Evolution of 'Diseases' in Florida 1980-2017

- Heel warts – mid to late 1980s
  - Severe acute foot rot that did not respond to traditional antibiotic therapy
  - Treats tried
    - Cautery – Yes, we applied a hot dehorning iron in these lesions!
    - Topical antibiotics – varying success (due to environmental conditions?)
    - Topical formalin gel
    - Enter Dr. Jan Shearer
      - Hoof spraying with tetracycline
      - Formaldehyde foot baths
      - Any foot baths

Evolution of 'Diseases' in Florida 1980-2017

- Otitis media ('Ear infections')
  - "What da heck is this!"
  - Early observations – trauma? 'Hit by milk truck'
  - Parasites (ticks / mites)

Evolution of ‘Diseases’ in Florida 1980-2017

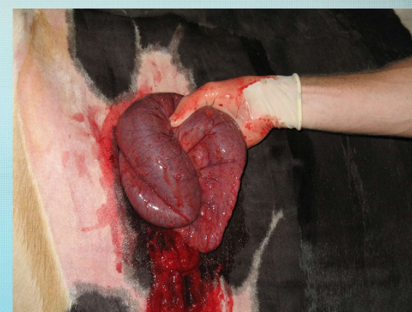
- Otitis media (‘Ear infections’)
  - Gina Temple, Jack Gaskins, Mary Brown
  - Caused by *Mycoplasma bovis*
  - Transmission – Predominantly through milk
  - Early clinical signs – Fever, head-shaking, ear-scratching
  - Treatment – Anything but the penicillins/cephalosporins and sulfas
  - Prevention – Avoid milk exposure, ventilation, nutrition, sanitation

Evolution of ‘Diseases’ in Florida 1980-2017

- **Bloody gut**
  - 1998 – ‘Dead cow syndrome’
  - Crash in milk followed by death
- **Bloody gut**
  - Followed 10 cows through a slaughter facility
  - Lung abscesses, hardware disease?
  - Lung abscesses, pneumonia
    - Resulting from bacterial escape from the small intestine after an episode of BG

Evolution of 'Diseases' in Florida 1980-2017

- **Bloody gut**
  - Earlier detection
  - Surgical treatment
  - Medical treatment
  - Cause
  - Prevention



Evolution of 'Diseases' in Florida 1980-2017

- **Mastitis**
  - 1980s – I'd go to meetings and get laughed at by other veterinarians
  - Milk quality was keeping milk 'legal'

Evolution of 'Diseases' in Florida 1980-2017

- **Mastitis**
  - 1980s – I'd go to meetings and get laughed at by other veterinarians
  - Milk quality was keeping milk 'legal'
  - Milker schools, Parlor Checks (milking machine function), Cultures

Time spent in parlor vs time spent in barns/pasture

5-6 min 2-3x/d vs 'the rest of the day'

Evolution of 'Diseases' in Florida 1980-2017

- **Mastitis**
  - Dave Bray and his 'colorful' farm analyses

"The germs that cause mastitis now are the same as the ones causing mastitis in the 1940s!"

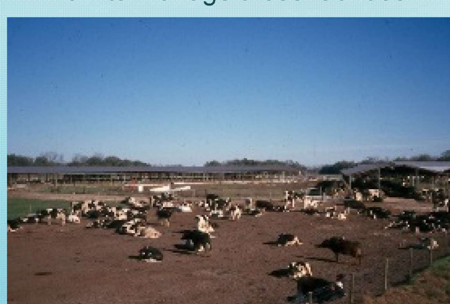
"We've got to move out of 1940s level of management."

Evolution of ‘Diseases’ in Florida 1980-2017

- **Mastitis**
  - Facilities were the 1st major step forward
  - How to manage those facilities

Evolution of ‘Diseases’ in Florida 1980-2017

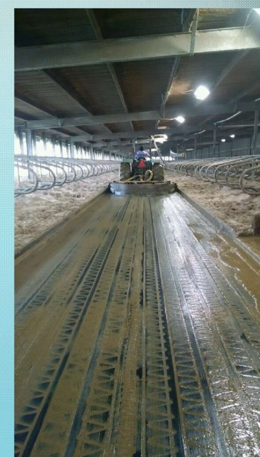
- **Mastitis**
  - Facilities were the 1st major step forward
  - How to manage those facilities



Evolution of ‘Diseases’ in Florida 1980-2017

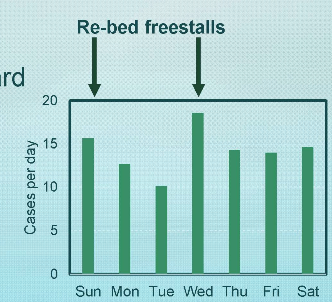
- **Mastitis**
  - Facilities were the 1st major step forward
  - How to manage those facilities
  - Where are we now?



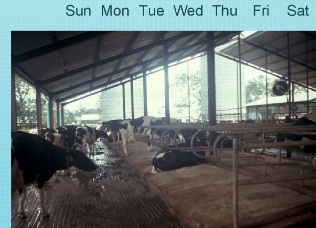
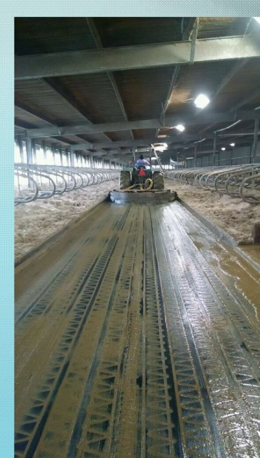



Evolution of ‘Diseases’ in Florida 1980-2017

- **Mastitis**
  - Facilities were the 1st major step forward
  - How to manage those facilities
  - Where are we now?





Evolution of Facilities in Florida 1980-2017

- Heat stress
- Cow housing
- Calf housing
- Maternity housing

Evolution of Facilities in Florida 1980-2017

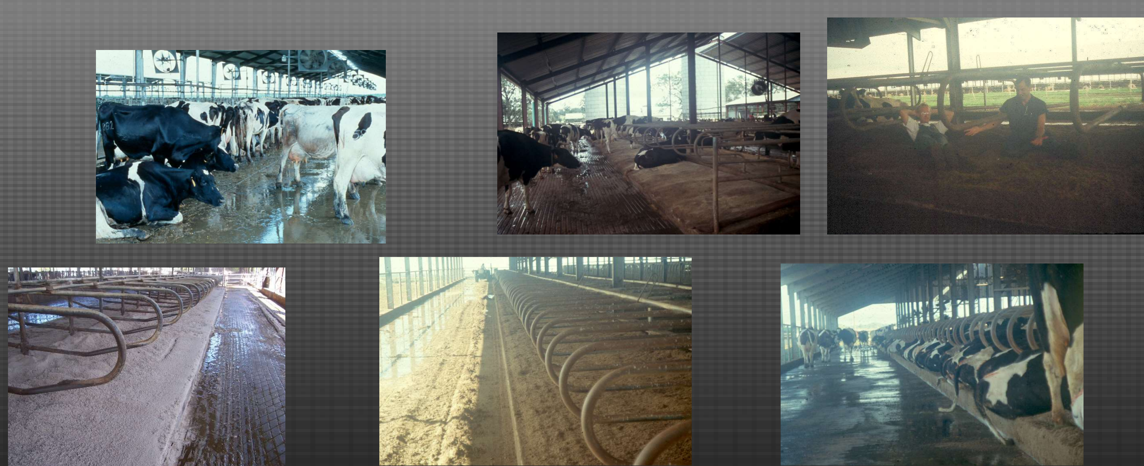
- Heat stress
  - 1980s – Bob Collier, Bill Thatcher, et al.
  - **This might be big!**

Evolution of Facilities in Florida 1980-2017

- **Heat stress / Cow Housing**

Evolution of Facilities in Florida 1980-2017

- **Heat stress / Cow Housing / Cow Comfort**

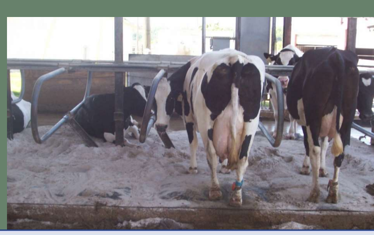


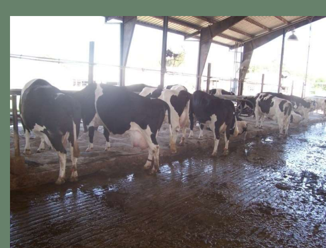
Evolution of Facilities in Florida 1980-2017

- Heat stress / Cow Housing / Cow Comfort

Evolution of Facilities in Florida 1980-2017

Welfare Assessments





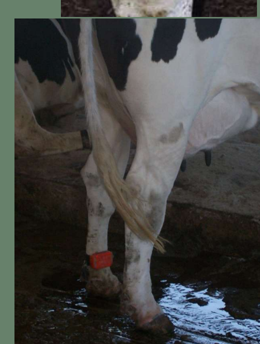


Table 4. Freestall Dimension

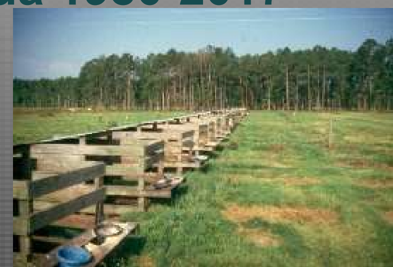
Animal weight (lb.)	Freestall width (In.)	Freestall length: Side lunge	Freestall length: forward lunge [a]	Neck rail height [b]	Curb to neck rail and brisket board (In.)
800-1,200	42 to 44	6′- 6″	7′6″ to 8′0″	41 to 43	62
1,200-1,500	45 to 48	7′- 0″	8′0″ to 8′6″	44-to 46	66
over 1,500	48 to 52	7′- 6″	8′6″ to 9′0″	46 to 48	71

[a] An additional 12″ to 18″ in stall length (compared to side lunge stalls) is required to allow the cow to thrust her head forward during the lunge process.

[b] Above top of curb or top of mattress (Midwest Plan Service, 2000).

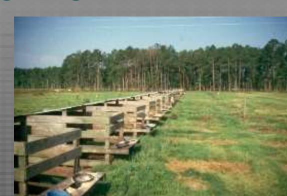
Evolution of Facilities in Florida 1980-2017

- Heat stress
- Cow housing
- **Calf housing**



Evolution of Facilities in Florida 1980-2017

- **Calf housing**




Evolution of Facilities in Florida 1980-2017
• Calf housing
7. 21. 2002

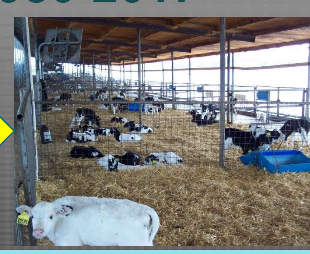

Evolution of Facilities in Florida 1980-2017
• Calf housing

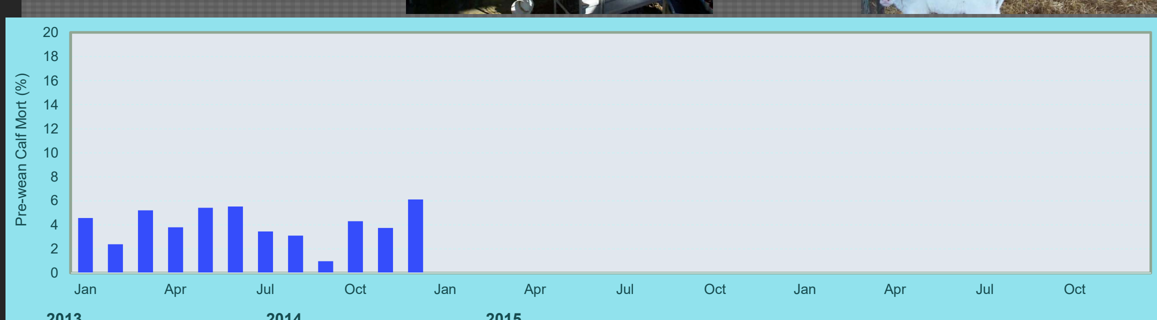
Evolution of Facilities in Florida 1980-2017

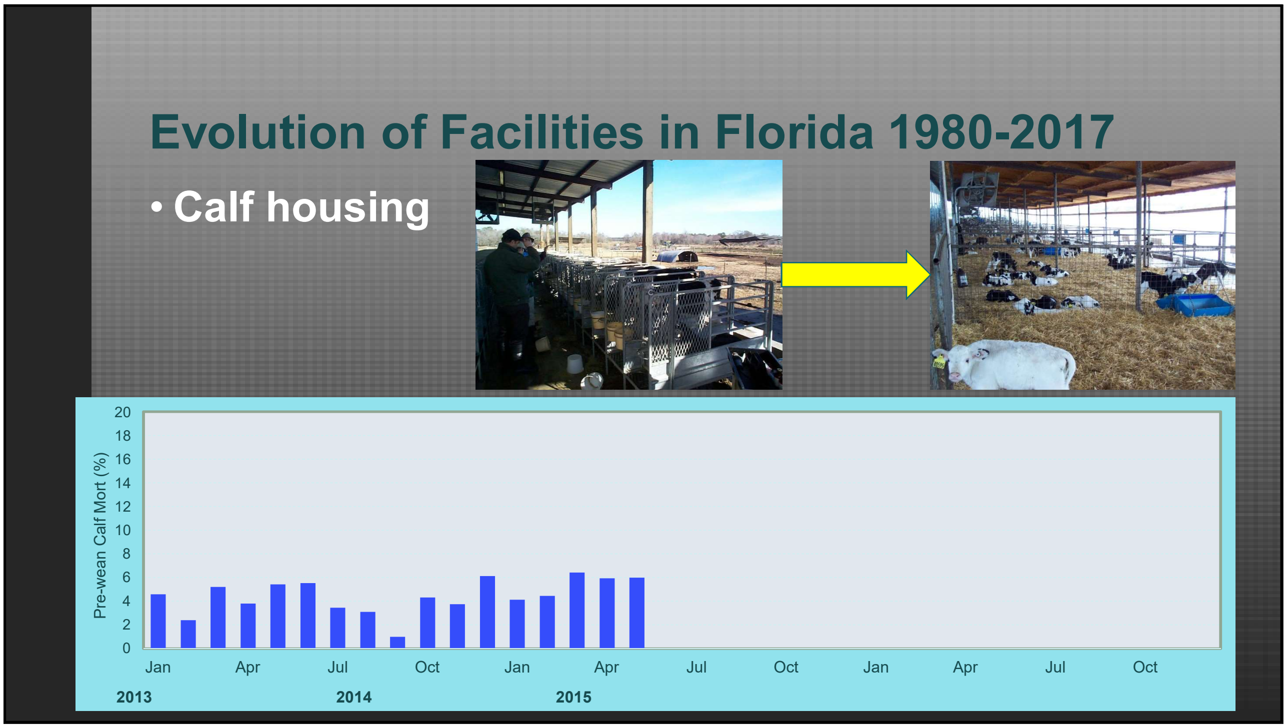
- Calf housing

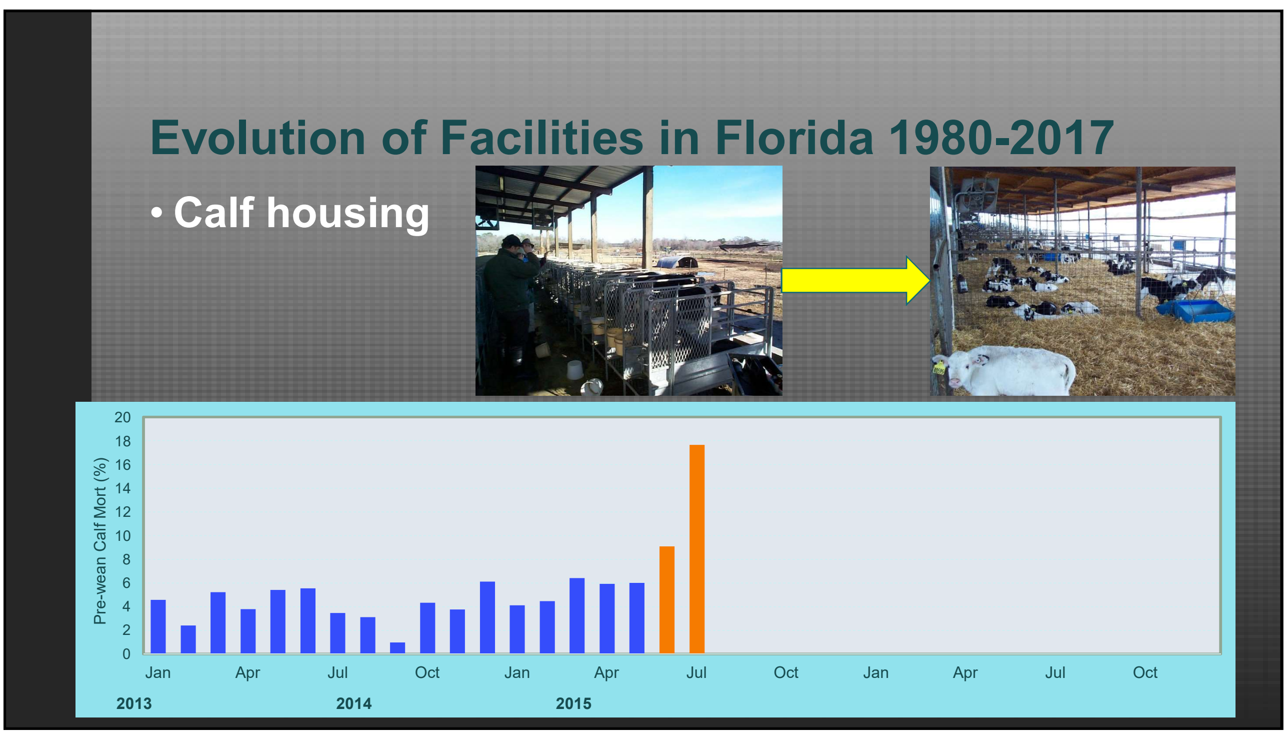
Evolution of Facilities in Florida 1980-2017

- Calf housing






Evolution of Facilities in Florida 1980-2017
• Calf housing
Pre-wean Calf Mort (%)
20
18
16
14
12
10
8
6
4
2
0
Jan
Apr
Jul
Oct
Jan
Apr
Jul
Oct
Jan
Apr
Jul
Oct
2013
2014
2015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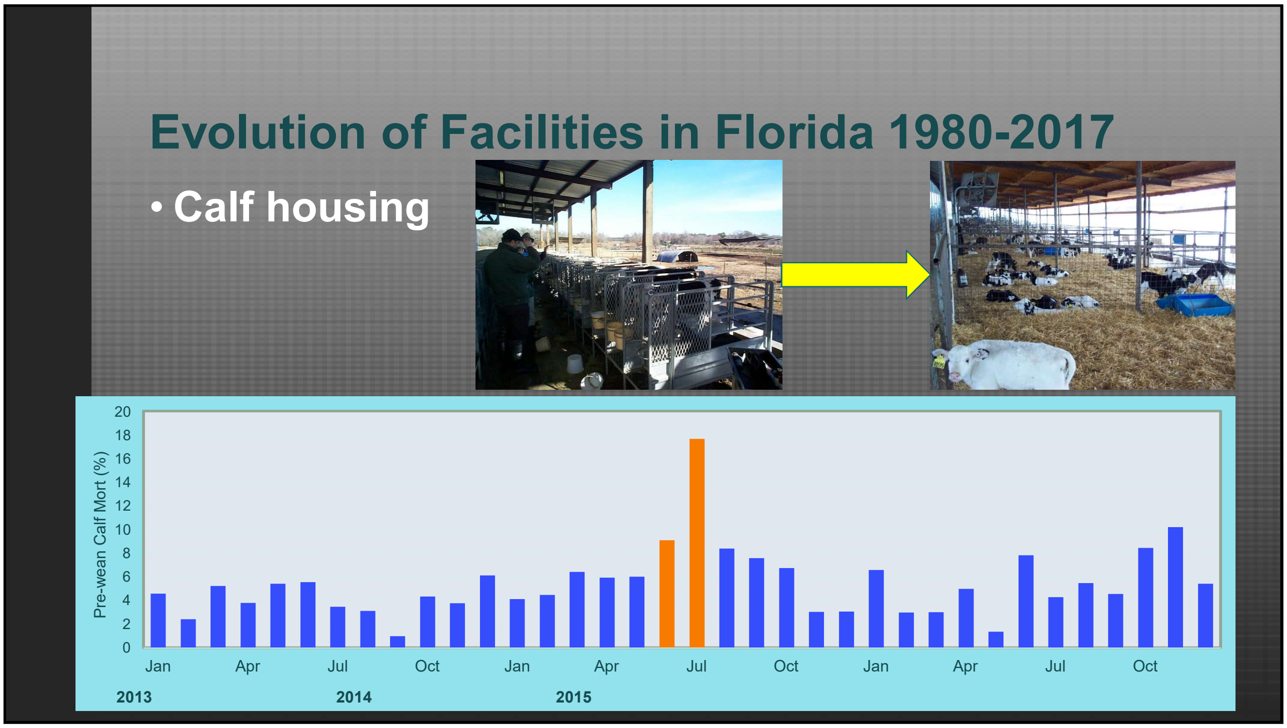
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Jan
Apr
Jul
Oct
Jan
Apr
Jul
Oct
2013
2014
2015


Group Feeding / Housing
• SANITATION

Group Feeding / Housing

- SANITATION
  - You've got to dot'em & cross'em in group housing systems



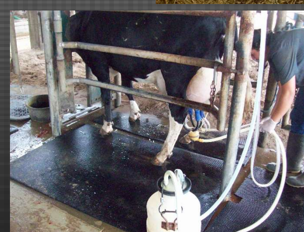


Evolution of Facilities in Florida 1980-2017

- Heat stress
- Cow housing
- Calf housing
- **Maternity housing**

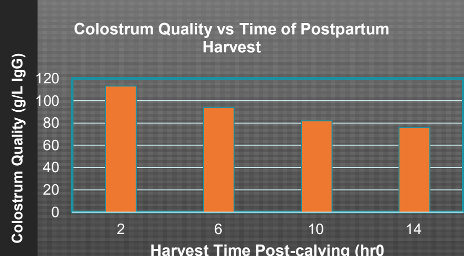

Evolution of Facilities in Florida 1980-2017

- Heat stress
- Cow housing
- Calf housing
- **Maternity housing**



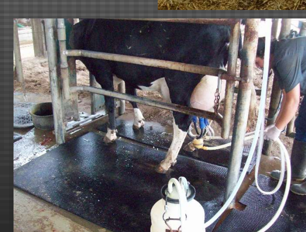
Evolution of Facilities in Florida 1980-2017

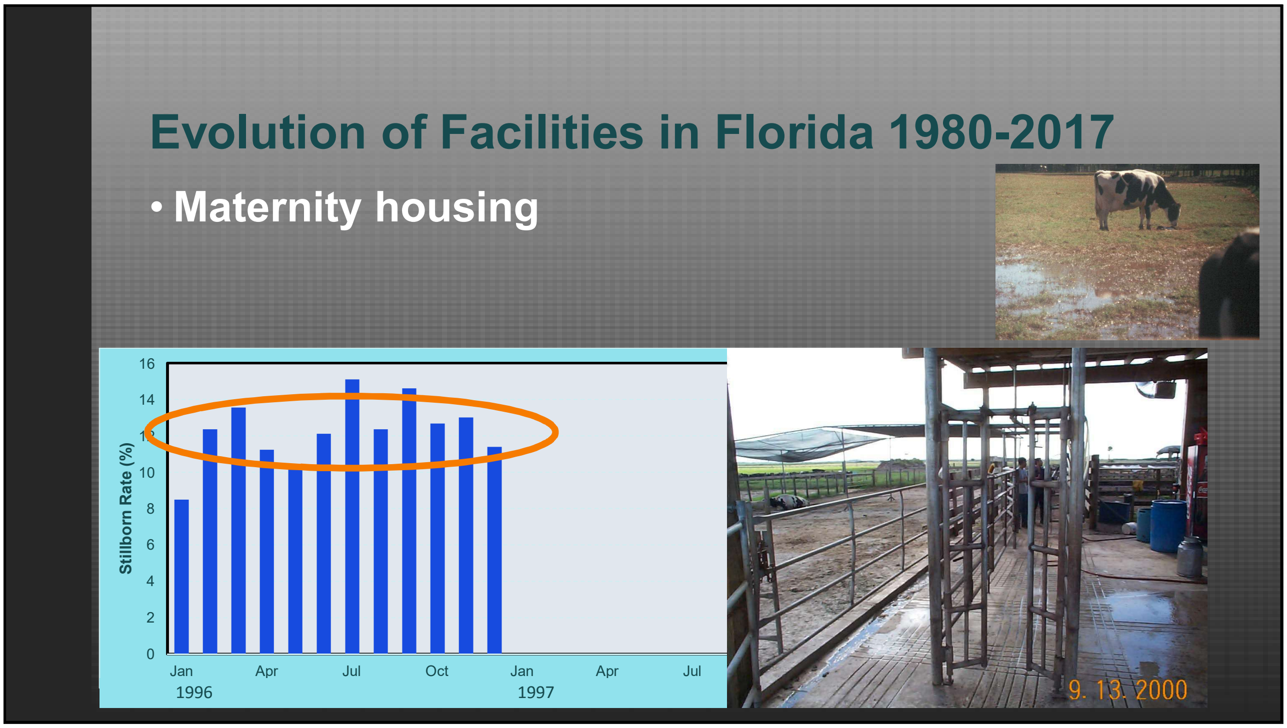
- **Maternity housing**



Moore et al., 2005

28-33% reduction in colostrum quality by delayed harvest of colostrum




Evolution of Facilities in Florida 1980-2017
• Maternity housing
Stillborn Rate (%)
16
14
12
10
8
6
4
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0
Jan
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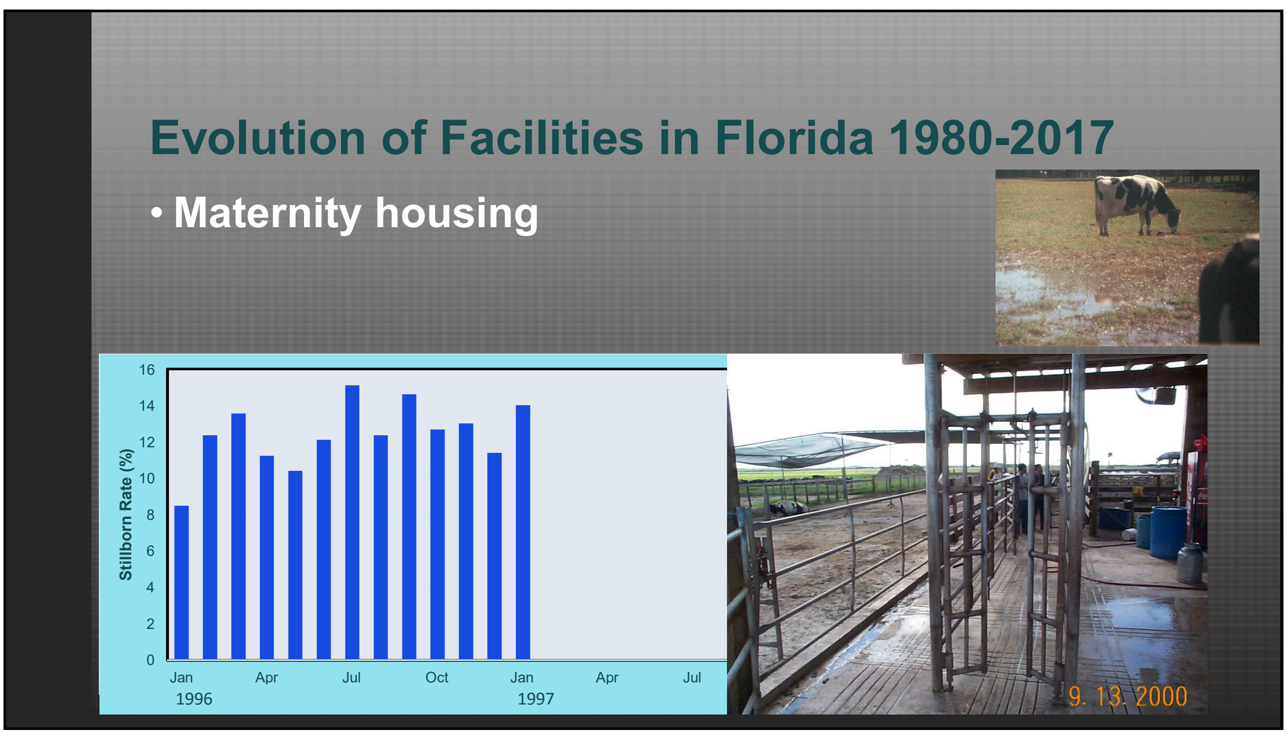
Jul
Oct
Jan
Apr
Jul
1996
1997
9. 13. 2000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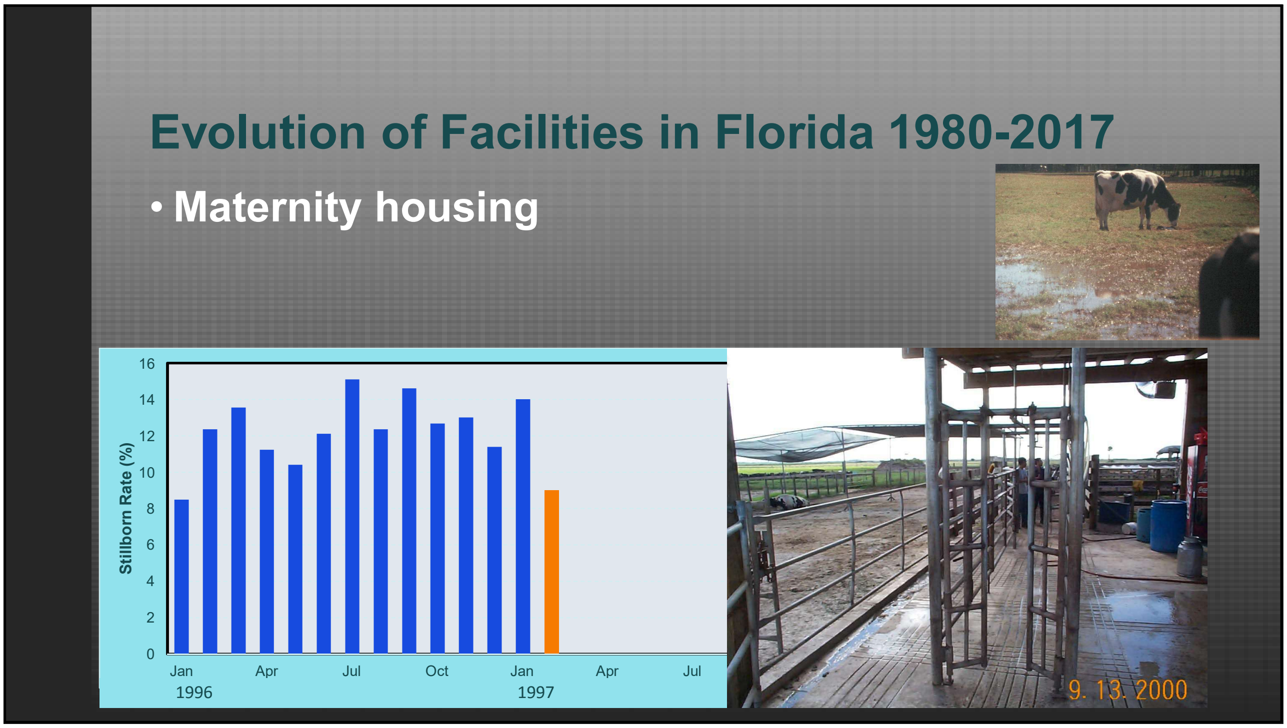
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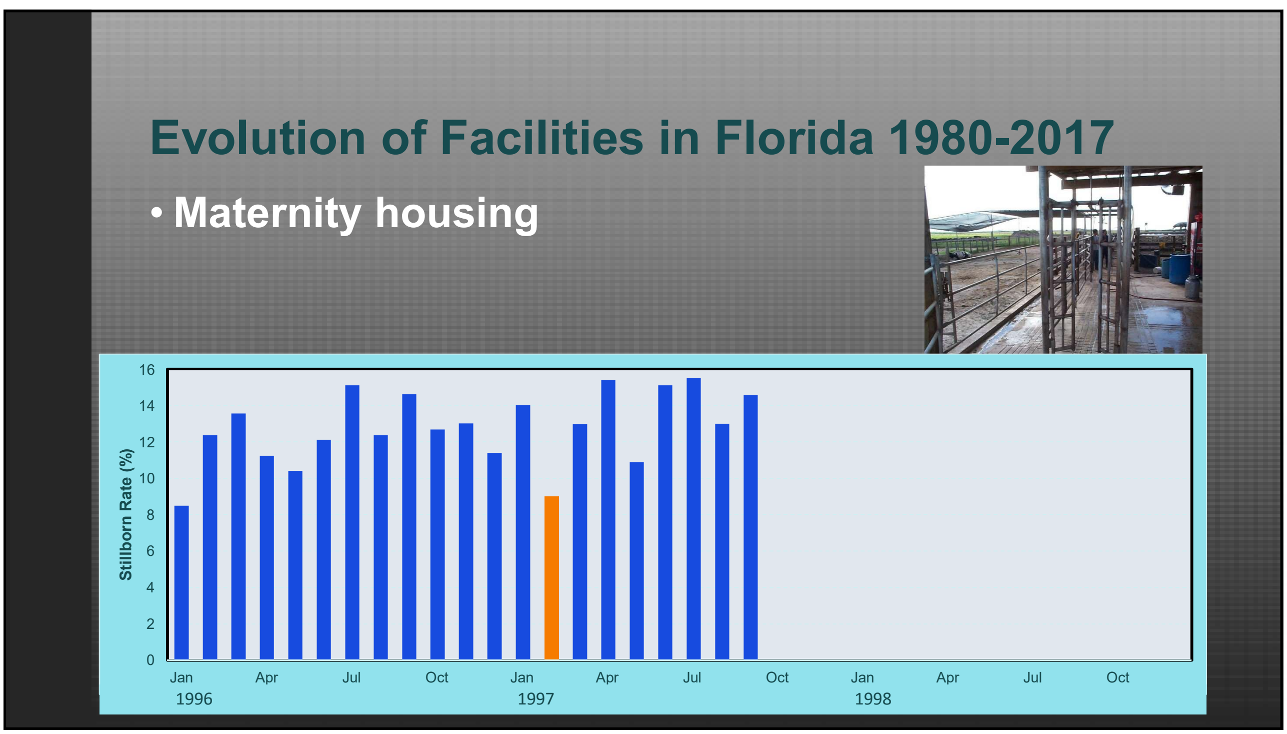
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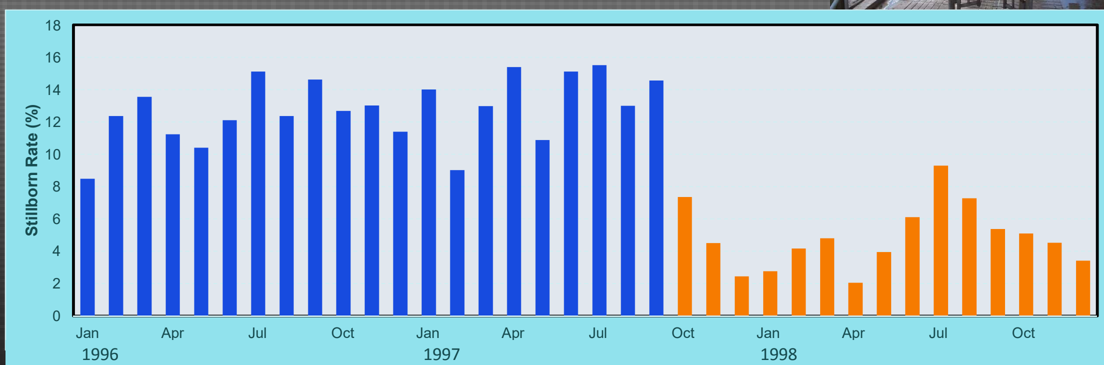
1998

Evolution of Facilities in Florida 1980-2017

- **Maternity housing**



Evolution of Feeding in Florida 1980-2017

- ‘One shot’ cottonseed hull based diet
- ‘One shot’ with supplemental hay

Evolution of Feeding in Florida 1980-2017

- ‘One shot’ cottonseed hull based diet
- ‘One shot’ with supplemental hay
- Partial TMR
- TMR



Evolution of Feeding in Florida 1980-2017

- ‘One shot’ cottonseed hull based diet
- ‘One shot’ with supplemental hay
- Partial TMR
- TMR

Forage production




End Result 1980-2017

- Herd milk production >28,000 lb/cow/lct
- SCC <200,000 year round
- Clinical mastitis rate <2 cases/100 cows/mo
- Pregnancy Rates >22%
- Cull Rates <30%
- Calf Mortality Rates <3%

Why Not Reproduction?

- Change is slow
- I am slower!

Petroglyphs of southern Utah, circa 1650

Cryptosporidia aka ‘Crypto’

- Diarrheal disease of young calves
- Every calf in Florida gets infected with crypto
- Every calf in Florida becomes diseased
- “What can you do about it?”

‘Crypto’

- Antibiotics – Halofuginone, Amikacin, Paramamycin
- Antiparasiticides – Deccox, Bovatec
- Activated charcoal & wood vinegar – ‘First Choice’
- Herbals – Essential oils of oregano
- Aloe vera juice – “Cures everything!”
- Vaccine – Promises, Promises
- Disinfectants - ammonium hydroxide, hydrogen peroxide, chlorine dioxide, 10% formol saline, and 5% ammonia

‘Crypto’

“What can you do about it?”

- Maximize sanitation
- Supply >>>100% of energy and protein requirements for maintenance and growth
- High quality feed ingredients! Milk works pretty good!
- Keep ’em hydrated
- Kaolin-pectin, bismusol, probiotics

Improvise, Adapt, Overcome!


Thank you !!

NOTES

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2015 – 2016 Southeast Milk Checkoff
Research Project Report

Effects of Prepartum Acidogenic Salts on Calcium and Energy Metabolism in Transition Cows

C.L. Higuita, R. Zimpel, W. Ortiz, F.R. Lopez, A. Vieira-Neto, B. Faria, M.L. Gambarini, E. Block, C. Nelson, and J.E.P Santos

Florida Dairy Production Conference
Gainesville, April 20, 2017

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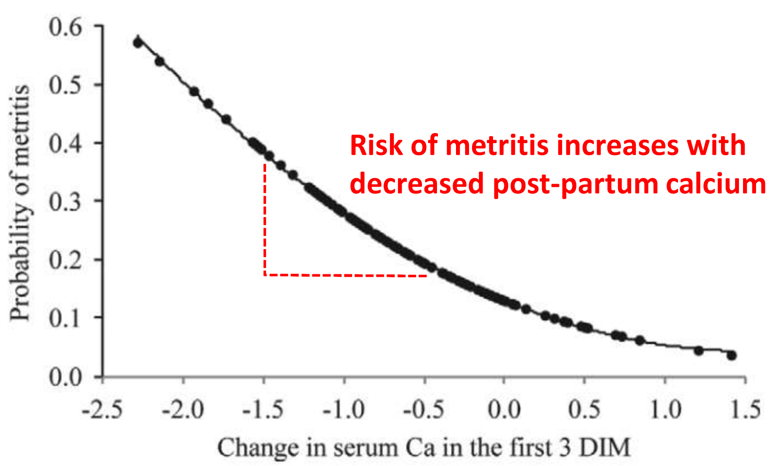
Consequences of Hypocalcemia



Martinez et al. (2012) J. Dairy Sci 95:7158-7172

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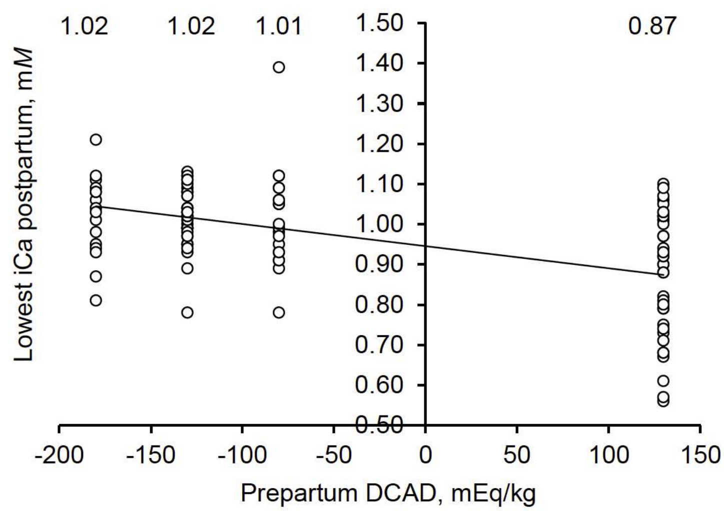
Feeding Acidogenic Salts Prepartum Increases Postpartum Calcium



Santos, J.E.P, 2016, Proceedings Florida Ruminant Nutrition Symposium

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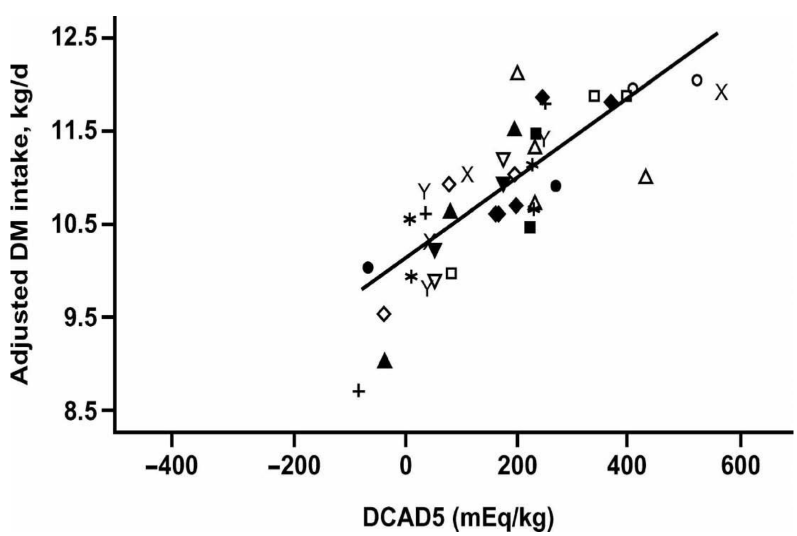
Feeding Acidogenic Salts to Reduces Prepartum Intake



Charbonneau et al. (2006) J. Dairy Sci. 89:537-548

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Hypothesis

Reducing the negative DCAD from -70 to -180 mEq/kg and extending the duration of feeding from 21 to 42 days will not affect performance and metabolism in dairy cows

Objective

Evaluate the effects of two levels of negative DCAD, -70 vs. -180 mEq/kg, and two durations of feeding, 21 vs. 42 days, on performance and metabolism in parous Holstein cows

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Cows and Treatments

- **114** parous Holstein cows at 233 d of gestation were enrolled in the experiment
- Randomized complete block design with a 2 x 2 factorial arrangement of treatments
  - ✓2 durations of feeding (**21 vs. 42 d**)
  - ✓2 levels of negative DCAD (**-70 vs. -180 mEq/kg**)

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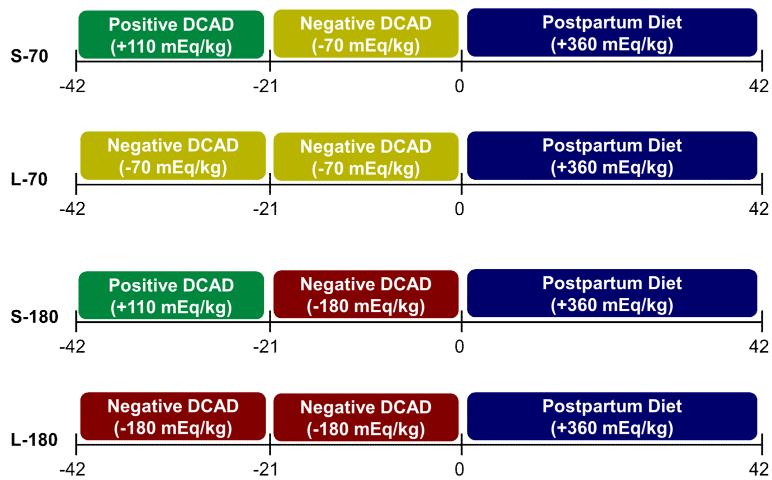
Dietary Treatment Arrangement



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Measurements

- Acid-base status and urine pH
- Concentrations of minerals and metabolites in blood
- Colostrum yield and composition
- Prepartum DM intake and lactation performance
- Daily body weight and weekly body condition

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Data Analyses

- Continuous data were analyzed by ANOVA with mixed models using SAS
- First 21 d of the dry period: positive DCAD vs. -70 vs. -180
  - Fixed effects: treatment, day, and treatment x day
  - Random effect: *block, cow (treatment)*
  - Orthogonal comparisons: Positive vs. Negative DCAD and -70 vs. -180 mEq/kg
- Day -21 to +42: 2 levels of DCAD (-70 vs. -180) and the two durations of feeding (21 vs. 42)
  - Fixed effects: DCAD, duration, DCAD x duration, day, DCAD x day, duration x day, DCAD x duration x day
  - Random effects: *block, cow (DCAD x Duration*)

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Diet Composition

	Diet		
Ingredient (% DM)	Positive DCAD	-70 mEq/kg	-180 mEq/kg
Corn silage	34.2	34.2	34.2
Triticale silage	20.4	20.4	20.4
Bermuda hay	6.7	6.7	6.7
Straw	13.8	13.8	13.8
Citrus pulp	7.7	7.1	6.7
Soybean meal	13.1	8.5	5.8
Prepartum mineral	4.2	4.2	4.2
Bio-Chlor*	0	5.2	8.3

* Contains: condensed corn fermentation solubles, processed grain by-products, condensed extracted glutamic acid fermentation product and magnesium chloride hexahydrate

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Diet Composition

	Diet		
Item, DM basis	Positive DCAD	-70 mEq/kg	-180 mEq/kg
CP, %	14.9 ± 0.8	14.7 ± 0.4	14.6 ± 0.6
ADF, %	29.4 ± 1.4	28.9 ± 1.2	29.1 ± 1.1
NDF, %	43.1 ± 1.7	43.7 ± 1.5	43.8 ± 1.5
Forage NDF, %	39.3 ± 1.7	39.3 ± 1.7	39.3 ± 1.7
Nonfiber CHO, %	31.7 ± 1.3	31.1 ± 1.6	31.1 ± 1.9
Starch, %	12.3 ± 0.4	12.6 ± 0.5	12.9 ± 0.6
Fat, %	2.8 ± 0.2	2.8 ± 0.1	2.8 ± 0.1
Ca, %	0.67 ± 0.07	0.64 ± 0.05	0.62 ± 0.05
P, %	0.33 ± 0.01	0.33 ±0.02	0.33 ± 0.03
Mg, %	0.44 ± 0.06	0.47 ± 0.06	0.48 ± 0.03
K, %	1.54 ± 0.10	1.49 ± 0.09	1.46 ± 0.09
S, %	0.29 ± 0.03	0.40 ± 0.03	0.47 ± 0.03
Na, %	0.08 ± 0.03	0.11 ± 0.03	0.13 ± 0.04
Cl, %	0.50 ± 0.07	0.86 ± 0.07	1.11 ± 0.03
DCAD, mEq/kg	+109 ± 35	-66 ± 17	-176 ± 20

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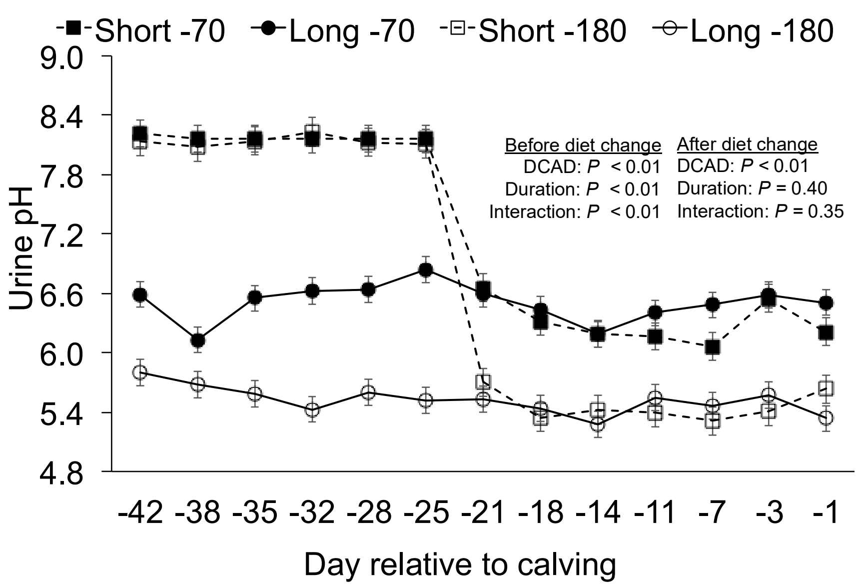
2017 Florida Dairy Production Conference

Urine pH



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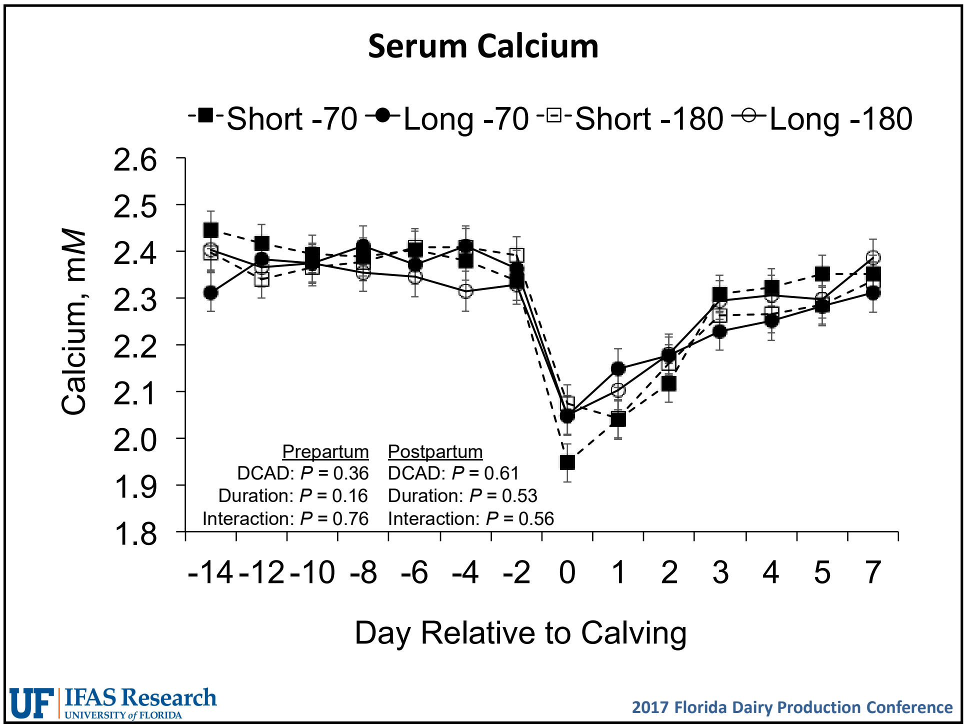
Serum Calcium
Short -70
Long -70
Short -180
Long -180
Calcium, mM
2.6
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
Prepartum
DCAD: P = 0.36
Duration: P = 0.16
Interaction: P = 0.76
Postpartum
DCAD: P = 0.61
Duration: P = 0.53
Interaction: P = 0.56
-14 -12 -10 -8 -6 -4 -2 0 1 2 3 4 5 7
Day Relative to Calving
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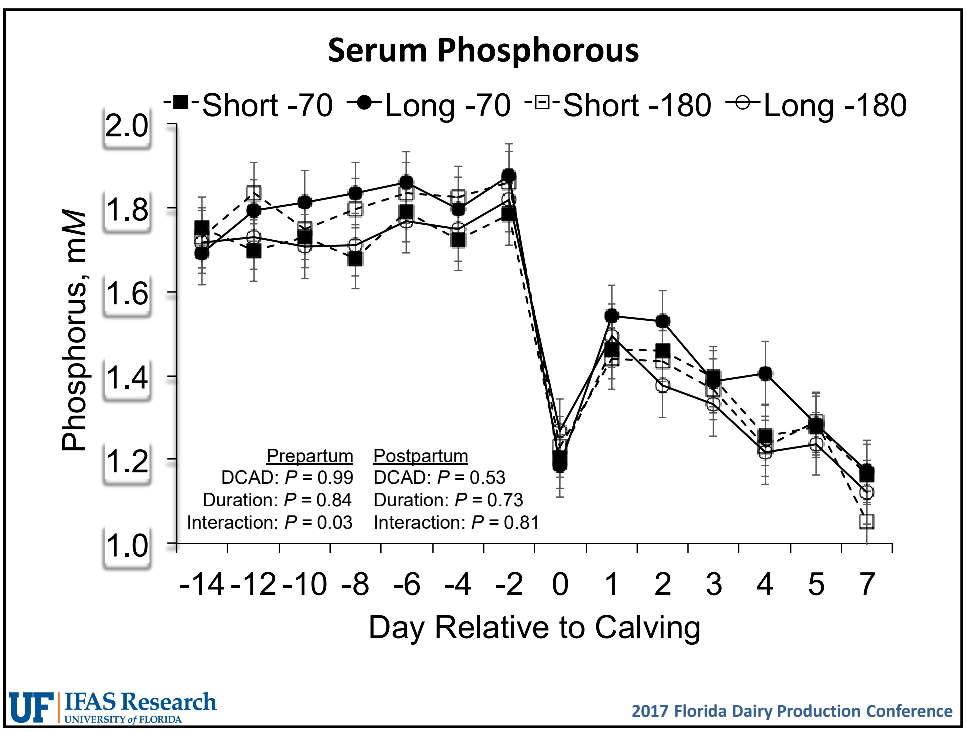
Serum Phosphorous
Short -70
Long -70
Short -180
Long -180
Phosphorus, mM
2.0
1.8
1.6
1.4
1.2
1.0
Prepartum
DCAD: P = 0.99
Duration: P = 0.84
Interaction: P = 0.03
Postpartum
DCAD: P = 0.53
Duration: P = 0.73
Interaction: P = 0.81
-14 -12 -10 -8 -6 -4 -2 0 1 2 3 4 5 7
Day Relative to Calving
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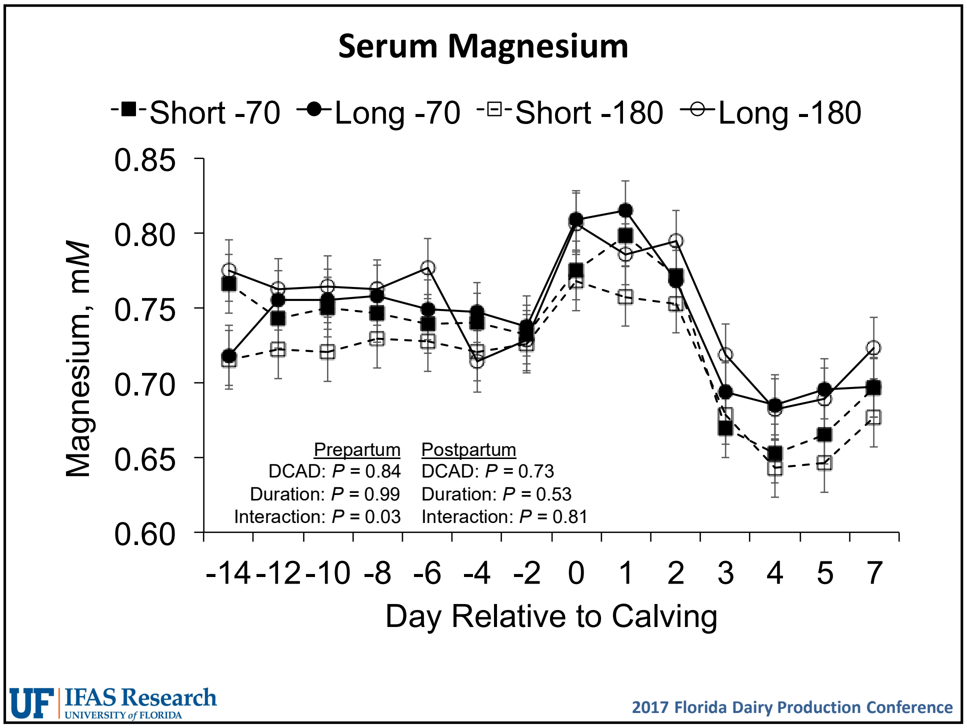
Serum Magnesium
Short -70
Long -70
Short -180
Long -180
Magnesium, mM
0.85
0.80
0.75
0.70
0.65
0.60
Prepartum
DCAD: P = 0.84
Duration: P = 0.99
Interaction: P = 0.03
Postpartum
DCAD: P = 0.73
Duration: P = 0.53
Interaction: P = 0.81
-14 -12 -10 -8 -6 -4 -2 0 1 2 3 4 5 7
Day Relative to Calving
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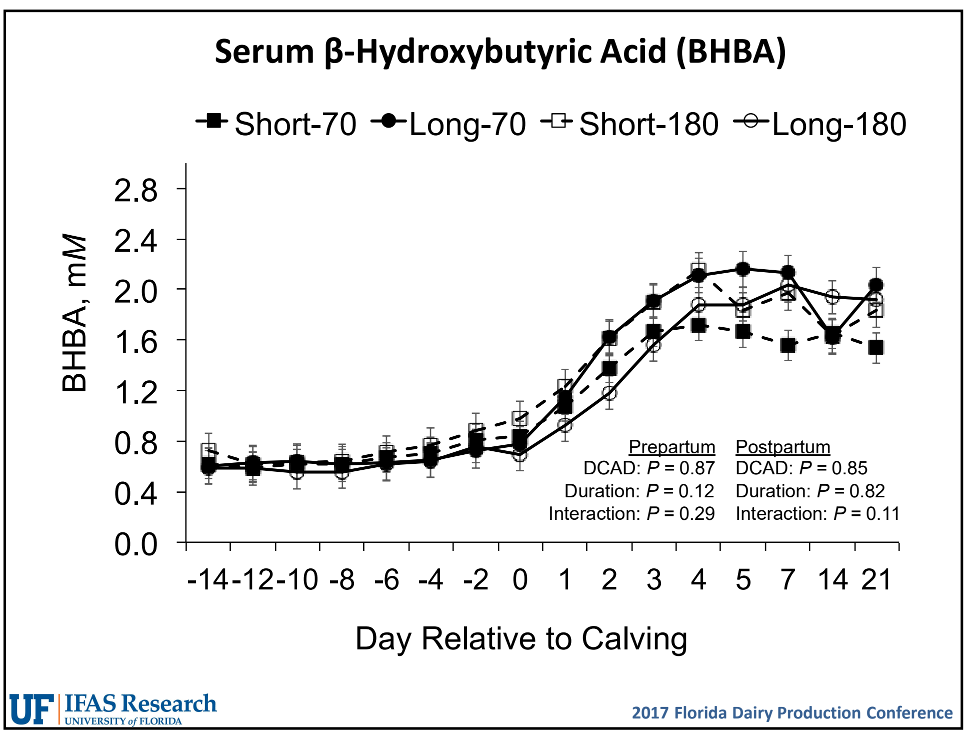
Serum β-Hydroxybutyric Acid (BHBA)
Short-70
Long-70
Short-180
Long-180
BHBA, mM
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
Prepartum
DCAD: P = 0.87
Duration: P = 0.12
Interaction: P = 0.29
Postpartum
DCAD: P = 0.85
Duration: P = 0.82
Interaction: P = 0.11
-14 -12 -10 -8 -6 -4 -2 0 1 2 3 4 5 7 14 21
Day Relative to Calving
IFAS Research
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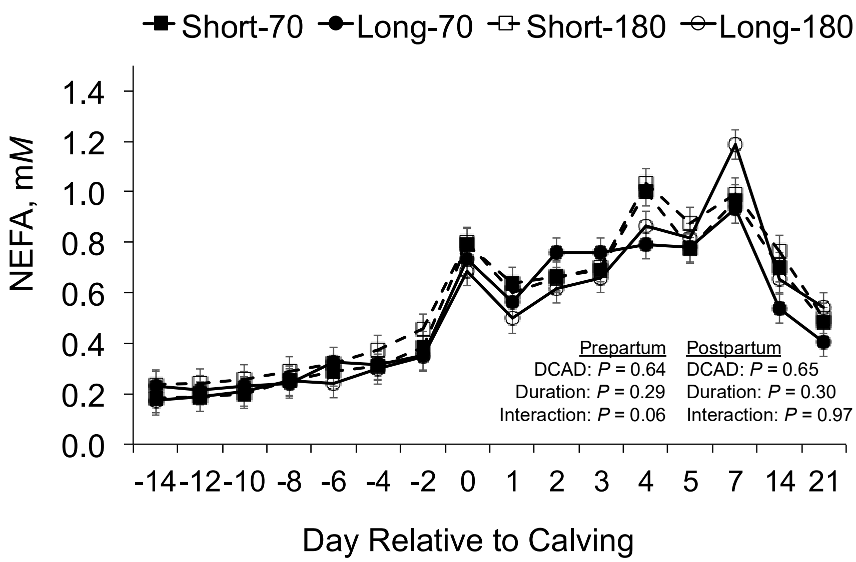
Serum Non-Esterified Fatty Acids (NEFA)



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Ionized Calcium and Measures of Acid-Base Status

	Treatment					P-value		
	Short		Long					
Item	-70	-180	-70	-180	SEM	Dur	DCAD	Inter
Blood pH	7.419	7.382	7.413	7.384	0.007	0.80	< 0.01	0.58
Blood PCO_2, mm Hg	40.4	38.1	39.8	39.7	0.75	0.50	0.12	0.14
Blood HCO_3^-, m*M*	26.2	22.6	25.7	23.8	0.5	0.49	< 0.01	0.13
Base excess, m*M*	1.62	-2.40	1.04	-1.43	0.63	0.75	< 0.01	0.21
Blood iCa, m*M*	1.26	1.29	1.25	1.28	0.01	0.44	< 0.01	0.93

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Postpartum Performance: Colostrum Yield and Components

	Treatment							
	Short		Long			P-value		
Item	-70	-180	-70	-180	SEM	Dur	DCAD	Inter
Colostrum, kg/d	4.56	3.49	4.43	4.26	0.42	0.45	0.14	0.29
Fat yield, %	4.31	4.92	4.46	4.63	0.40	0.85	0.33	0.58
Protein yield, %	11.77	12.61	12.57	12.57	0.44	0.38	0.34	0.34
Lactose yield, %	3.62	3.50	3.55	3.51	0.08	0.68	0.33	0.66
SNF yield, %	16.66	17.37	17.45	17.37	0.44	0.37	0.47	0.37
SCC yield, %	6.05	6.65	6.74	6.51	0.27	0.31	0.49	0.12
Colostrum NE, Mcal/kg	1.21	1.31	1.26	1.28	0.04	0.77	0.22	0.36

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Postpartum Performance: Milk Yield and Components

	Treatment							
	Short		Long			P-value		
Item	-70	-180	-70	-180	SEM	Dur	DCAD	Inter
Milk, kg/d	43.1	41.7	39.1	41.1	1.1	0.04	0.79	0.13
3.5 FCM, kg/d	46.7	46.0	43.9	45.8	1.3	0.23	0.63	0.31
ECM, kg/d	45.2	44.5	42.4	44.3	1.2	0.21	0.62	0.30
Fat yield, kg/d	1.73	1.73	1.66	1.73	0.06	0.52	0.57	0.51
Protein yield, kg/d	1.27	1.25	1.18	1.24	0.04	0.18	0.64	0.30
Lactose yield, kg/d	2.00	1.94	1.82	1.91	0.06	0.05	0.78	0.19
SNF yield, Kg/d	3.64	3.55	3.34	3.50	0.10	0.08	0.72	0.22
Milk NE, Mcal/kg	0.731	0.748	0.757	0.753	0.009	0.10	0.50	0.26

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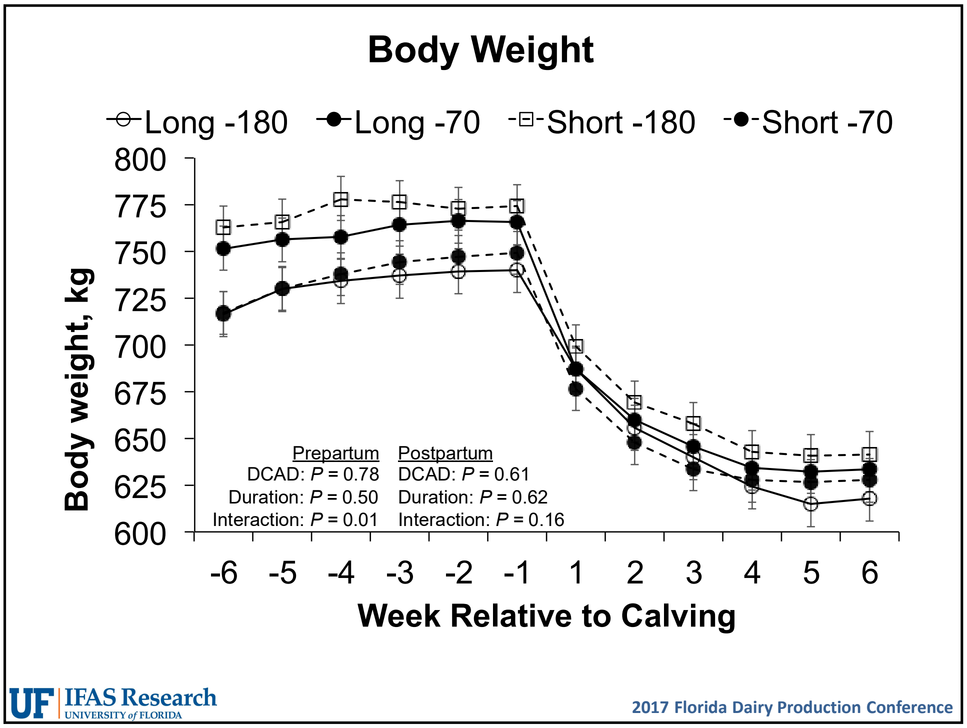
Body Weight
Long -180
Long -70
Short -180
Short -70
Body weight, kg
800
775
750
725
700
675
650
625
600
Prepartum
DCAD: P = 0.78
Duration: P = 0.50
Interaction: P = 0.01
Postpartum
DCAD: P = 0.61
Duration: P = 0.62
Interaction: P = 0.16
-6 -5 -4 -3 -2 -1 1 2 3 4 5 6
Week Relative to Calving
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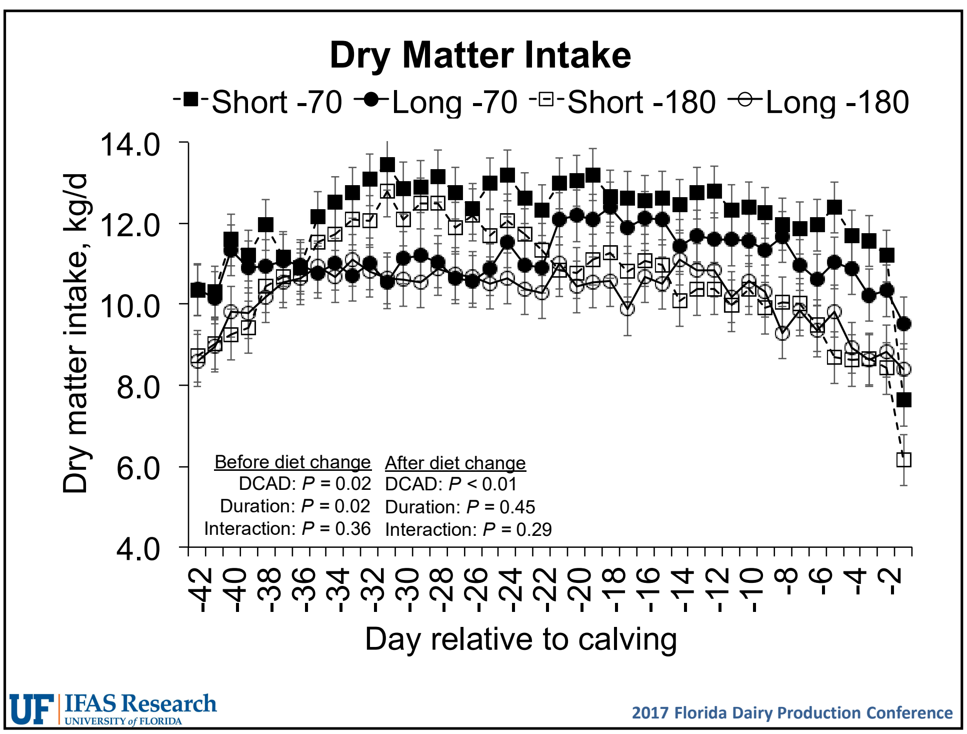
Dry Matter Intake
Short -70
Long -70
Short -180
Long -180
Dry matter intake, kg/d
14.0
12.0
10.0
8.0
6.0
4.0
Before diet change
DCAD: P = 0.02
Duration: P = 0.02
Interaction: P = 0.36
After diet change
DCAD: P < 0.01
Duration: P = 0.45
Interaction: P = 0.29
-42 -40 -38 -36 -34 -32 -30 -28 -26 -24 -22 -20 -18 -16 -14 -12 -10 -8 -6 -4 -2
Day relative to calving
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Conclusions

- Feeding a negative DCAD reduced DMI by 1 kg/d in the first 21 d of the dry period
- Reducing the level of negative DCAD from -70 to -180 mEq/kg in the last 21 d of gestation:
  - Reduced DMI by 1.8 kg/d
  - Induced a more exacerbated metabolic acidosis prepartum
  - Increased the concentration of iCa in blood prepartum

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Conclusions

- Extending the duration of negative DCAD had minor impacts on blood iCa and measures of acid-base status postpartum.
- Extending the duration of negative DCAD feeding decreased the milk yield 2.4kg/d, and lactose yield when fed for a longer time.
- Concentrations of minerals or metabolites were not significantly affected by level or duration of DCAD.
- Data suggest that extended feeding of negative DCAD is not detrimental to performance when fed at -180 mEq/kg

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2017 Florida Dairy Production Conference

Thank You!

Graduate Students:
Camilo Lopera Higuita
Roney Zimpel
William Ortiz
Francisco Lopez
Achilles Vieira-Neto
Bolivar Faria
Maria Lucia Gambarini

Funding:
Southeast Milk Checkoff
Arm and Hammer Animal Nutrition

2017

53rd Florida
Dairy Production Conference
Thursday, April 20th, 2017

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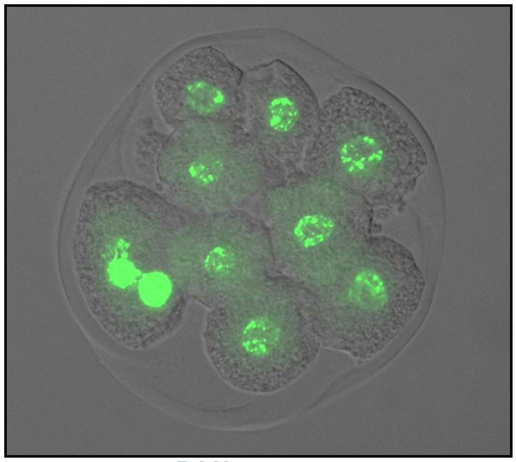
2017 Florida Dairy Production Conference

NOTES

Genetic and non-genetic effects on embryo production technologies



Southeast Milk, Inc.
Dairy Check-Off

2017

FLORIDA DAIRY PRODUCTION CONFERENCE

53rd Florida Dairy Production Conference
Thursday, April 20th, 2017

PJ Hansen
Dept. of Animal Sciences, University of Florida

UF UNIVERSITY of FLORIDA
DAIRY SCIENCE RESEARCH

USDA

United States Department of Agriculture
Animal and Plant Health Inspection Service
Veterinary Services
National Animal Health Monitoring System
February 2009

VS

Dairy 2007

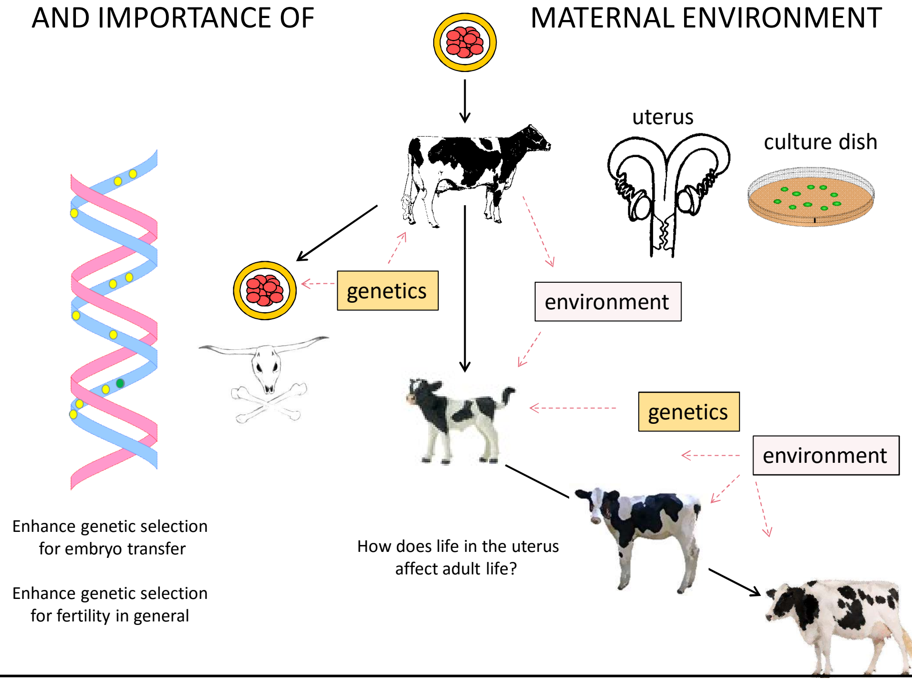
Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007

Survey of 17 states
79.5% of US dairies
82.5% of US cows

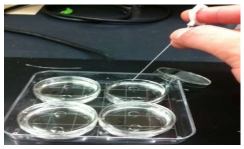
n. Operation average percentage of cattle pregnancies conceived during the previous 12 months by breeding method, and by herd size:

	Operation Average Percent Pregnancies							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Breeding Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Natural service (bull-bred)	29.1	(3.3)	22.0	(2.8)	19.7	(4.0)	26.8	(2.4)
AI (after detected estrus or timed)	70.3	(3.2)	77.0	(2.8)	79.9	(3.9)	72.5	(2.4)
Embryo transfer (superovulated or *in vitro* embryo)	0.6	(0.2)	1.0	(0.4)	0.4	(0.2)	0.7	(0.2)
Total	100.0		100.0		100.0		100.0	

EMBRYO TRANSFER CAN TEACH US ABOUT FERTILITY GENETICS AND IMPORTANCE OF MATERNAL ENVIRONMENT



DO CSF2-TREATED CALVES HAVE A DIFFERENT POSTNATAL PHENOTYPE?

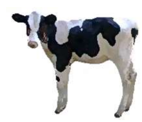


Day 7 ET to recipient cows

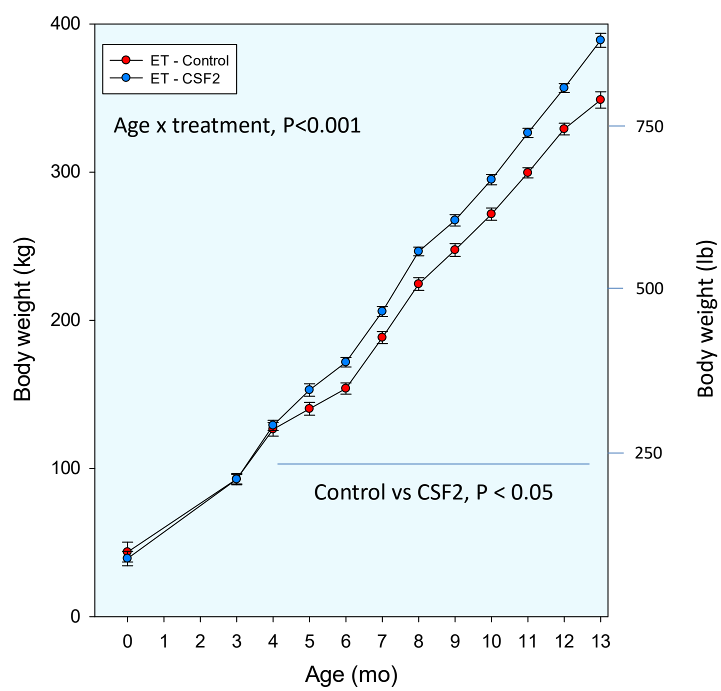
Day 5-7
CSF2 or vehicle

ET calves sired by bulls for both treatments
ET-Control (n=5)
ET-CSF2 (n=10)

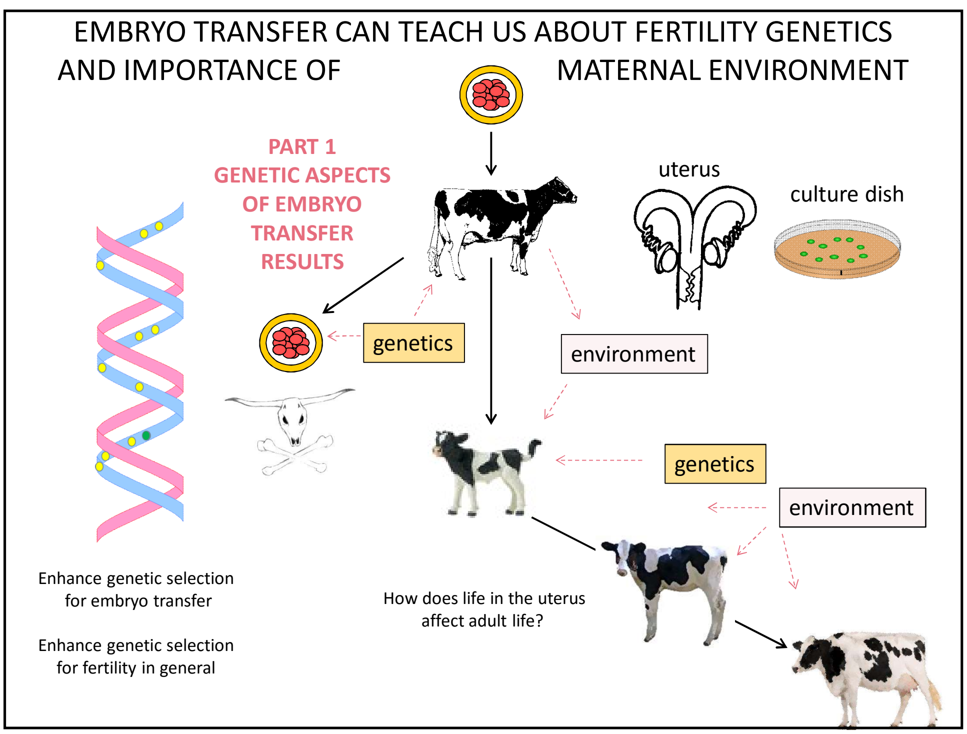
Body weight
Withers height



13 mo of age




NORTH
FLORIDA
HOLSTEINS
THANKS!
Don Bennink
Christine Meyer
Heidi Beach


EMBRYO TRANSFER CAN TEACH US ABOUT FERTILITY GENETICS AND IMPORTANCE OF MATERNAL ENVIRONMENT
PART 1
GENETIC ASPECTS OF EMBRYO TRANSFER RESULTS
uterus
culture dish
genetics
environment
genetics
environment
Enhance genetic selection for embryo transfer
Enhance genetic selection for fertility in general
How does life in the uterus affect adult life?

J. Dairy Sci. 100:2877–2891
https://doi.org/10.3168/jds.2016-11907

Evaluation of genetic components in traits related to superovulation, in vitro fertilization, and embryo transfer in Holstein cattle

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*Department of Animal Sciences, University of Florida, Gainesville 32611
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‡Animal Genomics and Improvement Laboratory, Agricultural Research Service, USDA, Beltsville, MD 20705-2350

Heritabilities for Embryo Yield and Pregnancy Success After Transfer

Trait	Heritability
Superovulation (n=926)	
Total structures recovered	0.32
Total no. good embryos	0.21
In Vitro Fertilization (n=628)	
Total structures recovered	0.15
No. of cleaved embryos	0.12
No. of high quality embryos	0.01
Proportion of embryos high quality	0.04
Embryos Transferred (n=12,089)	
Pregnancy success, recipient	0.03
Pregnancy success, embryo	0.02

Genetic Markers for Total No. of Structures and Good Embryos Could Be Identified

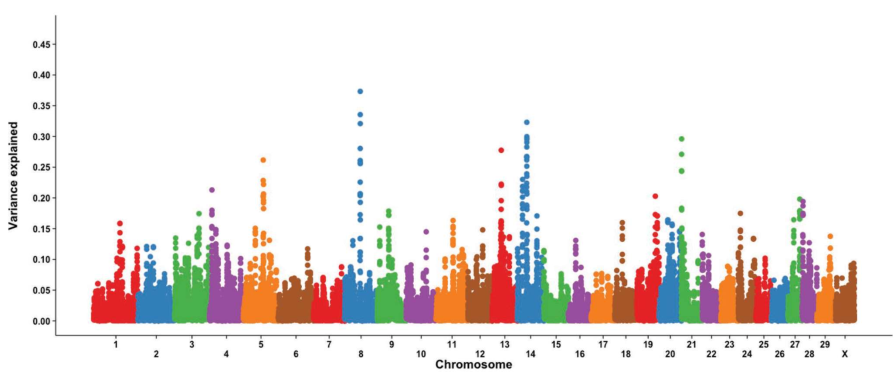


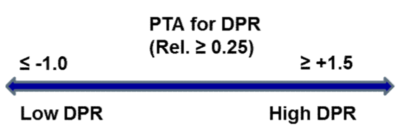
Figure 2. Proportion of SNP variance explained by 10-SNP windows associated with total structures recovered in the superovulation data set with Anscombe transformation. Color version available online.

Take-Home Messages

- There is a significant genetic component to number of structures and embryos recovered from both superovulation and IVF procedures
  - --could be used to identify and select for donors that do well in embryo transfer programs
  - --those genes controlling embryo yield are probably not related to fertility to AI (since they probably control follicle number)
- There was low heritability for embryo quality and embryo survival on both the recipient and embryo side
  - --just like AI, most of the variation in whether a cow gets pregnant to AI depends on environment and not genetics

---DOES NOT MEAN THAT GENETICS ARE NOT IMPORTANT---

Holstein cow population



Location	# Dairies	High DPR	Low DPR	Total
Florida	6	677	137	814
California	5	394	1129	1523
Total	11	1071	1266	2337

Genetic information (PTA values)

- Daughter pregnancy rate (DPR)
- Heifer conception rate (HCR)
- Cow conception rate (CCR)

Phenotypic information (Farm data)

- Pregnancy rate at first service
- Services per conception
- Days open

Differences in fertility between high and low DPR groups

Trait	N	LSMEANS (%) (SEM) High DPR		Low DPR		*P value*
Preg. rate first service (Lact1)	2213	53.1	(1.69)	28.6	(2.32)	<0.0001
Preg. rate first service (Lact2)	1969	43.9	(1.77)	23.0	(2.38)	<0.0001
Preg. rate first service (Lact3)	1321	41.0	(1.88)	25.0	(2.53)	<0.0001

Trait	N	LSMEANS (SEM) High DPR		Low DPR		*P value*
Services /conception (Lact1)	2213	1.93	(0.06)	3.26	(0.07)	<0.0001
Services /conception (Lact2)	1969	2.09	(0.07)	3.30	(0.07)	<0.0001
Services /conception (Lact3)	1321	2.20	(0.08)	3.20	(0.10)	<0.0001
Days open (Lact 1)	2213	98	(2.59)	163	(2.94)	<0.0001
Days open (Lact 2)	1969	112	(2.80)	167	(3.13)	<0.0001
Days open (Lact 3)	1321	110	(3.24)	158	(3.81)	<0.0001

Daughter Pregnancy Rate

$$\text{PR} = \frac{\text{Number of cows that became pregnant during a given 21-day period}}{\text{Number of cows that were eligible for breeding}}$$

National average for PR ~16%

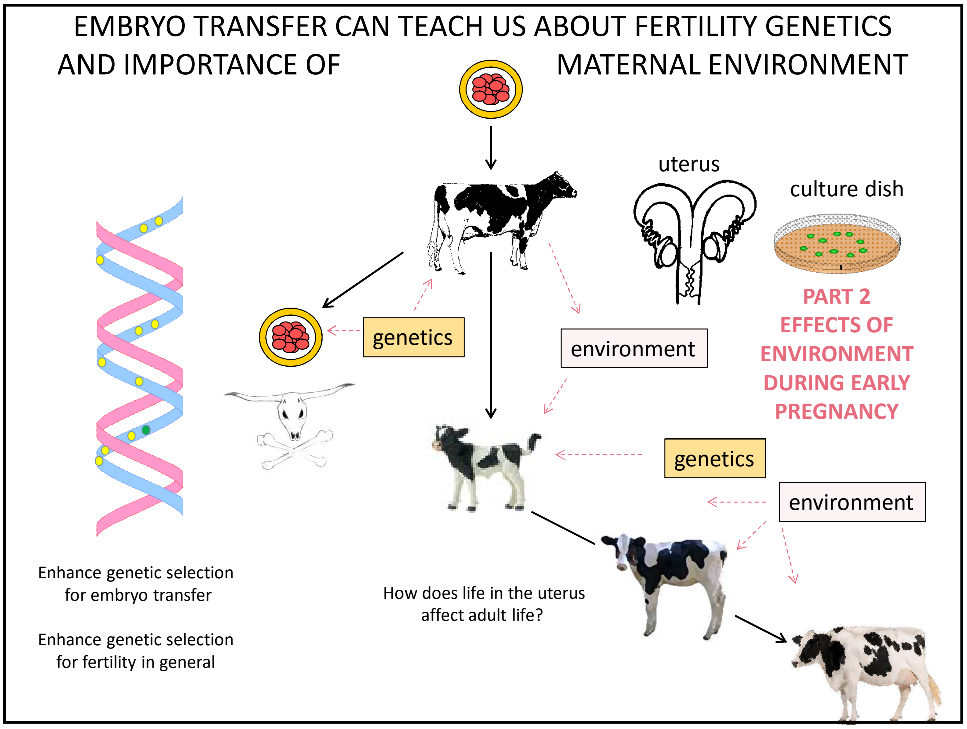
DPR = PR of a bull's daughters

PR (DPR) = 21/(days open – voluntary waiting period + 11)

A 1% increase in DPR = ~ -4 days open

1% PR=400 lb milk

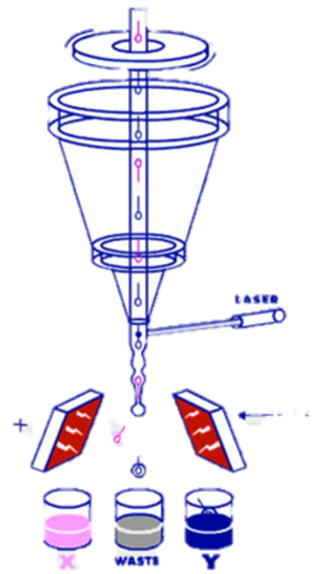
Welcome Super Petrone-ET
(Dec 2016)
+ 639 milk
+6.9 (-28 days open)


EMBRYO TRANSFER CAN TEACH US ABOUT FERTILITY GENETICS
AND IMPORTANCE OF MATERNAL ENVIRONMENT
uterus
culture dish
genetics
environment
PART 2
EFFECTS OF
ENVIRONMENT
DURING EARLY
PREGNANCY
genetics
environment
Enhance genetic selection
for embryo transfer
Enhance genetic selection
for fertility in general
How does life in the uterus
affect adult life?


PART 2 – EFFECTS OF ENVIRONMENT DURING
EARLY PREGNANCY ON POSTNATAL FUNCTION
NORTH
FLORIDA
HOLSTEINS
--249 SUPEROVULATION CALVES
--345 CALVES BORN BY IVF-CONV-SEMEN
--658 CALVES FROM IVF-REVERSE SORTED SEMEN

REVERSE-SORTING

SEX SORTING OF FROZEN-THAWED SEMEN



Genetic Merit

	AI	IVF-conv	IVF-sexed	Superov.	P-value
Genomic PTA for milk (lb)	447±12[a]	638±37[b]	625±26[b]	516±40[ab]	<0.0001
Genomic PTA for fat (lb)	19.6±0.4[a]	32.6±1.5[b]	31.5±1.1[b]	32.1±1.5[b]	<0.0001
Genomic PTA for protein (lb)	16.1±0.2[a]	24.4±0.9[b]	23.3±0.7[b]	21.1±0.9[b]	<0.0001
Dam PTA for milk (lb)	152±13[a]	477±73[b]	401±61[b]	45±66[a]	<0.0001
Sire PTA for milk (lb)	727±14[a]	762±41[a]	1015±29[b]	807±46[a]	<0.0001
Net merit dollars ($)	321±3[a]	456±9[b]	464±6[b]	420±10[c]	<0.0001
Genomic PTA for DPR	1.9±0.03[a]	2.0±0.09[a]	2.4±0.06[b]	2.1±0.1[ab]	<0.0001

Adult Performance – First Lactation

Endpoints	AI	IVF-conv	IVF-sexed	Superov.	P-value
Reproduction traits					
Age at first calving (months)	23.5±0.1	23.8±0.3	23.2±0.2	23.3±0.3	0.4520
Days open, first lactation (d)	100.0±2.1	108.3±5.5	102.7±3.9	87.5±7.6	0.1479
Production traits		706 lb			
Projected actual milk yield, 305 d (lb)	**24283±68[a]**	**24081±220[ab]**	**23577±167[b]**	**23960±328[ab]**	0.0014
Projected actual fat yield, 305 d (lb)	**854±3[a]**	**848±9[ab]**	**829±7[b]**	**846±13[ab]**	0.0072
Projected actual protein yield, 305 d (lb)	**736±2[a]**	**740±7[a]**	**720±6[b]**	**729±11[ab]**	0.0318

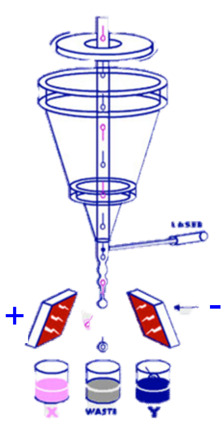
Potential Mechanisms

Damage to sperm during sex-sorting (?)

- DNA labeling (chromatin staining)
- Exposure to a laser beam
- Positive or negative charge on membrane
- Intensive manipulation

Delayed fertilization?

Aged oocyte → ↓ Fertility



Paternal contribution upon fertilization

- **Dogma:** only genomic DNA
- **Reality:** much more!

miRNA

mRNA

siRNA

Sperm-borne proteins

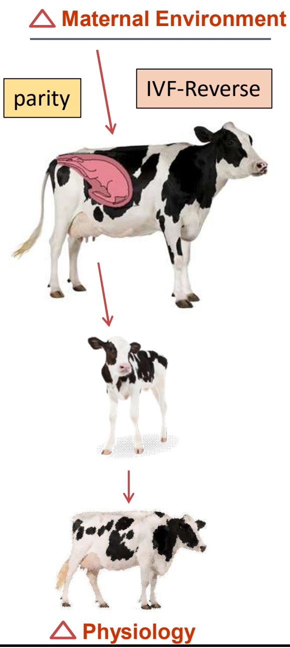
Effect of Dam Parity on Offspring Phenotype

	Dam parity		*P*-value	
Endpoints	Nulliparous (parity = 0)	Parous (parity ≥1)	Dam parity	Dam parity by technique interaction
Reproduction traits				
Age at first calving (mo)	23.3±0.2	23.6±0.2	0.29	0.16
Days open, first lactation	96.0±4.2	103.3±3.2	0.15	0.36
Production traits	603 lb			
Projected actual milk yield, 305 d (lb)	**23674±154**	**24277±136**	0.0019	0.37
Projected actual fat yield, 305 d (lb)	**829±6**	**860±5**	<0.0001	0.17
Projected actual protein yield, 305 d (lb)	**721±5**	**742±4**	0.0007	0.22

Conclusions

- Procedures used for IVP with reverse-sorted semen have consequences that extend to adult life
- IVP-sexed offspring are characterized by:
  - Reduction in milk, fat, and protein production
- The consequences of IVP-conv and MOET were minimal for postnatal function
- Dam parity while carrying a calf causes alterations in fetal programming
  - Performance of offspring from nulliparous heifers was inferior than those born from parous cows (parity ≥1)

Developmental Programming Occurs in Cattle



Type of cattle	Treatment	Altered Adult Phenotype	Reference
First trimester			
Beef cattle	Low crude protein	♂ Heavier, larger muscle size ♀ Lighter	Micke et al., Anim Reprod Sci 117:1 (2010: Mol Cell Endocrinol 332:234 (2011)
Beef cattle	Nutrient restriction	♀ Lower antral follicle count ♀ Higher blood pressure	Mossa et al., Biol Reprod 88:92 (2013)
Second trimester			
Beef cattle	Nutrient restriction	♂♀ reduced growth, increased muscle size	Micke et al., Anim Reprod Sci 117:1 (2010: Mol Cell Endocrinol 332:234 (2011)
Third trimester			
Beef cattle	Supplemental protein	♀ Higher heifer fertility	Martin et al., J Anim Sci 85:841 (2007)
Dairy cattle	Heat stress	♀ Decreased milk yield	Monteiro et al., J. Dairy Sci. 99:8443 (2016)

I'm An Artificial Calf

Ralph A. Porterfield

I'm a little heifer, I'm an artificial calf,
Some people think it's funny, but go ahead and laugh.
When I grow up to be a cow and join the milking herd
I'll bet I'll be a big success — perhaps the latest word.

You seldom find a little calf as beautiful as me,
If I could be your pin-up girl I'd be happy as can be.
Now I'll tell you my ambition which is not to fly or sail
But to always be on duty and to put 'er in the pail.

I want to be a glamour girl and take in every fair,
I want to win blue ribbons, at least to win my share.
In just another year or two I'll have symmetry and style
And to this I'm looking forward for I think it well worth while.

When people come to see me they tell me I have type,
And off they go just feeling fine without a single gripe.
It's always nice to please them for I'm sure that they can see
That artificial breeding is worth its modest fee.

Think it over, brother, for I know I'll pay my way
By eatin' and producin' and consumin' lots of hay.
Enroll your little herd of cows and be the last to laugh
'Cause you'll never go astray with an artificial calf.

Hoard's Dairyman 94, 177 (1949)

Students/Postdocs
Kristen Parker Gaddis
Luiz Siqueira
Sofia Ortega

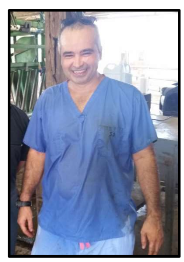
Other Collaborators
John Cole, USDA
Daniel Null, USDA
Serdal Dikmen, Uludag

North Florida Holsteins
Don Bennink
Christine Meyer
Heidi Beach


Parker Gaddis


Siqueira


Cole


Dikmen


Ortega

Southeast Milk, Inc.
Dairy Check-Off


hansen@animal.ufl.edu

NOTES

Challenges, Opportunities, & Prospects of US Dairy Production

Gordie Jones DVM

53rd Florida Dairy Production Conference
April 20th 2017

Dr. Gordie Jones

- 15 years Dairy Practice
- 10 years Dairy Nutrition / Facility /Cow Comfort consulting
- 3 years Monsanto (BST) consulting
- 6 years designed & managed Fair Oaks Dairy Farms (20,000 cows)
- 5 years building and managing my dairy farm!
- Consulting again

Remember we are here because we love cows!

“Pleistocene Mega fauna“

– Born during the last Ice Age

The First Farmers

- Were in Mesopotamia
- Modern day Iraq
- Large headed grains
- Wheat, Barley, Triticale
- A stick in the sand
- A little water and we were farmers!

The First Farmers

- Our First fences
- Were to keep the wild cows out!!
- She opened the gate
- And we now had a cow!

Only 11 species were able to be domesticated.

- Our Cow is the star!
- She Provided POWER, Protein, & Fertilizer
- She truly is the foundation of civilization.
- The foster mother of the human race
- All of the domesticated animals are "herd" species - looking for a leader
- Except the Cat!!

Covenant;

To care for, and keep

The Star of the show!