

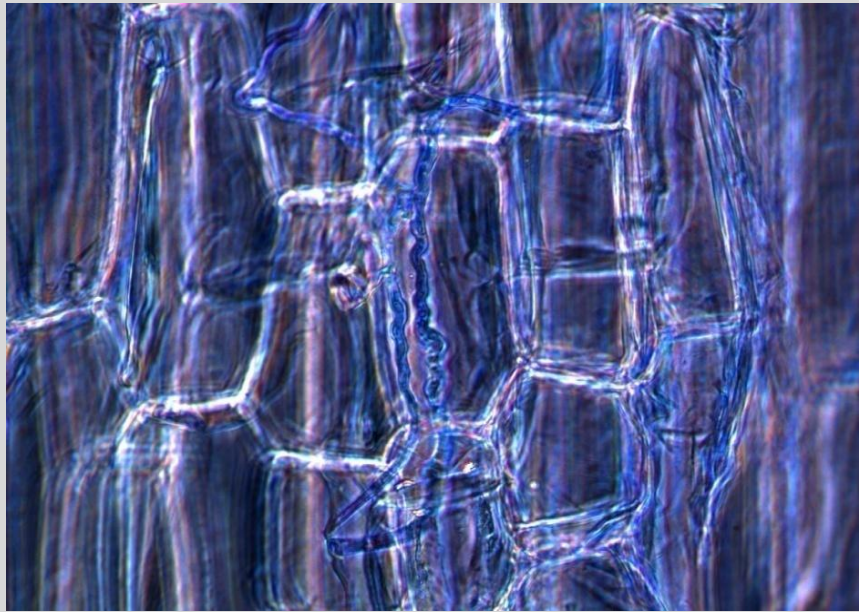


**United States Department of Agriculture
Agricultural Research Service**

**Management practices to mitigate
the adverse physiology in livestock
that are exposed to ergopeptides**

Glen Aiken

**USDA-ARS Forage-Animal Production Research Unit
Lexington, KY**



An *Epichloa* endophyte that infects ‘Kentucky-31’ tall fescue produces alkaloids that impart tolerances to environmental stresses, but also produces ergot alkaloids that can cause a toxicosis in grazing livestock

Signs of Fescue toxicosis

- **Reduced reproductive performance and milk production.**
- **Maintain rough hair coats during the summer.**
- **Core body temperatures are elevated.**
- **Dry matter intake is reduced**
- **Weight gains and thriftiness are low**

Adverse physiology caused by ergot alkaloids

Ergot alkaloids bind to:

- **α -adrenergic receptors to mediate vasoconstriction of the vasculature.**

As much as 50% reduction of blood flow to the skin to hinder thermo-regulation, and to the GI tract to reduce nutrient efficiency.

- **D₂ receptors of the anterior pituitary to reduce secretion of prolactin.**

Consistently low prolactin, and reductions in progesterone and thyroid hormones have been documented.

Fescue Foot

Why the high incidence in cold weather?



Provided by the Missouri Cooperative Extension Service

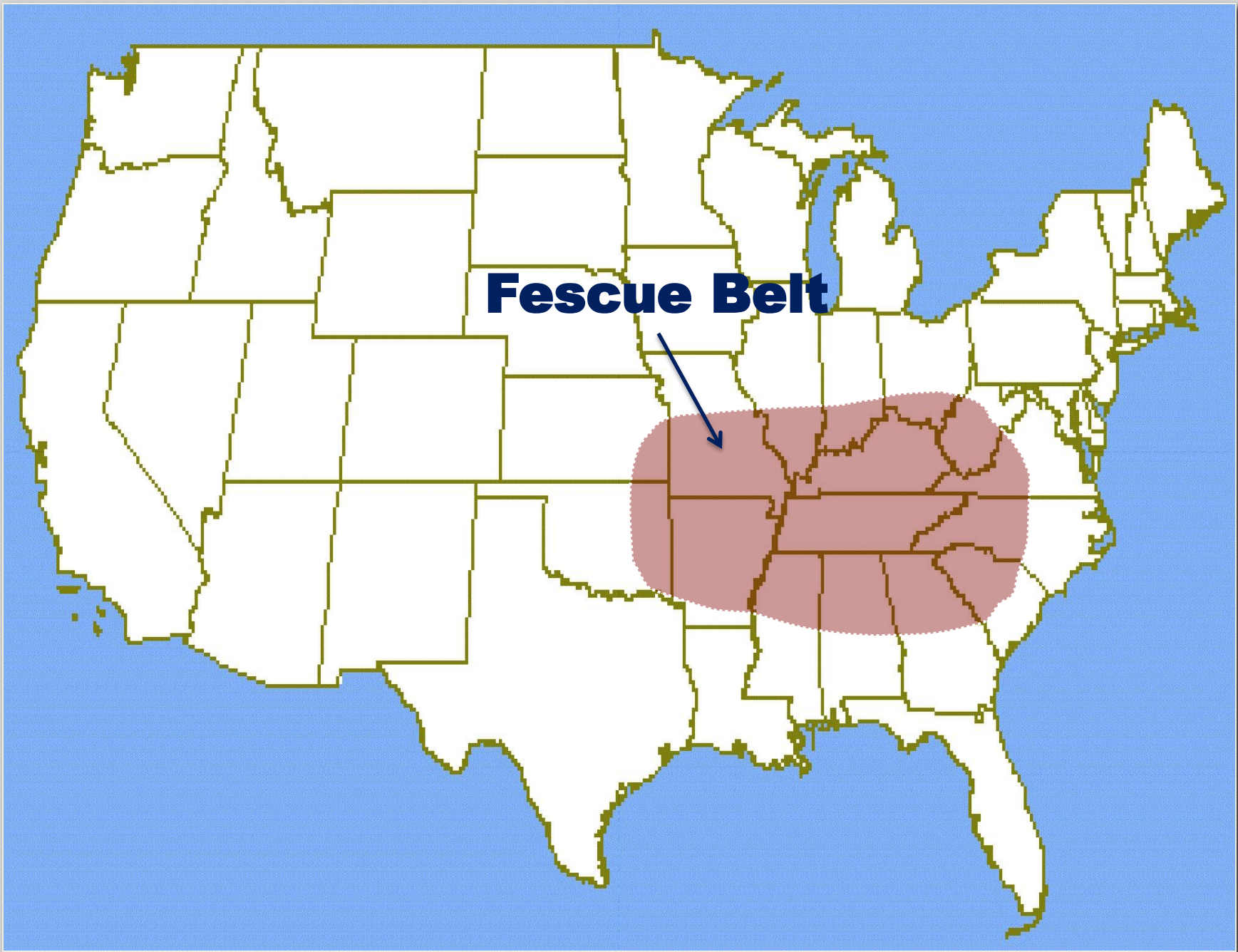


B Provided by the University of Sidney

Abdominal Fat Necrosis



**Fescue toxicosis costs the
U.S. beef industry over
1 billion dollars per year.**

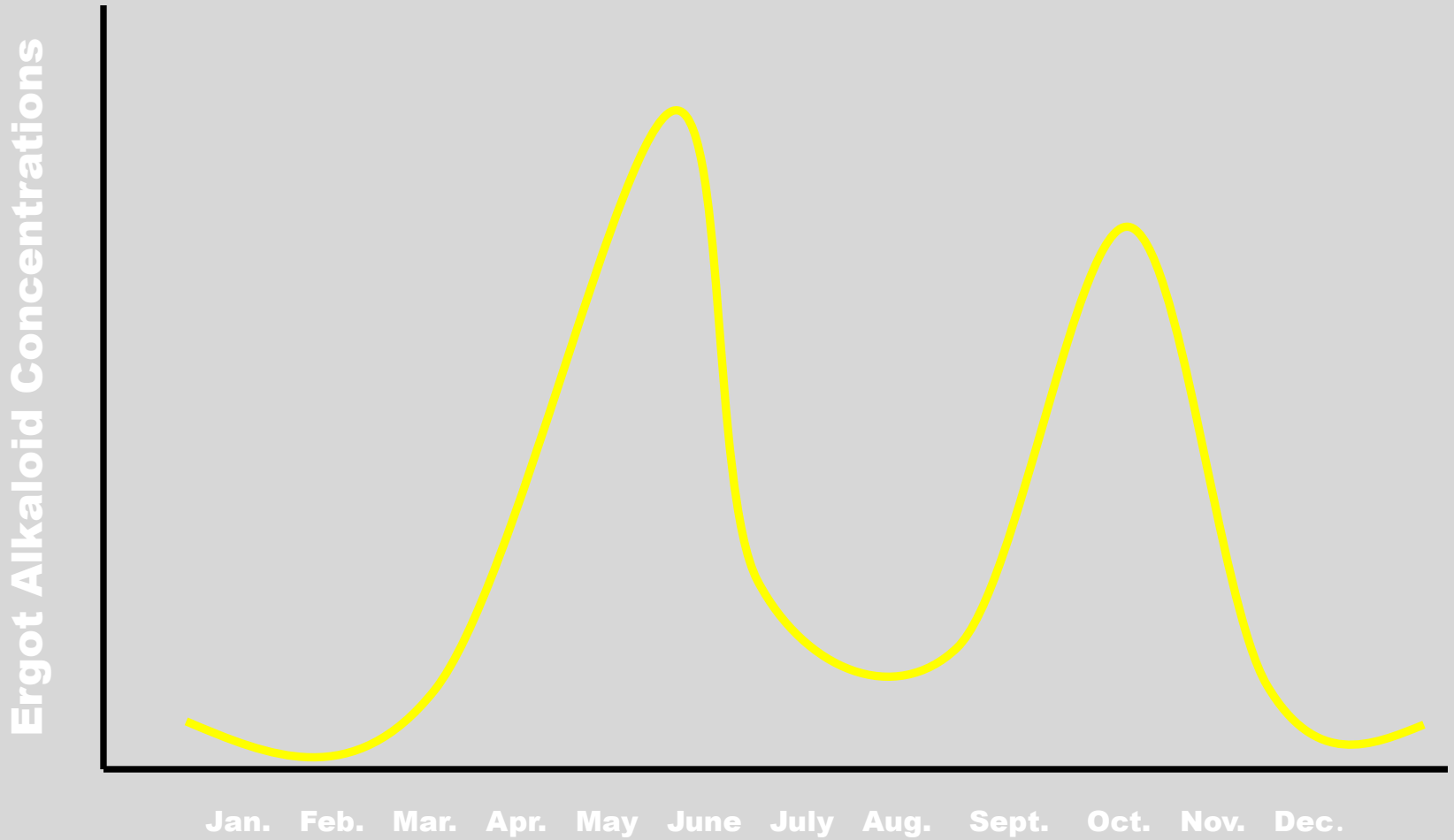


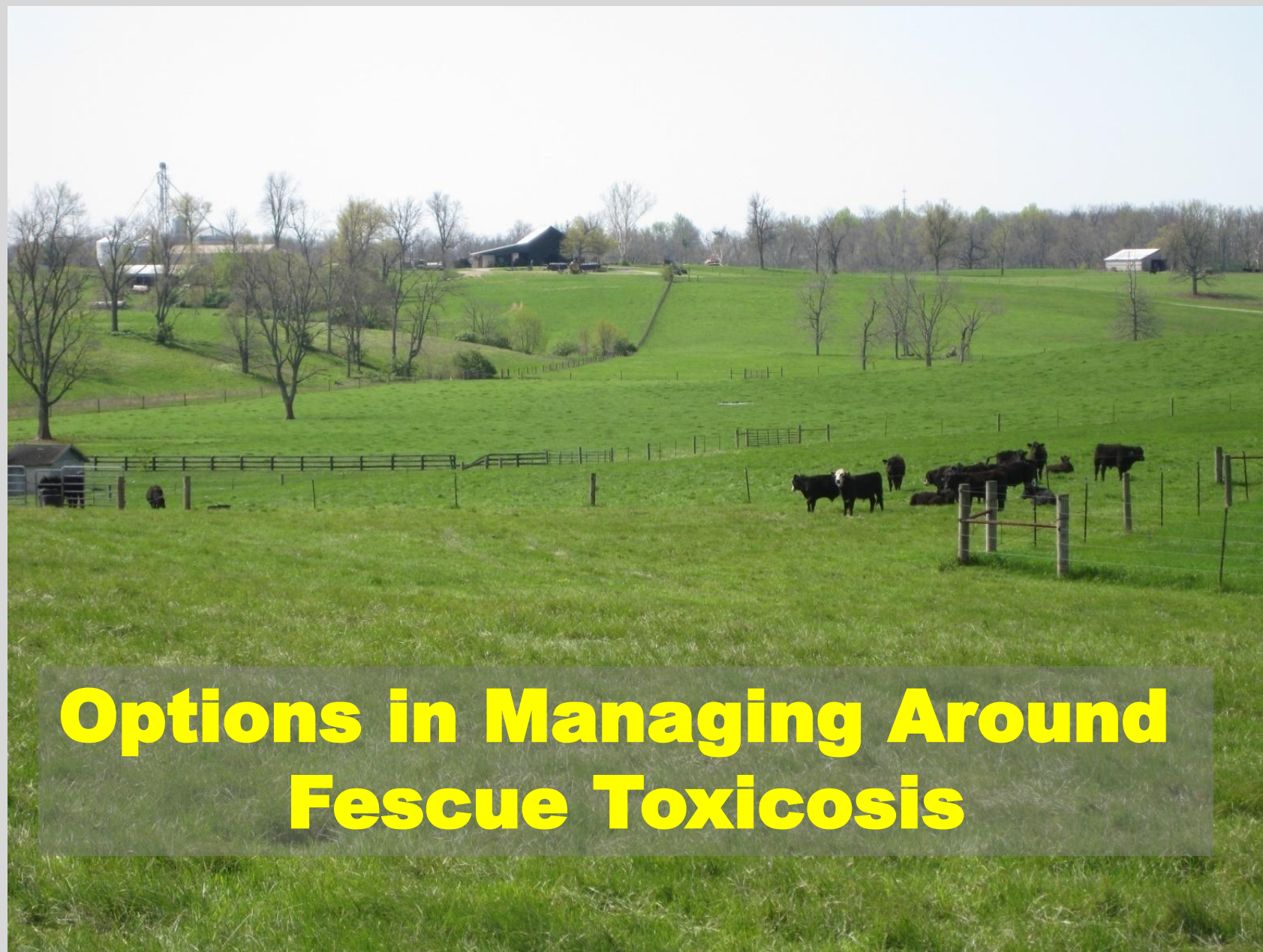
Fescue Belt

Extent of Ergot alkaloid toxicity depends on:

- **Plant reproduction development:**
 - **Rottinghaus et al. (1991) determined ergot alkaloid concentrations in plant parts rank in order of:
leaf blade, leaf sheath, stems, seed heads**
- **Plant growth rate:**
 - **Soil fertility**
 - **Air temperature**
 - **Season**

Seasonal Trends in Ergot Alkaloid Concentrations in Tall Fescue





Options in Managing Around Fescue Toxicosis



Option 1
Feed co-product feeds or inter-seed
clovers to increase cattle
performance and reduce the
severity of toxicosis.

Two-year grazing trial with steers grazing toxic endophyte-infected tall fescue evaluated effects of feeding pelleted soybean hulls combined with ear implants on mitigation or alleviation of fescue toxicosis

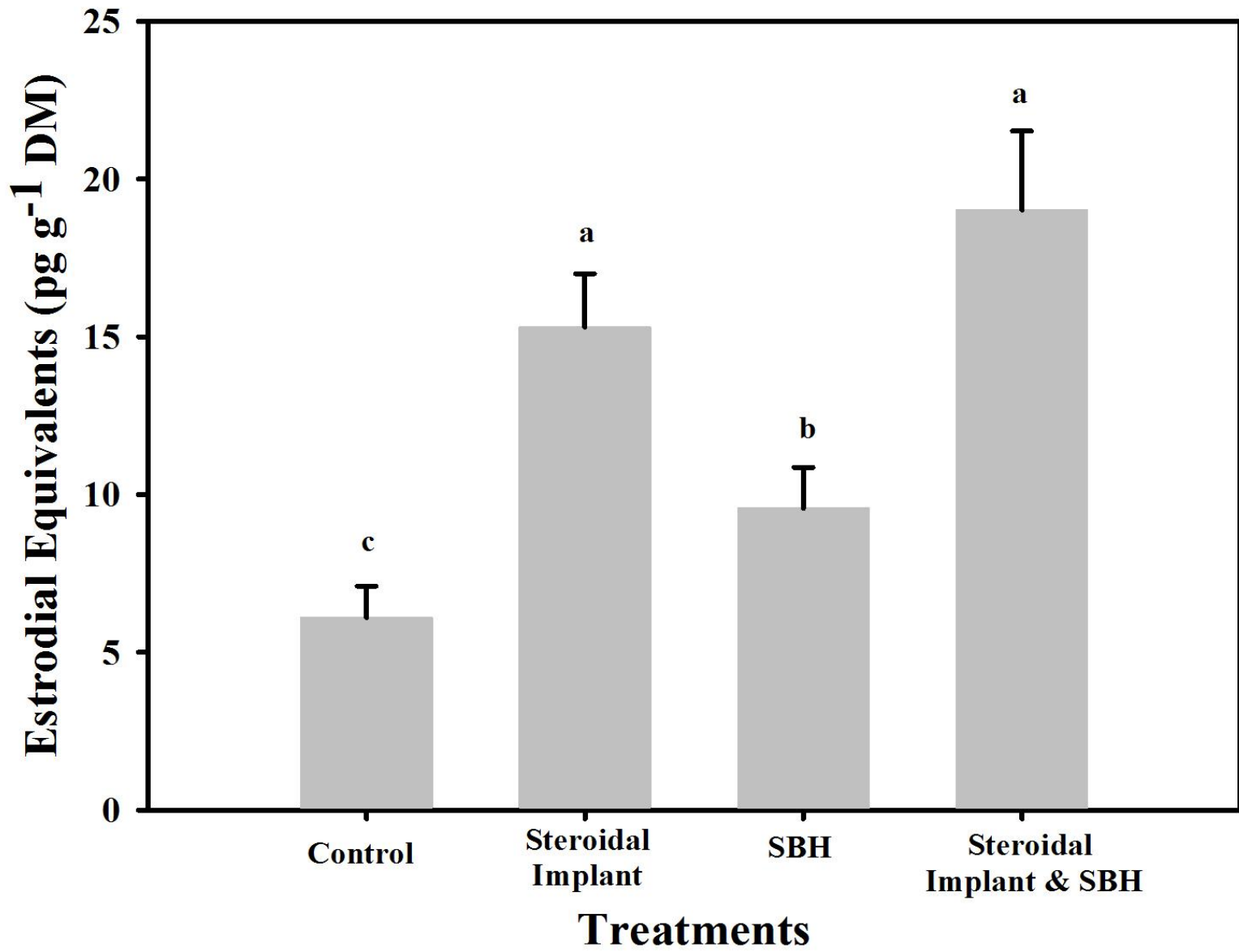


Steers fed Soybean hulls had:

- **32 percent greater daily weight gain than controls without ear implantation and 70 percent greater daily weight gain with ear implantation.**
- **Greater incidence of shedding rough hair coats**
- **2-fold greater serum prolactin than controls**

We concluded that ergot alkaloids were deluded in the the diets, but... we are now speculating that isoflavones in the soybean hulls could have been a mitigating factor through their potential function as beta-agonists.

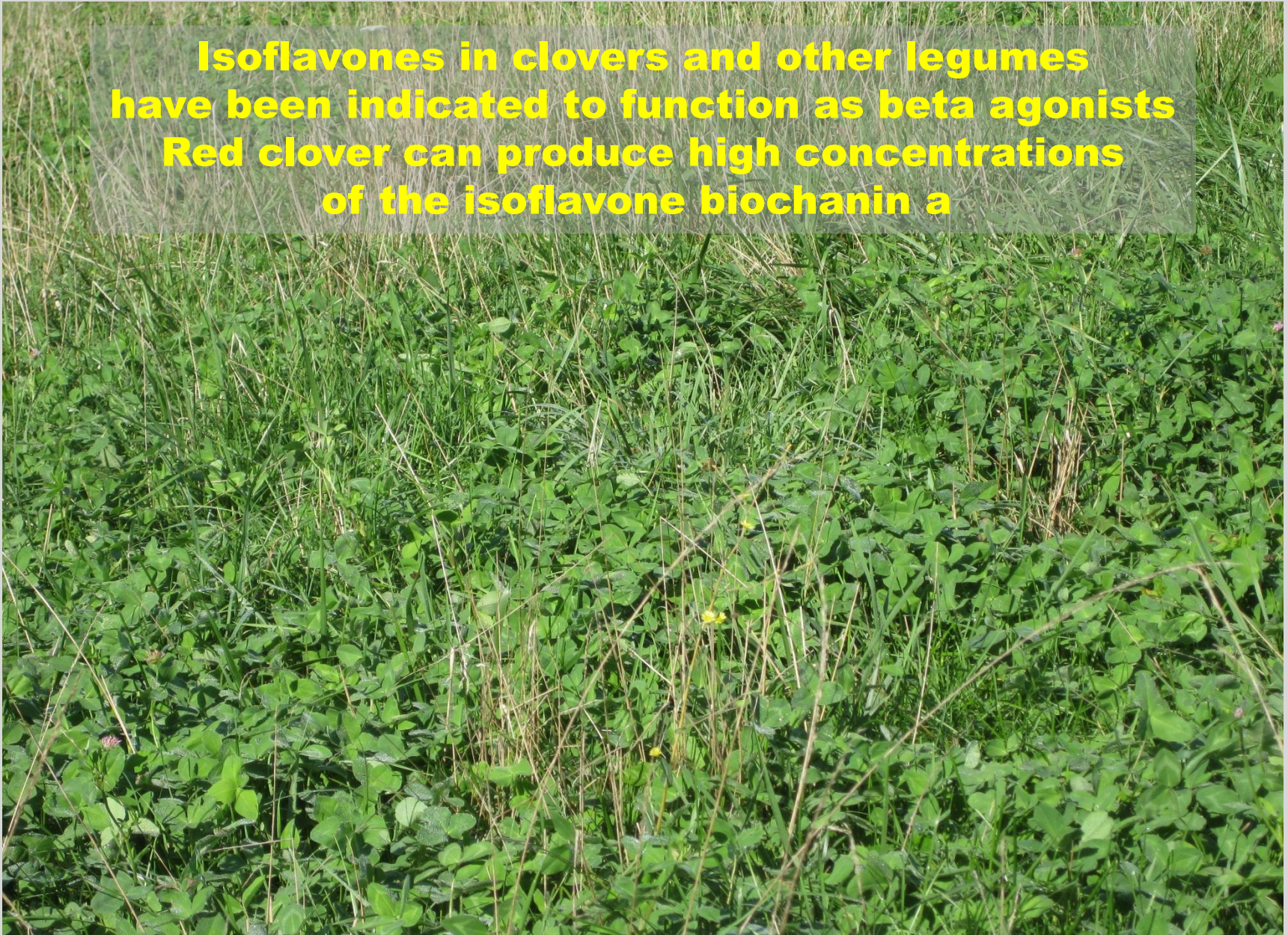
Shappell et al. 2015

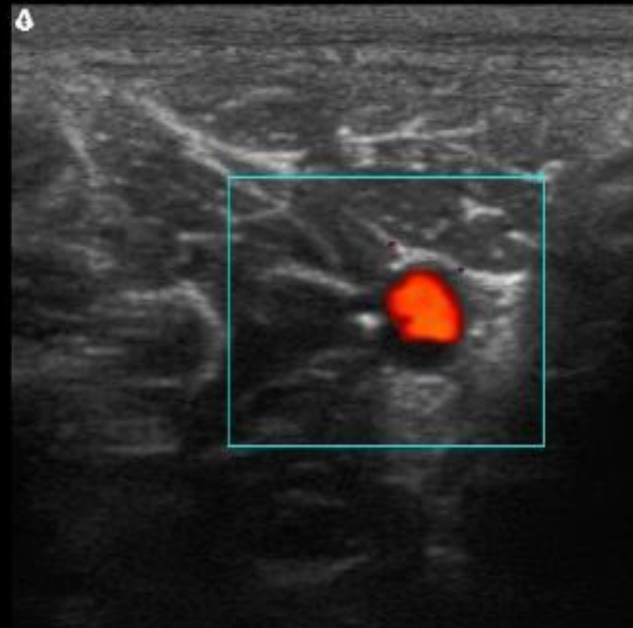


What about clovers?

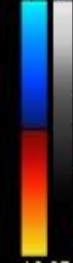


**Isoflavones in clovers and other legumes
have been indicated to function as beta agonists
Red clover can produce high concentrations
of the isoflavone biochanin a**





19.37



19.37

12L5_Vet
E/4/D/M/TV2

3 cm

Color

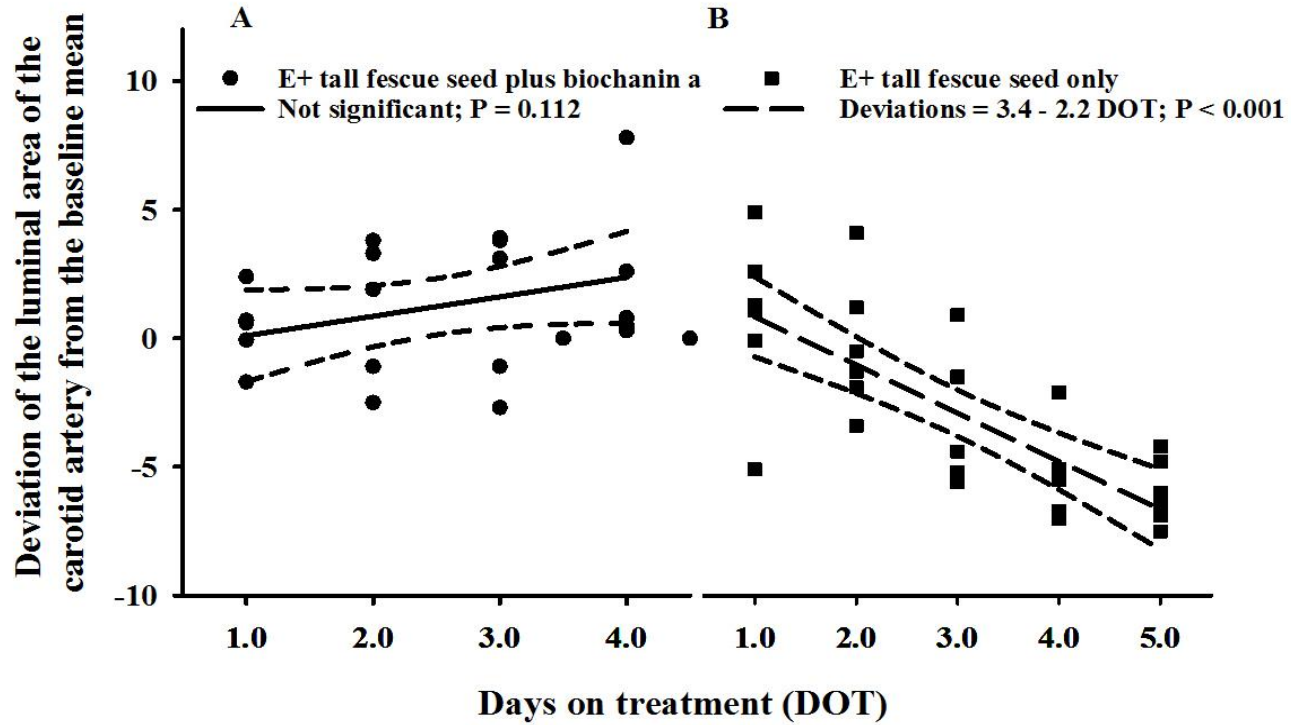
PRF 3.00kHz

WF 50Hz

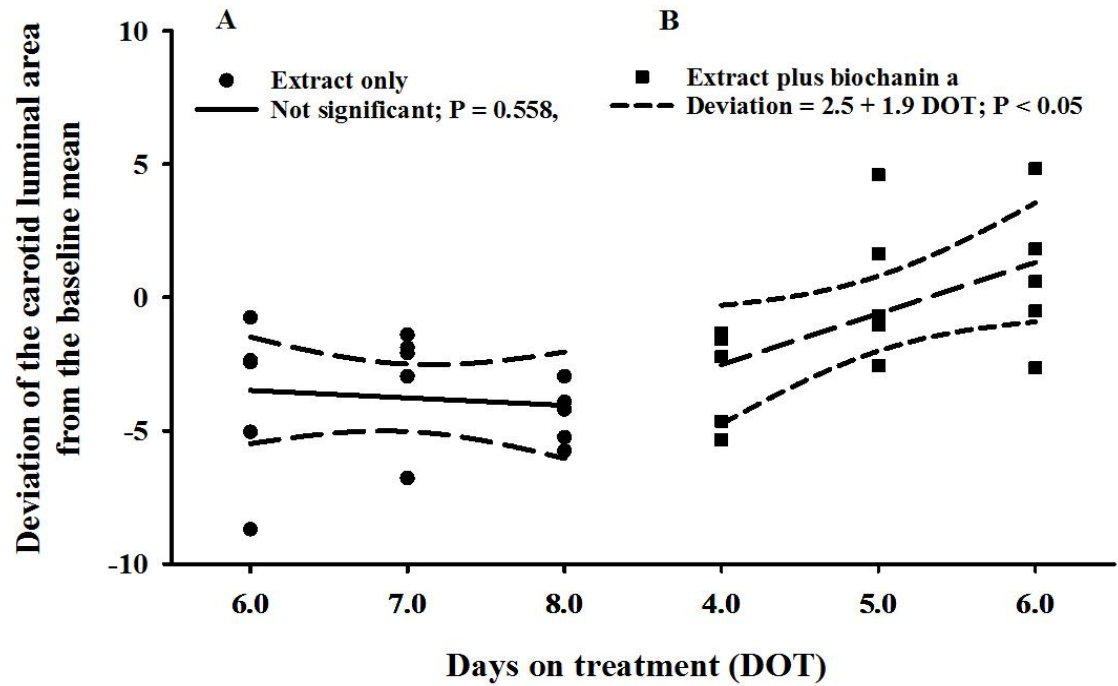
Freq 6.0MHz

**Cross-sections of the common carotid
of wether goats using color Doppler ultrasonography
for assessing alkaloid-induced vasoconstriction**

Experiment 1



Experiment 2





Option 3

Replace toxic endophyte-infected tall fescue with non-toxic, novel endophyte-infected tall fescue

Percentage Increase in Average Daily Gain with Novel Endophyte Fescue Relative to Wild-Type Endophyte Fescue

Class	State	NE/Cultivar	% Increase
Steers	GA	AR542/Jesup	+152
Suckling calves	GA	AR542/Jesup	+17
Postpartum cows	GA	AR542/Jesup	+142
Steers	AR	Strain 4/HiMag	+58
Heifers	GA	AR542/Jesup	+40
Steers	KY	AR584/9301	+29

Can novel endophyte-infected tall fescue persist?



**THE COMMITTEE ON
PERSISTENCE IS
NO LONGER OUT!!**

**Novel endophyte tall fescues
can persist under
*good grazing management***

Option 4 Managing seed heads





Seed heads of tall fescue can be mowed or chemically suppressed to increase cattle performance and reduce the severity of toxicosis



Metsulfuran

**Active ingredient in
Chaparral (Dow
AgroScience) herbicide
that suppresses seed
head emergence of tall
fescue**

**2-fold greater prolactin in blood serum
of steers grazing seed head suppressed fescue**

	Serum prolactin
	ng/mL
With Chaparral	100
Without Chaparral	47



Treated



Untreated

Maintaining vegetative fescue stands Can boost forage quality

**Leaf blades on tillers sampled
in Chaparral treated pastures had
16% greater crude protein and
11% greater in vitro DM digestibility
than those in untreated pastures.**

**Research indicates that
treating toxic tall
fescue with Chaparral
herbicide can increase
forage quality and
alleviate consumption
of highly toxic seed
heads.**

Summary

Fescue toxicosis can be alleviated by:

- **Replacing Kentucky 31 tall fescue with a non-toxic endophyte tall fescue.**

Fescue toxicosis can be mitigated by:

- **Feeding soybean hulls at approximately 1% of BW or by overseeding with red clover or other legumes.**
- **Chemically suppressing seed head emergence to maintain fescue in a vegetative growth stage and alleviate very toxic seed heads as a dietary source of ergot alkaloids.**



Questions