Managing with tall fescue(?)

Fescue toxicities and what can be done to minimize the effects

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- Know the problem - Sampling for E+ and alkaloids
- Fertility
- Hay vs silage, hay timing (bale saving)
- WSG, silvo
- Supplements, New product
- Stockpiling and N sources
- Replacement
  - Keeping W+ seed out and NE+ grass in
- Animal selection
- Animal mgmt – selection, breeding season, where do those animals go after grazing, maintaining some exposure
- MAP A WHOLE FARM PLAN

What is fescue toxicosis?

- Bovine fat necrosis
- Fescue foot
- Summer slump

Fescue foot and fat necrosis

Often accompanied by sudden environmental or dietary changes

Summer slump

Elevated body temps force cattle to spend a lot of time in or near water

Fescue Toxicosis Symptoms

Health

- Vasoconstriction (narrowing of blood vessels)
- Rough hair coat
  - Elevated core body temperature
  - Higher respiration rates

Production

- Reduced feed intake, weight gain, milk yield
- Reduced reproductive success
- Reduced birth and weaning weights
- Dystocia (difficulty birthing), thickened placentas (equids)

Environment

- Stream/bank degradation - more time in shade / water

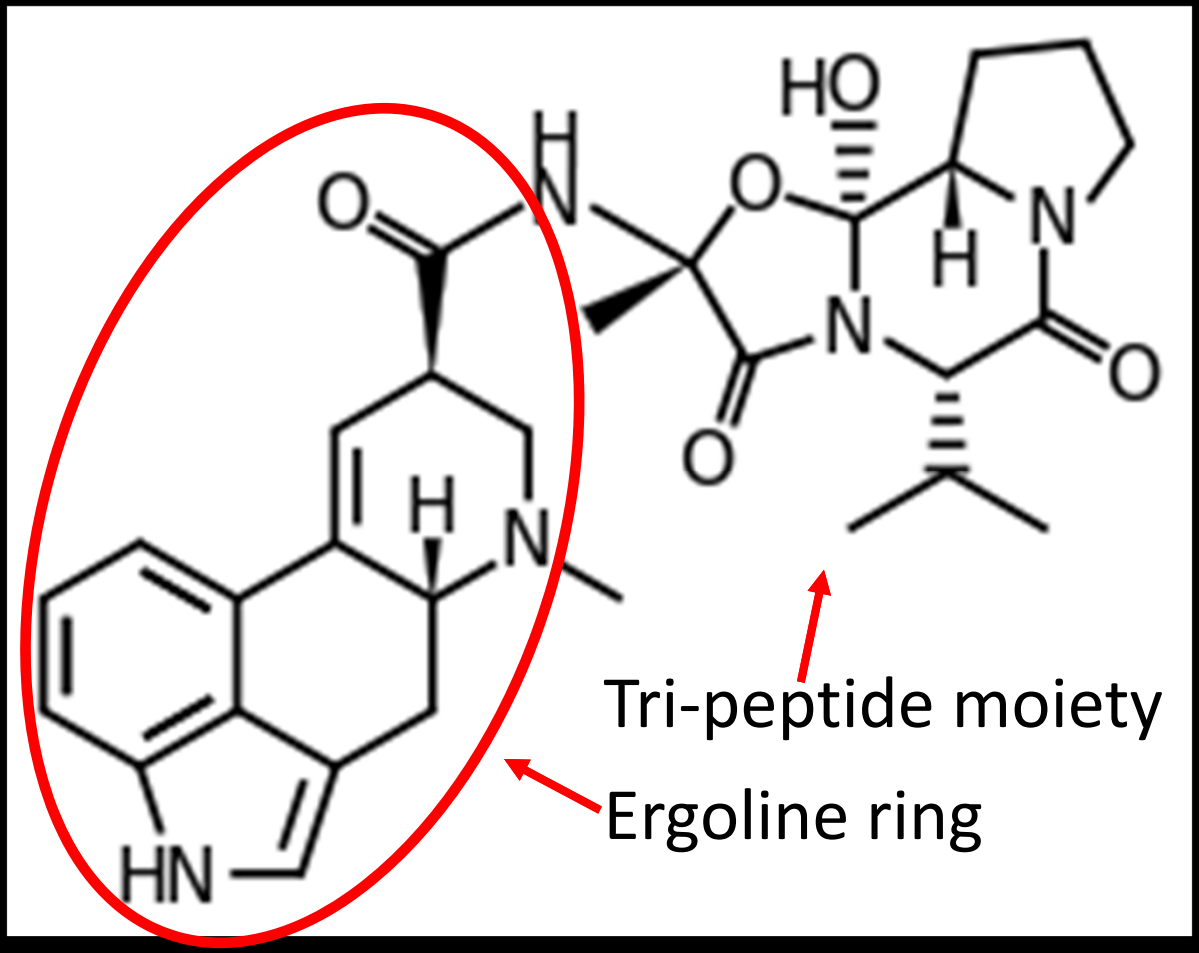
What's this mean in real terms?

Effect of fescue toxicosis on beef cattle performance when 70% or more of a pasture contains infected plants.

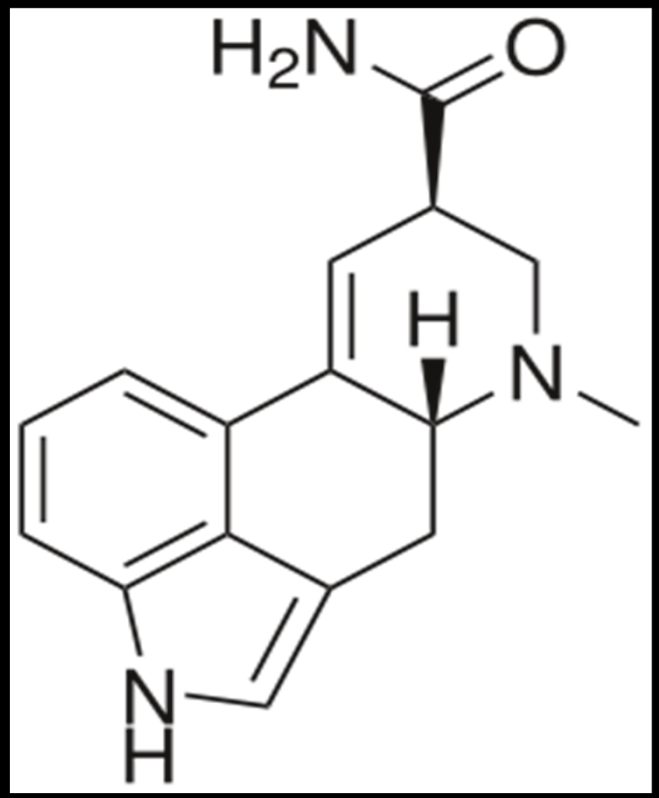
Performance Metric	Effect on Production	
Pregnancy rates	Decreased	15-40%
Milk production	Decreased	25%
Weaning weights	Decreased	65- 85lbs
Time spent grazing	Decreased	20%
Forage intake	Decreased	25-40%
Average daily gain	Decreased	0.3-1.2 lbs/day
Water usage	Increased	25%
Body temperature	Increased	1-4°F

†Paterson et.al, 1994

What's driving this? Ergot alkaloids



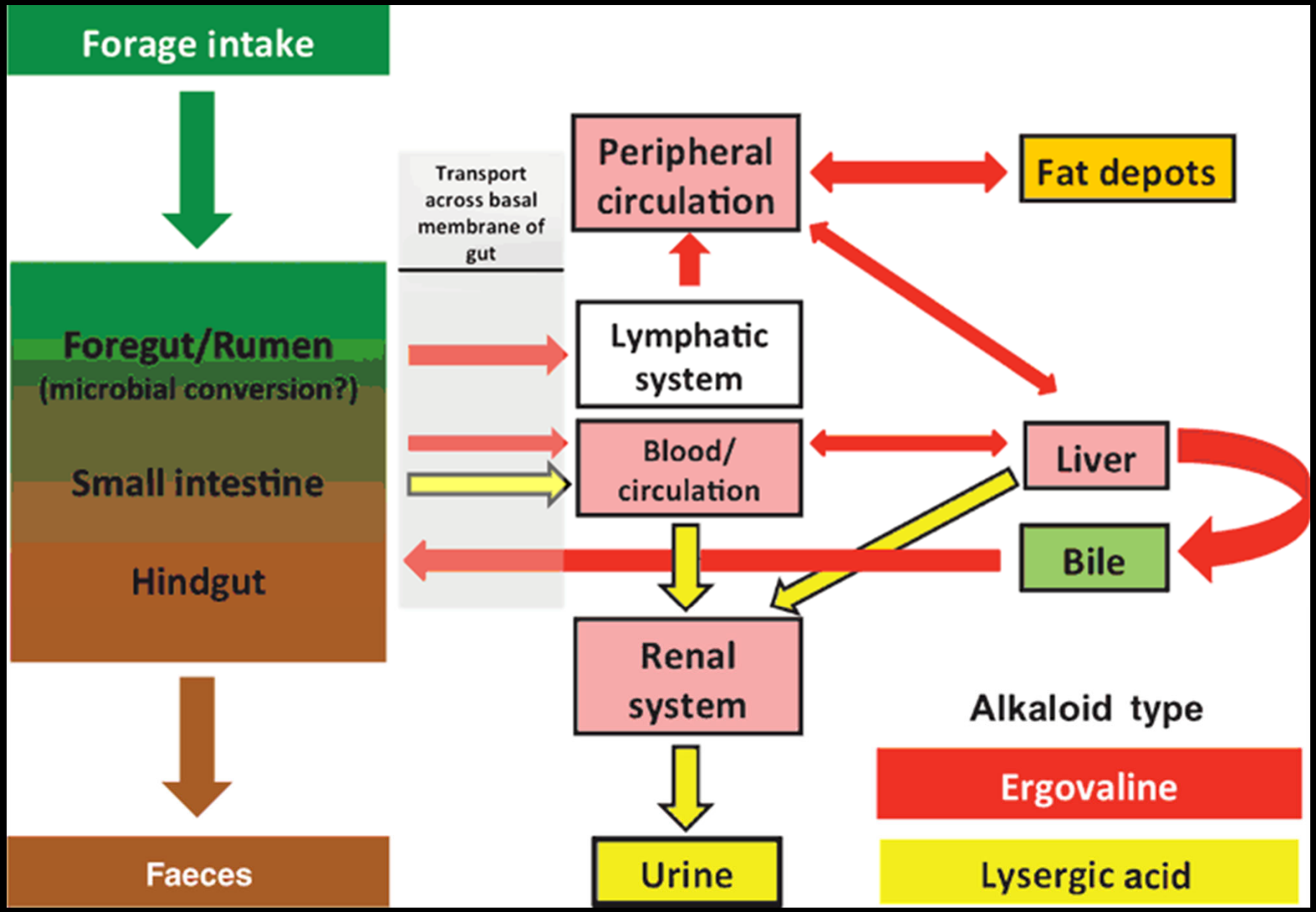
Ergovaline



Lysergic acid amide

Lysergic acid diethylamide

Points of entry into ruminants?



Klotz and Nicol, 2016

So how does this affect the beef cow?

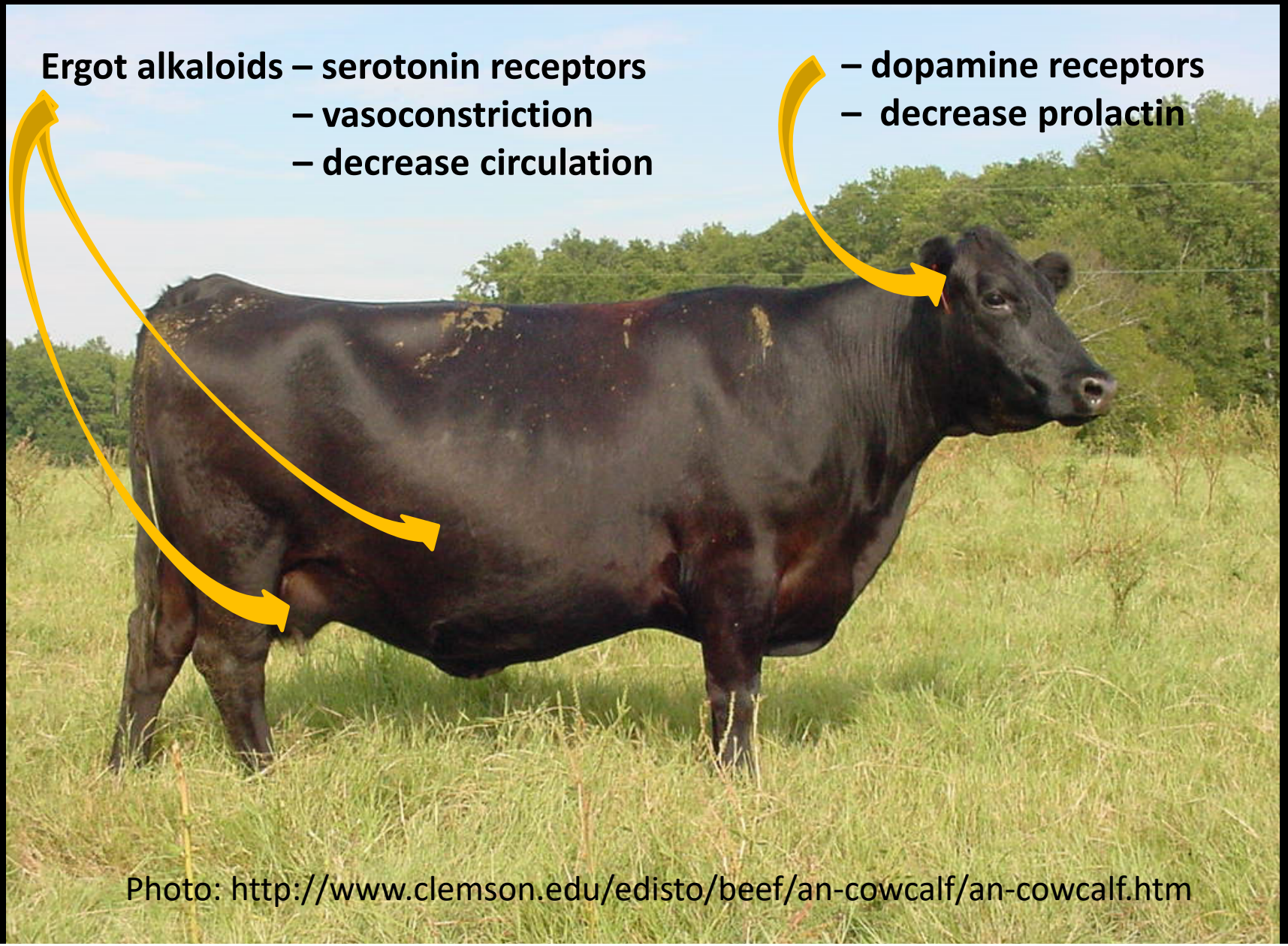


Photo: http://www.clemson.edu/edisto/beef/an-cowcalf/an-cowcalf.htm

Addiction (definition from Wikipedia)

… a state characterized by compulsive engagement in rewarding stimuli, despite adverse consequences…..a disease or biological process leading to such behaviors.

All addictive stimuli characterized by being:

- (Positively) reinforcing (i.e., increased likelihood of repeated use/exposure
- Intrinsically rewarding (i.e., they activate the brain's "reward pathways", and are therefore perceived as being something positive or desirable)

Addiction exacts a high toll on individuals and society as a whole through the direct adverse effects of drugs and associated healthcare costs… and the loss of productivity.

Two putative addictions in fescue systems

1. Cattle exhibit addiction to fescue alkaloids(?)
   - I love watching cattle when they enter a new paddock. *If it is a sward dominated by mature fescue they eagerly graze seedheads first*, the same way I might eat ice cream first if I didn't have 55 years of training that dessert is always the last course of the meal. (Darn you, Mom!) http://www.fullsirclefarms.com/a-cows-natural-diet

Maybe, maybe not!

Addictions in fescue systems

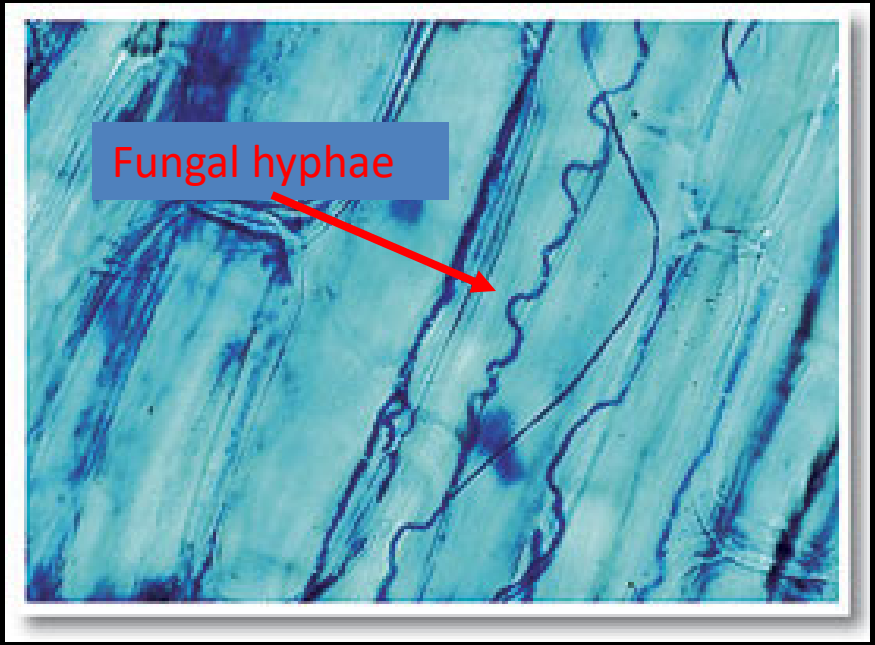
2. Producers exhibit addiction to fescue!

- We like, keep using because it's persistent
  - Drought
  - Flood
  - Poor nutrition
  - Abuse (overgrazing) tolerant
  - Lowers management requirements
- Excellent for stockpiling
  - But what percent are stockpiling?

Tall fescue

Endophytes and alkaloids

- Endophytes – fungi “within the plant”
  - Convey agronomic benefit
- Alkaloids – toxins produced by “wild type” endophytes
  - Good growing conditions support higher alkaloid concentrations
  - Prolactin greatly depressed by alkaloids
  - Circulation inhibited by alkaloids



Do I have a problem?

For many people struggling with addiction, the biggest and toughest step toward recovery is the very first one: deciding to make a change

Overcoming Drug Addiction
http://www.helpguide.org/articles/addiction/overcoming-drug-addiction.htm

Shenandoah Valley Survey

Booher and Benner, 2013

Endophyte Infection Levels in the Shenandoah Valley

- 2013: Tested 26 pastures in Rockingham, Augusta, & Rockbridge
- Collectively, the farms sampled represent about 10,000 animals

Results

- 65% of pastures were 100% infected
- 30% of pastures were 80-90% infected
- Lowest infection rate (1 pasture) was 50%

Management Options

- Keep it and make no changes

CONSIDER SAMPLING PASTURES….

- Keep it and work with it
- Get rid of it / Manage without

- Count costs before continuing

Management Considerations

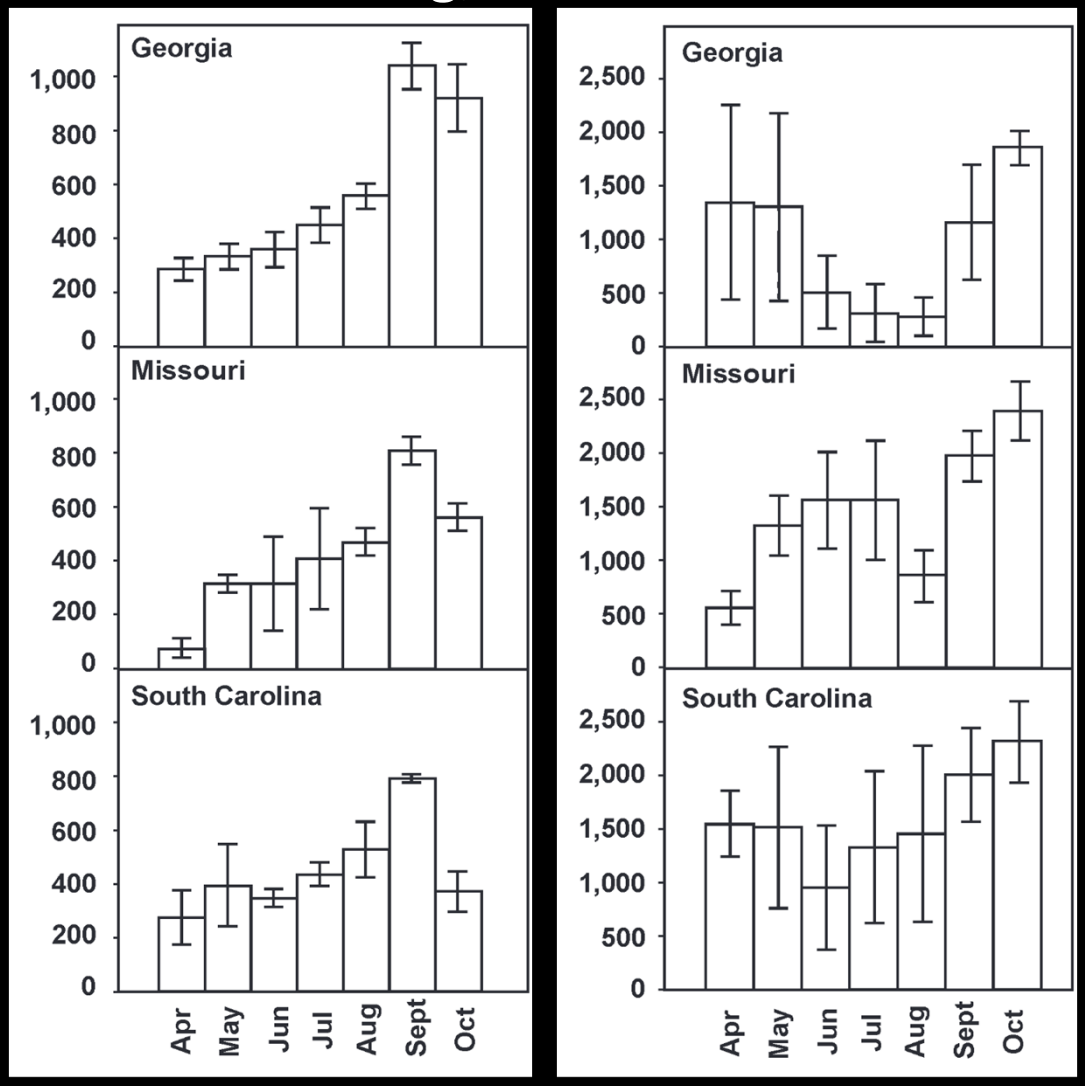
- Time until sale or retirement?
- Land control (own/long-term lease)?
- Profit center?
  - Fall calves?
  - Bred heifers?
  - Bulls?
- What is a reasonable replacement threshold?

Managing with wildtype endophytes

- Plant development
- Fertility
- Conservation method and harvest timing
- Dilution (within fields) and supplements
- Warm season grasses (among fields)
- Stockpiling
- Shade
- Fall calving

Plant growth drives alkaloid levels

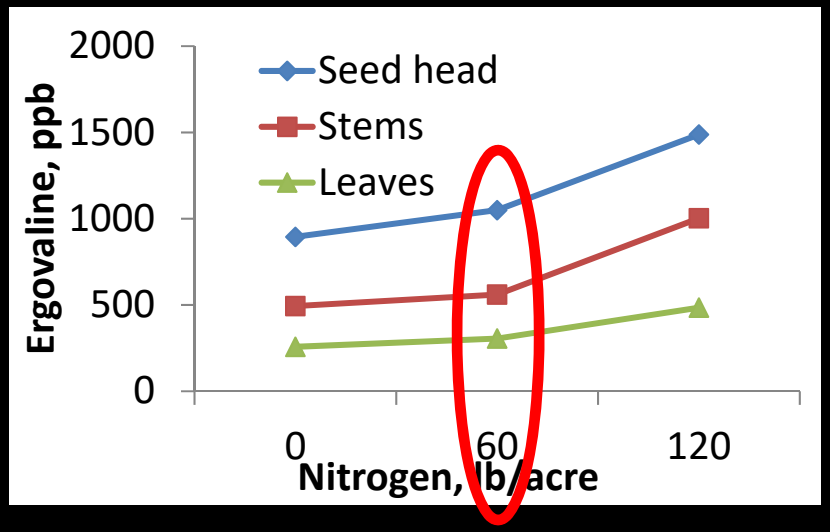
Alkaloid levels in regrowth



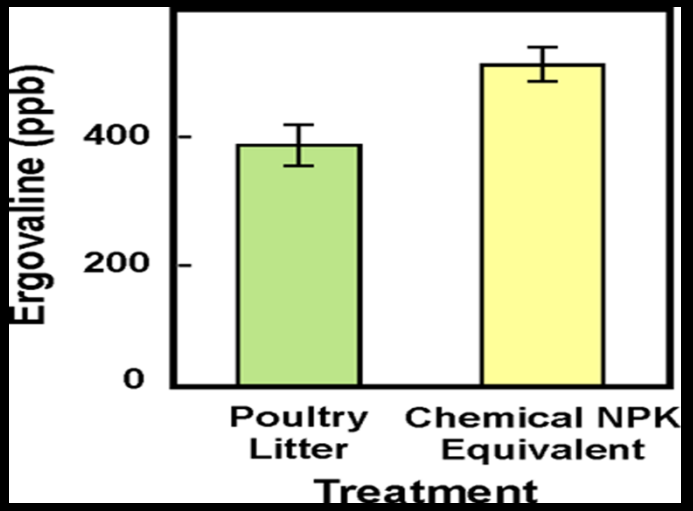
Managing with wildtype endophytes

Fertility management

- Distribute N or minimize spring applications
- Use alternative N sources when possible



Ergovaline in response to N rate

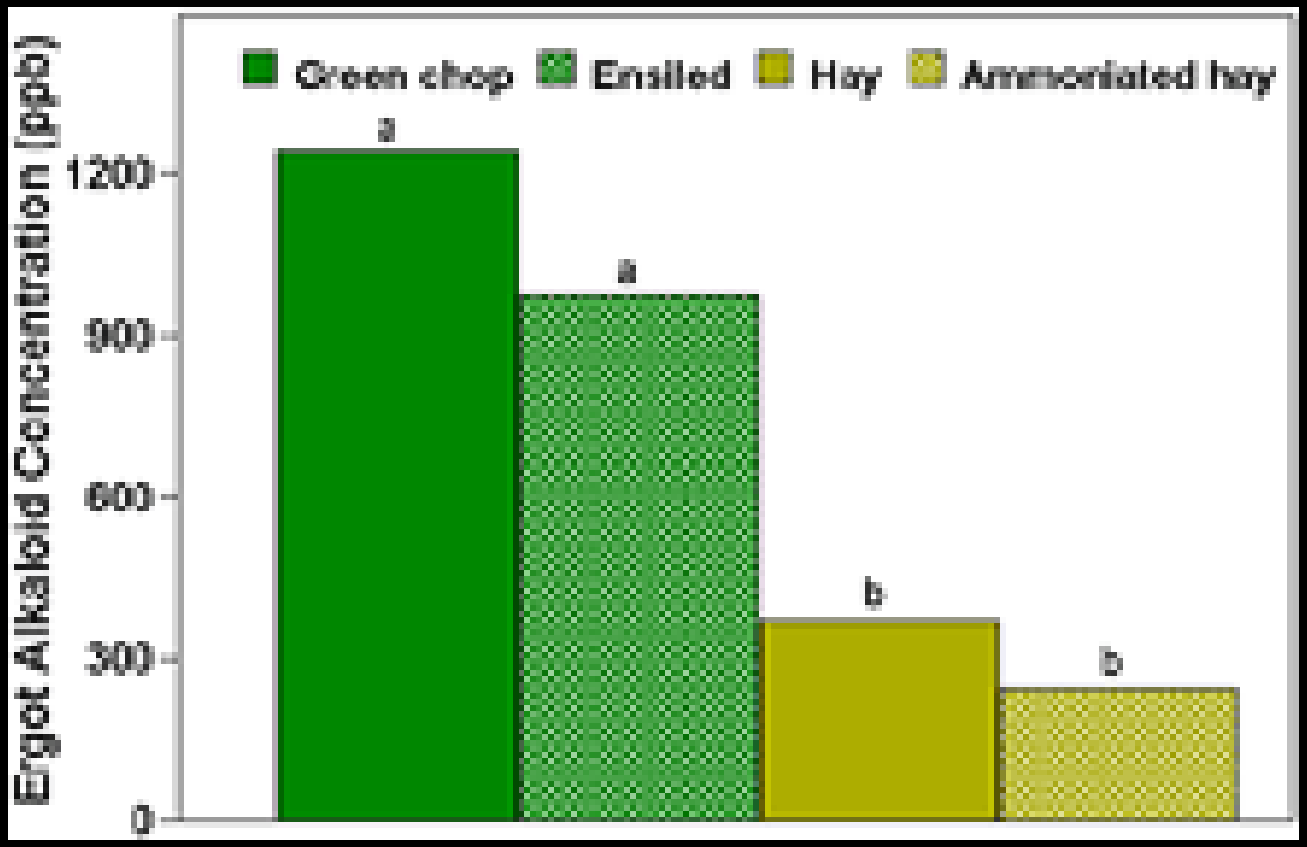


Ergovaline in response to fert source

Managing with wildtype endophytes

Harvest management

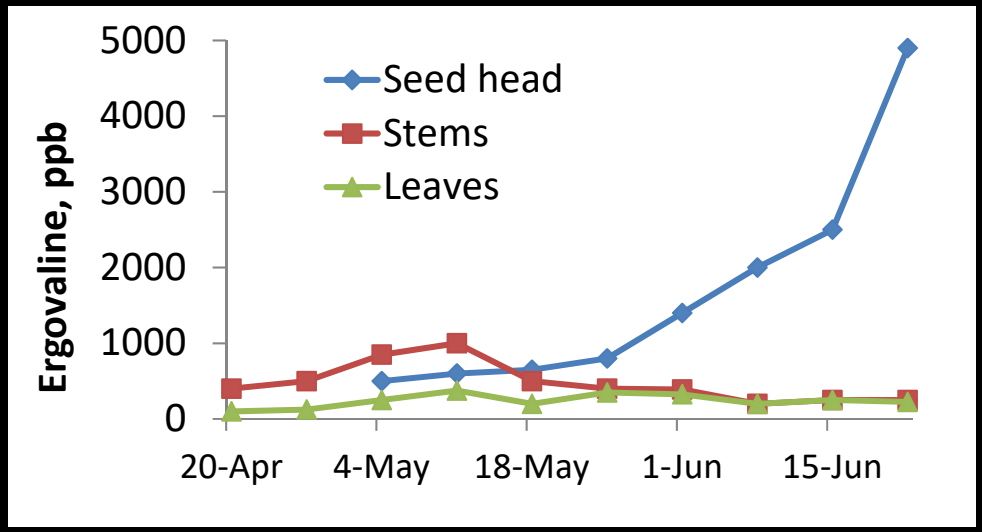
- Don’t make baleage
- Make hay at boot state (before going to seed)



Total alkaloids in response to harvest method (Roberts et al.)

Managing with wildtype endophytes

Suppress seedhead development



Ergovaline in plant parts over time

Can use -

- grazing management
  - closer in spring
  - summer stockpile
- clipping
- chemical control

Use heavy grazing pressure in spring

Effect of Seedhead Suppression on Weaning Weights and Breed-Back of Brangus Cattle

Chaparral™ SPECIALTY HERBICIDE

Location	205 Day Adjusted Weaning Wt.			Cow Pregnancy Rates	
	Chaparral Treated	Non-suppressed	difference	Chaparral Treated	Non-suppressed
Farm 1	473 lbs	418 lbs	**+55lbs**	95%	80%
Farm 2	483 lbs	463 lbs	**+20lbs**	95%	70%
†Farm 3	476 lbs	459 lbs	**+17lbs**	Equal at 91%	

†Heavy spring grazing on treated and untreated paddocks resulted in seedhead suppression through grazing, thus the non-treated paddock behaved similarly to the suppressed paddock.

Is dilution the solution?

White clover (or supplements)

ADG

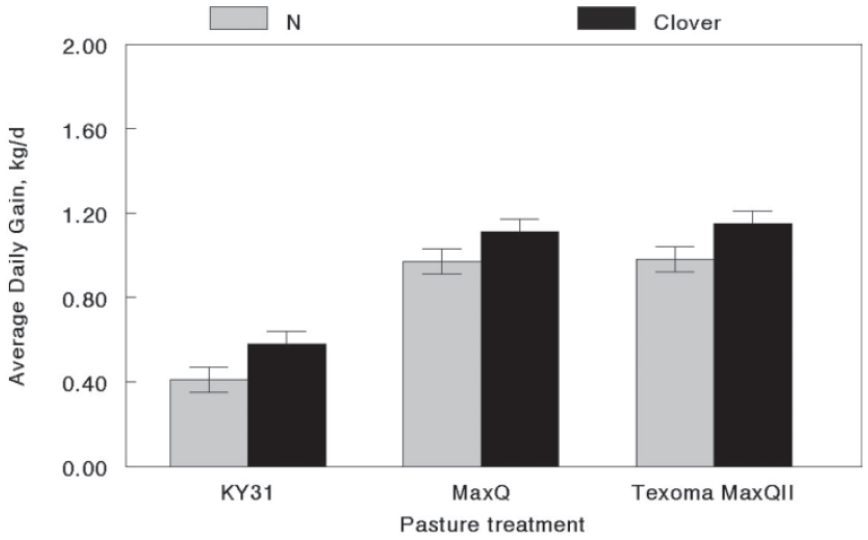


Figure 1. Effect of white clover (CL) or N fertilization on ADG of steers grazing toxic endophyte- (KY31) or nontoxic endophyte- (MaxQ and Texoma MaxQII) infected tall fescue. The lack of significant fescue type × CL interaction ($P = 0.26$) indicates that improved performance of steers with white CL addition to pasture is additive with performance improvements with nontoxic endophyte tall fescue.

Beck et al., 2012

Gain/ha

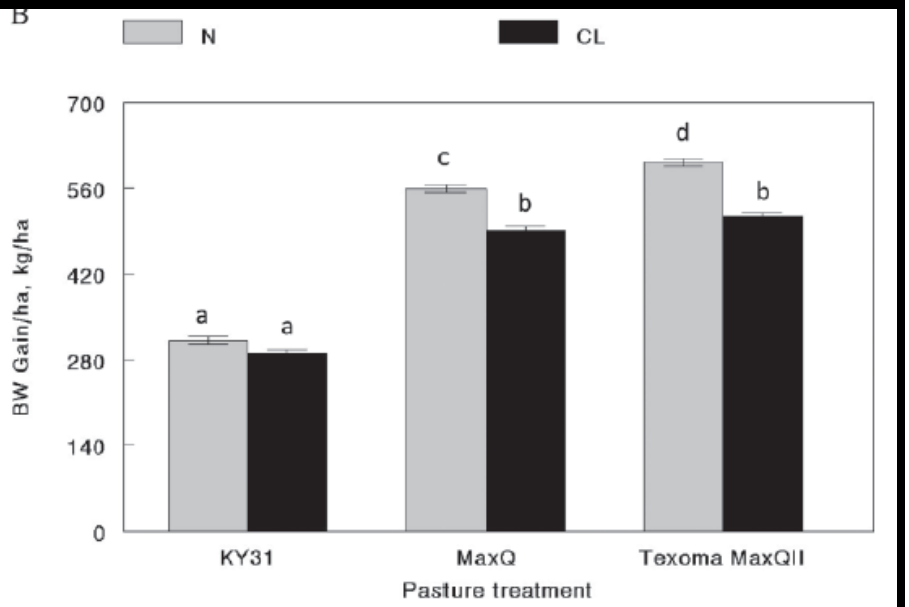


Figure 2. Effect of white clover (CL) or N fertilization on BW gain per hectare of steers grazing toxic endophyte- (KY31) or nontoxic endophyte- (MaxQ and Texoma MaxQII) infected tall fescue for the spring (A) and total grazing season (B). [a–c]Columns with differing letters differ ($P < 0.05$).

White clover economics

Table 5. Main effects of nitrogen fertilization or clover interseeded into tall fescue pastures on economics of the growing cattle enterprise during the autumn averaged across 4 yr

	Treatment			
Item	**N[1]**	**CL[2]**	**SE**	***P*-value**
Value of gain, $/ha	534.24	479.68	82.78	0.02
Cost of gain, $/ha	443.37	320.58	37.32	<0.01
Net return, $/ha	90.87	159.10	81.93	<0.01

[1]N = tall fescue pastures with 67 kg N fertilizer/ha applied in autumn and spring.

[2]CL = tall fescue pastures interseeded with white clover to replace N fertilizer.

[3]Tall fescue type × CL interaction, $P \geq 0.26$.

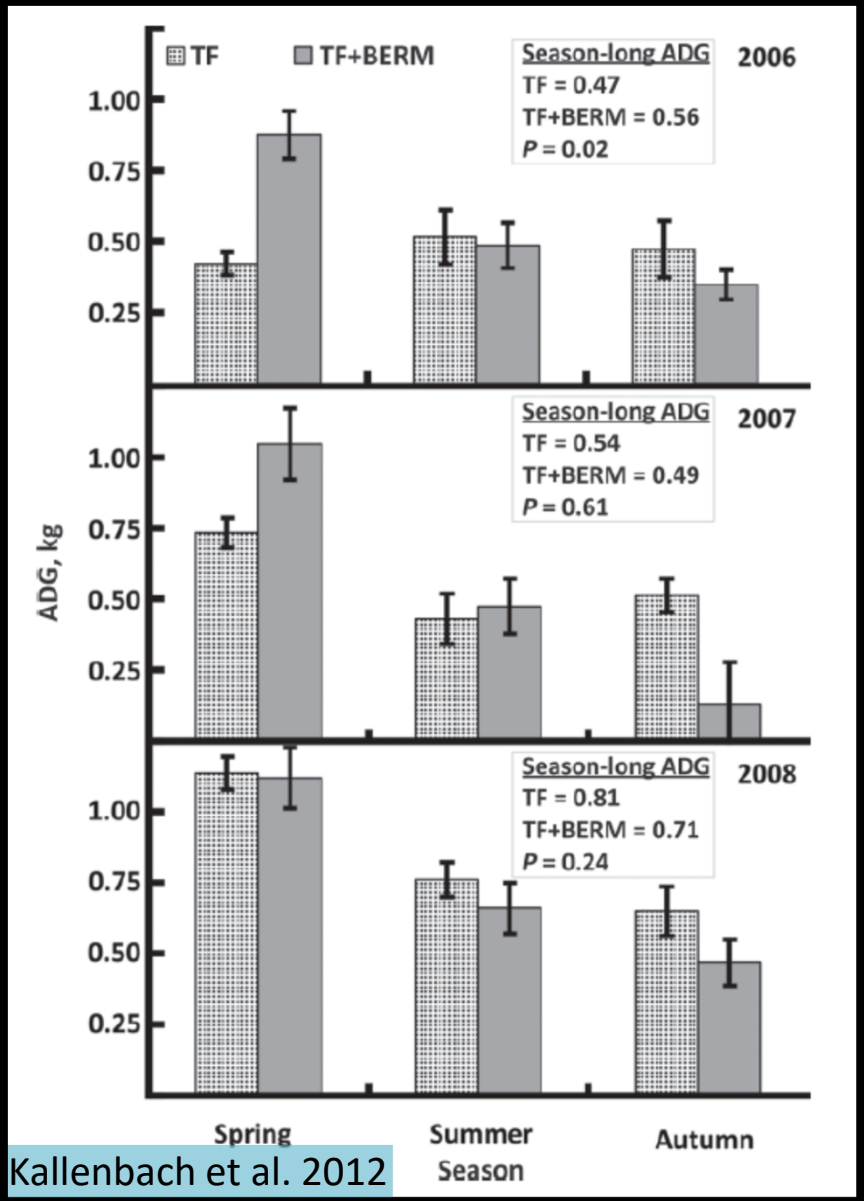
[4]Tall fescue type × CL interaction, $P = 0.02$.

Beck et al., 2012

Feed Isoflavones and Tannins

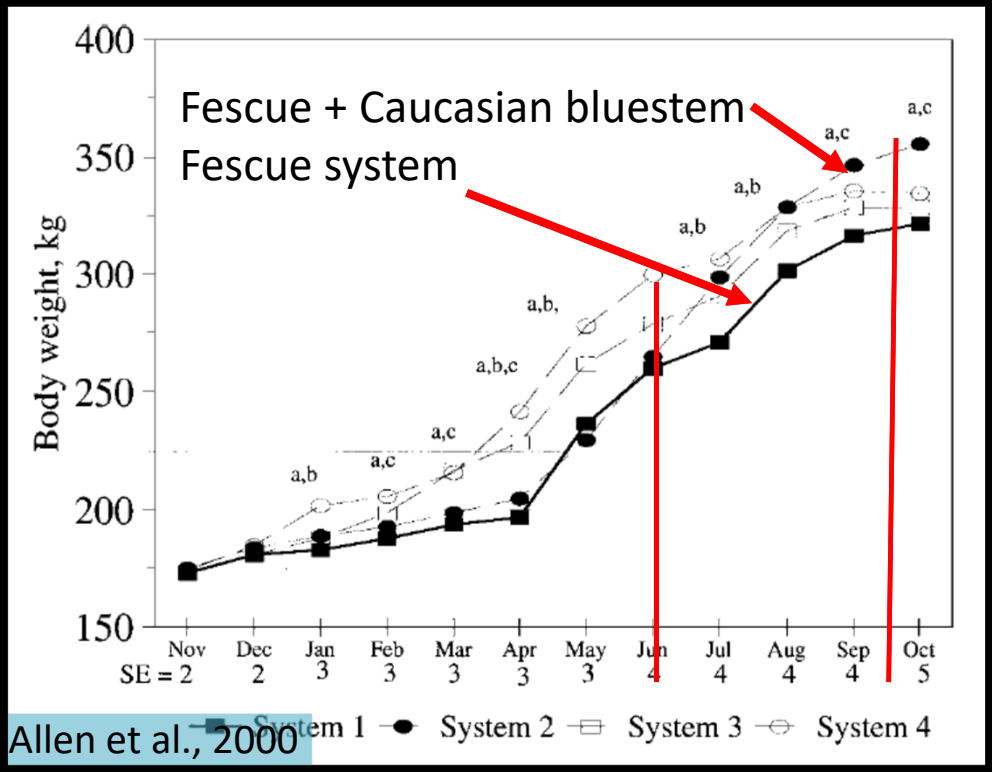
- Biochanin A (isoflavone) – vasodilator
  - Red clover
  - Soy (hulls < meal)
- Tannins – may bind toxic alkaloids
  - Lespedezas
  - Birdsfoot trefoil
  - Black locust and other trees
  - Sanfoin
  - Crown vetch

Add WSG to system?



Kallenbach et al. 2012

- Quality summer forage important
- Sometimes negative fall response after period of removal from TF



Allen et al., 2000

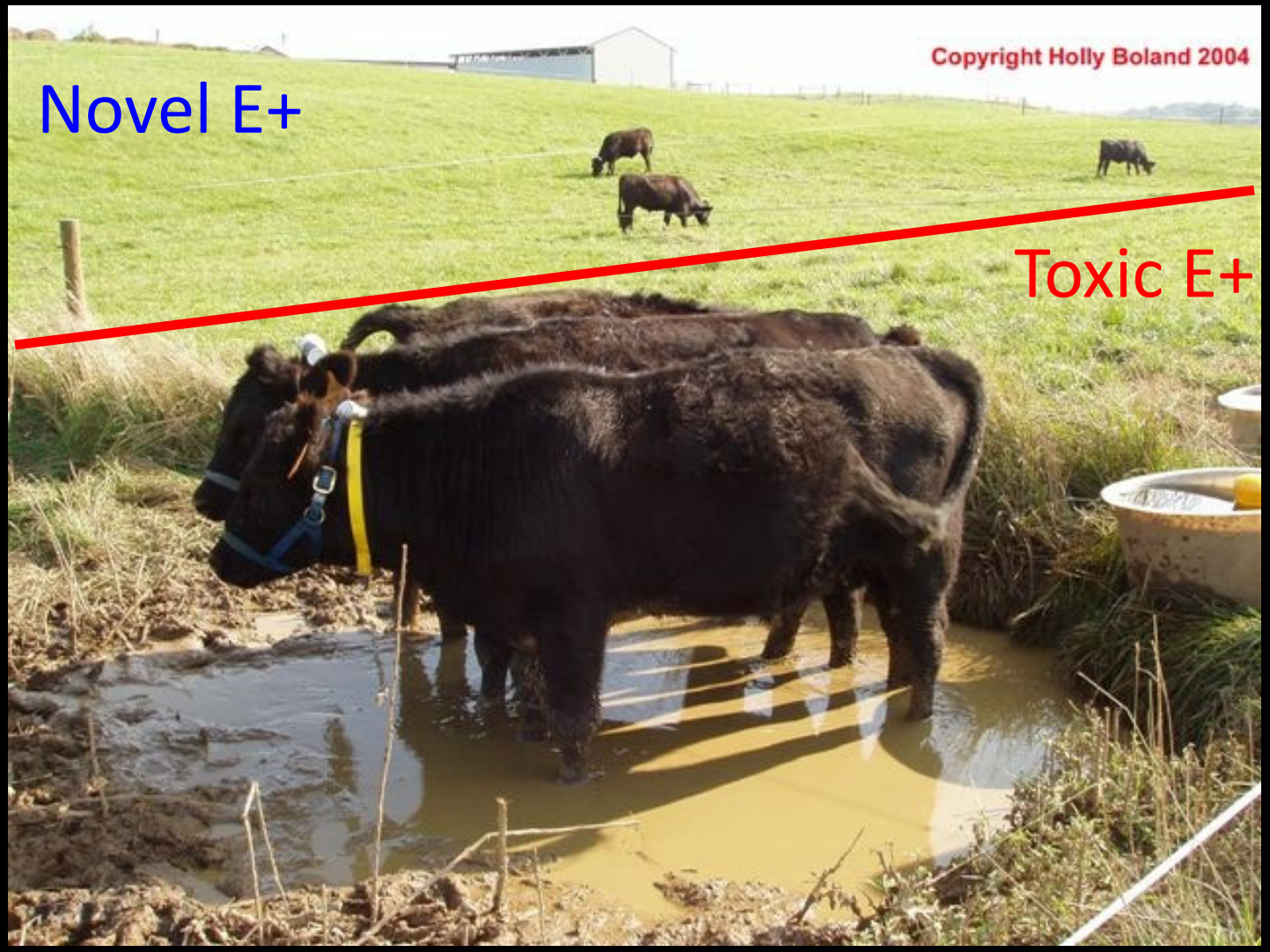
Silvopasture / Shade Stress abatement

More Trees or Better Grass?

Kallenbach 2012 Youtube

Forage	Shade (Trees)	Cows		Calves
		ADG (kg)	% Calving	Wean Mass (kg)
Infected (Toxic) Fescue	No	-0.5	38	204
Infected (Toxic) Fescue	Yes	0.3	88	221
Non-Toxic Fescue	No	0.6	63	233
Non-Toxic Fescue	Yes	0.5	88	247
p value		<0.01	<.05	<.01

Replacement?



Steer behavior in response to NE and E+ tall fescue in Blacksburg under mild temperatures

NE+ economics

Table 4. Main effects of cultivar of tall fescue on economics of the growing cattle enterprise during the autumn averaged across 4 yr[1]

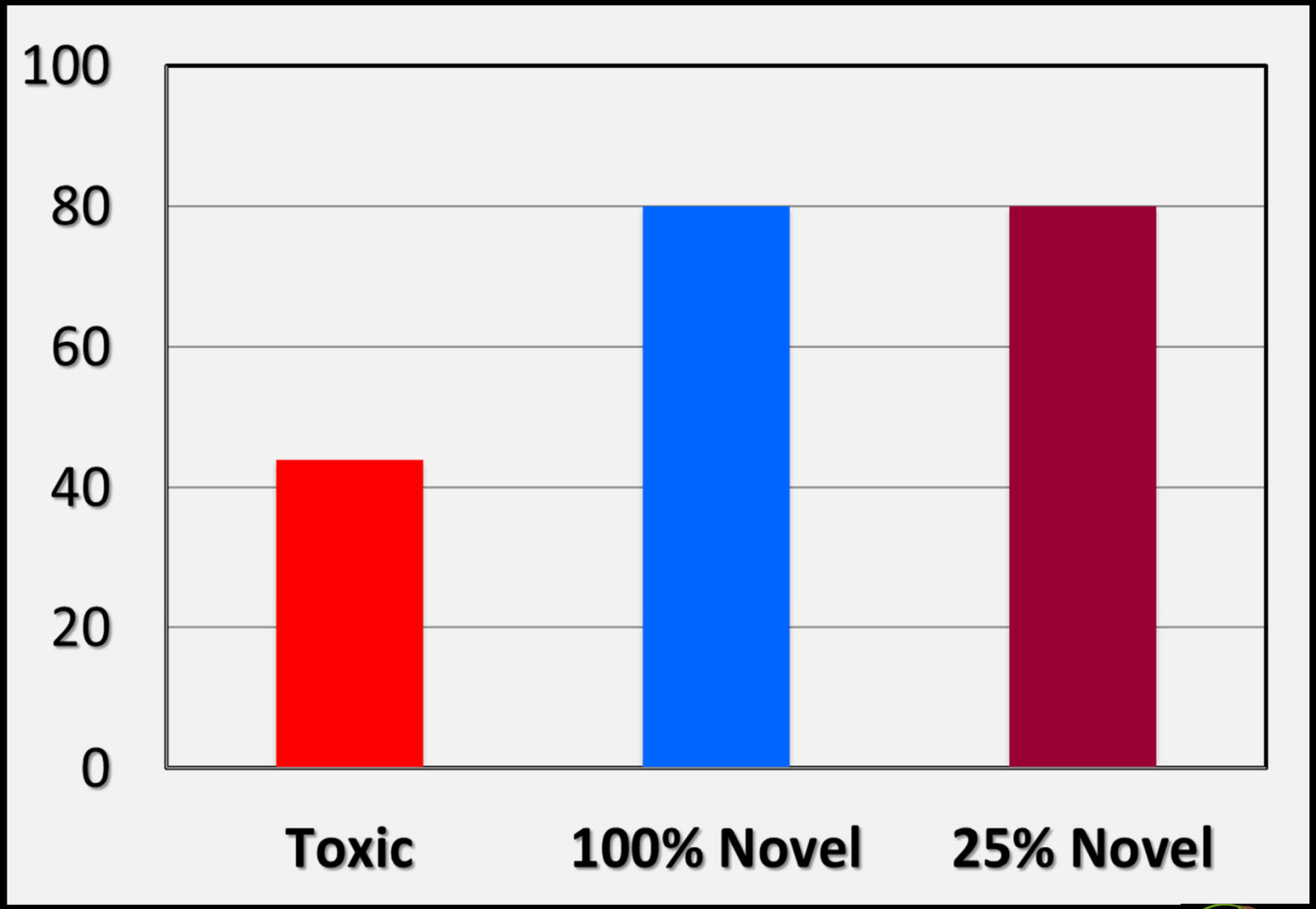
	Treatment				
Item	KY31	MaxQ	Texoma MaxQ II	SE	*P*-value
Value of gain, $/ha	404.45[c]	524.11[b]	592.33[a]	86.11	<0.01
Cost of gain, $/ha	364.52[b]	387.78[ab]	393.61[a]	37.59	0.03
Net return, $/ha	39.94[c]	136.33[b]	198.71[a]	82.71	<0.01

[a–c]Least squares means within rows with differing superscripts differ ($P < 0.05$).

[1]Tall fescue type × clover interaction, $P \geq 0.26$.

Beck et al., 2012

Calving Rates: Spring Calving



Caldwell et al, 2010

Alliance for Grassland Renewal

Partial replacement?

	Treatment				
Item	F100	F75	SNE100	S100	S75
Hay offered, kg/hd	757	809	643	535	446
Mineral offered,[3] kg/hd	20	18	23	20	19
Cow BW, kg					
Start of breeding	552	555	525	478	510
End of breeding	574	555	524	474	489
At weaning	505	533	526	485	504
Cow BW change, kg					
During breeding	16	–2	–4	–5	–21
BCS					
Start of breeding	6.1	5.9	6.3	5.7	5.7
End of breeding	6.2	6.0	5.3	5.2	5.1
At weaning	5.5	5.8	5.5	5.2	5.2
BCS change					
During breeding	0.1	0.1	–1.0	–0.4	–0.6
Calving rates, %	90	95	80	44	80
Calving interval, d	366	362	364	376	374
Age at weaning, d	233	233	231	228	227
Calf BW, kg					
Birth	35	35	37	37	38
At weaning	240	253	264	223	227
Adj. weaning weight,[4] kg	215	227	237	204	209
Calf BW gain, kg	205	218	227	186	189

Caldwell et al., 2013

Challenges for replacement

"1)…aggravation of developing and implementing a viable agronomic program to eradicate the existing toxic tall fescue,

2) establishing a summer annual forage as part of the eradication program,

3) taking land out of production during establishment of the novel endophyte–infected tall fescue, and

4) the risks and costs of stand establishment/failure and encroachment of toxic tall fescue over time"

Quote from Kallenbach, 2015

Managing across field or farm

- What is your profit center?
  - Fall calves?
  - Bred heifers?
  - Bulls?
- What is a reasonable replacement threshold?

http://vawatercentralnewsgrouper.wordpress.com/2012/12/05/new-stream-livestock-fencing-funds-and-initiative-announced-by-va-governors-office-on-dec-5-2012/

Management Summary

- Test pastures if unsure of problem
- Don’t allow seedhead formation/maturation
- Add clovers/tannin-containing legumes
  - Red clover, lespedezas may have anti-toxin effects
- Avoid large slugs of N in spring, fall
- If conserving, make TIMELY hay
- Use alternative forages in summer
- Add trees/shade
- Summer stockpile?
- Fall stockpile: Watch N, graze as late as possible
- Consider some renovation: 25% a good target

Conclusions: Issue is not going away

- Climate change scenarios
- Environmental / animal welfare concerns
- Many options available
- Must think about the whole farm and manage accordingly

Thanks!

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