

Why is Intake Reduced When Cattle are Fed Tall Fescue?

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The Problem

A major problem for the cattle producer that utilizes tall fescue forage is the unrealized or reduced gains in body weight in growing animals. This result has been reproduced across numerous studies evaluating cattle performance on tall fescue (Hoveland et al., 1983; Boling, 1985; Schmidt et al., 1986; Goetsch et al., 1987). Cattle have gained from 30 to 100% less consuming toxic endophyte-infected tall fescue compared to consumption of an endophyte-free tall fescue (Paterson et al., 1995). This effect of reduced gain is a consequence of a fungal endophyte present within the grass that produces toxins called ergot alkaloids. Fungal production of these toxins benefits the grass and fungus by causing a decrease in intake and has likely evolved as a strategy to prevent over grazing by cattle and other livestock. Not surprisingly, grazing time is reduced high endophyte-infected tall fescue pastures compared to pastures with low infection levels (Bond et al., 1984). The forage quality of endophyte-infected compared to endophyte-free tall fescues are similar, suggesting that the ergot alkaloids are responsible for the drop in weight gain (Burns, 2009). An understanding of how ergot alkaloids cause the observed decreased weight gain in cattle will permit the development of strategies aimed at mitigating or alleviating this source of loss.

The Question

Is the problem of reduced growth solely a consequence of reduced intake in affected animals? Other factors that could be contributing to the reduced growth besides intake are effects ergot alkaloids have on the digestion and absorption of nutrients.

The Research

A major challenge in conducting research directed at understanding the effects of ergot alkaloids is the associated decrease in intake in animals consuming tall fescue containing ergot alkaloids. This results in an inconsistent application of the ergot alkaloid treatment and often leaves one wondering if the observations made were a result of the ergot alkaloids or an effect of the decreased intake. To better understand the problem, intake of feed needed to be separated from the intake of ergot alkaloids.

To accomplish this, a series of studies (Koontz et al., 2012; Foote et al., 2013; Koontz et al., 2013; Koontz et al., 2015) were conducted that used steers that were ruminally cannulated to permit the application of a specific quantity of ergot alkaloids directly into the rumen (with ground Kentucky 31 tall fescue seed or a seed extract). By controlling intake researchers could directly focus on the effects that ingestion of ergot alkaloids cause without being masked by declines in intake. Findings from these experiments showed that consumption of ergot alkaloids caused decreased metabolism (Koontz et al., 2013) indicating that cattle exposed endophyte-infected tall fescue were, if anything, more efficient in terms of their metabolism. Further, the consumption of ergot alkaloids did not negatively effect the overall energy balance or digestion of feed (Koontz et al., 2015). Inclusion of ergot alkaloids did; however, cause a large reduction in blood flow to the stomachs of steers (Foote et al., 2013) and decreased particulate passage of gut contents (Koontz et al., 2015).

These observations signified a general decrease in digestive function as related to nutrient absorption. In all of these studies a consistent observation that was made was the increased percentage of rumen dry matter contents observed in steers receiving ergot alkaloids. Visually, looking through the cannula into the rumen of steer dosed with an ergot alkaloid-containing seed or extract it was evident that these steers were full. Voluntary intake of forages by ruminants can be limited by gut fill caused by restricted flow of contents through the digestive tract (Allen, 1996). Based on these observations and the previously mentioned findings, it was concluded that cattle gain less on toxic endophyte-infected tall fescue pastures simply because they eat less. Decreased feed intake is responsible for the decreases in weight gain associated with fescue toxicosis. Although simple sounding, this conclusion has resulted in a shift in the focus of current research to better understand the decrease in intake in animals suffering from fescue toxicosis.

The New Questions

If cattle gain less because they eat less, then what is driving the decline in intake? Cattle suffering from fescue toxicosis are also more susceptible to heat stress. Heat stress can also suppress intake, but it does not completely account for the total decrease in intake and observed gut fill associated with ergot alkaloid consumption (Koontz et al., 2012). Ongoing research is looking at the effects that ergot alkaloids may have on the motility of the cattle foregut to possibly explain the observed increase in gut contents (Egert et al., 2014). In addition to gut motility, there is research looking at the effects ergot alkaloids have on rumen microbial populations and associated fermentation of feedstuffs as another explanation for increased fill to explain the decrease in intake.

Until these questions are clearly answered, how do you know that your cattle are at an optimal intake? If cattle intake is suboptimal because of ergot alkaloids, how do you know that this is occurring if the animal is not overtly exhibiting signs of fescue toxicosis? Much of what can be done is related to routine assessment of your herd and is easier to accomplish with a managed grazing strategy like rotational grazing. Key signs to watch for are observable changes in body condition, or noticing individuals that are not grazing when the rest of the herd is actively grazing. If feasible, measurements such as periodic body weight assessment will allow weight gains to be calculated as well as monitoring changes in forage mass with respect to grazing will provide an idea of forage intake. If consumption of tall fescue forage or hay is suspected to be causing a decrease in intake, mitigation strategies, such as supplementing with a co-product feed (Carter et al., 2010)(e.g. - soyhulls or distillers grains) or inclusion of a legume in the pasture have been shown to boost the plane of nutrition and in the case of red clover can offset some of the negative effects of ergot alkaloids (Aiken et al., 2016).

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