't maintain an optimal body temperature, and it is much longer-lasting than we used to think," Allen says.

A new strategy

Allen has been working with endophyte-infected fescue to find a way to minimize the negative effects on livestock that graze it. About 10 years ago, she began to work with an extract from a brown seaweed that is known to be a good source of cytokinin, which is a plant growth regulator. The seaweed, *Ascophyllum nodosum*, is found off the coast of Nova Scotia and is known to

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►Symptoms of fescue toxicosis include elevated body temperature, reduced feed intake, rapid breathing, roughened hair coat, weight loss, lower pregnancy rates and decreased milk production.

enhance root growth and plant stress tolerance to drought, among other things.

Allen buys a proprietary product derived from the seaweed from Acadian Seaplants Ltd., based in Dartmouth, Nova Scotia. The company produces and markets it commercially, under the name Tasco®, in both a meal and water-soluble extract form.

Allen and graduate student John Fike ran a small trial using different rates of Tasco on endophyte-infected fescue. They found evidence that there were benefits to the animals grazing the Tasco-treated infected fescue.

Allen decided there was enough of a response to run a full-scale grazing trial. The first year the trial was held in Virginia, and she used 48 Angus and Angus-Hereford-cross steers on pastures either treated with Tasco or left untreated. The second and third years, she ran the study on pastures in both Virginia and Mississippi in a collaborative study with Mississippi State University. After the grazing trial, the cattle were transported to a feedlot in Texas to be finished. About 250 head were used in the study during the three-year period.

"We finished the cattle on a conventional feedlot diet, and they had no more exposure to Tasco after they got to Texas," Allen says. "Once they got here, they were handled as commercial cattle, and we looked at the carcass characteristics after harvest. Steers that had grazed the Tasco-treated fescue had more marbling and higher USDA Quality Grades regardless of the endophyte. Meat from these animals had a more desirable cherry-red color as well."

At the end of the three-year study, Allen and Saker found that the seaweed product's antioxidant activity on the fescue plant seemed to translate to an antioxidant effect on the animal. And it seemed to reverse some of the effects of the fescue toxicosis, lowering body temperature and slightly improving hair coat condition.

"It is not a cure for fescue toxicosis, but it is having some very important effects on the etiology of the syndrome and is addressing some of those effects," Allen says. She adds that one of the biggest is the effect on the immune response.

The immune response of the animals that consumed the treated fescue was improved, Saker says. "It was back up to, or even greater than, that of the animals that were fed the endophyte-free fescue."

Saker suggests two things are happening. First there is a likely effect of specific plant antioxidants — superoxide dismutase, which is a copper-containing antioxidant; alpha-tocopherol, a vitamin E precourser; glutathione peroxidase, which acts in concert with vitamin E; and ascorbic acid, which is essentially vitamin C. These antioxidant equivalents in the animal all play a role in the proper functioning of phagocytic cells, which are associated with the innate immune response.

The second thing Saker says she thinks may be happening is an increased utilization of copper by animals grazing the Tasco-treated infected fescue plants. Saker measured the endophyte-infected fescue and found it had a lower copper content compared to the endophyte-free fescue.

"With a copper deficiency, animals have a depressed innate immune response, because copper is an important mineral in regards to cell function," Saker says. "The treatment of the endophyte-infected fescue with the seaweed extract is perhaps improving the availability of copper to these animals as well and allowing improved immune cell function because of adequate levels of copper.

"Additionally, vitamin E and selenium status are altered in cattle consuming the Tasco-treated forage. Both of these trace nutrients are essential in innate immune cell function and protection and are associated with the animal enzyme antioxidant, glutathione peroxidase."

Other benefits of Tasco

Besides a lowered immune response, cattle that graze on infected fescue usually display an elevated body temperature, causing them to seek out shade or mud holes to cool off in, instead of grazing and gaining weight.

Rick Evans, research coordinator at the Prairie Research Unit of the North Mississippi Research and Extension Center, has been studying the body temperature differences between cattle grazing infected fescue with a mineral supplement and cattle grazing infected fescue with a mineral supplement containing a 10% Tasco treatment.

Evans says cattle fed the mineral supplement containing 10% Tasco had body temperatures averaging a half a degree lower than cattle that were on the same minerals without the Tasco. They also checked the calves, and found their body temperatures were 0.7 of a degree lower if they were on the Tasco and mineral supplement, rather than the minerals alone.

Evans has been working on feeding trials with Land O' Lakes Farmland Feed LLC, Kansas City, Mo. Dan Colling, Land O' Lakes beef nutritionist, says producers who have been feeding the Tasco mineral supplement have noted a difference.

"They just can't believe the addition of Tasco to the mineral program would be that dramatic to get the cattle to come out of their ponds," Colling says.

Colling says they have been working with several universities to conduct studies using the Tasco treatments. Consistent in every

study was the temperature decrease in the cattle fed the Tasco mineral supplement.

"We've seen heat tolerance increase on fescue, and the amazing thing is that what Rick Evans saw two years in a row matches what we saw in eastern Oklahoma on all different classes of livestock. As far as fescue goes, you are going to get a half a degree or more lower body temperature," Colling says. "If the cattle aren't hot, they are more comfortable, and they can eat more."

Looking toward the future

Colling says he believes the Tasco mineral supplement will be cost-effective. Currently, he estimates the price to be between $2.50 and $3 per head for the season.

Colling and Evans plan to work together in the future to further evaluate the product. Colling says they are working on additional projects right now. One study is testing the quality of colostrum and immune systems in newborn calves.

"Rick is going to start feeding it before cows calve to see if we can affect the quality of the colostrum, so we can see if the calves have a stronger immunity transferred from the colostrum," Colling said. "We have indications there is value, and we have some other indications that it helps with reproduction, but we don't know why — again, whether it is immune stimulation or whether it's some of the antioxidant effects that we've measured."

Evans and Colling have another goal — to figure out the amounts of Tasco necessary for maximum results on stressed cattle.

"We don't know what the optimal amount of the Tasco is yet," Evans says. "I know that we can feed too much, and large amounts on stressed cattle are not good."

When cattle are grazing endophyte-infected fescue, they are always stressed in the summertime, Colling says, "so we feel confident in putting it in our minerals and saying 'Hey, this is what you need to do.' We even put it on our feed tag — it is 10% of the mineral — 200 pounds (lb.) per ton in this mineral, because we don't want anybody using any less than that right now."

Colling says they are in the process of deciding how to market the Tasco and mineral supplement in the southern United States, as well as in the Midwest.

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►The cow on the right is muddy because she has been standing in water to cool herself. Some genetic lines appear to be more susceptible to fescue toxicosis, while others (the cow on the left, for instance) are more resistant to its effects.

Managing fescue

Vivien Allen, Texas Tech University, says producers have a number of other options to manage cattle grazing infected fescue. The first option, she says, is to simply remove the infected stand and replant with either noninfected fescue or other grasses. This option solves the problems the livestock have, but it could create new ones for the producer, including finding a viable forage system that doesn't include using fescue.

"[Producers] might also deliberately plant the normal endophyte-infected plant, because you are in a stressful environment to the point that endophyte-free fescue isn't going to survive," Allen says. "One of the things we've learned is that the region of adaptation for fescue changed when you took the endophyte out, and it did not extend as far out as it did formerly. Recent research with novel endophytes has promise for retaining plant stress tolerance while eliminating the animal problems."

Allen adds that there are a few other options that producers can use, including planting a legume in the pasture with the fescue.

Another strategy a producer can use is controlling the time of year cattle graze the infected fescue. "We know the middle of the summer, when it is very hot and stressful, is one of the worst times. ... So if you can design your system and have animals off fescue and on something else at that point, and then use the fescue when the temperature is lower, that can help alleviate it as well," Allen says.

►One management strategy to help reduce the effects of endophyte on grazing animals is to plant a legume within the fescue stand.