

# Beef Session I

Cow-Calf/Feedlot Combined

Fescue Toxicity Syndrome

Dr. Phil Hays, *Presiding*

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## Fescue Toxicity—An Overview

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Tall fescue (*Festuca arundinacea* Schreb.) is the most important cool-season grass grown in the United States providing the primary ground cover on approximately 35 million acres. It is a versatile plant used for livestock feed, lawns, turf and conservation purposes, and is adapted to a wide range of soil and climatic conditions. Tall fescue is relatively easy to establish, persistent, relatively free of disease and insect pests, produces high dry matter yields when properly fertilized and compares favorably to many other cool-season grasses when analyzed chemically. Despite all the many positive attributes of this grass, animal performance on Kentucky 31 has been erratic and oftentimes less than desired by producers and researchers.

### Historical Developments

Two events approximately 42 years apart were truly historical occurrences that led to the discovery of Kentucky 31 tall fescue and provided the key for our present knowledge of the endophyte-fescue-animal relationship.

The first important event occurred in the fall of 1931 in Menifee County, Kentucky when Dr. E. N. Fergus from the University of Kentucky Agronomy Department visited the W. M. Suiter farm and observed this tall fescue ecotype. From the original pound of seed taken from the Suiter farm, Dr. Fergus and colleagues at the University of Kentucky tested the grass in many locations in Kentucky. The variety was released in 1942 as the Kentucky 31 variety. From that original pound of seed, this variety now occupies approximately 35 million acres.

This new grass which had so many advantages was not without its shortcomings. These shortcomings became evident as tall fescue came into general farm use. The first shortcoming observed was that of relatively low palatability. Another was "something" which **occasionally** led to lameness of cattle grazing tall fescue, especially during fall

and winter, on pure stands which has been grown for seed. Although this disorder (fescue foot) was a serious problem during the post soil-bank days, when we consider the number of acres and the number of cattle grazing tall fescue, it is not a serious problem at present. Another problem that has received considerable attention has been referred to as "fat necrosis." Fat necrosis is defined as the presence of masses of hard or necrotic fat primarily in the adipose tissue of the abdominal cavity. Although this disorder has not been a problem throughout the fescue growing area, it has on occasion been a problem in some areas of the south and has been associated with cattle grazing tall fescue pastures heavily fertilized with broiler litter. The third category of disorders has been associated with reduced animal performance of cattle grazing tall fescue, especially during summer.

"Summer syndrome," "summer slump," "fescue toxicity" and "fescue toxicosis" are terms which have been widely used to denote poor animal performance by cattle grazing tall fescue during summer. Characteristic of this condition is reduced feed intake, decreased rate of gain and/or milk production, rough hair coat, rapid breathing, increased body temperature and a generally unthrifty condition.

Almost 42 years after Dr. Fergus made his historical farm visit in Kentucky, another farm visit made history. In June 1973, Dr. Joe Robbins, U.S.D.A., Athens, Georgia visited the farm of Mr. A. E. Hays, Mansfield, Georgia. During Dr. Robbins visit, he observed fescue pasture being grazed by two separate herds of cattle. One herd exhibited many of the signs associated with summer syndrome, while cattle in the adjacent pasture appeared healthy with no summer syndrome signs. During the next three years, Dr. Robbins and colleague Dr. C. W. Bacon examined pastures on the Hays farm in search of a causative agent of summer syndrome. In 1976, plants from the toxic pasture were found to be 100% infected with an endophyte fungus while plants

from the non-toxic pasture were less than 10% infected with the endophyte. This association marked a major breakthrough in the fescue-endophyte-summer syndrome relationship. Immediately, samples from research programs in Kentucky, Maryland, Alabama, Missouri and Virginia were analyzed for endophyte content. Samples from each state showed toxic pastures to be highly infected with the endophyte while non-toxic pastures were less than 50% infected.

“Fescue fungus,” “endophyte,” “fungal endophyte,” and “fescue endophyte” have all been used to denote the organism in question. Endo (within) + phyte (plant) means a plant that lives within another plant. In this case, the plant is a fungus (*Epichloe typhina*, recently renamed *Acremonium coenophialum*) that lives within tall fescue. Regardless of terminology used, it is generally accepted that we are all dealing with the same organism which will henceforth be referred to in this paper as the endophyte.

### Animal Response

Studies with animals consuming fescue containing the endophyte have shown the following animal responses: (1) lower feed intake; (2) lower weight gains; (3) lower milk production; (4) higher respiration rate; (5) higher rectal temperatures; (6) increased water consumption; (7) rough hair coat; (8) more time spent in shade; (9) excessive salivation; (10) greater urine volume; (11) reduced prolactin level; (12) reduced reproductive performance; and (13) nervousness. Some or all of these responses have been observed in numerous studies in dairy cattle, beef cattle and sheep consuming endophyte-infected pasture, green chop, hay and/or seed.

Although all of the above responses are important, feed intake, weight gains, milk production and conception are of particular significance. University of Kentucky research conducted by Drs. R. Hemken, J. Boling and colleagues revealed a 39% reduction in forage intake and a 37% decrease in milk production during summer in lactating dairy cows consuming endophyte-infected fescue. In addition, cows consuming endophyte-infected fescue lost weight, while animals consuming non-infected fescue gained weight.

Similar results have been found in grazing studies with beef cattle. Initial grazing studies at Auburn University (C. Hoveland, et. al.) showed an increase in beef production of 185 pounds per acre with a 0.83 lb. increase in average daily gain (ADG) with endophyte-free fescue compared to endophyte-infected fescue. Additional studies at Auburn University and University of Kentucky have confirmed these early findings. Workers at the University of Kentucky (N.

Gay, et. al.) showed ADG for animals grazing fescue containing high levels of endophyte to be 0.81 lbs/day while animals consuming fescue containing low levels of endophyte gained 1.37 lbs/day. More recent studies (J. Boling, et. al., 1983, University of Kentucky) showed 0.55 lbs/day increase in ADG of animals grazing low-endophyte KY 31 compared to infected KY 31. In the same study, Johnstone (a newly released low-endophyte variety) resulted in a 0.97 lbs/day increase in ADG over endophyte-infected KY 31. Animals grazing endophyte-infected fescue showed typical “summer syndrome” symptoms while animals grazing low-endophyte fescue remained healthy. Additional studies from Kentucky, Alabama, Missouri, Texas, Tennessee, North Carolina, and Maryland have shown similar responses. Several other states have research in progress. Studies at Auburn University and University of Kentucky have shown increased daily gains, intake, and lower body temperatures of steers consuming endophyte free seed or hay when compared to endophyte-infected seed or hay.

Additional work is needed to determine how the endophyte affects reproductive performance. Work in Kentucky by Gay, et. al. (1984), using beef cows, showed a 26% increase in conception rates with cows grazing endophyte-free compared to highly infected fescue pastures. Work in Missouri during 1985 showed a 36% increase in conception rate with low-endophyte Kentucky 31 compared to highly infected Kentucky 31.

### Endophyte Distribution

Surveys from states within the fescue region show that over 90% of the tall fescue pasture and hay fields sampled contain the endophyte. Of states that have conducted surveys to determine level of infection, results show that most fescue fields are infected with high levels of the endophyte. Nesmith and colleagues from the University of Kentucky (1985) reported 83% of fields sampled in Kentucky contained over 50% infection with 53% of the fields over 80% infected. Results from Illinois during 1985 showed an average level of infection of 78.2%. From these and other surveys, it appears that the majority of the 35 million acres currently dominated by Kentucky 31 are infected with the endophyte and that the level of infection is high in most pastures. Data is not sufficient to establish a relationship between level of infection and animal performance among animal species and classes. Data from Auburn, Missouri and Kentucky with growing beef animals, suggest that for every 10% increase in endophyte level, a reduction of 0.1 pound A.D.G. is possible.