Proceedings of the 55th

FLORIDA DAIRY PRODUCTION CONFERENCE

Alto Straughn IFAS Extension Professional Development Center
Gainesville • Florida • September 18, 2019

Department of Animal Sciences
Institute of Food and Agricultural Sciences
University of Florida
Gainesville, Florida 32611

Proceedings of the

55th Florida Dairy Production Conference

Wednesday, September 18, 2019

Alto Straughn IFAS Extension Professional Development Center
2142 Shealy Drive
Gainesville, FL 32608

MISSION STATEMENT

The mission of the Florida Dairy Production Conference is 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, students and dairy educators.

PLANNING COMMITTEE

Ricardo Chebel
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PROGRAM

9.00 AM	***Welcome and opening remarks*** **Saqib Mukhtar** (Associate Dean for Extension, University of Florida)
9.10	***Dairy calf and heifer management*** **Joao Costa** (University of Kentucky)
9.50	***Selecting replacement heifers*** **Francisco Peñagaricano** (University of Florida)
10.20	BREAK
10.50	***Critical aspects for improving reproductive success*** **Milo Wiltbank** (University of Wisconsin)
11.30	***Nutritional manipulations to improve health and fertility*** **José Santos** (University of Florida)
12.00 PM	LUNCHEON
1.30	***Addressing animal welfare concerns in dairy farming*** **Meggan Hain** (Organic Valley Cooperative)
2.15	***Engaging and educating the public about dairy practices*** **Gary Corbett** (Fair Oaks Farms, Indiana)
3.00	BREAK
3.30	***When dairy farming meets social media: sharing my experience*** **Tara Vander Dussen** (New Mexico Milkmaid, New Mexico)
4.00	***When dairy farming meets social media: sharing my experience*** **Brittany** & **Courtney Nickerson** (Nickerson Cattle Company & Nickerson Bar III, FL)
4.30	***Producer Panel*** Moderator: Ricardo Chebel (University of Florida)
5.00	RECEPTION

Dairy calf and heifer management: *influence of nutrition, socialization, performance, and welfare*

Joao H. C. Costa, PhD

Assistant Professor, Dairy Science
Department of Animal & Food Sciences -University of Kentucky

Email: costa@uky.edu

September 18th, 2019

KENTUCKY

Outline –

- Introduction
- Benefits of early socialization
- Milk feeding strategies: accelerated programs

What about dairy calves?

- USA National data:
  - Individual housing until weaning: **85.3%**

NAHMS, 2014

Individual housing is associated with…

- Lower social ranking and competitive success
- Increased aggressiveness
- Increased fear responses

See review by Costa et al., 2016

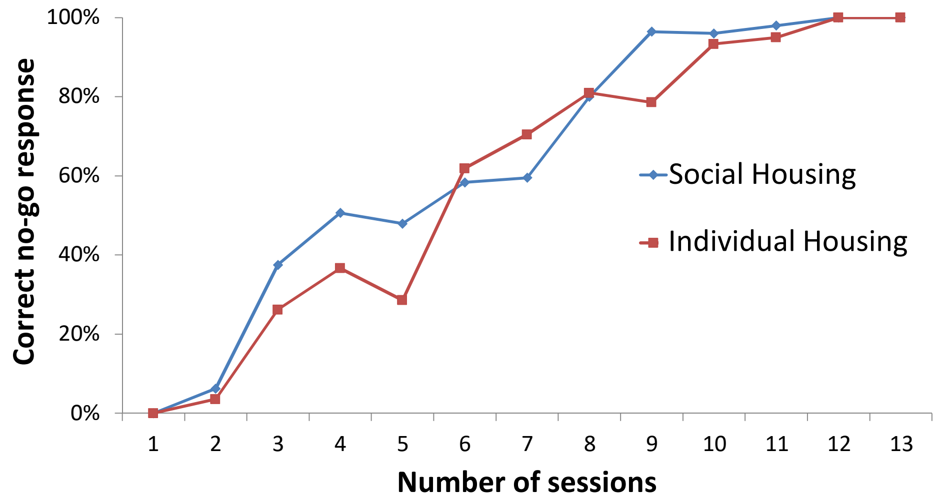
Adaptability and flexibility: Reversal Learning

Effects of social rearing on cognition

Initial Discrimination

Positive		**Negative**
approach for milk reward	⇔	do not approach; time-out punishment

Discrimination learning



Meagher et al., 2015

Effects of social rearing on cognition

Initial Discrimination

Positive
approach
for
milk reward

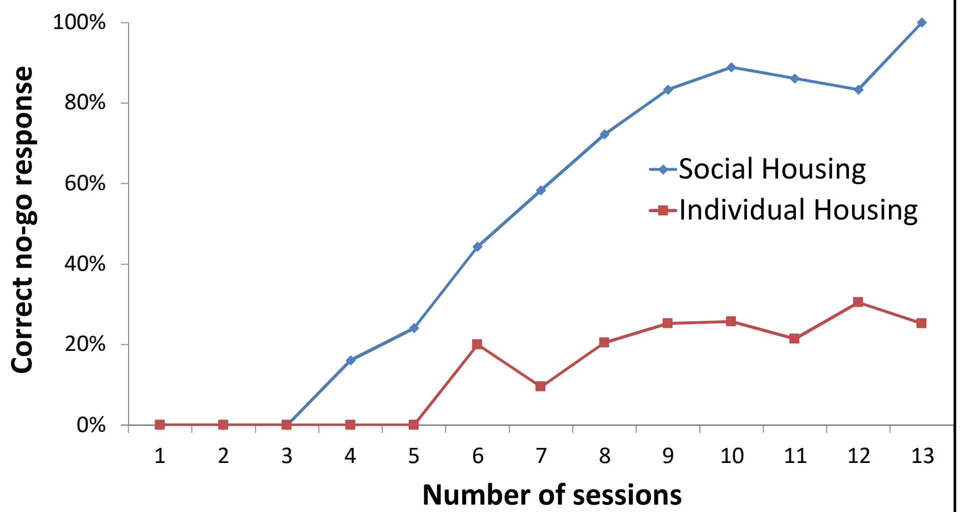
Negative
do not
approach; time-
out punishment

Reversal

Positive
approach
for
milk reward

Negative
do not
approach; time-
out punishment

Reversal learning



Meagher et al., 2015

But my calves do not play with computers….

Food neophobia test

- 70 d of age
- Presented 2 kg of:
  chopped carrots (n = 8)

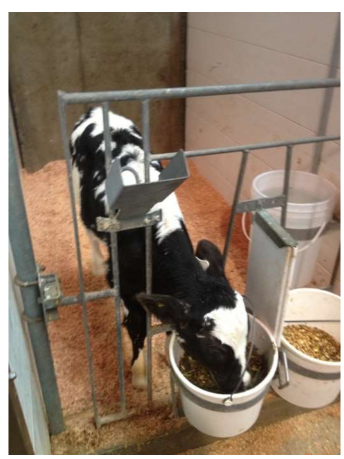
- The test lasted 30 min and was repeated 3 times per calf

Costa et al., (2014) J Dairy Science: 97:7804–7810

Food neophobia test

- 70 d of age
- Presented 2 kg of:
  chopped hay (n = 8)

- The test lasted 30 min and was repeated 3 times per calf



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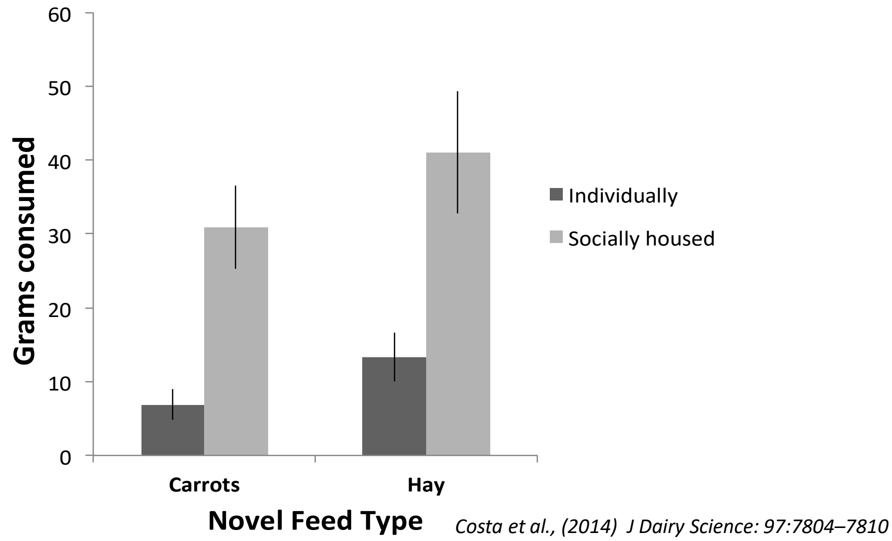
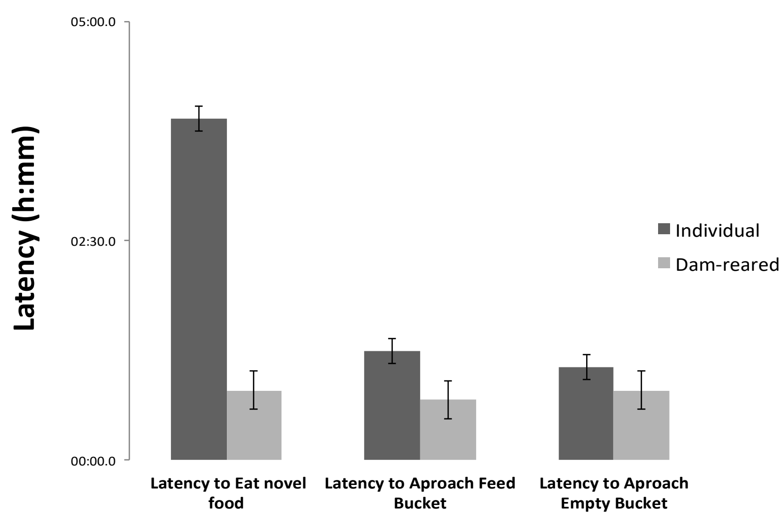
How much novel food did they eat?



Costa et al., (2014) J Dairy Science: 97:7804–7810

Latency to eat and approach buckets

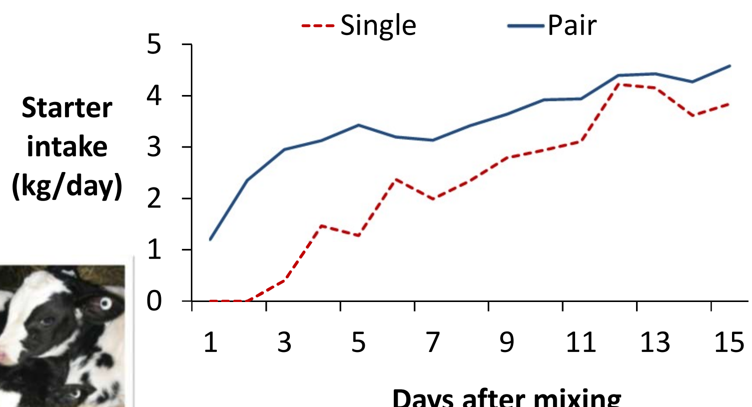


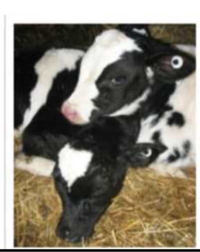
Costa et al., (2014) J Dairy Science: 97:7804–7810

Responses to mixing after weaning? Paired versus individual housing

De Paula Vieira et al. 2010. J. Dairy Sci. 93: 3079-3085

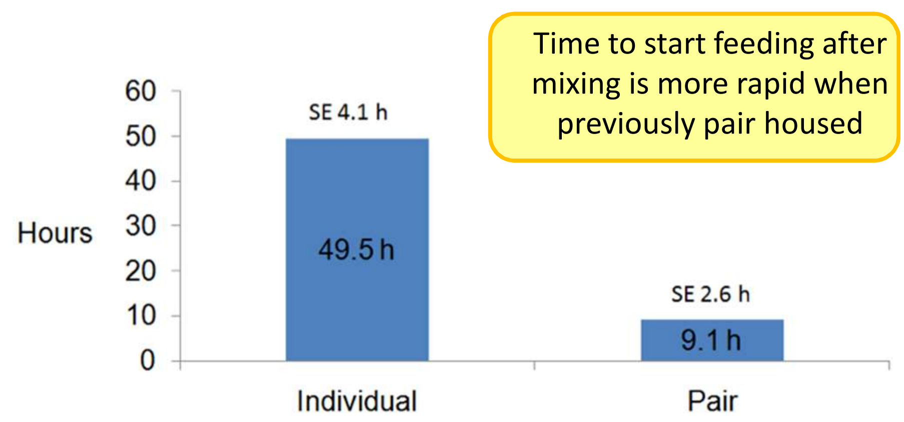
Starter intake was higher after mixing in previously paired versus individually-housed calves





De Paula Vieira et al. 2010. J. Dairy Sci. 93: 3079-3085

Pair housing improves access to resources at mixing



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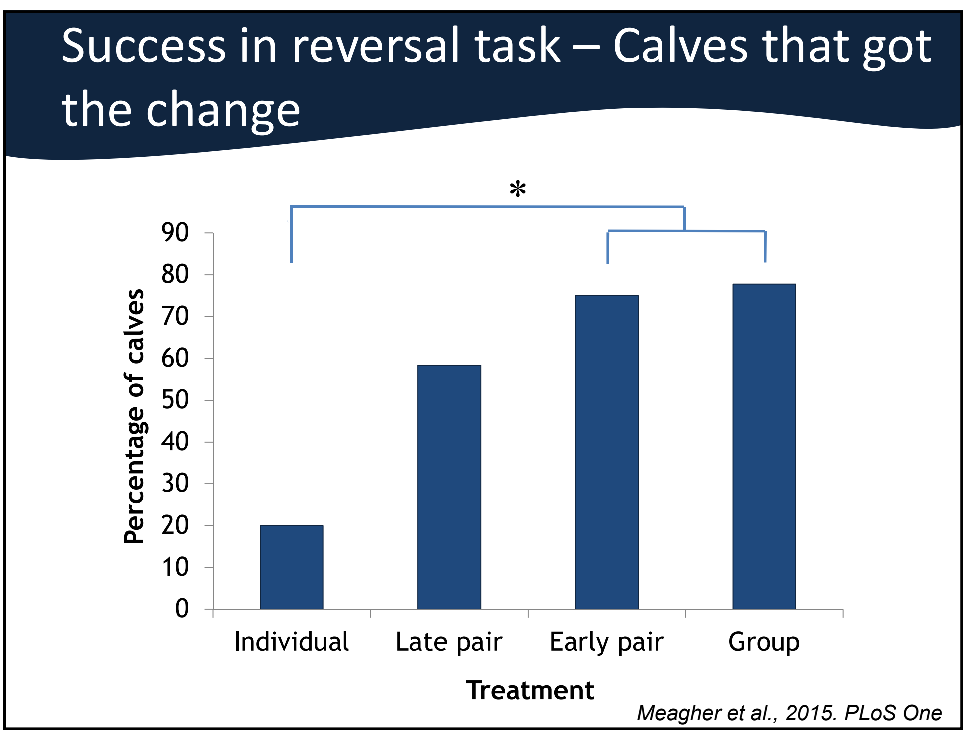
Individual
Late pair
Early pair
Group


Success in reversal task – Calves that got the change
*
Percentage of calves
90
80
70
60
50
40
30
20
10
0
Individual
Late pair
Early pair
Group
Treatment
Meagher et al., 2015. PLoS One

Limitations => Future directions

Are the cows on our farms "normal"?

Limitations => Future directions

- Does the early life environment influence how cows cope with stress?

Regrouping

Diet changes

Transition period

Milking procedure

Take Home Message… Round 1 of 3

- Early life socialization is likely to **promote behavioural flexibility** and **adaptability** to novelty
- The housing system in which young dairy calves are raised **impacts neophobic behaviours** towards new food items.

Housing environment affects PERFORMANCE…

Early social housing effects in dairy calves: Performance effects

Parameters	Socialization effects	Number of studies
Final Body Weight	+	6
	=	2
	-	0
Average Daily Gain (ADG)	+	4
	=	6
	-	0
Solid feed DMI	+	7
	=	7
	-	0

See review by Costa et al., 2016

Early social housing effects in dairy calves: Performance effects

Parameters	Socialization effects	Number of studies
Final Body Weight	+	6
	=	2
	-	0
Average Daily Gain (ADG)	+	4
	=	6
	-	0
Solid feed DMI	+	7
	=	7
	-	0

Pattern shows that milk feeding strategy influences this effect.

More milk greater chances of find positive influence.

Not enough studies for a meta-analysis

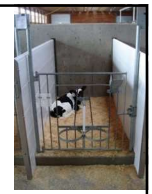
See review by Costa et al., 2016

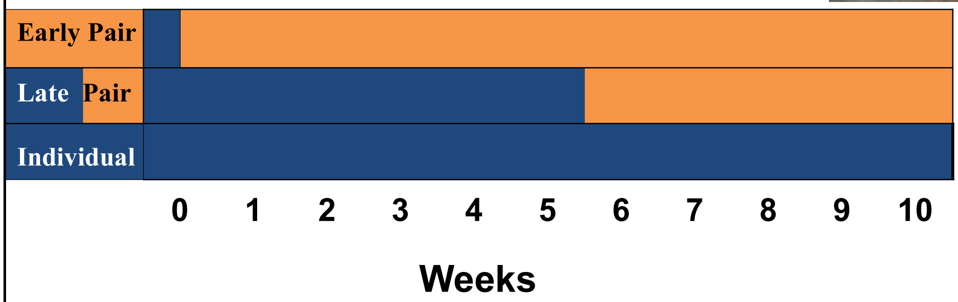
Social contact affects early feeding behavior

- Social Facilitation
  - greater stimulation and attention towards the feed
- Social Learning
  - two heads think better than one

When to pair dairy calves?

What we did…

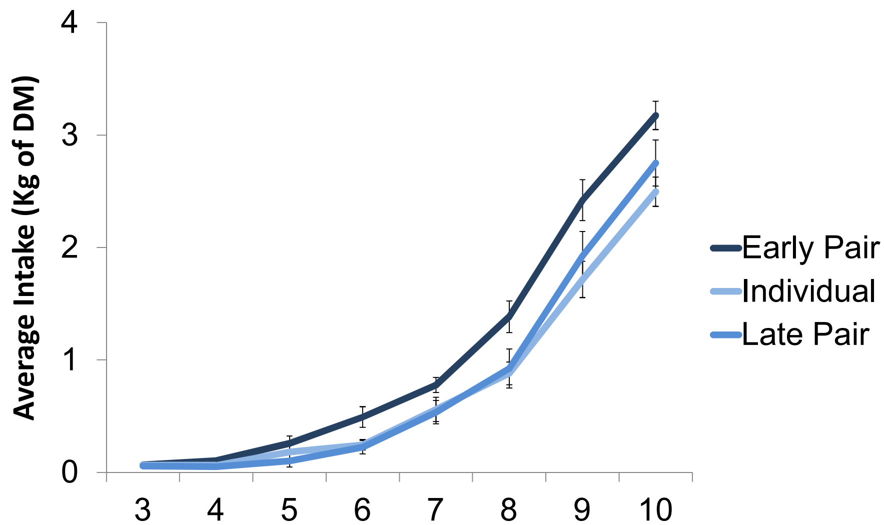




Ad libitum access to grain and TMR: intake measured daily

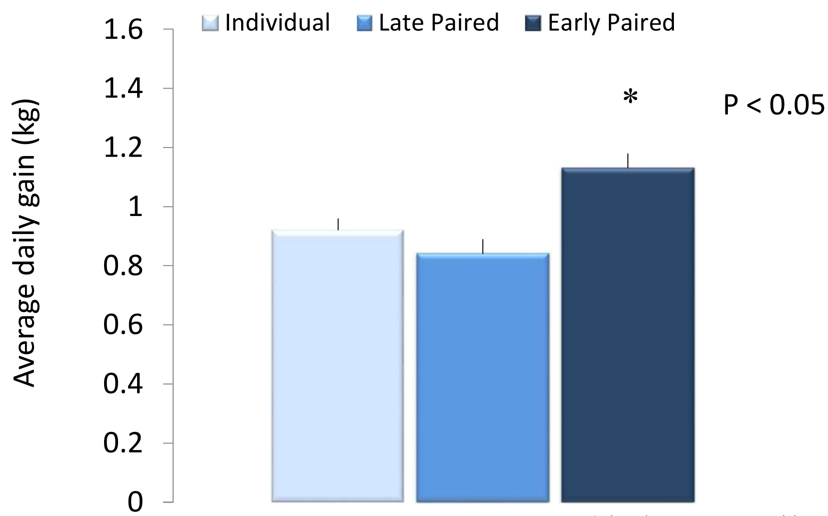
Weekly body weight and calculated Average Daily Gain (ADG) per calf

Early paired calves had higher solid feed DMI…



Costa et al., (2015) J Dairy Science: 98 (9), 6381-6386

…and higher weight gains



Costa et al., (2015) J Dairy Science: 98 (9), 6381-6386

Take Home Messages – Round 2 of 3

Early social housing (including pair housing) increases **feed intake** and **weight gains**

What about how we feed them?

Summary of latest results

- Higher AGD during preweaning is associated with:
  - Early breeding and calving age
  - Lower culling rate
  - Indication of increased milk production above 1 lb per day of ADG

So how can we achieve these advantages ?

Recommendation for calf growth…

Who has heard this saying before?

"Calves need to double their birth weight by weaning"

Recommendation for calf growth…

"Calves need to double their birth weight by weaning"

Hypothetical situation (average Holstein farm):

Birth weight:
~ 85 lb or 38 kg
Weaning age:
8 weeks = 56 days
Target ADG:
85 lb/56 days = 1.5 lb/day or 0.66 kg/d

What happens when we allow calves to drink more milk?

How much milk should we feed them?

In nature..

- Nurses calf 5 - 10 times/d
- Nursing bouts last 5 - 10 min
- Provides about 10 L of milk/d

What do we do?

- Feed 2 times a day
- Feed using a bucket
- Provide about 4 L of milk

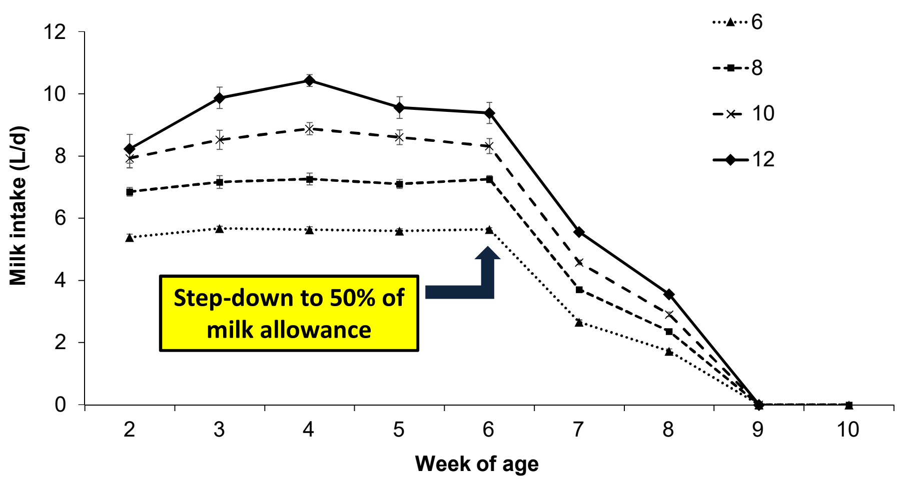
What is the optimal amount of milk?

Optimal milk allowance for **group-housed** calves using a gradual weaning protocol?

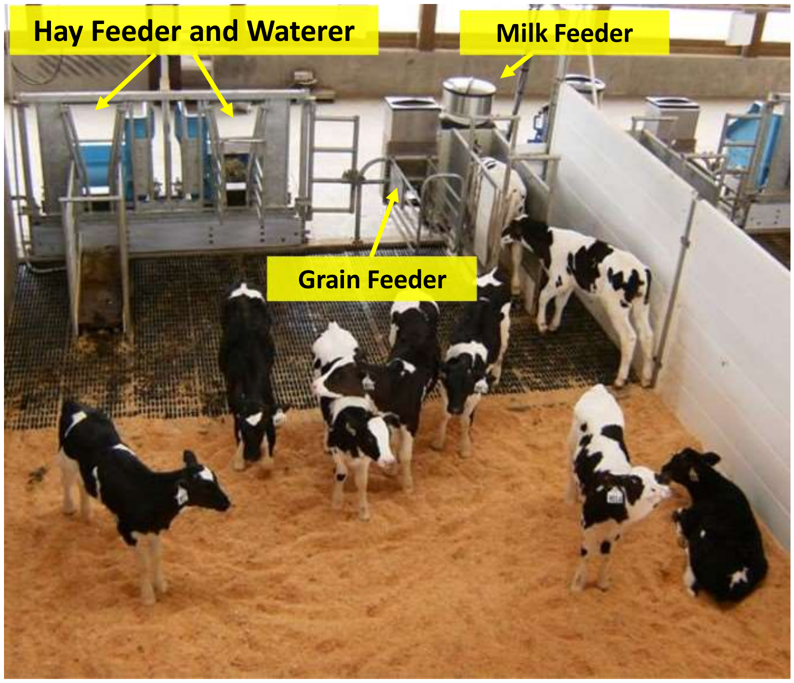
Objective: To determine the body weight gain and starter intakes of calves fed different levels of milk using the step down milk feeding regime

Rosenberger et al., *2017*. J. Dairy Sci.

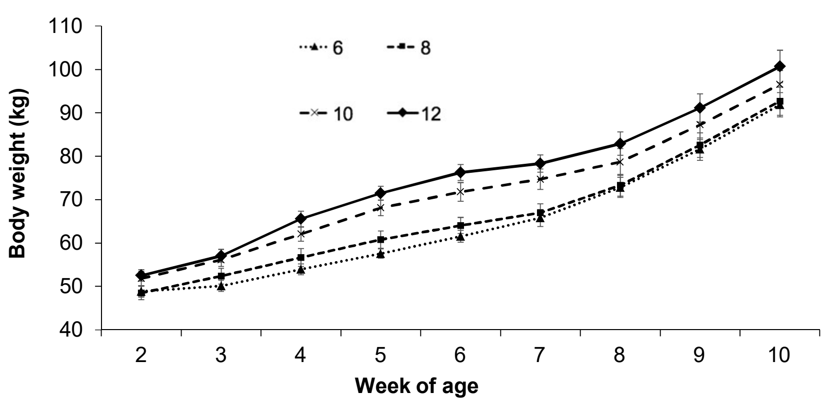
Calves were assigned to
1 of 4 treatments within groups of 8 (n=14/treatment):
6, 8, 10 or 12 L of milk / day



Rosenberger et al., *2017*. J. Dairy Sci.

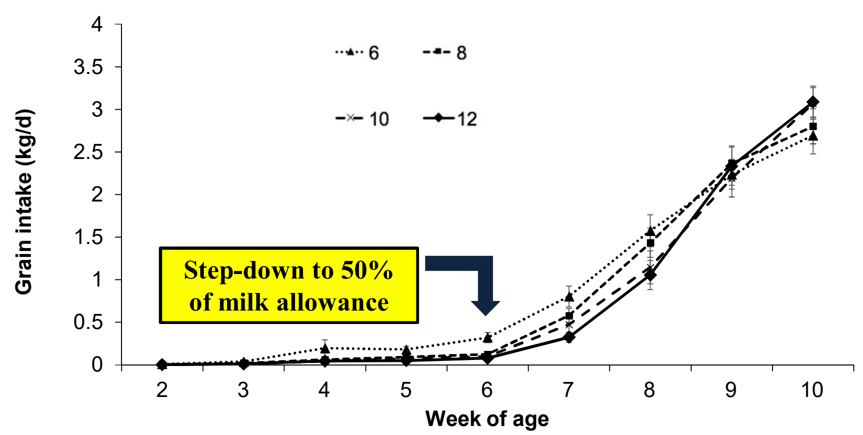


Higher milk allowance = Increased BW



Rosenberger et al., *2017*. J. Dairy Sci.

Grain intake was not different after weaning



Rosenberger et al., *2017*. J. Dairy Sci.

What we found…

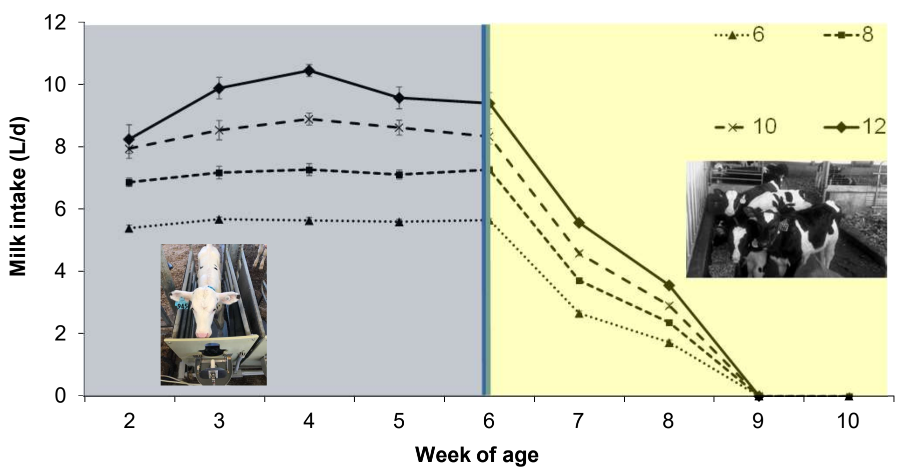
Item	6 L/d	8 L/d	10 L/d	12 L/d	SE	*P-values*[2]
ADG (kg/d)	0.77	0.78	0.81	0.90	0.04	0.01
Total[1] ME (Mcal)	260.9	279.1	295.1	305.1	20.6	0.001
Milk DMI (kg)	11.9	15.2	18.1	21.4	0.6	0.001
Starter DMI (kg)	64.0	63.7	63.4	60.3	6.7	0.50

1. Total ME is calculated from intakes of milk and starter only. Calves also consumed forage but intakes could not be recorded reliably.
2. d.f. = 1,39

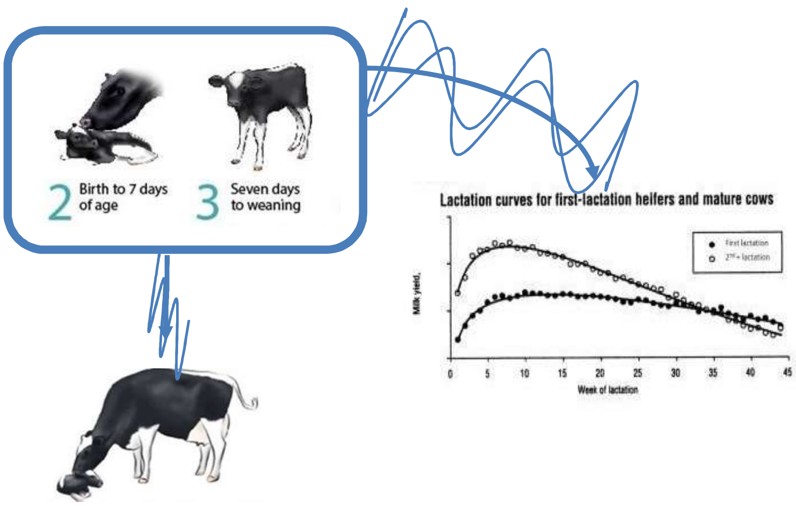
The conundrum

Ad libitum milk =
Low solid feed intake
(de Passille et al., 2011)

Solid feed intake =
Rumen development
(Hill et al., 2008)



Very long time….but it's a long term investment!



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AN ECONOMIC ANALYSIS OF THE COSTS ASSOCIATED WITH PRE-WEANING MANAGEMENT STRATEGIES FOR DAIRY HEIFERS

Hawkins et al., *2019.* *Animals*

Objective

Calculate the cost from birth to weaning

Evaluate different management styles and systems

Develop an on-farm tool to calculate costs and predict cost changes with management change

Hawkins et al., *2019*. *Animals*

Model Description

10,000 iterations

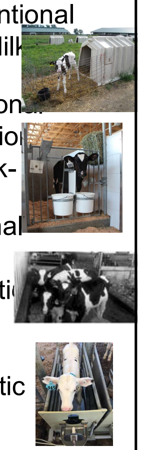
1000 heifers in replacement female program

88 heifers in the preweaning phase

Hawkins et al., *2019*. *Animals*

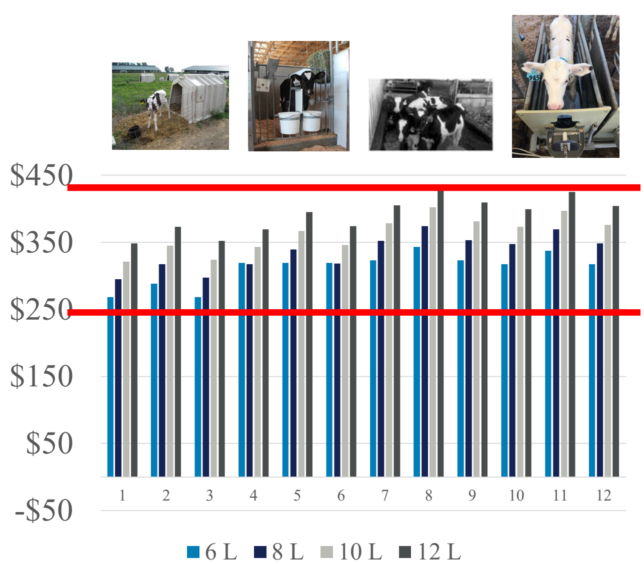
Management Pathways

1. Individual Hutches Outside-Milk Replacer-Conventional
2. Individual Hutches Outside-Pasteurized Whole Milk-Conventional
3. Individual Hutches Outside-Whole Milk-Conventional
4. Individual Hutches Inside-Milk Replacer-Conventional
5. Individual Hutches Inside-Pasteurized Whole Milk-Conventional
6. Individual Hutches Inside-Whole Milk-Conventional
7. Group Housing-Milk Replacer-Conventional
8. Group Housing-Pasteurized Whole Milk- Conventional
9. Group Housing-Whole Milk-Conventional
10. Group Housing-Milk Replacer-Automatic
11. Group Housing- Pasteurized Whole Milk-Automatic
12. Group Housing-Whole Milk-Automatic



Hawkins et al., *2019*. *Animals*

Total Cost average ranged from $268.67-$430.42 from birth to weaning.



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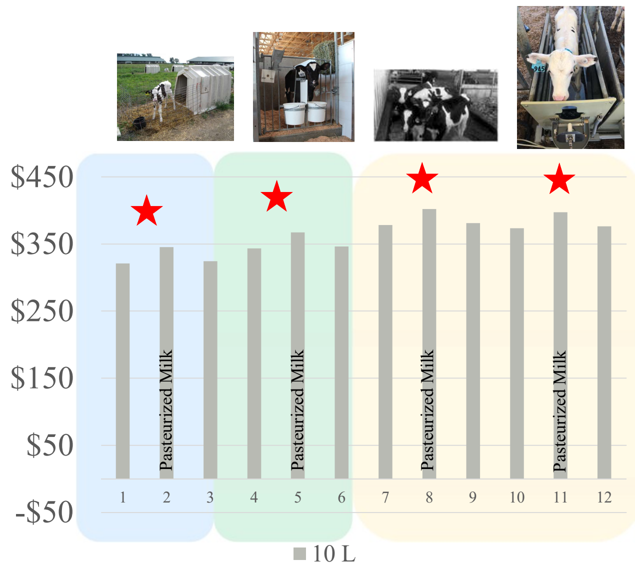
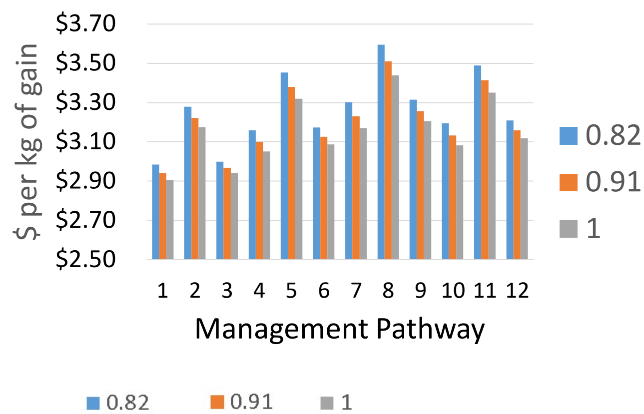


Hawkins et al., ***2019***. *Animals*

As ADG increases due to increased milk consumption, the cost per kg of gain always decreases.



Hawkins et al., ***2019***. *Animals*

Conclusions

The higher ADG achieved, the lower cost per kg of gain

Changes in management style can result in differences in total cost

Cannot use total cost as the sole factor to determine efficient farms

Hawkins et al., *2019*. *Animals*

Take Home Messages

- Accelerated feeding programs are associated with improved performance.
  - **Calves** during the first month of life are not able to eat solids enough
  - **Higher** milk allowance works better with a gradual weaning program

Thank you! Questions?

Disclosures
Joao HC Costa, PhD

Financial relationships:
Dr. Costa is employed at University of Kentucky

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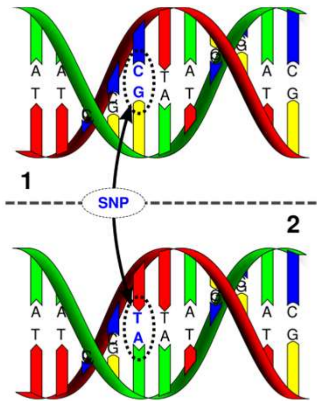
NOTES

Selecting Replacement Heifers



Francisco Peñagaricano

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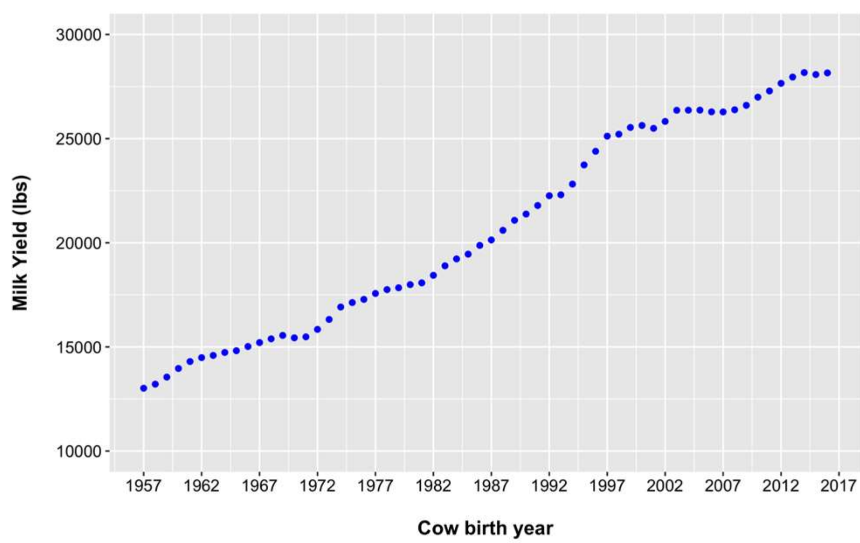
What is the importance of genetic selection?



Selecting replacement heifers

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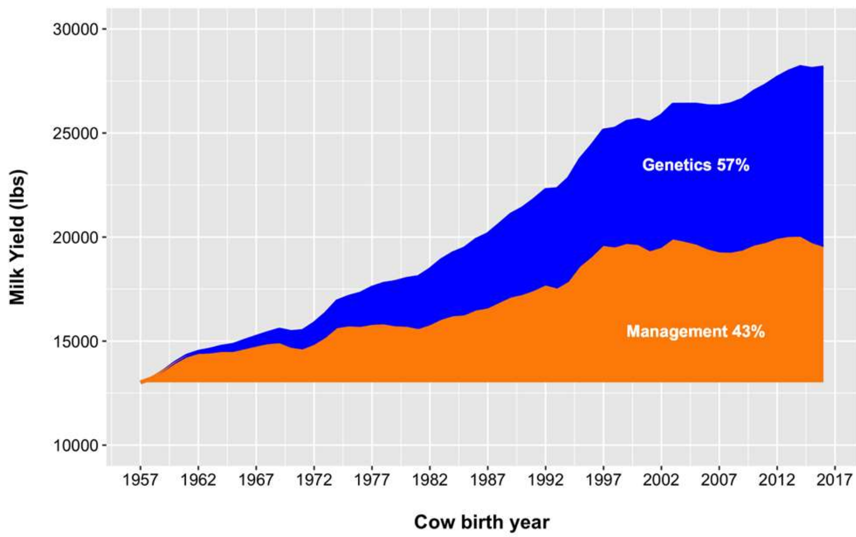
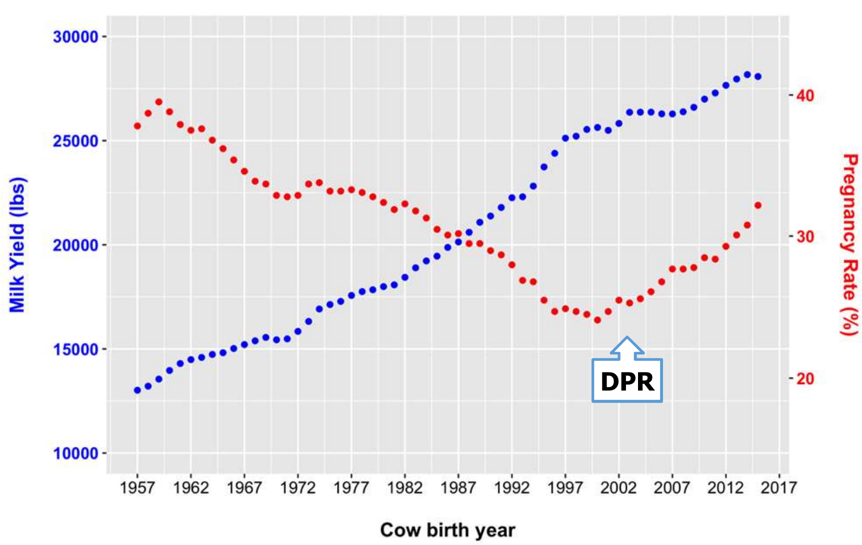
What is the importance of genetic selection?



Selecting replacement heifers

UF UNIVERSITY of FLORIDA

What is the importance of genetic tools?



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How do we identify the best/worst animals?

Economic Selection Indices

Traits	NM$ (2018)	CM$ (2018)	FM$ (2018)	GM$ (2018)
Milk	−0.7	−7.9	18.4	−0.7
Fat	26.8	22.8	27.1	22.9
Protein	16.9	20.9	0	14.4
Productive Life	12.1	10.3	12.2	6.6
Somatic Cell Score	−4.0	−4.4	−2.3	−3.5
Body Weight Composite	−5.3	−4.5	−5.3	−5.8
Udder Composite	7.4	6.3	7.5	7.4
Feet & Legs Composite	2.7	2.3	2.8	2.8
Daughter Pregnancy Rate	6.7	5.7	6.8	17.8
CA$ (calving trait subindex)	4.8	4.1	4.8	4.5
Heifer Conception Rate	1.4	1.2	1.4	2.4
Cow Conception Rate	1.6	1.4	1.7	4.3
Livability	7.3	6.2	7.4	4.9
HTH$ (health trait subindex)	2.3	1.9	2.3	2.1

Selecting replacement heifers

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Dairy cattle breeding: 4 paths of selection

- ❑ selection of **sires of bulls**
- ❑ selection of **dams of bulls**
- ❑ selection of **sires of cows**
- ❑ selection of **dams of cows**
  - large population of cows on commercial farms
  - low selection intensity and low selection accuracy
  - **negligible effect on the genetic gain**

Selection of dams of cows

recent advances have modified the importance of this selection path:

- **improvements in herd management**

  ↓ **involuntary culling rates** and ↑ **reproductive efficiency**

- **use of sexed semen** (produce a **surplus of heifers**)

the selection of replacement heifers is feasible !

Selecting replacement heifers

Selection intensity

proportion of selected heifers:

$$\frac{\textbf{number of heifers selected}}{\textbf{total number of heifers available}}$$

- **repro performance** determines the number of **replacements**
- **culling rates** determine the number of **heifers selected**
- **sexed semen** can generate a considerable **surplus of heifers**

↓ proportion → ↑ selection intensity → ↑ genetic gain

Selection accuracy

estimate **as precisely as possible** the **genetic merit** of a heifer:

↑ **selection accuracy** → ↑ **genetic gain**

Selecting replacement heifers

Selection accuracy

estimate **as precisely as possible** the **genetic merit** of a heifer:

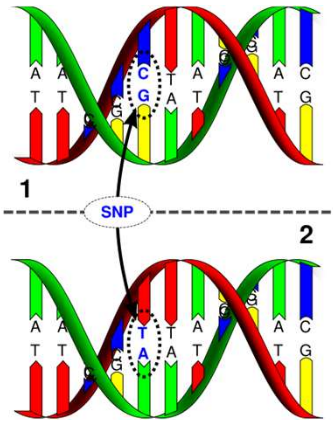
- **WITHOUT extra information:**

  selection (culling) decisions are based on **parent average**

  reliability ranges from **0** to **0.40**

Selecting replacement heifers

Genomic testing: the latest revolution



the use of genetic markers across the genome to predict breeding values

allows to select animals at an early age

JOIN THE REVOLUTION

Selecting replacement heifers

Selection accuracy

estimate **as precisely as possible** the **genetic merit** of a heifer:

- **WITHOUT extra information:**

  selection (culling) decisions are based on **parent average**

  reliability ranges from **0** to **0.40**

- **WITH genomic testing:**

  selection (culling) decisions are based on **genomic-predicted genetic merit**

  reliability ranges from **0.65** to **0.85**

Selecting replacement heifers

Genotyping strategy

- **full genotyping** or **selective genotyping**

- alternative strategies for **selective genotyping**:

❑ genotyping only the **top-ranked heifers** when:

the best heifers need to be identified

use of sexed semen, donors in IVF or ET programs

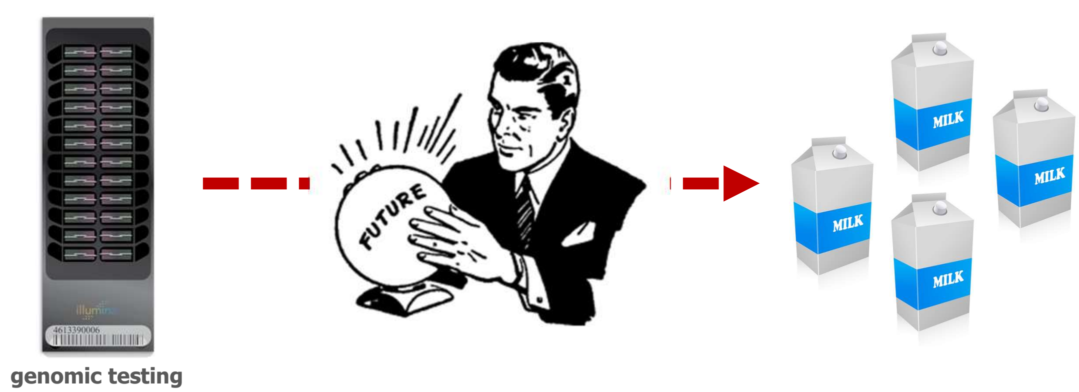
❑ genotyping only the **bottom-ranked heifers** when:

the worst heifers need to be identified

early culling, use of beef semen

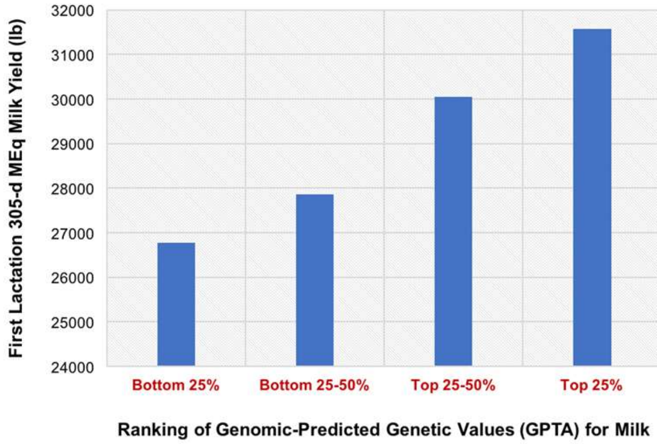
Selecting replacement heifers

Can genomic testing predict future performance?



Selecting replacement heifers

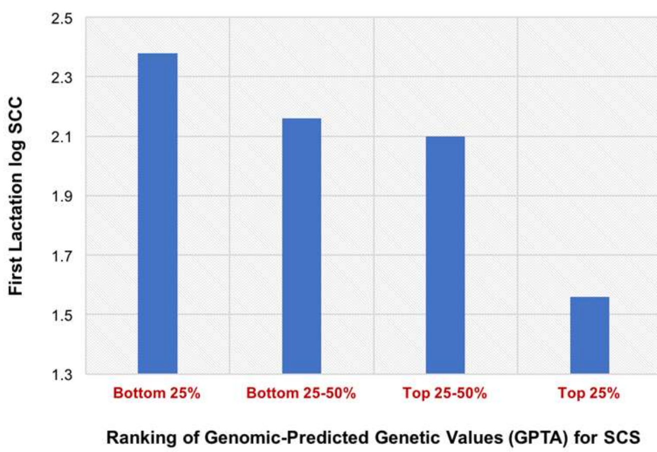
Predicting production using genomic testing



Weigel et al. (2015) Western Dairy Management Conference

Selecting replacement heifers

Predicting udder health using genomic testing



Weigel et al. (2015) Western Dairy Management Conference

Predicting fertility using genomic testing

- **fertility traits are among:**

  the most **complex**, **hard to measure**, **lowly heritable** traits

  fertility traits can benefit the most from genomic testing

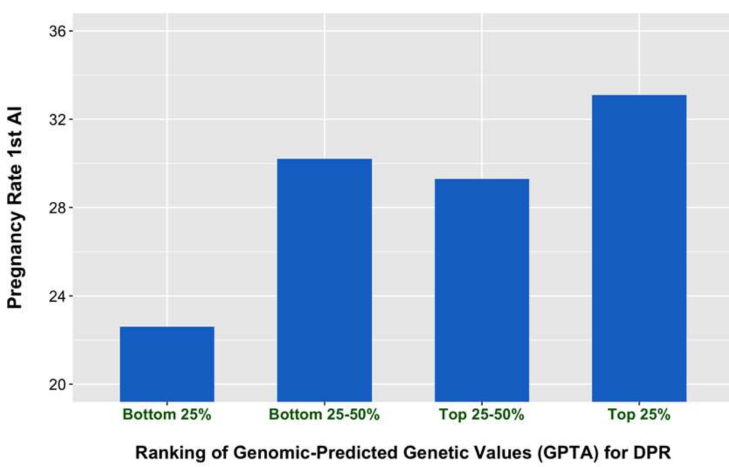
- **Daughter Pregnancy Rate (DPR):**

  the **primary trait** for **selection** for **cow fertility**

  can we predict repro performance using genomic DPR?

Selecting replacement heifers

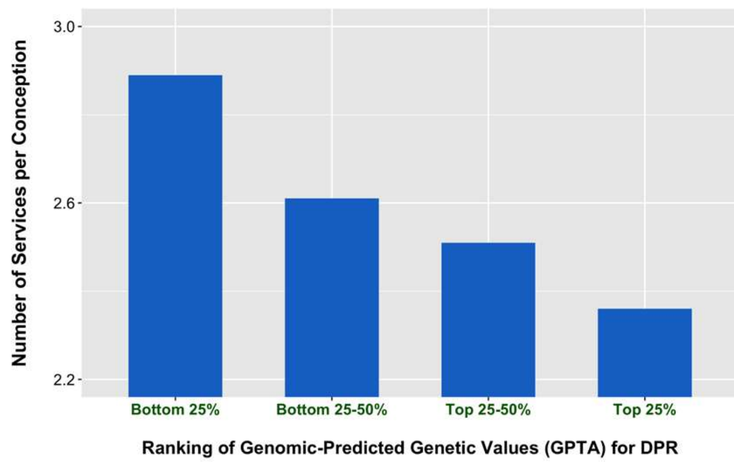
GDPR vs Pregnancy 1st AI



F. Lima, F. Silvestre, F. Peñagaricano and W. Thatcher (2019)

Selecting replacement heifers

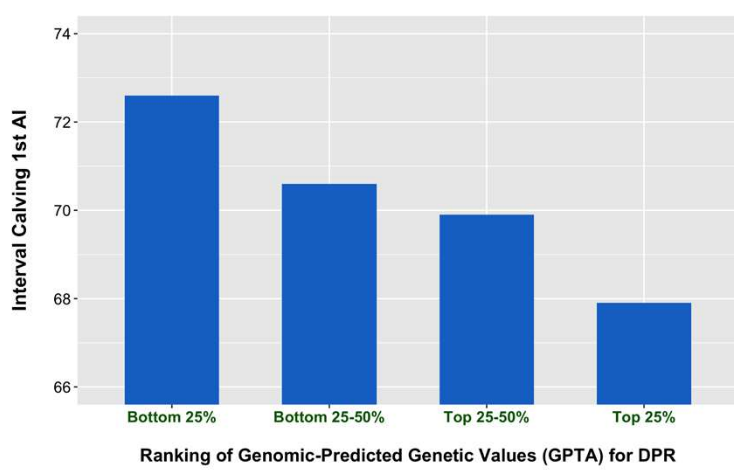
GDPR vs Number Services per Conception



F. Lima, F. Silvestre, F. Peñagaricano and W. Thatcher (2019)

Selecting replacement heifers

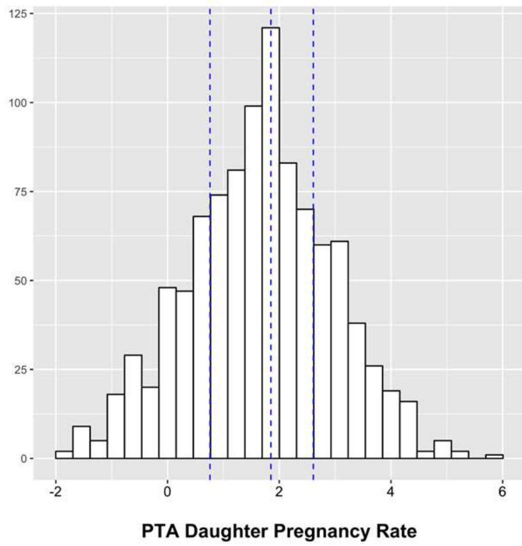
GDPR vs Interval Calving 1st AI



F. Lima, F. Silvestre, F. Peñagaricano and W. Thatcher (2019)

Selecting replacement heifers

GDPR vs Estrous Behavior & Fertility



Holstein heifers ($n \approx 1{,}000$)

GDPR quartiles: **top** vs **bottom**

- longer synchronized estrus
- more intense synchronized estrus
- **higher pregnancy rate at 1st AI** (62.7 vs 43.6)

A. Veronese, R. Chebel, F. Peñagaricano, R. Bisinotto et al. (2019)

Selecting replacement heifers

GDPR vs Physiological Responses

high GDPR (3.26 ± 0.76) vs **low GDPR** (-0.17 ± 0.75)

Item	GDPR High (n = 48)	GDPR Low (n = 51)
Estrous cycle day at $PGF_{2\alpha}$ treatment	12.1 ± 0.8	11.7 ± 0.8
Progesterone at $PGF_{2\alpha}$ treatment, ng/mL	4.58 ± 0.48	3.37 ± 0.48
Detected in estrus,[1] % (no.)	89.6 (43)	80.4 (41)
Progesterone on d 0,[2] ng/mL	0.03 ± 0.01	0.01 ± 0.01
Estradiol on d 0,[2] pg/mL	4.53 ± 0.23	3.79 ± 0.23
Ovulation according to ultrasound,[3] % (no.)	90.7 (39)	75.0 (30)
Ovulatory follicle diameter, mm	16.3 ± 0.3	14.6 ± 0.4
Ovulation according to progesterone,[4] % (no.)	100.0 (43)	97.6 (40)

A. Veronese, R. Chebel, F. Peñagaricano, R. Bisinotto et al. (2019)

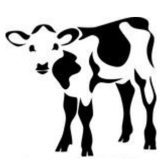
Genomic testing of replacement heifers

- genomic testing can be effectively used to predict performance
- genomic testing is more accurate than using sire's PTA values
- genomics can be used to make proper selection/culling decisions

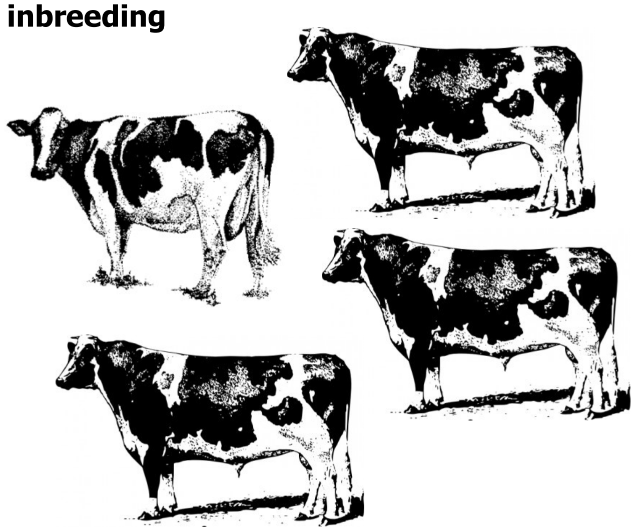
Genomic mating

the use of genomics to control inbreeding

genomic inbreeding?



select the sire that
minimizes the inbreeding



Selecting replacement heifers

What if we purchase the replacements?

- **use objective information:**

  genomic PTAs > parent average > sire information > lottery

Selecting replacement heifers

Take home messages

- genetic selection is a very powerful tool
- best selection tool: economic selection index

- genomics has transformed dairy cattle breeding worldwide
- replacement heifer selection: use of genomic testing

- genomic predictions can effectively predict future performance
- extra benefits of genomic testing:

  parentage verification, control inbreeding, tracking genetic disorders

UF UNIVERSITY of FLORIDA

Thanks for your attention!

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FLORIDA DAIRY PRODUCTION CONFERENCE

NOTES

Critical Aspects for Improving Reproductive Success

Milo C. Wiltbank[1], Alexandre Prata[1,2], Roberto Sartori[2], Paul Fricke[1], Giovanni M. Baez[1], Pedro L. J. Monteiro[1,2]
[1]*Department of Dairy Science, University of Wisconsin-Madison, Madison, WI USA*
[2]*Department of Animal Science, University of São Paulo, Piracicaba, SP Brazil*

55th Florida Dairy Production Conference
Gainesville, FL; September 18, 2019

What are common ways to measure reproduction on dairy farms?

Days Open

Calving Interval

Services per Conception

What are common ways to measure reproduction on dairy farms?

Da

alvi terval

vices per c ption

What are common ways to measure and MANAGE reproduction on dairy farms?

21-day pregnancy rate ***

Service Rate

Pregnant per AI (Conception rate)

Measuring Reproductive Efficiency on dairy farms

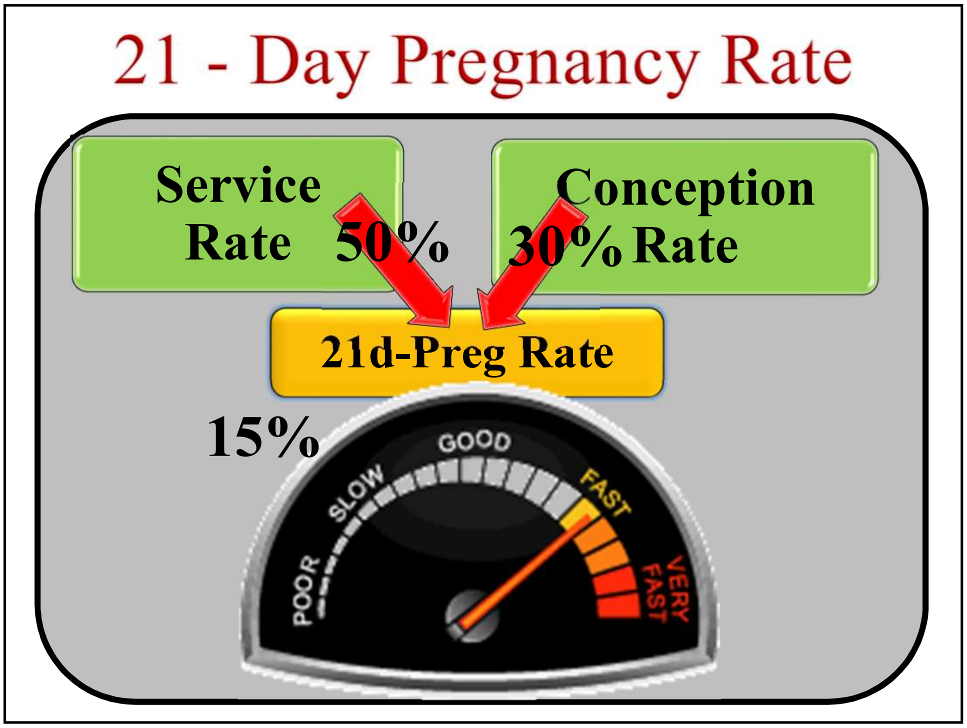
21-day Pregnancy Rate

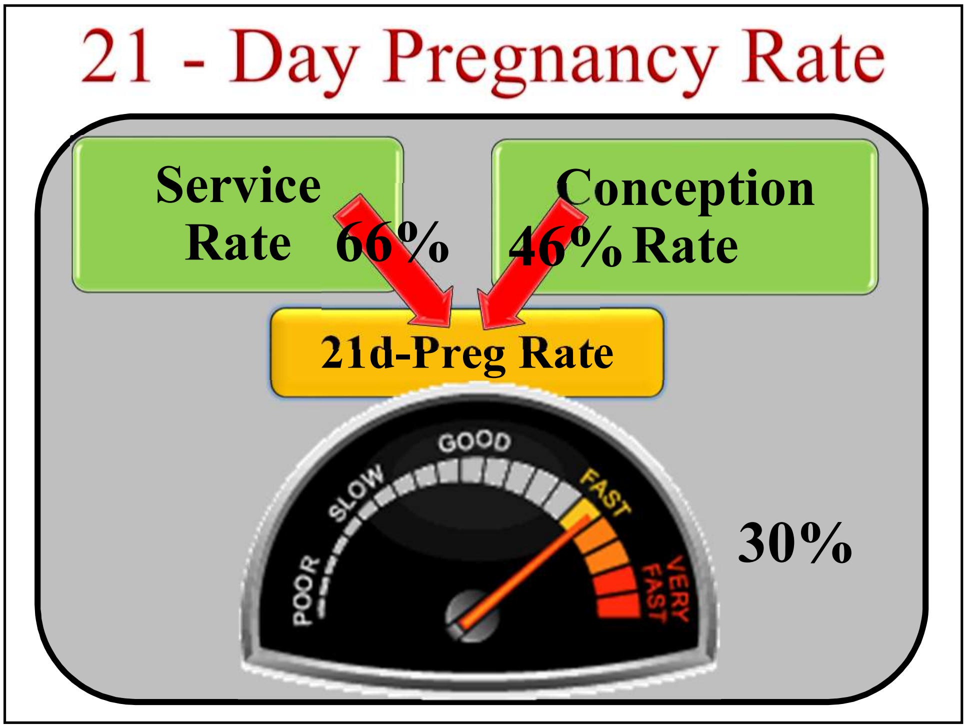
Percentage of eligible cows that become pregnant during a 21-day period.

Eligible cow = Non-pregnant cow, past the voluntary waiting period, and designated for breeding .

21-day Period

$$\frac{\text{\# of Cows that become pregnant}}{\text{\# of Cows Eligible for AI}}$$





Farm 1;
VWP= 40 DIM

Farm 2;
VWP= 76 DIM

Pregnancy Eligible	Pregnant	21-day Preg Rate	Date	Pregnancy Eligible	Pregnant	21-dPreg Rate
192	24	12%	5/1/2014	131	46	35%
199	30	15%	5/22/2014	114	27	24%
230	32	14%	6/12/2014	126	41	33%
237	35	15%	7/03/2014	111	32	29%
263	56	21%	7/24/2014	101	30	30%
261	35	13%	8/14/2014	94	29	31%
294	55	19%	9/04/2014	93	27	29%
279	64	23%	9/25/2014	101	35	35%
224	21	9%	10/16/2014	114	49	43%
0	0	0	11/6/2014	92	29	32%
2,179	352	16%	TOTAL	1,077	345	32%

21-Day Pregnancy Rate for Farm 1; VWP= 40 DIM

Date	Breeding Eligible	Bred	Service Rate, %	Pregnancy Eligible	Pregnant	21-day Preg Rate
5/1/2014	**195**	**111**	**57%**	**192**	**24**	**12%**
5/22/2014	**204**	**106**	**52%**	**199**	**30**	**15%**
6/12/2014	**233**	**110**	**47%**	**230**	**32**	**14%**
7/03/2014	**241**	**122**	**51%**	**237**	**35**	**15%**
7/24/2014	**269**	**158**	**59%**	**263**	**56**	**21%**
8/14/2014	**266**	**122**	**46%**	**261**	**35**	**13%**
9/04/2014	**305**	**173**	**57%**	**294**	**55**	**19%**
9/25/2014	**283**	**147**	**52%**	**279**	**64**	**23%**
10/16/2014	**265**	**127**	**48%**	**224**	**21**	**9%**
11/6/2014	**262**	**139**	**53%**	**0**	**0**	**0**
TOTAL	**2,261**	**1,176**	**52%**	**2,179**	**352**	**16%**

21-Day Pregnancy Rate for Farm 2; VWP= 76 DIM

Date	Breeding Eligible	Bred	Service Rate, %	Pregnancy Eligible	Pregnant	21-day Preg Rate
5/1/2014	**136**	**92**	**68%**	**131**	**46**	**35%**
5/22/2014	**117**	**76**	**65%**	**114**	**27**	**24%**
6/12/2014	**127**	**84**	**66%**	**126**	**41**	**33%**
7/03/2014	**112**	**73**	**65%**	**111**	**32**	**29%**
7/24/2014	**102**	**65**	**64%**	**101**	**30**	**30%**
8/14/2014	**96**	**68**	**71%**	**94**	**29**	**31%**
9/04/2014	**93**	**56**	**60%**	**93**	**27**	**29%**
9/25/2014	**103**	**73**	**71%**	**101**	**35**	**35%**
10/16/2014	**115**	**83**	**72%**	**114**	**49**	**43%**
11/6/2014	**92**	**62**	**67%**	**92**	**29**	**32%**
TOTAL	**1,093**	**732**	**67%**	**1,077**	**345**	**32%**

For one year

Farm 1 AI number	Pregnant/ AI (P/AI)	Pregnant	Total
First	**32.3%**	**146**	**452**
Overall 2nd+	**33.0%**	**210**	**637**
Total	**32.7%**	**356**	**1089**

Farm 2 AI number	Pregnant/ AI (P/AI)	Pregnant	Total
First	**57.7%**	**205**	**355**
Overall 2nd+	**43.7%**	**164**	**375**
Total	**50.5%**	**369**	**730**

Item	Farm 1	Farm 2	Difference
21-d Preg Rate	16%	32%	32-16= 16 16/16 =100%
Service Rate	52%	67%	15/52=28.8%
Pregnant/AI (P/AI)	32.7% (356/1089)	50.5% (369/730)	17.8/32.7 = 54.4%
First Service P/AI	32.3% (146/452)	57.7% (205/355)	25.4/32.3 = 78.6%
2^+ Service P/AI	33.0% (210/637)	43.7% (164/375)	10.7/33 = 32.4%

Item	Farm 1	Farm 2	Difference
21-d Preg Rate	16%	32%	100%
Service Rate	52%	67%	28.8%
Pregnant/AI (P/AI)	32.7% (356/1089)	50.5% (369/730)	54.4%
First Service P/AI	32.3% (146/452)	57.7% (205/355)	78.6%
2^+ Service P/AI	33.0% (210/637)	43.7% (164/375)	32.4%
PGF Use	2.79/cow	4.92/cow	2.13 X $2.65 = **$5.64**
GnRH Use			
Straws/cow			

Item	Farm 1	Farm 2	Difference
21-d Preg Rate	16%	32%	100%
Service Rate	52%	67%	28.8%
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PGF Use	2.79/cow	4.92/cow	2.13 X $2.65 = **$5.64**
GnRH Use	3.09/cow	5.92/cow	2.83 X $1.55 = **$4.39**
Straws/cow			

Item	Farm 1	Farm 2	Difference
21-d Preg Rate	16%	32%	100%
Service Rate	52%	67%	28.8%
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PGF Use	2.79/cow	4.92/cow	2.13 X $2.65 = **$5.64**
GnRH Use	3.09/cow	5.92/cow	2.83 X $1.55 = **$4.39**
Straws/cow	3.06/pregnancy 3.17/cow	1.98/pregnancy 2.46/cow	-0.71 X $20.00 = **-$14.20**

<u>Measuring Reproductive Efficiency on dairy farms</u>

21-day Pregnancy Rate

Percentage of eligible cows that become pregnant during a 21-day period.

1995 reasonable goal >15%

2000 reasonable goal > 18%

2005 reasonable goal > 20%

2010 reasonable goal > 22%

2015 reasonable goal > 25%

2020 > 30%

Progams that improve service rate

Programs that improve fertility

30:30

4 Keys to Achieving a 30% Pregnancy Rate in a 30,000 lb. Dairy Herd

Milo C. Wiltbank, Ph.D.
Paul M. Fricke, Ph.D.
Professors of Dairy Science
University of Wisconsin-Madison

DEPARTMENT OF
DAIRY SCIENCE
University of Wisconsin-Madison

4 Keys to a 30% Pregnancy Rate

Key 1: Aggressively inseminate cows at the end of the voluntary waiting period.

Key 2: Increase fertility to First AI.

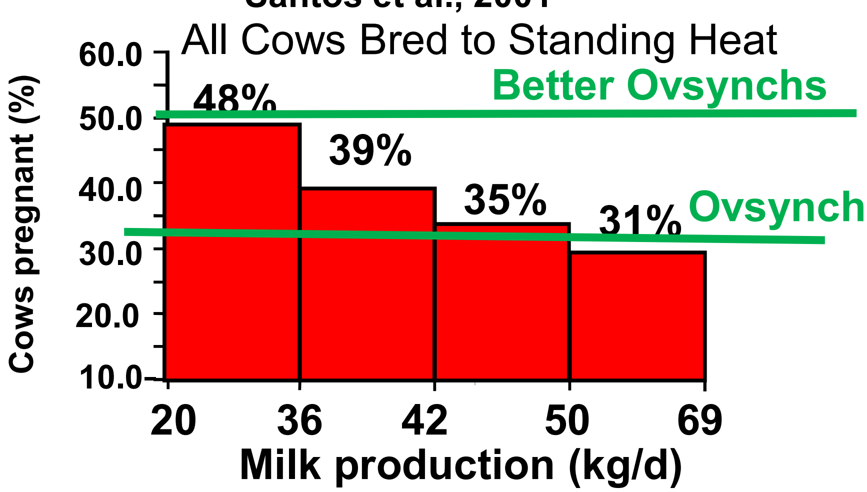
Key 3: Identify non-pregnant cows and aggressively reinseminate them.

Key 4: Increase fertility to second and later AIs.

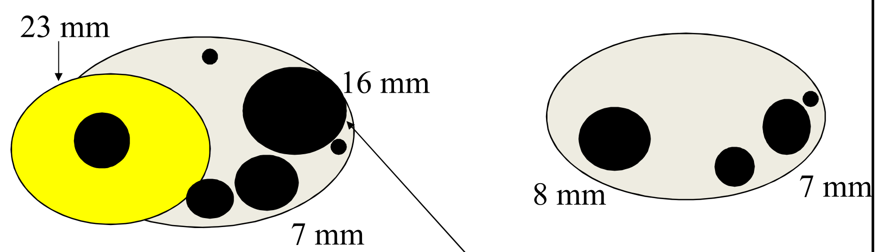
Outline

1. Use fertility program for first AI
2. Get cows in high fertility cycle
3. Use fertility program for Resynchs
4. Consistency, consistency, consistency

Conception Rate in relation to milk production
Santos et al., 2001

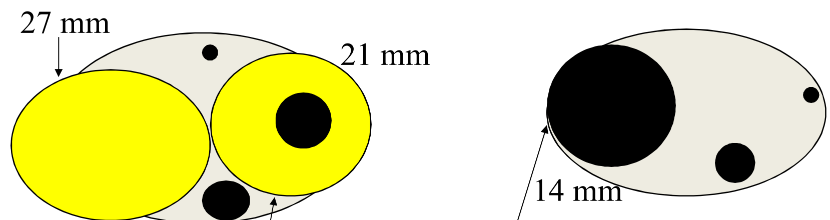


Injecting 1st GnRH
Day 6 or 7 of the cycle



GnRH induced LH surge will ovulate the dominant follicle.

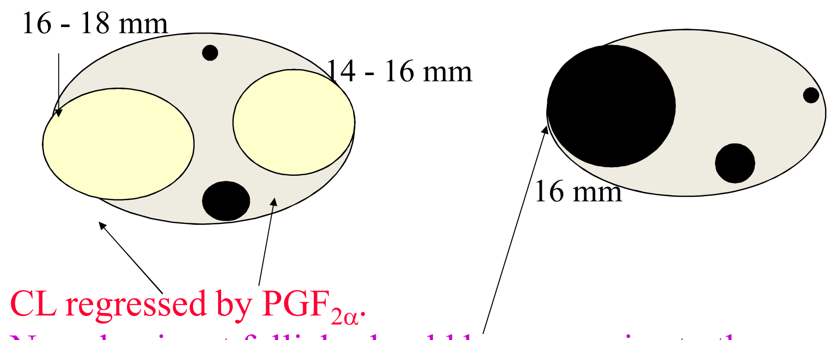
7 Days Later



CL are responsive to $PGF_{2\alpha}$.

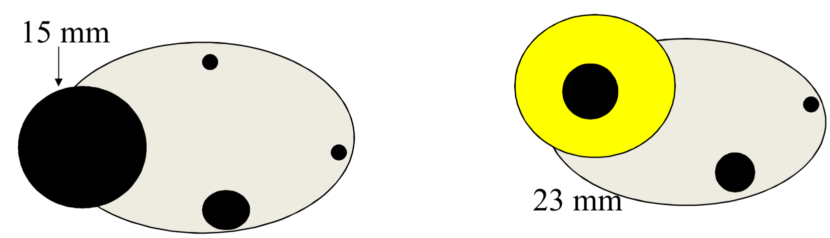
New dominant follicle

Day of 2nd GnRH



CL regressed by $PGF_{2\alpha}$.
New dominant follicle should be responsive to the GnRH induced LH surge.

One Week after AI



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Presynch-Ovsynch 14/12

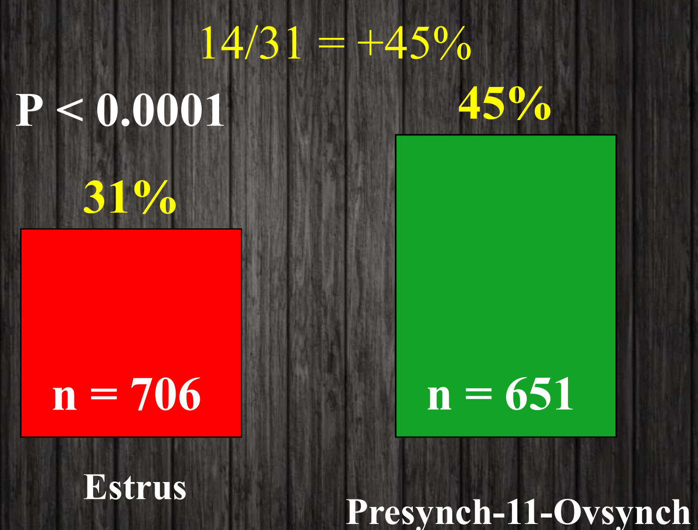
Sun	Mon	Tue	Wed	Thu	Fri	Sat
			PGF			
			PGF			
	GnRH					
	PGF		GnRH	TAI		

	Ovsynch	Presynch -Ovsynch	
Moreira et al., 1997 Florida (only cycling cows)	29%[a] (76/262)	43%[b] (114/264)	+14% (+48%)
Stevenson et al., 2003 Kansas State (all cows)	36%[a] (98/272)	48%[b] (133/278)	+12% (33%)

Presynch-Ovsynch 14/11

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				PGF		
				PGF	Heat Det	
Heat Detection						
	GnRH					
	PGF		GnRH	TAI		

Pregnancy per AI at First AI with Presynch-11 vs. estrus in lactating cows



Strickland et al., 2010

Double Ovsynch for First TAI

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH	
					PGF	
	GnRH					
	GnRH					
	PGF	PGF	GnRH	TAI		

Double Ovsynch is a Fertility Program

J. Dairy Sci. 100:8507–8517
https://doi.org/10.3168/jds.2017-13210

Fertility of lactating Holstein cows submitted to a Double-Ovsynch protocol and timed artificial insemination versus artificial insemination after synchronization of estrus at a similar day in milk range

V. G. Santos,* P. D. Carvalho,* C. Maia,† B. Carneiro,† A. Valenza,‡ and P. M. Fricke*[1]
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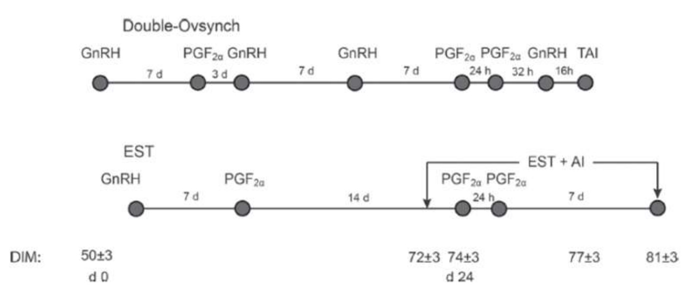
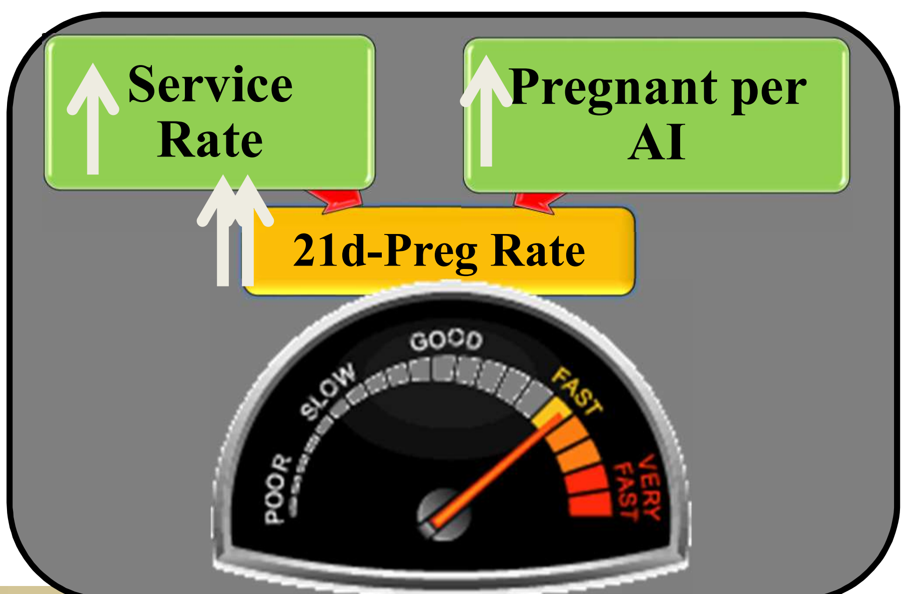


Double Ovsynch is a Fertility Program

	Double Ovsynch	AI to Estrus	Difference % (P Value)
n	294	284	
Submission Rate %	100% (294/294)	77.5% (220/284)	+ 29% ($P < 0.01$)
P/AI % at 33 d	49.0% (144/294)	38.6% (85/220)	+ 27% ($P = 0.02$)
P/AI, % at 66 d	44.6% (131/294)	36.4% (80/220)	+23% ($P = 0.05$)
% Pregnant of all cows	**44.6% (131/294)**	**28.2% (80/284)**	**+58% ($P < 0.01$)**

21 - Day Pregnancy Rate using Fertility Programs



Don’t Worry! Breed Happy!

Outline

1. Use fertility program for first AI
2. Get cows in high fertility cycle
3. Use fertility program for Resynchs
4. Consistency, consistency, consistency

Association of changes among body condition score during the transition period with NEFA and BHBA concentrations, milk production, fertility, and health of Holstein cows

R.V. Barletta [a,*], M. Maturana Filho [b], P.D. Carvalho [a], T.A. Del Valle [b], A.S. Netto [b], F.P. Rennó [b], R.D. Mingoti [b], J.R. Gandra [d], G.B. Mourão [c], P.M. Fricke [a], R. Sartori [c], E.H. Madureira [b], M.C. Wiltbank [a]

Overall 50% of cows lost BCS.

34% Lost

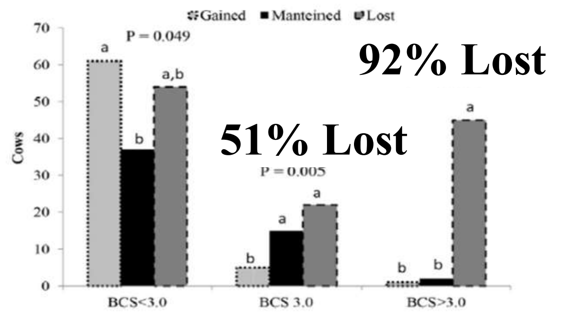


Fig. 1. Distribution of cows that lost (▨; n = 122), maintained (■; n = 54) or gained (▨; n = 69) BCS during the transition period (days −21 to +21 relative to parturition), according to BCS at Day −21 relative to parturition.
[abc] Different superscript letters differ at $P < 0.05$.

Association of changes among body condition score during the transition period with NEFA and BHBA concentrations, milk production, fertility, and health of Holstein cows

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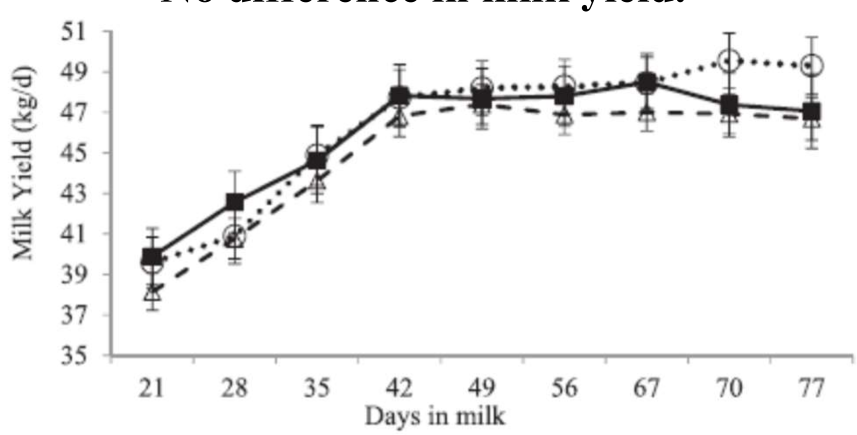
No difference in milk yield.



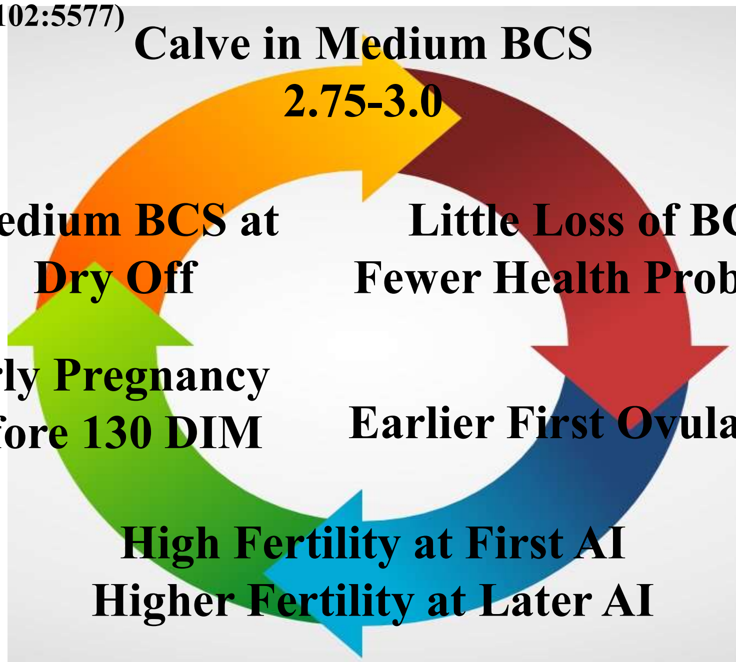
Diseases in cows with different BCS Changes

Disease	Gained BCS	Maintained BCS	Lost BCS
Number of cows	66	52	116
Metritis	19.7%	21.2%	23.3%
Mastitis	16.7%[b]	17.3%[a,b]	29.3%[a]
Ketosis	15.2%	19.2%	26.7%
Pneumonia	9.1%	11.5%	14.7%
>1 Health Problem	39.4%[b]	46.2%[b]	62.9%[a]

Reproduction in cows with different BCS Changes

Disease	Gained BCS	Maintained BCS	Lost BCS
Number of cows	66	52	116
Ovulatory Follicle, mm	18.5 + 0.5	19.0 + 0.8	18.4 + 0.4
Pregnant/AI, 30d Preg Diag	53.0%[a]	26.9%[b]	18.3%[b]
Pregnant/AI, 60d Preg Diag	45.5%[a]	25.0%[b]	15.7%[b]
Pregnancy Loss	14.3%	7.1%	14.3%
First Ovulation, d post-partum	33.9 + 0.5[a]	37.9 + 0.7[b]	47.1 + 1.0[c]

High Fertility Cycle (Middleton, Minela, Pursley, 2019; J.D.S. 102:5577)



Comparison of Genomics and High Fertility Programs

Julio Giordano Laboratory at Cornell University

Genetic merit for fertility and type of reproductive management strategy affected the reproductive performance of primiparous lactating Holstein cows. ADSA Abstract #109 2019

2,400 First Lactation Dairy Cows:

Three groups by Genomic Merit for Reproduction
Two Groups for Reproductive Management
1) IATF – Double Ovsynch
2) AI to estrus (75%) + IATF (Ovsynch+CIDR)

Genomics and High Fertility Programs

	Double Ovsynch	AI to Estrus + TAI	Difference % (P Value)
n	1155	1245	
All Cows	**58.4% (675/1155)**	**48.9% (609/1245)**	**+19.4% (P < 0.0001)**

Genomics and High Fertility Programs

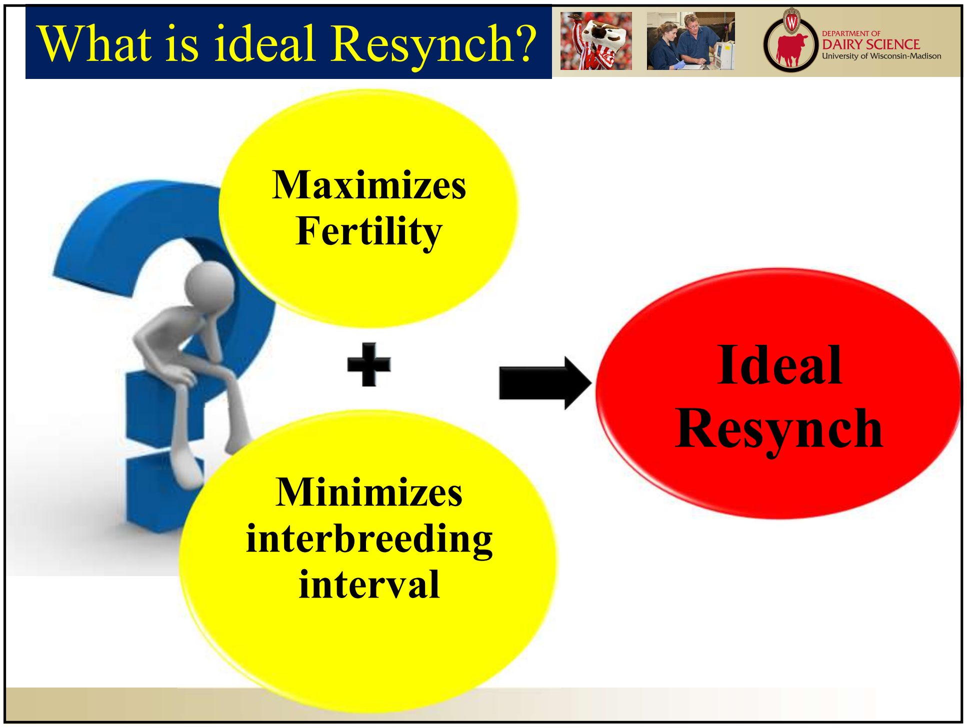
	Double Ovsynch	AI to Estrus + TAI	Overall Differences
n	1155	1245	
High Fertility Genomics			**59.7%[a] (468/784)**
Medium Fert Genomics			**52.4%[b] (426/812)**
Low Fertility Genomics			**49.5%[b] (398/804)**
All Cows	**58.4% (675/1155)**	**48.9% (609/1245)**	**+19.4% (P < 0.0001)**

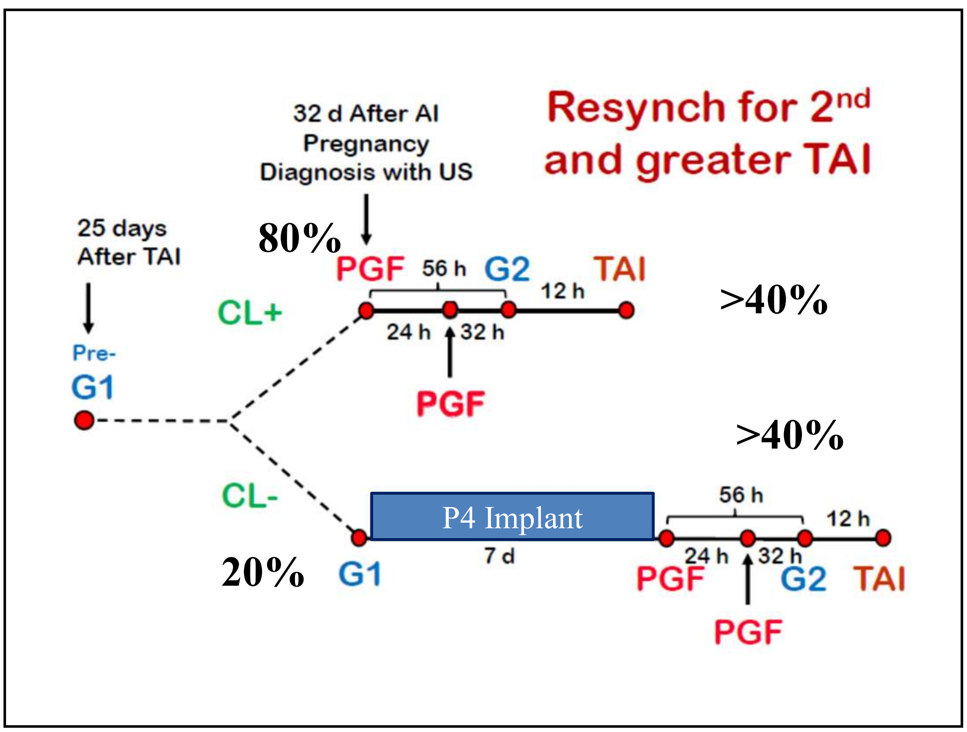
Genomics and High Fertility Programs

	Double Ovsynch	AI to Estrus + TAI	Overall Differences
n	1155	1245	
High Fertility Genomics	**65.4%[a]**	**54.4%[a]**	**59.7%[a] (468/784)**
Medium Fert Genomics	**57.6%[b]**	**47.8%[b]**	**52.4%[b] (426/812)**
Low Fertility Genomics	**56.1%[b]**	**43.4%[b]**	**49.5%[b] (398/804)**
All Cows	**58.4% (675/1155)**	**48.9% (609/1245)**	**+19.4% (P < 0.0001)**

Outline

1. Use fertility program for first AI
2. Get cows in high fertility cycle
3. Use fertility program for Resynchs
4. Consistency, consistency, consistency


What is ideal Resynch?
DEPARTMENT OF DAIRY SCIENCE
University of Wisconsin-Madison
Maximizes Fertility
+
Minimizes interbreeding interval
Ideal Resynch


Resynch for 2nd and greater TAI
32 d After AI Pregnancy Diagnosis with US
25 days After TAI
Pre-G1
CL+
80%
PGF
56 h
G2
12 h
TAI
24 h
32 h
PGF
>40%
CL-
20%
G1
P4 Implant
7 d
56 h
12 h
24 h
32 h
PGF
G2
TAI
PGF
>40%

First AI = Double Ovsynch

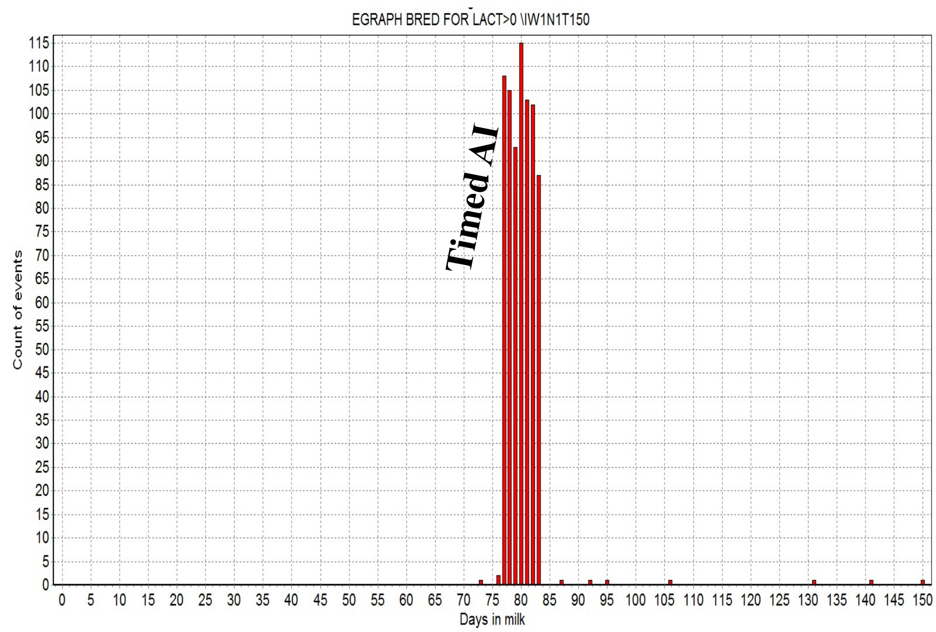
2nd+ AIs = Resynch-25 + CL verification

Sun	Mon	Tuse	Wed	Thur	Fri	Sat
					GnRH	
					PGF	
	GnRH					
	GnRH					
	PGF	PGF	GnRH	TAI		
Day 3						
Day 10						
Day 17						
Day 24	GnRH					
Day 31	Preg Check PGF	+PGF	GnRH	TAI		

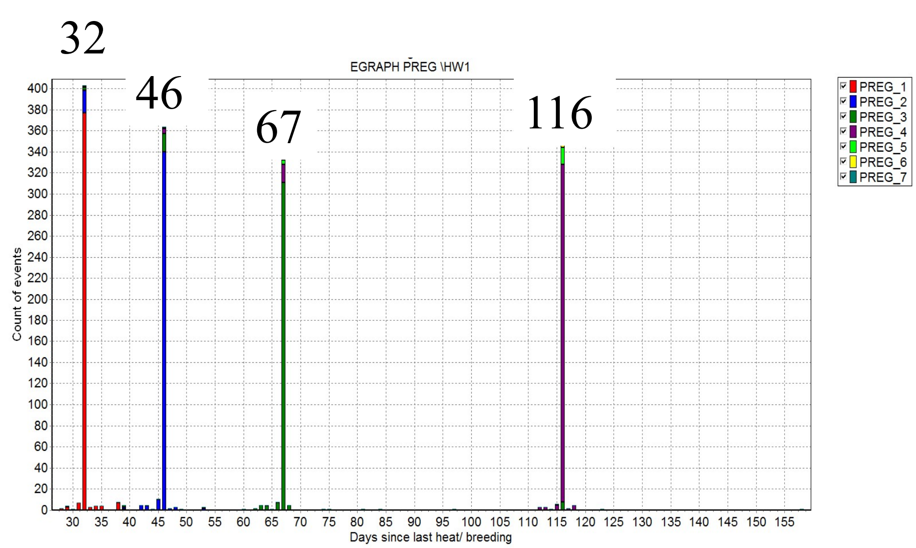
35 days Between AIs

Outline

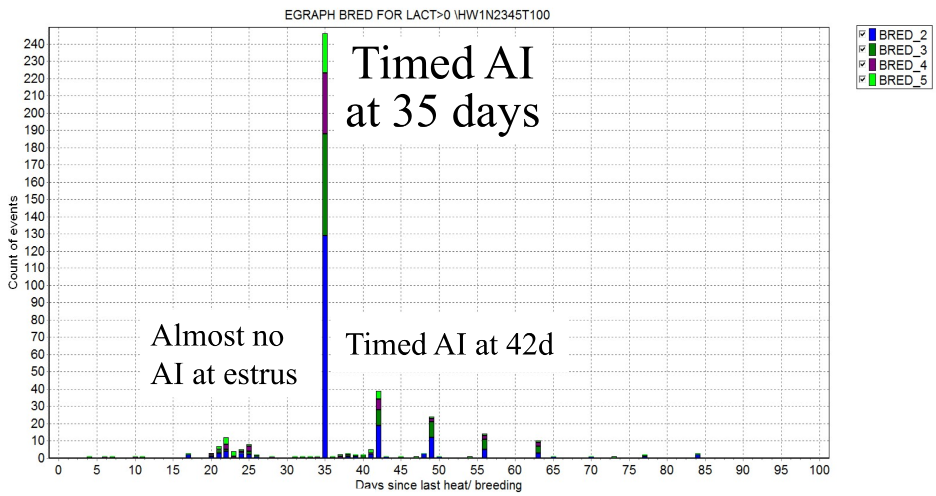
1. Use fertility program for first AI
2. Get cows in high fertility cycle
3. Use fertility program for Resynchs
4. Consistency, consistency, consistency

Pregnancy Diagnosis Calendar



Calendar for timing of 2nd and later AIs



IA anterior 35

On-farm Application

(Video)

Outline

1. Use fertility program for first AI
2. Get cows in high fertility cycle
3. Use fertility program for Resynchs
4. Consistency, consistency, consistency


NOTES

Nutritional Manipulations to Improve Health and Fertility

José Eduardo P. Santos
Department of Animal Sciences
University of Florida

Pictures by Bonnie Mohr http://www.bonniemohr.com/

FLORIDA DAIRY PRODUCTION CONFERENCE

UF UNIVERSITY of FLORIDA

Timeline Management of Dairy Cows For Successful Transition

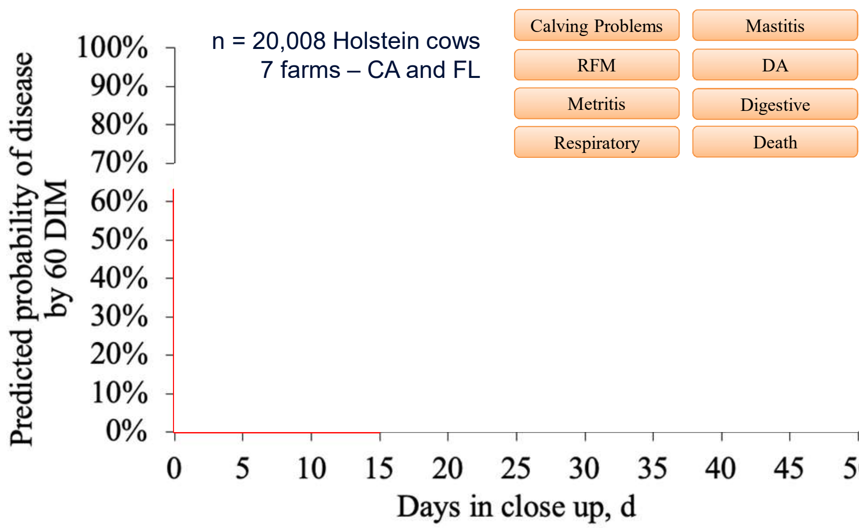
Provide Proper Comfort and Heat Abatement

1. **Dry off** (- 45 d)
   - 230 days of gestation
   - Proper body condition
   - Control of mastitis
   - Routine hoof trimming
   - Vaccination program
   - Proper diet to avoid over and under consumption of nutrients
2. **Close up** (-21 d)
   - Move based on days pregnant - <u>255 days of gestation</u>
   - Proper grouping
   - Vaccination program
   - Feed diets to minimize metabolic disorders in early lactation.
3. **Parturition** (Calving)
   - Training of personnel
   - Minimize intervention
   - Reduce calving related disorders
4. **Early Postpartum** (0 to 28 d)
   - Monitor health for early diagnosis of diseases and treatment.
   - Feed diets that do not limit intake.
   - Control ketosis.
5. **High group** (> 28 DIM)
   - Feed diets that maximize milk production and recovery of body condition

- 45 d | -21 d | Calving | 0 to 28 d | > 28 DIM

Day Relative to Calving

Days in Close Up Pen and Morbidity



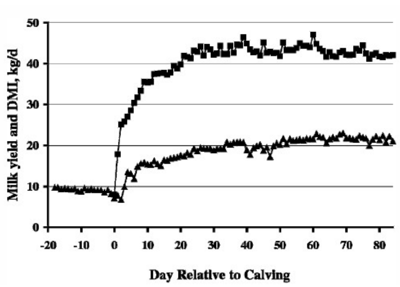
Vieira-Neto et al. (unpublished results)

3

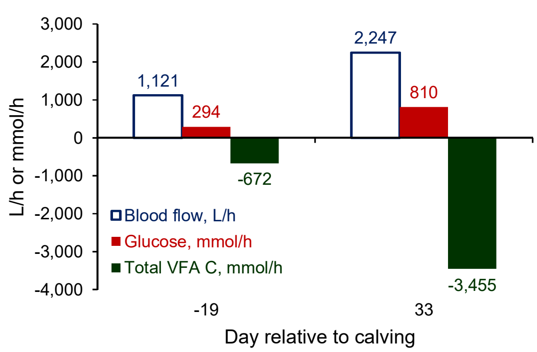
J. Dairy Sci. 86:1201–1217

Splanchnic Metabolism of Dairy Cows During the Transition From Late Gestation Through Early Lactation

C. K. Reynolds[1], P. C. Aikman, B. Lupoli, D. J. Humphries, and D. E. Beever
Centre for Dairy Research, Department of Agriculture,
The University of Reading, Earley Gate, Reading RG6 6AT England



Hepatic Flux



Holstein Cows at Peak Production

Average Holstein cow peaks at 45 kg/day

- Maintenance energy required: 15 Mcal/d of ME
- Energy for milk synthesis 55 Mcal of ME/d
- Total energy needed = 70 Mcal of ME/d
- **Therefore, consuming at 4.6 times maintenance**

Selz-Pralle Aftershock peaked at 123 kg/day

- Maintenance energy required: 16 Mcal/d of ME
- Energy for milk synthesis 134 Mcal of ME/d
- Total energy needed = 150 Mcal of ME/d
- **Therefore, consuming at 9.3 times maintenance**

Santos et al. (2010) Reprod. Dom. Rum. VII:387-404 5

Risk factors for resumption of estrous cycles by 65 days postpartum and pregnancy at 1st AI in lactating dairy cows

Variable	Cyclic, % (n/n)	Adjusted OR (95% CI)	*P* value
BCS change from calving to 65 DIM			
Lost 1 unit or more	58.7 (279/475)	Referent	-------
Lost < 1 unit	74.6 (2,507/3,361)	1.96 (1.52, 2.52)	< 0.001
No change	80.9 (2,071/2,560)	2.39 (1.74, 3.28)	< 0.001
Milk yield in the first 90 DIM			
Q1, 32.1 kg/d	72.7 (1,011/1,390)	Referent	------
Q2, 39.1 kg/d	77.6 (1,204/1,552)	1.34 (1.13, 1.60)	< 0.01
Q3, 43.6 kg/d	77.6 (1,350/1,739)	1.36 (1.15, 1.62)	< 0.001
Q4, 50.0 kg/d	75.3 (1,292/1,715)	1.21 (1.02, 1.43)	0.04

Variable	Pregnant, % (n/n)	Adjusted OR (95% CI)	*P* value
BCS change from calving to 65 DIM			
Lost 1 unit or more	28.9 (132/472)	Referent	------
Lost < 1 unit	37.3 (1204/3230)	1.42 (1.13, 1.79)	< 0.01
No change	41.6 (1008/2422)	1.69 (1.32, 2.17)	< 0.001
Milk yield in the first 90 DIM			
Q1, 32.1 kg/d	37.2 (496/1,334)	Referent	------
Q2, 39.1 kg/d	38.9 (576/1,481)	1.06 (0.91, 1.24)	0.42
Q3, 43.6 kg/d	39.3 (652/1,661)	1.09 (0.93, 1.26)	0.26
Q4, 50.0 kg/d	37.6 (620/1,648)	1.03 (0.88, 1.21)	0.65

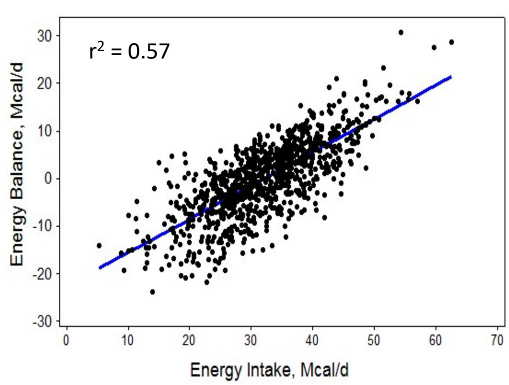
Santos et al. (2009) Anim. Reprod. Sci. 110: 207–221

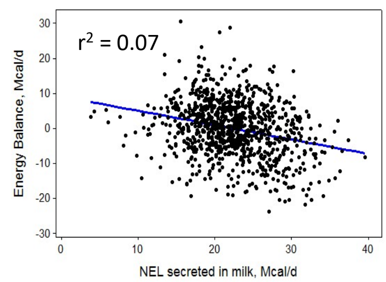
Take Home Message

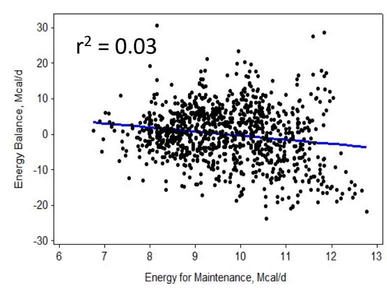
- ✓ Avoid excessive body condition loss with the onset of lactation
  - ✓ Best proxy we have on farm for loss of body fat
  - ✓ Ideally, cows should not lose more than 0.5 units of body condition from the week before calving to first AI

Important that cows and heifers do not calve overconditioned

If Energy Balance is a Major Drive of Reproductive Success in Dairy Cows, then the Focus Should be on Intake and not Milk Yield

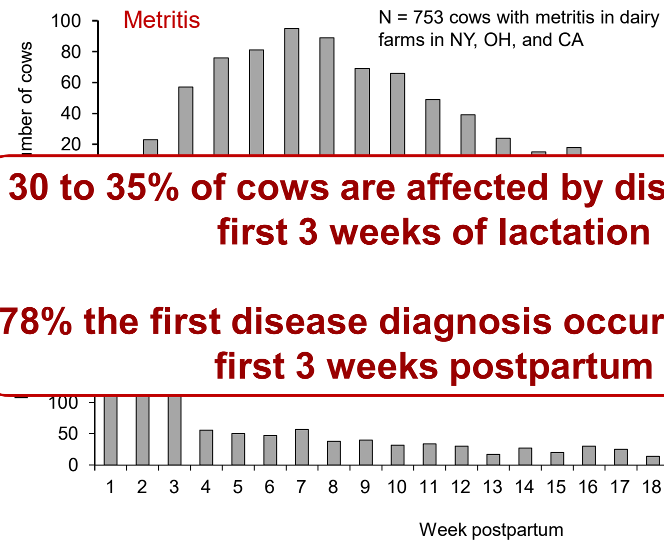






Santos et al. (2010) Soc. Reprod. Fertil. Suppl. 67: 387-403

Morbidity is a Problem of Early Lactation Cows

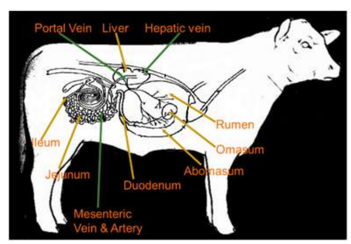


30 to 35% of cows are affected by disease in the first 3 weeks of lactation

78% the first disease diagnosis occurs within the first 3 weeks postpartum

Ribeiro et al. (2016) J. Dairy Sci. 99: 2201-2220

Disease Reduces Nutrient Balance



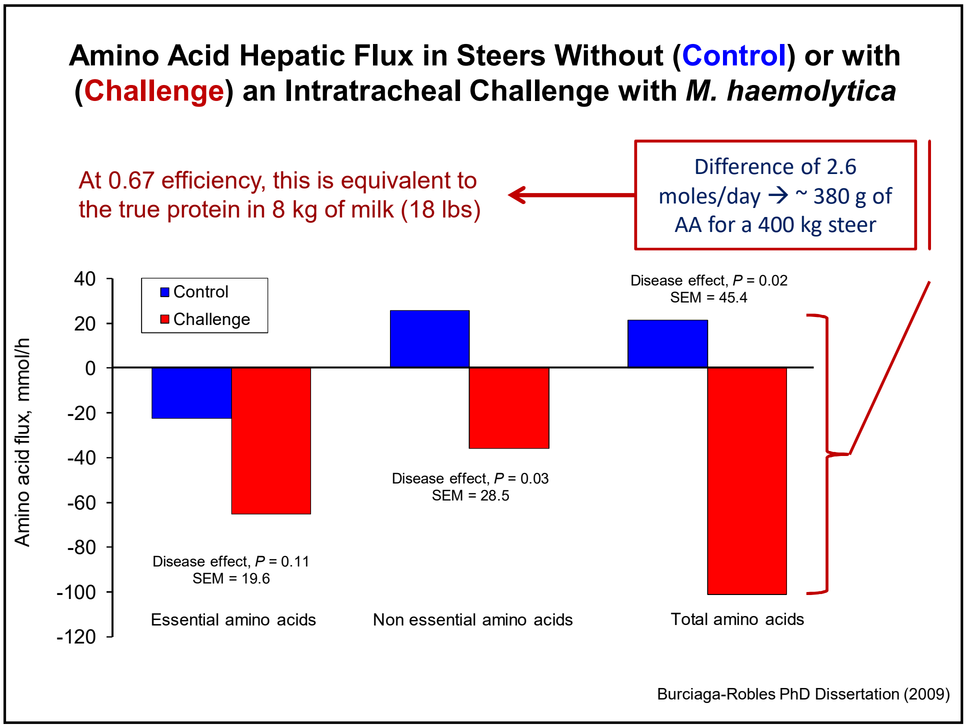
✓ Control/Fed
- Fed *ad libitum* and not challenged

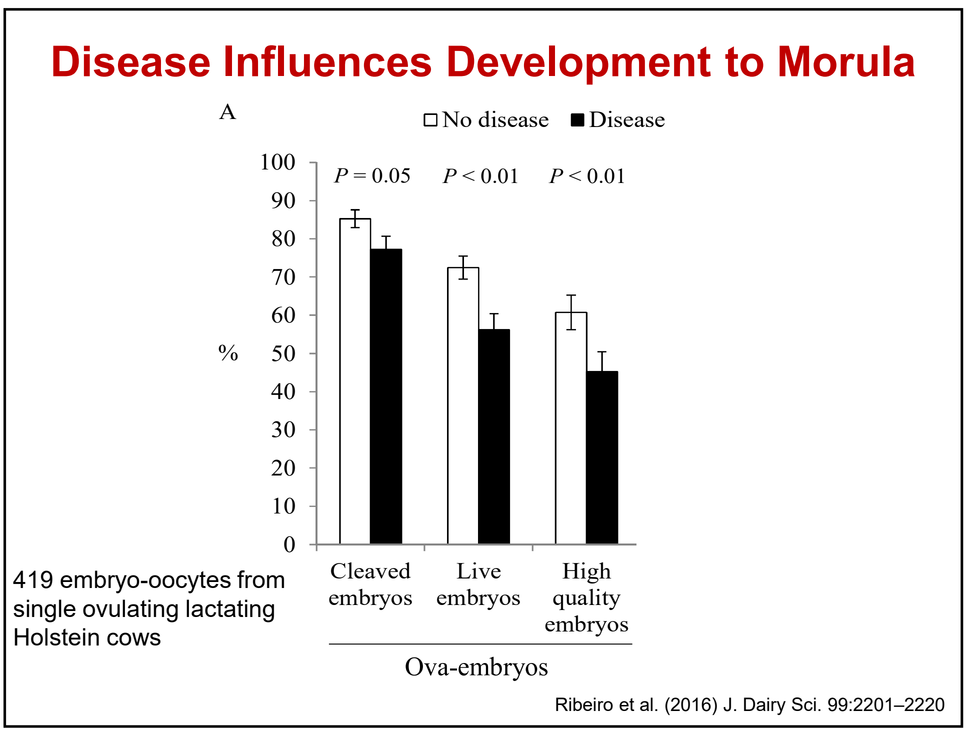
✓ Control/Fasted
- Fasted for 72 h (-14 to +58 hours relative to challenge) and not challenged

✓ Challenge/Fed
- Fed *ad libitum* and underwent intra-tracheal challenge with *M. haemolytica*

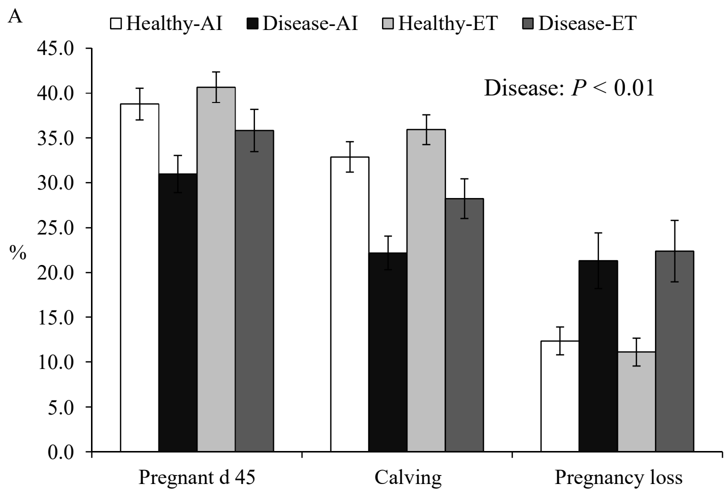
✓ Challenge/Fasted
- Fasted for 72 h (-14 to +58 hours relative to challenge) and underwent intra-tracheal challenge with *M. haemolytica*

Burciaga-Robles PhD Dissertation (2009)


Amino Acid Hepatic Flux in Steers Without (Control) or with (Challenge) an Intratracheal Challenge with M. haemolytica
At 0.67 efficiency, this is equivalent to the true protein in 8 kg of milk (18 lbs)
Difference of 2.6 moles/day → ~ 380 g of AA for a 400 kg steer
Control
Challenge
Amino acid flux, mmol/h
Disease effect, P = 0.11
SEM = 19.6
Disease effect, P = 0.03
SEM = 28.5
Disease effect, P = 0.02
SEM = 45.4
Essential amino acids
Non essential amino acids
Total amino acids
Burciaga-Robles PhD Dissertation (2009)

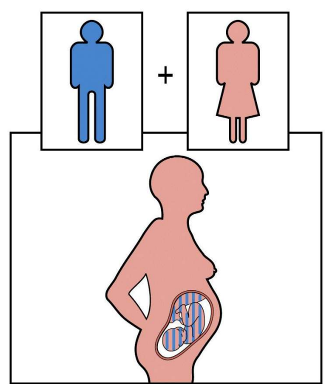

Disease Influences Development to Morula
A
No disease
Disease
P = 0.05
P < 0.01
P < 0.01
%
Cleaved embryos
Live embryos
High quality embryos
Ova-embryos
419 embryo-oocytes from single ovulating lactating Holstein cows
Ribeiro et al. (2016) J. Dairy Sci. 99:2201–2220

Negative Impacts of Disease on Fertility Are Not Bypassed by Embryo Transfer (ET)



Ribeiro et al. (2016) J. Dairy Sci. 99:2201–2220

The ”semi-alogenic” fetus



Maternal immune system paradox in gestation:

Pathogen surveillance

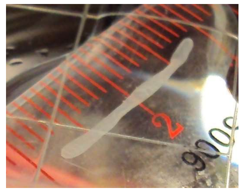
vs.

Tolerance to conceptus alloantigens

Bovine Conceptus Changes its Gene and Protein Expression to Allow Maintenance of Pregnancy

Ovoid

Tubular



Filamentous

↓ BOLA (MHC-I heavy chain)

↓ C3

↑ CD55 (DAF)

Ribeiro et al. (2016) Biol. Reprod. (2016) 94(4):97, 1–18

Take Home Message

- ✓Stimulate DM intake
  - ✓ Intake influences nutrient balance that is critical for resumption of ovarian cyclicity
  - ✓ Cyclic cows have increased estrous expression, pregnancy per AI, and improved maintenance of pregnancy
- ✓Minimize disease
  - ✓ Disease causes inflammation and tissue damage, which alters function
  - ✓ Alters partition of nutrients to favor control of infection and tissue repair in place of tissue accretion
  - ✓ The priority shifts from production/growth to survival
  - ✓ Creates long-term negative effects on reproduction

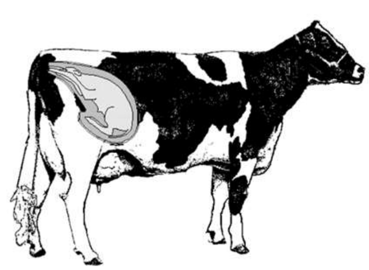
Prepartum Diet Formulation

Focus on 4 important aspects

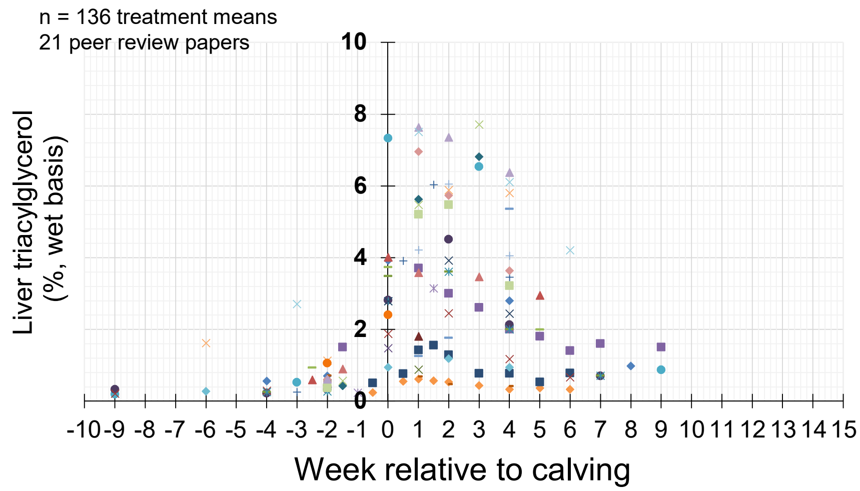
- ✓Avoid excessive caloric intake (gain of adipose tissue or BCS)
- ✓Reduce fatty liver and ketosis
- ✓Prevent hypocalcemia
- ✓Supply adequate amount of metabolizable protein

Caloric Needs of Prepartum Cows

- ✓ Last 3 weeks of gestation for a pregnant Holstein cow weighing 680 kg plus 40-50 kg of uterine/fetal weight
  - ✓ Cow needs ~11 Mcal/d of NE_L ($680^{0.75}$ x 0.08)
  - ✓ She needs another ~4 Mcal for fetal/uterine tissue accretion
  - ✓ To account for cow to cow variability and diet selection/competition, a total of 17 Mcal/d should be offered prepartum
  - ✓ This cow eats 11 to 13 kg of DM daily; therefore, the diet should contain:
  - ✓ ~ 17 Mcal/12 kg = **1.42 to 1.45 Mcal/kg DM (0.65 Mcal/lb for a cow eating 26 lb DM)**
- ✓ Diet with 70 to 75% forage
- ✓ 45 to 50% NDF
- ✓ 15 to 18% starch
- ✓ 25 to 30% NFC
- ✓ 3% fatty acids

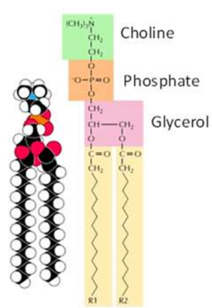


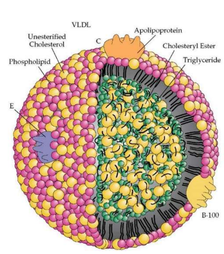
Hepatic Triacylglycerol Around Calving

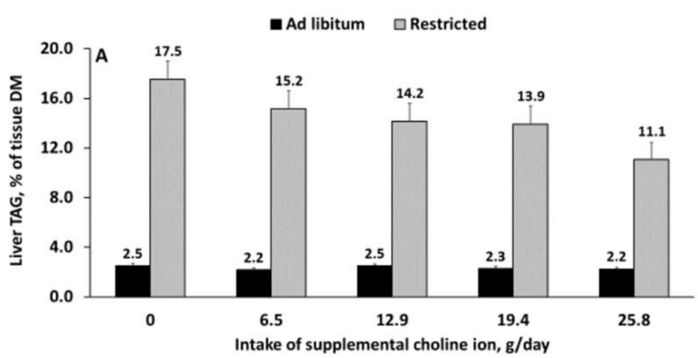


Summarized by M. Zenobi

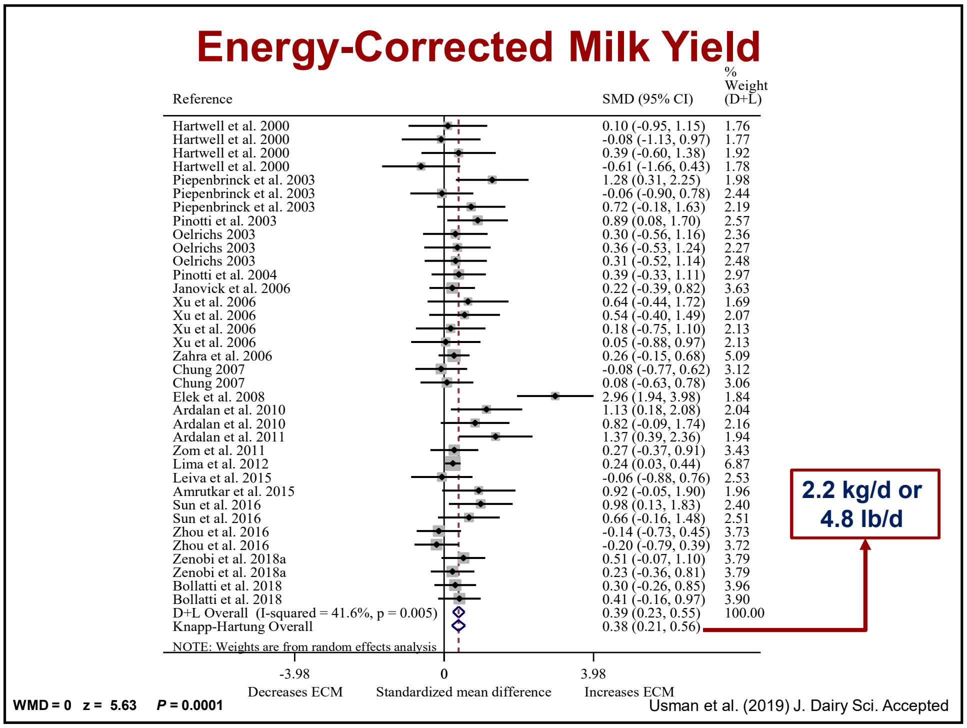
Choline Reduces Fatty Liver

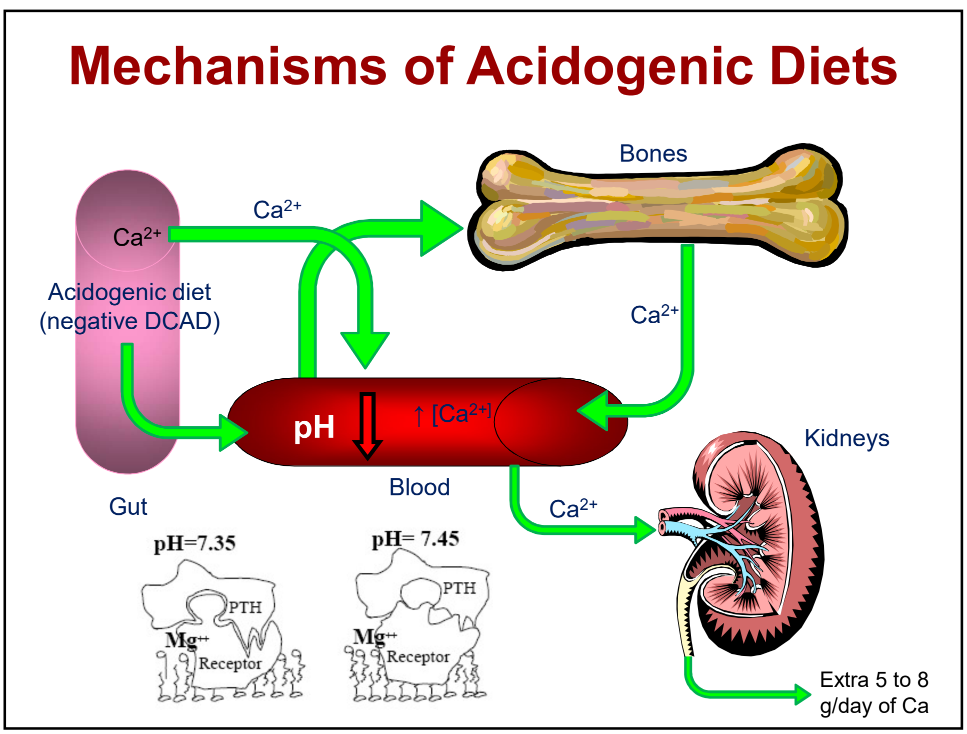




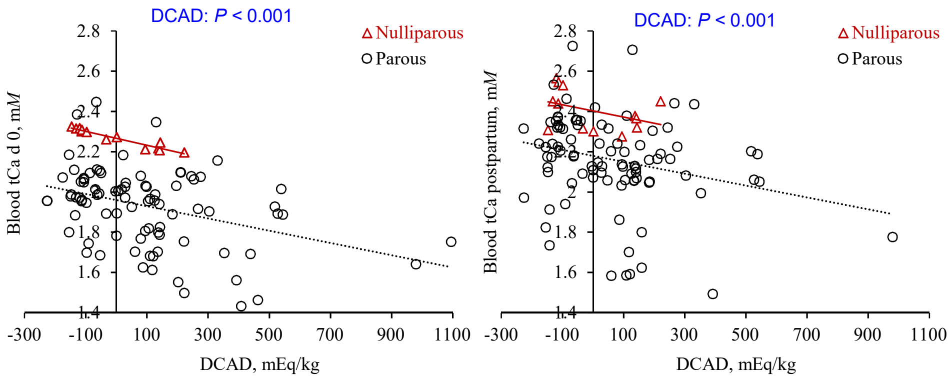


Zenobi et al. (2018) J. Dairy Sci. 101:5902–5923


Energy-Corrected Milk Yield
Reference
SMD (95% CI)
% Weight (D+L)
Hartwell et al. 2000 0.10 (-0.95, 1.15) 1.76
Hartwell et al. 2000 -0.08 (-1.13, 0.97) 1.77
Hartwell et al. 2000 0.39 (-0.60, 1.38) 1.92
Hartwell et al. 2000 -0.61 (-1.66, 0.43) 1.78
Piepenbrinck et al. 2003 1.28 (0.31, 2.25) 1.98
Piepenbrinck et al. 2003 -0.06 (-0.90, 0.78) 2.44
Piepenbrinck et al. 2003 0.72 (-0.18, 1.63) 2.19
Pinotti et al. 2003 0.89 (0.08, 1.70) 2.57
Oelrichs 2003 0.30 (-0.56, 1.16) 2.36
Oelrichs 2003 0.36 (-0.53, 1.24) 2.27
Oelrichs 2003 0.31 (-0.52, 1.14) 2.48
Pinotti et al. 2004 0.39 (-0.33, 1.11) 2.97
Janovick et al. 2006 0.22 (-0.39, 0.82) 3.63
Xu et al. 2006 0.64 (-0.44, 1.72) 1.69
Xu et al. 2006 0.54 (-0.40, 1.49) 2.07
Xu et al. 2006 0.18 (-0.75, 1.10) 2.13
Xu et al. 2006 0.05 (-0.88, 0.97) 2.13
Zahra et al. 2006 0.26 (-0.15, 0.68) 5.09
Chung 2007 -0.08 (-0.77, 0.62) 3.12
Chung 2007 0.08 (-0.63, 0.78) 3.06
Elek et al. 2008 2.96 (1.94, 3.98) 1.84
Ardalan et al. 2010 1.13 (0.18, 2.08) 2.04
Ardalan et al. 2010 0.82 (-0.09, 1.74) 2.16
Ardalan et al. 2011 1.37 (0.39, 2.36) 1.94
Zom et al. 2011 0.27 (-0.37, 0.91) 3.43
Lima et al. 2012 0.24 (0.03, 0.44) 6.87
Leiva et al. 2015 -0.06 (-0.88, 0.76) 2.53
Amrutkar et al. 2015 0.92 (-0.05, 1.90) 1.96
Sun et al. 2016 0.98 (0.13, 1.83) 2.40
Sun et al. 2016 0.66 (-0.16, 1.48) 2.51
Zhou et al. 2016 -0.14 (-0.73, 0.45) 3.73
Zhou et al. 2016 -0.20 (-0.79, 0.39) 3.72
Zenobi et al. 2018a 0.51 (-0.07, 1.10) 3.79
Zenobi et al. 2018a 0.23 (-0.36, 0.81) 3.79
Bollatti et al. 2018 0.30 (-0.26, 0.85) 3.96
Bollatti et al. 2018 0.41 (-0.16, 0.97) 3.90
D+L Overall (I-squared = 41.6%, p = 0.005) 0.39 (0.23, 0.55) 100.00
Knapp-Hartung Overall 0.38 (0.21, 0.56)
NOTE: Weights are from random effects analysis
-3.98
0
3.98
Decreases ECM
Standardized mean difference
Increases ECM
2.2 kg/d or 4.8 lb/d
WMD = 0 z = 5.63 P = 0.0001
Usman et al. (2019) J. Dairy Sci. Accepted

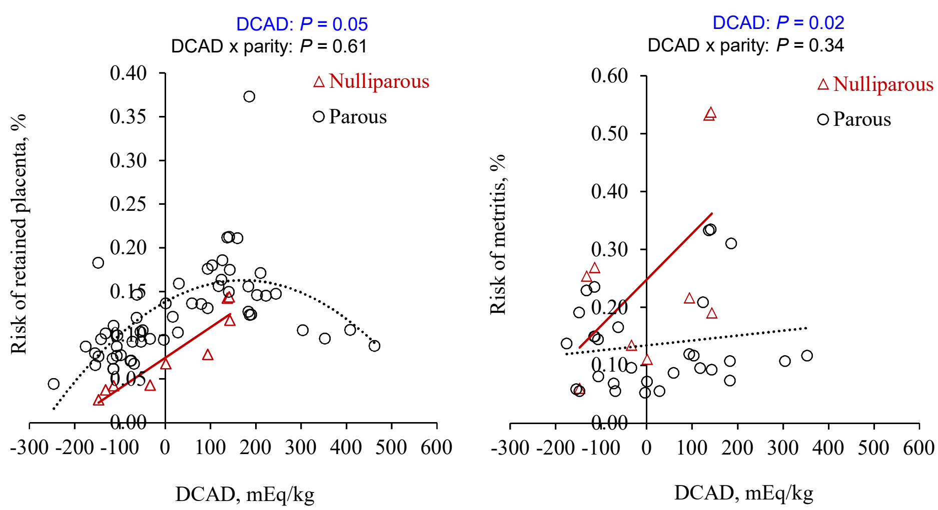

Mechanisms of Acidogenic Diets
Bones
Ca2+
Ca2+
Acidogenic diet (negative DCAD)
Ca2+
pH
↑ [Ca2+]
Kidneys
Gut
Blood
Ca2+
pH=7.35
pH= 7.45
PTH
PTH
Mg++
Receptor
Mg++
Receptor
Extra 5 to 8 g/day of Ca

DCAD and Blood [tCa] on the Day of Calving and Postpartum

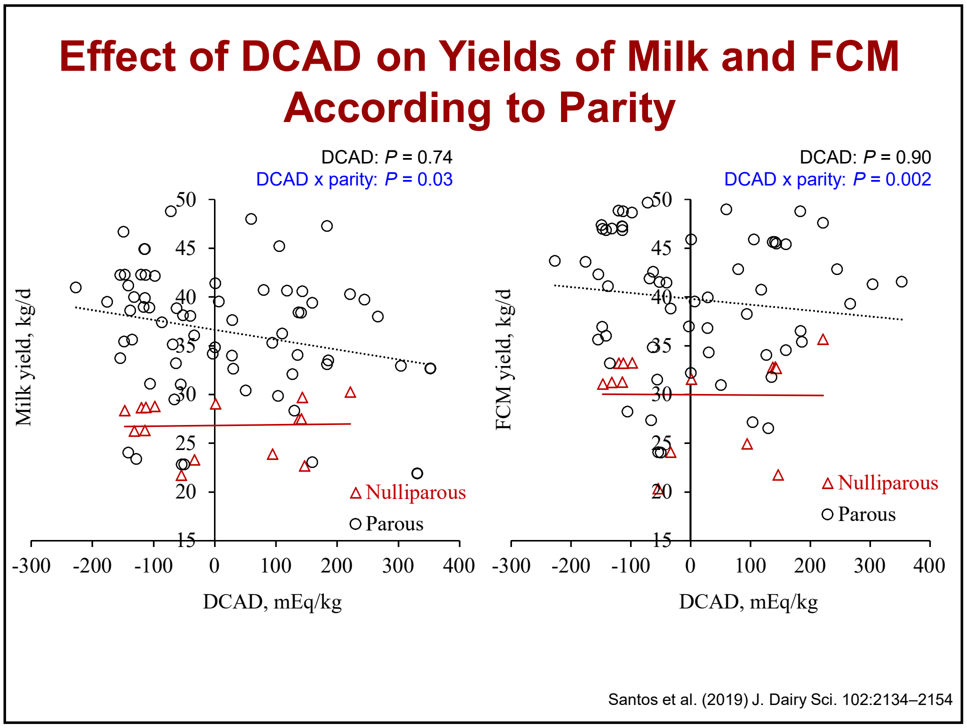


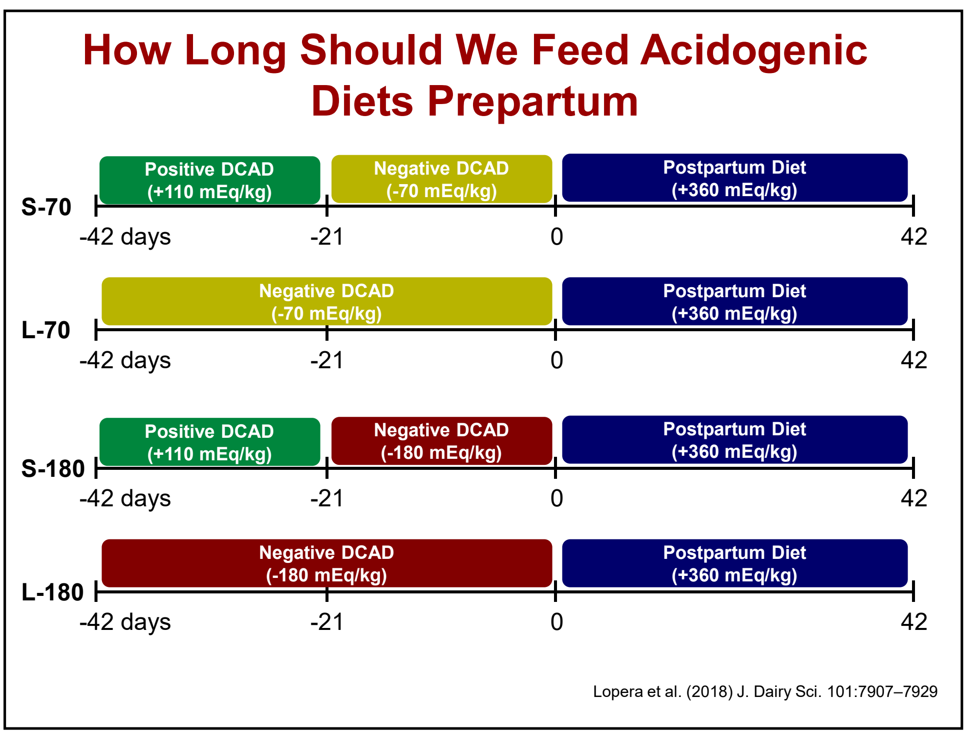
Santos et al. (2019) J. Dairy Sci. 102:2134–2154

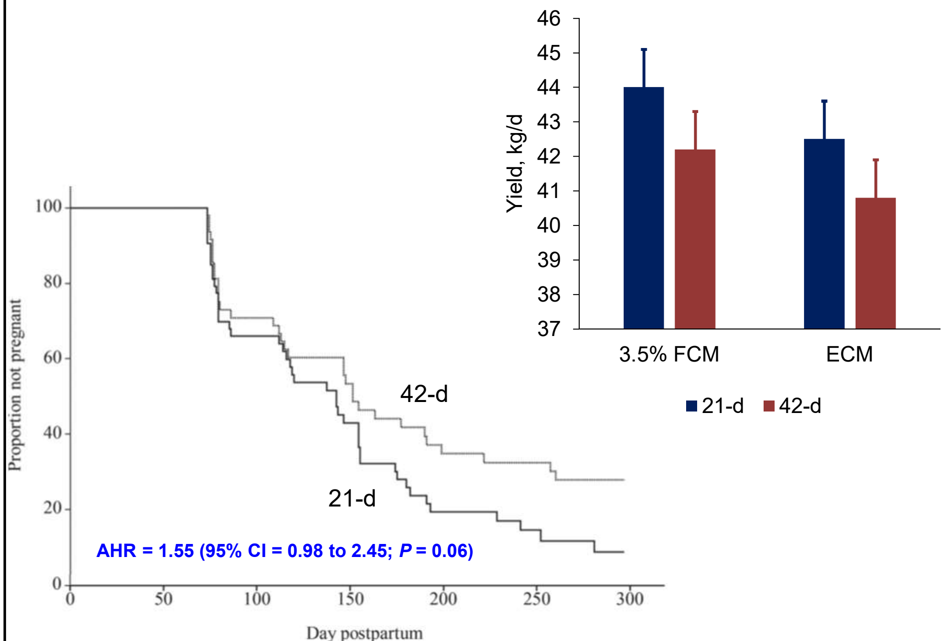
Effect of DCAD on Risk of Retained Placenta or Metritis



Santos et al. (2019) J. Dairy Sci. 102:2134–2154

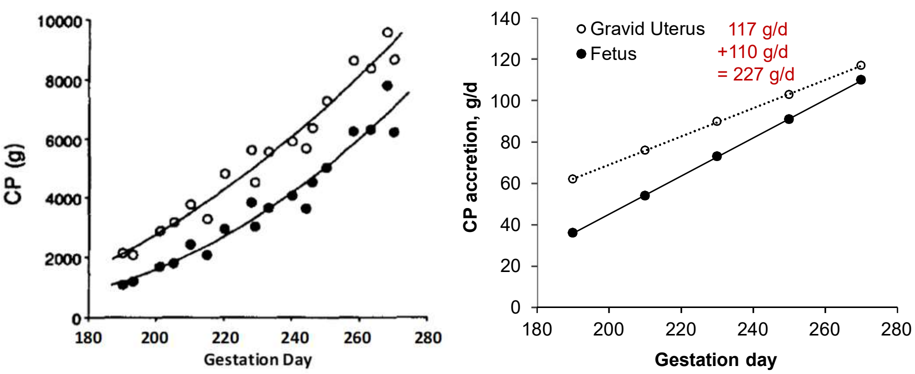

Effect of DCAD on Yields of Milk and FCM According to Parity
DCAD: P = 0.74
DCAD x parity: P = 0.03
Milk yield, kg/d
DCAD, mEq/kg
Nulliparous
Parous
DCAD: P = 0.90
DCAD x parity: P = 0.002
FCM yield, kg/d
DCAD, mEq/kg
Nulliparous
Parous
Santos et al. (2019) J. Dairy Sci. 102:2134–2154


How Long Should We Feed Acidogenic Diets Prepartum
S-70
Positive DCAD (+110 mEq/kg)
Negative DCAD (-70 mEq/kg)
Postpartum Diet (+360 mEq/kg)
-42 days
-21
0
42
L-70
Negative DCAD (-70 mEq/kg)
Postpartum Diet (+360 mEq/kg)
S-180
Positive DCAD (+110 mEq/kg)
Negative DCAD (-180 mEq/kg)
Postpartum Diet (+360 mEq/kg)
L-180
Negative DCAD (-180 mEq/kg)
Postpartum Diet (+360 mEq/kg)
Lopera et al. (2018) J. Dairy Sci. 101:7907–7929



Lopera et al. (2018) J. Dairy Sci. 101:7907–7929

Accretion of Protein in the Gravid Uterus of Pregnant Holstein Cows

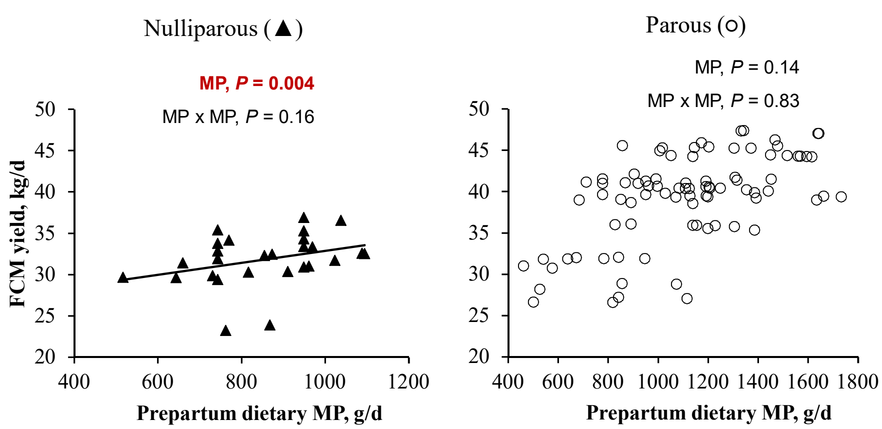


Bell et al. (1995) J. Dairy Sci. 78:1954-1961

Protein Needs of Prepartum Cows

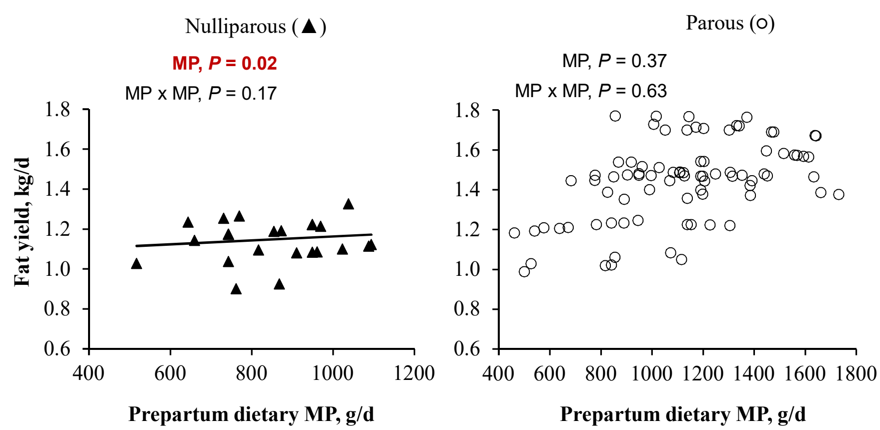
- ✓ Dry cows weighing 600 to 650 kg dry cow requires approximately 480 g/d of metabolizable protein for maintenance
- ✓ Metabolizable protein needed for gravid uterus accretion assuming calf birth weight of 43 kg
  - 230 d of gestation = 260 g/d
  - 250 d of gestation = 300 g/d
  - 270 d of gestation = 340 g/d
- ✓ Estimated requirements for metabolizable protein as parous cows approach calving
  - 820 g/d to meet maintenance and gravid uterus accretion (~ 2 lbs/d of digestible amino acids)

Effect of Prepartum Supply of Metabolizable Protein on Yield of FCM



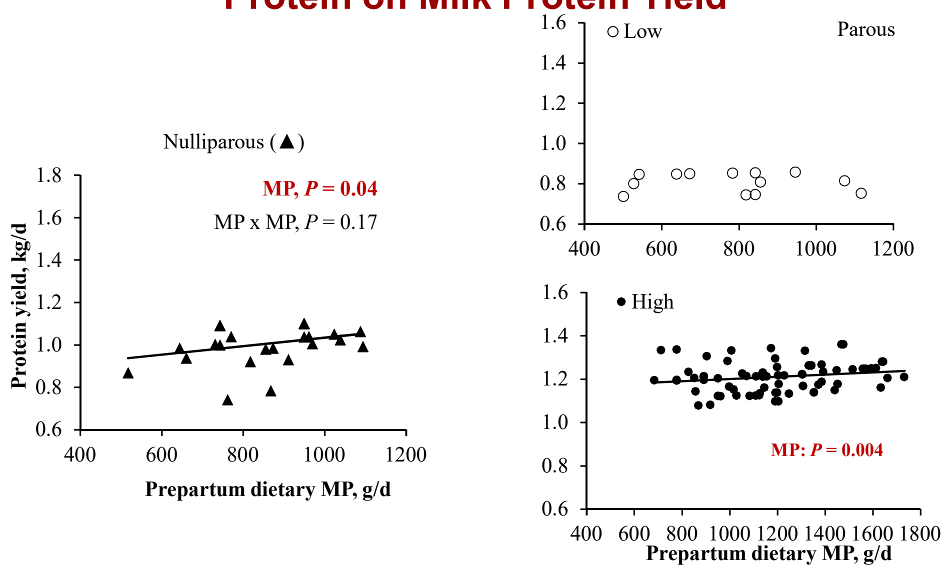
Husnain and Santos (2019) J. Dairy Sci. https://doi.org/10.3168/jds.2018-16043

Effect of Prepartum Supply of Metabolizable Protein on Milk Fat Yield



Husnain and Santos (2019) J. Dairy Sci. https://doi.org/10.3168/jds.2018-16043

Effect of Prepartum Supply of Metabolizable Protein on Milk Protein Yield



Husnain and Santos (2019) J. Dairy Sci. submitted

Experiments with mean milk < 28 kg/d

Experiments with mean milk > 36 kg/d

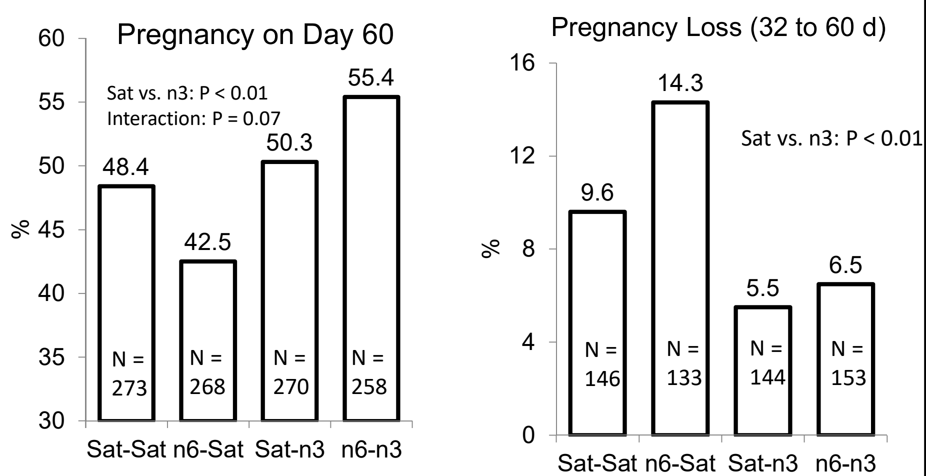
Meta-Analysis of Lipid Supplementation During the Transition Period

- ✓ 17 experiments and 26 comparisons with 1,385 cows
- ✓ 7 different fat sources
- ✓ Effects of lipid supplementation
  - ✓ 27% increase in risk of pregnancy per AI (e.g. 32 vs. 40%)
  - ✓ Days open tended to be reduced
  - ✓ Milk yield tended to increase
  - ✓ Concentration of milk fat unchanged and milk protein tended to decrease
  - ✓ Body weight unchanged

Rodney et al. (2015) J. Dairy Sci. 98:5601-5620

Effects of Fatty Acid Supplementation During the Transition and Breeding Periods on Fertility of Dairy Cows

Transition diets = -30 to 30 DIM
Breeding diets = 30 to 160 DIM



Silvestre *et al.* (2011) J. Dairy Sci. 94 :189–204

Summary of Diet Manipulations

- ✓ Feed prepartum diets to supply 17 Mcal of NE/d (~ 1.45 Mcal/kg or 0.65 Mcal/b)
- ✓ Supplement rumen-protected choline pre- and early postpartum
  - ✓ At least 13 g of choline ion
- ✓ Formulate prepartum diets with a DCAD of ~ -100 mEq/kg
  - ✓ Plan for 3 weeks in the close up pen (move at 255 d of gestation)
- ✓ Formulate prepartum diets for parous and nulliparous cows separately
  - ✓ Nulliparous need more MP prepartum (~ 1,100 g/d) which is achieved with diets with 14 to 15% CP
  - ✓ Parous cows require less MP (~ 800 to 900 g/d), which can be achieved with 12 to 13% CP
- ✓ Supplement moderate amounts of FA to improve fertility (1 to 1.5% diet DM in early lactation)
  - ✓ Effects differ with source of FA fed
  - ✓ Source of FA rich in omega-6 and omega-3 seem the most bioactive

NOTES

Addressing Animal Welfare Concerns in Dairy Farming

Dr. Meggan Hain
Florida Dairy Production Conference
September 18, 2019

Defining Animal Welfare:

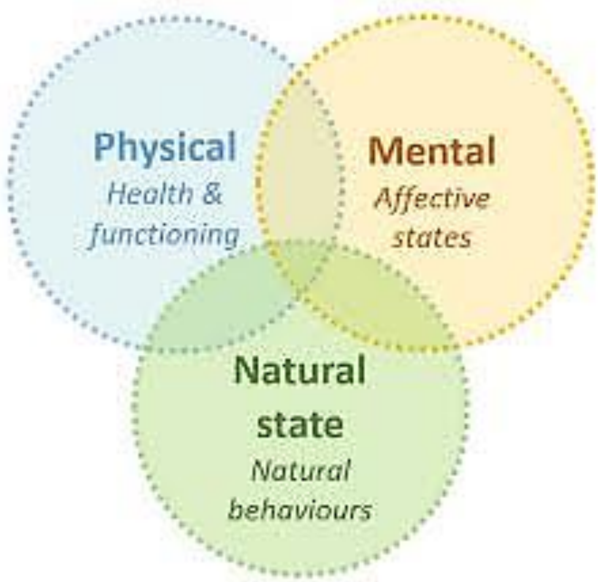
Animal welfare means how an animal is coping with the conditions in which it lives. An animal is in a good state of welfare if (as indicated by evidence) it is healthy, comfortable, well nourished, safe, able to express innate behavior, and if it is not suffering from unpleasant states such as pain, fear, and distress.

--AVMA

The Five Freedoms:
Farm Animal Welfare Committee (FAWC), UK Welfare Code, 1979.

Freedom from hunger and thirst, by ready access to water and a diet to maintain health and vigor.
Freedom from discomfort, by providing an appropriate environment.
Freedom from pain, injury and disease, by prevention or rapid diagnosis and treatment.
Freedom to express normal behavior, by providing sufficient space, proper facilities and appropriate company of the animal's own kind.
Freedom from fear and distress, by ensuring conditions and treatment, which avoid mental suffering.

The Three Domains of Animal Welfare:
Dr. David Fraser



Animal Right vs. Animal Welfare:

These two ideas are often confused but they are actually quite different. Both are ethical philosophies which essentially attempt to define right and wrong in regard to our relationships with animals. In my mind I simply these two philosophies down to these key differences:

- **Animal Welfare**: This philosophy is essentially focused on doing our best to provide a good life for the animals that we encounter whether they are pets, farm animals, work animals or wild animals. Under this belief we can own animals, but we are responsible for providing those in our care with a good life.
- **Animal Rights**: This philosophy goes a step further in that it believes that animals have rights equal to humans and that we don't have the right to hold dominion over animals. Under this belief we should not own, eat or use animals (they see them equal to humans, so anything we would not do to another human we should not do to animals).

Essentially all who work in agriculture are practicing animal welfare, whether we do it well or not. Of the activist which we encounter most fall on a spectrum from being focused on animal welfare to those focused on animal rights. Those on the animal welfare end of the spectrum focused on improving animal care and they are essentially our allies, whether we choose to accept them. But those on the animal rights end are the spectrums are opposed to animal ownership and farming. Some of these groups are pretty civil but some are militant, and several are recognized as domestic terrorists. It is this last group which represents a significant risk. That said they are still a very small portion of the population and they are not representative of the wider public and particularly of our consumers. As we think about animal care and welfare and how we communicate what we do, we must remember that we are speaking to our consumers and the public (who are generally innocent). We can create allies if we are smart.

What to Expect from a Third Party Animal Welfare Audit:

- Some Audit program will require an application process and potentially document review to be done before the audit.
- Most audits are scheduled and are not surprise audits.
- Who will do the audit? Depending on the nature of the audit the auditor may be independent.
  - For second party audits (FARM) the auditor is often a member of coop or milk handler staff and someone you know well. They don't have to be independent.
  - For third party audits the auditor has to be independent and hired as a contractor of the audit company or coop. These auditors should be certified by an animal auditing company (PAACO etc.).
- Most audits will involve a combination of:
  - Interview questions speaking to the farm manager and sometimes staff members.
  - Document review, most audits which require specific employee standard operating procedures, training documentation for employees, and treatment, mortality and health records.
  - Farm Review and Observations, finally the auditor will make observations of the farm, building and the animals. This includes specific animal scoring measures and key observations (water, feed, bedding and housing quality)

- Finally, most audits will end with an exit interview. While this is not the official results it will give you a good idea of what looks great and where there is room for improvement.
- You should receive a follow-up communication from the audit company with the official results and any follow-up needed.
- Each auditing company is different in how they manage follow-up and certificates.

Here are a few Key Animal Measures for Dairy Welfare:

The Best way to evaluate animal Welfare is with Objective Repeated Animal Measures and Observation. "If you can measure it you can manage it." These are typically used to score animal welfare during audits, but you can use them too, to monitor animal welfare on your farm between audits.

1. Lameness
2. Body Condition Score
3. Lesion and Injuries
4. Hygiene scores
5. Mortality rates
6. Illness (Morbidity) rate
7. Cow Longevity
8. Somatic Cells Score

Meggan's Keys of Excellent Animal Welfare:

These are my opinion and should be taken as such.

1. It comes down to farmer's philosophy.
    a. But if you don't believe, share and show that philosophy it is no good.
2. Ownership is key (for employees and farmers).
3. The best care takers are details people.
4. The best farmers are always experimenting and learning (some of my favorite farmers are blue collar philosophers and scientists).
5. The best farmers aren't always the best managers (these are two very different skills and types of communication).
6. Patients is indeed a virtue especially with cows.
7. A nurturing nature is invaluable, especially for calves (being motherly in a good thing)
8. You can teach a cow guy to drive a tractor, but you can't teach a tractor guy to care for cows.
9. Good Welfare will make you money.

NOTES

Engaging and Educating the Public about Dairy Practices

Gary Corbett
Fair Oaks Farms, Indiana

NOTES

When dairy farming meets social media: Sharing my experience

Tara Vander Dussen
Dairy Producer, Environmental Scientist, and New Mexico Milkmaid

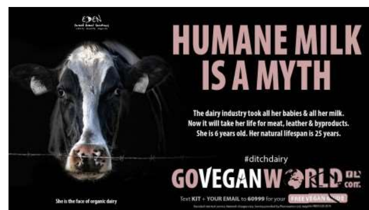
55th Florida Dairy Production Conference
Gainesville, Florida
Wednesday, September 18, 2019

New Mexico Milkmaid

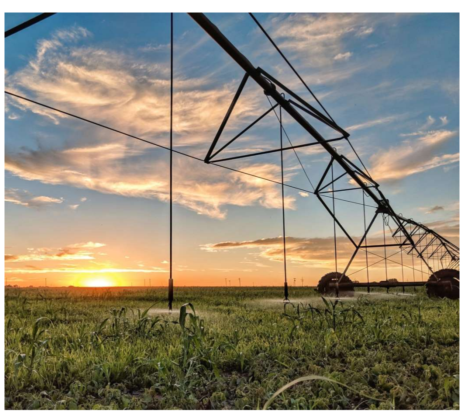
* Dairy farmer in Eastern NM
* Environmental Scientist at Glorieta Geoscience Inc.
* Mom
* New Mexico Milkmaid Blogger
  * Instagram
    @newmexicomilkamid
  * Facebook
    * https://www.facebook.com/newmexicomilkmaid/
  * Website
    * www.newmexicomilkmaid.com
  * Twitter
    @NMMilkmaid

Why Ag-vocating?

- Online conversations: posts, shares, comments and groups
- Consumers are hungry for information about their food
  - Online activists were telling their version of our story
  - I saw a need for farmers to tell our story
- Consumers want to hear directly from the farmer
  - Launched New Mexico Milkmaid website in 2016



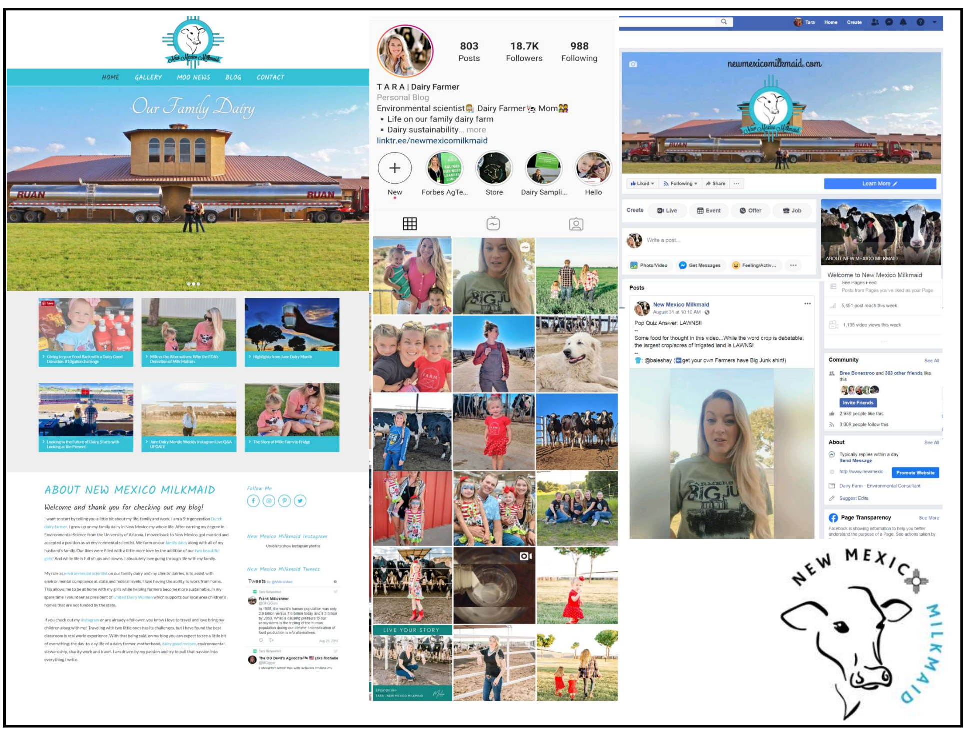
Getting Started



- Where to start?
  - Blog, Facebook, Instagram, YouTube, Twitter
- What to share?
  - Dairy Sustainability
- How to share?
- How much to share?
  - Still a work in progress

Goal of New Mexico Milkmaid

* My goal is to bridge the gap between consumers and farmers, and change people's perceptions about large dairy farms and dairy sustainability by sharing my experiences as an environmental scientist, mom, and dairy farmer.

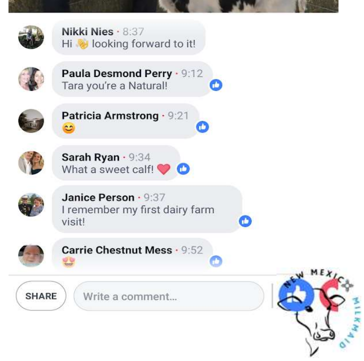


Content for New Mexico Milkmaid

* 1 blog posts a month
* Daily posts to Instagram
* Videos on Instagram and Facebook
* Sharing relevant articles and posts from fellow bloggers, media outlets and magazines

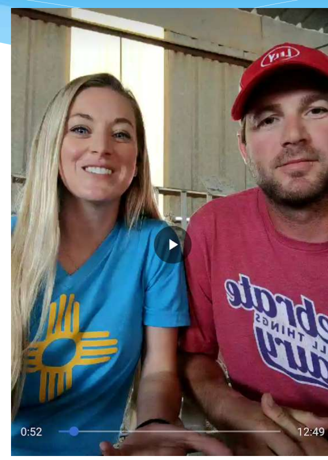
Engaging not Educating

* Consumers want to feel apart of the conversations and connect with the farmer
* Farmers need to focus on interacting with consumers and then educating through engagement
* Consumers just want to know the food they are feeding their families is safe.



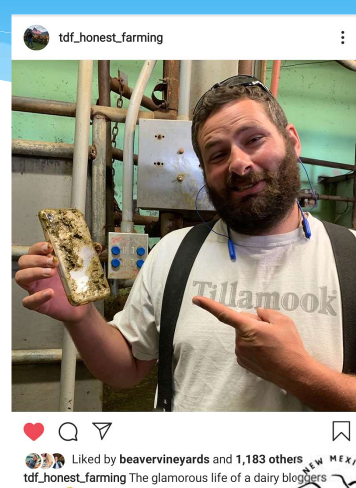
Encourage Questions

* By inviting the audience to ask questions and leave comments and concerns, I hope to make them feel like they have a voice at the agricultural table.
* Videos feel less rehearsed and more natural
* Videos feel more authentic and authenticity is everything!



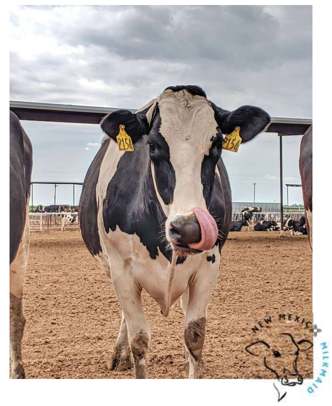
Be Yourself, Be Authentic

* Be Authentic
* Share about everyday life… not just dairy farming
  * Mom stories, Personal struggles, Braid Tutorials
  * People want to relate to you
* Find your voice
  * @TDF_Honest_Farming
    * Attacks the myths and activists head on with humor and honesty
  * @DairyGirlFitness
    * Sharing about working out and incorporating milk
  * @FarmingwiththeHilbys
    * Motherhood on the farm
  * @DairyCarrie
    * Recipes and motherhood humor



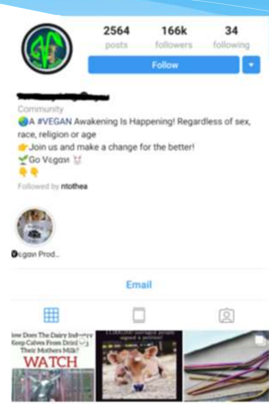
Have Fun!

- Team up with other farmers and companies
  - Podcasts, Guest blogs
- Tongue Out Tuesday
- #MilkChugChallenge
- Dairy Mafia
- Farmers have big junk



Biggest Obstacles

- Negativity from fellow farmers
- Communicating with the older generation
- Hate messages and comments from vegan activist



Opportunities for Sharing Our Story

- Forbes AgTech Summit
- NYC National Farmer Day
- SXSW
- #DairyAmazing Symposium
- Podcasts
- Thought Catalog

Questions?

NOTES

When dairy farming meets social media: Sharing my experience

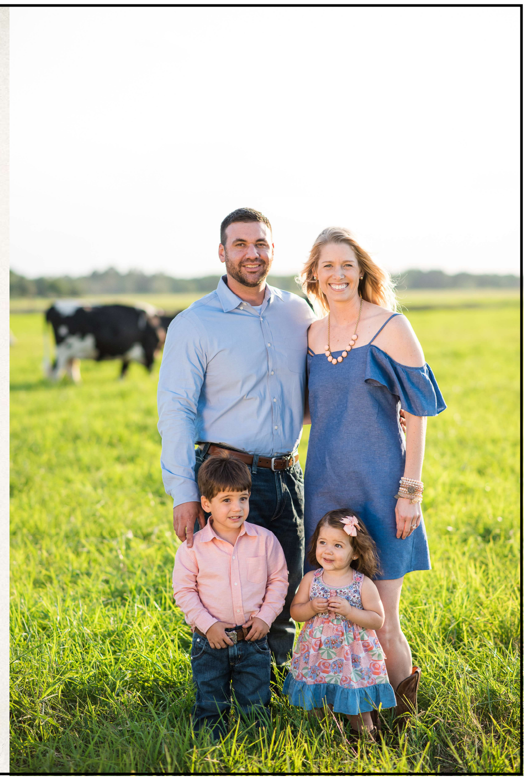
Brittany N. Thurlow &
Courtney N. Campbell

Brittany

- Wife and Mother
- Graduated with Masters from USF - Entrepreneurship
- Member of SMI Board of Directors
- Officer of SMI Board of Directors & Executive Committee
- Member of the SMI Feed Mill Committee

Courtney

- Wife and Mother
- Graduated with Masters from UF - Food & Resource Economics
- Ex-Officio Member of SMI Board of Directors
- Member of the SMI Feed Mill Committee
- Member of the Florida Dairy Farmer Board of Directors
- Member of Farmer Advisory Group at DMI



About Our Farms

- 5^{th} Generation Dairy Farmers
- Located in Hardee County, FL
- Rotational Grazing Dairies
- Milking approx. 4,500 cows
- Southeast Milk Inc. Members
- Free Range 365 Certified

Nickerson Cattle Company

Nickerson Bar III

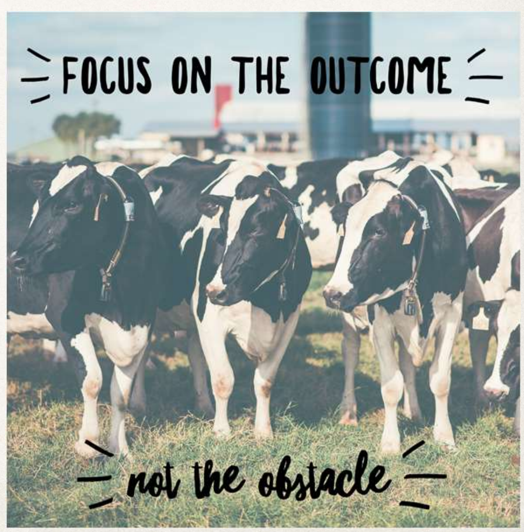
Free Range 365

- Grassroots effort to promote dairy products sourced from cows with free range access to pasture 365 days per year.
- Trademarked by Chad Rucks of Okeechobee, FL
- Driven by the "Core Four" – Chad Rucks, Gary Keyes, Courtney Campbell, & Brittany Thurlow

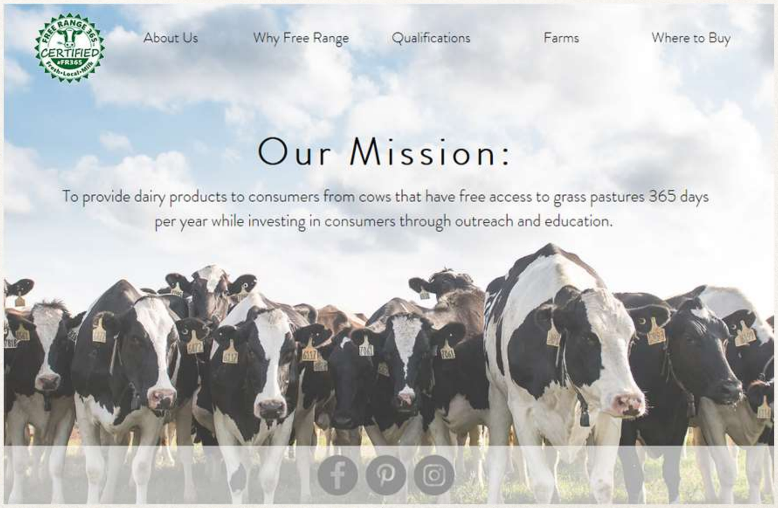
Our Process

A planned approach to implement a presence before approaching customers:

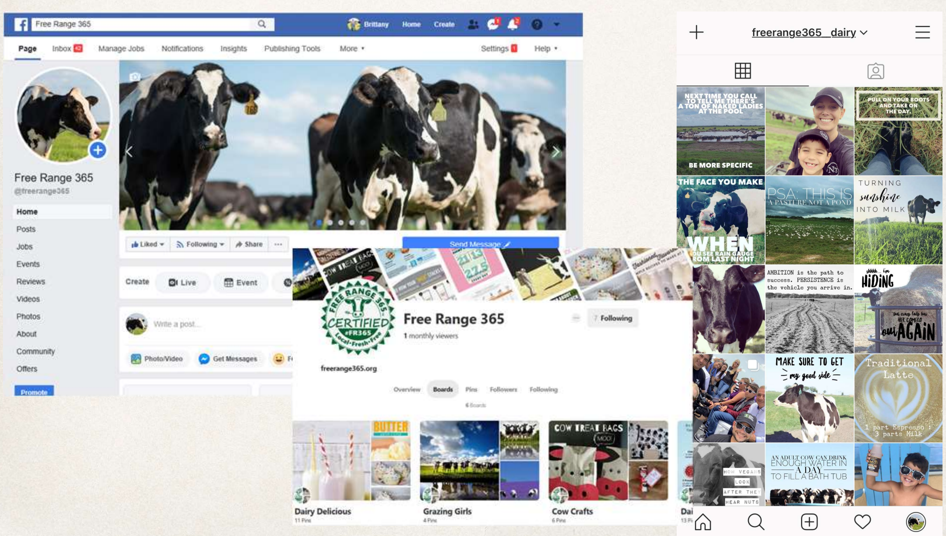
1. Website
2. Social Media account
    - Facebook
    - Instagram
    - Pinterest
3. Press Interviews & Publications



Website: www.freerange365.org



Social Media Accounts



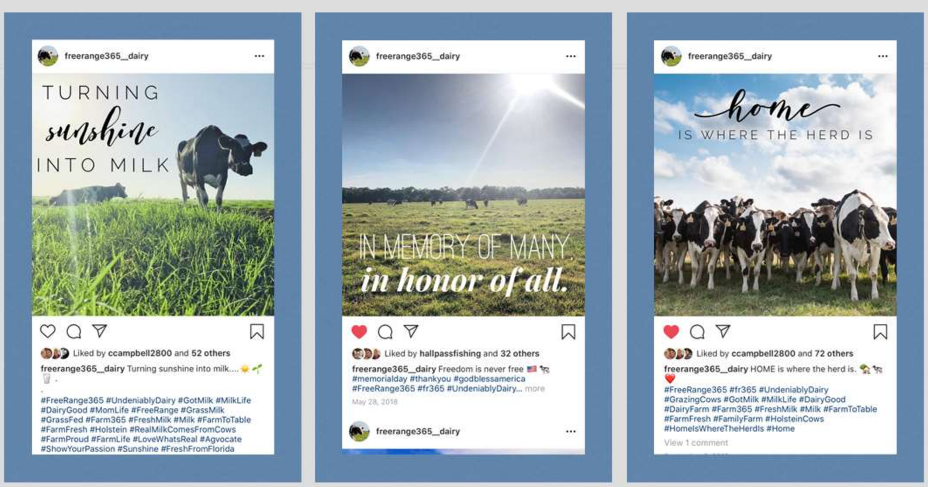
Press & Publications

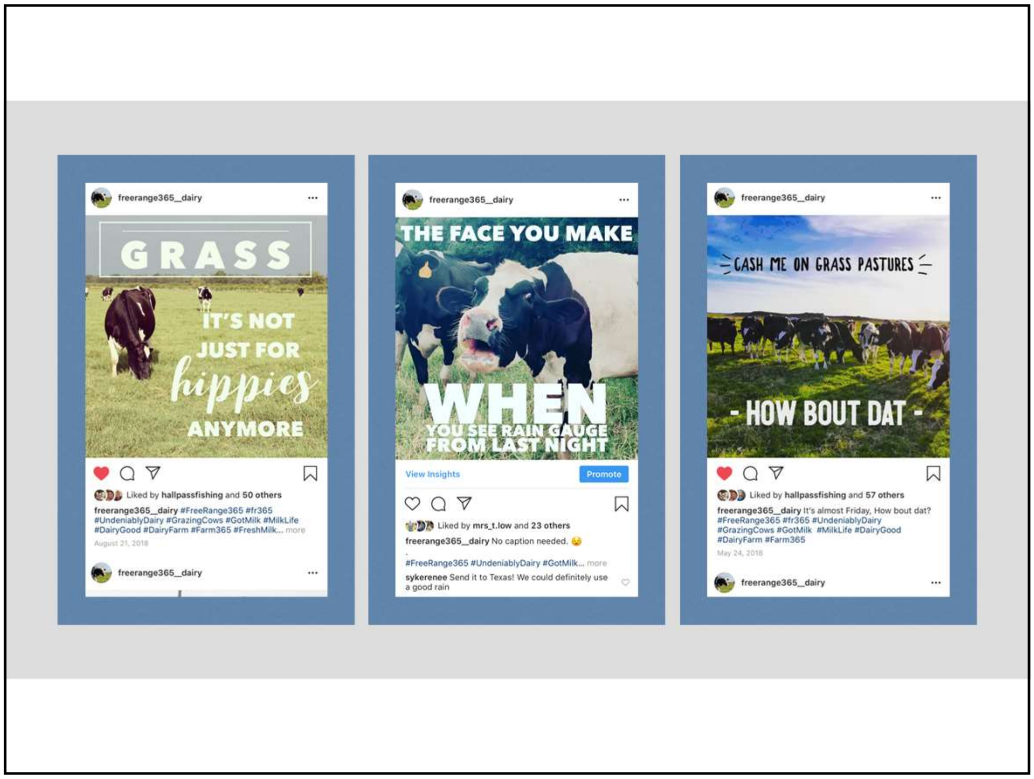
Social Media Overview

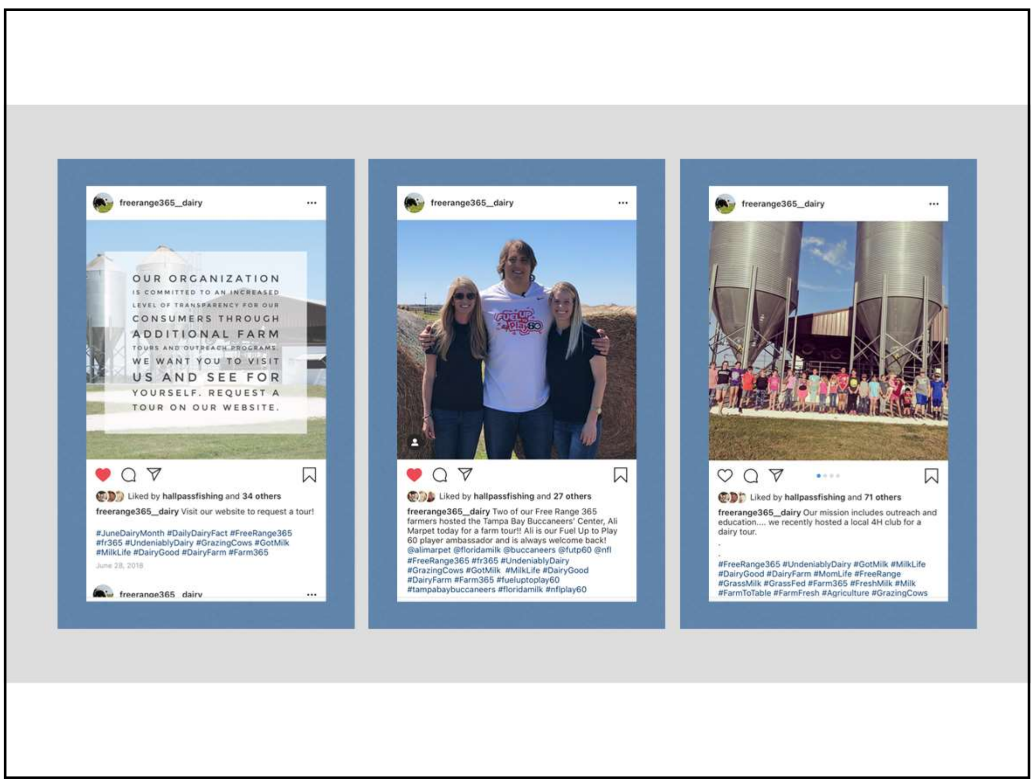
- All accounts were activated in March of 2018
- Primarily Facebook & Instagram Centric
  - Facebook - 425 Followers
  - Instagram - 587 Followers
- Co-managed by Brittany & Courtney

Social Media Content

- All posts are intended to create a quick positive impression
- Posts are photo centric with wording and captions to deliver our intended message
- Hashtags are used to further our reach & to bring users to our page



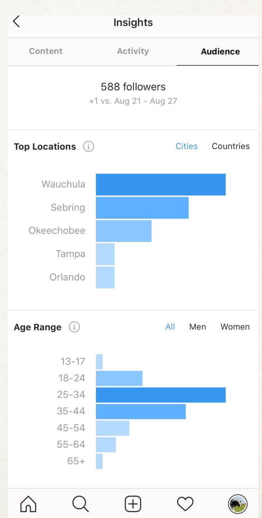

freerange365_dairy
GRASS
IT'S NOT JUST FOR hippies ANYMORE
Liked by hallpassfishing and 50 others
freerange365_dairy #FreeRange365 #fr365 #UndeniablyDairy #GrazingCows #GotMilk #MilkLife #DairyGood #DairyFarm #Farm365 #FreshMilk... more
August 21, 2018
freerange365_dairy
THE FACE YOU MAKE
WHEN
YOU SEE RAIN GAUGE FROM LAST NIGHT
View Insights
Promote
Liked by mrs_t.low and 23 others
freerange365_dairy No caption needed.
#FreeRange365 #UndeniablyDairy #GotMilk... more
sykerenee Send it to Texas! We could definitely use a good rain
freerange365_dairy
CASH ME ON GRASS PASTURES
- HOW BOUT DAT -
Liked by hallpassfishing and 57 others
freerange365_dairy It's almost Friday, How bout dat? #FreeRange365 #fr365 #UndeniablyDairy #GrazingCows #GotMilk #MilkLife #DairyGood #DairyFarm #Farm365
May 24, 2018

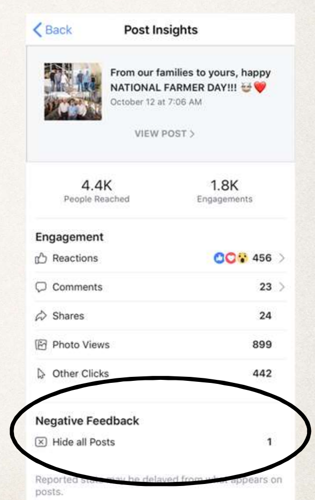

freerange365_dairy
OUR ORGANIZATION IS COMMITTED TO AN INCREASED LEVEL OF TRANSPARENCY FOR OUR CONSUMERS THROUGH ADDITIONAL FARM TOURS AND OUTREACH PROGRAMS. WE WANT YOU TO VISIT US AND SEE FOR YOURSELF. REQUEST A TOUR ON OUR WEBSITE.
Liked by hallpassfishing and 34 others
freerange365_dairy Visit our website to request a tour!
#JuneDairyMonth #DailyDairyFact #FreeRange365 #fr365 #UndeniablyDairy #GrazingCows #GotMilk #MilkLife #DairyGood #DairyFarm #Farm365
June 28, 2018
freerange365_dairy
Liked by hallpassfishing and 27 others
freerange365_dairy Two of our Free Range 365 farmers hosted the Tampa Bay Buccaneers' Center, Ali Marpet today for a farm tour!! Ali is our Fuel Up to Play 60 player ambassador and is always welcome back! @alimarpet @floridamilk @buccaneers @futp60 @nfl #FreeRange365 #fr365 #UndeniablyDairy #GrazingCows #GotMilk #MilkLife #DairyGood #DairyFarm #Farm365 #fueluptoplay60 #tampabaybuccaneers #floridamilk #nflplay60
freerange365_dairy
Liked by hallpassfishing and 71 others
freerange365_dairy Our mission includes outreach and education.... we recently hosted a local 4H club for a dairy tour.
#FreeRange365 #UndeniablyDairy #GotMilk #MilkLife #DairyGood #DairyFarm #MomLife #FreeRange #GrassMilk #GrassFed #Farm365 #FreshMilk #Milk #FarmToTable #FarmFresh #Agriculture #GrazingCows

A Different Perspective

- Our social media content is published as the Free Range 365 “organization” versus our personal or farm stories
- We strategically follow processors, dairy brands, & potential partners
- We study our metrics, interactions, and followings to garner the highest return on our posts

Metrics & Impressions





Things We've Learned

- Timing is everything
- Take LOTS of pictures ALWAYS
- Hire a photographer
- Apps are your friend:
  - Word Apps
    - (Font Space, Word Swag, etc.)
  - Repost Apps
    - (Repost It, etc.)
  - Photo Editing Apps
    - (Lightroom, Pic Monkey, etc.)

Our Why

- To create a sustainable market for Florida dairy farms
- To promote grazing/pasture based dairy practices
- To reinforce positive impressions with customers & consumers
- To give our kids the chance to be 6th generation dairy farmers

Questions?

NOTES

PRODUCER PANEL

SUMMARIES OF SOUTHEAST MILK CHECK-OFF PROJECTS FUNDED IN 2017

Georgia Youth Programs

J.F. Bohlen
Department of Animal and Dairy Science, University of Georgia

Outlined below are youth and collegiate activities that the Southeast Milk Inc. Milk Checkoff Program helped support in 2017:

- In 2017, there were 244 heifers exhibited by 209 young people at the State Livestock Show in Perry, GA (February 2017).

- Gordon County won the State Dairy Judging Contest (March 2017) and represented Georgia at World Dairy Expo on October 2nd. They were recognized as top 15 in the contest and in the top 20 of Guernseys.

- In 2017, the UGA Dairy Challenge team competed at the national contest in Visalia, CA (April 2017). These students were commended by the judges and industry professionals but were not called top two (the only results announced). A second group of students competed in the regional contest hosted by Florida in November of 2017.

- Mary Wright, a Dairy Science major from Yardley, PA, was the recipient of the 2017 SMI Scholarship (May 2017). She is from a small dairy farm, was president of the UGA Dairy Science Club, served as the national American Dairy Science Association Student Affiliate Division's (ADSA-SAD) second vice president, and now currently attends veterinary school at the University of Pennsylvania.

- At the National ADSA-SAD meetings in Pittsburgh, PA (June 2017):
  - Kayla Alward received the Genevieve Christen Distinguished Undergraduate Awards, was the outstanding student member for ADSA-SAD, and won the national Dairy Foods Presentation with her talk on "the potential impact of a novel canned latte on the North American dairy products market". Kayla was the only student in ADSA-SAD history to win national presentations in Dairy Production (2015), Dairy Original Research (2016) and Dairy Foods (2017)
  - Third place National Chapter
  - Second place National Scrapbook
  - Dr. Jillian Bohlen will serve as 3rd year advisor to the national organization

- Oconee County won the State Dairy Quiz Bowl Contest (June 2017) and represented Georgia at NAILE in the national contest on November 3rd – 4th. They were name honorable mention for the contest.

- Georgia had a group of 23 youth and 5 chaperones attend the Southeast Dairy Youth Retreat in Bradenton, FL (July 2017).

- Three young people and one chaperone were selected to serve as delegates to the 2017 National 4-H Dairy conference in Madison, WI (October 2017).

Evaluating Anti-Müllerian Hormone as a Reproductive Tool in Dairy Cattle

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Part 1: The objective of this study was to examine the impact of life events and stage of life at sampling on circulating Anti-Müllerian Hormone concentration in Holstein heifers. Virgin, Holstein heifers (n=105) of breeding age (13 $\pm$ 0.8 months) were enrolled prior to first service in the trial. Animals were heat detected using tail-chalk and bred via artificial insemination and pregnancy checked at 32+ days. Serum samples for AMH were collected at three time points: upon enrollment (heifer), at 5-20 days in milk (fresh) and at 45-60 days in milk (pre-breeding). Transrectal ultrasonography was performed upon enrollment (heifer) and at 45-60 days in milk (pre-breeding) to determine antral follicle count (AFC), cyclicity status, and uterine health. Heifers were blocked into a top, middle and bottom third by AMH concentration. LOW (<183 pg/mL; n=36), MID (183-354 pg/mL; n=35) and HIGH (>354 pg/mL; n=34) groupings. Reason for leaving the herd, health incidences, sex of offspring and calving difficulty were also not impacted by AMH concentration (P>0.05). AFC and cyclicity had a positive impact on heifer AMH concentration (P<0.01). Total AFC for heifers differed by AMH group with the HIGH group having the most follicles (8.76), followed by the MID (5.87) and then the LOW (3.53) group (P<0.0001). This confirms previous studies that AFC is directly correlated with circulating AMH concentration. However, AFC was not different by AMH group pre-breeding (P>0.05). From the heifer sample to the fresh sample, average AMH concentration dropped from 313.15 pg/mL to 160.01 pg/mL (P<0.0001). Average AMH concentration at the pre-breeding sample was 183.23 pg/mL, which was lower than the heifer sample (P<0.0001), but not different from the fresh sample (P>0.05). AFC and AMH at the heifer sample had a positive impact on AMH at the fresh sample (P<0.01). Pre-breeding AMH was positively impacted by both the fresh and heifer AMH concentration (P<0.001). Most animals kept their AMH categorization as HIGH, MID or LOW through all two time points with more of the LOW AMH animals maintaining their categorization than the other groups. Although no differences were seen in circulating AMH concentration based on health events, differences in AMH concentration across three time points indicate a drop in circulating AMH concentration post-calving but that animals maintain their AMH categorization relative to herdmates.

Part 2: To examine the reproductive performance of animals based on variations in breeding programs and Anti-Müllerian Hormone (AMH) concentrations, primiparous and multiparous (n=308) purebred, lactating Holstein cows were enrolled after calving. At 45-60 days in milk (DIM) blood was pulled and analyzed for AMH concentration and transrectal ultrasonography was performed to record antral follicle count (AFC), presence of corpora lutea (CL) and cyclicity status, and any uterine or ovarian anomalies. Animals were then randomly assigned to either an estrous detection (n=155) or a timed artificial insemination (TAI) (n=98) breeding protocol. First service conception rate, days in milk at breeding, as well as 7-day average milk-weight on the day of sampling and breeding were recorded. Animals were blocked by AMH concentration into HIGH (>272 pg/mL; n=103) MID (158-272; n=102) and LOW (<158 pg/mL; n=103) groupings. AMH concentration was positively correlated with AFC, lactation number, age and milk-weights (P<0.001). Conception risk to first service was not impacted by breeding protocol, AMH category or DIM (P>0.05); however, a numerical difference in conception risk by AMH level was seen with HIGH animal's having a 39.7% conception risk, MID animals being 40.2% and LOW animals only having a 28.8% risk. AMH concentration for animals conceiving to 1st service averaged 276.82 $\pm$ 195.20 pg/mL while AMH concentration for open animals following 1st service averaged 245.35 + 152.75 pg/mL. As lactation number increased, so did the likelihood that animals were bred on an estrous detection protocol vs. the TAI protocol (P=0.0018) Cyclicity was positively correlated with lactation number (P<0.0001). Though conception risk to first service was not impacted by AMH concentration, this study does potentially elucidate more information regarding variables correlated with AMH that were previously undescribed.

Added value of calf growth, health, and genetics measures to predict lifetime performance including profitability

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[1] University of Florida, [2] Colorado State University

Introduction: Prediction of future cow profitability based on early available calf information is a valuable tool to dairy farmers for raising the best replacement heifers. Cow profitability is determined by a combination of genetic and environmental factors. Disease events and reduced calf growth negatively impact the likelihood of a heifer to calve and reduces milk production. Furthermore, genetic predictions are available for calves as the average genetic value of the parents or through genomic testing. For dairy farmers considering culling surplus heifers, identification of the best animals to raise remains subjective. Linear regression models may be used to predict net profit, but linear assumptions may not hold. The machine learning method of random forest (RF) does not assume data distributions and thrives on large datasets with many predictors. Each method can be used to generate predictions to help cull the lowest heifers, however costs are incurred with each piece of additional information. Therefore, our objective was to determine the value of genetic and phenotypic information in early lifetime for prediction of net profit from calf selection with regression and random forest methods.

Materials and Methods: Data were collected on 3,256 heifer calves born between April 2012 and November 2014 that survived beyond 120 days of age from a single farm in Florida. These records contained genetic parent average estimates and genomic estimates, ordinal variables of health treatment records for respiratory, digestive, otitis, other health events and a combination of all health events and body weights. The response variables were survival to first calving and cumulative milk production through the second lactation. Two models were created for each prediction method. A mixed linear regression model was used for the continuous response of milk production through the second lactation for heifers that calved. The second model was a mixed logistic regression model for the binary response of survival to the first lactation. The RF method was trained with the same response variables in the two-model approach for the continuous and binary response. The expected net revenue of milk production through the second lactation from selection is the product of predicted milk production given first calving, the probability of survival to first calving and the fraction of heifers calves retained. Net profit is the expected net revenue from selection minus the cost of information, which is equivalent to the value of information.

Results and Conclusion: Net profit was very similar between the regression and RF methods in this dataset, indicating similar predictive ability. At low culling levels, the cost of genomic predictions was greater than net revenue, resulting in negative net profit. At higher culling levels, genomic predictions, health and growth combined resulted in the greatest net profit. When 20% of heifer calves were culled, net profit ranged from $123 to $256 per retained heifer. Additional sources of information may increase the predictive ability but are cost dependent. This approach can be expanded to better predict lifetime net profit from selection using other data sources from precision dairy farming and improved prediction methods.

Status: Graduate student Michael Schmitt completed this study and we are preparing articles for Extension and a peer-reviewed journal.

Florida 4-H Dairy Youth Program

Chris DeCubellis
4-H Dairy/Animal Science State Specialized Agent

Objectives

Today's youth are tomorrow's citizens, consumers, parents, employees, and leaders. In Florida 4-H, we offer age-appropriate, learn-by-doing educational opportunities to help prepare young people to be thriving citizens that contribute to society, and to have the skills necessary to prepare them for the workforce. The objectives of the youth dairy program are to provide young people with hands-on educational opportunities to positively develop skills in young people to help them mature into productive members of society so that they will thrive as adults; to help participating youth develop subject matter expertise related to dairy science; and to expose participants to career opportunities in the industry. It is hoped that lessons learned and achievements in youth programming will translate into success as an adult.

Methods

In local, state, and national youth dairy programs, young people participate in a variety of educational activities, events, and competitions to help them positively develop life skills and subject matter expertise as they proceed through their dairy projects and dairy related activities. Young people learn a tremendous amount of skills and responsibility through the rearing and daily care of project animals. Farm tours and hands-on clinics and workshops encourage young people to develop an understanding and appreciation for the skills and work necessary to provide dairy products for consumers. Competitions such as dairy quiz bowls, judging contests, public speaking contests, and dairy shows help young people hone technical skills and knowledge related to dairy science, as well as provides them an opportunity to practice life skills such as time management, responsibility, and the establishment of a strong work ethic.

Results

In 20018-19, over 1,200 Florida youth participated in some aspect of youth dairy programs, including farm tours, clinics, dairy product clinics, and dairy projects. Over 270 youth participated in a 4-H dairy project, exhibiting over 350 head of cattle at Florida fairs. Approximately half of the participants at the Southeast Dairy Youth Retreat were from Florida. Florida youth participated in dairy quiz bowl contests at the regional, state, and national levels, excelling in national competitions, including a first place and second place finish. Florida youth participated in state, regional, and national dairy judging opportunities. Florida won 1st place at the 2018 National 4-H Dairy Judging Contest at the North American International Livestock Exhibition in Louisville, Kentucky. Florida also had a Distinguished Junior Member at the 2019 Holstein Convention. Florida youth also participated in speech, tri-fold display, and video competitions related to dairy science at the state and national levels. Adult volunteers passionate about dairy science and developing young people continue to donate countless hours of their time and expertise to supplement youth programs. Florida youth are demonstrating skills in public speaking and decision making, and are gaining knowledge and expertise related to dairy science.

Implications/Conclusions

The number of youths participating in dairy youth opportunities in Florida remains strong, and there is room for continued growth. Young people are on a trajectory to thrive through their participation in youth dairy opportunities. It is hoped that these youth will consider careers in the dairy industry. However, for those who choose a career in another field, the lessons and skills learned today through youth dairy programming will pay off tremendous dividends for the remainder of their lives, and they will mature into productive citizens, and consumers who appreciate the hard work and skills necessary to produce the wholesome and nutritious dairy products they enjoy.

Developing black oat varieties for Florida dairies

Jose Dubeux[1], Ann Blount, Stephen Harrison, Lynn Sollenberger, Joe Vendramini, Cheryl Mackowiak, Nicolas DiLorenzo

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Black oat (*Avena strigosa* Schreb) is a cool-season annual grass that has Mediterranean origin and has been used in Europe for centuries. Black oat is also successfully used in the southern portion of South America, in regions with similar latitude to Florida. It is best adapted to sandy or loamy soils, but it also grows in heavy clay and soils with low fertility. Compared to annual ryegrass or other cool-season small grains, black oats are more heat tolerant and disease resistant, allowing an early planting in late August/early September. Black oats can also be planted in late winter/early spring and fill another forage gap in April-June. The overall objective of this on-farm, multi-site, and outreach-oriented research was to assess the potential of black oat varieties in different Florida locations, including dairy farms and experimental stations, located in North, Central, and South Florida. The ultimate goal is to release new black oat varieties for the Florida Dairies. Specific objectives included: seed increase and evaluation of 22 black oat lines in a joint collaboration with LSU AgCenter; assessment of yield and nutritive value of black oat lines and contrast with other cool-season forages such as cereal rye (*Secale cereale* L.), triticale (*X Triticosecole* Wittmack), annual ryegrass (*Lolium multiflorum* L.), and oats (*Avena sativa* L.); establishment of on-farm demonstration sites, comparing black oats with other cool-season grasses; and assessment of early planting in July and regular planting in the Fall (Oct-Nov). Our results demonstrated: 1) In South Florida (RCREC-Ona), black oats were better than other small grains (rye, oat, triticale) and annual ryegrass. In Central (UF Dairy in Gainesville and North Florida Holstein in Bell) and North Florida (Marianna), black oats had similar productivity than the most productive oat (Legend 567) and other small grains/annual ryegrass; 2) In Ona, the plant introduction (PI) CI7280 showed the best results, being a promising cultivar for future release; 3) Nutritive value of black oats is high, comparable to other cool-season forages. Average IVOMD ranged from 75 to 80% and crude protein from 20 to 24%; 4) During the Fall, no major diseases were identified in black oats. During the summer planting, leaf spot (*Bipolaris* spp.) was observed not only in black oats, but in all cool-season forages planted; 5) Because of limited seed supply, in 2016-2017 we only tested 10 lines/cultivars of black oats in Marianna and Ona, and only five lines in North Florida Holstein and at the UF-Dairy. We seed-increased 22 lines of black oats. 6) Summer planting was problematic regarding weed management and presence of leaf spot. Fall planting seems more adequate for black oat establishment. Currently, the best black oat lines are participating in regional trials for future release.

Producers and collaborators: 1) Mr. Don Bennink - North Florida Holsteins, Gilchrist County Florida; 2) Mr. Jerry Wasdin - UF Dairy, Alachua County, Florida; 3) Range Cattle Research and Education Center, Ona, FL

Seasonal variation in rectal temperature and milk yield for cows housed in tunnel ventilation barns

Peter J. Hansen, Serdal Dikmen, and Colleen C. Casey
University of Florida and Uludag University, Bursa, Turkey

Introduction: New engineering approaches to mitigate effects of heat stress on dairy cattle are based on increasing heat loss via either conduction, convection, evaporation, radiation, or some combination. In some cases, new technology is adopted by dairies before scientific data have been obtained to scrutinize the effectiveness of a new cooling system. In addition, existing housing is sometimes retrofitted so that the cooling system is not engineered to produce optimal results. Therefore, the expected increase in cooling from adoption of a new cooling technology does not always occur. The purpose of the proposal was to evaluate the effectiveness of the tunnel ventilation barn – for reducing seasonal variation in body temperature and milk yield.

Objective: Determine whether seasonal variation in rectal temperature and milk yield is lower for cows maintained in tunnel ventilation barns than for cows maintained in free stall barns.

Results: Rectal temperatures were measured for 1502 lactating Holsteins located on 9 dairies during the summer. Cows on four dairies were housed in tunnel ventilation barns and cows on five dairies were housed in free stall barns with sprinklers and fans. Rectal temperatures were measured between 2:00 and 4:00 PM. Overall, cows in tunnel barns had lower (P-value = 0.014) rectal temperature (101.7°F) than cows in free stall barns (101.9°F). In a second analysis, it was tested whether milk yield during the first 90-days of milk would be greater for cows in tunnel ventilation barns than cows in free stall barns. Milk yield records from 6528 cows on 4 dairies with free stalls and 3 dairies with tunnel ventilation were analyzed. Milk yield was greater (P-value < 0.0001) for cows in tunnel ventilation barns than conventional barns (91.2 lb vs 87.5 lb).

Conclusion: These results indicate cows in tunnel ventilation barns have improved ability to regulate body temperature in summer and greater milk yield during the first 90-days in milk. Additional statistical analysis is underway to further elucidate interactions of housing system with month of calving and to estimate the return on investment of constructing tunnel barns.

Improving Nitrogen Fertilizer Use Efficiency for Cool-Season Forage Production on Southeastern Dairies

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Colleen Larson[4] **and Mary Sowerby**[5]
[4] Okeechobee County, [5] Suwannee County, FL

Forage yield gains typically occur when the best genetics are coupled with optimal nutrient management. Although N often limits non-legume forage production on Florida dairies, it is also considered a major potential nutrient contaminant of Florida groundwater and springs.

Objectives: 1) test soluble and controlled release (polymer coated) N fertilizers at different proportions, 2) test new forage lines and management at dairies, and 3) support agent-driven, on-farm forage management demonstrations and field day events.

Methods: Three dairies participated in testing the effects uncoated versus coated N fertilizer proportions had on annual ryegrass and small grains production, as well as nutrient export. The polymer-coated urea, Environmentally Smart Nitrogen (ESN, Agrium, Denver, CO) was supplied at 0, 25, 50, 75, or 100% of the total mineral N supplement (40 lbs N/acre) was in addition to dairy N practice. Annual ryegrass (Earlyploid), triticale (Tricale 342), rye (FL401), and oat (FL0567) were tested. Yield, as well as tissue and soil nutrient content were assessed.

Results: Supplementing an additional 40 lbs N/acre at planting increased forage yields across dairies; however, the dairy with the greatest coarse/sandy soil benefitted most. For example, applying 40 lbs N at 100% soluble, increased rye yield 15% and oat yield 30% over not supplementing. Crude protein increased from 8.8 to 12.6% for rye and from 12.3 to 13.3% for oat. In comparison, applying the supplemental N as 50% ESN, resulted in 56% greater ryegrass yield and 25% greater triticale yield, compared to not supplementing. Crude protein increased from 12.6 to 14.5% for ryegrass, but it remained unchanged at 12.4% CP for triticale.

Implications: Supplementing with an additional 40 lbs N/acre (100% soluble or 50:50 soluble:slow-release), increased nutrient export, which helps the environment. An extra 24, 23, and 61 lbs N/acre was exported out of the field via rye, oat, and ryegrass biomass, respectively (but no change with triticale). The supplemental N also increased P exports by 21, 21, 48, and 23 lbs P_2O_5/acre, for rye, oat, ryegrass, and triticale, respectively. When forage genetic potential is realized through good nutrition, less environmental impact is expected.

As of 2019, two cereal ryes and one triticale will soon be released as new cultivars. The releases resulted from our efforts to produce novel cultivars that fit the needs of the southeastern dairy and beef cattle industries and were tested on dairies in 2017 through this check-off. The FL2X 405 cereal rye is a leafier version of FL401 rye, often used in dairy silage production or as an early forage producer in mixtures with ryegrass for grazing dairies. Both, FL2X 406 cereal rye and FL08128 triticale, are excellent full-season forage producers and will fit well in dairy operations, either for grazing or silage. Agent-led field days hosted at dairies were well-attended.

Forage feeding for group-housed dairy calves: Impacts on performance and behavior

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Providing access to forage has been shown to influence feeding behavior and non-nutritive oral behavior in individually housed calves, and these effects may be enhanced or altered in calves reared in social housing. We evaluated the effect of hay provision on the behavioral development and performance of group-housed dairy calves. Holstein calves (n = 32) were group-housed (4 calves/group) at 17 ± 3 (mean ± SD) d of age. All calves were provided milk replacer (8 L/d) via an automated milk feeder and pelleted starter and water ad libitum. Pens were randomly assigned to receive either chopped coastal Bermuda grass in buckets adjacent to the starter trough (starter and hay, STH; n = 4 pens), in buckets adjacent to the starter trough, or no additional feed (starter only, ST; n = 4 pens). Calves were weaned through a 10 d step down program beginning at 46 d of age. Intake of solid feed and hay were recorded daily and body weights were measured weekly. The behavior of 2 focal calves/pen was recorded continuously from video for 12 h on 2 consecutive days during each of wks 4, 6, and 7 of life, to measure solid feed intake time, grooming, and pen-directed sucking. Hay provision influenced total feed intake, with pens provided hay having greater total solid feed intake in the week prior to weaning (0.79 vs 0.55 kg/d; STH vs ST; SE = 0.19). Average daily gain (ADG) was similar during the pre-weaning period, but tended to be greater during weaning for calves that received hay. Calves in pens provided hay also had fewer unrewarded visits to the milk feeder during weaning (12.5 vs. 21.1 visits/12 h; STH vs. ST; SE = 3.59) and performed less pen-directed sucking (9.11 vs. 19.3 min/12 h; STH vs. ST; SE = 2.86). Self-grooming time and bout characteristics evolved differently between treatments over time, with pens of calves provided hay having a greater increase in the frequency and duration of self-grooming bouts during weaning. Overall, we found that providing hay to pre-weaned calves resulted in behavioral and performance benefits, including greater total feed intake and reductions in pen-directed sucking, suggesting that access to hay may improve calf welfare.

Effects of calcitriol treatment on resolution of mastitis in dairy cows

Corwin D. Nelson[1] **and Lorraine Sordillo**[2]
[1] University of Florida; [2] Michigan State University

Students: Teri Williams, Michael Poindexter, and Mercedes Kweh

Background: Recent reports have indicated vitamin D_3 facilitates induction of innate host defenses in cattle and may have critical implications for defense against mastitis. We hypothesized that vitamin D signaling in the mammary gland improves resolution of intramammary infections. The objective of this study was to determine the effect of intramammary 1,25-dihydroxyvitamin D_3 (calcitriol) treatment on indicators of inflammation during an intramammary bacterial infection.

Procedures: Lactating dairy cows received an intramammary challenge with *Streptococcus uberis.* After the onset of mild or moderate mastitis, cows were randomly assigned to receive 10 µg of calcitriol (n = 7) or placebo (sterile PBS; n = 6) after every milking for 5 days. Data were analyzed by ANOVA with mixed models using the MIXED procedure of SAS with significance declared at $P \leq 0.05$.

Results: Milk somatic cells, mastitis severity scores, rectal temperatures, and milk bacterial counts were not different between treatments. Percentages of neutrophils in milk were decreased ($P \leq 0.05$) in calcitriol-treated cows compared with placebo. The antioxidant potential and concentrations of 8-iso-15R isoprostane, a marker of inflammation, in milk of infected quarters also were decreased ($P \leq 0.05$) in calcitriol-treated cows compared with placebo. Transcript abundance for the 25-hydroxyvitamin D 24-hydroxylase and inducible nitric oxide synthase were greater ($P \leq 0.05$) in milk somatic cells of calcitriol-treated cows compared with placebo.

Conclusion and implications: Although administration of 10 µg of calcitriol had no effect on clinical signs of severity, the percentage of neutrophils in milk and indicators of redox activity were decreased by intramammary calcitriol treatment. Use of vitamin D metabolites offer the potential to decrease severity of mastitis on the basis of inflammatory indicators observed in this project.

Additional funding was provided by the Michigan Animal Health Alliance to Lorraine Sordillo

Milk Check-Off Veterinary Student Scholarship

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Department of Large Animal Clinical Sciences, University of Florida

Objective:

The objective is to encourage and recognize junior and senior veterinary students who have shown outstanding leadership qualities, scholastic abilities and proficiency in dairy cattle production medicine.

Background:

The Food Animal Reproduction and Medicine Service (FARM Service) in the College of Veterinary Medicine (CVM) has developed a Certificate in Food Animal Veterinary Medicine (FAVM), which is offered to encourage the development of students capable of providing professional service to the area of food animal medicine upon graduation. Students participating in the certificate program are mentored through didactic, clinical and extracurricular activities that provide a strong entry level training in food animal veterinary medicine. Faculty mentors play an important role in helping students clarify and pursue their career goals and set the path for their completion of certificate requirements.

Students who successfully complete the certificate program receive a University of Florida certificate and accompanying transcript annotation that documents their directed training in FAVM. The certificate identifies a new graduate veterinarian as capable and ready for an entry-level position in a food animal practice or a food systems profession. The certificate provides students an edge in employment readiness because of their dedication, work ethic and commitment to the certification process. They are better prepared to provide leadership in the area of food systems veterinary medicine. This process also prepares the way for specialty training in an internship and (or) residency program and (or) advanced training in a graduate education (MS, PhD) program.

This scholarship is awarded to a certificate candidate who has met the following criteria.

Criteria:

The award is to be made to a junior or senior student who have shown outstanding leadership qualities, scholastic abilities and proficiency in dairy cattle production medicine. Special consideration is given to students that have an interest in the practice of food animal medicine in Florida after graduation.

Justification:

This scholarship award is in support of annual scholarships in the UF/College of Veterinary Medicine

Requested: $1,000.00

Recipient for 2019: Wayne Garcia (Class of 2020)

- Active and leader in the UF CVM Food Animal Club and the UF Dairy Science Club
- Florida native
- Dairy externships in New York, New Mexico, Florida
- Recipient of the American Association of Bovine Practitioners Amstutz and Zoetis Veterinary Scholarships.
- Participated in the US Dairy Education and Training Consortium
- Participated in several dairy research project,
    - *Using honey to treat udder cleft dermatitis (2017)*
- Participant in the Regional and National Dairy Challenge (2016)

Identification of causal variants underlying sire conception rate

Francisco Peñagaricano
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Background: Fertility is arguably a very important economic trait in dairy cattle. Most studies have investigated cow fertility, while service sire fertility has been largely overlooked. However, recent studies have shown that service sire has a considerable impact on herd fertility. The goal of this research project was to perform a comprehensive genomic analysis of dairy bull fertility including gene mapping and genomic prediction.

Methods: Sire conception rate (SCR) was used as a measure of service sire fertility. The analysis included 11,500 U.S. Holstein bulls with SCR records and about 300k single nucleotide polymorphism (SNP) markers spanning the entire genome.

Results: Five genomic regions located on chromosomes BTA8, BTA9, BTA13, BTA17 and BTA29 showed significant effects on bull fertility. Most of these regions harbor genes, such as *ADAM28*, *DNAJA1*, *TBC1D20*, *SPO11*, *PIWIL3* and *TMEM119*, that are directly implicated in testis development, male germ line maintenance, and sperm maturation. Interestingly, the inclusion of these five major markers as fixed effects in predictive models increased predictive correlations to 0.403, representing an increase in accuracy of about 20% compared with the standard whole-genome model.

Conclusions: This study contributes to the identification of genetic variants and individual genes responsible for the genetic variation in bull fertility. The inclusion of markers with large effect markedly improved the prediction of dairy sire fertility. This research is the foundation for the development of novel genomic tools that could help the dairy industry make accurate genome-guided selection decisions on service sire fertility.

Outcomes: Scientific papers published with this grant:

- P Nicolini, R Amorín, Y Han, and F Peñagaricano (2018) Whole-genome scan reveals significant non-additive effects for sire conception rate in Holstein cattle. *BMC Genetics* 19: 14.
- JP Nani, FM Rezende, and F Peñagaricano (2019) Predicting male fertility in dairy cattle using markers with large effect and functional annotation data. *BMC Genomics* 20: 258.

Building capacity for use of genomics to advance dairy science research

UF/IFAS Dairy Cattle Research Group

Background: The advent of genomics has revolutionized dairy cattle research. The identification of genomic regions, individual genes and specific mutations controlling economically relevant phenotypes have multiple benefits, including better understanding of the biology underlying these complex traits, promote the development of new management practices, and contribute to the design of novel genomic methods for improving dairy cow profitability via selective breeding. Additionally, in dairy cattle research, genomics can be used to properly design and analyze experiments.

Objectives: The goal of this proposal was to build capacity for use genomic data in our dairy cattle research programs. Specific aims: (1) develop a database of genomic information on heifers born at the UF/IFAS Dairy Unit for use by all investigators; (2) create a DNA bank from heifers born at the UF/IFAS Dairy Unit that can be used to exploit new genotyping or sequencing technologies in the near future.

Results: We genotyped around 130 heifers with this grant. Heifers were genotyped using CLARIFIDE® Ultra Plus, a commercially available genotyping platform with roughly 62,000 genetic markers across the entire bovine genome. Now, since 2015, we have been genotyping every heifer born at our dairy research herd using a variety of funds, including federal, industry, and milk check-off grants. Our current database has almost 2,000 genotyped animals.

Outcomes: Some research performed using genotype data from the UF/IFAS Dairy Unit:

- HA Pacheco, S da Silva, A Sigdel, CK Mak, KN Galvão, RA Teixeira, LT Dias, F Peñagaricano (2018) Gene mapping and gene-set analysis for milk fever incidence in Holstein dairy cattle. *Frontiers in Genetics* 9: 465.
- A Sigdel, R Abdollahi-Arpanahi, I Aguilar, F Peñagaricano (2019) Whole genome mapping reveals novel genes and pathways involved in milk production under heat stress in US Holstein cows. *Frontiers in Genetics* (in press).