57TH FLORIDA DAIRY PRODUCTION CONFERENCE

Straughn IFAS Extension Professional Development Center
Gainesville, Florida November 2nd, 2023

UF | IFAS
UNIVERSITY of FLORIDA

WELCOME

On behalf of all the faculty of the University of Florida Department of Animal Sciences, welcome to the 57th Florida Dairy Production Conference.

The Florida Dairy Production Conference started in 1964 and aims to create a program which brings together some of the newest research, innovations, recommendations, and ideas for improving the sustainability and profitability of the Florida dairy industry.

The presented information provides practical take-home messages for dairy farmers and highlights emerging trends in the dairy industry. The conference strives to provide a friendly learning and sharing atmosphere with networking opportunities for our target audience of dairy owners and employees, allied dairy industry professionals, UF faculty, students, and dairy educators.

This year's conference includes aspects of heat stress effects on dairy cattle, nutrition, uterine health, and employee training.

A full synopsis of the meeting and complete proceedings including links to recorded presentations can be found here: Florida Dairy Production Conference - Florida Dairy Extension - University of Florida, Institute of Food and Agricultural Sciences - UF/IFAS (ufl.edu)

Regards,

Izabella Toledo	Fernanda Batistel
José Santos	Geoffrey Dahl
Colleen Larson	Matti Moyer

The Organizing Committee

Schedule of Events

9:50 AM **Welcome and introduction**. John Arthington, Chair, Department of Animal Sciences, University of Florida

Leticia Cassarotto Trevisan, Chair

10:00 AM **Beef on Dairy: A new look on beef.** Dale Woerner, Department of Animal and Food Sciences, Texas Tech University

10:50 AM Refreshment Break

11:10 AM **Impact and evaluation of heat stress on dairy cows.** Sha Tao, Department of Animal Sciences, University of Georgia

12:00 PM Lunch

Mariana Nehme Marinho, Chair

1:30 PM **Employee training & development: Considerations beyond the obvious.** Robert Hagevort, Ag Science Center, New Mexico State University

2:20 PM **The economics of uterine diseases.** Klibs Galvão, Department of Large Animal Clinical Sciences, University of Florida

3:10 PM **Refreshment Break**

Daniel de Oliveira, Chair

3:30 PM **Nitrogen efficiency of Florida dairy herds: Potential performance indicator for dairy farms.** Diwakar Vyas, Department of Animal Sciences, University of Florida

4:00 PM **Reducing water use to cool cows using "Smart" technologies.** Geoffrey Dahl, Department of Animal Sciences, University of Florida

4:30 PM **Soil organic carbon stocks in Florida dairies.** José Carlos Dubeux, Agronomy Department, University of Florida

5:00 PM Reception

57th Florida Dairy Production Conference Sponsors

Silver

Florida Dairy Farmers
Avery LeFils
averyl@floridamilk.com

RD Life Sciences
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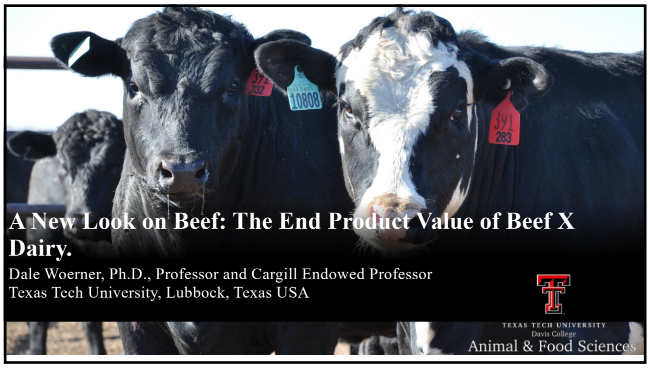
A New Look on Beef: The End Product Value of Beef X Dairy.
Dale Woerner, Ph.D., Professor and Cargill Endowed Professor
Texas Tech University, Lubbock, Texas USA
TEXAS TECH UNIVERSITY
Davis College
Animal & Food Sciences

1


25.4 M
5.1 M
???
USDA NASS Cattle Report (2018); NASS Slaughter Report (2021); USDA ERS (2020)

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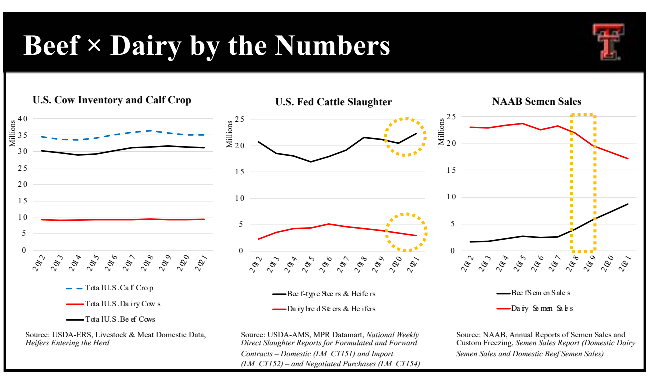
Beef × Dairy by the Numbers
U.S. Cow Inventory and Calf Crop
Millions
Total U.S. Calf Crop
Total U.S. Dairy Cows
Total U.S. Beef Cows
Source: USDA-ERS, Livestock & Meat Domestic Data, Heifers Entering the Herd
U.S. Fed Cattle Slaughter
Millions
Beef-type Steers & Heifers
Dairy bred Steers & Heifers
Source: USDA-AMS, MPR Datamart, National Weekly Direct Slaughter Reports for Formulated and Forward Contracts – Domestic (LM_CT151) and Import (LM_CT152) – and Negotiated Purchases (LM_CT154)
NAAB Semen Sales
Millions
Beef Semen Sales
Dairy Semen Sales
Source: NAAB, Annual Reports of Semen Sales and Custom Freezing, Semen Sales Report (Domestic Dairy Semen Sales and Domestic Beef Semen Sales)

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Beef × Dairy Research at Texas Tech
HPFY
HY-PLAINS FEEDYARD, LLC
Performance Cattle Company, LLC
Max D. Garrison, DVM - President
ABS
Cargill
BEEF
Funded by the Beef Checkoff

4

Cattle Type Comparison

Conventional Beef Cattle

- Quicker Growth Rate
- Gut Health
- Dressing Percent
- Muscle to Bone
- Steak Shape
- Lean Color

Dairy Cattle

- Genetic Consistency
- Oxidative Fiber Type
- Marbling
- External Leanness
- Tender
- Flavorful

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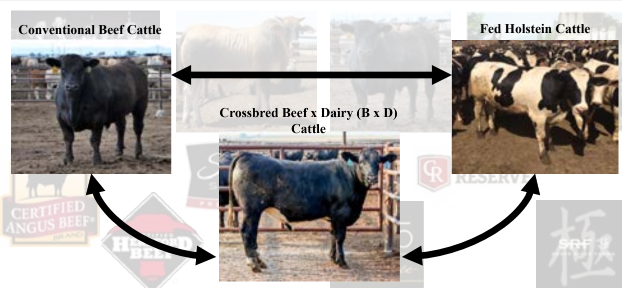
Where does the B x D crossbred fit?



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Dairy Cow Performance

DAIRY B									
	All Dairy			Beef on Dairy					LACT
	LACT I	LACT II	LACT	LACT I	LACT II	LACT	LACT I	LACT II	DIFF
Item	(Dairy)	(Dairy)	DIFF	(Dairy)	(Beef)	DIFF	P-Value	P-Value	P-Value
Days open (previous lactation)	113	115	2	120	114	-6	0.05	0.56	0.05
Times bred	2.0	1.9	0.0	2.1	1.9	-0.3	0.11	0.35	0.06
Gestation time, d	277	277	1	277	279	2	0.74	<0.01	<0.01
Total milk, lbs	30,294	31,526	1,232	27,390	29,436	2,046	<0.01	<0.01	0.03
Days in milk	337	344	7	336	341	5	0.52	0.17	0.52
Average daily milk, lbs/d	90	92	2	81	85	4	<0.01	<0.01	<0.01
305-d MHE, lbs	28,886	27,874	-1,012	25,850	26,114	264	<0.01	<0.01	<0.01
Peak daily milk, lbs	119	121	2	106	114	8	<0.01	<0.01	<0.01
Days dry before freshening	49	55	5	51	57	6	0.02	<0.01	0.71
Mastitis, %	16	19		13	13		0.30	0.01	

Increased gestation time by breeding to beef semen (1-2 days)

Cows bred to beef semen were inherently less productive

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Feedlot Growth

	Paired Feedlot Closeouts			Phenotype Expression	
Item	Native	B × D	*P*-value	B × D Steers	B × D Heifers
Number of pens	26	26		6	3
Total animal count	1,603	1,492		411	181
Initial BW, lbs	799	805	0.77	788	724
Final BW, lbs	1,329	1,342	0.57	1,432	1,354
Days on feed	157	166	0.16	176	189
ADG, lbs/d	3.5	3.3	0.19	3.7	3.3
Feed:gain	6.6	7.1	0.02		
Dressing percentage	64.1	63.1	<0.01	62.9	62.7
Choice or better, %	78.7	78.7	0.99	82.7	88.9

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Estimated Carbon Footprint

Item	Beef	B × D	Holstein
	Paired Feedlot Closeouts		
Total CO2e, kg	1386	1489	2255
Total CO2e, kg/kg BW	2.3	2.4	3.6
Total CO2e, kg/kg HCW	3.6	3.9	5.8
Total CO2e, kg/kg BW gain	5.8	6.1	6.3

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Carcass Performance

	Eating Quality Study				Phenotype Expression	
Item	Native	B × D	Holstein	*P*-value	B × D Steers	B × D Heifers
Number of carcasses	966	518	935	--	411	181
HCW, lbs	873^{a}	867^{b}	865^{b}	<0.01	901	849
12th rib fat thickness, in	0.51^{a}	0.43^{b}	0.35^{c}	<0.01	0.53	0.56
Ribeye area, in^2	14.7^{a}	14.3^{b}	13.6^{c}	<0.01	13.8	14.1
KPH fat, %	3.6^{b}	4.5^{a}	4.5^{a}	<0.01	--	--
USDA Yield Grade	3.1^{b}	3.2^{ab}	3.3^{a}	<0.01	3.3	3.1
Marbling score	447^{b}	481^{a}	482^{a}	<0.01	493	543

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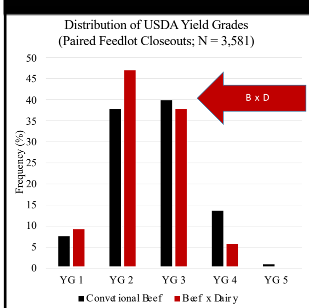
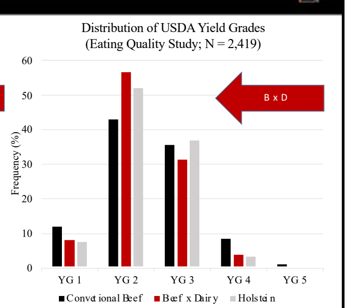
Yield Grades





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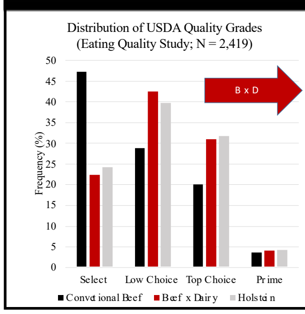
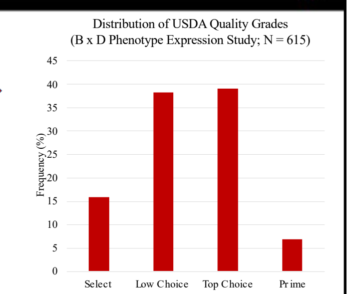
Quality Grades





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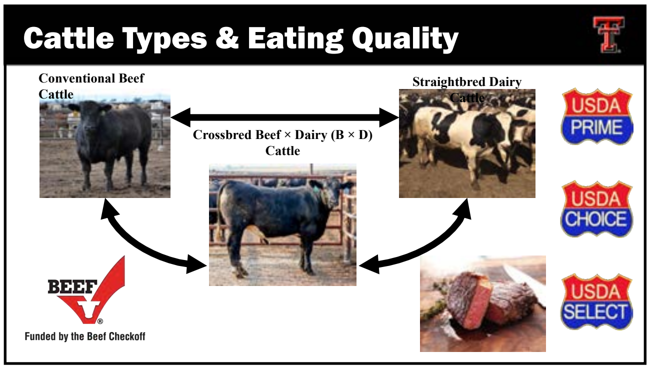
Cattle Types & Eating Quality
Conventional Beef Cattle
Straightbred Dairy Cattle
Crossbred Beef × Dairy (B × D) Cattle
USDA PRIME
USDA CHOICE
USDA SELECT
BEEF
Funded by the Beef Checkoff

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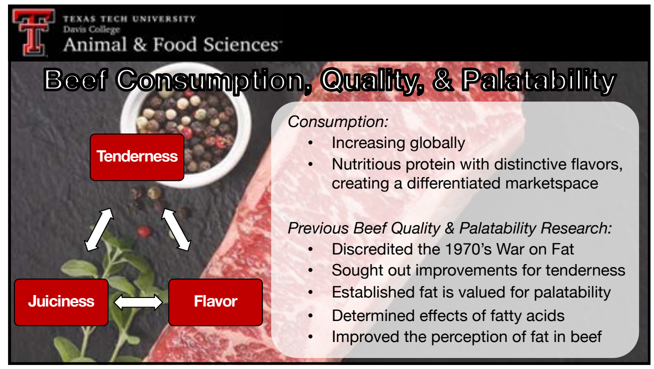
TEXAS TECH UNIVERSITY
Davis College
Animal & Food Sciences
Beef Consumption, Quality, & Palatability
Tenderness
Juiciness
Flavor
Consumption:
• Increasing globally
• Nutritious protein with distinctive flavors, creating a differentiated marketspace
Previous Beef Quality & Palatability Research:
• Discredited the 1970's War on Fat
• Sought out improvements for tenderness
• Established fat is valued for palatability
• Determined effects of fatty acids
• Improved the perception of fat in beef

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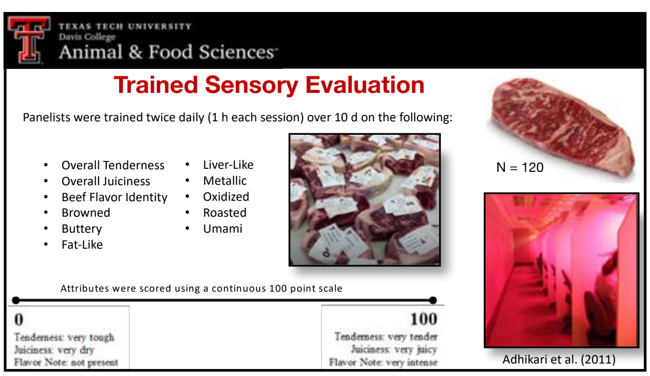
TEXAS TECH UNIVERSITY
Davis College
Animal & Food Sciences
Trained Sensory Evaluation
Panelists were trained twice daily (1 h each session) over 10 d on the following:
• Overall Tenderness
• Overall Juiciness
• Beef Flavor Identity
• Browned
• Buttery
• Fat-Like
• Liver-Like
• Metallic
• Oxidized
• Roasted
• Umami
N = 120
Attributes were scored using a continuous 100 point scale
0
Tenderness: very tough
Juiciness: very dry
Flavor Note: not present
100
Tenderness: very tender
Juiciness: very juicy
Flavor Note: very intense
Adhikari et al. (2011)

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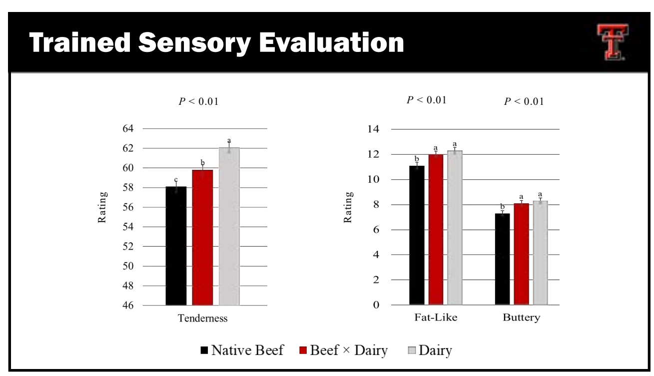
Trained Sensory Evaluation
P < 0.01
P < 0.01
P < 0.01
Rating
64
62
60
58
56
54
52
50
48
46
Tenderness
14
12
10
8
6
4
2
0
Fat-Like
Buttery
c
b
a
Native Beef
Beef × Dairy
Dairy

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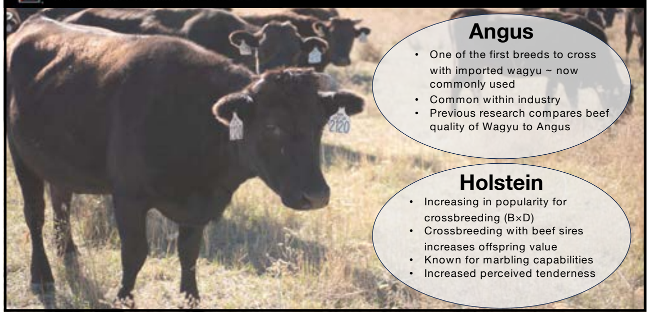
Animal & Food Sciences



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Animal & Food Sciences

Estimated marginal means of instrumental tenderness measurements for striploin steaks (N = 120; n = 40), representing Wagyu × Holstein, Wagyu × Angus, and conventional USDA Prime

	Wagyu × Holstein	Wagyu × Angus	Prime	SEM[1]	*P*-Value[2]
Slice Shear Force, kg	8.09[b]	9.88[b]	10.25[a]	0.23	$\boxed{< 0.01}$
Warner-Bratzler Shear Force, kg	1.70[b]	2.05[b]	2.13[a]	0.04	< 0.01

[a-c] Estimated marginal means in the same row without a common superscript differ (P < 0.05)
[1] Standard error (largest) of the estimated marginal means
[2] Observed significance levels for main effect of groups

*** WBSF values under 3.9 kg qualify for Certified Very Tender (ASTM, 2011)

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Estimated marginal means of descriptive sensory attributes for striploin steaks (N = 120; n = 40), representing Wagyu × Holstein, Wagyu × Angus, and conventional USDA Prime

Attribute	Wagyu × Holstein	Wagyu × Angus	Prime	SEM[1]	*P*-Value[2]
Overall Tenderness	67.8[a]	63.8[b]	60.7[c]	0.70	< 0.01
Overall Juiciness	62.1[a]	58.9[b]	57.9[b]	0.58	< 0.01**
Beef Flavor ID	56.8	56.3	55.4	0.39	0.05
Browned	54.9[a]	54.1[ab]	53.0[b]	0.42	< 0.01
Fat-Like	21.9[a]	20.0[b]	18.7[b]	0.53	< 0.01*
Buttery	5.83[a]	4.44[a]	2.38[b]	0.55	< 0.01*
Roasted	56.1	55.3	55.2	0.40	0.24
Umami	21.9[a]	20.9[a]	19.4[b]	0.33	< 0.01
Liver-Like	0.20[b]	0.74[a]	1.57[a]	0.28	< 0.01
Metallic	0.99[b]	2.06[a]	2.48[a]	0.28	0.01**
Oxidized	0.13	0.03	0.10	0.08	0.49

[a-c] Estimated marginal means in the same row without a common superscript differ (P < 0.05)
[1] Standard error (largest) of the estimated marginal means
[2] Observed significance levels for main effect of groups
*** Crude Fat as a covariate value (α < 0.05)**
**** Recorded off-temperature as a covariate value (α < 0.05)**

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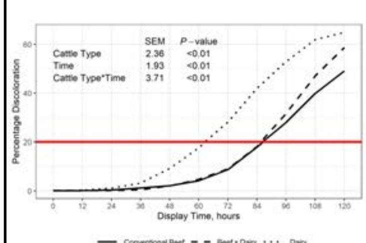
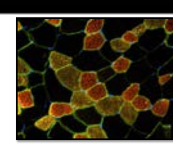
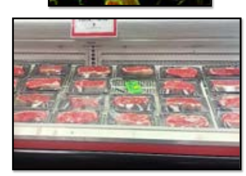
Color Display at Retail







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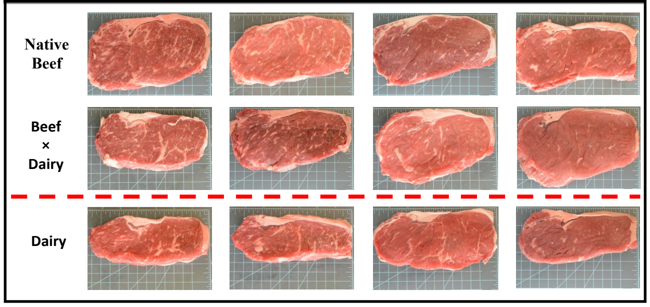
Steak Size & Shape



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Expression of Phenotype & Red Meat Yield

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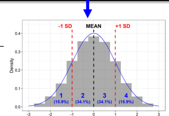
Study Design

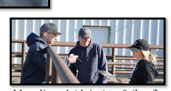
Study 1: Beef- versus dairy-type

6 pens of steers
3 pens of heifers

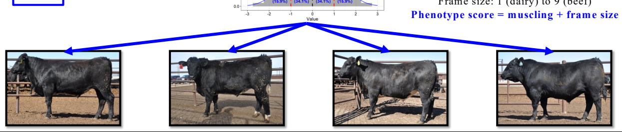
Sire: Angus or SimAngus
Dam: Holstein

Processing Time	Days on Feed	BW, lbs
Arrival	0	777
Re-Implant	104	1,234
Harvest	180	1,417





Muscling: 1 (dairy) to 9 (beef)
Frame size: 1 (dairy) to 9 (beef)
Phenotype score = muscling + frame size



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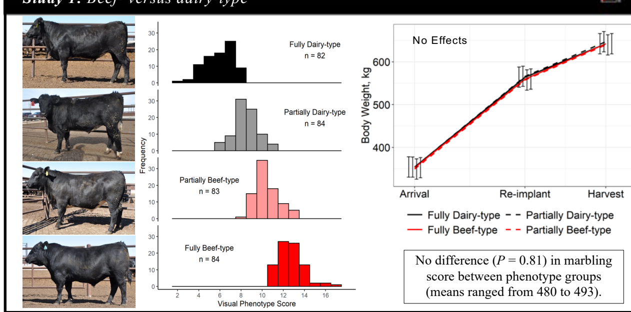
Phenotype Groups

Study 1: Beef- versus dairy-type



No difference (P = 0.81) in marbling score between phenotype groups (means ranged from 480 to 493).

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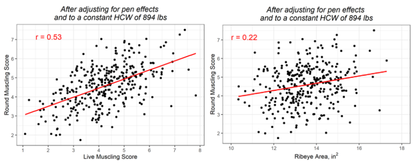
Muscling Considerations

Trait	Fully Dairy-type	Partially Dairy-type	Partially Beef-type	Fully Beef-type	*P*-value
Live muscling score	2.8[d]	4.0[c]	4.5[b]	5.6[a]	<0.01
Ribeye area, in^2	13.2	13.5	13.6	13.5	0.30
Round muscling score	3.8[c]	4.5[bc]	4.8[ab]	5.3[a]	<0.01



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Cattle Type on Carcass Yield and Value

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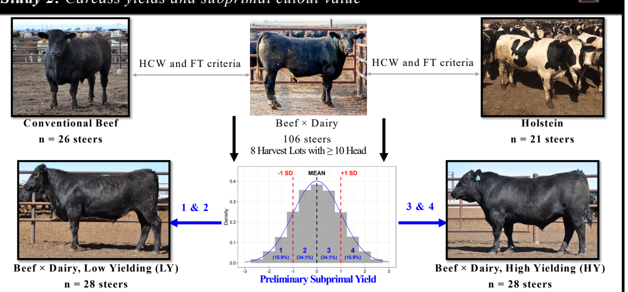
Study Design

Study 2: Carcass yields and subprimal cutout value



Average Crossbred = Arithmetic Mean of HY and LY Groups

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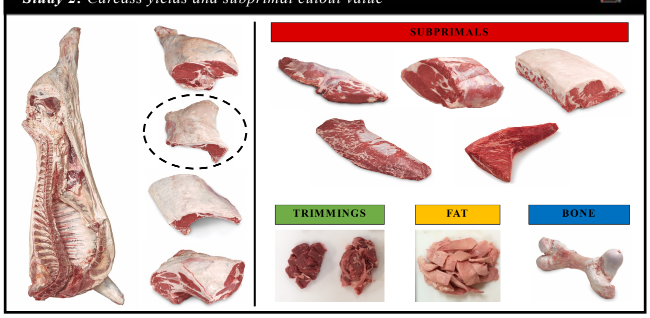
Fabrication Techniques

Study 2: Carcass yields and subprimal cutout value



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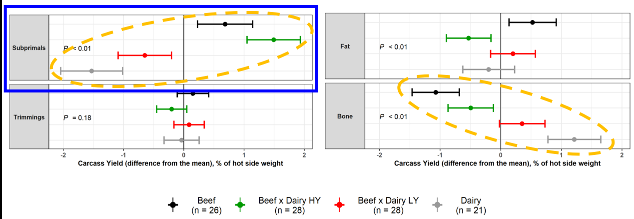
Carcass Yields

Study 2: *Carcass yields and subprimal cutout value*



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Subprimal Cutout Value

Study 2: *Carcass yields and subprimal cutout value*

Subprimal Cutout Value, $ per cwt			
Beef	B×D HY	B×D LY	Dairy
2.97[b]	7.59[a]	-2.12[c]	-8.45[d]

[a-d] Means with different superscripts differ ($P \leq 0.05$).

Average B×D
2.74

!! IMPORTANT !!

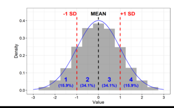
NOT ALL Beef × Dairy Crossbreds Have a Greater Subprimal Cutout Value than Beef Cattle

		Beef × Dairy		
Carcass traits	Beef	HY	LY	Dairy
HCW, lbs	900	904	917	865
12th rib fat, in	0.54	0.40	0.44	0.33

Subprimal Cutout Value Differences

does not include value of trimmings, fat, or bone

Beef vs. Dairy	+ $11.42 per cwt
B×D HY vs. B×D LY	+ $ 9.71 per cwt
Average B×D vs. Dairy	+ $11.19 per cwt



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Liver Abscess Concerns

Study 1: *Beef- versus dairy-type*

	No Liver Abscess		Liver Abscess	
Trait	No Skirt Damage	Skirt Damage	No Skirt Damage	Skirt Damage
Number of cattle (%)	208 (38%)	44 (8%)	136 (25%)	162 (29%)
Dressing percentage	63.2	62.9	63.0	62.2
Marbling score[1]	493	490	492	477

[1] Marbling scores: 400 to 499 = Small (Low Choice), 500 to 599 = Modest (Average Choice)

USDA National Weekly Boxed Beef Cutout And Boxed Beef Cuts - Negotiated Sales

Agricultural Marketing Service

Livestock, Poultry, and Grain Market News

Outside Skirt Cutout Value: $1,188.00/cwt

Outside Skirt Damage:

5 lbs. per carcass × $1,188.00/cwt = *$59.40 per animal*

Survey of B × D Crossbred Gut Health (N = 1,161)

Trait	Prevalence, %
Liver scores	
0	69
A	28
A+	3
Gut pile condemnation	20
Outside skirt damage	14

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Maximizing Value

ENVIRONMENTAL SUSTAINABILITY

CARCASS YIELD & MARBLING

HIGH-QUALITY PRODUCT

CONSISTENCY

TRACEABILITY

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Beef × Dairy in the Literature

ACCEPTED MANUSCRIPT

Invited review: A carcass and meat perspective of crossbred beef × dairy cattle

B A Foraker, J L Frink, D R Woerner

Translational Animal Science, txac027, https://doi.org/10.1093/tas/txac027

Published: 22 February 2022 **Article history**

ACCEPTED MANUSCRIPT

Crossbreeding beef sires with dairy cows: cow, feedlot, and carcass performance

B A Foraker, M A Ballou, D R Woerner

Translational Animal Science, txac059, https://doi.org/10.1093/tas/txac059

Published: 09 May 2022 **Article history**

Meat and Muscle Biology™

Expression of beef- versus dairy-type in crossbred beef and dairy cattle does not impact shape, eating quality, or color of strip loin steaks.

Blake A. Foraker, Bradley J. Johnson, Ryan J. Rathmann, Jerrad F. Legako, J. Chance Brooks, Markus F. Miller, and Dale R. Woerner

DOI: https://doi.org/10.22175/mmb.13926

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Dale.Woerner@TTU.edu

TEXAS TECH UNIVERSITY
Davis College
Animal & Food Sciences

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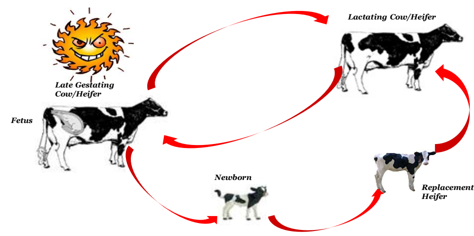
Impact and Evaluation of Heat Stress on Dairy Cows

Sha Tao

UNIVERSITY OF GEORGIA Dairy Team

1

Heat stress has negative impacts on dairy cattle at different stages of her life cycle



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Outline

1) Consequences of heat stress during lactation

2) Identifying heat stress

3) Heat abatement

4) Heat audit

3

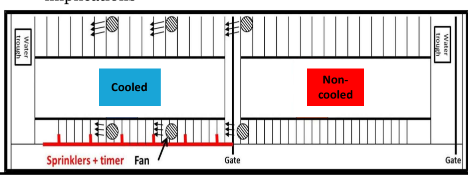
Experimental models to study heat stress in dairy cattle

- Seasonal effect
  - Summer vs. winter; summer vs. spring., etc
  - Heat stress/photoperiod/forage availability/nutrition., etc.
  - Cannot account observed effects into heat stress only.
- Environmental chambers
  - Real heat stress trial
  - Compare with other models, the control group is critical.
  - Tight stall, behavioral responses could be different from those in free stall or on grazing platform
  - Cost is high, fewer facilities

4

Experimental models to study heat stress in dairy cattle

- Deprivation of evaporative cooling
  - Evaporative cooling + shade vs. shade only
  - All animals are exposed to similar environment, but cooling reduces body temperature.
  - Probably have better practical implications



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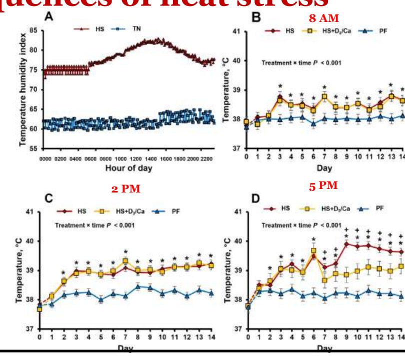
Consequences of heat stress

- Physiological responses
  - Increased body temperature

Lactating cows

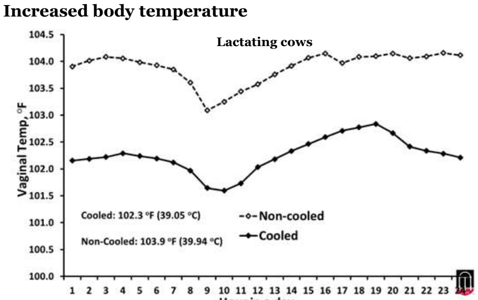


Ruiz-González et al., 2023

6

Consequences of heat stress

- Physiological responses
  - Increased body temperature



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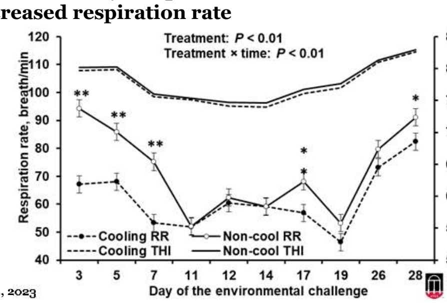
Weng and Tao, Unpublished

7

- Physiological responses
  - Increased body temperature
  - Increased respiration rate



Chen et al., 2023

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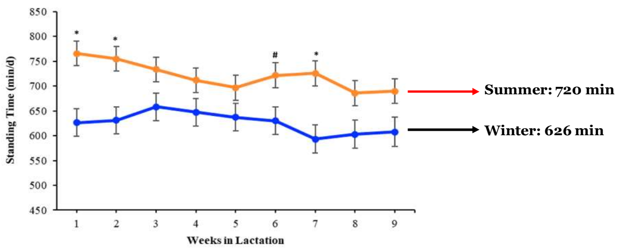
Behavioral responses
- Seasonal effects on standing time



Toledo et al., 2023

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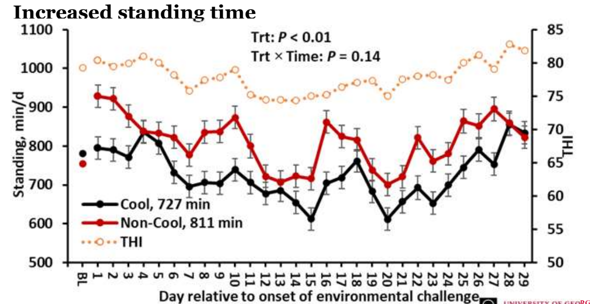
Behavioral responses
- Increased standing time



Marins and Tao, unpublished

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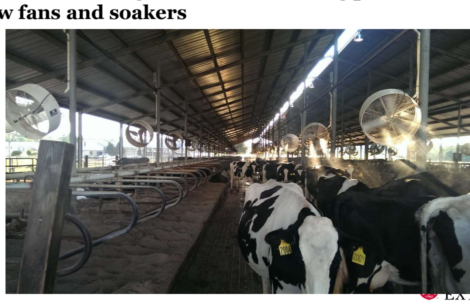
Behavioral responses
- Increased standing time – With cooling provided - standing below fans and soakers



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11

Behavioral responses
- Increased standing time – around water trough. What does that mean?

12

❑ Behavioral responses

Sorting: **<u>Concentrate</u>** vs. **<u>Forage</u>**

Low heat increment — High heat increment

Heat stressed lactating cows select for concentrates and sort against forage?

West JW, 1999

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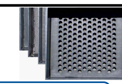
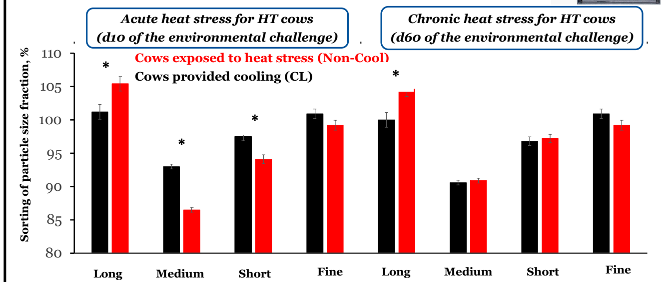
❑ Behavioral responses

- **Sorting: Concentrate vs. Forage**



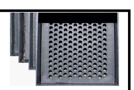


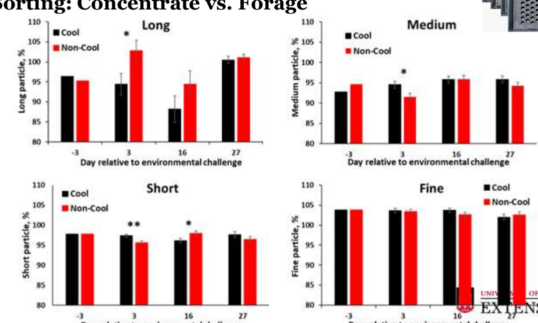
Miller-Cushon et al., 2019

14

❑ Behavioral responses

- **Sorting: Concentrate vs. Forage**





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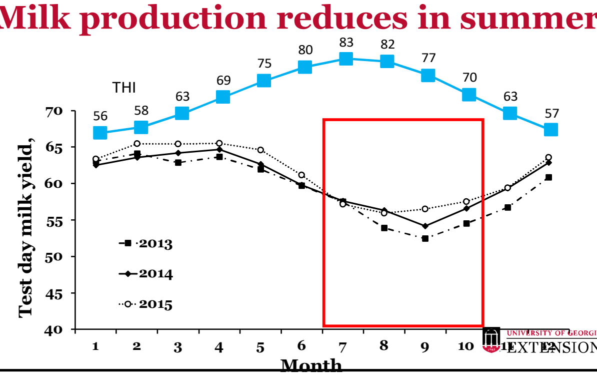
Milk production reduces in summer



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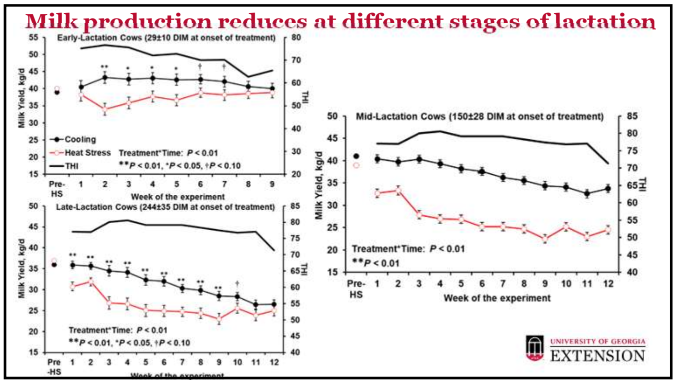
Milk production reduces at different stages of lactation
Early-Lactation Cows (29±10 DIM at onset of treatment)
Mid-Lactation Cows (150±28 DIM at onset of treatment)
Late-Lactation Cows (244±35 DIM at onset of treatment)
Milk Yield, kg/d
THI
Week of the experiment
Cooling
Heat Stress
Treatment*Time: P < 0.01
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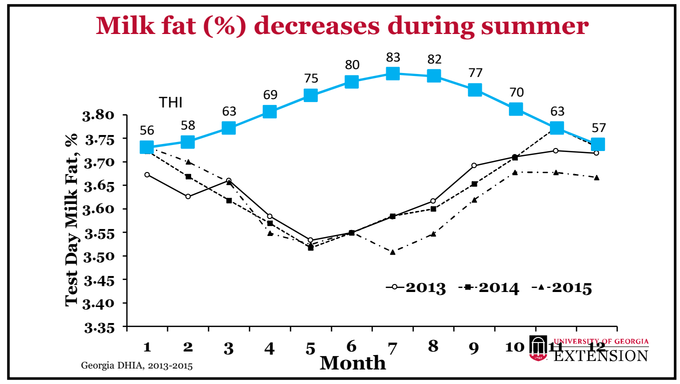
Milk fat (%) decreases during summer
THI
56
58
63
69
75
80
83
82
77
70
63
57
Test Day Milk Fat, %
Month
2013
2014
2015
Georgia DHIA, 2013-2015
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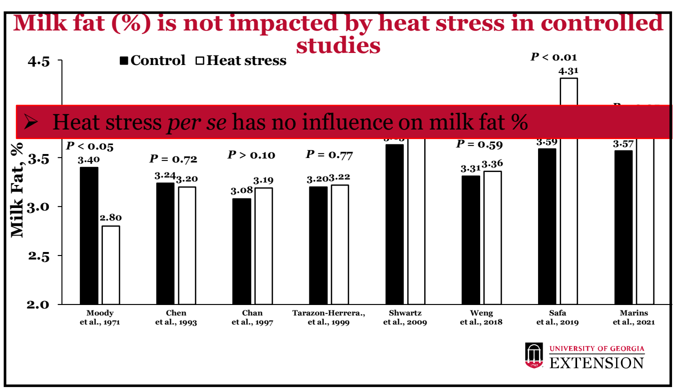
Milk fat (%) is not impacted by heat stress in controlled studies
Control
Heat stress
Heat stress *per se* has no influence on milk fat %
Milk Fat, %
Moody et al., 1971
Chen et al., 1993
Chan et al., 1997
Tarazon-Herrera., et al., 1999
Shwartz et al., 2009
Weng et al., 2018
Safa et al., 2019
Marins et al., 2021
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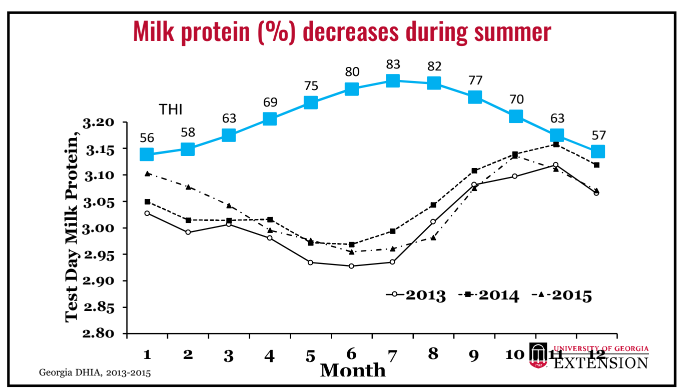
Milk protein (%) decreases during summer
THI
56
58
63
69
75
80
83
82
77
70
63
57
Test Day Milk Protein, %
Month
2013
2014
2015
Georgia DHIA, 2013-2015
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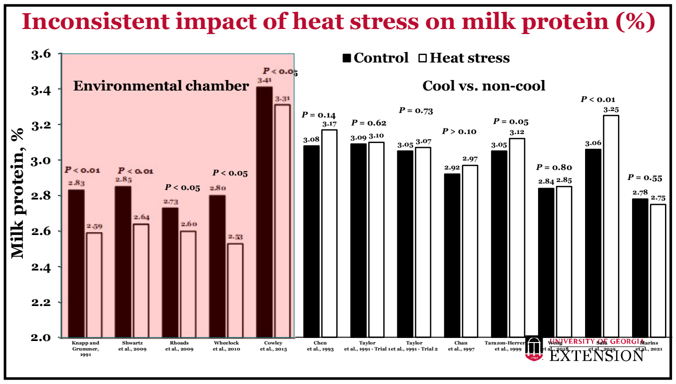
20


Inconsistent impact of heat stress on milk protein (%)
Control
Heat stress
Environmental chamber
Cool vs. non-cool
Milk protein, %
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
P < 0.01
P < 0.01
P < 0.05
P < 0.05
P < 0.05
P = 0.14
P = 0.62
P = 0.73
P > 0.10
P = 0.05
P = 0.80
P < 0.01
P = 0.55
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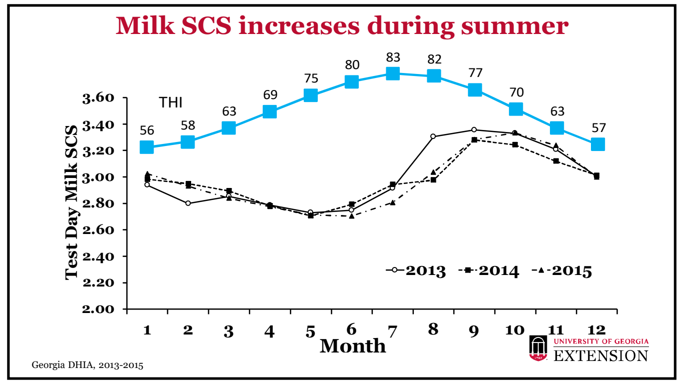
21


Milk SCS increases during summer
THI
56
58
63
69
75
80
83
82
77
70
63
57
Test Day Milk SCS
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
2013
2014
2015
1
2
3
4
5
6
7
8
9
10
11
12
Month
Georgia DHIA, 2013-2015
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EXTENSION

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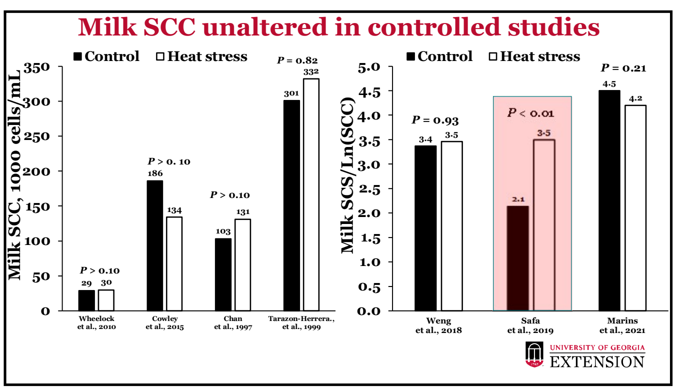
Milk SCC unaltered in controlled studies
Control
Heat stress
Milk SCC, 1000 cells/mL
P > 0.10
29
30
P > 0. 10
186
134
P > 0.10
103
131
P = 0.82
301
332
Wheelock et al., 2010
Cowley et al., 2015
Chan et al., 1997
Tarazon-Herrera., et al., 1999
Milk SCS/Ln(SCC)
P = 0.93
3.4
3.5
P < 0.01
2.1
3.5
P = 0.21
4.5
4.2
Weng et al., 2018
Safa et al., 2019
Marins et al., 2021
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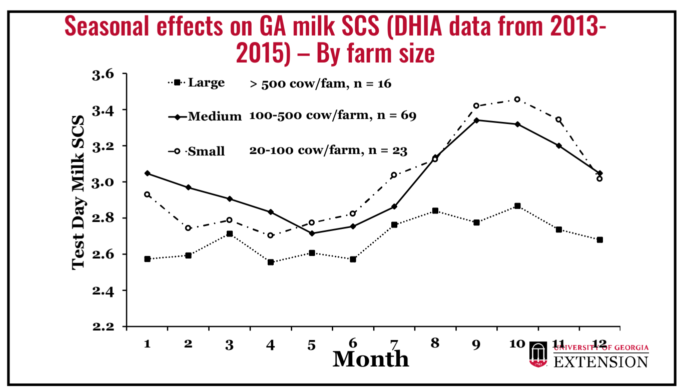
23


Seasonal effects on GA milk SCS (DHIA data from 2013-2015) – By farm size
Large > 500 cow/fam, n = 16
Medium 100-500 cow/farm, n = 69
Small 20-100 cow/farm, n = 23
Test Day Milk SCS
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
1
2
3
4
5
6
7
8
9
10
11
12
Month
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EXTENSION

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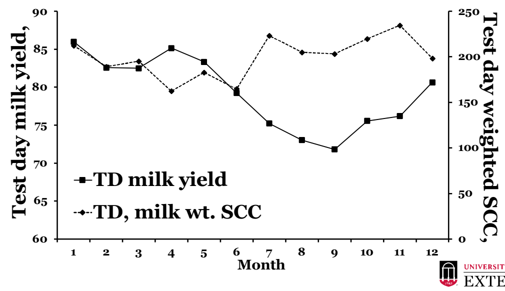
Example farm 1 (DHIA data, 2013-15 average) Herd size: 280, Milk rolling: ≈24,000 lbs;



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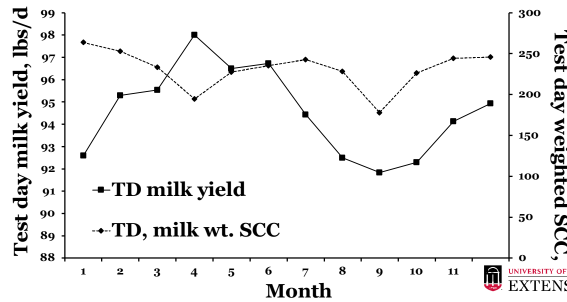
Example farm 2 (DHIA data, 2013-15 average) Herd size: 430, Milk rolling: ≈31,000 lbs;



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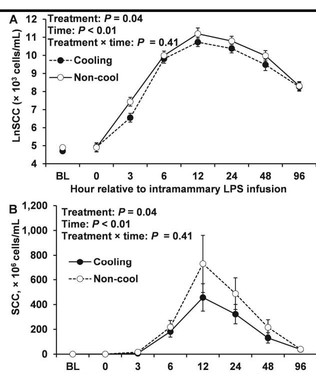
Heat stress cows have greater increase in SCC following LPS induced mastitis



Chen et al., 2023

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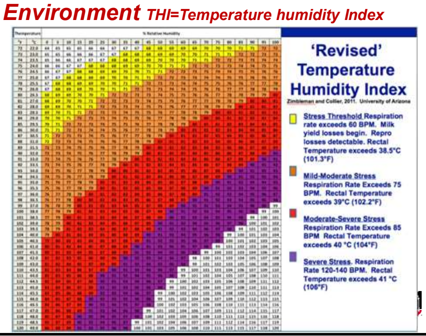
How to Identify Heat Stress

1) Environment *THI=Temperature humidity Index*



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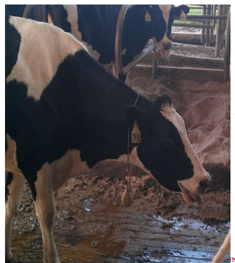
How to Identify Heat Stress

2) Cow Rectal Temperature and Respiration Rate



Respiration Rate > 45 breath/min

Rectal Temperature > 38.5 °C (101.3 °F)

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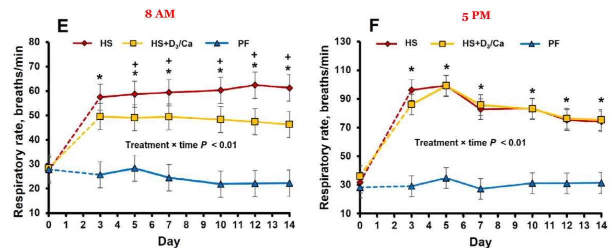
Respiration rate of thermal neutral cows



Ruiz-González et al., 2023

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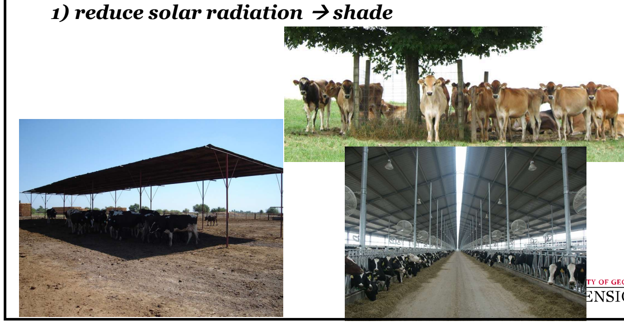
30

How to Cool Cows at High Ambient Temperature?

1) reduce solar radiation → shade



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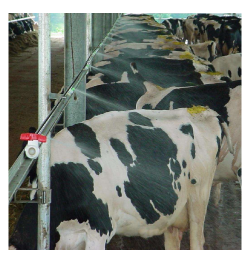
How to Cool Cows at High Ambient Temperature?

2) increase evaporative heat loss →

water + forced ventilation



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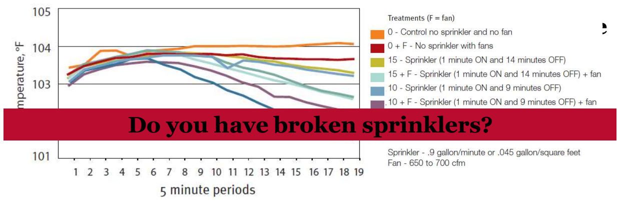

Sprinklers wet the cow, the dripping of water takes some heat out of the body; fans blow air to evaporate the water on the skin bringing heat out by evaporation.

Keys – 1. Wet the skin, not the hair; 2. combined with fans.

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33

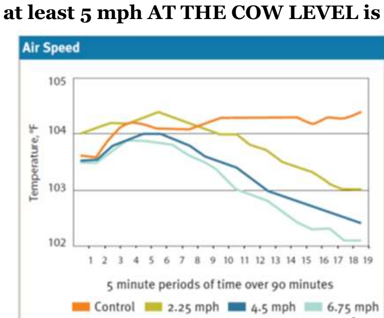
How to Cool Cows at High Ambient Temperature?

2) increase evaporative heat loss →

water + forced ventilation

34

- **Wind speed is key over volume**
- **Maintain at least 5 mph AT THE COW LEVEL is critical**



Brouk., 2002

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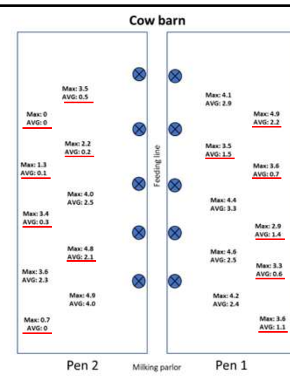
Wind Speed (m/s)
1 m/s = 2.24 mile/h

Cow level: close and far of fan
- **Standing at feed line**
- **Lying down at bedding**

Measurement time: 30 seconds

Max: Maximum
AVG: Average

Minimal speed: > 2.23 m/s (5 mile/h)



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36

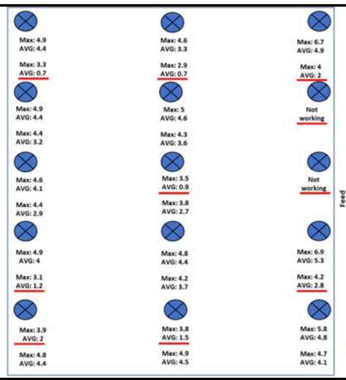
Wind Speed (m/s)
1 m/s = 2.24 mile/h

Cow level: close and far of fan
- **Standing at feed line**
- **Lying down at bedding**

Measurement time: 30 seconds

Max: Maximum
AVG: Average

Minimal speed: > 2.23 m/s (5 mile/h)



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37

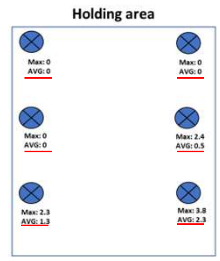
Wind Speed (m/s)
1 m/s = 2.24 mile/h

Cow level: standing front of the fan

Measurement time: 30 seconds

Max: Maximum
AVG: Average

Minimal speed: > 2.23 m/s (5 mile/h)



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Where to Cool?

1) Holding pen
Heat sink, first priority

2.1) Early and Mid lactating cows
Improve milk, repro and health

2.2) Dry and close-up cows
Increase milk production in next lactation

2.3) Late lactating cows
Increase milk production

3) Calf and heifer?
Future producer, cooling should be considered

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How to evaluate cooling facility?

Heat audit:
- ***Evaluate the cooling facility***
- ***Continuous measurement of body temperature over a day***
- ***Measurements of environment will facilitate interpretation.***
- ***Facilitate management decision***

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Measure of Environment

1. ***Local weather station and airport***
2. ***Measure on farms***
   - ***Hobos***
   - ***Wind meter***

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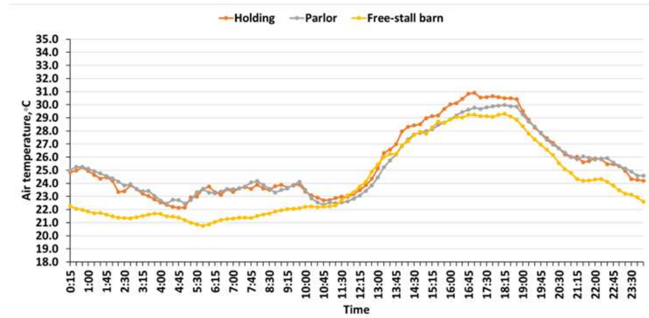

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Measure of Vaginal Temperature

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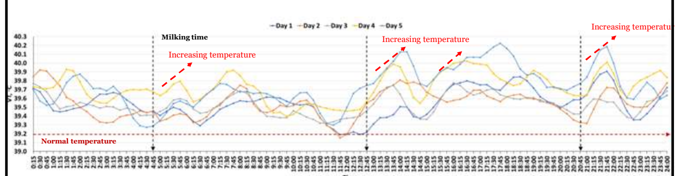
Confinement herd - Vaginal temperature



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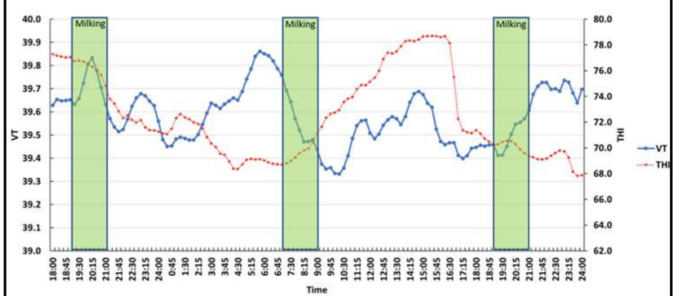
Confinement herd - Vaginal temperature



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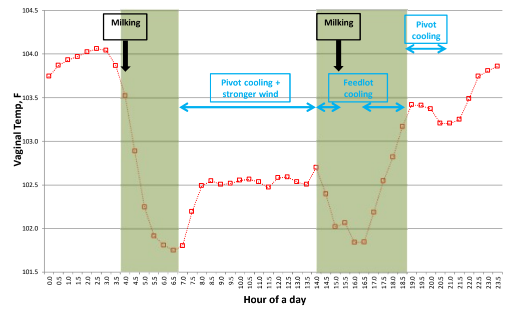
A grazing herd– Vaginal Temperature



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Conclusions

1) Intensive cooling is critical for dairy farms

2) Cooling needs to be applied to both lactating and dry cows

3) Heat audit is the best way to evaluate the effectiveness of your heat abatement facility

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Dairy Team

Thank you!!!

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Gainesville, FL
November 2,2023

Robert Hagevoort PhD
Professor, Extension Dairy Specialist & Topliff Dairy Chair
NMSU Ag Science Center at Clovis
dairydoc@nmsu.edu
http://aces.nmsu.edu/ces/dairy/

1

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U.S. DAIRY EDUCATION & TRAINING CONSORTIUM

2

Dr. Robert Hagevoort

- Professor & Extension Dairy Specialist
  - New Mexico State University
- BS Tropical Animal Nutrition
- MS Range Nutrition
- PhD Animal Nutrition
- Focus
  - 15 years private dairy consulting experience
  - 17 years Extension Dairy Specialist
  - Regulatory and environmental issues
  - Dairy workforce training & safety
  - U.S. Dairy Education & Training Consortium

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3

Dr. David Douphrate

Associate Professor - Texas A&M University
Physical therapist
Business administration
Doctorate in occupational health and safety
Since 2003:
- Worker health and safety
- Workplace productivity and efficiency
- Safety management and leadership
- Dairy industry
  - 12 states
  - 75+ dairy farms and owners
  - 3000+ dairy workers

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TEXAS A&M UNIVERSITY School of Public Health

4

Any Ag producer I talk to considers this their no. 1 issue:

1. Employee management
2. ….
3. …..
4. …….

5

And within Employee Management these are the 2 major pieces:

a. Employee performance
b. Employee turnover

6

Today's realities:

- Facilities continue to increase in size (number of animals), a worldwide trend
- Larger facilities employ more people
- Employees are not just family labor anymore – hired labor
- Employees usually from different cultural/linguistic backgrounds (foreign born)
- Employment often not based on skills
- Limited/unknown education/training pertaining to position
- May not be familiar working with/around calves/heifers
- We have an industry which suffers from "growing pains"
- Employee management is considered the number 1, 2, and 3 issue…

7

What does that mean for owners & management?

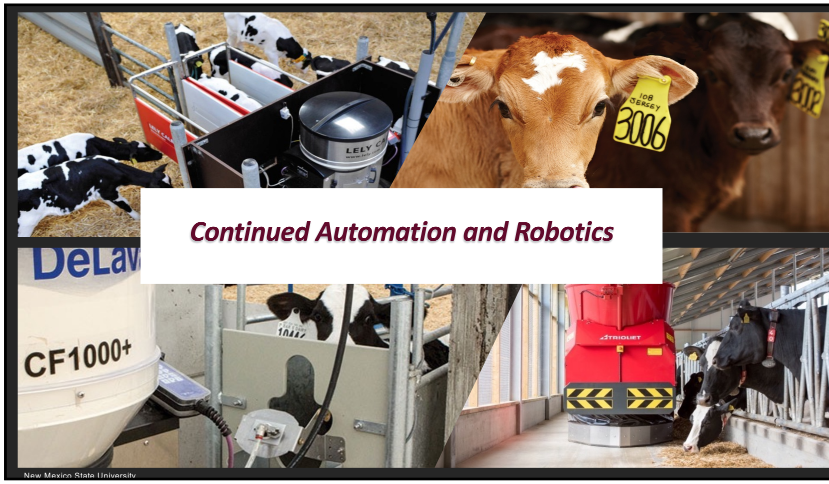
- Owners and managers are now **people managers**, **not calf managers**
- Yet they were raised to be **calf managers**
- They went to school to learn about dairy/farm management (tech skills)
- Where did they learn how to manage people? (soft skills)
- What about their personality types (Briggs Meyers)?
  - **I**ntroverts vs. **E**xtroverts
  - **S**ensing vs. **IN**tuitive
  - **T**hinking vs. **F**eeling
  - **J**udging vs. **P**erceiving

8

Looking down the road:

- Fewer employees – but higher tech skills….
- High level of specialization at each position
- Define: what are those higher tech skills?
- Who will be teaching and training these folks on these skillsets?
- Understand: “manual labor” does not equate “low skill labor”
- Manual vs automation?

9



Continued Automation and Robotics

New Mexico State University

10

More and more specialization at each position…
Who is training & educating these highly specialized people?

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11

More and more specialization at each position…
Who is training & educating these highly specialized people?

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More and more specialization at each position…
Who is training & educating these highly specialized people?

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Training Challenges

- Low-literacy, non-English speaking workforce
- High employee turnover rate
- Increasing task diversification & specialization on dairies and calf ranches
- Minimization of disruption of operations
- Historical focus on animal performance, not worker performance
- Limited to no internet connectivity
- Limited computer/IT resources

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What we have learned:
Dairy Safety Awareness Training

Gender (%)	
Male	1,256 (88.6)
Female	162 (11.4)
Age	34.4 (12.0)
Job position (%)	
Milker	489 (34.5)
Feeder	67 (4.7)
General	862 (60.8)
Years of experience	7.4 (9.1)
Highest education level achieved (%)	
No Education	83 (6.1)
Elementary School	385 (28.2)
Middle School	334 (24.4)
High School	391 (28.6)
Higher Education	174 (12.7)

Country of Origin (%)	
Mexico	716 (52.4)
Guatemala	310 (22.7)
United States	251 (18.4)
Honduras	35 (2.6)
El Salvador	27 (2.0)
Colombia	9 (0.7)
Puerto Rico	8 (0.6)
Peru	2 (0.2)
Cuba	2 (0.2)
Netherlands	2 (0.2)
China	1 (0.1)
Nicaragua	1 (0.1)
Portugal	1 (0.1)
Native language (%)	
Spanish	892 (64.5)
K'iche	310 (22.4)
English	178 (12.9)
Other	3 (0.2)

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General findings and observations:

- Large majority **no** longer coming from an Ag-background
- Large majority **no** experience working with large animals or equipment
- **60%** of employees 5th grade level education or below

3 cultures, 3 languages, 3 statures….

- Shift in typical workforce make-up to more Central Americans
  - different culture (indigenous (Mayan) vs. Hispanic)
  - different language (K'iche vs. Spanish)
  - different body stature/build

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Ergonomic challenges anywhere in the workplace

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Do you really know who works for you?

- What is your workforce make up?
- Do you know how many of your employees read or write?
- And at what level is their reading comprehension?
- How do your employees communicate amongst themselves? What languages?
- Who does the translating, and what are their competency levels?
- Are your training materials adjusted to that level and in those languages?
- What materials do you use: written – audio – video?
- Do you evaluate the training effectiveness or just deliver and check the box?
- What do you know about the cultures in your workplace?
- Do you know the difference between the Latino/Hispanic and the indigenous Mayan cultures?
- Were you even aware of the differences between these cultures?
- What are the consequences for male/female dynamics in your workplace?
- What is hiding under the surface of cultures and languages, out of your sight?
- What does all of this mean for productivity, results and performance metrics?

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In Extension we do lots of different dairy training activities….

Problem with these kind of training activities:
How effective are these kinds of class settings?

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Same class, 20 minutes later…..

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~~Need for *more* dairy training tools!~~

Need for ~~*more*~~ *effective* training tools!

- Written (paper) SOP's are not learning tools! (=procedural tools)
- Reading comprehension
- Comprehension retention
- Adult learners - Visual learners!
- Paper instruction is soooo antiquated!
- We can do better, more efficient and more effective!

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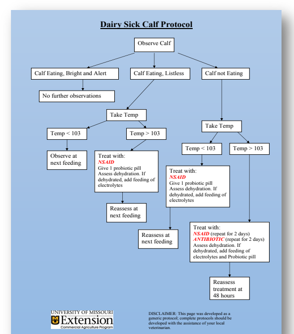
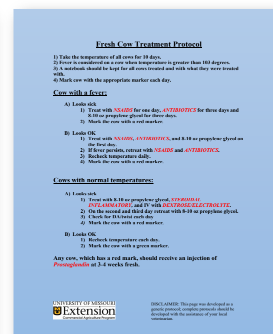
Paper Standard Operating Procedures





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Translating SOP's to Video-SOP's

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Translations & Voiceover

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2014-15 Dairy Safety Training: m-learning

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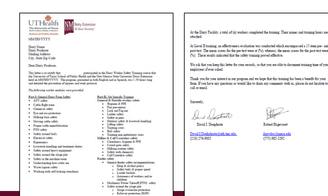
Training Documentation

- Takes app. 1.5 hrs.
- **Individual** training
- **Interactive**, with questions in vignettes
- Workers receive a certificate
- Owner receives a training report



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Don't underestimate the power of recognition!!

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Training Effectiveness (levels 1 & 2)

Level one (n=1,435)

	Very good (%)	Good (%)	Bad (%)
Q1. Was it easy to use the iPad?	90.3	7.5	2.2
Q2. Did you like watching the training videos on the iPad?	95.2	4.1	0.7
Q3. Were the test questions easy to understand?	83.9	15.5	0.6
Q4. How did you like the atmosphere of the training?	94.6	4.9	0.4
Q5. Did you learn new ideas and techniques (something new)?	89.3	9.3	1.4

Level two (n= 1,435)

	Mean (SD)
Pre-test	74.2 (18.3)
Post-test	92.5 (9.6)

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Training Effectiveness (level 3)

Level three (n=88)

	Yes (%)	No (%)
Q1. Did you take the Dairy Safety Training using this iPad tablet?	98.9	1.1
Q2. Have you applied safety techniques that you learned from the safety training?	95.4	4.6
Q3. Have you taken steps to prevent any injuries or accidents involving yourself or coworkers because of this safety training?	97.7	2.3
Q4. Have you observed any safety issues at work?	34.5	65.5
Q5. Have you reported any safety issues to your coworkers or supervisor? (if answered "yes" to Q4.)	90.0	10.0
Q6. As compared to before the safety training, do you think you have performed your job in a safer manner?	100.0	0.0

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Dairy Safety Awareness Training: m-learning

- Susan Harwood (DOL) Training Grant
  Mobile platform learning (m-learning):

– Effectiveness evaluation (Kirkpatrick model):

- Level 1: 1,487 employees 41 farms: NM, TX, KS, CO, NY
- Level 2: avg. pre-test score 73% and the avg. post-test score 94%
- Employees receive certificate
- Dairy receives letter certifying who attended, scores pre/post
- Level 3: evaluating impacts (3-6 mos.) indicate changing safety behavior

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Safe Animal Handling Training 2017

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From Classroom to Live Training

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Findings and observations from animal handling training:

- Large majority have no experience working with large animals or equipment
- Many employees know little about animal senses (sight, hearing, smell, etc.)
- Many employees have wrong perceptions about how to act around animals
- Even seasoned workers who may know the “what” may not know the “why”
- Experienced workers appreciate the validation of their skills
- Owners/managers can make a great impact by reinforcing how important animal handling skills are to them
- Many owners managers take this awareness training to build on and practice concepts with workers

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In short, where does all of this put you?

Challenges:

- Labor is the number one challenge in **ALL** business of more than 1 employee
- Managing people is far more difficult than managing cows
- Most owners/managers are at a total disadvantage: they are great cow managers
- Even your personality might not be helpful to become a good manager/coach/CEO
- Recent changes in our labor force put these labor challenges on steroids
- To boot: a generation which doesn’t want to do physical challenging work

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What about some tips on where to start:

What I see successful operators do:

- They know the metrics, first and foremost… - informed management decisions
- Get out of their comfort zone and purposely focus more on leading people
- If that is not in their personality: hire somebody excellent to help do that
- Get to understand who their audience is: get to know who really works for you
- Get to understand what would make workers more successful in their jobs
- Be a clear communicator of what expectations are (by whatever means)
- Demonstrate leadership and excellence: it starts at the top and trickles down
- Don't forget to be human for the humans that work on your facilities….

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Thank you

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The Economics of Uterine Diseases

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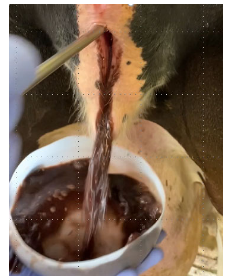
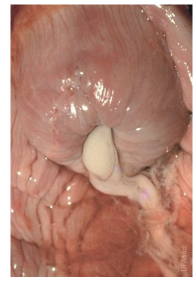
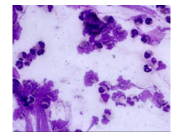
Metritis	C. Endometritis	S. Endometritis
		 
≤ 21 DIM	> 21 DIM	≥ 35 DIM

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Considerations

- Highly prevalent; 25%; range from 10 to 50%.
- Affect animal welfare.
- Decrease milk yield.
- Decrease fertility; decease CR and increase PL.
- Increased culling; died or sold.

- What is the economic cost of these diseases?

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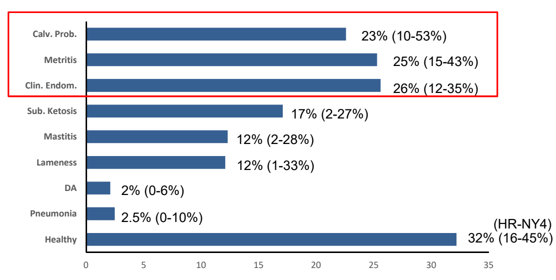
Disease Prevalence in the First 60 DIM



11,711 postpartum dairy cows from 16 farms from 6 regions of the US.

Pinedo et al., 2020; J Dairy Sci

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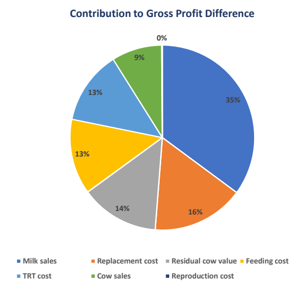
Metritis Cost

Table 1. Productive, reproductive, and economic parameters according to disease status

Item	Metritis ± SE	No Metritis ± SE	[1]Diff	*P*-value
Milk by 305 DIM, kg	9,463	10,277	-814	<0.01
Pregnant by 305 DIM, %	69	79	-10	<0.01
Culled by 305 DIM, %	36	27	9	<0.01
Sold, %	31	24	7	<0.01
Died, %	5	3	2	<0.01
Dry-matter intake, kg	5,770	6,227	-457	<0.01
Milk sales by 305 DIM, $/cow	3,738	4,059	-322	<0.01
Cow sales, $/cow	338	257	81	<0.01
Residual cow value	879	1,005	-126	<0.01
Feeding costs by 305 DIM, $/cow	1,529	1,650	-121	<0.01
Replacement costs, $/cow	566	418	148	<0.01
Reproduction costs, $/cow	80	81	-1	0.61
Treatment costs, $/cow	118	0	118	<0.01
Gross profit, $/cow	2,662	3,173	-511	<0.01

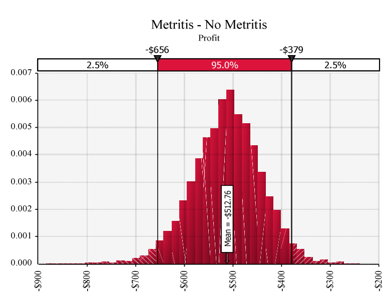
Pérez-Báez et al., 2020; J Dairy Sci

Metritis Cost



Pérez-Báez et al., 2020; J Dairy Sci

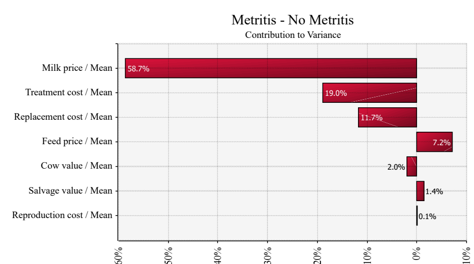
Metritis Cost



- Historical prices from 2008 to 2018

Pérez-Báez et al., 2020; J Dairy Sci

Metritis Cost



- Historical prices from 2008 to 2018

Pérez-Báez et al., 2020; J Dairy Sci

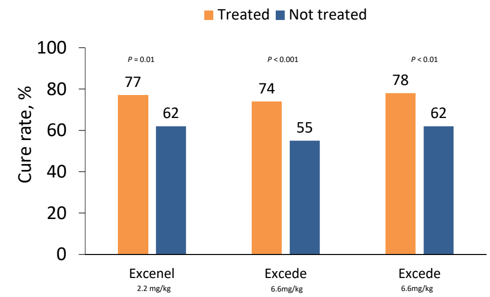
Metritis Cost by Herd

Table 1. Herd description, milk loss and profit loss from metritis by herd.

State-Herd Nº	Region[1]	Metritis, %	Rolling herd Average, kg	Milk Loss, kg[3]	Profit Loss, $/cow[4]
MN	MW	29	16,260	407	352
OH-1	MW	15	13,140	2,213	948
OH-2	MW	19	10,585	625	392
OH-3	MW	21	12,775	1,422	639
WI-1	MW	19	14,618	821	461
WI-2	MW	17	14,964	345	217
NY-1	NE	22	14,267	811	395
NY-2	NE	22	14,764	778	374
NY-3	NE	25	13,769	884	442
NY-4	NE	22	13,271	1,175	759
FL	SE	41	11,300	1065	520
CA-1	SW	43	12,500	662	279
CA-2	SW	21	12,300	1879	888
CA-3	SW	24	13,100	1005	484
TX-1*	SW	24	8,635	965	594
TX-2	SW	36	9,348	333	156
Average	-	25	12,849	814	511

Pinedo et al., 2020; JDS; Pérez-Báez et al., 2020; JDS

Ceftiofur Is an Effective Treatment



Chenault et al., 2004; JAVMA; McLaughlin et al., 2012; JDS; de Oliveira et al., 2020; JDS

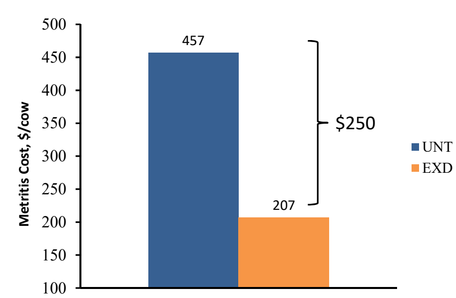
TRT Reduces Economic Loss

Table 2. Effect of treatment on performance and economic outcomes.

Item	UNT	EXD	NMET	*P*-value
Total milk yield by 300 DIM, kg	10,509	10,767	11,111	0.15
DMI, kg	6,244	6,360	6,559	0.18
Pregnant by 300 DIM, %	61^{a}	71^{b}	72^{b}	< 0.01
Culled by 300 DIM, %	39^{a}	29^{b}	28^{b}	< 0.05
Milk sales	4,197	4,303	4,442	0.14
Cow sales, $/cow	296^{a}	217^{b}	211^{b}	0.01
Residual cow value, $/cow	892^{a}	$1{,}042^{b}$	$1{,}050^{b}$	0.01
Feeding costs by 300 DIM, $/cow	1,623	1,654	1,706	0.18
Replacement cost, $/cow	686^{a}	513^{b}	498^{b}	0.01
Reproduction costs, $/cow	70	64	63	0.10
Treatment cost by 60 DIM, $/cow	37^{a}	112^{b}	10^{c}	< 0.01
Gross profit, $/cow	$2{,}969^{a}$	$3{,}219^{a,b}$	$3{,}426^{b}$	0.01

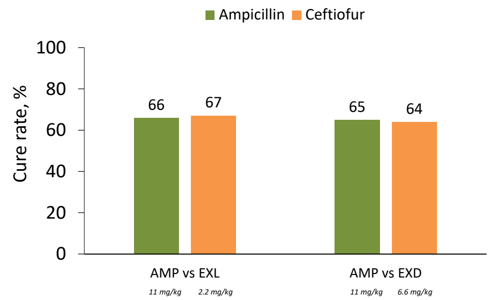
Vilar Silva et al., 2021; J Dairy Sci

TRT Reduces Economic Loss



Silva et al., 2021; J Dairy Sci

Ampicillin (Polyflex) is Also Effective



Lima et al., 2014; JDS; Merenda et al., 2021; JDS

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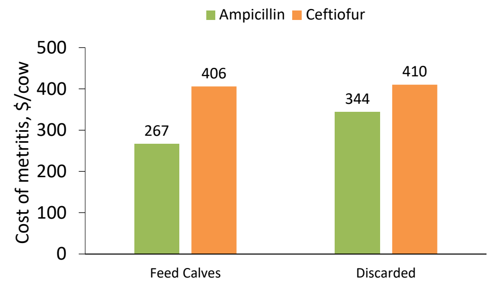
Ampicillin is More Economical



Lima et al., 2019; JDS

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Cost of Clinical Endometritis

Table 3. Effect of treatment on performance and economic outcomes.

Item	CE	No CE	Diff	*P*-value
Milk by 305 DIM, kg	8,856	9,100	- 244	< 0.01
DMI by 305 DIM, kg	5,679	5,786	-107	< 0.01
Pregnant by 305 DIM, %	73	80	-7	< 0.01
Culled by 305 DIM, %	32	25	7	< 0.01
Milk sales, $/cow	4,308	4,427	-119	< 0.01
Residual cow value, $/cow	1,098	1,200	-102	< 0.01
Cow sales, $/cow	430	341	89	< 0.01
Feed costs, $/cow	1,713	1,745	-32	< 0.01
Replacement costs, $/cow	606	489	117	< 0.01
Cost of reproduction, $/cow	77	69	8	< 0.01
Gross profit, $/cow	3,360	3,566	-206	< 0.01

Ojeda et al., 2023; MS Thesis

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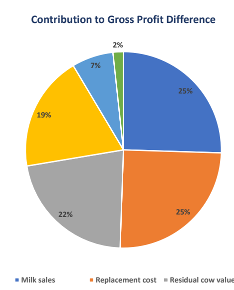
Cost of Clinical Endometritis



Ojeda et al., 2023; MS Thesis

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Additive Effect of Metritis and CE

Table 3. Effect of treatment on performance and economic outcomes.

Item	NUD	MET	CE	MET+CE	P-value
Milk by 305 DIM, kg	9,215	9,072	9,023	8,612	< 0.01
DMI by 305 DIM, kg	5,854	5,790	5,760	5,547	< 0.01
Pregnant by 305 DIM, %	83	78	76	69	< 0.01
Culled by 305 DIM, %	23	28	29	35	< 0.01
Milk sales, $/cow	4,483	4,413	4,389	4,189	< 0.01
Cow sales, $/cow	313	370	397	460	< 0.01
Residual cow value, $/cow	1,237	1,166	1,144	1,054	< 0.01
Feed costs, $/cow	1,765	1,746	1,737	1,673	< 0.01
Replacement costs, $/cow	448	528	555	654	< 0.01
Cost of reproduction, $/cow	67	74	77	76	< 0.01
Gross profit, $/cow	3,717	3,434	3,549	3,155	< 0.01

Ojeda et al., 2023; MS Thesis

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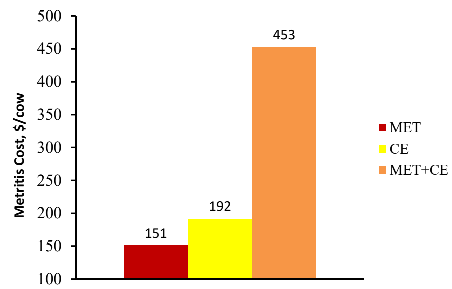
Additive Effect of Metritis and CE



Ojeda et al., 2023; MS Thesis

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Conclusions

- Metritis is a prevalent and costly disease to the dairy industry. $500/case
- Antibiotic treatment of metritis is economical. The welfare and the increase in antibiotic resistance should also be taken into account when making treatment decisions.
- Clinical endometritis is also costly. $200/case
- Additive effect of metritis and clinical endometritis

Thanks!!!

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- Federico Cunha
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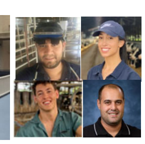
- Alliance dairies
- North Florida Holsteins
- American Dairy Co.
- IFAS Dairy Unit



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- Ext. Accession # 1009647
- Accession # 1008863
- Accession #: 1019435

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

Questions???