KSU BEEF STOCKER FIELD DAY

SEPTEMBER 30, 2010

KSU BEEF STOCKER UNIT

PROCEEDINGS

Beef Stocker Field Day 2010
September 30, 2010
KSU Beef Stocker Unit

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Beef Stocker Field Day 2010
September 30, 2010
KSU Beef Stocker Unit

Welcome to the 11th annual KSU Beef Stocker Field Day. We appreciate your attendance and support of this educational event. We are fortunate to have assembled an outstanding list of presenters and topics that we believe are relevant to your bottom line.

As always, if you have any questions on the program or suggestions for future topics, please let us know. Our strength in delivering relevant information lies in working closely with you, our stakeholder.

Sincerely,

Dale A. Blasi, PhD
Extension Beef Specialist
Department of Animal Sciences and Industry
College of Agriculture

THANK YOU

We would like to express a special "THANK YOU" to Elanco Animal Health for their support of today's educational program and activities for the beef stocker segment. With their financial assistance, we are able to deliver the caliber of programming that today's events have in store for you. Please take a moment to stop by their display to see the line of products that they have to offer.

Beef Stocker Field Day 2010
September 30, 2010
KSU Beef Stocker Unit

9:30 a.m.	Registration/Coffee
10:15 a.m.	Introductions
10:30 a.m.	**What is in Store for the Stockers?** *Dr. Glynn Tonsor, Kansas State University*
11:15 a.m.	**Panel: Receiving Protocols: What We Do?** *Wes Ishmael, BEEF magazine, moderator* *Frank Brazle, Chanute, KS* *Rich Porter, Reading, KS* *Hal Mayer, Alta Vista, KS*
12:00 Noon	Barbecue Lunch
1:30 p.m.	**Managing BRD Risk by Controlling Variation of Incoming Cattle** *Dr. Jared Gould, Elanco*
2:15 p.m.	**Cutting Bull Management** *Dr. Hans Coetze, Kansas State University*

2:30 - 5:00 p.m. **Breakout Sessions**

Rethinking Growth Implants: Where Do They Fit?
Dr. Gerry Kuhl, Professor Emeritus, Kansas State University

Tips for the Mixer Wagon
Dr. Scott Laudert, Elanco

Current Thinking on Mycoplasma
Dr. Bob Larson, Kansas State University

5:00 p.m. Complimentary Cutting Bull's Lament BBQ

Notes – Notes -- Notes

What is in Store for the Stockers?

Dr. Glynn Tonsor
Kansas State University

Livestock & Meat Market Outlook

Glynn Tonsor
Dept. of Agricultural Economics
Kansas State University

Beef Stocker Field Day
September 30, 2010

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OVERVIEW

- SUPPLY:
  - Historically tight supplies
    - Shrinking cow herd, low cold storage stocks,…
- DEMAND:
  - Export demand has been strong
  - Domestic demand more volatile & worrisome
- FEEDS:
  - Excellent pastures; volatile grain prices

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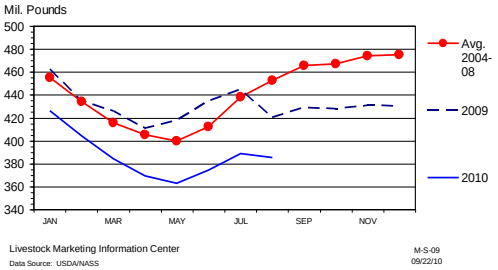
BEEF IN COLD STORAGE
End of the Month



Livestock Marketing Information Center
Data Source: USDA/NASS
M-S-09
09/22/10

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What is driving cow herd dynamics?

- Excellent Pasture Conditions &
- Expected Profits = EXPANSION (typically)

- Are cow-calf producers cash strapped???
- Is the age of operators at hand and retirement decisions at play???

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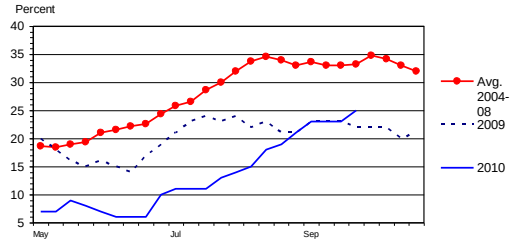
US RANGE AND PASTURE CONDITION
Percent Poor and Very Poor, Weekly



Livestock Marketing Information Center
Data Source: USDA/NASS
G-NP-30
09/27/10

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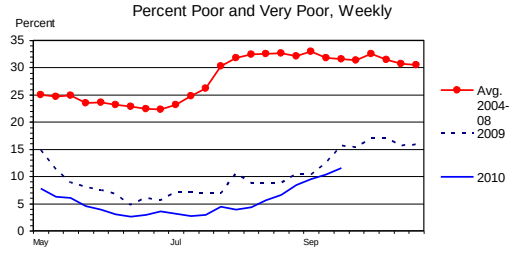
GREAT PLAINS REGION
RANGE AND PASTURE CONDITION
Percent Poor and Very Poor, Weekly



Livestock Marketing Information Center
Data Source: USDA/NASS
G-NP-32
09/20/10

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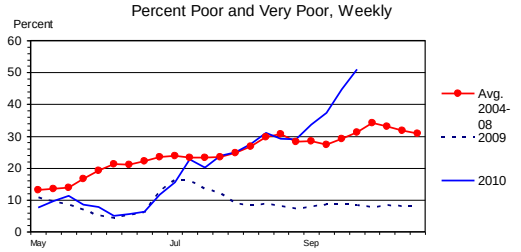
SOUTHEAST REGION
RANGE AND PASTURE CONDITION
Percent Poor and Very Poor, Weekly



Livestock Marketing Information Center
Data Source: USDA/NASS

G-NP-36
09/27/10

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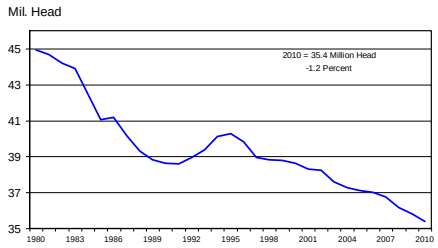
CALF CROP
July 1 Estimates, U.S., Annual



Livestock Marketing Information Center
Data Source: USDA/NASS

C-N-18B
07/23/10

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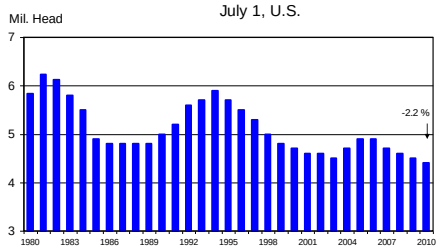
HEIFERS HELD AS BEEF COW REPLACEMENTS
July 1, U.S.



Livestock Marketing Information Center
Data Source: USDA/NASS

C-N-37
07/23/10

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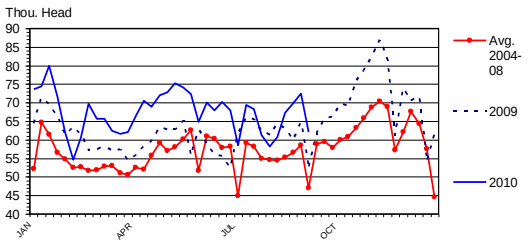
BEEF COW SLAUGHTER
Federally Inspected, Weekly



Data Source: USDA-NASS, Compiled by LMIC

C-S-34
09/24/10

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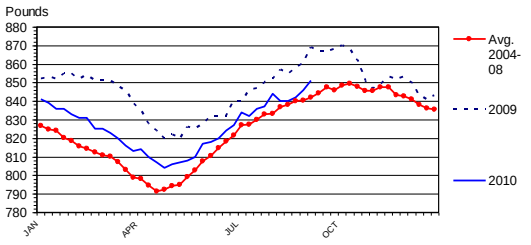
STEER DRESSED WEIGHT
Federally Inspected, Weekly



Data Source: USDA-NASS, Compiled by LMIC

C-S-18
09/24/10

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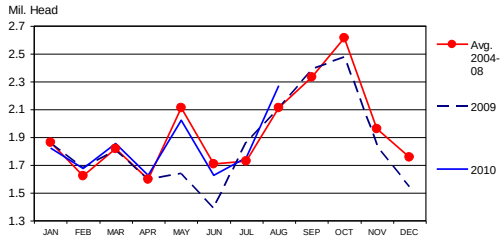
FEEDLOT PLACEMENTS
US Total, Monthly



Livestock Marketing Information Center
Data Source: USDA/NASS

C-N-08
09/17/10

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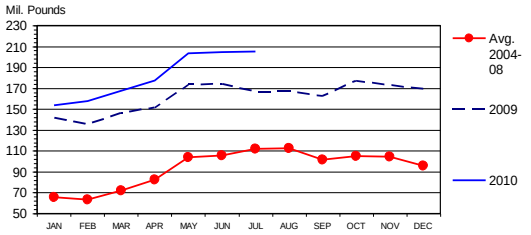
U S BEEF AND VEAL EXPORTS
Carcass Weight, Monthly



Data Source: USDA-ERS & USDA-FAS, Compiled by LMIC

I-N-16
09/10/10

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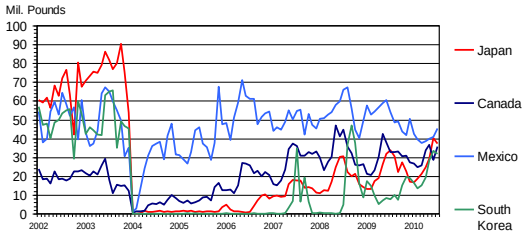
U S BEEF EXPORTS TO MAJOR MARKETS
Carcass Weight, Monthly



Data Source: USDA-ERS & USDA-FAS, Compiled by LMIC

I-N-35
09/10/10

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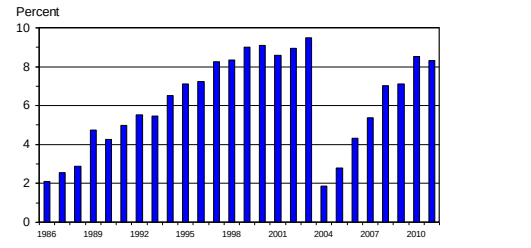
U S BEEF AND VEAL EXPORTS
As a Percentage of Production, Carcass Weight, Annual



Data Source: USDA-ERS & FAS; Compiled & Forecasts by LMIC

I-N-07
09/24/10

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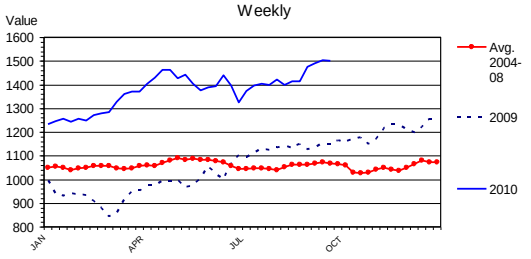
NATIONAL RESTAURANT NEWS STOCK MARKET INDEX

Weekly



Data Source: National Restaurant News; Compiled & Weekly Analysis by LMIC

09/27/10

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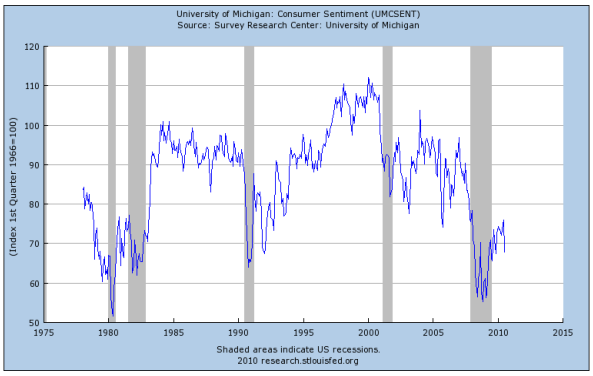

Source: Fed. Reserve Bank, St. Louis http://research.stlouisfed.org/fred2/graph/?id=UMCSENT#

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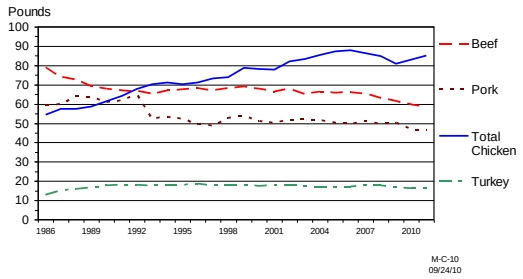
U S RED MEAT & POULTRY CONSUMPTION

Per Capita, Retail Weight, Annual



M-C-10
09/24/10

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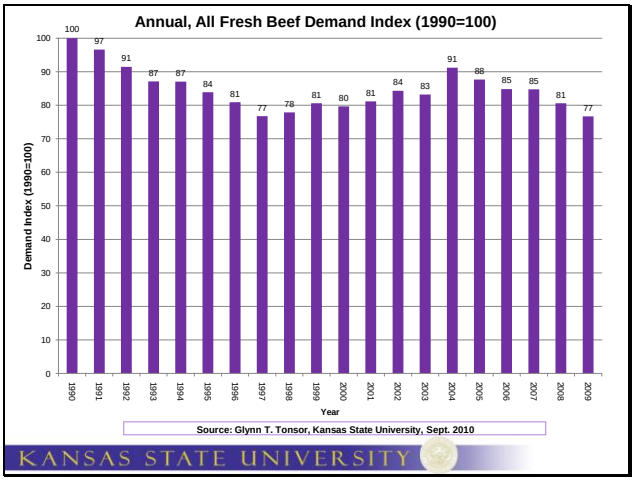
Annual, All Fresh Beef Demand Index (1990=100)
Demand Index (1990=100)
Year
100 97 91 87 87 84 81 77 78 81 80 81 84 83 91 88 85 85 81 77
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
Source: Glynn T. Tonsor, Kansas State University, Sept. 2010
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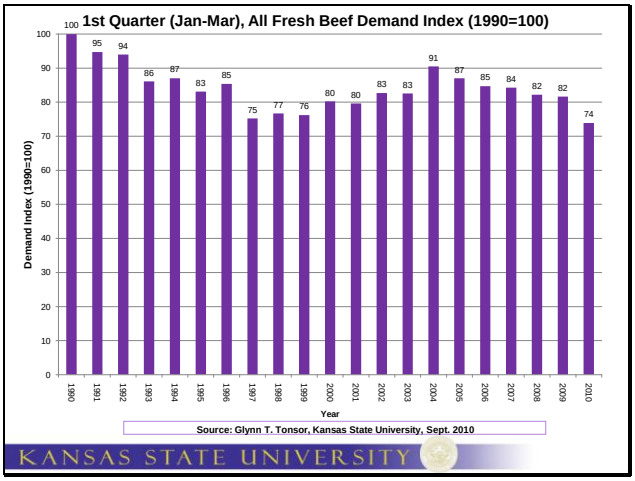
1st Quarter (Jan-Mar), All Fresh Beef Demand Index (1990=100)
Demand Index (1990=100)
Year
100 95 94 86 87 83 85 75 77 76 80 80 83 83 91 87 85 84 82 82 74
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Source: Glynn T. Tonsor, Kansas State University, Sept. 2010
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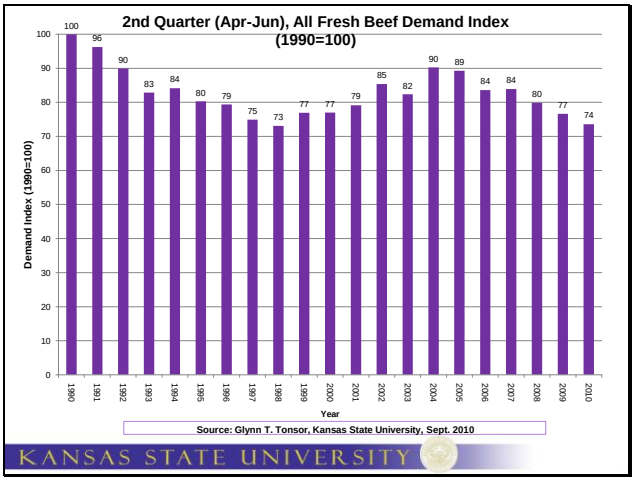
2nd Quarter (Apr-Jun), All Fresh Beef Demand Index (1990=100)
Demand Index (1990=100)
Year
100 96 90 83 84 80 79 75 73 77 77 79 85 82 90 89 84 84 80 77 74
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Source: Glynn T. Tonsor, Kansas State University, Sept. 2010
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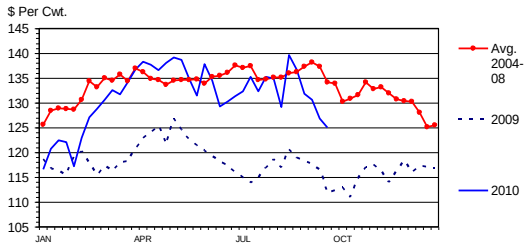
MED. & LRG. #1 STEER CALF PRICES
400-500 Pounds, Southern Plains, Weekly



Data Source: USDA-AMS, Compiled by LMIC

C-P-49A
09/27/10

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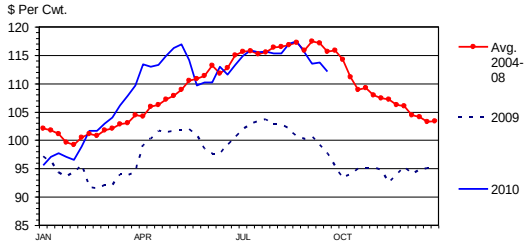
MED. & LRG. #1 FEEDER STEER PRICES
700-800 Pounds, Southern Plains, Weekly



Data Source: USDA-AMS, Compiled by LMIC

C-P-49
09/27/10

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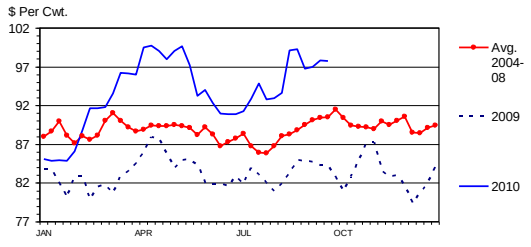
SLAUGHTER STEER PRICES
Southern Plains, Weekly



Data Source: USDA-AMS, Compiled by LMIC

C-P-52
09/27/10

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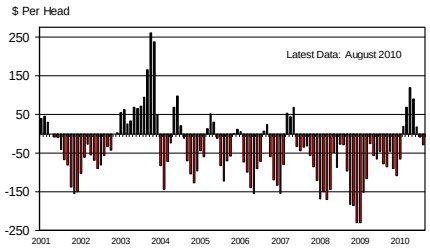
AVERAGE RETURNS TO CATTLE FEEDERS

Feeding 725 Lb. Steers, S. Plains, Monthly



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09/17/10

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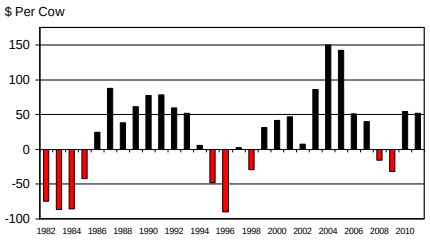
ESTIMATED AVERAGE COW CALF RETURNS

Returns Over Cash Cost (Includes Pasture Rent), Annual



C-P-66
08/30/10

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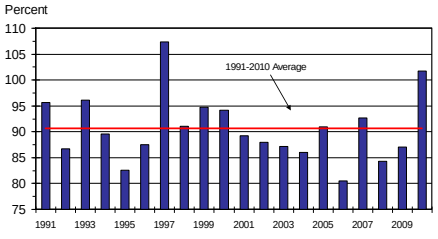
BUY/SELL MARGINS

S. Plains, Mar. 7-800 lb. Steer as % of Nov. 5-600 lb. Steer



C-P-60
08/30/10

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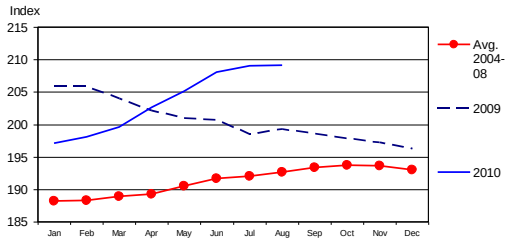
CPI - MEATS
1982-1984 Base, Monthly



09/17/10

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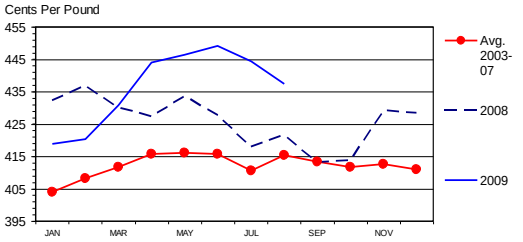
RETAIL BEEF PRICE
Choice, Monthly



M-P-09
09/17/10

Data Source: BLS & USDA-ERS, Compiled by LMIC

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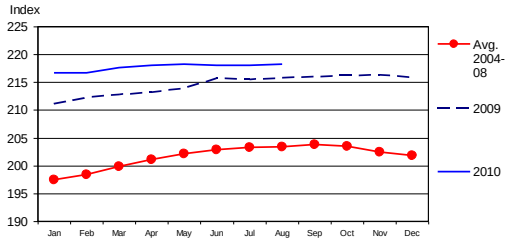
CONSUMER PRICE INDEX - ALL ITEMS
1982-1984 Base, Monthly



09/17/10

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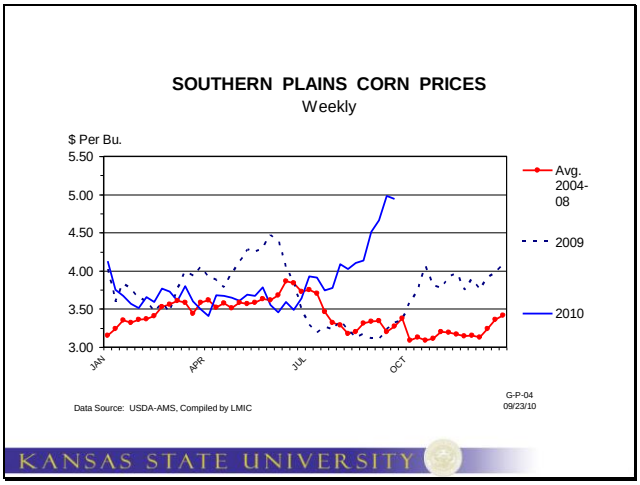

Futures Prices (9/29 – mid day)

Live Cattle		Feeder Cattle	
• Oct:	96.50	• Sep:	109.60
• Dec:	98.43	• Oct:	109.90
• Feb (11'):	100.33	• Nov:	110.13
• Apr (11'):	101.83	• Jan (11'):	110.93
• Jun (11'):	98.78	• Mar (11'):	110.88

Basis Adjust:
SEE: http://www.agmanager.info/livestock/marketing/
& http://www.beefbasis.com/

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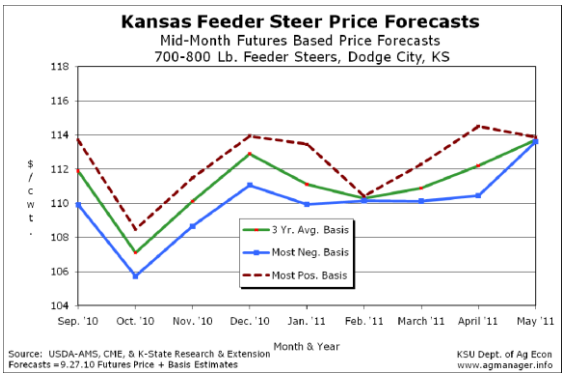

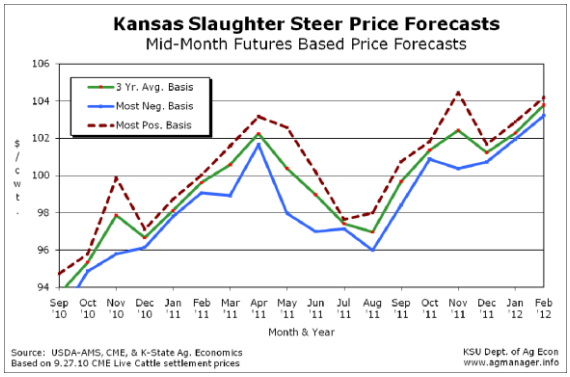

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QUARTERLY CATTLE & BEEF FORECASTS (LMIC: 9/28)

Year Quarter	Comm'l Slaughter	% Chg. from Year Ago	Average Dressed Weight	% Chg. from Year Ago	Comm'l Beef Production	% Chg. from Year Ago
2010						
I	8,167.50	2.40	765.34	(2.30)	6,250.90	0.05
II	8,683.00	0.93	754.20	(1.71)	6,548.70	(0.80)
III	8,943.42	4.99	753.29	(4.08)	6,737.00	0.71
IV	8,176.58	(0.78)	779.42	(0.05)	6,373.00	(0.83)
Year	33,970.50	1.90	762.71	(2.07)	25,909.60	(0.21)
2011						
I	8,046.60	(1.48)	778.47	1.72	6,264.00	0.21
II	8,347.36	(3.87)	764.07	1.31	6,378.00	(2.61)
III	8,490.37	(5.07)	780.65	3.63	6,628.00	(1.62)
IV	7,813.93	(4.44)	783.86	0.57	6,125.00	(3.89)
Year	32,698.26	(3.75)	776.65	1.83	25,395.00	(1.99)
2012						
I	7,877.51	(2.10)	786.16	0.99	6,193.00	(1.13)
II	7,939.83	(4.88)	770.67	0.86	6,119.00	(4.06)
III	8,100.96	(4.59)	788.55	1.01	6,388.00	(3.62)
IV	7,626.19	(2.40)	789.91	0.77	6,024.00	(1.65)
Year	31,544.49	(3.53)	783.78	0.92	24,724.00	(2.64)

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QUARTERLY CATTLE & BEEF FORECASTS (LMIC: 9/28)

Year Quarter	Live Sltr. Steer Price 5-Mkt Avg	% Chg. from Year Ago	Feeder Steer Price Southern Plains 7-800#	5-600#
2010				
I	89.44	8.84	100.88	116.23
II	96.33	14.04	113.04	127.77
III	94-96	14.38	115.14	124.44
IV	94-97	14.66	103-107	112-116
Year	93-95	12.92	107-110	119-123
2011				
I	93-97	6.21	99-104	113-119
II	96-101	2.25	104-111	116-125
III	94-99	1.58	108-116	117-127
IV	95-101	2.62	104-113	113-124
Year	94-98	2.13	104-111	115-123
2012				
I	94-101	2.63	102-112	115-127
II	97-105	2.54	107-118	117-130
III	94-102	1.55	109-120	118-132
IV	94-104	1.02	105-118	113-128
Year	96-101	2.60	108-115	118-127

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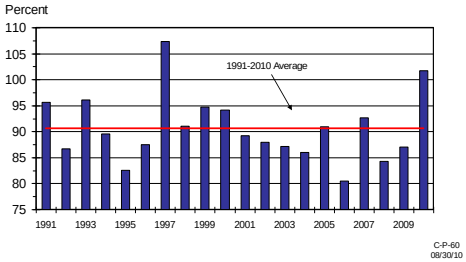
BUY/SELL MARGINS

S. Plains, Mar. 7-800 lb. Steer as % of Nov. 5-600 lb. Steer



C-P-60
08/30/10

Livestock Marketing Information Center

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BUY/SELL MARGINS

9/27 Dodge City, KS Situation:

- Basis ($9) adj. futures for 500-550 lbs in November: $119
- Basis ($0) adj. futures for 700-750 lbs in March: $110
- = 92% ratio (Sale/Purchase Price)

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Kevin Dhuyvetter's "Buy-Sell" spreadsheet tool
(http://www.agmanager.info/livestock/budgets/production/beef/cattlebuysell.swf)

Breakeven Selling Price Worksheet

Purchase weight (lbs)	500
Purchase price ($/cwt)	$119.00
Average Daily Gain (pay-to-pay)	2.00
Feeding cost of gain ($/cwt)	$65.00
Interest rate on feeder and feeding cost of gain	8.00%
Percent death loss*	1.50%
Costs per head (trucking, etc.)**	$12.00
Desired profit per head	$0.00

* Enter ONLY if death loss is NOT included in feeding cost of gain, otherwise enter zero.

** Do not enter any costs included in feeding cost of gain.

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Kevin Dhuyvetter's "Buy-Sell" spreadsheet tool
(http://www.agmanager.info/livestock/budgets/production/beef/cattlebuysell.swf)

Selling Weight[1]	Purchase Price: $113.00	$115.00	$117.00	$119.00	$121.00	$123.00	$125.00
	Breakeven Selling Price[2]						
600	108.75	110.46	112.17	113.89	115.60	117.31	119.02
650	105.94	107.53	109.12	110.71	112.29	113.88	115.47
700	103.56	105.04	106.52	108.01	109.49	110.97	112.45
750	101.52	102.91	104.30	105.69	107.08	108.47	109.86
800	99.75	101.06	102.37	103.68	105.00	106.31	107.62
850	98.22	99.46	100.70	101.94	103.18	104.42	105.66
900	96.87	98.05	99.23	100.40	101.58	102.76	103.94

[1] Enter the minimum selling (pay) weight you want to consider.
[2] Based on a feeding cost of gain of $65/cwt.

Expected Sales Price: $110/cwt ;
Expected Return (750 lbs) of +/- $4.50/cwt; +/-$34/head

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Kevin Dhuyvetter's "Buy-Sell" spreadsheet tool
(http://www.agmanager.info/livestock/budgets/production/beef/cattlebuysell.swf)

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Summary

- Duration of supply situation:
  - Cow herd liquidation continuing in face of excellent pasture conditions & exp. profit…
  - 2011 hog expansion MAY be tempered w/ recent feed cost escalation
- Duration of demand situation:
  - Domestic concerns may persist
  - Export growth vital both in short run & long run
- Stocker Placements this Fall:
  - May be profitable – but competition over calves may grow diminishing expected profits…

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Looking Beyond Today's Ps & Qs

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Additional Demand Drivers/Issues in need of Evaluation:

- Animal welfare
  - "social pressures" are here to stay …
  - beef/cattle are not immune:
    - Recent analysis suggests meat expenditures reallocate to non-meat in response to increasing media attention…
- Differentiation of niche products = stigmatizing conventional products?
- Convenience
  - Strong driver of beef demand reductions (08' Beef Board study)
  - Today's twenty-somethings are particularly looking for quick & easy meals that are low cost
    - Unemployment for adults under 30 was 19.5% in 2nd quarter of 2010
    - These habits may persist and shape lifetime consumption habits…

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Global Comparative Advantage Assessment is Needed

- State of National Animal ID & Traceability
  - Current & future roles in trade negotiations:
    - South Korea: has 12/2010 rule of all imported meat being traceable…
    - Canada: national program facilitating age verification…

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Impacts of New/Potential Policy on Markets is Needed

- Multiple regulation discussions:
  - "fair market" proposed rules / "anti-competition" listening sessions …

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More information available at: AgManager (http://www.agmanager.info/)

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Notable AgManager Resources

(http://www.agmanager.info/livestock/marketing/)

- Weekly commentary & newsletters
- Current & historical price information
- Risk management/forecasting tools

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Weekly Email Distribution of AgManager Updates

- http://listserv.ksu.edu/web?SUBED1=AGMANAGERUPDATE&A=1

OR email your request to:

- Rich Llewelyn [rllewely@AGECON.KSU.EDU]

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Regular Newsletters & Commentary

- KSU Radio Interview
  - (http://www.agmanager.info/livestock/marketing/outlook/newsletters/default.asp)
  - OR (http://www.ksre.k-state.edu/news/DesktopDefault.aspx?tabid=66)
  - Weekly, released on Mondays (Tonsor, Mark, Peel, LMIC)
- "In the Cattle Markets"
  - (http://www.lmic.info/memberspublic/InTheCattleMarket/CattleMktsframe.html)
  - Weekly (Mark, Feuz, Petry, Riley/Anderson)
- Recent Cattle Finishing Returns
  - (http://www.agmanager.info/livestock/marketing/outlook/newsletters/FinishingReturns/default.asp);
  - monthly updates based on *Focus on Feedlots* newsletter

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Regular "Situation Update" Commentary: LMIC

- "Chart of the Week"
  - (http://www.lmic.info/index.shtml)
- "Weekly Price & Production Summary"
  - (http://www.lmic.info/priprod/pandp.html)
- "Quick Market Reports"
  - (http://www.lmic.info/quick/quickdr.html)

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Current Price & Basis Information

- Futures Markets
  - (http://www.cmegroup.com/trading/commodities/) OR (http://www.agmanager.info/livestock/marketing/futures/default.asp)
  - LC, FC, LH & C, SB, S, W
- Cash Markets
  - http://www.agmanager.info/livestock/marketing/graphs/default.asp#Price Charts
  - http://www.agmanager.info/livestock/marketing/database/default.asp#Cattle and Beef Databases
    - Dodge City, Pratt, & Salina 700-800 lb steer; KS Direct Slaughter steer prices
- Basis (Cash - Futures) Information
  - http://www.agmanager.info/livestock/marketing/graphs/default.asp#Basis Charts
  - BeefBasis.com (http://www.beefbasis.com/)

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Risk Management and Return Forecasting Tools Available:

- Feeder Cattle Sales Risk Management Tool,
  - Compare expected sales prices of alternative FC marketing strategies
  - (http://www.agmanager.info/livestock/marketing/LRP/default.asp)
- Feedlot Profitability Tool: NAIBER's Feeding Risk Analyzer
  - Forecasts feedlot returns and variability in returns for future placements
  - (http://www.naiber.org/cattleriskanalyzer/)
- BeefBasis.com
  - Decision support for hedging feeder cattle (output for cow-calf; input for feedlots)
  - (http://www.beefbasis.com/Home/tabid/53/Default.aspx)

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Managing BRD Risk by Controlling Variation of Incoming Cattle

Dr. Jared Gould
Elanco

Managing BRD Risk by Controlling Variation of Incoming Cattle with Micotil

Elanco

BBU331 1

Label update summary

- Micotil® (tilmicosin injection) is now approved for a flexible dose range from 10 mg/kg (1.5 mL/cwt) to 20 mg/kg (3.0 mL/cwt) for both metaphylaxis and individual pull-and-treat Bovine Respiratory Disease (BRD) therapy
- New treatment claims for *Pasteurella multocida* and *Histophilus somni* were added in addition to *Mannheimia haemolytica*
- Micotil is still indicated for the control of BRD associated with *M. haemolytica*
- Ovine Respiratory Disease (ORD) indications have not changed
- The updated label also includes a new withdrawal time of 42 days, regardless of dose, and a maximum injection volume of 10 mL per injection site
- The new withdrawal period of 42 days is immediate and retroactive to any animal previously-receiving Micotil

Elanco Micotil

BBU303 2

Variability in Bovine Respiratory Disease (BRD) Morbidity, Mortality, and Inweight Associated with Arrival Truckload

Elanco Animal Health
Greenfield, IN

T5CB39905

For product label, including the boxed warning, see www.elanco.com or call 1-800-428-4441.

Elanco Micotil

BBU328 3

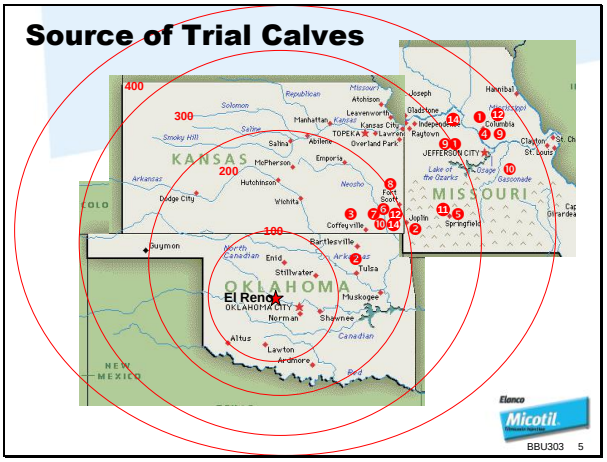
Study Design — 45-day Backgrounding Period

- 14 truckloads
- 1200 calves; 6 replicates; 100-hd pens
- All cattle purchased within 500 miles of backgrounding facility
- Average arrival weight: 501 lb
- Health and performance data collected by treatment group

Elanco Micotil

BBU303 4

Source of Trial Calves



Elanco Micotil

BBU303 5

Overall Study Results

Table 1. Effects of Micotil metaphylaxis at processing on BRD morbidity and mortality during a 45-day[a] backgrounding period

	Control	Micotil Metaphylaxis	SEM[c]	P-value
No. of calves/No. of pens	600/6	600/6		
Morbidity, %	35.2	21.5	1.79	0.0003
Avg days to BRD onset	11.0	18.4	0.92	0.0002
Treatment success, %	76.5	77.8	3.10	0.78
Treatment failure, %	9.0	8.7	2.56	0.95
Treatment relapse, %	14.5	13.5	1.96	0.72
Chronics, %	1.7	0.8	0.37	0.14
BRD mortality, %	1.17	0.5	0.61	0.46
Total mortality, %	1.33	1.0	0.62	0.71
Case fatality rate, %[b]	8.0	3.7	1.9	0.14

[a]Actual days ranged from 45 to 48.
[b]Case fatality rate for BRD mortality based on Micotil used as first-line treatment for BRD during the entire study length through harvest.
[c]SEM=Standard error of the mean

Elanco Micotil

BBU303 6

Overview of each Truckload

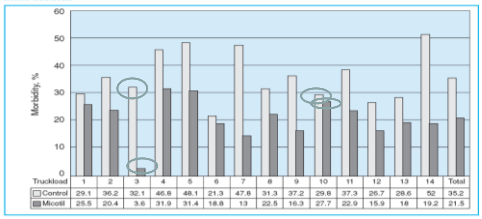
Truck	Ship Date	Source	Buyer	# on Load
1	8/31/99	Columbia & Sedalia, MO	A	95
2	8/31/99	Joplin, MO & Tulsa, OK	B	96
3	9/1/99	Fredonia, KS	B	56
4	9/2/99	Columbia, MO	A	95
5	9/2/99	Springfield, MO	B & C	103
6	9/3/99	Erie, KS	B	95
7	9/5/99	Erie, KS	B	46
8	9/5/99	Ft. Scott, KS & ?	A & B	97
9	9/7/99	Sedalia & Fulton, MO	A	86
10	9/8/99	Cuba, MO & Erie, KS	A & B	94
11	9/9/99	Springfield, MO	C	99
12	9/9/99	Columbia, MO & Erie, KS	A	89
13	9/10/99	?, MO	B	97
14	9/10/99	Boonville, MO & Erie, KS	A	94

Elanco Micotil

BBU303 7

Variability in BRD Morbidity Associated with Arrival Truckload

Figure 3. Effect of Micotil metaphylaxis at processing in the backgrounding period on respiratory morbidity within truckload

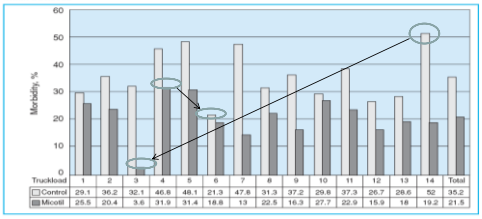


Elanco Micotil

BBU303 8

Variability in BRD Morbidity Associated with Arrival Truckload

Figure 3. Effect of Micotil metaphylaxis at processing in the backgrounding period on respiratory morbidity within truckload



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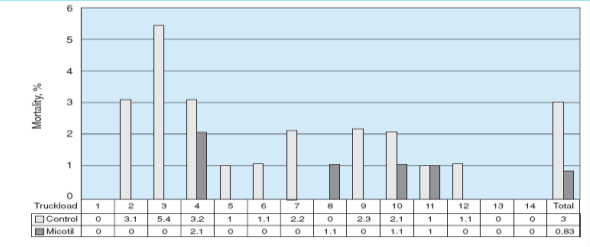
BBU303 9

Variability in BRD Mortality Associated within Arrival Truckload

Figure 4. Effect of Micotil metaphylaxis at processing in the background period on respiratory mortality within truckload*



Truckload	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Control	0	3.1	5.4	3.2	1	1.1	2.2	0	2.3	2.1	1	1.1	0	0	3
Micotil	0	0	0	2.1	0	0	0	1.1	0	1.1	1	0	0	0	0.83

*Respiratory mortality observed over the course of the entire research study.

Variability in Inweight Associated with Arrival Truckload

- All cattle within this study were individually and accurately dosed
- However, in most production settings dosages are determined by treating to the average — which means a percentage of cattle are under-dosed

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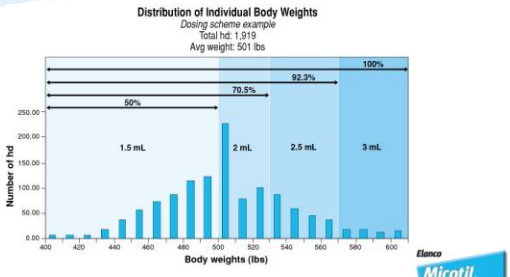
BBU303 11

Distribution of Individual Body Weights



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BBU303 12

Summary

- Variability in disease and disease severity is common, even among calves that originate from the same location
- Disease variability should be taken into account when making comparisons between different groups of calves regarding any intervention (vaccines, antibiotics, feeds, etc.)
- There are clear advantages of controlling BRD from the onset using the practice of metaphylaxis

BBU303 13

Micotil® (tilmicosin injection) flexible dosing research summary

For product label, including the boxed warning, see www.elanco.com or call 1-800-428-4441.

BBU301 14

Micotil® (tilmicosin injection) flexible dosing research with dose ranges between 10 mg/kg and 20 mg/kg body weight

- Two Micotil metaphylaxis studies utilizing a negative control or 10 mg/kg or 20 mg/kg BW dose

BBU301 15

Pilot efficacy study — effects of metaphylactic treatment with 10 mg/kg or 20 mg/kg Micotil® (tilmicosin injection) on the incidence of BRD

Elanco study nos. T5CAM0629 & T5C480633

BBU301 16

Pilot efficacy study — effects of metaphylactic treatment with 10 mg/kg or 20 mg/kg Micotil® (tilmicosin injection) on the incidence of BRD

Study objectives

- Compare the efficacy of Micotil metaphylaxis for control of bovine respiratory disease (BRD) in newly received, high-risk feedlot cattle to untreated controls
- Compare the efficacy of Micotil metaphylaxis for control of BRD in newly received, high-risk feedlot cattle dosed at 10 mg/kg or 20 mg/kg body weight

BBU301 17

Study Description

T5C480633 (TX)

- Trial initiated December 2006
- Trial completed September 2007

T5CAM0629 (CO)

- Trial initiated November 2006
- Trial completed June 2007

BBU301 18

Trial Animals

T5C480633 (TX)
- 1,000 high-risk Heifer calves
- Source — Texas sale barns
- Mean processing weight — 456 lbs
- Trial location — Hereford, TX

T5CAM0629 (CO)
- 1,000 high-risk steer calves
- Source — Colorado sale barns
- Mean processing weight — 584 lbs
- Trial location — Wellington, CO

Elanco Micotil BBU301 19

Experimental design — metaphylactic treatment groups

1. Micotil® (tilmicosin injection) at 10 mg/kg body weight (MIC10)
   - (1.5 mL/100 lb BW) SC in neck
2. Micotil at 20 mg/kg body weight (MIC20)
   - (3.0 mL/100 lb BW) SC in neck
3. Non-treated control (NC)

Animals dosed based on individual body weight

Elanco Micotil BBU301 20

Experimental design

- Calves randomized to treatment at processing
- Pen size → 50 animals / pen
- Number animals / treatment
  - NC — 200 hd / 4 pens
  - MIC10 — 400 hd / 8 pens
  - MIC20 — 400 hd / 8 pens
- Four replicates, each replicate consisted of:
  - One NC pen
  - Two MIC10 pens
  - Two MIC20 pens

Elanco Micotil BBU301 21

Experimental design — BRD treatment

- Calves monitored for BRD daily
- Pen riders and treatment crew blinded to treatment
- Post-metaphylaxis evaluation period
  - Moratorium for first 5 days on feed
  - Unless CIS ≥4 (severely ill)
- Treatment Protocol
  - 1st line — Baytril® (enrofloxacin), 5.0 ml/cwt SC
  - 2nd line — Nuflor® (florfenicol), 6.0 ml/cwt SC
  - 3rd line — Bio-Mycin® 200 (oxytetracycline), 4.5 ml/cwt SC

Baytril is a registered trademark of Bayer Corporation.
Nuflor is a registered trademark of Schering Plough Animal Health Corp.
Biomycin 200 is a registered trademark of Boehringer Ingelheim.

Elanco Micotil BBU301 22

Results

Elanco Micotil BBU301 23

Pilot efficacy study — effects of metaphylactic treatment with 10 mg/kg or 20 mg/kg Micotil® (tilmicosin injection) on the incidence of BRD[1] — T5C480633 (TX)

	NC	MIC10	MIC20	P-value
No. Calves, n	200	400	400	
Processing Body Temp ≥ 104 F, %	9.0	10.0	14.5	0.09
BRD Morbidity, % (n)	34.0 (68)[a]	24.3 (97)[b]	16.8 (67)[c]	<0.01
BRD Total Loss*, %(n)	17.0(34)[a]	10.0 (40)[b]	7.5 (30)[b]	0.01
BRD Mortality, % (n)	13.5 (27)[a]	7.5 (30)[b]	6.0 (24)[b]	0.02
BRD Removals, % (n)	3.5 (7)	2.5 (10)	1.5 (6)	0.33
Non-BRD Total Loss*, %(n)	1.0 (2)	1.8 (7)	0.5 (2)	0.30

[1] Data presented as an arithmetic means and analyzed on a pen means basis
[2] P-values are from the assessment of the overall treatment effect
*Total loss = Mortality + Removals
[a,b,c] Different superscripts in same row differ P<0.05

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Pilot efficacy study — effects of metaphylactic treatment with 10 mg/kg or 20 mg/kg Micotil® (tilmicosin injection) on the economic performance in feedlot calves — T5C480633 (TX)

- An economic model was developed for each pen of calves
- Summary effects were calculated for each treatment group
- Model inputs
  - Calf cost
  - Health cost
    - Metaphylaxis cost
    - Therapy cost
    - Chronic cost
    - Mortality cost
  - Feed Cost
- Model output
  - $ per head

Elanco Micotil BBU301 25

Pilot efficacy study — effects of metaphylactic treatment with 10 mg/kg or 20 mg/kg Micotil® (tilmicosin injection) on the economic performance in feedlot calves[1,2] — T5C480633 (TX)

	NC	MIC10	MIC20	P-value
Calf Cost, $/hd	467.65	471.32	469.80	0.58
Health Cost, $/hd	97.61	71.73	59.89	0.12
Meta Cost, $/hd	0.00[a]	7.93[b]	15.80[c]	< 0.01
Therapy Cost, $/hd	15.09[a]	9.83[b]	6.82[b]	< 0.01
Chronic Cost, $/hd	12.87	11.51	5.75	0.15
Mortality Cost, $/hd	69.65	42.48	31.52	0.09
Feed Cost, $/hd	388.32	418.35	431.43	0.07
Return, $/pen	45,608.06[a]	50,329.52[b]	52,285.67[b]	< 0.01
$/hd	-41.41[a]	45.19[b]	84.61[b]	0.02

[1] Data presented as an arithmetic means and analyzed on a pen means basis
[2] Costs and Returns are reflective of 2006-2007 values
[abc] Different superscripts in same row differ P<0.05

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Conclusions — T5C480633 (TX)

- BRD morbidity was lowest in cattle receiving 20 mg/kg Micotil® (tilmicosin injection) metaphylaxis compared to cattle receiving 10 mg/kg and the negative controls (P<0.01)
- BRD morbidity (P<0.01) and mortality (P=0.02) was lower in both Micotil metaphylaxis groups relative to negative controls
- $ per head was greatest in calves receiving 20 mg/kg Micotil metaphylaxis compared to cattle receiving 10 mg/kg or the negative control (P=0.02; difference of $126, 20 mg/kg compared to negative control, and $86, 10 mg/kg compared to negative control)

Elanco Micotil BBU301 27

Pilot efficacy study — effects of metaphylactic treatment with 10 mg/kg or 20 mg/kg Micotil® (tilmicosin injection) on the economic performance in feedlot calves[1] — T5CAM0629 (CO)

	NC	MIC10	MIC20	P-value
No. Calves, n	200	397	400	
Processing Body Temp ≥ 104 F, %	5.0	3.5	2.5	0.32
BRD Morbidity, % (n)	68.5 (137)[a]	49.9 (198)[b]	44.0 (176)[b]	< 0.01
Total Loss*, BRD %(n)	6.5 (13)	3.8 (15)	5.3 (21)	0.36
BRD Mortality, % (n)	0.5 (1)	1.3 (5)	2.3 (9)	0.29
BRD Removals**, % (n)	6.0 (12)	2.5 (10)	3.0 (12)	0.11
Non-BRD Total Loss*, % (n)	3.5 (7)	4.5 (18)	2.3 (9)	0.25

[1] Data presented as an arithmetic means and analyzed on a pen means basis
* Total Loss = Mortality + Removals
** BRD Removals = debilitating health condition that prevents continuation on trial
[ab] Different superscripts in same row differ P<0.05

BBU301 28

Pilot efficacy study — effects of metaphylactic treatment with 10 mg/kg or 20 mg/kg Micotil® (tilmicosin injection) on the economic performance in feedlot calves[1,2] — T5CAM0629 (CO)

	NC	MIC10	MIC20	P-value
Calf cost, $/hd	582.55	574.28	578.45	0.20
Health cost, $/hd	78.44	69.75	77.07	0.66
Meta cost, $/hd	0.00[a]	10.04[b]	20.22[c]	< 0.01
Therapy cost, $/hd	30.97[a]	18.69[b]	18.51[b]	< 0.01
Chronic cost, $/hd	38.17	24.50	20.28	0.18
Mortality cost, $/hd	9.30	16.52	18.06	0.47
Feed cost, $/hd	325.69	352.26	344.50	0.08
Return, $/pen	65,890.71	68,100.89	68,816.95	0.24
$/hd	331.15	365.73	376.33	0.49

[1] Data presented as an arithmetic means and analyzed on a pen means basis
[2] Costs and Returns are reflective of 2006-2007 values
[abc] Different superscripts in same row differ P<0.05

BBU301 29

Pilot efficacy study — effects of metaphylactic treatment with 10 mg/kg or 20 mg/kg Micotil® (tilmicosin injection) on the incidence of BRD[1] — Health Summary

T5C480633 (TX)	NC	MIC10	MIC20	P-value
No. Calves, n	200	400	400	
BRD Morbidity, % (n)	34.0 (68)[a]	24.3 (97)[b]	16.8 (67)[c]	<0.01
BRD Total Loss*, % (n)	17.0(34)[a]	10.0 (40)[b]	7.5 (30)[b]	0.01
BRD Mortality, % (n)	13.5 (27)[a]	7.5 (30)[b]	6.0 (24)[b]	0.02
T5CAM0629 (CO)	NC	MIC10	MIC20	
No. Calves, n	200	397	400	
BRD Morbidity, % (n)	68.5 (137)[a]	49.9 (198)[b]	44.0 (176)[b]	<0.01
BRD Total Loss*, % (n)	6.5 (13)	3.8 (15)	5.3 (21)	0.36
BRD Mortality, % (n)	.5 (1)	1.3 (5)	2.3 (9)	0.29

[1] Data presented as an arithmetic means and analyzed on a pen means basis
*Total loss = Mortality + Removals
[a,b,c] Different superscripts in same row differ P<0.05

BBU301 30

Conclusions — T5CAM0629 (CO)

- BRD morbidity was lower (P<0.05) in both Micotil® (tilmicosin injectioni) metaphylaxis groups relative to negative control
- $ per head based on close-out data was numerically greatest in calves receiving 20 mg/kg Micotil metaphylaxis compared to cattle receiving 10 mg/kg or the negative control (P=0.49; difference of $45, 20 mg/kg compared to negative control, and $34, 10 mg/kg compared to negative control)

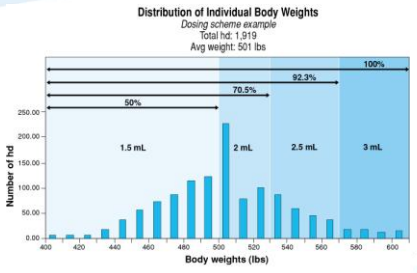
BBU301 31

Implications

- Micotil® (tilmicosin injection) metaphylaxis continues to demonstrate a reduction in BRD morbidity
- In one study, animal health improved in cattle receiving 20 mg/kg of Micotil metaphylactically
- Micotil flexible dosing will offer the veterinarian and producer flexibility in tailoring a health program to match the risk level of calves

BBU301 32

Distribution of Individual Body Weights



BBU301 33

Micotil® (tilmicosin injection) 300 Injection

- Micotil 300 is indicated for the treatment of bovine respiratory disease (BRD) associated with *Mannheimia haemolytica, Pasteurella multocida, and Histophilus somni,* and for the treatment of ovine respiratory disease (ORD) associated with *Mannheimia (Pasteurella) haemolytica*
- Micotil 300 is indicated for the control of respiratory disease in cattle at high risk of developing BRD associated with *Mannheimia (Pasteurella) haemolytica*

BBU303 34

Important Safety Information

- Micotil® (tilmicosin injection) is to be used by, or on the order of, a licensed veterinarian.
- For cattle or sheep, inject subcutaneously. Intravenous use in cattle or sheep will be fatal. Do not use in female dairy cattle 20 months of age or older. Use in lactating dairy cattle or sheep may cause milk residues.
- The following adverse reactions have been reported:
  - In Cattle: Injection site swelling and inflammation, lameness, collapse, anaphylaxis/ anaphylactoid reactions, decreased food and water consumption, and death.
  - In Sheep: dyspnea and death
- Always use proper drug handling procedures to avoid accidental self-injection. Do not use in automatically powered syringes.
- Consult your veterinarian on the safe handling and use of all injectable products prior to administration.
- **Micotil has a pre-slaughter withdrawal time of 42 days.**
- See label for complete use information, including boxed human warnings and non-target species safety information.

BBU303 35

Exercise Caution to Avoid Accidental Self-injection

- Always keep needles properly covered until ready to use
- Carry syringe in proper manner to ensure safe handling
- Handle loaded syringes with care
- Never carry loaded syringes in coat or pockets

BBU303 36

Injection Guidelines

- Inject subcutaneously in cattle and sheep only
- Do not use in automatically powered syringes (hydraulic, CO_2 or needleless)
- In cattle, administer a single subcutaneous dose of 10 to 20 mg/kg of body weight (1 to 2 mL/30 kg or 1.5 to 3 mL/100 lbs)
- In sheep greater than 15 kg, administer a single subcutaneous dose of 10 mg/kg of body weight (1 mL/30 kg or 1.5 mL/100 lbs)
- **Do not inject more than 10 mL per injection site**
- Do not use in lambs less than 15 kg body weight
- Animals intended for human consumption must
  not be slaughtered within 42 days of the last treatment

BBU303 38

Injection Guidelines

- If no improvement is noted within 48 hours, the diagnosis should be reevaluated
- Do not administer intravenously; intravenous injection will be fatal
- Injection of this antibiotic has been shown to be fatal in swine and non-human primates, and it may be fatal in horses and goats
- Do not use in female dairy cattle 20 months of age or older. Use of tilmicosin in this class of cattle may cause milk residues. Do not use in lactating ewes if the milk is intended for human consumption
- Effects of tilmicosin on bovine and ovine reproduction, pregnancy and lactation have not been determined

BBU303 39

Boxed Warning

CAUTION: Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

Human Warnings: Not for human use. Injection of this drug in humans has been associated with fatalities. Keep out of reach of children. Do not use in automatically powered syringes. Exercise extreme caution to avoid accidental self-injection. In case of human injection, consult a physician immediately and apply ice or cold pack to injection site while avoiding direct contact with the skin. Emergency medical telephone numbers are 1-800-722-0987 or 1-800-428-4441. Avoid contact with eyes.

Note To The Physician: The cardiovascular system is the target of toxicity and should be monitored closely. Cardiovascular toxicity may be due to calcium channel blockade. In dogs, administration of intravenous calcium offset Micotil-induced tachycardia and negative inotropy (decreased contractility). Dobutamine partially offset the negative inotropic effects induced by Micotil in dogs. ß-adrenergic antagonists, such as propranolol, exacerbated the negative inotropy of Micotil in dogs. Epinephrine potentiated lethality of Micotil in pigs. This antibiotic persists in tissues for several days.

Elanco Micotil

BBU303 40

Human-Exposure Actions

- Seek immediate medical attention
- Apply ice or cold pack to injection site while avoiding direct contact with skin
- Take label with you for information purposes
- Call Rocky Mountain Poison and Drug Center at 1-800-722-0987 or Eli Lilly & Co. at 1-800-428-4441 (select the option for human exposure)

Elanco Micotil

BBU303 41

Questions?

Elanco Micotil

BBU303 42

Cutting Bull Management

Dr. Hans Coetze
Kansas State University

Cutter Bull Management

Hans Coetzee BVSc, PhD, DACVCP
Veterinary Clinical Sciences
Kansas State University

What are we going to talk about?

- Cutter bulls don't come cheap
  - → Financial Cost
  - → Animal welfare implications -> impact on consumer perception and confidence in beef
- What difference does an antibiotic make in BRD?
- What does the research say about timing and method of castration?
  - → Banding vs. Cutting?
- What about pain relief?
  - → HSUS tactic OR potential production tool?

Cutter Bulls vs. Steers

Table 1. Effect of Gender Status upon Arrival on Calf Performance

Item	Steers	Bulls
No. Head	967	1,795
Starting wt, lb	468	464
60 d wt, lb	599	581
60 d, ADG	2.23	1.95
Morbidity, %	18.7	25.1
Mortality, %	.72	2.28

Dale Blasi, 27 loads of calves received at KSU Beef Stocker Unit

Table 6. Estimate Table — Difference Between Steers and Bulls

	100 days				
	466 lb	522 lb	550 lb	592 lb	660 lb
Gain, lb	28	31	35	21	37
Sickness - times steer	1.34		2.4		
Death loss - times steer	3.2		2.2		

Dr Frank Brazle, KSU Stocker Day, 2 October 2008

Cost difference between steers and bulls

Table 7. Estimate of Value Difference — 550 lb Bulls

Item	Dollars
Gain, 35 lb	$35.00
Drugs	8.33
Cost/labor at $20/hr	1.05
Death loss	7.80
Quality grade	?
Handling	?
Difference	$52.18/hd

- On a 550 lb calf a $52.18 difference is $9.48 per cwt

Dr Frank Brazle, KSU Stocker Day, 2 October 2008

Raising cutter bulls is expensive even though they cost less

Can an antibiotic help?

What difference does an antimicrobial make?

- Median NNT is

Treatment

→ 2 BRD cases for 1 treatment success,

Prevent Mortality

→ 6 BRD cases to prevent 1 mortality and

Prevent sickness

→ 9 calves to prevent 1 case of BRD

Courtesy; Dr Mike Apley

How is castration performed in the United States?

Web-based survey of bovine castration methods in the U.S.A

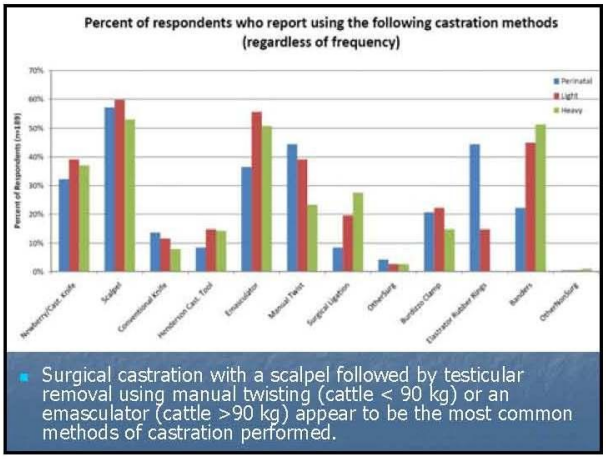
- September 2007:- Invitations sent to email addresses belonging to 1,669 AABP members and 303 AVC members
- Survey questions about:-

→ Castration methods,

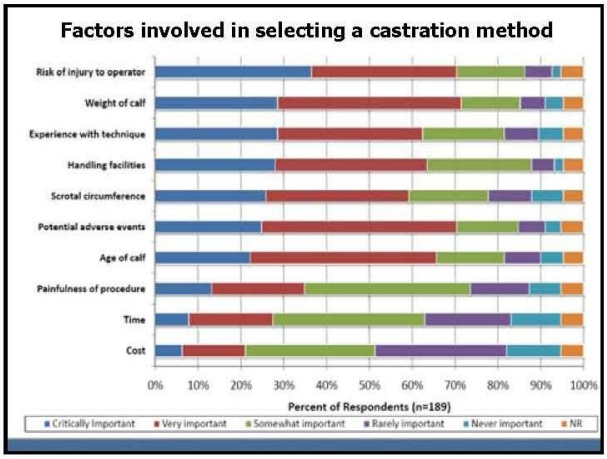
→ Adverse events,

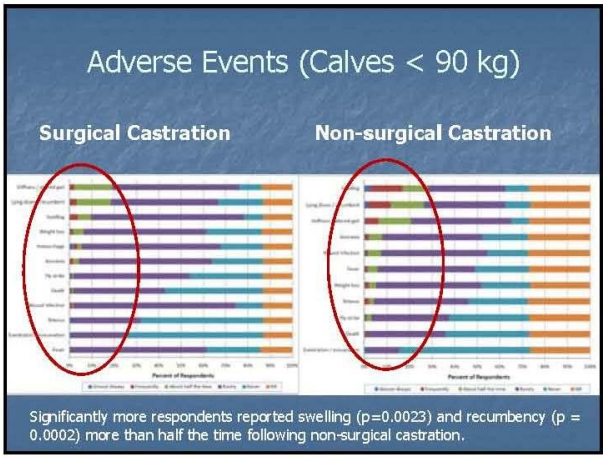
→ Husbandry procedures conducted at the time of castration

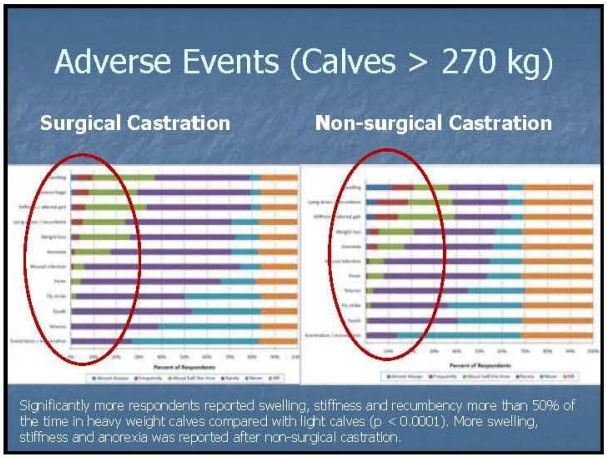
- 189 complete responses included in the analysis

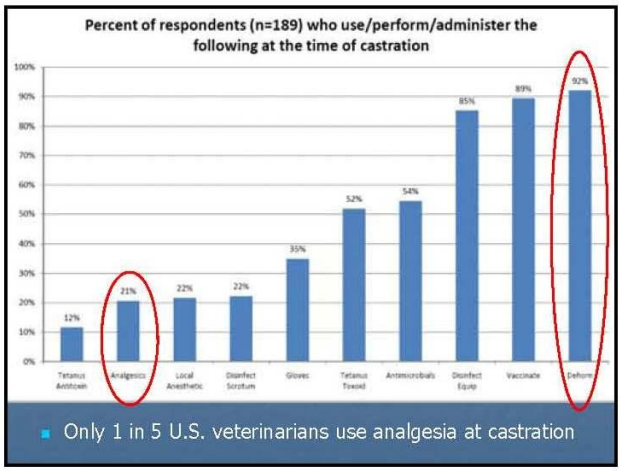


- Surgical castration with a scalpel followed by testicular removal using manual twisting (cattle < 90 kg) or an emasculator (cattle >90 kg) appear to be the most common methods of castration performed.









- Only 1 in 5 U.S. veterinarians use analgesia at castration

Survey Conclusions

- Surgical castration with a scalpel followed by emasculator (>90 kg) or twisting (< 90 kg) is most common castration method used by practitioners
- Risk of injury, calf size, handling facilities and experience were the most important considerations in selecting a castration method
- Non-surgical castration is perceived to cause more adverse events than surgical castration
- 1/5 veterinarians currently use anesthesia or analgesia at the time of castration
- 90% of veterinarians vaccinate and dehorn at the time of castration

AVMA Policy on Castration and Dehorning

- **Earliest age practicable**
- **Disbudding is the preferred method of dehorning calves**
- **Local anesthesia/ analgesia** should be considered
- **Elastrator rubber banding techniques have been associated with increased chronic pain and should be discouraged**
- The castration method used should take into account the animal's age, weight, skill level of the technician, environmental conditions, and facilities available, as well as human and animal safety

"Earliest age practicable" (AVMA Policy)

How have we measured the relationship between age/ method of castration and pain response?

- Plasma Cortisol Concentration
- Performance

What are the deficiencies in the published literature?

- Age and methods effects under the same experimental conditions
- Effect of performing dehorning and castration at the same time

Peak plasma cortisol concentration (Cmax) (nmol/L) with time (Tmax) (minutes) following castration

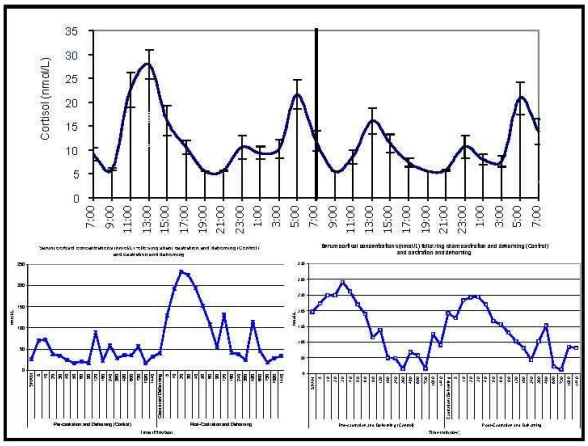
	Age				
Method	6 days	21 days	42 days	2 – 4 months	5.5 months
Rubber ring	**60** (36 min)	45 (48 min)	45 (60 min)	**76** (90 min)	
Latex Band				101 (30 – 60 min)	
Burdizzo	**80** (24 min)	50 (24 min)	60 (24 min)	**64** (30 min)	87 (30 min)
Surgery (Pull)	**105** (24 min)	65 (24 min)	110 (24 min)	**68** (30 min)	
Surgery (Cut)					129 (30 min)

From: Stafford, K. & Mellor, D. 2005. *New Zealand Veterinary Journal*. 53(5). 271 – 278.

Duration of plasma Cortisol response (Cortisol concentrations above pre-treatment levels)

	Age				
Method	6 days	21 days	42 days	2 – 4 months	5.5 months
Rubber ring	**132 min**		96 min	**132 min**	180 min
Latex Band				**180 min**	
Burdizzo	**60 min**	60 min	72 min	**90 min**	90 min
Surgery (Pull)	**132 min**	84 min	132 min	**180 min**	
Surgery (Cut)					360 – 600 min

From: Stafford, K. & Mellor, D. 2005. *New Zealand Veterinary Journal*. 53(5). 271 – 278.



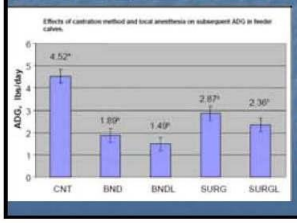
"Elastrator rubber banding techniques have been associated with increased chronic pain and should be discouraged"

(AVMA Policy, 2008)

Research Findings

- Fisher and others concluded that banding produced fewer acute effects, but greater suppression of growth compared to surgical castration in 9 and 14 month old bulls (*Res Vet Sci* 2002, **73(1):**61-70).

Growth and Performance



- Castrating feeder cattle decreased performance.
- Calves surgically castrated had improved ADG relative to calves castrated by banding.
- Local anesthesia with lidocaine had no effect on performance, post-castration behavior or vocalization during castration.

Rust, Thomson, Loneragan, Apley, Swanson. 2007. Bovine Practitioner.

- **Not a true correlation with acute pain**
- **Gain may also be negatively influenced by removal of testosterone source**

Effect of castration timing, technique and pain management on health and performance of young feedlot bulls in Alberta

- Booker et al, Bovine Practitioner, Spring 2009
- 956 feedlot bulls randomly assigned to 8 groups (20 calves/ pen; 6 pens/ group) representing combinations of castration timing, technique and pain management

i. Timing- Day 0 or Day 70 castration
ii. Method- Band or surgical castration
iii. Pain relief- Xylazine epidural (0.07 mg/kg) and flunixin (2.2 mg/kg) IV or nothing

Study Procedures

- Time between arrival and enrollment was 2- 3 weeks
- Calves processed on arrival using standard feedlot procedures
- Interval between administration of epidural and castration ranged from 20 – 90 minutes
- No placebo treatments given

Study Conclusions

- Bulls castrated at allocation had higher incidence of undifferentiated fever (P= 0.086) than calves castrated at 70 days post-allocation
- Bulls castrated using a band had a lower occurrence of UF (P=0.021), improved average daily gain (live weight basis P=0.056) ,carcass weight and prime carcasses (P=0.020) compared to surgically castrated calves
- There were no health and performance differences between calves receiving anesthesia and analgesia and untreated calves

Conclusion-
Research is currently not providing us with all the answers

Scientists should recognize that, when research findings related to animal welfare are equivocal or remain unsettled, the question of how animals ought to be cared for and treated will then shift to **the realms of ethics and social values**

Dr. Stanley Curtis, *Feedstuffs* Oct. 2007

Why pain management is important

- 10 million calves castrated in the U.S.A annually
- The NCBA and AVMA encourages the use of local anesthetics and analgesics
- Only 1 in 5 veterinarians currently use pain relief at castration
- There are currently no drugs specifically approved by the FDA to provide analgesia in food animals in the USA
- Castration practices without pain relief were recently scrutinized by a State legislature (New Jersey, 2008)

New Jersey Society for the Prevention of Cruelty to Animals v. New Jersey Dept. of Agriculture, 196 N.J. 366 (2008)

Where might the puck be heading?

- "Wendy's has one of the most comprehensive animal welfare auditing programs in the industry" *Temple Grandin*
- United Kingdom Animal Welfare Legislation:-

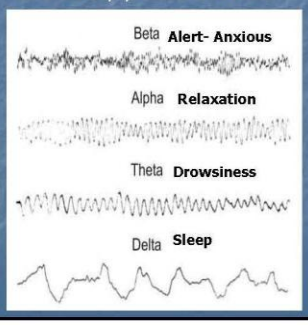
Under the Protection of Animals (Anaesthetics) Act 1954, as amended, it is an offence to castrate calves which have reached two months of age without the use of an anaesthetic. Furthermore, the use of a rubber ring, or other device, to restrict the flow of blood to the scrotum, is only permitted without an anaesthetic if the device is applied during the first week of life.

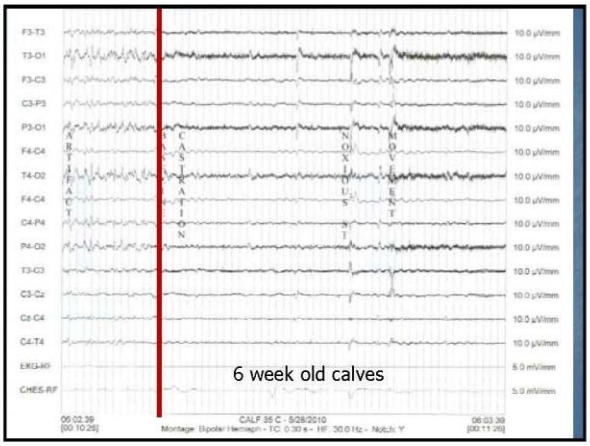
Under the Veterinary Surgeons Act 1966, as amended, only a veterinary surgeon may castrate a calf which has reached the age of two months.

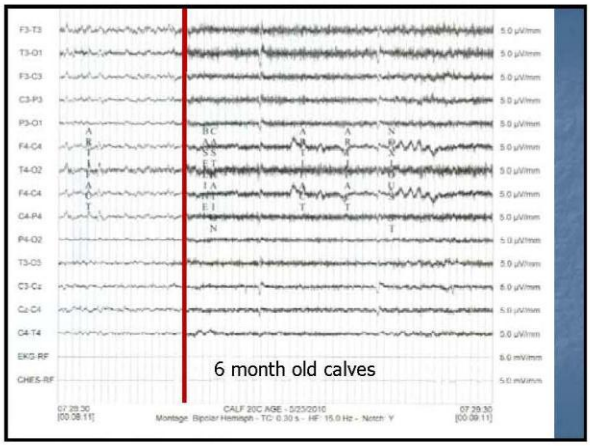
Is castration painful?

Electroencephalography (EEG)

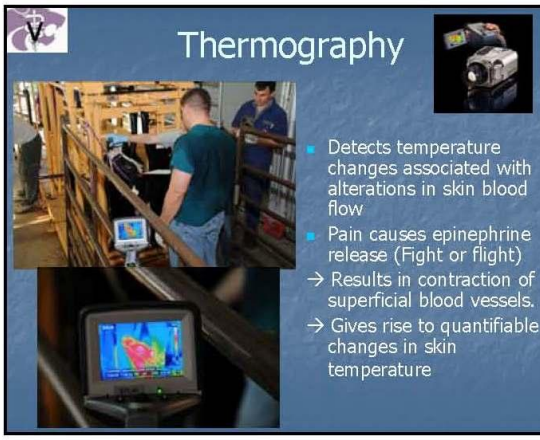
- Measurement of electrical activity on the scalp produced in brain







Thermography



- Detects temperature changes associated with alterations in skin blood flow
- Pain causes epinephrine release (Fight or flight)

→ Results in contraction of superficial blood vessels.

→ Gives rise to quantifiable changes in skin temperature

So castration appears to be painful, but how easy is it to provide pain relief?

Managing pain in cattle is a challenge

1. Recognition of pain in cattle is difficult
2. No pain relief drugs are specifically approved for analgesia in cattle in the U.S.
3. Extra-label drug use must be conducted **under veterinary supervision.**
4. Time delay between drug administration and onset of activity (e.g. local anesthesia)
5. Inconvenient routes of drug administration (IV)
6. Short drug half-lives necessitate frequent drug administration
7. Cost of drugs and meat/milk withhold periods

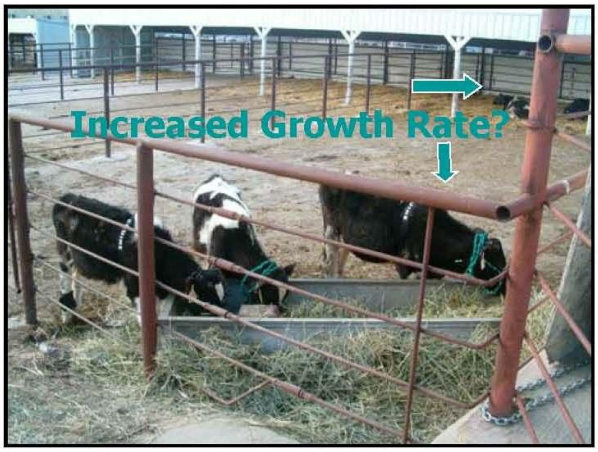
What are my options?
NSAIDs currently used in cattle in the U.S.

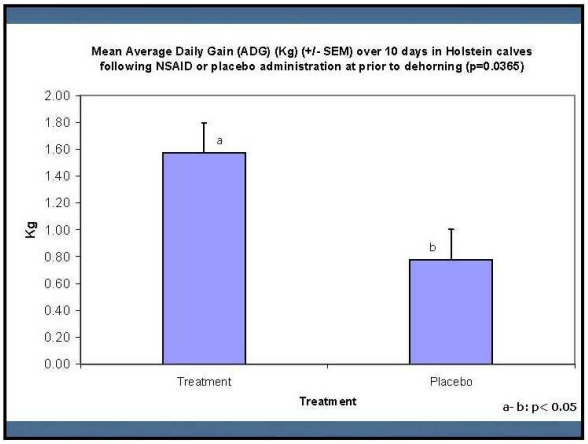
Drug	Approved Species	Indications	Dose (Cattle)	T ½	Withhold period
Flunixin meglumine injection	Cattle, horses and pigs	NSAID-Antipyretic, Anti-inflammatory	2.2 mg/kg IV ONLY!	3-8 h	Meat- 4 days Milk- 36 hours
Phenylbutazone injection	Horses and dogs	NSAID-Anti-inflammatory	4 mg/kg IV ONLY!	40 – 55 h	Not approved in cattle
Ketoprofen injection	Horses and dogs	NSAID-Anti-inflammatory	1.5 mg/kg	0.42 h	Not approved in cattle
Aspirin bolus	No FDA approval Horses and Cattle	NSAID-Reduction of fever Relief of minor muscle aches and joint pain	50 – 100 mg/kg Oral F < 20%	0.5 h (IV salicylate)	No formal FDA approval Not for use in lactating cattle

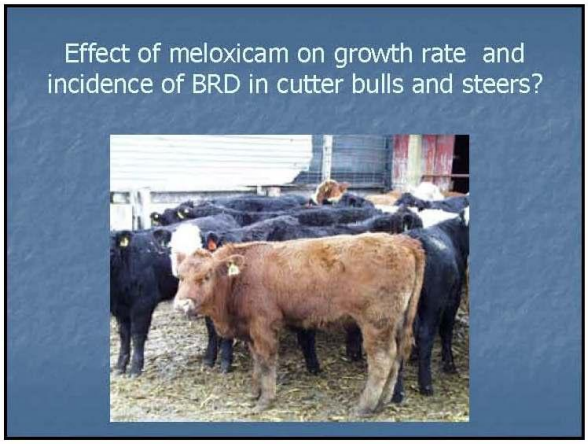
Is there something we can use that may work better?

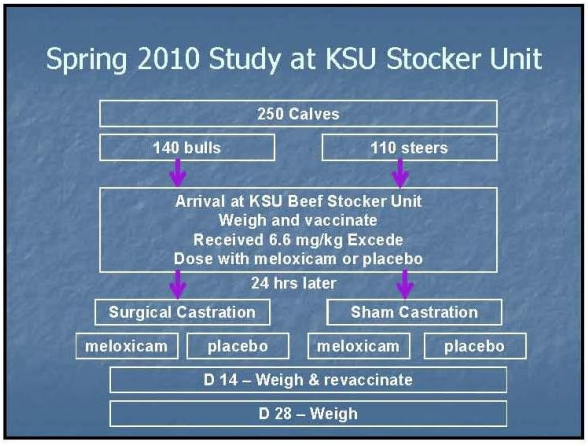
- Meloxicam is a prescription-only NSAID used to treat arthritis in people
- **Meloxicam tablets have 100% oral bioavailability in ruminant calves**
- Human generic tablets are very inexpensive
- Oral meloxicam at 1mg/kg has a half-life of 27 hours
- EU meat withdrawal period is 15 days (0.5 mg/kg IM) and Canadian withdrawal is 20 days
- Consult your veterinarian

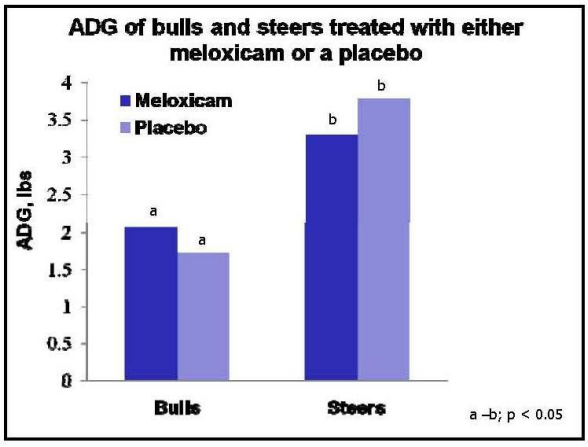
With such a long half-life, does meloxicam have a positive effect on performance and health after dehorning and castration?

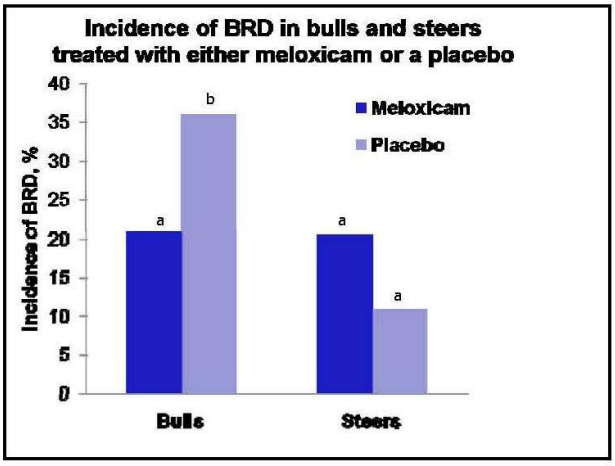



Mean Average Daily Gain (ADG) (Kg) (+/- SEM) over 10 days in Holstein calves following NSAID or placebo administration at prior to dehorning (p=0.0365)
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Kg
a
b
Treatment
Placebo
Treatment
a- b: p< 0.05


Effect of meloxicam on growth rate and incidence of BRD in cutter bulls and steers?

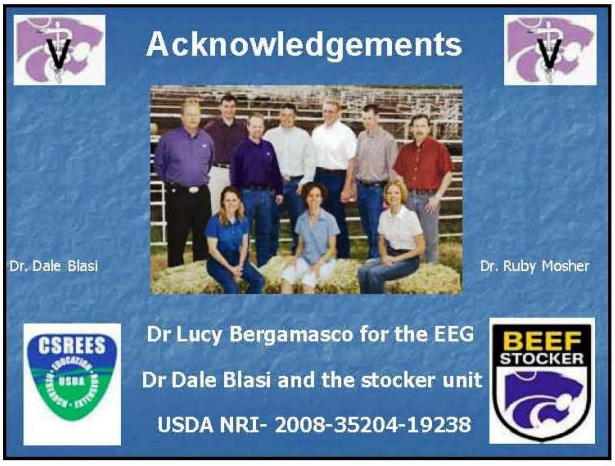

Spring 2010 Study at KSU Stocker Unit
250 Calves
140 bulls
110 steers
Arrival at KSU Beef Stocker Unit
Weigh and vaccinate
Received 6.6 mg/kg Excede
Dose with meloxicam or placebo
24 hrs later
Surgical Castration
Sham Castration
meloxicam
placebo
meloxicam
placebo
D 14 – Weigh & revaccinate
D 28 – Weigh


ADG of bulls and steers treated with either meloxicam or a placebo
Meloxicam
Placebo
ADG, lbs
4
3.5
3
2.5
2
1.5
1
0.5
0
a
a
b
b
Bulls
Steers
a –b; p < 0.05



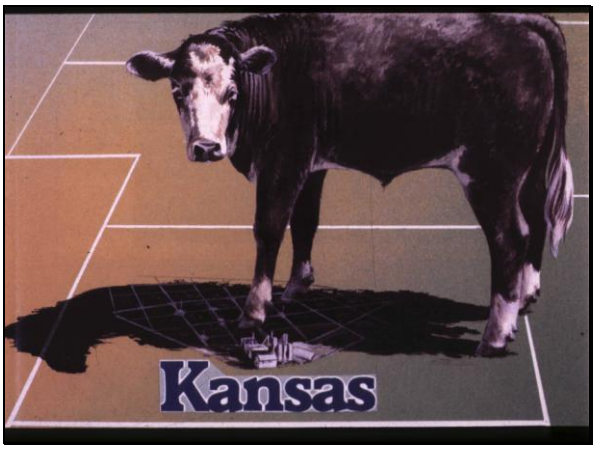
Conclusions

- Raising cutter bulls is not without cost
- You may need to treat up to 9 calves with an antibiotic to prevent 1 case of BRD
- Scientific findings regarding the optimal timing and method of castration in and use of analgesia are conflicting
- How castration is performed on farms is going to be increasingly scrutinized by the public (led by Animal Rights groups)
- Oral meloxicam may provide a convenient and cost-effective means of providing pain relief and perhaps production benefits
- This may be an opportunity for us to get ahead of this before it becomes an issue



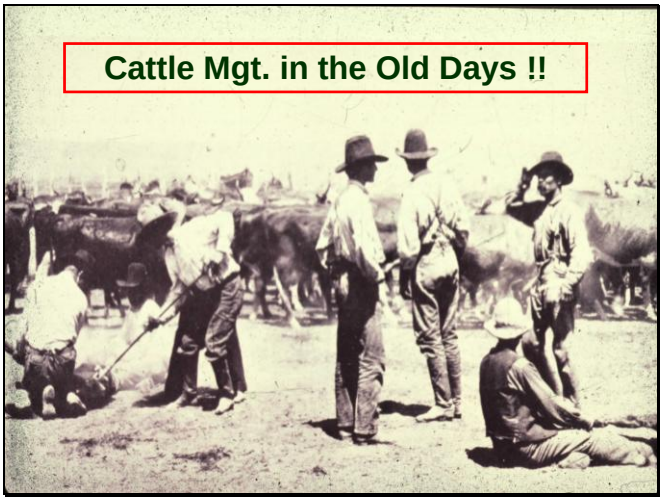
Rethinking Growth Implants: Where do they fit?

Dr. Gerry Kuhl
Professor Emeritus, Kansas State University



Stocker Profitability

- Buy'em Cheap
- Keep'em Alive
- Make'em Gain
- Sell'em High



Management

" Applying the Practices that Pay ! "

Growth Enhancers

- Genetic Improvement
- Optimal Nutritional Management
- Effective Health Programs
- Anabolic Implants
- Repartitioning Agents

Typical Responses to Implants

	Expected Benefit	
Growth Phase	Rate of Gain	Feed Efficiency
Suckling	4 – 8 %	---
Growing	10 – 20%	8 – 10%
Finishing	12 – 20%	8 – 12%

Reasons for NOT Implanting Stockers

- K-State 2000 Stocker Survey
- 10 % of Respondents DO NOT Implant :
  - #1 No Perceived Benefit
  - #2 "Natural Beef" Program
  - #3 Price of Implants
  - #4 Lack of Facilities
- Other State Surveys Suggest Only 50 to 65 % of Stockers are Implanted !

What About 'Natural' Beef ?

- Cattlemen Have a Every Right to Produce 'Natural' or 'Organic' Beef in Demand by Some Consumers.
- However, Don't Disparage Traditional Beef :
  - All Beef is Tasty, Safe and Wholesome !
  - All Beef is Organic !
  - All Beef Contains Low Levels of Estrogen !
  - Traditional or Conventional Beef is Cheaper to Produce and MORE Eco – Friendly !

Estrogen From Various Sources*

Source	Nanograms of Estrogen (1 in 1,000,000,000)
Beef ~ Non-implanted Steer, 3 oz.	1.3
Beef ~ Implanted Steer, 3 oz.	1.9
Beef ~ Pregnant Cow, 3 oz.	119
Peas, 3 oz.	340
Ice Cream, 3 oz.	511
Cabbage, 3 oz.	2,043
Eggs, 3 oz.	2,980
Soybean Oil, 3 oz.	170,250
Adult Man, produced daily	100,000
Adult Woman, produced daily	5,000,000

* Adapted from Preston, Texas Tech, 1997.

News Articles Like This are Common, Even in Kansas, Promoting - - - -

> Organic Beef !
> Organic Brats !
> Organic Beer !

They're Also BULLSHIT !!

Wear purple, think green

This season, consider a mo eco-friendly tailgate party

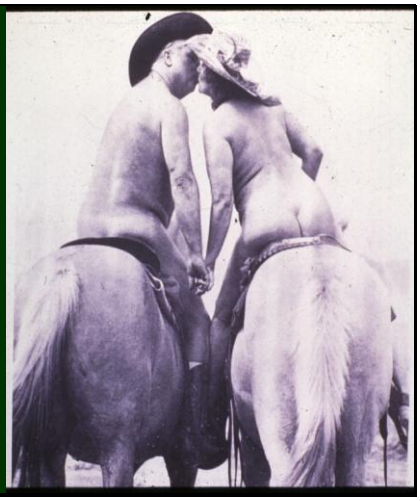
Environmental Study of US Beef Industry - - - 1977 to 2007*

- **Evaluated the Combined Impact of Improved Nutrition and Management on Sustainable Beef Production**
- **13% more Beef Produced with 13% Fewer Cattle**
- **Complete System Analysis Found, Per Lb of Beef Produced:**
  - ✓ **10% Less Feed Energy Used**
  - ✓ **20% Fewer Feedstuffs Needed**
  - ✓ **30% Less Land Required**
  - ✓ **14% Less Water Used**
  - ✓ **9% Less Fossil Fuel Used**
  - ✓ **18% Reduction in Carbon Footprint**

*** Dr. Jude Capper, Washington State University, 2010**

GRAZING CATTLE

Riding the Herd Can Be FUN !



What About Implanting Suckling Calves

- 10 – 30 Lb Higher Weaning Weight
- Implant Benefits Depend On :
  - Genetic Potential of Calf
  - Milk Production of Dam
  - Pasture Conditions
  - Creep Feeding
- Cow-Calf Operations that Implant*:
  - Only 14% of All US Operations
  - 55% of Operations over 300 Cows

*National Animal Health Monitoring System, 1997.

Growth Promoting Implants

- Numerous "Designer" Implants Today
- Differing FDA Approved Uses
- Different Active Ingredients:
  - Estrogenic and/ or Androgenic
  - Varying Dosages and Potencies
  - Varying Effective Anabolic Lifespans
- Few have Delayed or Extended Payouts
- Some have Protective Antibiotic Coatings

Implants For Stockers*

Brand	Approved Use	Relative Potency	Active Lifespan
Ralgro	St. & Hfr.	Mild	70-100 d.
Synovex-S	Steers	Moderate	80-120 d.
Component E-S	Steers	Moderate	80-120 d.
Synovex-H	Heifers	Moderate	80-120 d.
Component E-H	Heifers	Moderate	80-120 d.
Revalor-G	St. & Hfr.	Moderate	70-120 d.
Component TE-S	St .& Hfr.	Moderate	70-120 d.
Compudose	Steers	Moderate	150-200 d.
Encore	Steers	Moderate	350-400 d.

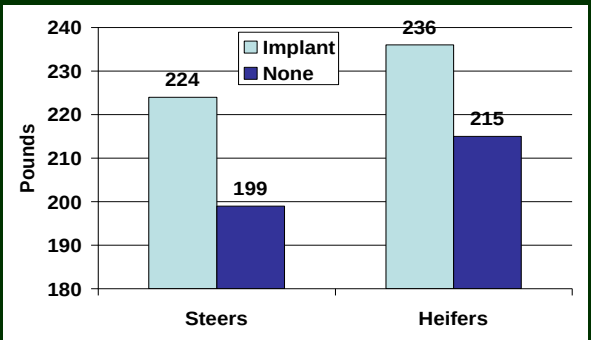
* McCollum, Texas A&M,1998 and Kuhl, KSU, 1999.

Benefit Of Implanting Grazing Yearlings*

- Summary of 19 Early Field Trials
- Total of 981 Stockers
- Average Implant Response
  - +20.0 Lb.

*Corah and Coworkers, K-State, 1976.

Benefit of Implanting Stockers



6,860 Steers, Synovex-S, 41 trials, 132 d
2,555 Heifers, Synovex-H, 17 trials, 142 d

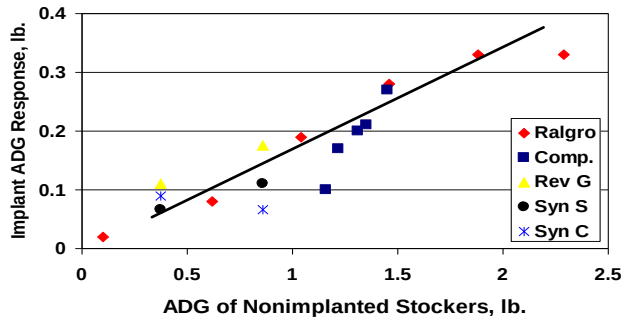
Stocker Implant Responses Grazing Small Grain Pastures*

Total Head	Grazing Days	Average Daily Gain, Lb. Control	Ralgro	Synovex
STEERS - - 10 Trials:				
1050	147	1.53	1.83**	1.81**
		- - -	19.6%	18.3%
HEIFERS - - 7 Trials:				
645	129	1.47	1.70**	1.64**
		- - -	15.6%	11.6%

*Laudert, K-State, National Wheat Pasture Symposium, 1983.

Implant Response to Nutrition*

Data from Kuhl 1997 and Paisley 1999



*Summary by Chris Reinhardt, K-State, 2006.

Factors Boosting Stocker Implant Responses

- High Forage Quality
- Proper Stocking Rate
- Supplementation
- Feed Additives
- Health Programs Including Deworming
- External Parasite Control
- "Total Quality Management"

Stocker Responses To Ralgro On Endophyte Fescue Pastures*

Item	Low Endophyte			High Endophyte		
	None	Ral-36	Ral-72	None	Ral-36	Ral-72
No. Steers	50	50	50	50	50	50
Daily Gain, lb	1.28	1.43*	1.48*	.95	1.29*	1.38*
Benefit, lb	- - -	.15	.20	- - -	.34	.43
Benefit, %	- - -	12%	16%	- - -	36%	45%

*Brazle, K-State, 1988. Average of two 87-day fall grazing trials evaluating one or two initial 36 mg (zeranol) Ralgro implants.

Factors To Consider When Implanting Or Reimplanting Grazing Cattle

- Season of Year
- Growing Conditions
- Quantity & Quality of Forage
- Stocking Rate
- Length of Grazing Season
- Supplementation Options
- ALL Influence Cattle Performance

Match Your Implant Program To Your Forage And Stocker Situation

Age at Castration and Implant Benefits`

Item	Knife Castrated When 1-2 mo. Old	Left Intact -- Banded at 825 Lb
Suckling Implant	Synovex-C	None
Weaning Wt, Lb	494	489
Growing Implant	Synovex-S	None
End Growing Wt, Lb	897**	865
Feedlot Implant	Revalor-S	Revalor-S
Finished Wt, Lb	1298**	1273

*Bruns et al., SDSU, 2003 with 164 calves. No differences in carcass quality .

Costly Confusion

Compensatory Growth and Implants Have NO Biological Connection !

Implanted Stocker Cattle Will Exhibit Full Compensatory Gain in the Feedlot

Profit Robbers From Poor Implanting*

- Improper Technique & Poor Sanitation
- Abscesses
- Lost or Expelled Implants
- Implant Embedded in Cartilage
- Crushed or Bunched Pellets
- Missing Pellets
- Remember "Total Quality Management !"

Implanting Quality Assurance

Remember The Goal !

+ Active
+ Undamaged
+ Uncontaminated
+ Maximum Response
  In Every Animal

" It Takes a Lot of Hard Work To Figure out How to Do Something Simple ! "

- - - Rich Porter
Porter Farms
Reading, KS

Ralgro in Stocker Cattle on Subsequent Feedlot ADG / F:G*

	Pasture Implant	
Reference	Control	Ralgro
Brazle, 1996	3.86	3.74
Brazle, 1996	3.78	3.52
Grigsby, 1988	2.61	2.63
Rush, 1989	2.89/7.7	2.88/7.5
Mader, 1985	2.71/6.74	2.79/6.99
Brethour, 1981	3.60	3.81
Hutcheson, 1987	2.72/7.55	2.79/7.72
Simms, 1988	3.19/6.5	3.15/6.7
Kuhl, 1997	3.38	3.39
Overall	**3.19**	**3.19**

*Compiled by Reinhardt, K-State, 2006.

Implanting Stockers with Revalor-G on Subsequent Feedlot Performance*

Reference	Grass type	Pasture Implant Treatment Control	Rev-G
		Feedyard ADG/Feed Efficicency	
Kuhl, 1997	Summer	3.38/6.85	3.47/6.76
Eng, 1997	Summer	3.44/6.66	3.48/6.69
Grant, 1993	Summer	3.03/7.68	3.16/7.63
Paisley, 1997	Dormant	3.63/-	3.65/-
Greene, 1998	Dormant	4.23/6.17	4.15/6.40
Johnson, 1999	Summer	3.97/6.20	3.91/6.56
Larson, 1999	Summer	4.41/5.54	4.32/5.92
Average	**RG vs C**	**3.26/6.52**	**3.27/6.66**

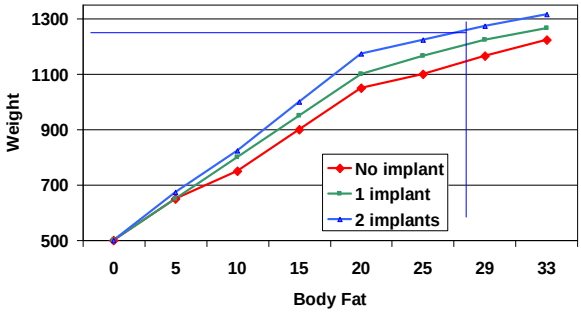
*Compiled by Reinhardt, K-State, 2006.

Effect of Revalor-G in Stockers on Subsequent Quality Grade*

Reference	Grass type	Pasture Implant Treatment Control	Rev-G
		Percent Choice	
Kuhl, 1997	Summer	81.4	67.8
Eng, 1997	Summer	33.1	43.9
Grant, 1993	Summer	67.5	62.5
Paisley, 1997	Dormant	59.5	44.4
Greene, 1998	Dormant	56.7	42.9
Johnson, 1999	Summer	73.1	73.7
Larson, 1999	Summer	34.9	30.0
Average	**RG vs C**	**58**	**52**

* Compiled by Reinhardt, K-State, 2006.

Growth Curve Modification by Implants*



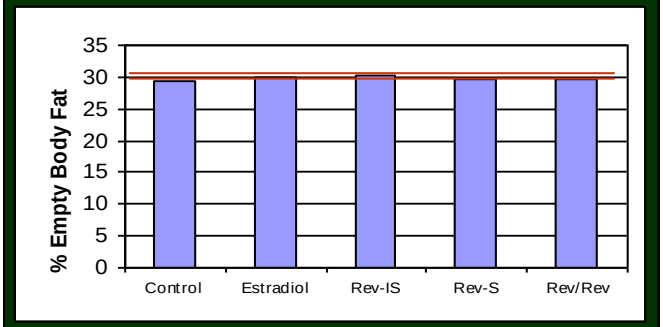
*Reinhardt, K-State, 2006.

Implant Research Studies*

- In Most Studies, Cattle Have Been Fed Equal Number Days (~ Constant Age)
- Cattle Implanted with Estrogen + TBA Likely Can Be Fed 4 - 6 % Longer Without Becoming Over Finished
- This Should Minimize Any Grade Effect

*Kuhl, K-State, 2010.

Body Fat Content of Steers Grading Low Choice (Guiroy, 2001)



Implants and Finished Weight*

- Implants increase the growth curve.
- Increasing dose increases weight at a common body fatness.
- Compare cattle at equal fatness when evaluating grade differences.
- Implants do not change the amount of carcass fat required to reach Choice.

*Reinhardt, K-State, 2006.

Implants and Beef Tenderness*
Summary of 19 Studies

- Implants improve tenderness
  - In some studies… 2
- Implants reduce tenderness
  - In some studies… 3
- Implants have no significant effect on tenderness
  - In most of the studies… 14

*Nichols et al., Professional Animal Scientist, 2002.

Implanting Stockers Pays !

- 20+ Lb (15 – 30 Lb) Added Gain
- 10 – 20 % Boost in Gain
- Response is Proportional to the Growth Rate of Stockers on Grass ~~ Nutrition & Mgt.
- Stocker Response is Maintained Through the Finishing Phase
- Little or No Influence on Carcass Traits

*Kuhl, K-State, 2010.

Occasionally, limiting growth stimulants may be a good thing!!

Lifetime Sequential Implanting of Cattle*

Increase the Potency of Implants Used At Successive Stages of Production :

Mild → Moderate → Strong

*Mader, University of Nebraska, 1997

Implant Potency Principle*

Use Lower Potency Implants :

- On Younger, Immature Cattle
- During Production Phases of Lower Energy Intake
- Higher Risk Cattle with Lower Expected Feed Intakes
- Especially with High Quality Grid Cattle

*Pritchard, South Dakota State University, 2005.

Systematic Implanting During Suckling, Growing and Finishing Makes Dollars and Sense !

If You Always Do
What You've Always Done,

You'll Always Get
What You've Always Gotten !

EDUCATION

IS

Going From Cocksure Ignorance
To
Thoughtful Uncertainty !

Tips for the Mixer Wagon

Dr. Scott Laudert
Elanco

TechTalk Elanco
Scientific Update From Elanco Animal Health

Troubleshooting Poor Ration Uniformity in Feedlot Rations

GJ Vogel, PhD and SB Laudert, PhD, Elanco Animal Health

Introduction

Ration mixing and feed delivery are two of many important processes in cattle feeding operations. Based on experience, one would assume that poor mixing translates into poor animal performance. Unfortunately, limited information exists which demonstrates the impact of mixing on fed cattle performance. Wagner et al. (1988) reported that cross-bred heifers fed a silage-based diet gained 9 percent faster and 14 percent more efficiently when fed a mixed vs. an unmixed ration. More recently, Zinn et al. (2000) reported that imposing a 20 percent variation in weekly protein supplement inclusion rates decreased daily gain by 8 percent and increased feed conversion by 5 percent when compared to steers receiving a similar diet with no variation in supplement inclusion rate. Unfortunately, limited information exists where marginal mixing is related to cattle performance. Nevertheless, the above information supports the long-standing theory that providing rations which are more uniform will equate to improved animal performance.

Assessing Ration Uniformity

Assessing ration uniformity is a relatively simple process. Normally, a 'marker' is added into the ration at a set amount. The marker can be a normal component of the ration (i.e., protein, calcium, non-protein nitrogen, salt) or a substance added specifically to measure ration uniformity (i.e., colored iron filings, dyes). Ideally, the marker should be a unique component that can be accurately and inexpensively measured. Following the collection and analysis of a series of samples, a coefficient of variation (CV) is calculated. A CV is a statistical measure used to describe the variation that occurs within a set of observations. Coefficient of variation is calculated by expressing the standard deviation of a set of numbers as a percentage of its mean [(i.e., (standard deviation/mean)*100]. As CVs become smaller, the ration is more uniform because there is less variability. It generally is accepted that CVs less than 10 percent represent acceptable mixing, whereas CVs greater than 20 percent represent areas for concern (Groesbeck, 2007).

Several reports have been published documenting the variability of feed mixers in commercial operations. Wicker and Poole (1991) reported that of nearly 100 commercial feed mixers tested, approximately 51 percent had mixing CVs less than 10 percent while 19 percent of the mixers had CVs greater than 20 percent. Results from 153 mixing studies conducted in commercial feedlots (Vogel, 2000) indicated the average CV was 9.5 percent. Of these, 66 percent were found to have a CV below 10 percent while 31 percent had a CV between 10 percent and 20 percent. Only 3 percent showed poor mixing characteristics with CVs greater than 20 percent. This would indicate that most commercial feedyards do an acceptable job manufacturing feed. When results from mixing studies report less than optimum results, there are several areas which should be investigated to determine the cause of poor results.

Factors Affecting Ration Uniformity

Improper mixing time — Individual mixers vary widely with respect to optimal mixing times. Wicker and Poole (1991) determined that inadequate mixing time is the primary reason for poor mixing results. Wilcox and Unruh (1986) demonstrated that

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approximately 4 minutes of mix time were required in a horizontal ribbon mixer to obtain a CV below 10 percent (Figure 1). Similarly, results obtained from a stationary paddle mixer within a commercial feedyard demonstrated that longer mixing times improve feed additive distribution and increase the likelihood of acceptable assay results (Table 1). However, in most commercial feedyards, mixing times often are minimized to preserve the integrity of the flaked grains and to maximize feedmill production. Consequently, feedlot rations may tend to be slightly undermixed. The manufacturer of the feed mixer should be contacted to determine the appropriate mixing time.

Figure 1. Effect of mixing time on salt variation in a horizontal ribbon mixer (adapted from Wilcox and Unruh, 1986)

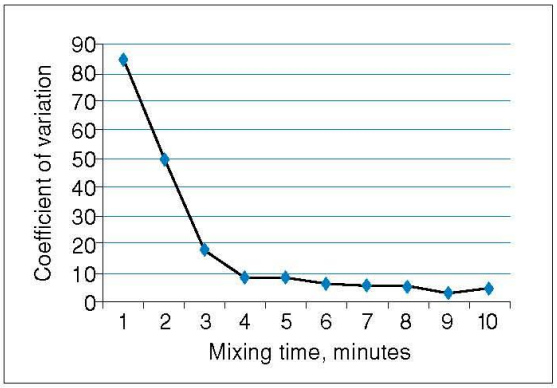


Table 1. Hypothetical effect of mixing time on ration coefficient of variation (CV), assay results and percent of feed additive assays within tolerance using a stationary paddle mixer within a commercial feedyard

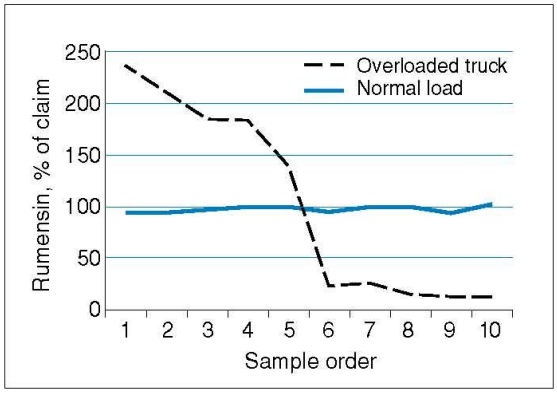
Mixing time, seconds	Ration CV	Average assay result, % of claim	Percent assays within tolerance
30	12	69.1	0
40	19	93.9	90
55	6	99.1	100

Mixer overload — Another critical error that can occur during feed mixing is overloading the capacity of the mixer. Overloading a mixer beyond its effective capability causes problems by creating 'dead spots' of stationary feedstuffs that are not incorporated uniformly into the ration. Wicker and Poole (1991) demonstrated that when a mixer was loaded beyond its capacity, additional mixing time would not reduce variation (Table 2). Similar results have been observed with respect to feed additive distribution at commercial feedyards. In a specific example, when a feed mixer truck was overloaded with feed, distribution of Rumensin® (Elanco Animal Health) was poor (Figure 2). Upon discharge, the majority of Rumensin was located in the front half of the load while little Rumensin was found near the back. When the truck was filled to the appropriate level and then mixed, Rumensin was distributed evenly throughout the feed truck.

Table 2. Effect of batch size and mixing time in a 5-ton mixer on lysine and methionine variation (Wicker and Poole, 1991)

Batch size, tons	Mixing time, minutes	Coefficient of variation	
		Methionine	Lysine
5	2.0	34.6	12.0
5	2.5	5.0	8.3
5	3.0	2.6	4.6
6	2.0	34.9	56.2
6	2.5	31.4	62.6
6	3.0	29.8	34.0

Figure 2. Potential effect of overloading a feed truck mixer on Rumensin assay results



Worn, broken or improperly adjusted equipment — Often, little attention is given to the fact that worn, broken or improperly adjusted equipment affects ration uniformity. When mixing equipment is worn or broken, the efficiency of mixing is decreased. Wagner and Pritchard (1993) compared different mixer wagons to determine the optimal length of time required to mix a silage-based grower ration and a whole-shell-corn-based finisher ration. Their results demonstrated that a poor condition auger mixer required eight minutes to mix either the grower or finisher ration, whereas a good condition auger mixer required two minutes and four minutes to adequately mix the grower and finisher rations, respectively.

Ingredient buildup on mixers — Because of the high use of fat, molasses and/or liquid supplement in feedlot rations, buildup on augers, mixer shells and doors is possible. This buildup will decrease the efficiency of the mixer. Swingle (1996) reported results from a series of mixer studies conducted at a commercial feedmill where ingredient buildup within the mixer was present. Within four batches of feed where ingredient buildup was present, the mixer CVs were 5, 36, 24 and 14 percent. The ionophore concentrations of the four batches were 92, 80, 133 and 88 percent of theory, respectively. Following cleaning, mixer CVs on four batches of feed were 17, 5, 3 and 3 percent, while the ionophore concentrations were 101, 101, 100 and 108 percent of theory, respectively. Every operation should have a standard operating procedure (SOP) in place to properly clean feed mixing equipment.

Weighing errors — Weighing errors also can create problems with ration uniformity. Yates and Parks (2000), upon reviewing results from feedmill audits, found the capability to weigh accurately and precisely varied among feedyards. In general, they found that as the amount of the ingredient required became a larger percentage of the batch size, the ability to repeatedly weigh accurately and precisely improved. With smaller ingredient inclusion rates (i.e., protein supplements, fat, molasses), greater variability was observed. The authors concluded that within feedmill operations where large scales are used for small ingredient inclusion rates, scale resolution might be needed. The addition of more scales, particularly liquid scales, and the use of variable speed motors, were noted as means to enhance weighing accuracy. It also is important to note that weighing errors typically are more pronounced in situations where front-end loaders are used to add ingredients directly to a feed truck mixer.

Improper sequencing of ingredients — Proper sequencing of ingredients also may affect ration uniformity. Making simple changes in order of ingredient inclusion may improve ration uniformity. For example, the addition of molasses, fat and/or liquid supplements immediately following grain addition may provide for a more uniform distribution within the mix rather than adding these ingredients last, after roughages have been added to the mix. The manufacturer of the feed mixer should be contacted to determine if a specific ingredient sequence order is recommended.

Ration heterogeneity issues — Segregation within a ration sometimes may occur when one or more of the ingredients separate from the remainder of the ration. Ration segregation may occur at a number of locations during the feed manufacturing process. Segregation may occur in the mixer, the surge bin, the auger or elevator, the storage bin and/or in the feed truck. Typically, the physical characteristics of feedstuffs sometimes may affect ration uniformity. Wilcox and Balding (1976) listed particle size and shape, particle density, electrostatic charge, hygroscopicity and flowability of ingredients as characteristics that have the potential to impact ration uniformity. Of these, particle size is considered to be the most important factor. To overcome the tendencies for feedlot rations to separate, molasses or fat often is added.

Variation in ingredient composition — Ration analyses may deviate from their formulated specifications because of unexpected deviations in the content of ingredients. Routine testing of incoming feed ingredients may be helpful in establishing nutrient values rather than using textbook values. If questions arise based on results of complete feed drug assays, the drug levels in the supplement may need to be checked for deviations. If the drug is added to the complete ration via a feed ingredient machine, proper machine calibration may need to be investigated. If further investigation into the cause of deviations in the drug level is required, the drug manufacturer should be contacted and provided with the lot number of the product to help determine the release assay potency of the lot.

Improper sampling — Improper sampling can create a misperception of poor mixing. Improper sampling can be attributed to both timing of sampling and the technique used. For example, animals often sort feed once it has been delivered to the bunk. For this reason, it is recommended that all samples be obtained immediately after feed delivery and before cattle have had an opportunity to come in contact with the feed. When samples are taken, it is recommended to take samples from below the crown of the feed within the feedbunk using a small garden scoop. When conducting ration uniformity studies, approximately five individual samples are needed from equally spaced intervals along the feedbunk upon discharge from the delivery truck (Vogel, 2000).

Analytical error — Variation within any analytical process is inherent. Variation also may exist in analytical processes between laboratories. Therefore, it is recommended that one laboratory be used to help minimize this variation. Nevertheless, because of the sensitivity of most analytical processes, the amount of analytical error is usually small.

Summary

Proper evaluation of feed mixers is important to help maximize animal performance and to minimize potential adverse effects from feeding poorly mixed rations. When results from analytical tests are more variable than expected, a thorough evaluation of the mixing procedure is warranted.

Consumption by unapproved species or feeding undiluted may be toxic or fatal. Do not feed to veal calves. The label contains complete use information, including cautions and warnings. Always read, understand and follow the label and use directions.

Rumensin: Feedlot Cattle

- **For improved feed efficiency:** Feed 5-40 g/ton (90% DM) of Rumensin continuously in a complete feed to provide 50-480 mg/hd/d. No additional improvement in feed efficiency has been shown from feeding Rumensin at levels greater than 30 g/ton (360 mg/hd/d).
- **For the prevention and control of coccidiosis:** Feed 10-40 g/ton of Rumensin continuously to provide 0.14-0.42 mg/lb of body weight per day up to 480 mg/hd/d.

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Elanco

AI10801

Current Thinking on Mycoplasma

Dr. Bob Larson
Kansas State University

Mycoplasma in stocker calves

G.A. Hanzlicek B.J. White, D.G. Renter, R.L. Larson

Introduction

It is not clear if Mycoplasma organisms play a major or minor role in the bovine respiratory disease complex (BRDC) in U.S. stocker and feedlot cattle. Mycoplasma belongs to the class of bacteria called Mollicutes. Mycoplasma bovis is the most frequently identified Mycoplasma organism known to cause disease in cattle, and it is commonly isolated from the nose and upper respiratory tract of both diseased and non-diseased calves.[1-3] If the organism can move from the upper respiratory tract and successfully infect the lung or move through the blood stream to other sites of the body (such as joins or tendon sheaths), disease can develop. Mycoplasma bovis can be associated with pneumonia, arthritis and tenosynovitis, and middle ear infections (mostly lighter calves). Although it is possible for Mycoplasma bovis to cause pneumonia in cattle by itself, it is almost always secondary to BRDC caused by a chain reaction of stress, viral infection, and bacterial (e.g. Mannheimia infection).

A characteristic of Mycoplasma organisms that makes them different from other bacteria associated with BRDC is that they lack a cell wall. Many antibiotics target the cell wall as a method of killing disease-causing bacteria and because Mycoplasma organisms lack a cell wall, they are not susceptible to many common BRDC treatments.

A survey of Kansas stocker operations completed in 2001 found that BRDC and arthritis that was unresponsive to treatment was more common in lighter weight cattle and in larger operations.[4] The survey also found that outbreaks of disease were more likely in operations that received cattle from multiple sources; and as the number of loads received during the winter increased, the more likely an outbreak was to occur. The study also suggested that castration or dehorning (either on arrival or delayed) may increase the likelihood of a problem. It appeared that loads from the western region of the U.S. (Wyoming, Colorado, Utah, Nevada, and California) were less likely to be affected; and operations that obtain cattle from a single source from any region of the country were at lower risk. Affected loads were more likely to receive metaphylaxis but the type of metaphylaxis and the BRDC treatment regimen did not appear to be related to the syndrome.[4]

Several studies have investigated the prevalence of Mycoplasma organisms in general, and Mycoplasma bovis specifically in calf populations at single sampling periods, but few have explored the associations between prevalence and seroconversion in individual calves at multiple time points.[5-7] In a prevalence study at multiple stocker production units, 2% of calves were identified as having Mycoplasma bovis from nasal samples at arrival (diagnosed with PCR), and 0% to 4% of operations had at least one positive calf at arrival when identified by PCR testing of nasal samples (while 0% to 6% were positive according to nasal culture).[7] Another study revealed that 50% of calves were Mycoplasma bovis seropositive at arrival and 40% of the negative calves had seroconverted by day 28.[8] This indicates that exposure to Mycoplasma bovis continues after arrival and that recently arrived stocker calves are able to mount an immune response. A Canadian study reported that calves that experienced BRDC had higher Mycoplasma bovis titers on day 28 than calves that had not experienced BRDC; however there was no association with seroconverting to Mycoplasma bovis during the trial and BRDC.[9] In two other studies, there was no difference between BRDC cases and controls with respect to serostatus or seroconversion.[8,9] In a more recent study, stocker calves that were nasal PCR positive were more likely (OR 10.6) to experience fever during a background period than negative calves.[7]

A group of investigators in the College of Veterinary Medicine and the Department of Animal Sciences and Industry at Kansas State University recently completed a longitudinal cross sectional time series study to investigate three objectives: 1) determine the prevalence (commonness) of *Mycoplasma bovis* and other Mycoplasma organisms in nasal samples and *Mycoplasma bovis* antibody concentration in weaned beef stocker calves on three sampling days—arrival (Day 0) revaccination (Day 10), and study completion (Day 42), 2) determine the changes in nasal *Mycoplasma bovis* and related organism serostatus over 3 time periods: arrival to day 10 (AR), day 10 to day 42 (RV), and arrival to day 42 (ENT), and 3) examine associations of nasal Mollicutes status, and *Mycoplasma bovis* nasal status, and *Mycoplasma bovis* serostatus and seroconversion with growth performance (average daily gain) and morbidity, mortality and case fatality risk.

Results

A total of 305 mixed-breed beef calves from two arrival groups (n = 134 and n = 171) comprised the study population. One calf from the second group was positive for BVDV persistent infection and removed from the study location within one day of initial processing. The remaining 304 calves had an average arrival weight of 404 lbs. (Standard Deviation 90.8 lb.s) and consisted of 18.4% (n = 56) steers and 81.6% (n= 248) bulls.

On day 0, 90.4% of the calves were Mollicutes nasal culture positive and 26.6% of the calves had antibodies to *Mycoplasma bovis*. By day 42, 98.2% had antibodies to *Mycoplasma bovis*. Calves that did not seroconvert to *M bovis*

between days 0 and 42 gained more weight (0.31 lbs. per day) during the study than those calves that did seroconvert. The percent of calves seropositive to *M bovis* increased throughout the study indicating exposure and an immunological response to the organism. Although associations with health outcomes were not identified, seroconversion to *Mycoplasma bovis* was associated with a decreased rate of weight gain during the study period.

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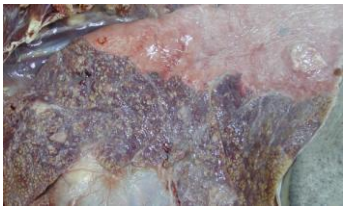
Mycoplasmosis:

What do we know?

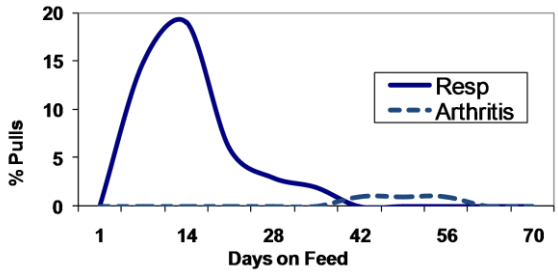
What do we need to know?

Mycoplasma Syndromes

- Pneumonia
- Arthritis / tenosynovitis
- Middle ear infections
- Conjunctivitis (pinkeye)
- Mastitis



BRD Mycoplasma Pen Pattern



BVD and *Mycoplasma bovis*

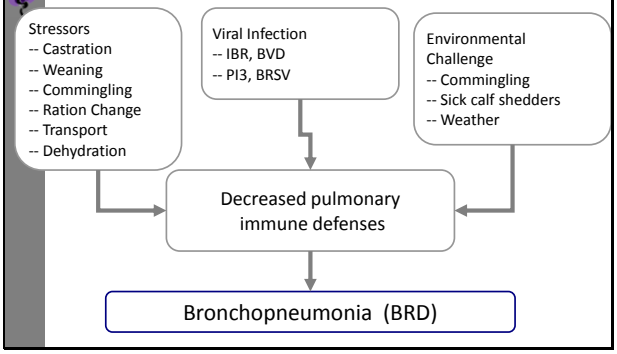
- Survey: 49 chronic animals
  - *Mycoplasma bovis* 80% cases (45% joints, 71% lungs)
  - BVD 40% cases
  - *Mannheimia haemolytica 23%* cases
    - » 2001, Haines, et al, Can Vet J

- Survey of chronic non-responders
  - *Mycoplasma bovis* 59/64 cases
  - BVD 40/64 cases
    - » 2002, Shahriar, et al, Can Vet J
- Association between BVD and *M bovis*?

Mycoplasma Syndromes: What do we know?

- *Mycoplasma* species commonly found at in surveys of samples sent to diagnostic labs
- Pneumonia and arthritis major concerns
- Associated with other organisms (*Mannheimia,* BVD)?

Bovine Respiratory Disease Classic Model



Bovine Respiratory Disease

- BRD not normally caused by a single pathogen
- Bacterial pathogens:
  - Normal inhabitants of upper respiratory tract
  - Cause disease when normal defense mechanisms break down

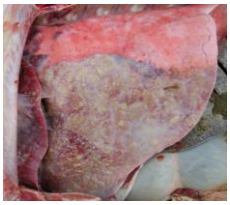
Antibodies to *Mycoplasma* sp.

- Two surveys from Ontario feedlots
- *Mycoplasma bovis* and *Mycoplasma dispar* titers common
  - Greater than 50% on arrival
  - Not associated with weight gain or relapse
    - 1989 Martin et al., Can J Vet Res
- MB and MD titers increased in most yards
- Low *M dispar* titers with subsequent rise increased risk of being treated

1986, Rosendal and Martin, Can J Vet Res

M bovis pathology

- Survey 45 cases fatal pneumonia (US)
  - 25 (56%) positive for Mycoplasma bovis
  - 12/25 positive if they have lung abscesses
  - Lungs with no abscesses more chronic
    - 1995 Adegboye et al., J Vet Diagn Invest



Treatment options

- Unique bacteria:
  - No cell wall
  - Differs from most other BRD pathogens
- Concern of first line therapy?
- Role of metaphylaxis

Antimicrobial Susceptibility

- US Diagnostic lab isolates n=223 (2003-03)
- Laboratory testing (not tested in cattle) using published MIC or CLSI interpretive criteria
  - Active compounds:
    - Enrofloxacin, florfenicol, spectinomycin
  - Active against > 50% isolates:
    - Oxytetracycline, chlortetracycline
  - Few isolates susceptible:
    - Tilmicosin
  - No isolates susceptible:
    - Erythromycin, ampicillin, ceftiofur

2005, Rosenbusch et al. J Vet Diagn Invest

Mycoplasma: What do we know?

- Reservoir: cattle
  - More common in pneumonia cases
- Reported in increasing frequency associated with bronchopneumonia and arthritis
  - Chronic cases most common
- Relatively accurate live animal testing possible
  - Pathology more definitive

KSU Mycoplasma Project

Research Questions:

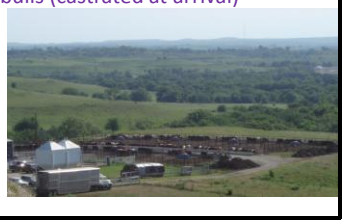
- Are mycoplasmas (specifically *M bovis)* primary or secondary pathogens?
- Is the previously reported US stocker prevalence (2% PCR) repeatable?
- What does positive status mean (performance or health)?

KSU Mycoplasma Project

- Objective:
  - Determine potential differences in prevalence of Mycoplasma in apparently normal calves at arrival compared to first treatment
  - Evaluate associations between Mycoplasma status (at arrival or first treatment) and subsequent health outcomes

Materials and Methods

- 293 Southeastern stockers
  - Three loads; arrived 8/30 and 9/1
  - Mean wt: 485 lbs; 12 head pens
  - 113 steers / 180 bulls (castrated at arrival)
- Processed
  - Viral (MLV)
  - Clostridial
  - Deworm
  - Metaphylaxis (2)



Testing Procedure

- Nasal Swab
  - All at arrival
  - All 1st Pulls
- Cultures
- Positive cultures
  - M bovis PCR (KSU)

Results

- 43 DOF
- BRD Sickness risk:
  148/293 (50.5%)
- BRD Death risk :
  27/293 (9.2%)
- Arthritis risk:
  6/293 (2.0%)

Results

	Culture Positive
Arrival	16 / 293 (5.5%)
Initial BRD Tx	37 / 145 (25.5%)

Arrival Culture Status

- Associated with initial weight (P < 0.03)
  - Less likely to culture Mycoplasma at arrival from nose of heavier stocker calves
  - Top of weight range (562 lbs.) 27.5 times less likely to be culture positive than low end of weight range (392 lbs.)
- No association with:
  - Gender (bull or steer)
  - ADG

First treatment diagnostics

- Culture status not associated with ADG

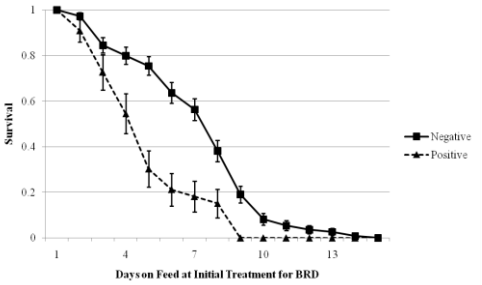
First treatment culture status and subsequent health outcomes

Health Outcome	Odds Ratio	95% Conf Interval	p-value
Death	2.8	1.0 7.8	<0.06
Second Treatment	2.9	1.2 6.9	0.02
Third Treatment	2.9	1.1 7.6	0.03

If we cultured Mycoplasma from the nose of a calf at his first pull – he was about 3 times more likely to die and to require more treatments than if he was culture-negative

Kaplan-Meier Survival Curve

Days to first treatment by first treatment culture status



Arthritis

- Late in feeding phase
- Polyarthritis in several calves
- 2 joints cultured: *M bovis* positive

Conclusions

- Mycoplasma cultures:
  - Lighter calves more likely to be positive
  - 5.5% positive at arrival; 25.5% at 1st pull
- Health outcomes
  - Culture at arrival not associated with health
  - Culture at first pull associated with increased odds of death or retreatment

Notes – Notes -- Notes

Be sure to visit the BeefStockerUSA website at:

www.beefstockerusa.org

An information site for stocker producers presented by Kansas State University Research and Extension:

Department of Animal Sciences & Industry

Food Animal Health and Management Center
College of Veterinary Medicine

"Knowledge for Life"