**Proceedings of the 54th**

# FLORIDA DAIRY PRODUCTION CONFERENCE

Alto Straughn IFAS Extension Professional Development Center
Gainesville • Florida • September 26, 2018

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

**Proceedings of the**

# 54th Florida Dairy Production Conference

## Wednesday, September 26, 2018

**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
Albert De Vries
Colleen Larson
Francisco Peñagaricano
José Santos

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Proceedings from past Florida Dairy Production Conferences are available at http://dairy.ifas.ufl.edu

## Table of Contents

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# Program

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## 54th Florida Dairy Production Conference

**Wednesday, September 26, 2018**
**Alto Straughn IFAS Extension Professional Development Center**
**Gainesville, Florida**

| | |
|---|---|
| 9.00 AM | ***Welcome and opening remarks***<br>**Thomas Obreza** (Senior Associate Dean for Extension, University of Florida) |
| 9.10 | ***Team building to maximize performance and animal welfare***<br>**Don Niles** (Dairy Dreams, Wisconsin) |
| 9.50 | ***The economics of animal welfare***<br>**Ricardo Chebel** (University of Florida) |
| 10.20 | BREAK |
| 10.50 | ***How to implement a successful milk quality program***<br>**Pamela Ruegg** (Michigan State University) |
| 11.30 | ***Impact of transition disorders on production and reproduction performance***<br>**Rafael Bisinotto** (University of Florida) |
| 12.00 PM | LUNCHEON |
| 1.30 | ***Feeding transition cows***<br>**Michael Hutjens** (University of Illinois) |
| 2.15 | ***Forage options for dairy farms in the southeast***<br>**Jose Dubeux** (University of Florida) |
| 3.00 | BREAK |
| 3.30 | ***My experience with undercover activist videos: improving public perception of dairy production***<br>**Jacob Larson** (Larson Dairy, Florida) |
| 4.00 | ***Optimizing dairy cattle management and welfare***<br>**Kyle Averhoff** (Royal Farms Dairy, Kansas) |
| 4.30 | ***Producer Panel***<br>Moderator: Albert De Vries |
| 5.00 | RECEPTION |

# TEAM BUILDING TO MAXIMIZE PERFORMANCE AND ANIMAL WELFARE


2018 Florida Dairy Production Conference

Don Niles, Dairy Dreams LLC


## THE MODERN BOVINE MATERNITY WARD

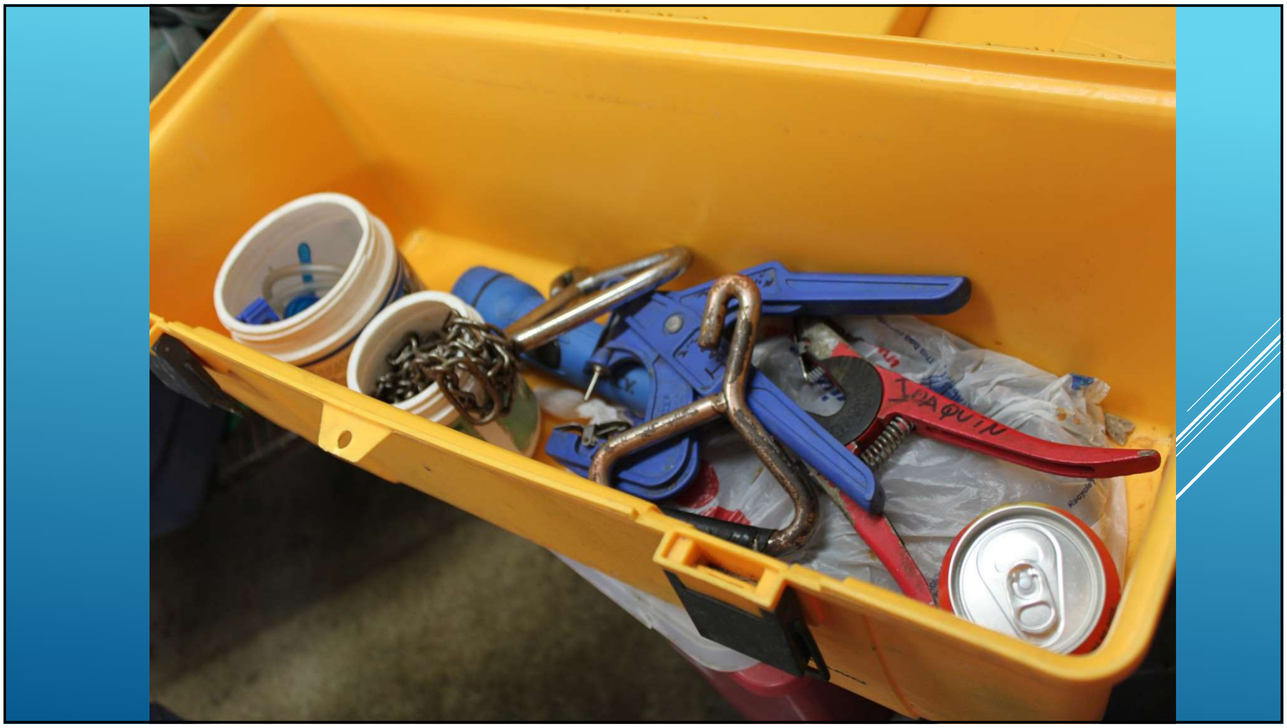
Focusing the greatest attention on the animals that need the greatest care

## MATERNITY PHILOSOPHY

- Strive for maternity perfection
  - Sexed semen, TAI meds, ET, breeders all cost $
  - **Most important reason-** because we can and we should. Culture of continuous improvement
- Mimic human maternity care as our model

# MATERNITY PERFORMANCE

- DOAs
  - Goal < 2%
  - Each DOA is an event that needs to be investigated
    - Interview
    - Camera
    - Post Mortem?



- Wash
- Check position
- Both arms help dilate
- Release
- Monitor for progress – 20 min
- On recheck – sanitize
- Distress more action


| Date/Fecha | Cow ID/Identida Arete | Pen/corrall | M/F - sexo | Calf ID | Casa de vecerras | Difficulty - Dificultad | Time Born - horan | Time Fed - comir | Colostrum - total leche | Colostrum Meter Reading - mide leche | Feeder - quien comir | Puller - quien saca | Teats - teta | Calf Weight | Calcium bolus | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6-16-12 | 11255 | 11 | M | | 15 | 1 | 2:00 | 2:20 | 2 | 60 | O | O | 4 | 96 | B.C | |
| ↓ | 4471 | 11 | M | | 14 | 1 | 3:35 | 4:10 | 2 | 60 | O | O | ↓ | 90 | B.C | |
| ↓ | 7263 | 11 | m | | 13 | 1 | 3:40 | 4:15 | 2 | 60 | O | O | ↓ | 82 | B.C. | |
| ↓ | 11051 | 11 | f | 15213 | 11 | 1 | 6:15 | 6:40 | 2 | 60 | JU | JU | ↓ | 88 | B.C. | |
| ↓ | 12587 | 9 | f | 15214 | 12 | 1 | 6:30 | 7:00 | 2 | 70 | JU | JU | ↓ | 79 | | 269 |
| ↓ | 10519 | 11 | M | | 16 | 1 | 6:40 | 7:20 | 2 | 60 | JU | JU | 3 | 83 | B.C. | |
| ↓ | 9772 | 11 | f | 15215 | 10 | 1 | 9:00 | 9:20 | 2 | 60 | JU | JU | 4 | 90 | B.C. | |
| ↓ | 7571 | 11 | f | 15216 | 8 | 1 | 10:10 | 10:20 | 2 | 60 | JU | JU | 4 | 104 | B.C | |
| 6-17-12 | 12521 | 9 | M | | 7 | 1 | 1:55 | 2:20 | 2 | 70 | JU | JU | 4 | 91 | | |
| ↓ | 9627 | 11 | M | | 3 | 1 | 4:50 | | 2 | 60 | JU | JU | 3 | 69 | | |
| | 10636 | 11 | M | | 2 | 2 | 9:50 | 10:10 | 2 | 80 | O | O/S | 4 | 101 | | |

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| 15150 | 6.0 | 6/ 5/12 | 60 | O | 8335 |
| 15151 | 6.4 | 6/ 5/12 | 60 | R | 12578 |
| 15152 | 5.8 | 6/ 5/12 | 1 | R | 11196 |
| 15153 | 5.6 | 6/ 5/12 | 60 | J | 11155 |
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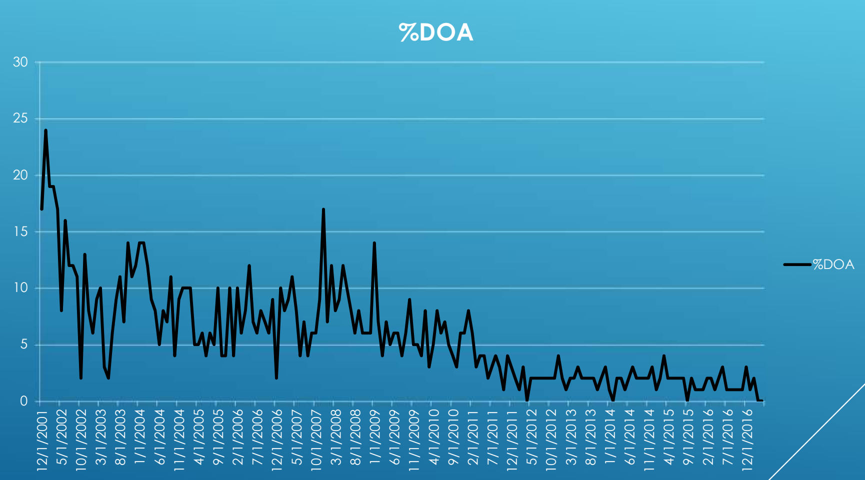


- 24 hr, round the clock, dedicated maternity care
- Clean sheets/clean straw
- Initial exam followed by natural progression unless assistance required
- Clean instruments/clean instruments
- Ice chips, IV electrolytes/bucket of electrolytes

## HUMAN/BOVINE PROCEDURES

## WHERE ELSE CAN TEAM BUILDING APPLY TO ANIMAL WELFARE?

- Timed AI Protocols
- Infectious Disease Control
  - BLV
  - Johnes

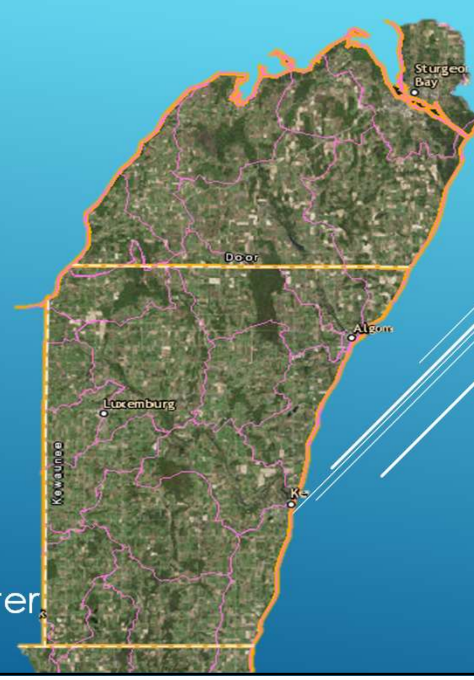
# PENINSULA PRIDE FARMS

A secure future for farmers and our neighbors

PENINSULA PRIDE FARMS

## WHO WE ARE

- Farmer-led, not-for-profit organization in Kewaunee and southern Door counties
- Farmers, businesses, agencies focused on improving surface and ground water quality



PENINSULA PRIDE FARMS

## GOALS FOCUS ON IMPROVEMENT

- Define issues, set goals and determine how to measure progress
  in protecting surface and ground water
- Evaluate member farms to craft individual plans
  for continuous improvement
- Assist farmers in meeting voluntary standards recommended
  by state workgroup for sensitive fields

PENINSULA PRIDE FARMS

## MEMBER FARMS VARY IN SIZE

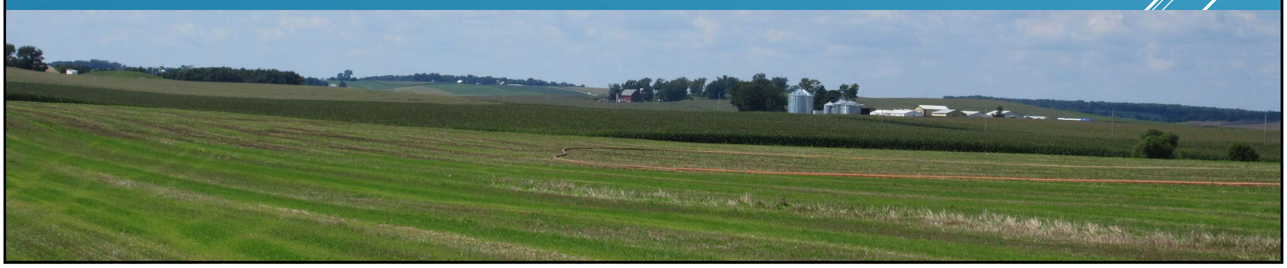
- 46 dairy and crop farmers
- Dairy sizes, 60 to 6,000 cows
- 34,755 cows – 50% of area cows
- 69,737 acres – 50% of tillable acres

Mark and Lisa Schmidt family, Casco, Wis.

PENINSULA PRIDE FARMS

## MEMBERS MUST SHOW COMMITMENT

- Continuous improvement in farming practices
- Independent analysis of nutrient management plans



PENINSULA PRIDE FARMS

## DUES, DONATIONS SUPPORT EFFORTS

- Two-tier membership dues based on farm size
- Grants including start-up matching grant from state ag department
- Donations from businesses that support our mission

**Note:** Peninsula Pride Farms is a 501c3 so donations are tax deductible.

PENINSULA PRIDE FARMS

## WE AIM TO PROTECT LAKES, STREAMS

- Focus on surface water
- Improving soil health
- Reducing phosphorus loss

PENINSULA PRIDE FARMS

## WE WANT SAFE DRINKING WATER

- Focus on ground water
- Reduce pathogens
- Reduce loss of nitrogen

PENINSULA PRIDE FARMS

"We will empower farmers with knowledge, training and shared experiences. And we will demonstrate how the agricultural community is committed to doing its fair share in making improvements."

PENINSULA PRIDE FARMS

**"The Door County Peninsula can have both safe, clean water and a thriving agricultural community."**

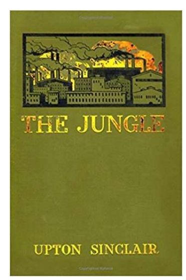
## NOTES

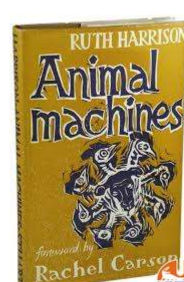
# Economics of Animal Welfare

**Ricardo C. Chebel**
***Department of Large Animal Clinical Sciences &***
***Department of Animal Sciences***

## Historical Perspective of Animal Welfare

- "The Jungle" – Upton Sinclair (1906)
  - Novel describing the hardship encountered by immigrants arriving in industrialized cities (e.g. Chicago) and working in the meatpacking stockyards
  - Descriptions of poor work conditions and hygiene promoted changes in the food industry ("Pure Food and Drug Act" and "Meat Inspection Act")
- "Animal Machines" – Ruth Harrison (1965)
  - Report of animal conditions during a period of increasing scale and mechanization of food producing systems (e.g. veal calves, battery cages)
  - British government commissioned Roger Brambell (1965) to investigate welfare of intensively farmed animals



## Five Freedoms
## (UK's Farm Animal Welfare Council, 1979)

**Freedom** from/to

- Thirst, hunger, malnutrition → Access water/feed to maintain health and vigor
- Discomfort, exposure → Shelter and resting area
- Pain, injury, disease → Prevention, diagnosis, treatment
- Fear, distress → Prevent mental suffering
- Express normal behavior → Facilities, companionship

Five Domains of Potential Welfare Compromise

## The Struggle of Animal Welfare

**Science Based Guidelines**

**Sustainability**

### Public Perception

A growing number of people are calling for more "humane practices" in the treatment of animals. These individuals are generally of nonfarm background (Albright, 1983)

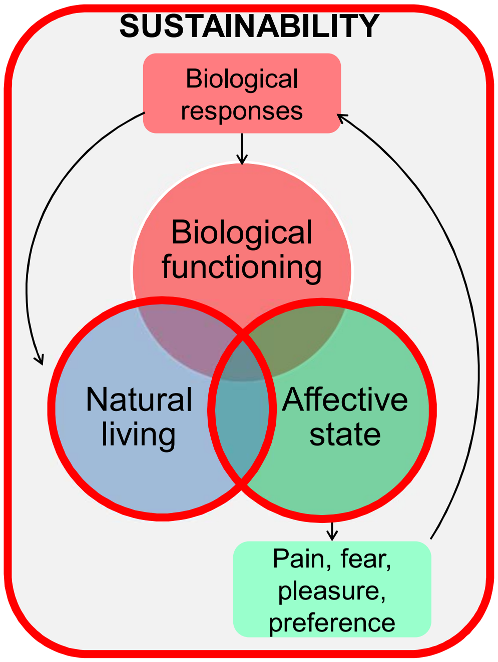
### Profitability

Farmers perceive animal welfare standards as:

- Means of achieving economic results
- Means of satisfying moral and ethical considerations (Cornish et al. Animals 6:74-91)

- The public have a rudimentary understanding of animal welfare. To improve welfare we must address the shortcomings in the public's understanding, knowledge and awareness of the environmental, social, human health and animal welfare impacts of all animal production systems (Cornish et al. Animals 6:74-91)

# Areas of Animal Welfare Concern




- According to the World Organization for Animal Health:
  - Good animal welfare is present when animals are healthy, comfortable, well nourished, safe, able to express innate behavior, and are not suffering from pain, fear, and distress
  - Animal-based measureable outcomes (beef): behavior, morbidity and mortality, changes in BCS, reproductive efficiency, and physical appearance

Fraser et al. (1997)

# Cattle Losses

Stillbirth
1992 = 1.6%
2007 = 5.6%

Mortality
1992 = 7.6%
2007 = 7.8%

**Mortality = 1.8%

*Culled = 28.4%
*Died = 4.8%

NAHMS (1992, 2007** and 2014*)

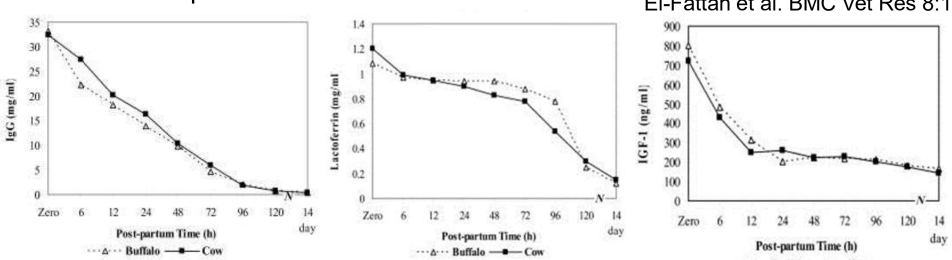
# Colostrum

Do all calves receive colostrum or colostrum replacer soon after birth even if immediately transported off the farm?

# Colostrum Management

- Prevention of diseases in new born calves and promote proper growth
- Colostrum composition

El-Fattah et al. BMC Vet Res 8:19-25

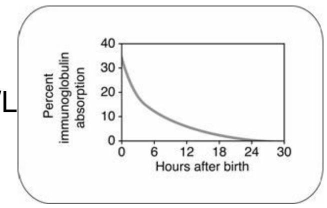



| Components | Colostrum | Transition | | Milk |
|---|---|---|---|---|
| | 1st milking | 2nd milking | 3rd milking | 6th milking |
| Fat | 6.7% | 5.4% | 3.9% | 4% |
| Total protein | 14% | 8.4% | 5.1% | 3.1% |
| Lactose | 2.7% | 3.9% | 4.4% | 5% |
| Insulin | 65.9% | 34.8% | 15.8 | 1.1% |

Hammon et al. J Dairy Sci 83:85-92
Foley et al. J Dairy Sci 61:1033-1060

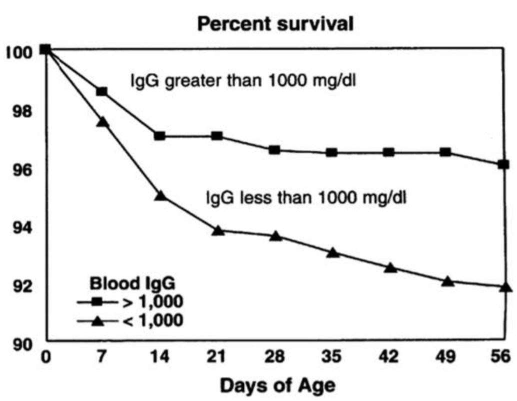
# Colostrum Management

- A calf needs ~ 15 g of IgG per L of serum
  - 88 lb (40 kg) body weight
  - Blood = 10% of BW (25 to 30% hematocrit)
  - 40 kg x 0.10 = 4,0 L of blood (4,0 L x (1-0.25) = 3,0 L of serum)
  - 3,0 L of serum = 45 g of IgG
- Absorption of IgG (and other substances) depends on time of feeding of colostrum
  - Absorption in the first 2 h ~ 35%
  - IgG concentration in good colostrum = 50 to 70 g/L
    - Only 36% of colostrum (Besser et al. JAVMA 198:419)
  - 2 L at birth = 42 g of IgG (border line)
  - Recommendation = 4 L at birth and 2 L within 6 h of birth

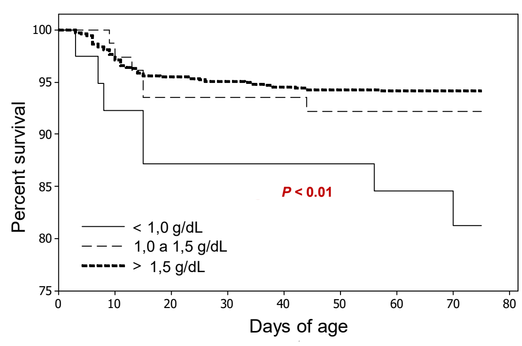



http://www.omafra.gov.on.ca/english/livestock/veal/facts/08-001.htm

# IgG Serum Concentration and Calf Survival




NAHMS. National dairy heifer evaluation project. (USDA-APHIS Veterinary Services; 1993)




Perdomo et al. J. Dairy Sci. *in-review*

- When the price of a female calf is $250 to $500, failure of passive transfer costs the dairy additional $27.8 to $88.2 per calf raised in the herd

## Effect of Volume of Colostrum Fed at Birth and Lactation Performance

- Brown Swizz calves fed 2 or 4 L of colostrum at birth
- Identical management thereafter

| | Amount of colostrum fed at birth | | |
|---|---|---|---|
| | 2 L (n = 37) | 4 L (n = 31) | P – value |
| ADG, kg/d | 0,8 ± 0.02 | 1,0 ± 0.03 | < 0.01 |
| Milk yield 1st lactation, kg (305-d ME) | 8,952 ± 341 | 9,907 ± 335 | < 0.01 |
| Milk yield 2nd lactation, kg (305-d ME) | 9,642 ± 341 | 11,294 ± 335 | |
| Survival to the end of 2nd lactação, % | 75.3 | 87.1 | NS |

- Veterinary costs for calves fed 2 L nearly doubled compared with 4 L
- Over two lactations, milk yield of calves fed 4 L of colostrum was 1,210 lb greater than the milk yield of calves fed 2 L
- If the difference in survival is true, the cost of culling would be nearly $93.70/cow in the herd when the cost of replacement is $700

Faber et al. (2005) Prof. Anim. Sci 21:420-425

## Lameness

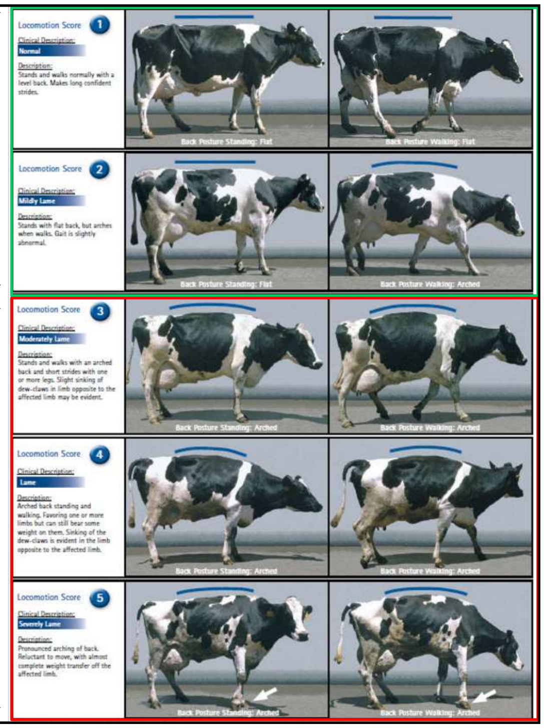
- The FARM Program has several evaluation points for foot health:
  - 95 percent of the lactating and dry dairy herd scores a 2 or less, where 1 is sound, 2 is moderately lame and 3 is severely lame
  - The dairy farmer is taking action to improve animals with severe lameness
  - A lameness prevention protocol is in place
- Severely lame cow being defined as an animal either unable to move, or able to move, but barely able to bear weight on the affected limb. Signs may also include back arch, poor body condition, head bob and an inability to flex the lower leg joints

# Locomotion Scoring

Considered normal

Considered abnormal

Associated with reduced milk yield and fertility and increased culling



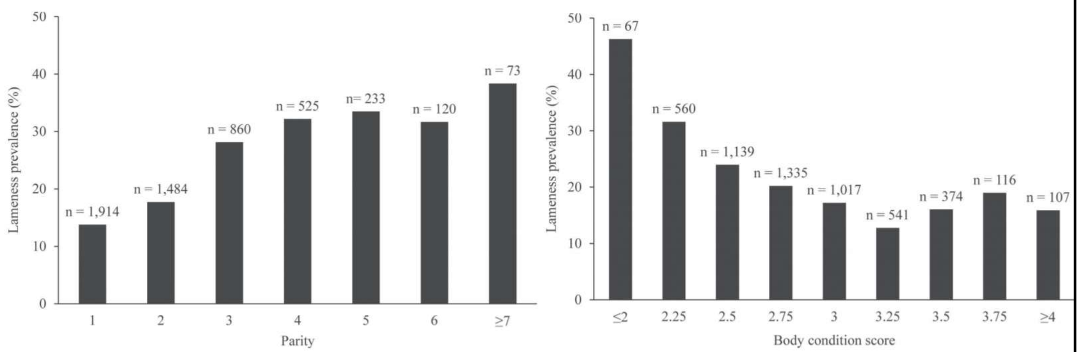

Fonte: Zinpro

# Prevalence of Lameness and associated Risk Factors in Canadian Herds

- Experiment conducted in 141 freestall Canadian dairies
- ~40 cows between 10 and 120 DIM sampled (~29% of the herd)
- Cows scored for lameness = limping present (score of ≥ 3 on a 5-point scale)
- Cows were scored for leg cleanliness, BCS, hock injuries, and claw length
- Additional information collected:
  - Pen space and flooring (type of flooring, width of feed alley, floor cleanliness, and floor slipperiness)
  - Stall management (stocking density, stall dimensions, stall base, stall bedding type, cleanliness, quantity, and dryness)
  - Footbath (Length, depth, and width were measured, frequency of use, frequency of changing solutions, products used and their concentrations)

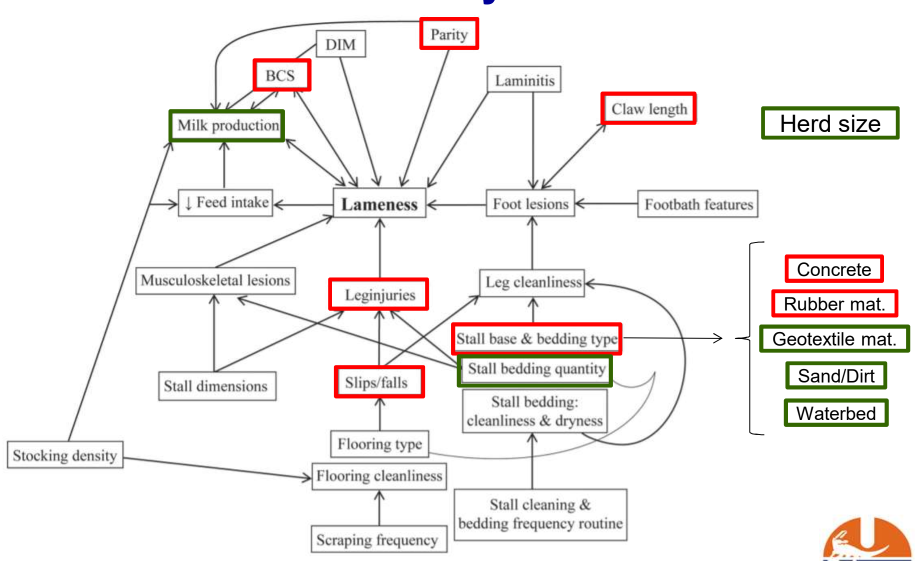
Solano et al. (2015) JDS (98):6978-6991

## Prevalence of Lameness according to Parity and Body Condition Score




Solano et al. (2015) JDS (98):6978-6991

## Causal-Web of Factors Hypothesized to affect Lameness in Dairy Cows



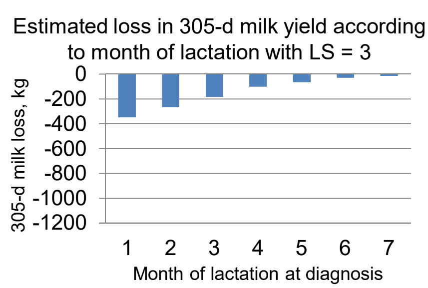

Solano et al. (2015) JDS (98):6978-6991

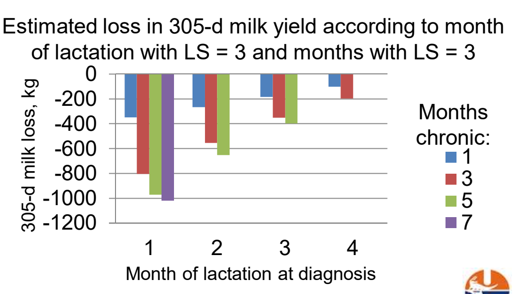
## Lameness associated Loss in Milk Production

- New York data: 2,520 Holstein cows from 2 herds (Warnick et al., 2001)
  - First event of lameness treatment and foot lesion/hoof overgrowth recorded (incidence = 48.6%)
  - As much as 5.7 lb/d loss in milk yield after diagnosis
- Florida data: 465 Holstein cows from 1 herd (Hernandez et al., 2005)
  - Locomotion score of cows (0 to 5) weekly from calving to 100 DIM
  - Lame cows classified into low (22 to 42), medium (43 to 47), and high (48 to 63) cumulative sums of weekly locomotion score
  - Association of severity of lameness and 305-d milk yield:
    - High vs. medium scores = ↓ 668 lb less 305-d milk (*P* = 0.17)
    - Medium vs. low scores = ↓ 976 lb less 305-d milk (*P* = 0.09)
    - High vs. low scores = ↓ 1,643 lb less 305-d milk (*P* = 0.01)

## Locomotion Score associated Loss in Milk Production

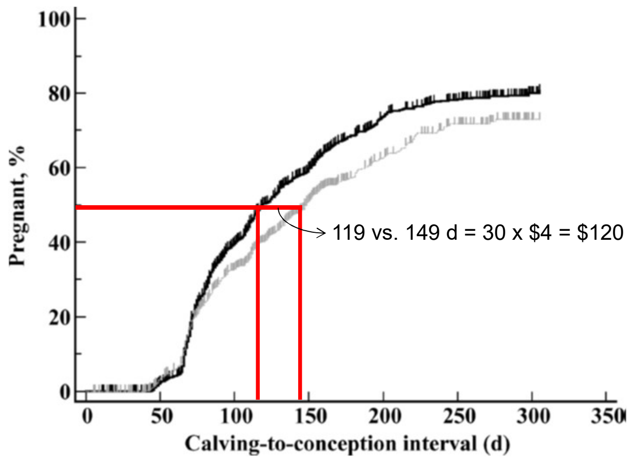
- UK data: 7 herds with at least 100 milking cows (Archer et al., 2010)
  - Cows repeatedly score for locomotion (0 to 3) during a 12 month period
  - From 11,735 records: LS 0 = 1.7%, LS 1 = 34.6%, LS 2 = 37.1%, and LS 3 = 26.6%
  - 93% of cows were LS 2 or 3 on at least 1 visit
  - Cows assessed in consecutive months: chronic cases = 50% (lame on both occasions), new cases = 13%, recovered = 15%, and unaffected = 22%



# Association between Lameness Postpartum and Reproductive Efficiency

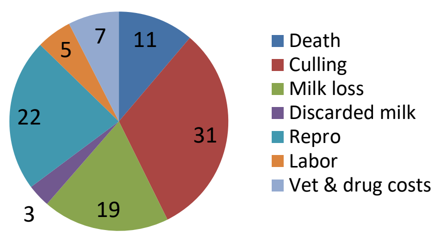
- Lame cows within 30 DIM had prolonged (34 vs. 29 d) anovular period (Garbarino et al., 2006)
- Lame cows within 70 DIM had longer interval from calving to conception (Bicalho et al., 2007)



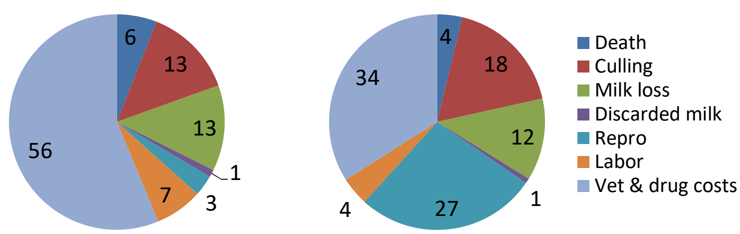

(Bicalho et al., 2007)

# Lameness associated Performance Inefficiencies

- Economic losses due to clinical lameness
  - Guard (2008) = $267




  - Liang et al. (2017): Primiparous = $185.10 ± 64.46, multiparous = $333.17 ± 68.76



## How Much Do Diseases Cost for a Dairy Herd?

| Ref. | Disease | Country | Obs. | Cost/case |
|---|---|---|---|---|
| Gohary et al. (2016) | Ketosis SC (1.4 mmol/L) | Canada | Incidence, treatment, death, production, metritis, DA, reproduction, replacement | $203 |
| McArt et al. (2015) | Ketosis SC (1.2 mmol/L) | USA | Incidence, death, treatment, DA, reproduction, production, replacement | $289 |
| Bar et al. (2007) | Mastitis | USA | Incidence, death, treatment, reproduction, production, replacement | $179 |
| Rolli et al. (2015) | Mastiteis 30 DIM | USA | Incidence, death, treatment, reproduction, production, replacement | $444 |
| Overton and Fetrow (2008) | Metritis | USA | Treatment, reproduction, production, replacement | $360 |
| Mahnani et al. (2015) | Metritis | Iran | Treatment, reproduction, production, replacement | $162.3 |
| Oetzel (2005)* | HypoCa | USA | Treatment, production, replacement | $300 |
| | HypoCa SC | USA | Treatment, production, replacement | $125 |
| Guard (2008)* | DA | USA | Treatment, reproduction, production, replacement | $494 |
| | RP | USA | Treatment, metritis risk, reproduction, production, replacement | $315 |
| | Lameness | USA | Treatment, reproduction, production, replacement | $469 |

## Body Condition Score

- The FARM Program questions whether:
  - 99% or more of the animals have a Body Condition Score of 2 or more?

## As for the Negative Energy Balance … The Cow is not Alone!

- Elephant seals
  - 28 d lactation (fasting)
  - Pup body weight gains = 10%/d
  - Use of maternal body reserves
    - 42% loss of body weight (reduction of 58% in body fat and 14% in lean weight)
- Baleen whales (i.e. blue whale)
  - 110 x $10^3$ lb body weight gain during pregnancy
  - 7 mo lactation producing 198 lb/d of milk at ~40% fat and 12% protein
  - Almost no feed intake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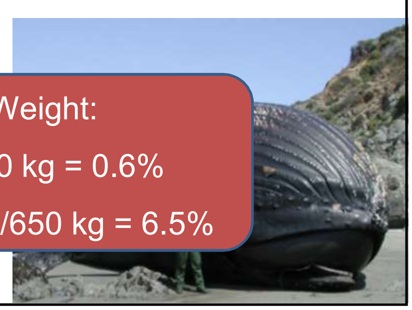
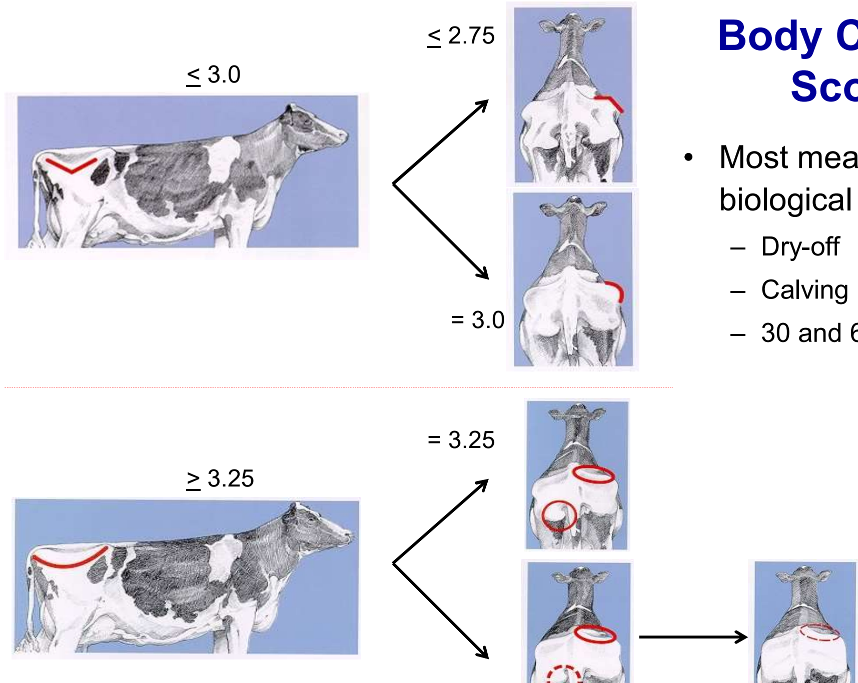


3.5% FCM vs Live Body Weight:

Blue whale = 1,030 kg/180,000 kg = 0.6%

High Producing dairy cow = 45 kg/650 kg = 6.5%




Source: Elanco Animal Health

## Body Condition Scoring

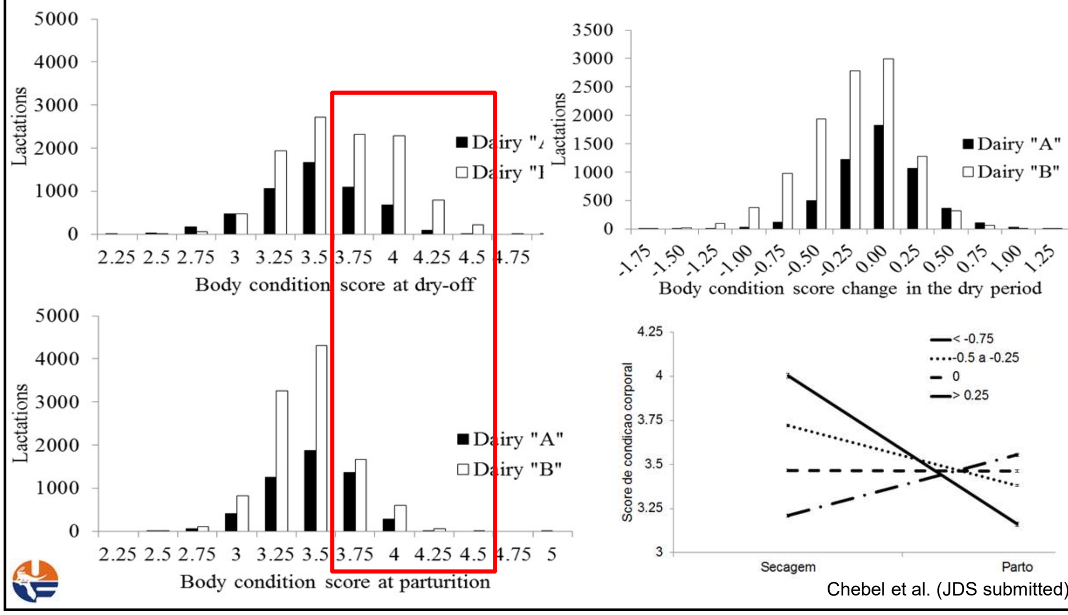
- Most meaningful biological phases
  - Dry-off
  - Calving
  - 30 and 60 DIM

## Association between Body Condition Score Loss in the Dry Period and Performance

- Data from 16,104 lactations (9,950 cows) of parous cows from 2 herds
- Cows received body score at dry-off and at calving
- Evaluation of:
  - Association between loss of BCS in the dry period and health, reproduction and production
  - Risk factors for BCS change in dry period
  - Factors associated with BCS drying

Chebel et al. (JDS submitted)

## Body Condition Score and Body Condition Score Change




Chebel et al. (JDS submitted)

## Association between Body Score Change and Diseases and Treatments

| Item, % | BCS Change | | | | P - value |
|---|---|---|---|---|---|
| | ≤ -0.75 | -0.5 a -0.25 | 0 | ≥ +0.25 | |
| Lactations | 1,604 | 6,430 | 4,819 | 3,251 | --- |
| Stillbirth | 4.6 | 4.7 | 4.5 | 3.5 | 0.97 |
| Uterine diseases | 15.8 | 13.6 | 13.3 | 12.2 | < 0.001 |
| Metabolic diseases | 1.1 | 2.7 | 3.4 | 3.4 | 0.36 |
| Indigestion | 2.7 | 3.4 | 2.8 | 2.2 | 0.01 |
| Antibiotics | 14.1 | 12.4 | 11.8 | 10.1 | < 0.001 |
| Anti-inflammatory | 13.7 | 10.0 | 7.9 | 6.9 | < 0.001 |
| Supportive therapy | 8.1 | 8.4 | 7.6 | 5.9 | < 0.001 |
| Culling within 60 DIM | 2.7 | 5.5 | 5.9 | 4.3 | < 0.001 |

Chebel et al. (JDS submitted)

## Association between Body Score Change and Reproductive Performance and Milk Production

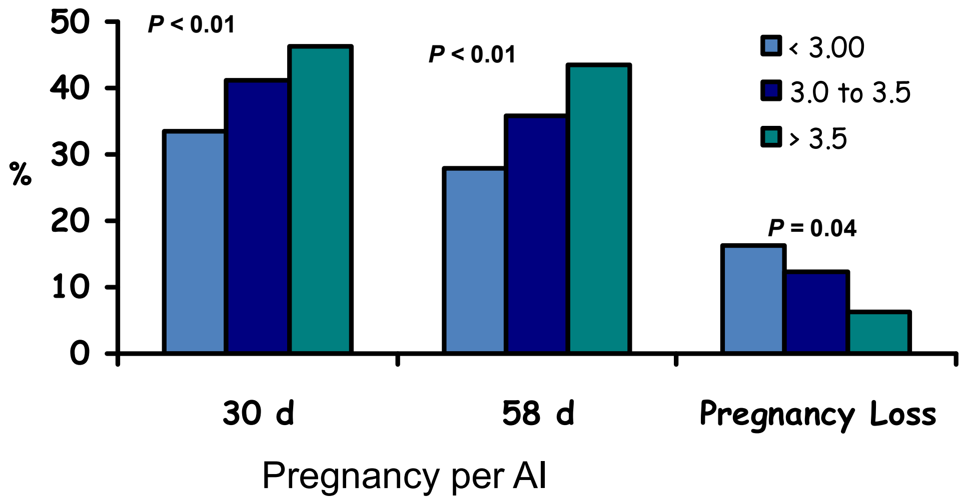
| Item, % | BCS Change | | | | P - value |
|---|---|---|---|---|---|
| | ≤ -0.75 | -0.5 a -0.25 | 0 | ≥ +0.25 | |
| 1st AI | 1,540 | 5,812 | 4,258 | 2,955 | --- |
| Pregnancy at 38 d | 24.6 | 31.6 | 35.8 | 43.9 | < 0.001 |
| Pregnancy at 75 d | 20.8 | 28.3 | 33.1 | 41.9 | < 0.001 |
| Pregnancy loss | 15.6 | 10.5 | 7.4 | 4.5 | < 0.001 |
| 2nd IA | 1,213 | 4,081 | 2,717 | 1,669 | --- |
| Pregnancy at 38 d | 24.8 | 29.4 | 30.9 | 38.1 | < 0.001 |
| Pregnancy at 75 d | 22.1 | 26.8 | 28.9 | 36.4 | < 0.001 |
| Pregnancy loss | 11.0 | 8.9 | 6.4 | 4.4 | < 0.001 |
| Milk yield by 60 DIM, kg/d | 42.4 ± 0.3 | 43.4 ± 0.1 | 43.8 ± 0.1 | 45.5 ± 0.2 | < 0.001 |

- Body condition at dry-off and BCS loss during the dry period impacts performance in the subsequent lactation
- Cows should dry-off between 2.75 and 3.25

Chebel et al. (JDS submitted)

## Association Between BCS and BCS Loss and Reproductive Performance of Lactating Cows

## Association between BCS at AI and Pregnancy per AI and Pregnancy Loss




Santos et al. (2008)

## Association between BCS Loss and Milk Yield

- Study funded by the USDA to identify genes associated with cyclicity and reproductive outcomes
  - Cows (n = 5,260) from 9 commercial dairy herds (CA, FL, MN, TX, WI)
    - BCS at 7 ± 3 and 35 ± 5 DIM
    - Health events: calving events, uterine and metabolic diseases, mastitis, respiratory disease, and displaced abomasum

| BCS at calving | BCS change | | | |
|---|---|---|---|---|
| | Gained | No change | Moderate loss (0.25-0.75) | Excessive loss (≥ 1) |
| ≤ 3.00 | 34.4 ± 0.3[a] | 37.1 ± 0.3[b] | 38.2 ± 0.3[c] | 34.4 ± 4.4[a,b,c] |
| 3.25 - 3.5 | 35.4 ± 0.5[a] | 36.3 ± 0.3[a] | 37.9 ± 0.2[c] | 39.1 ± 1.0[c] |
| ≥ 3.75 | 26.0 ± 2.3[a] | 35.0 ± 1.0[b] | 37.5 ± 0.4[c] | 38.5 ± 0.9[c] |

- It is OK for cows to lose BCS in early lactation, as long as BCS remains > 2, otherwise ~ 6 lb/d of milk may be lost

Chebel et al. (2015)

## Stocking Density
## Feed bunk and Water trough

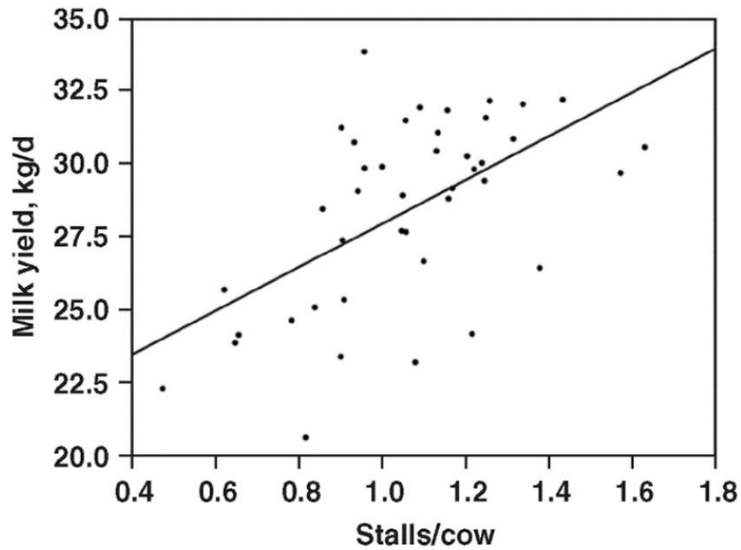
- Is sufficient feed bunk space provided allowing all animals to feed at the same time or are sufficient quantities of feed available for all animals during a 24-hour period?
- Do all age classes of animals (including milk-fed dairy calves) have access to clean, fresh water as necessary to maintain proper hydration?

## Association between Stall Stocking Density and Productivity

- Survey of 47 dairy herds (~ 3,129 lactating cows) from NE of Spain
  - Herds offered the exact same lactating ration
  - Survey data collected
    - Owners' profile: future intentions, number of workers, and time devoted to the dairy
    - Animals: reproductive performance, incidence of diseases, culling rate, etc.
    - Facilities: number of feeders, waters, stalls, cleanliness, etc.
    - Management practices: numbers of daily milkings, feed deliveries, feed push-ups, cleaning frequency, etc.
    - Feed delivered, daily total milk production, and milk quality data obtained for each herd for a period of 8 mo before the survey was applied

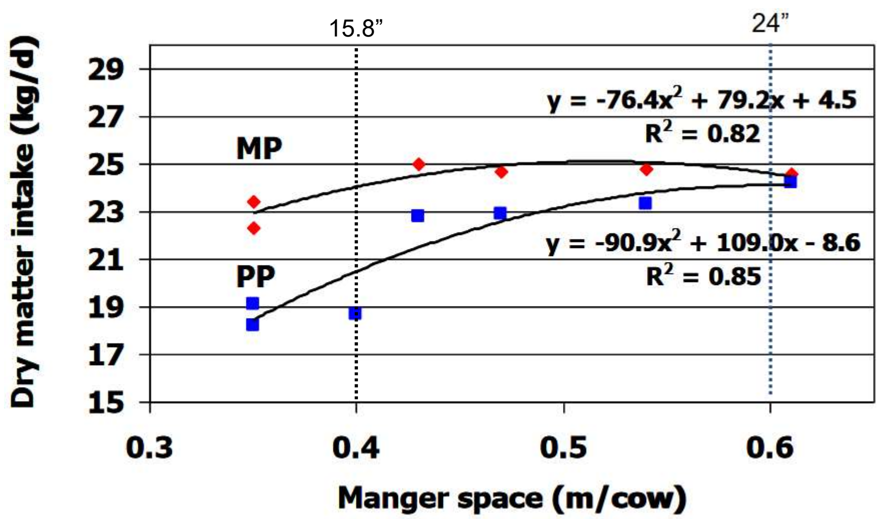
Bach et al. (2008) JDS 91:3259

## Association between Stall Stocking Density and Productivity

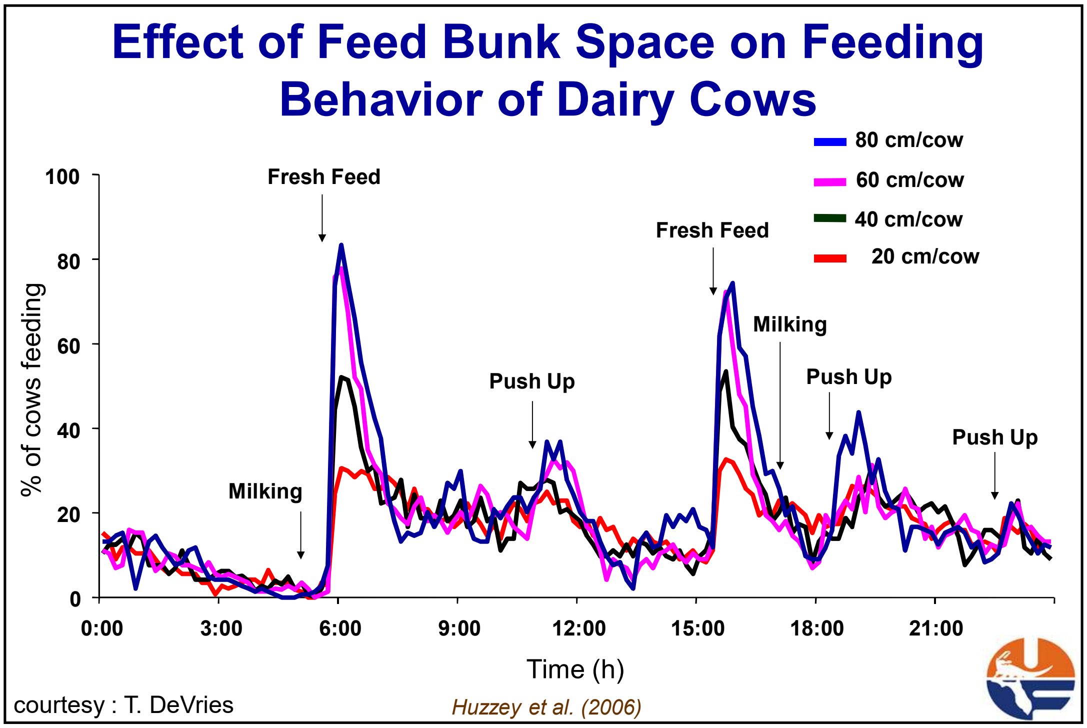



Bach et al. (2008) JDS 91:3259

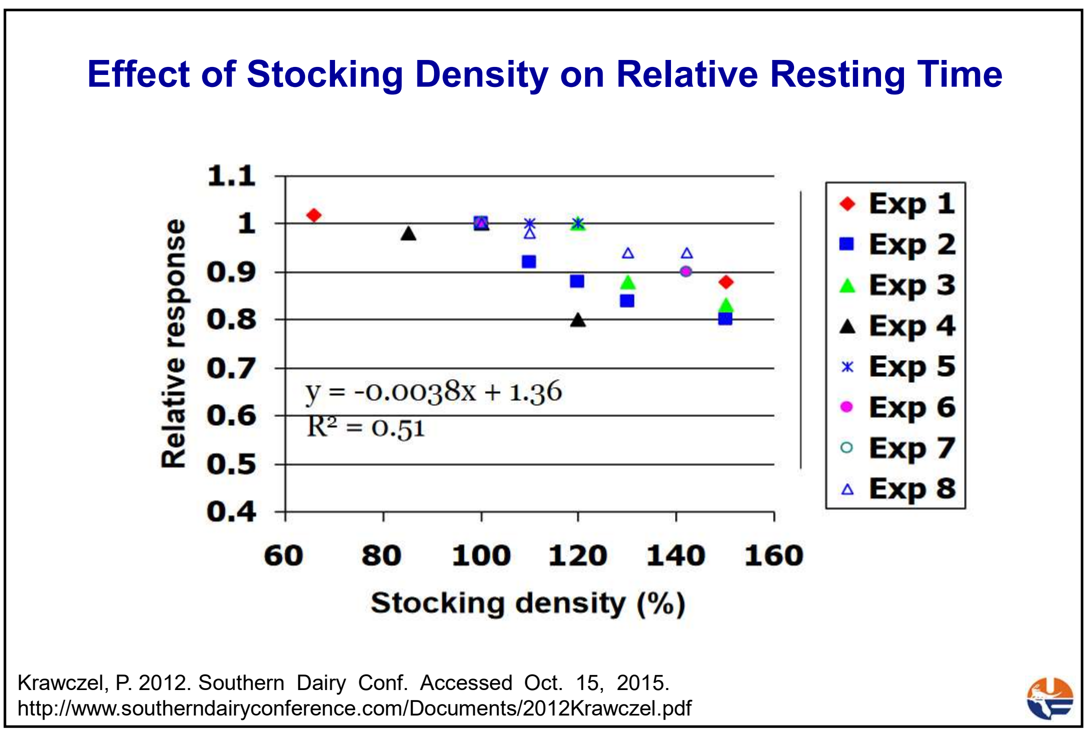
## Effect of Stocking Density on DMI according to Parity




Krawczel, P. 2012. Southern Dairy Conf. Accessed Oct. 15, 2015.
http://www.southerndairyconference.com/Documents/2012Krawczel.pdf



Effect of Feed Bunk Space on Feeding Behavior of Dairy Cows
80 cm/cow
60 cm/cow
40 cm/cow
20 cm/cow
Fresh Feed
Fresh Feed
Milking
Milking
Push Up
Push Up
Push Up
% of cows feeding
100
80
60
40
20
0
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
Time (h)
courtesy : T. DeVries
Huzzey et al. (2006)

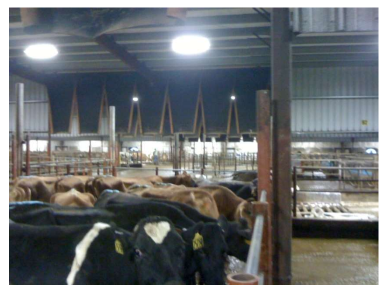



Effect of Stocking Density on Relative Resting Time
Relative response
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
y = -0.0038x + 1.36
R² = 0.51
60
80
100
120
140
160
Stocking density (%)
Exp 1
Exp 2
Exp 3
Exp 4
Exp 5
Exp 6
Exp 7
Exp 8
Krawczel, P. 2012. Southern Dairy Conf. Accessed Oct. 15, 2015.
http://www.southerndairyconference.com/Documents/2012Krawczel.pdf

## Cow Time Budget – Basic Behavioral Needs

| | |
|---|---|
| • Eating | = 3 to 5 h/d |
| • Lying (resting) | = 10 to 14 h/d |
| • Standing/walking (grooming, agonistic, estrous activity) | = 2 to 3 h/d |
| • Drinking water | ~ 0.5 h/d |
| • Total | = 20.5 to 21.5 h/d |
| • Time left for milking (exit to return to the pen) | = 2.5 to 3.5 h |

Grant (2008)



## Economic Evaluation of Stall Stocking Density of Lactating Cow Barns

- Model evaluating the effect of the change in stocking (over 100%) on farm profitability ($/stall per year) according to several scenarios:
  - Probability of slaughter and death, insemination, conception, abortion and childbirth
  - Lactation curve, DMI, live weight, dry period and maximum number of inseminations
  - Prices of milk, value of animals slaughtered and sold, cost of food and other variable costs
  - Fixed costs (e.g. barn)
- According to available publications, the effect of increasing stocking (for every 10% above 100%):
  - ↓ 0.5 kg/cow per day in milk production
  - ↓ 0.1 percentage points in the probability of conception
  - No effect on probability of disposal

De Vries et al. (2016)

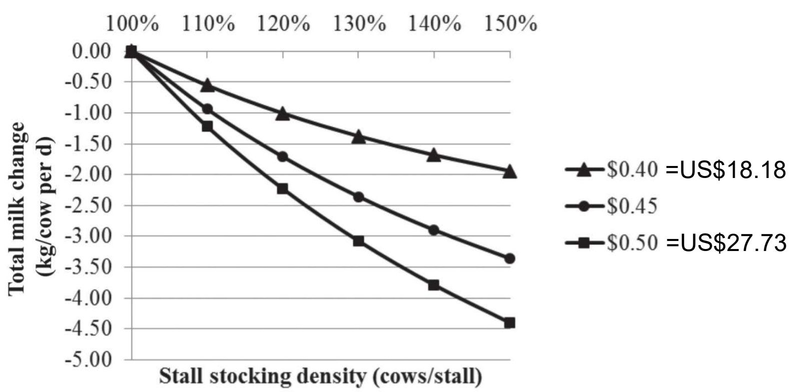
## Maximum Profit per Stall per Year (dprofit) according to Milk Loss and Milk Price

| Milk loss[2] (kg/d) | Milk price ($/kg) | Maximum dprofit (optimum SSD) |
|---|---|---|
| 0.5 | $0.40 | 6 (110%) |
| 0.5 | $0.45 | 145 (148%) |
| 0.5 | $0.50 | 371 (150%) |
| 0.75 | $0.40 | 0 (100%) |
| 0.75 | $0.45 | 29 (118%) |
| 0.75 | $0.50 | 145 (137%) |
| 1.0 | $0.40 | 0 (100%) |
| 1.0 | $0.45 | 0 (100%) |
| 1.0 | $0.50 | 38 (117%) |

$0.40/kg = $18.2/cwt
$0.45/kg = $20.5/cwt
$0.50/kg = $27.7/cwt

De Vries et al. (2016)

## Break-even Total Milk Change per Cow per Day according to Stocking Density and Milk Prices




- Economic return according to stocking is highly dependent on the decrease of milk production, the cost of dry matter, and the price of milk
- In general, from the economic standpoint the ideal stall stocking density of lactating cows is between 110 and 130%

De Vries et al. (2016)

## Associations among Herd-level Feeding Management Practices and Feed Sorting and Milk Production

- Observational study in 24 Canadian herds (66 to 570 lactating cows, mean = 161.8 ± 120 lactating cows)
  - Average feedbunk space = 21” (14” to 39”)
  - No description of grouping strategy
- Management associated with DMI:
  - Milking frequency: 2x vs 3x milking = ↑ DMI by 3.1 lb/d
  - Feeding frequency: 1x vs 2x feeding = ↑ DMI by 2.6 lb/d
- Management associated with milk yield:
  - Milk frequency: 2x vs 3x milking = ↑ milk yield by 13 lb/d
  - Feeding frequency: 1x vs 2x feeding = ↑ milk yield by 4.4 lb/d
  - Linear water space: ↑ linear water through space by 0.4” (1.5 to 4.6”)= ↑ milk yield by 0.84 lb/d

Sova et al. (2013)

## What is the Ideal Stocking Density in the Prepartum Period?

## Effect of Prepartum Stocking Density on Performance

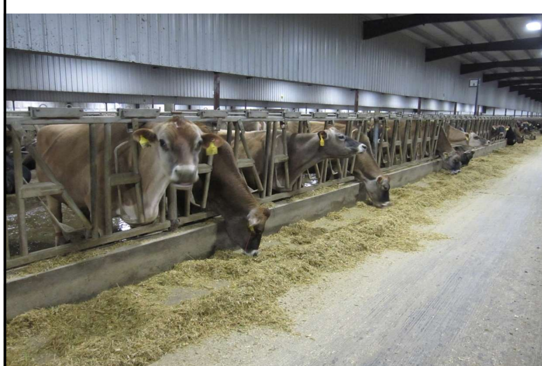
- Evaluation of behavior, metabolites, immune function, and performance of Jersey cows housed at 100 vs 80% stocking density (headlocks) during the prepartum period
- Nulliparous (n = 324) and parous (n = 404) animals assigned to one of two treatments at 28 d before expected calving date
  - 80SD = 38 animals, 48 headlocks, and 44 stalls
  - 100SD = 48 animals, 48 headlocks, and 44 stalls
  - Nulliparous and parous animals separate throughout the study
- After calving, animals from different treatments were commingled in the same pens

Silva et al. (2014)

## Prepartum Pen Design

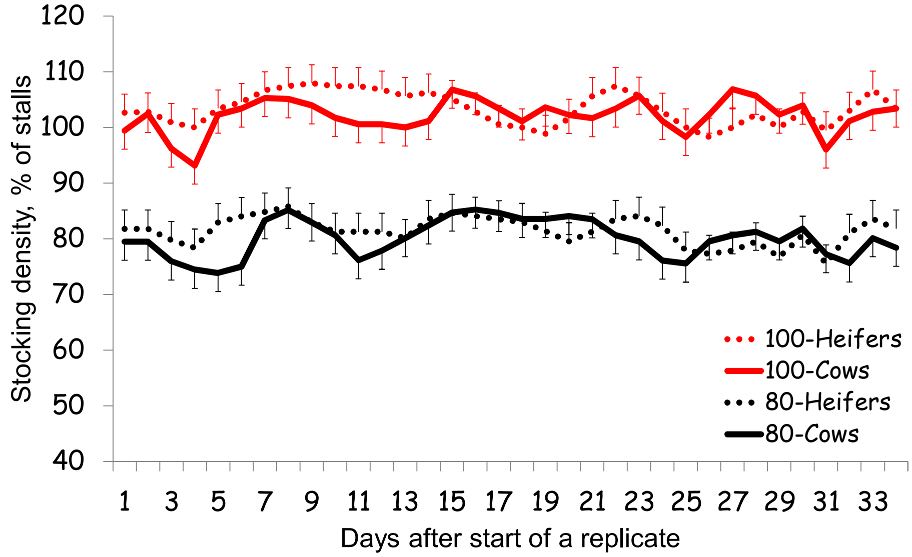
SD80: 38 cows, 80% headlocks, 86% stalls

SD100: 48 cows, 100% headlocks, 109% stalls



Silva et al. (2014)

## Stocking Density According to Stalls




Silva et al. (2014)

## Effect of Stocking Density on Health and Removal from the Herd

- No effect on innate and adaptive immunity or concentrations of haptoglobin

| | 80SD | 100SD | *P* – value |
|---|---|---|---|
| RFM, % | 5.1 | 7.8 | 0.19 |
| Acute metritis, % | 9.9 | 9.4 | 0.64 |
| Metritis, % | 21.2 | 16.7 | 0.11 |
| Endometritis, % | 5.8 | 7.9 | 0.35 |
| DA up to 60 DIM, % | 1.0 | 0.7 | 0.78 |
| Removed within 60 DIM, % | 6.1 | 5.1 | 0.63 |
| 1st AI P/AI, % | 36.8 | 44.0 | 0.29 |
| Milk yield, kg/d (±SEM) | 34.2 ± 0.5 | 33.8 ± 0.5 | 0.56 |

## Stocking Density in the Prepartum Period and Performance

- 100% stocking density reduced lying time and increased displacement rate from the feedbunk
- Stocking density did not affect:
  - Innate immune parameters
  - Incidence of health disorders during the postpartum period
  - Body condition and locomotion score during the peripartum period
  - Energy corrected milk yield in the first 150 d postpartum
  - Reproductive performance
- Reduced close-up pen use in approximately 20%

## Heat Stress

- Are all age classes of animals provided all reasonable means of protection from heat and cold?

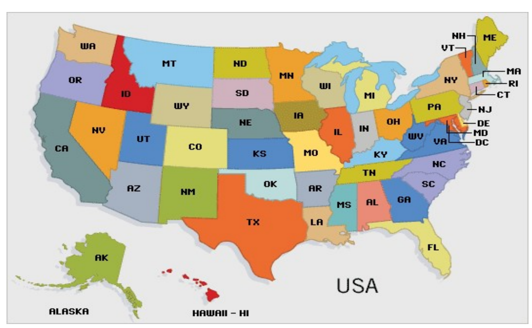
## Annual Production and Economic Losses Due to Heat Stress

| State | ↓DMI (kg/cow/yr) | ↓Milk (kg/cow/yr) | ↑Days open | ↑Repro cull (%) | ↑Deaths (%) | Heat Stress (% annual hours) | Loss ($/cow/yr) |
|---|---|---|---|---|---|---|---|
| AZ | 611 | 1,233 | 37 | 4.5 | 1.0 | 28 | 437 |
| CA | 145 | 293 | 12 | 0.9 | 0.2 | 12 | 110 |
| FL | 894 | 1,803 | 59 | 8.0 | 1.7 | 49 | 676 |
| Average | 550 | 1,110 | 36 | 4.5 | 1.0 | 30 | $408 |

St-Pierre et al. (2003)

## Dairy Heat Stress Losses in USA

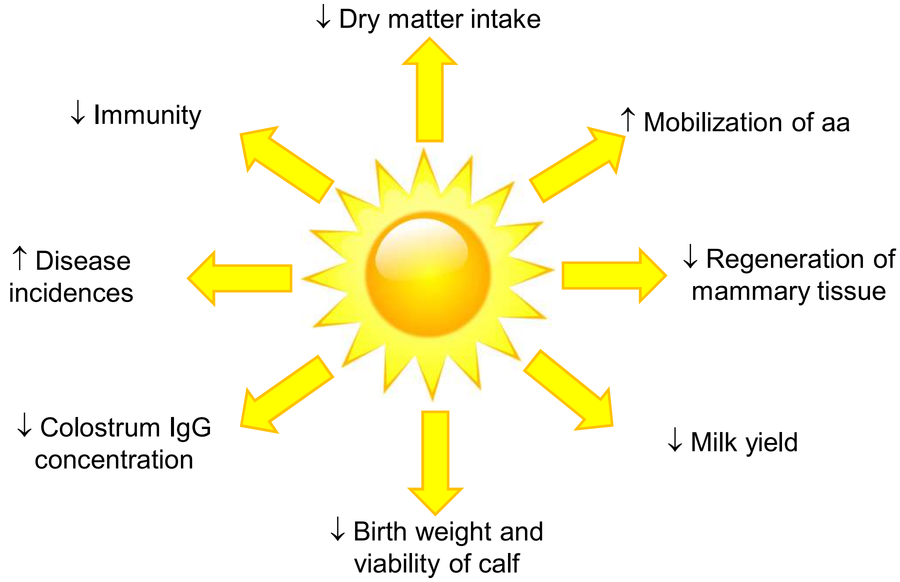
- Consequences of heat stress:
  - Feed intake ↓
  - Milk production ↓
  - Reproduction ↓
  - Repro culling ↑
  - Death ↑



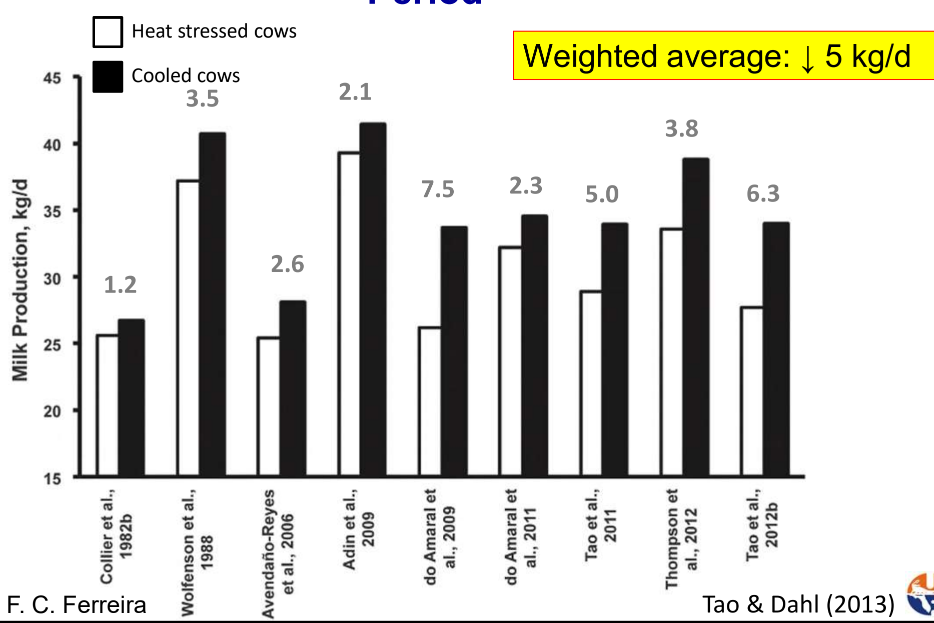

- Average losses due to heat stress:
  - Without any heat abatement = $ 167/cow/year
  - With OPTIMAL heat abatement = $ 100/cow/year

St-Pierre et al. (2003)

## Consequences of Heat Stress during the Prepartum period on Health and Production




## Milk Yield of Cows Cooled vs. Non-Cooled in the Dry Period




Courtesy: F. C. Ferreira

Tao & Dahl (2013)

J. Dairy Sci. 99:9931–9941
http://dx.doi.org/10.3168/jds.2016-11566


## Economic feasibility of cooling dry cows across the United States

F. C. Ferreira,*† R. S. Gennari,* G. E. Dahl,* and A. De Vries*[1]
*Department of Animal Sciences, University of Florida, Gainesville 32611
†EMBRAPA Gado de Leite, Juiz de Fora, MG, Brazil 36038-330

- Large economic losses if dry cows are under heat stress
- Cooling dry cows is very profitable when building a dry cow barn is not needed (except Alaska)
- Cooling dry cows may be profitable when a new barn needs to be built in approximately 89% of the scenarios evaluated
  - Under reasonable assumptions

Courtesy: F. C. Ferreira

# Thank you!!!

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*College of Veterinary Medicine*
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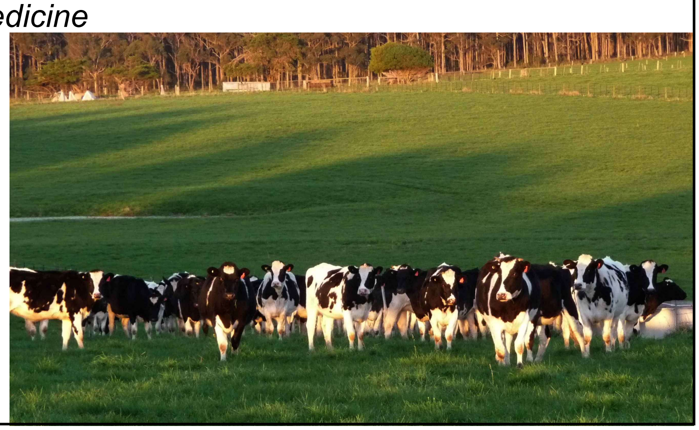

# NOTES

# How to Implement a Successful Milk Quality Program

P.L. Ruegg, DVM, MPVM
Michigan State University



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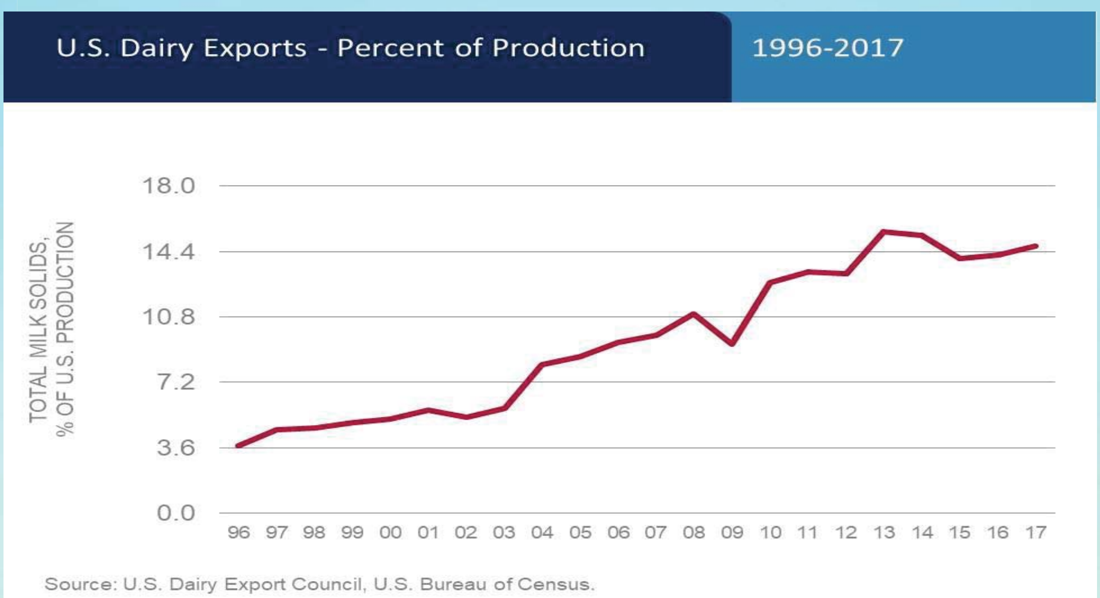
# The US Dairy Industry is Increasingly Dependent on Exports



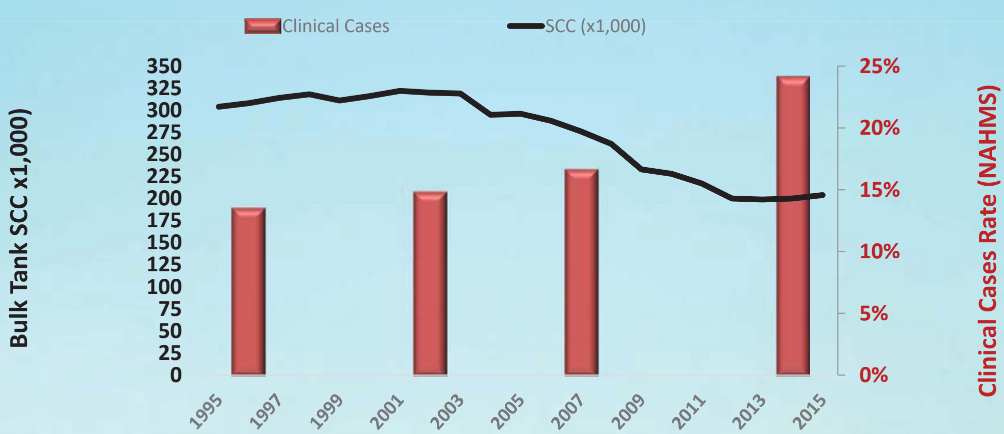
# Producing High Quality Milk is Required to Market Milk Globally

- Criteria for acceptable milk quality are set by export requirements
  - <400,000 cells/mL is global SCC standard
- Processors control the standards
  - USDA export certificate is required for most producers


In 2017
<3% of US Milk did not meet EU standards for Quality

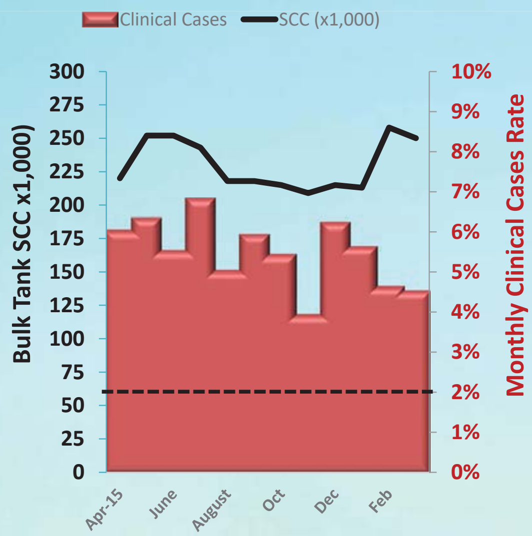


# Trends in US Milk Quality & Production 1995 – 2015 (NAHMS Data)




- Improved Bulk Tank SCC
  - **Less subclinical mastitis**
- **Increased Clinical Case Rate**

# Acceptable BTSCC Does NOT Always Mean That Mastitis is Controlled




Data from a 2,500 Cow Dairy in WI

- Low BTSCC
  - Result of improved milking management & culling of chronic cows
  - Control of contagious pathogens
- High Clinical Case Rate
  - A consequence of more intense management
  - Higher yielding cows in freestall barns with bedding that supports bacterial growth
  - Exposure to Environmental pathogens

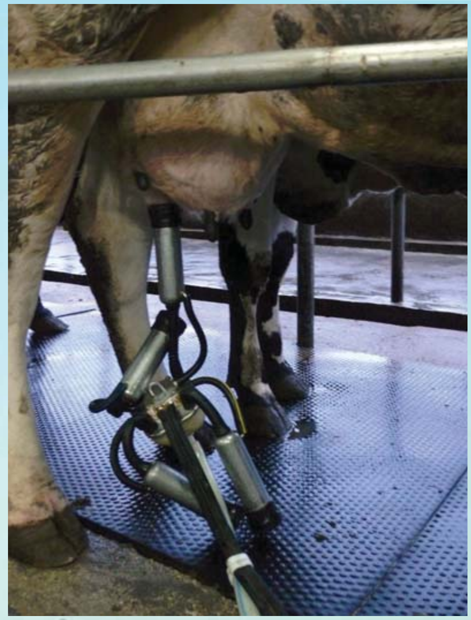


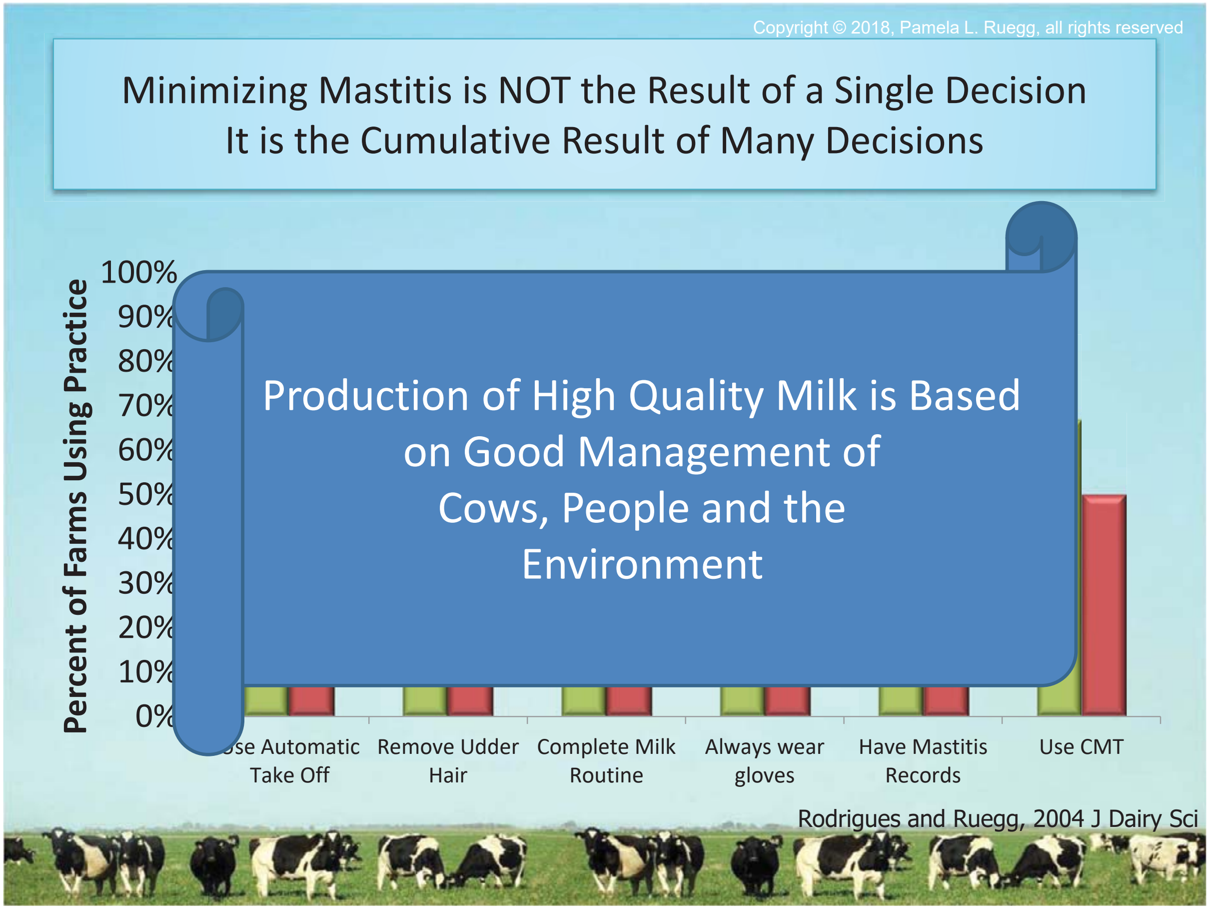
# High Quality Milk Is NOT Just Defined by Bulk Tank SCC

- Prevention of Mastitis
  - Low bulk tank SCC
  - Low Clinical Case Rate
- Justifiable Antibiotic Usage
- Socially Acceptable Animal Care
  - Sufficient Space
  - Dry Lying Areas
  - Humane Husbandry Practices

# Mastitis Transmission

- Management practices that expose teats to bacteria that cause mastitis
  - In **milk** that came from infected udders of cows
  - In the **environment** that the cow lives in

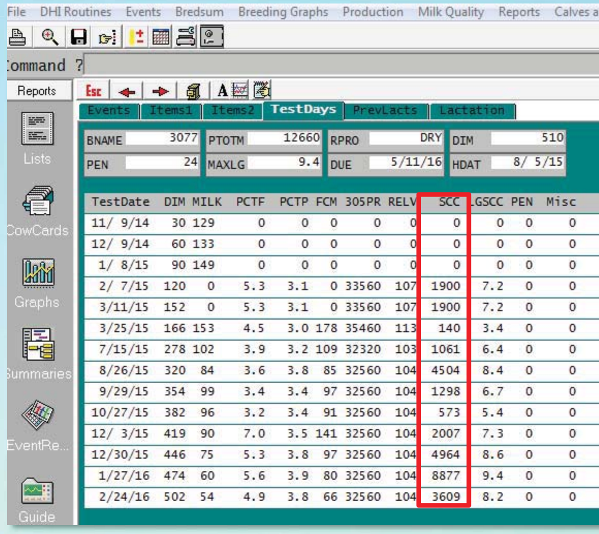



Copyright © 2018, Pamela L. Ruegg, all rights reserved
Minimizing Mastitis is NOT the Result of a Single Decision
It is the Cumulative Result of Many Decisions
Percent of Farms Using Practice
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Production of High Quality Milk is Based on Good Management of Cows, People and the Environment
Use Automatic Take Off
Remove Udder Hair
Complete Milk Routine
Always wear gloves
Have Mastitis Records
Use CMT
Rodrigues and Ruegg, 2004 J Dairy Sci


Copyright © 2018, Pamela L. Ruegg, all rights reserved
Producing High Quality Milk
Top 5 Actions
1. Cull chronically infected cows
2. Reduce bacterial exposure of teats of highest risk cows
3. Develop & keep a Professional work force
4. Don't use antibiotics on cows that won't benefit
5. Think about eating lambs…

# The Greatest Risk for Transmission of Contagious Mastitis is Other Cows

- Spread occurs when healthy udders contact infected milk from chronically infected quarters
- Cows with long-term subclinical infections
- Separate healthy cows from infected cows
  - or use of separate milking equipment




| TestDate | DIM | MILK | PCTF | PCTP | FCM | 305PR | RELV | SCC | LGSCC | PEN | Misc |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/ 9/14 | 30 | 129 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12/ 9/14 | 60 | 133 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1/ 8/15 | 90 | 149 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2/ 7/15 | 120 | 0 | 5.3 | 3.1 | 0 | 33560 | 107 | 1900 | 7.2 | 0 | 0 |
| 3/11/15 | 152 | 0 | 5.3 | 3.1 | 0 | 33560 | 107 | 1900 | 7.2 | 0 | 0 |
| 3/25/15 | 166 | 153 | 4.5 | 3.0 | 178 | 35460 | 113 | 140 | 3.4 | 0 | 0 |
| 7/15/15 | 278 | 102 | 3.9 | 3.2 | 109 | 32320 | 103 | 1061 | 6.4 | 0 | 0 |
| 8/26/15 | 320 | 84 | 3.6 | 3.8 | 85 | 32560 | 104 | 4504 | 8.4 | 0 | 0 |
| 9/29/15 | 354 | 99 | 3.4 | 3.4 | 97 | 32560 | 104 | 1298 | 6.7 | 0 | 0 |
| 10/27/15 | 382 | 96 | 3.2 | 3.4 | 91 | 32560 | 104 | 573 | 5.4 | 0 | 0 |
| 12/ 3/15 | 419 | 90 | 7.0 | 3.5 | 141 | 32560 | 104 | 2007 | 7.3 | 0 | 0 |
| 12/30/15 | 446 | 75 | 5.3 | 3.8 | 97 | 32560 | 104 | 4964 | 8.6 | 0 | 0 |
| 1/27/16 | 474 | 60 | 5.6 | 3.9 | 80 | 32560 | 104 | 8877 | 9.4 | 0 | 0 |
| 2/24/16 | 502 | 54 | 4.9 | 3.8 | 66 | 32560 | 104 | 3609 | 8.2 | 0 | 0 |

# Which Cows Should be Culled?

- **All cows** diagnosed with:
  - *Mycoplasma bovis* infection
  - Chronic *Staph aureus* infections
- Cows with multiple quarters affected by mastitis
- Cows with more than 2 clinical cases in 1 lactation
- Older cows with history of more than 3 monthly SCC tests >200,000 cells/mL
- Cows that maintain high SCC over 2 lactations

## Producing High Quality Milk
## Top 5 Actions

1. Cull chronically infected cows
2. Reduce bacterial exposure of teats of highest risk cows
3. Develop & keep a Professional work force
4. Don't use antibiotics on cows that won't benefit
5. Think about eating lambs…



## Choice of Bedding Influences Milk Quality

- Herds in study
- 325 herds milking 255 to 8,100 cows
  - 282,235 lactating cows
- 81 lb/cow/day
- Bedding types
  - Sand (mostly clean)
    - n = 195 herds
  - Mattresses & org. bedding
    - n = 62
  - Recycled manure products
    - N = 29

Rowbotham & Ruegg, 2015 J Dairy Science

# Herds Using Sand Had Less Mastitis

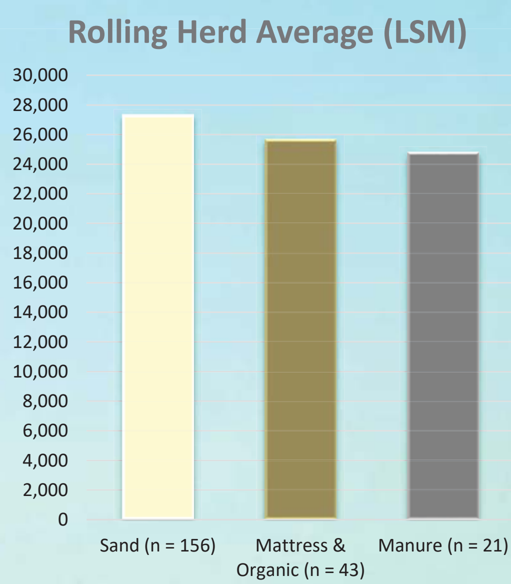
Rowbotham & Ruegg, JDS 2015

| Outcome | Sand | Mattress & Bedding | Manure |
|---|---|---|---|
| Average number milking cows | 849 | 706 | 1,502 |
| Milk/cow/day (lb) | **83.1** | 76.1 | 78.1 |
| Bulk milk SCC (cells/mL) | **198,000** | **220,000** | **248,000** |
| Cows with Milk not Sold (%) | **1.6%** | **1.9%** | **2.4%** |
| Cows milking <4 ¼ (%) | **4.5%** | 4.8% | **6.3%** |

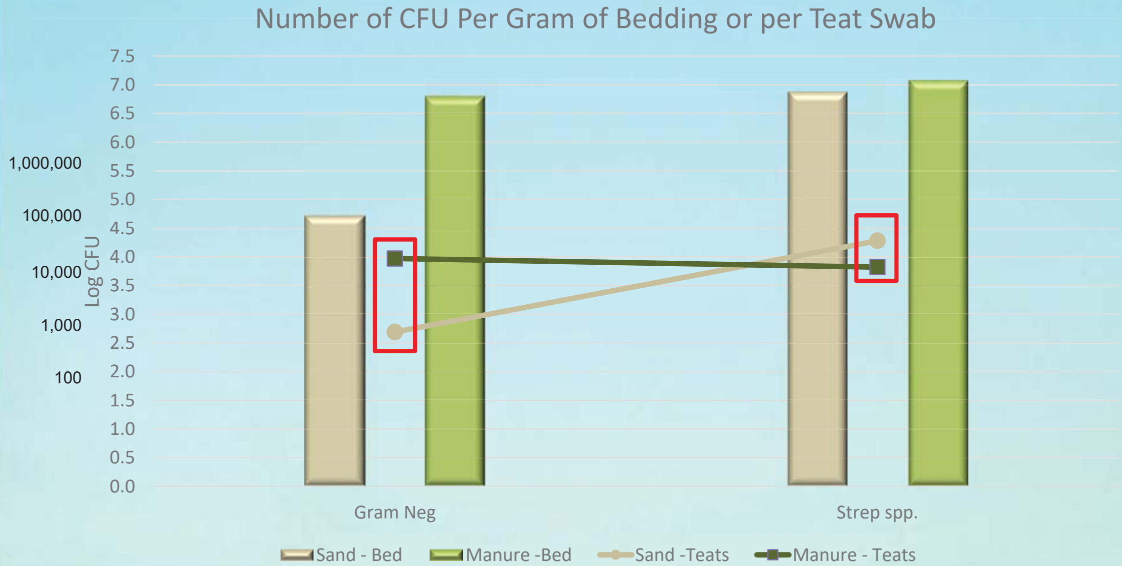


# Herds Using Sand Had Higher RHA & Milk Income

- 2542 lb greater RHA for herds using SAND
- $461 per cow per lactation
  - $18.52/cwt
- **$393,000 greater milk sales per year for sand bedded herds**



# Teats of Cows on Manure Are Exposed to More Gram negative Bacteria

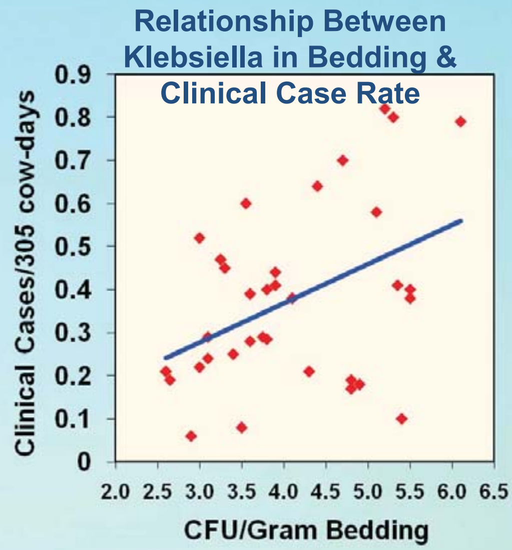



Rowbotham and Ruegg, JDS 2016



# Exposure to Bacteria in Bedding

- Housing & bedding are the usual source of exposure to environmental bacteria
- Organic bedding
  - more moisture
  - more Gram neg. bacteria
- Rate of clinical mastitis is associated with number of cfu of Gram neg. bacteria




Hogan et al., 1989 JDS 72:250-258


Action 2: Reduce Exposure of Teats
Provide enough dry lying space
Minimum of 100 ft2 per cow in loose housing
<15% Overstocked in Freestalls


Identify Effective Dry Lying Space
Not JUST AREA Available

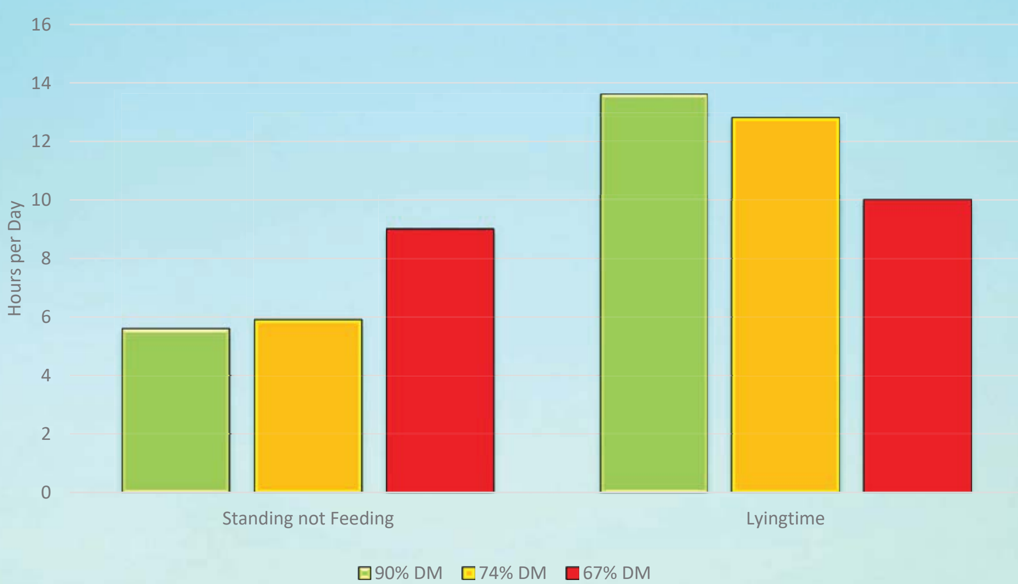
# Cows Prefer Dry Lying Areas

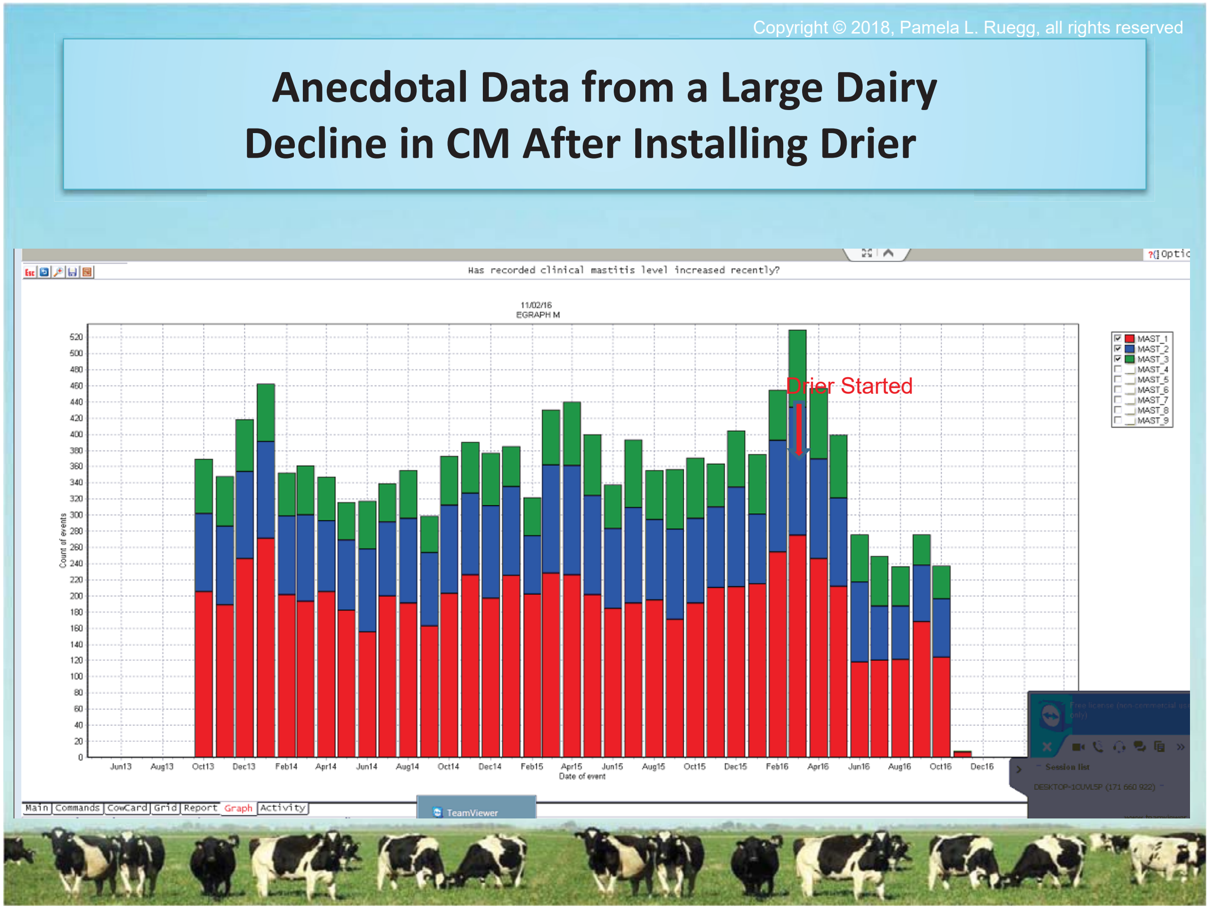
Video From Nina Von Kyserlink UBC

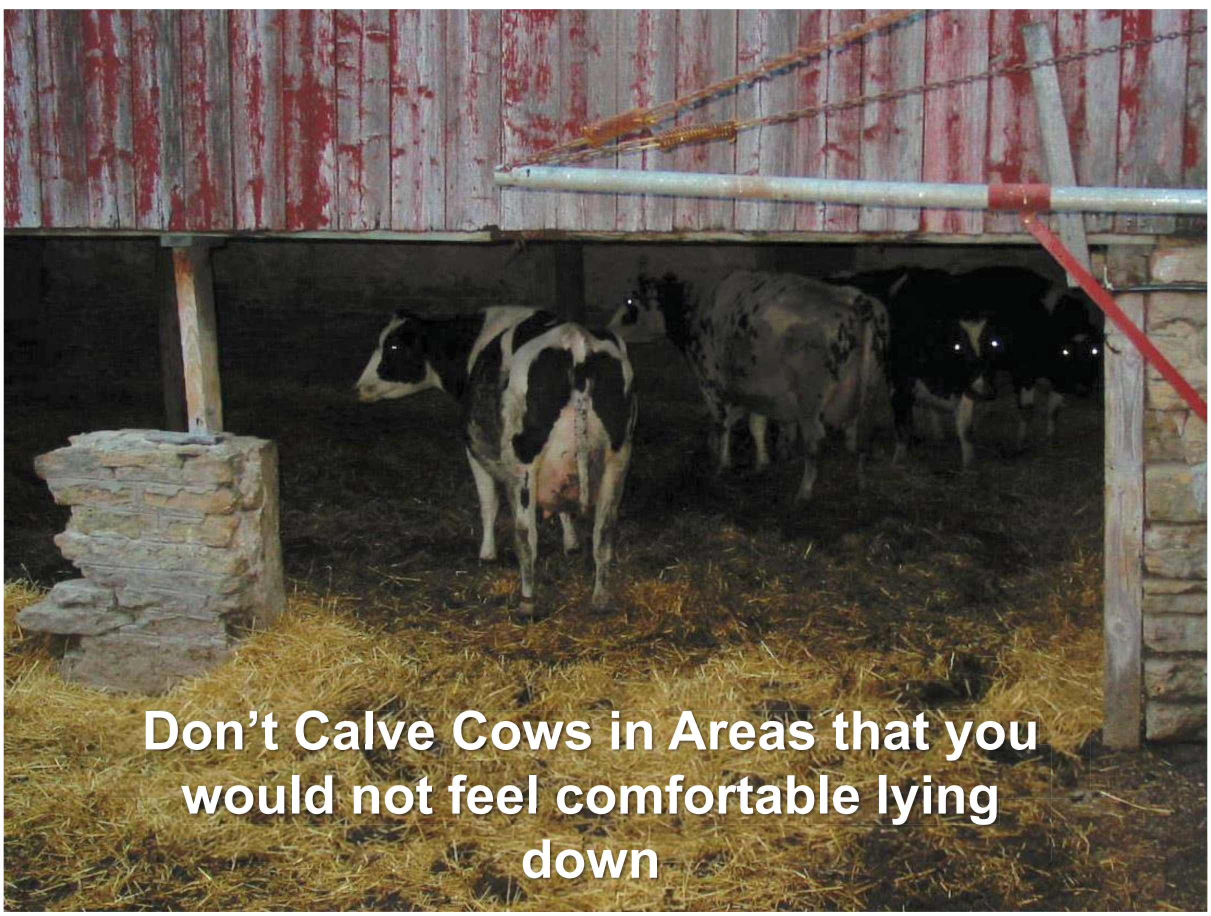



# Bedding Should be >75% Dry Matter

Chen et al., JDS 2017




Copyright © 2018, Pamela L. Ruegg, all rights reserved
Anecdotal Data from a Large Dairy
Decline in CM After Installing Drier
Has recorded clinical mastitis level increased recently?
11/02/16
EGRAPH M
Drier Started
MAST_1
MAST_2
MAST_3
MAST_4
MAST_5
MAST_6
MAST_7
MAST_8
MAST_9
Count of events
Date of event
Jun13
Aug13
Oct13
Dec13
Feb14
Apr14
Jun14
Aug14
Oct14
Dec14
Feb15
Apr15
Jun15
Aug15
Oct15
Dec15
Feb16
Apr16
Jun16
Aug16
Oct16
Dec16
Main
Commands
CowCard
Grid
Report
Graph
Activity
TeamViewer


Don't Calve Cows in Areas that you would not feel comfortable lying down

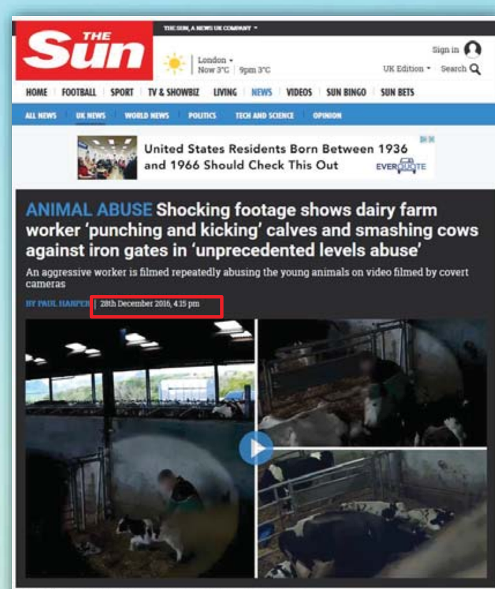
# Producing High Quality Milk
# Top 5 Actions

1. Cull chronically infected cows
2. Reduce bacterial exposure of teats of highest risk cows
3. Develop & keep a Professional work force
4. Don't use antibiotics on cows that won't benefit
5. Think about eating lambs…



# Action 3: Train, Supervise & Retain Workers

- Most welfare issues have been the result of:
  - Poorly trained workers
  - who are insufficiently managed
  - don't have appropriate tools
  - & should never have been hired



# People Who Work with Cows Should be People Who Like Cows

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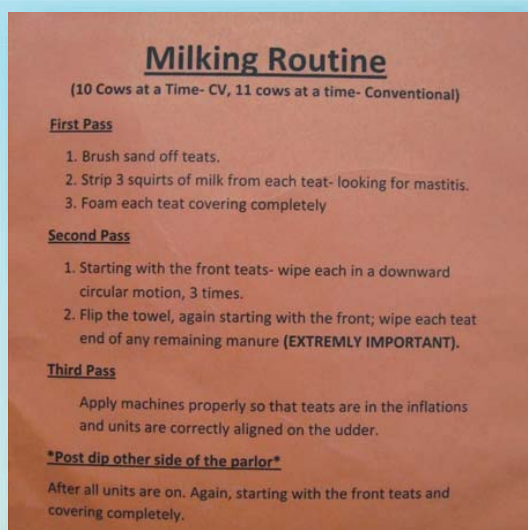
# Trained Farm Workers Are Essential to Production of High Quality Milk

- Data from 101 farms
- High adoption of best management practices
  - 89% milkers always wear gloves
  - 97% always postdip
  - 98% always predip
  - 89% always forestrip
- Training was rare
  - At hiring: 49%
  - Never: 29%
- 59% did not have a written milking routine



**Milking Routine**

(10 Cows at a Time- CV, 11 cows at a time- Conventional)

First Pass

1. Brush sand off teats.
2. Strip 3 squirts of milk from each teat- looking for mastitis.
3. Foam each teat covering completely

Second Pass

1. Starting with the front teats- wipe each in a downward circular motion, 3 times.
2. Flip the towel, again starting with the front; wipe each teat end of any remaining manure **(EXTREMLY IMPORTANT).**

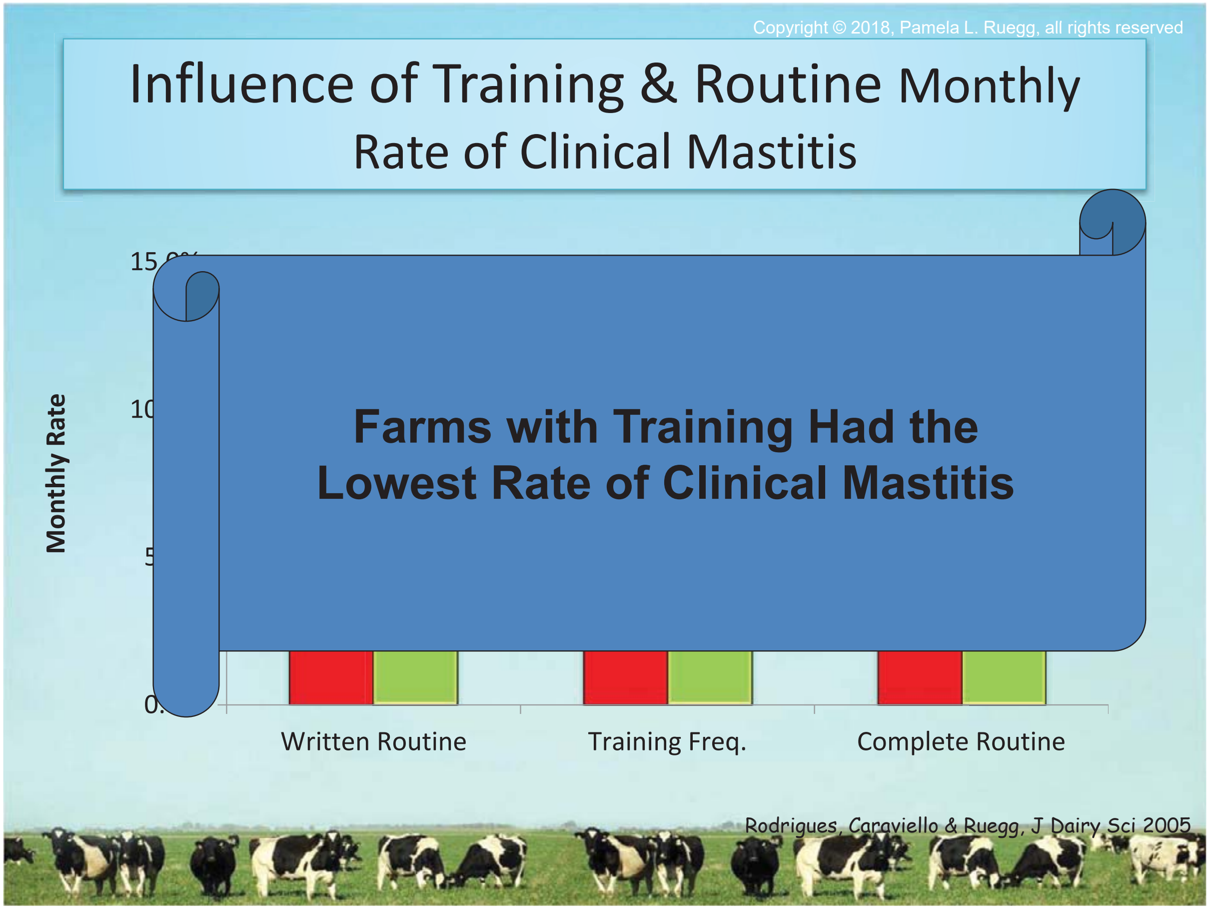
Third Pass

Apply machines properly so that teats are in the inflations and units are correctly aligned on the udder.

*Post dip other side of the parlor*

After all units are on. Again, starting with the front teats and covering completely.

Rodrigues, Caraviello & Ruegg, J Dairy Sci 2005



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Influence of Training & Routine Monthly
Rate of Clinical Mastitis
Monthly Rate
Farms with Training Had the
Lowest Rate of Clinical Mastitis
Written Routine
Training Freq.
Complete Routine
Rodrigues, Caraviello & Ruegg, J Dairy Sci 2005


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Producing High Quality Milk
Top 5 Actions
1. Cull chronically infected cows
2. Reduce bacterial exposure of teats of highest risk cows
3. Develop & keep a Professional work force
4. Use antibiotics only on cows that will benefit
5. Think about eating lambs…

## Changing Expectations About Antibiotic Usage

- Consumers perceive risk even though residues are declining.
- There is a general perception that we are overusing antibiotics
- Treatment & prevention of mastitis is the most common reason antibiotics are used
- Can we defend all antibiotic usage on our farms?


HUFF POST FOOD

**Painkillers, Antibiotics, Growth Hormones Among The 20 Chemicals Found In Typical Glass Of Milk**

A study from the *Journal of Agricultural and Food Chemistry* reveals that a single glass of milk can contain traces of 20 painkillers, antibiotics and growth hormones. Although the doses of the drugs were too small to have any affects on milk drinkers, the mere existence of so many different types offers a window into milk production across the food chain. The researchers analyzed 20 types of cow's, goat's and sheep's milk purchased in Spain and Morocco; the highest quantity of medicine was found in cow's milk.

Some of the chemicals found included niflumic acid (painkiller), florfenicol (antibiotic) and 17a-ethinylestradiol (steroid hormone). Click here to see the list of the other chemicals found.

MORE: Antibiotics, Chemicals in Milk, Chronic Pain, Hormones, Growth Hormones, Milk, Glass of Milk

From Huff Post
http://www.huffingtonpost.com/2011/07/07/milk-painkillers-antibiotics-hormones_n_892257.html



## Action 4: Use Antibiotics only on Cows that will Benefit Get a Diagnosis Before Giving a Drug

- Mastitis signs are **inflammation**
  - <u>do not always</u> indicate active infection
- Only some cases will benefit from antibiotics
  - Active bacterial infections
    - Most **culture negative** cases will not require antibiotics
  - Infections caused by organisms that are susceptible to the drugs that are available
  - Infections that are not chronically distributed throughout the mammary gland tissue
- When possible **determine the bacteria**
  - Before treatment or To modify treatment duration

# Only about 40-50% of Cases Will Benefit from Antibiotic Therapy




# Work with your Local Vet to Develop Appropriate Treatment Protocols

- Is the pathogen going to be killed by the drug?
  – Does the drug have the ability to act on the bacteria?
  – All IMM tubes are labeled for Gram + bacteria
  – But not all can treat Gram –negative bacteria
- Non-severe Culture negative cases are unlikely to benefit from antibiotics
- Read & Follow the labels on ALL products used on your farm

## Producing High Quality Milk
## Top 5 Actions

1. Cull chronically infected cows
2. Reduce bacterial exposure of teats of highest risk cows
3. Develop & keep a Professional work force
4. Don't use antibiotics on cows that won't benefit
5. Think about eating lambs…



## Look at Every Management Practice Like you Are about to Eat a Lamb Chop

- Are we confident that we can defend ALL of our management practices?
  - Do the animals have good quality of life?
  - Are they free of pain?
  - Are they free of fear?
  - Do they have sufficient dry resting space?
  - Are you comfortable explaining to a non-ag friend why we do what we do?
    - If not…what can be changed?

# Producing High Quality Milk is the Cost of Maintaining Market Access

- Our ability to market milk is not
  - defined entirely by us
  - defined only by SCC
- But also by..
  - How we meet changing expectations of antibiotic usage and animal care practices

YOUR MILK COMES FROM A GOOD PLACE

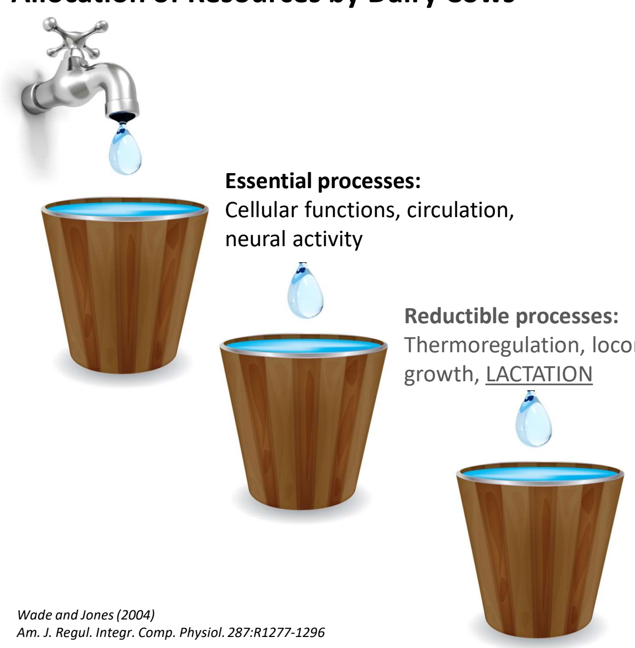
## NOTES

# Impact of Transition Disorders on Production and Reproduction Performance

**Rafael S. Bisinotto**
Large Animal Clinical Sciences
UF UNIVERSITY of FLORIDA

54th Florida Dairy Production Conference
Gainesville, FL

## Allocation of Resources by Dairy Cows



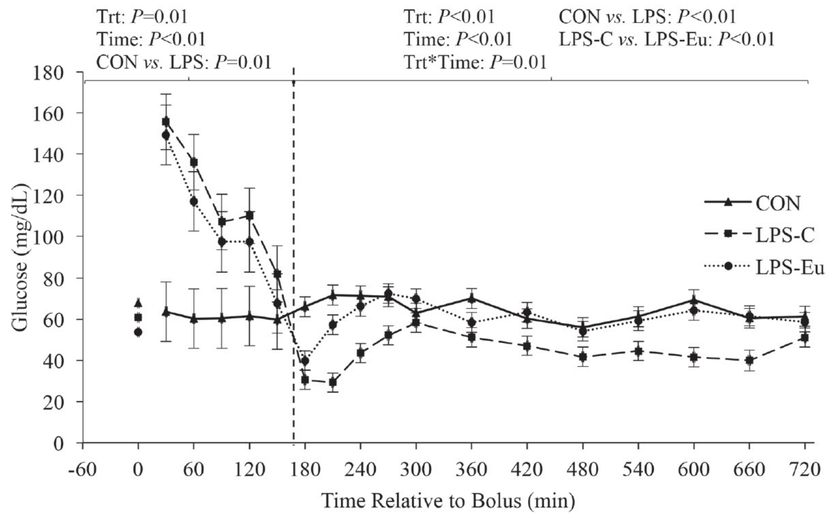
**Essential processes:**
Cellular functions, circulation, neural activity

**Reductible processes:**
Thermoregulation, locomotion, growth, LACTATION

**Expendable processes:**
Fat deposition, REPRODUCTION

*Wade and Jones (2004)*
*Am. J. Regul. Integr. Comp. Physiol. 287:R1277-1296*

## Cost of Maintaining an Active Immune System




*Kvidera et al. (2017) J. Dairy Sci. 100:2360-2374*

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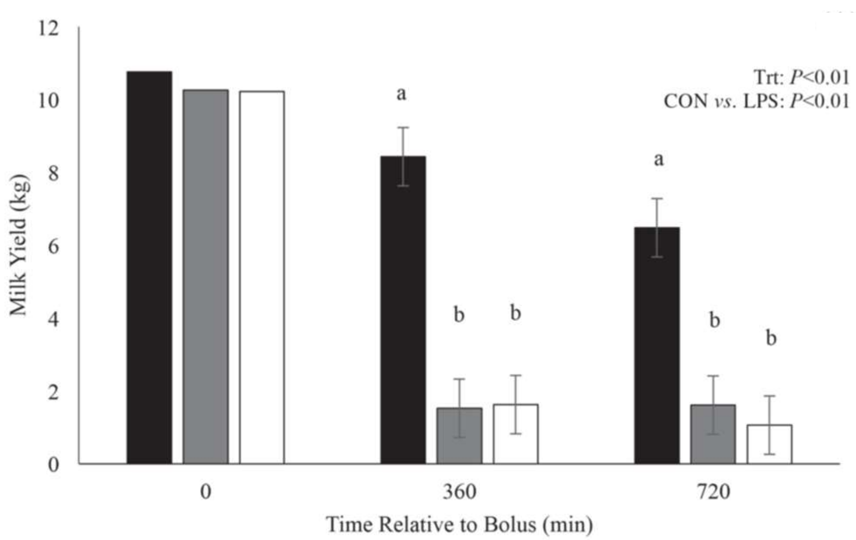
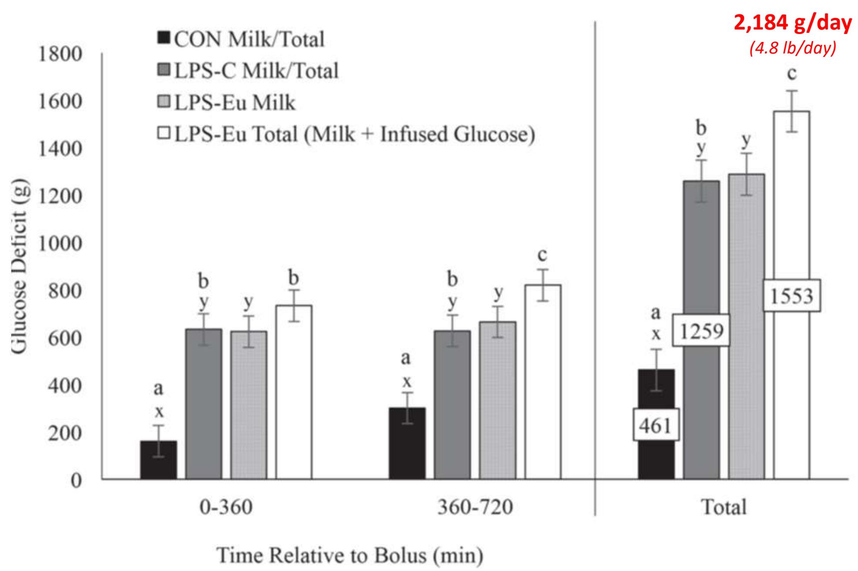


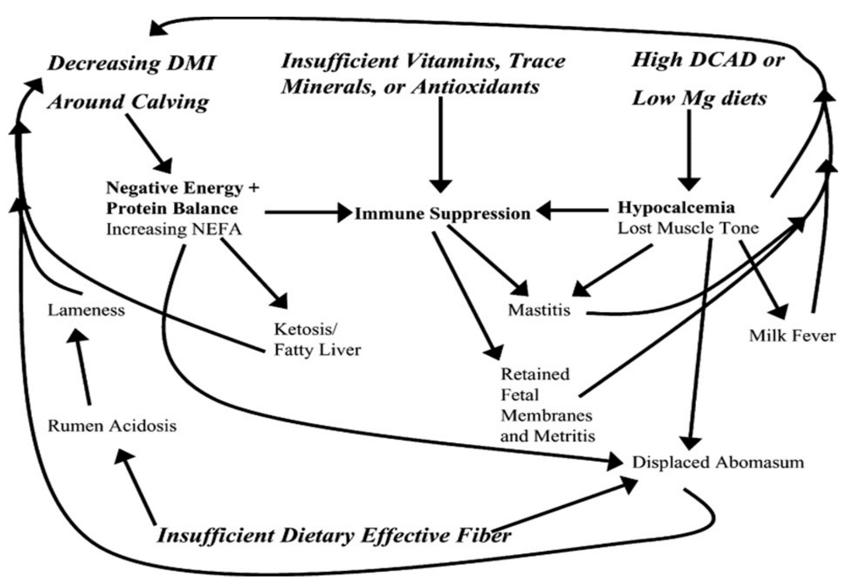

*Kvidera et al. (2017) J. Dairy Sci. 100:2360-2374*

## Cost of Maintaining an Active Immune System



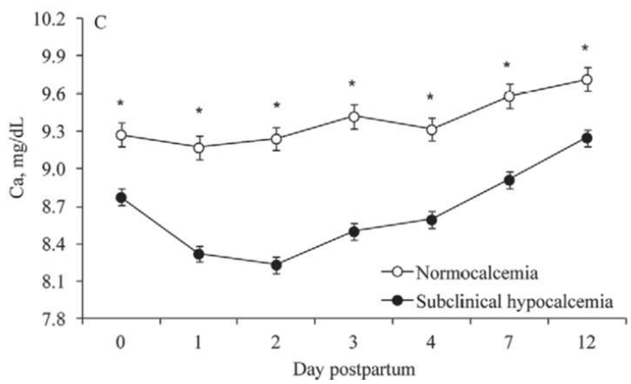

Kvidera et al. (2017) J. Dairy Sci. 100:2360-2374

## Network of Diseases and Metabolic Disorders Postpartum




Goff (2006) J. Dairy Sci. 89:1292-1301

## Network of Diseases and Metabolic Disorders Postpartum

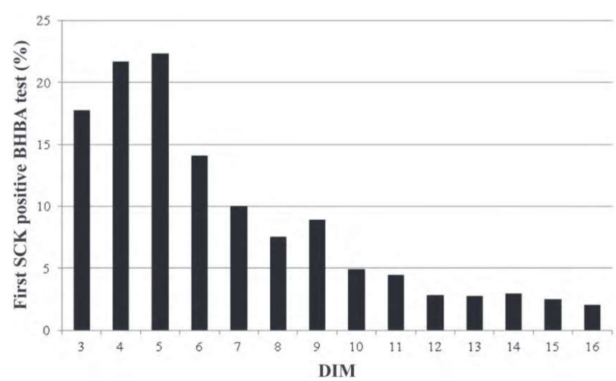



**Cows with subclinical hypocalcemia** ***(Ca ≤ 8.59 mg/dL)*****:**

- **3-fold increase in the risk of metritis**
- **11-fold increase in the risk of puerperal metritis**
- **1.3-fold increase in the risk of clinical endometritis**

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

## Network of Diseases and Metabolic Disorders Postpartum



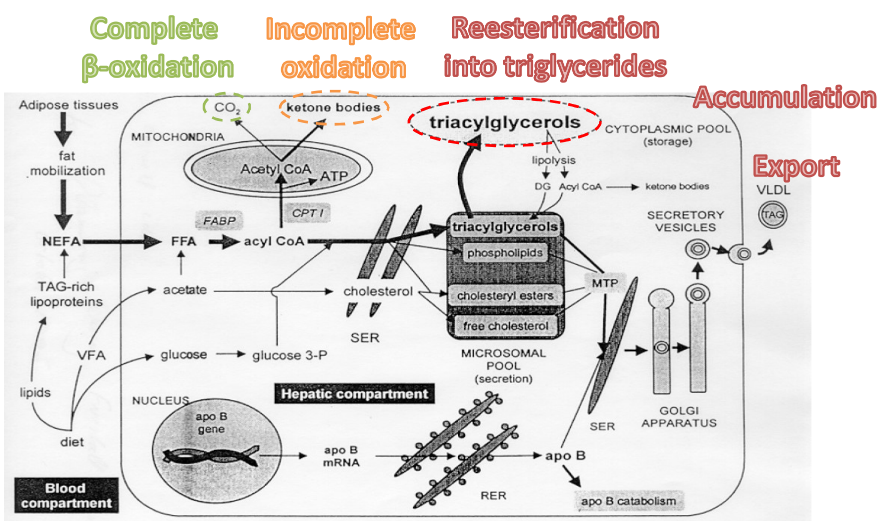

**Cows with subclinical ketosis / hyperketonemia** ***(BHB = 1.2 - 2.9 mmol/L)*****:**

- **19.3-fold increase in the risk of DA**
- **3-fold increase in the risk of death or culling within 30 DIM**

*McArt et al. (2012) J. Dairy Sci. 95:5056-5066*

## Impact of Transition Disorders on Performance of Dairy Cows


## Subclinical Ketosis and Fatty Liver



## Subclinical Ketosis and Elevated NEFA Concentrations Postpartum

**Measured during week 1 postpartum**

- ✓ **BHB ≥ 1.4 mmol/L ::: ↓ 2.4 kg at first test day** *Chapinal et al. (2012) J. Dairy Sci. 95:1301-1309*
- ✓ **BHB ≥ 1.4 mmol/L ::: ↓ 1.9 kg at first test day** *Duffield et al. (2009) J. Dairy Sci. 92:571-580*
- ✓ **NEFA ≥ 0.7 mEq/L ::: ↓ 1.8 kg at first test day** *Chapinal et al. (2012) J. Dairy Sci. 95:1301-1309*

**Measured during week 2 postpartum**

- ✓ **BHB ≥ 1.4 mmol/L ::: ↓ 1.5 kg at first test day** *Chapinal et al. (2012) J. Dairy Sci. 95:1301-1309*
- ✓ **BHB ≥ 2.0 mmol/L ::: ↓ 3.3 kg at first test day** *Duffield et al. (2009) J. Dairy Sci. 92:571-580*
- ✓ **NEFA ≥ 0.7 mEq/L ::: ↓ 1.7 kg at first test day** *Chapinal et al. (2012) J. Dairy Sci. 95:1301-1309*

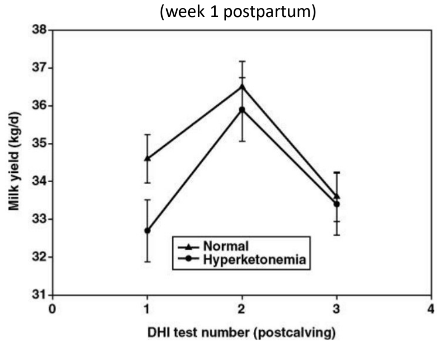
**Measured during weeks 1-2 postpartum**

- ✓ **NEFA and BHB positively associated with milk yield in test days 1 to 4**
- ✓ **NEFA ≥ 0.57 mEq/L ::: ↑ 488 kg ME305** *Ospina et al. (2010) J. Dairy Sci. 93:1596-1603*
- ✓ **NEFA ≥ 0.72 mEq/L ::: ↓ 647 kg ME305** *Ospina et al. (2010) J. Dairy Sci. 93:1596-1603*

## Subclinical Ketosis and Elevated NEFA Concentrations Postpartum

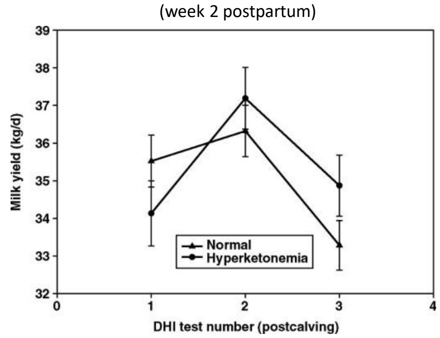
**BHB ≥ 1.4 mmol/L**

(week 1 postpartum)




**BHB ≥ 1.4 mmol/L**

(week 2 postpartum)




**DIM at Diagnosis of hyperketonemia** (BHB ≥ 1.2 mmol/L)

- **3-5 DIM vs. later ::: 6.1-fold increase in the risk of DA**
- **3-7 DIM vs. later ::: 4.5-fold increase in the risk of removal from herd**
- **3-7 DIM vs. Later ::: ↓ 2.1 kg of milk/day during first 30 DIM**

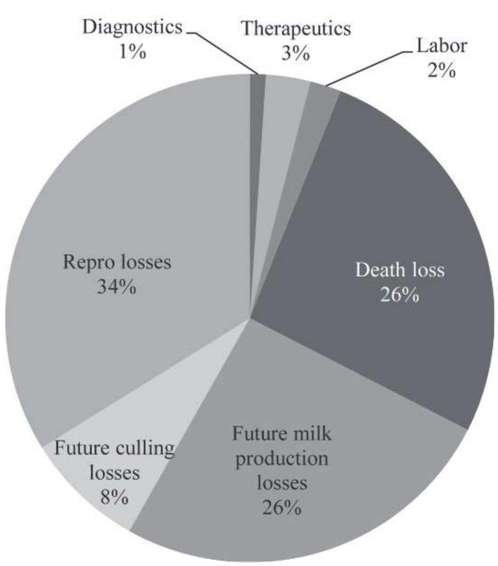
*Duffield et al. (2009) J. Dairy Sci. 92:571-580; McArt et al. (2012) J. Dairy Sci. 95:5056-5066*

## Subclinical Ketosis and Elevated NEFA Concentrations Postpartum

| | Disease status | | | |
|---|---|---|---|---|
| Parameter | Healthy | ↑ NEFA | AOR or AHR | *P*-value |
| Cyclic by 49 DIM | 91.1% | 80.5% | 0.43 (0.25 to 0.75) | < 0.01 |
| P/AI 1st service | 60.3% | 42.2% | 0.52 (0.35 to 0.76) | < 0.01 |
| Conception 70 d past VWP | - | - | 0.84 | 0.05 |

*Ospina et al. (2010) J. Dairy Sci. 93:1596-1603; Ribeiro et al. (2013) J.Dairy Sci. 96:5682-5697*

## Subclinical Ketosis and Elevated NEFA Concentrations Postpartum




**Component cost of hyperketonemia**
- **36% of total cost (primiparous)**
- **44% of total cost (multiparous)**

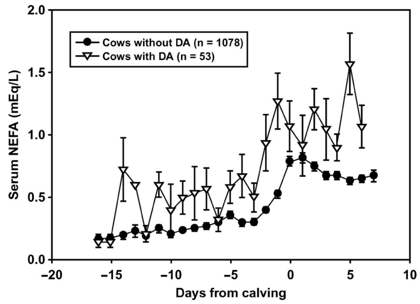
**DA cost of hyperketonemia**
- **27% of total cost (primiparous)**
- **26% of total cost (multiparous)**

**Metritis cost of hyperketonemia**
- **37% of total cost (primiparous)**
- **30% of total cost (multiparous)**

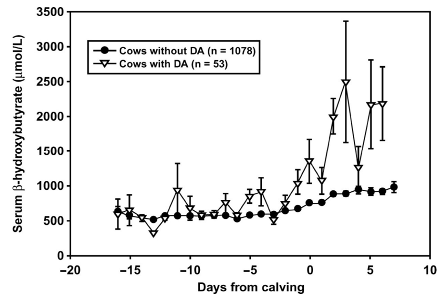
**Total cost of hyperketonemia**
- **US$ 375/case (primiparous)**
- **US$ 256/case (multiparous)**

*McArt et al. (2012) J. Dairy Sci. 95:5056-5066*

## Subclinical Ketosis and Elevated NEFA Concentrations Prepartum



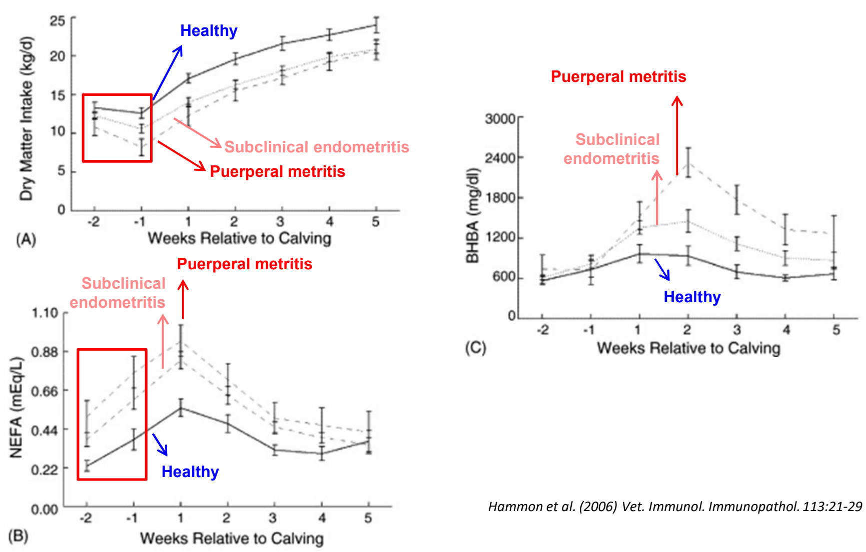

↑NEFA (> 0.5 mEq/L) prepartum
<u>↑ risk of DA by 3.6-fold</u>




↑BHBA (> 1.2 m*M*) postpartum
<u>↑ risk of DA by 8-fold</u>

*LeBlanc et al. (2005) J. Dairy Sci. 88:159-170*

## Subclinical Ketosis and Elevated NEFA Concentrations Prepartum



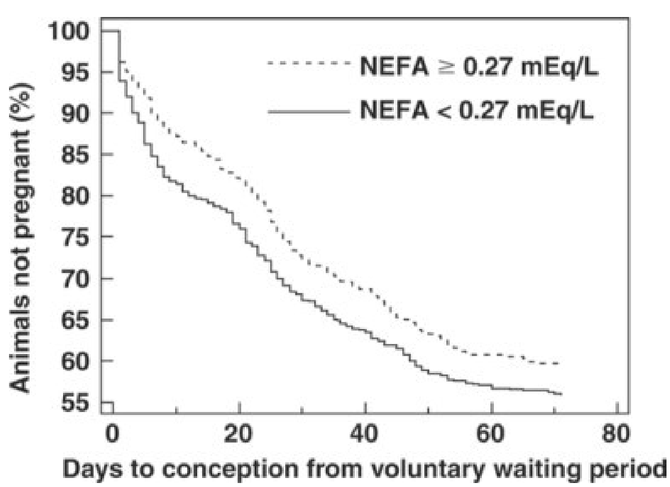

*Hammon et al. (2006) Vet. Immunol. Immunopathol. 113:21-29*

## Subclinical Ketosis and Elevated NEFA Concentrations Prepartum

| Item | Prepartum BCS change | | | |
|---|---|---|---|---|
| | Gained | No change | -0.25 to -0.50 | ≥ -0.75 |
| | Adj. OR (95% CI) | | | |
| n | 3,251 | 4,819 | 6,430 | 1,604 |
| Metritis or RFM | 12.2%<br>Ref. | 13.3%<br>1.17 (1.02-1.35) | 13.6%<br>1.24 (1.08-1.42) | 15.8%<br>1.68 (1.39-2.03) |
| Antimicrobial Tx | 10.1%<br>Ref. | 11.8%<br>1.15 (0.95-1.39) | 12.4%<br>1.32 (1.10-1.57) | 14.1%<br>1.57 (1.24-2.00) |
| Antiinflammatoty Tx | 6.7%<br>Ref. | 7.9%<br>1.04 (0.83-1.29) | 10.0%<br>1.25 (1.02-1.52) | 13.7%<br>1.57 (1.22-2.03) |
| Supportive Tx | 5.9%<br>Ref. | 7.6%<br>1.38 (1.14-1.66) | 8.4%<br>1.51 (1.26-1.81) | 8.1%<br>1.63 (1.26-2.09) |
| P/AI first service | 41.9%<br>Ref. | 33.1%<br>0.68 (0.62-0.75) | 28.3%<br>0.55 (0.50-0.60) | 20.8%<br>0.36 (0.31-0.41) |
| Hazard of pregnancy to 305 DIM | Ref. | 0.70<br>(0.64-0.77) | 0.76<br>(0.70-0.83) | 0.88<br>(0.79-0.99) |

*Chebel et al. (2018) J. Dairy Sci. 101:4595-4614*

## Subclinical Ketosis and Elevated NEFA Concentrations Prepartum




*Ospina et al. (2010) J. Dairy Sci. 93:1596-1603; Ribeiro et al. (2013) J.Dairy Sci. 96:5682-5697*

## Calcium Homeostasis in Dairy Cows During the Transition Period

**Serum Ca concentration in dairy cows = 9-10 mg/dL**

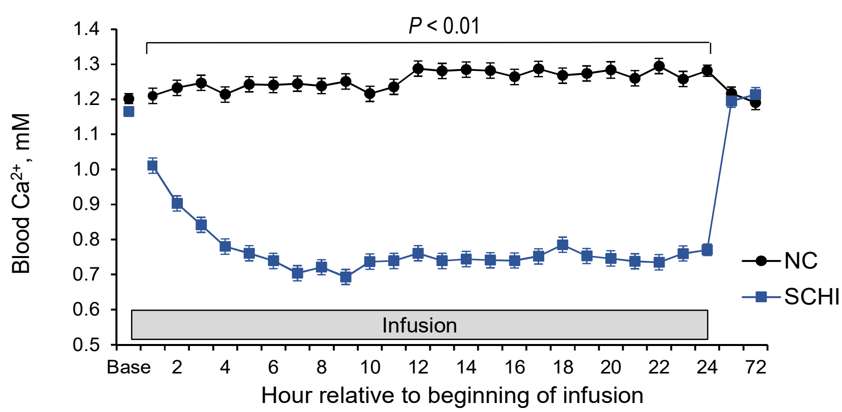
**Total blood Ca pool = 2-4 g**

**Ca requirement colostrum = 10-12 times blood pool**

**Ca requirement peak milk = 20-30 times blood pool**

*Horst et al. (2005) J. Mammary Gland. Biol. Neoplasia 10:141-156*

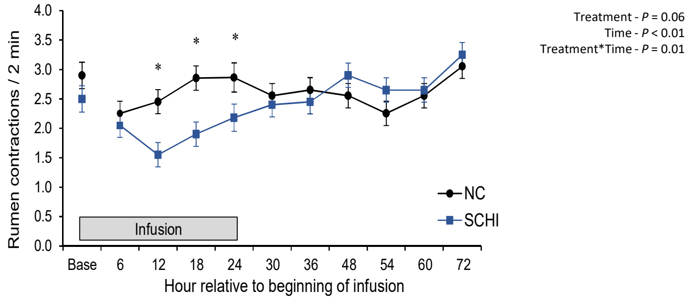
## Importance of Calcium for Biological Processes

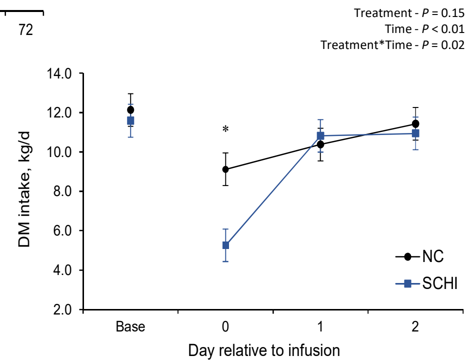



Treatment - $P < 0.01$
Time - $P < 0.01$
Treatment*Time - $P < 0.01$

*Martinez et al. (2014) J. Dairy Sci. 97:874-887*

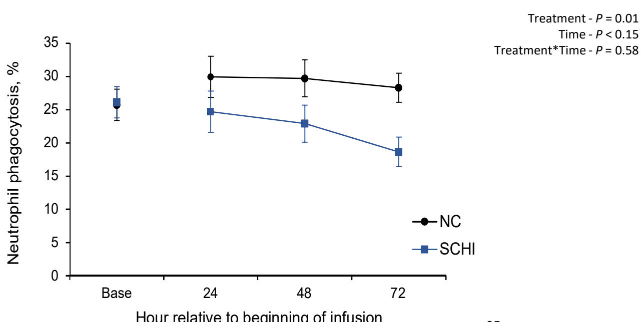
## Importance of Calcium for Biological Processes

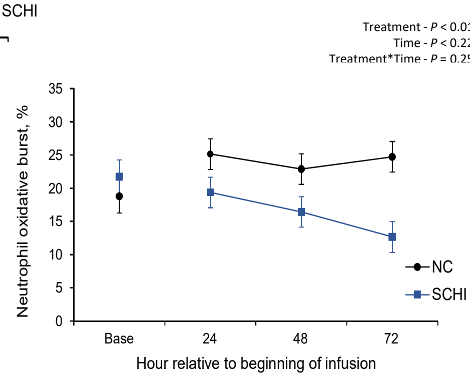



*Martinez et al. (2014) J. Dairy Sci. 97:874-887*

## Importance of Calcium for Biological Processes




*Martinez et al. (2014) J. Dairy Sci. 97:874-887*

## Importance of Calcium for Biological Processes

**Measured during week 1 postpartum**

- ✓ **Ca ≤ 8.4 mg/dL ::: ↓ 2.6 kg at first test day**

**Measured during week 2 postpartum**

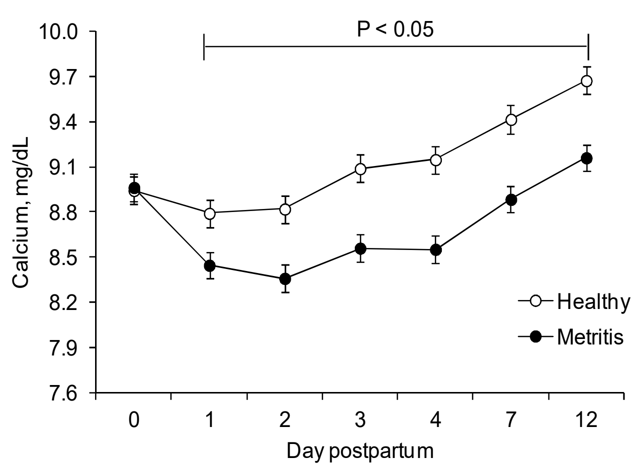
- ✓ **Ca ≤ 8.4 mg/dL ::: ↓ 4.8 kg at first test day**
  **↓ 2.6 kg/d across DHIA tests 1 to 4**

**Measured during week 3 postpartum**

- ✓ **Ca ≤ 8.4 mg/dL ::: ↓ 7.1 kg at first test day**
  **↓ 3.5 kg/d across DHIA tests 1 to 4**

*Chapinal et al. (2012) J. Dairy Sci. 95:1301-1309*

## Association Between Hypocalcemia and Uterine Health




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

## Association Between Hypocalcemia and Uterine Health

| Ca status | Low-risk group | |
|---|---|---|
| | Normocalcemia | SCH |
| Metritis,[3,4,5] % (no./no.) | 14.3 (4/28) | 40.7 (11/27) |
| Puerperal metritis,[4,6] % (no./no.) | 0.0 (0/28) | 29.6 (8/27) |

| Ca status | High-risk group | |
|---|---|---|
| | Normocalcemia | SCH |
| Metritis,[3,4,5] % (no./no.) | 20.0 (2/10) | 77.8 (35/45) |
| Puerperal metritis,[4,6] % (no./no.) | 10.0 (1/10) | 53.5 (24/45) |

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

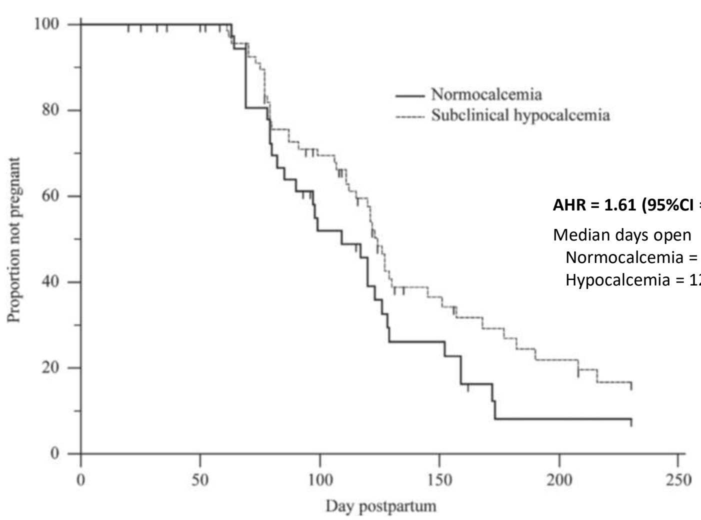
**Population-Attributable Risk**

* Reduction in metritis incidence if cows did not have SCH

**Metritis = 66.6%**

**Puerperal metritis = 91.2%**

## Association Between Hypocalcemia and Uterine Health



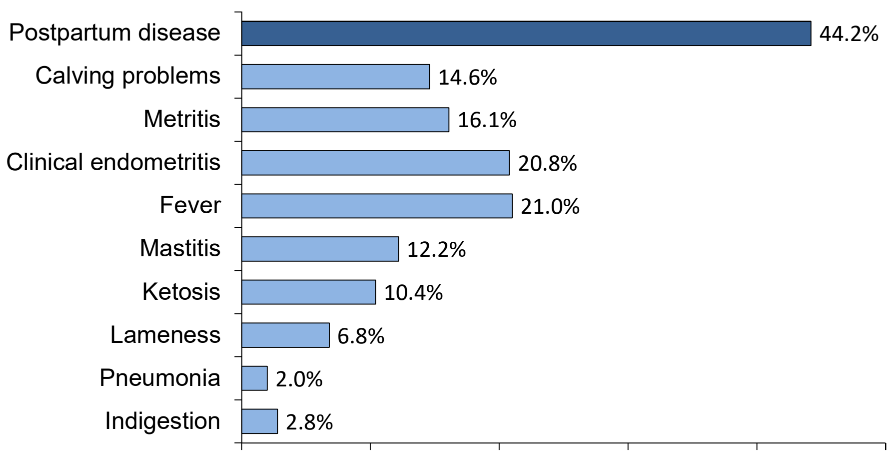

**AHR = 1.61 (95%CI = 0.97-2.65), *P* = 0.06**

Median days open
Normocalcemia = 109 days
Hypocalcemia = 124 days

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

## Occurrence of Diseases During the First 60 DIM

5,719 dairy cows (8 studies in 7 dairies in the US)




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

## Effect of Disease on Fertility Outcomes

| | **P/AI d 60,** % (AOR – 95% CI) | | **Pregnancy loss,** % (AOR – 95% CI) | |
|---|---|---|---|---|
| Health status | | | | |
| Healthy | 51.4 | Ref. | 8.9 | Ref. |
| 1 case of disease | 43.3** | 0.79 (0.69 - 0.91) | 13.9*** | 1.73 (1.25 - 2.39) |
| > 1 cases of disease | 34.7*** | 0.57 (0.48 - 0.69) | 15.8*** | 2.08 (1.36 - 3.17) |
| Type of disease | | | | |
| Calving problems | 40.3*** | 0.75 (0.63 - 0.88) | 15.9** | 1.67 (1.16 - 2.40) |
| Metritis | 37.8*** | 0.66 (0.56 - 0.78) | 11.3 | 1.01 (0.71 - 1.60) |
| Clinical endometritis | 38.7*** | 0.62 (0.52 - 0.74) | 15.1* | 1.55 (1.04 - 2.32) |
| Fever postpartum | 39.8*** | 0.60 (0.48 - 0.65) | 18.0** | 2.00 (1.24 - 3.14) |
| Mastitis | 39.4 | 0.84 (0.64 – 1.10) | 19.8*** | 2.62 (1.48 - 4.64) |
| Clinical ketosis | 28.8*** | 0.50 (0.36 - 0.68) | 14.6 | 1.64 (0.75 - 3.59) |
| Lameness | 33.3*** | 0.57 (0.41 - 0.78) | 26.4** | 2.67 (1.38 - 5.12) |
| Pneumonia | 32.4 | 0.63 (0.32 – 1.27) | 16.7 | 1.87 (0.40 - 8.69) |
| Indigestion | 36.7 | 0.78 (0.46 – 1.34) | 15.8 | 1.81 (0.52 - 6.32) |

** P < 0.05, ** P < 0.01, *** P < 0.001*

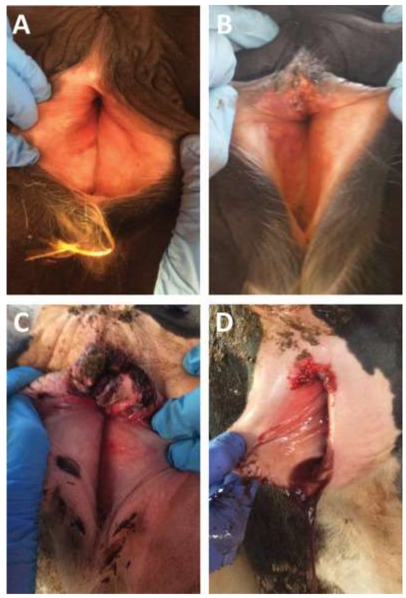
*Santos et al. (2010) Soc. Reprod. Fertil. 67:387-403*

## Effect of Vulvovaginal Laceration at Calving

Vulvovaginal Laceration Score (**VLS**)

**VLS = 0**
No laceration

**VLS = 1**
Laceration < 2 cm
(dorsal commissure)




**VLS = 2**
Laceration ≥ 2 cm
(dorsal commissure)

**VLS = 2**
Laceration ≥ 2 cm
(dorsal commissure)
with VD = 5

*Veira-Neto et al. (2016)*
*J. Dairy Sci. 99:4629-4637*

## Effect of Vulvovaginal Laceration at Calving

**Increased incidence of metritis**

- ✓ **VLS 0 = 42.4%**
- ✓ **VLS 1 = 52.0% (OR = 1.5, *P* = 0.10)**
- ✓ **VLS 2 = 69.1% (OR = 2.6, *P* < 0.001)**

**Increased incidence of purulent vaginal discharge at 32 DIM**

- ✓ **VLS 0 = 43.1%**
- ✓ **VLS 1 = 46.6% (OR = 1.3, *P* = 0.29)**
- ✓ **VLS 2 = 56.5% (OR = 1.7, *P* = 0.01)**

**Reduced proportion of cyclic cows by 64 DIM**

- ✓ **VLS 0 = 86.8%**
- ✓ **VLS 1 = 81.0% (OR = 0.7, *P* = 0.21)**
- ✓ **VLS 2 = 70.0% (OR = 0.4, *P* = 0.001)**

**Reduced P/AI after first insemination postpartum**

- ✓ **VLS 0 = 33.6%**
- ✓ **VLS 1 = 28.4% (OR = 0.7, *P* = 0.07)**
- ✓ **VLS 2 = 28.7% (OR = 0.6, *P* = 0.03)**

## Effect of Disease on Fertility Outcomes

| | P/AI d 60, % (AOR – 95% CI) | | Pregnancy loss, % (AOR – 95% CI) | |
|---|---|---|---|---|
| Health status | | | | |
| Healthy | 51.4 | Ref. | 8.9 | Ref. |
| 1 case of disease | 43.3** | 0.79 (0.69 - 0.91) | 13.9*** | 1.73 (1.25 - 2.39) |
| > 1 cases of disease | 34.7*** | 0.57 (0.48 - 0.69) | 15.8*** | 2.08 (1.36 - 3.17) |
| Type of disease | | | | |
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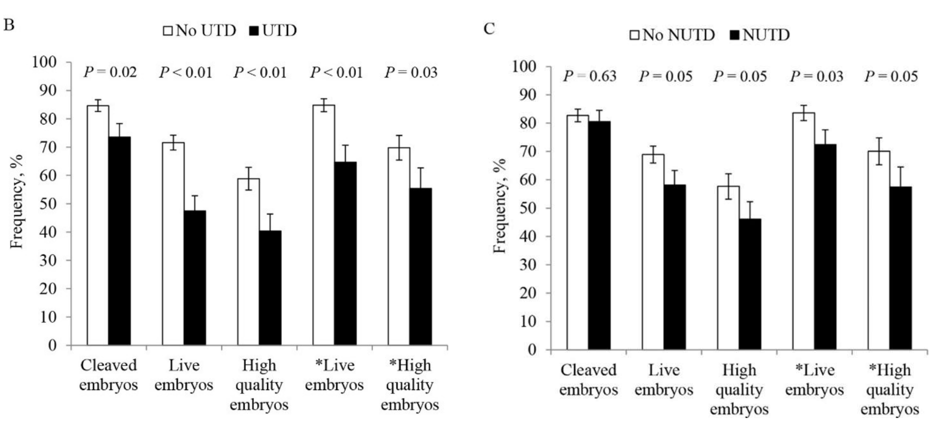
** P < 0.05, ** P < 0.01, *** P < 0.001*

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

## Effect of Disease on Fertility Outcomes




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

## Conclusions

- ✓ Lactation and reproduction are not essential processes from a nutrient allocation standpoint
- ✓ Performance during lactation is largely affected
  - ✓ Metabolic status
  - ✓ Health disorders
- ✓ Optimum productive and reproductive efficiency requires adequate
  - ✓ Management of the transition period
  - ✓ Animal husbandry for maintenance of health
  - ✓ Nutrition and welfare

## NOTES


## Todays Program

- Focus on fresh cow feeding strategies
- KPI (Key Performance Indicators) of a successful transition program

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## Fresh Cow Rations

- Similar feed ingredients to the high group TMR
- Add functional fiber (3 to 4 lbs of long fiber as hay or 1 to 2 lbs of processed straw)
- Fresh cow additive package (yeast product, Rumensin, chromium, buffer, and organic trace minerals)
- Moving cows vs. stepping up nutrient levels (less fiber, more starch, RUP)
- Rumen fill factor to move fresh cows

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## Examples of Fresh, Close-Up, and High Group Rations (Hoards Feeding Guide, 2018)

| Item | Close Up Dry | Fresh Cow | Early Lactation |
|---|---|---|---|
| Dry Matter Intake (lb) | 22 | 34 | 66 |
| Milk Yield (lb/day) | None | 77 | 120 |
| Metabilizable Protein (lb/day) | 8.0 | 13.8 | 11.6 |
| NE-l (Mcal/lb DM) | 0.60 | 0.65 | 0.73 |
| NDF (%) | 35 | 30 | 28 |
| NFC (%) | 34 | 35 | 38 |

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## University of Wisconsin

THE UNIVERSITY of WISCONSIN MADISON

**Hypocalcemia**

**Risks and Rewards**

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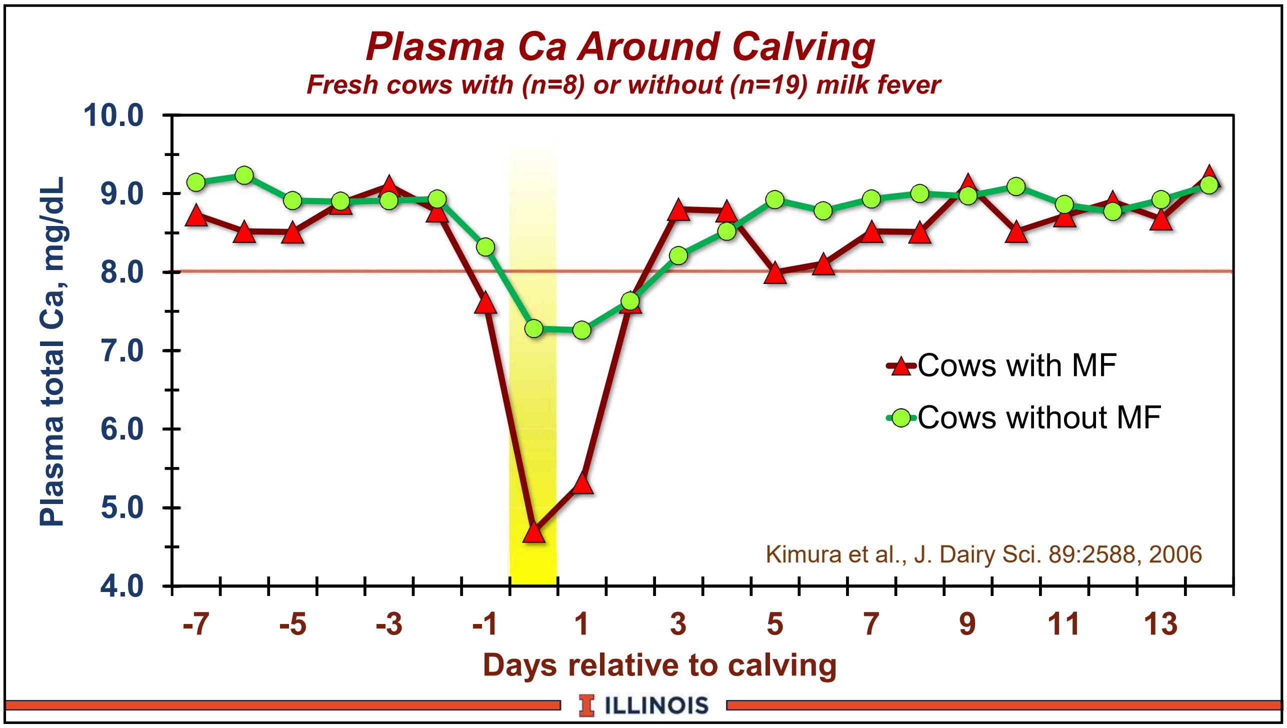


# Effects of Subclinical Hypocalcemia

- Subclinical hypocalcemia was associated with:
  - increased risk for metritis (3.2X)
  - increased risk for post-partum fever (2.4X)
  - increased post-fresh BHBA (1.0 vs. 0.7 mmol/L)
  - longer median days open (124 vs. 109 days)
- Identified immune suppression associated with hypocalcemia
  - reduced neutrophil concentration
  - reduced percentage of neutrophils undergoing phagocytosis and oxidative bursts

*Martinez et al., J. Dairy Sci. 95:7158, 2012*

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## Tools to Reduce Hypocalcemia

- Anionic product
  - DCAD below zero (-50 to -100 meq/kg)
  - Urine pH of 5.5 to 6.0 (Holstein); 5.0 to 5.5 (Jersey)
  - 150 to 180 grams of total calcium
- Calcium supplementation (bolus or paste)
  - 50 to 60 grams per treatment
  - Calcium chloride, sulfate, or propionate
  - At calve and 12/24 hours later or as needed

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## DCAD Guidelines

- SoyChlor, BioChlor, and Aminate (2nd generation); avoid ammonium salts
- Full acidification (pH < 6—Holstein; <5.5 Jersey)
- 150 to 180 grams of calcium (50+ grams as inorganic calcium sourced)
- Not needed for heifers
- Test feeds for sodium, potassium, chlorine, and sulfur (wet chemistry)

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## Strategies When Using Calcium Bolus(s)

- Older cows (3rd lactation cows)
- Cows that exhibit lameness (score 3 and higher)
- Heavy cows (3.5 BCS or higher)

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## Michigan State University

MICHIGAN STATE
UNIVERSITY

**Adding Fatty Acids to Fresh Cow Rations**

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## Experimental Design (Dr. Lock)

- Fresh cows were fed from day 0 to 21 days after calving
- Added 1.5 percent to the ration dry matter intake
- Percent of palmitic and oleic was evaluated
- All cows moved at day 22 to ration with no supplemental fatty acids (carry over effect continued for next 40 days)

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## MSU Research Results

| Item | Control | High Palmitic | Inter Palmitic | Low Palmitic |
|---|---|---|---|---|
| Palmaiic (%) | None | 80 | 70 | 60 |
| Oleic (%) | None | 10 | 20 | 30 |
| Milk (lb/day) | 102.4[a] | 106.9[b] | 107.4[b] | 109.3[b] |
| DMI (lb/day) | 44.7 | 45.5 | 46.0 | 48.0 |
| Milk fat (lb/day) | 4.18[c] | 4.73[d] | 4.58[d] | 4.60[d] |
| NEFA (Meq/l) | 0.72 | 0.84 | 0.75 | 0.67 |
| Plasma insulin (ug/l) | 0.26 | 0.27 | 0.31 | 0.31 |

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# University of Illinois
# Methionine Research Summary

**Feed rumen protected methionine at:**

**0.09% in DM Prefresh (30d)**

**& 0.1% in DM Postfresh (60d)**

Batistel et al. (2017)

Alharthi et al. (2017)

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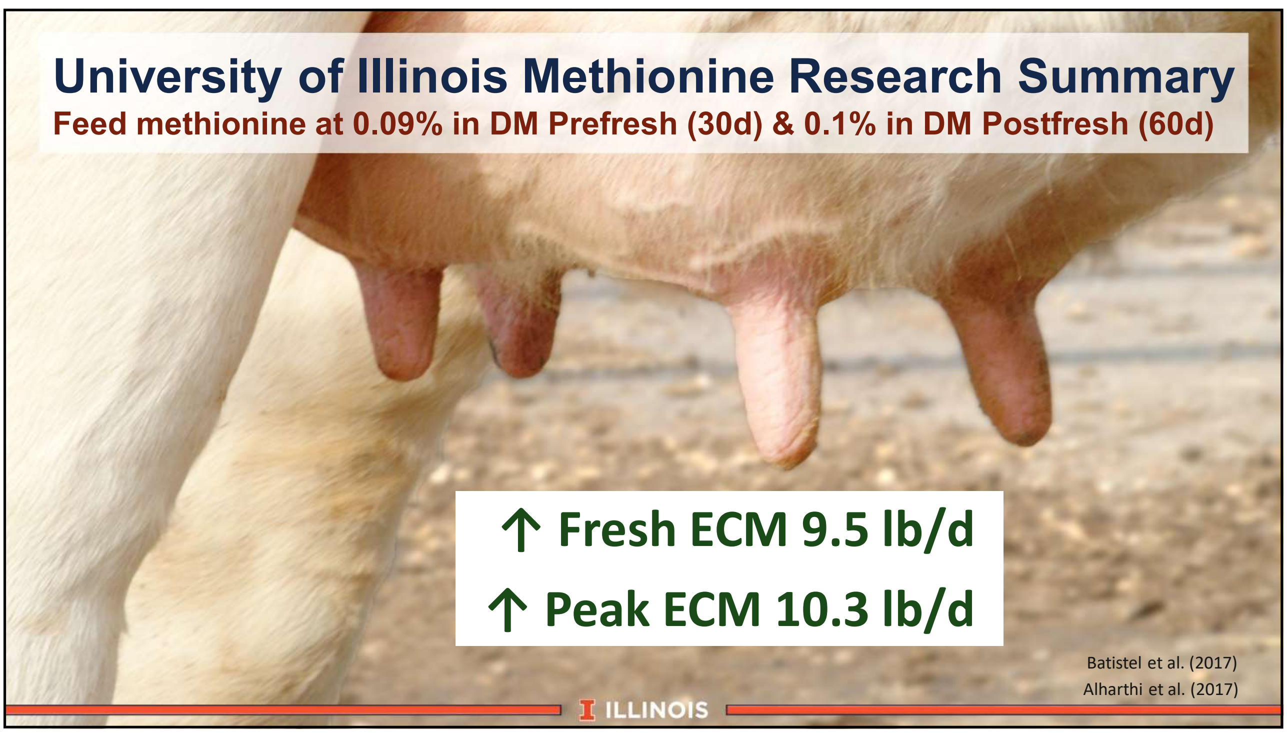

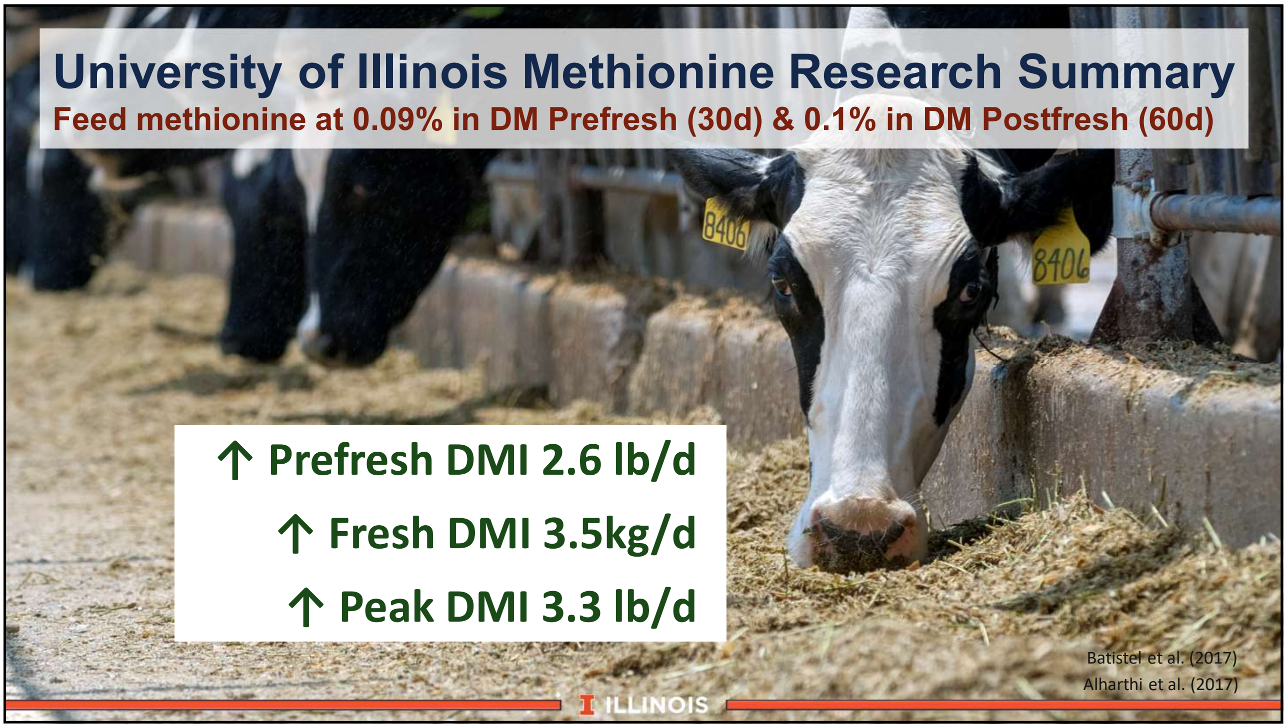


## University of Illinois Methionine Research Summary

**Feed methionine at 0.09% in DM Prefresh (30d) & 0.1% in DM Postfresh (60d)**

↑ Prefresh DMI 2.6 lb/d

↑ Fresh DMI 3.5kg/d

↑ Peak DMI 3.3 lb/d

Batistel et al. (2017)
Alharthi et al. (2017)

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## University of Illinois Methionine Research Summary

**Feed methionine at 0.09% in DM Prefresh (30d) & 0.1% in DM Postfresh (60d)**

↑ Liver Functionality Index

↑ Neutrophil Function

↓ Oxidative Stress

↓ Inflammation

Batistel et al. (2017)
Alharthi et al. (2017)

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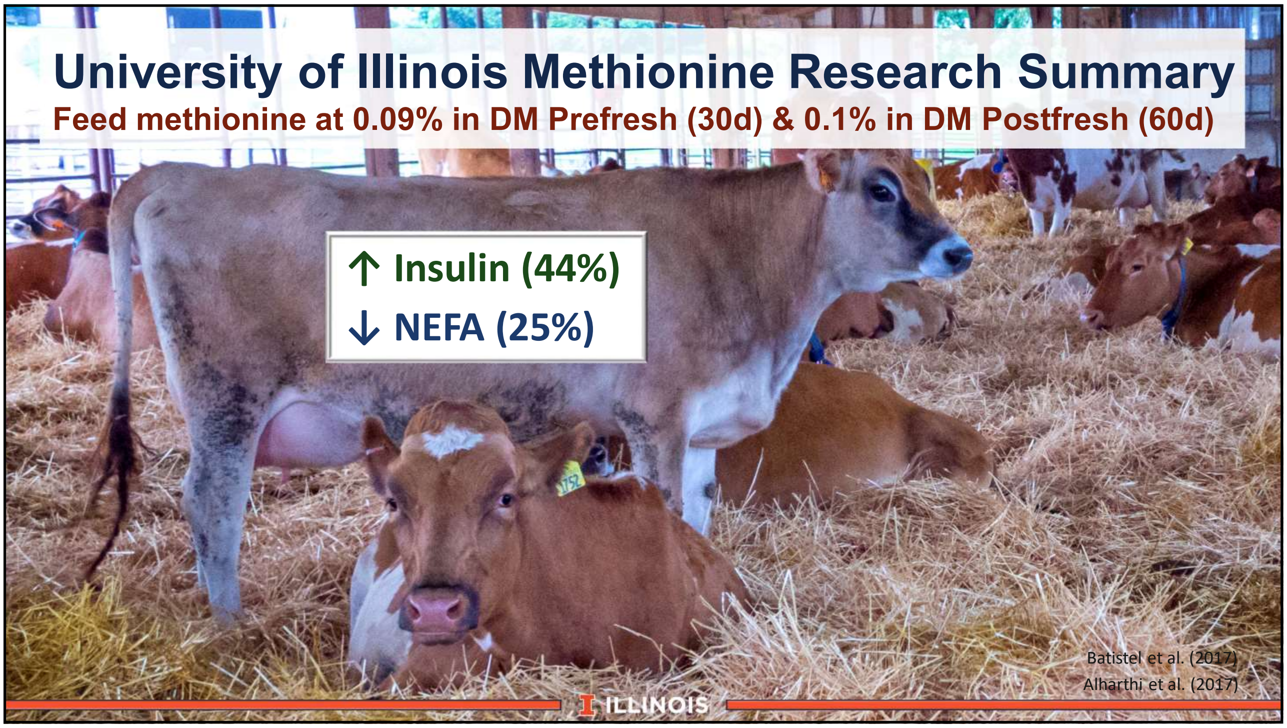
University of Illinois Methionine Research Summary
Feed methionine at 0.09% in DM Prefresh (30d) & 0.1% in DM Postfresh (60d)
↑ Insulin (44%)
↓ NEFA (25%)
Batistel et al. (2017)
Alharthi et al. (2017)
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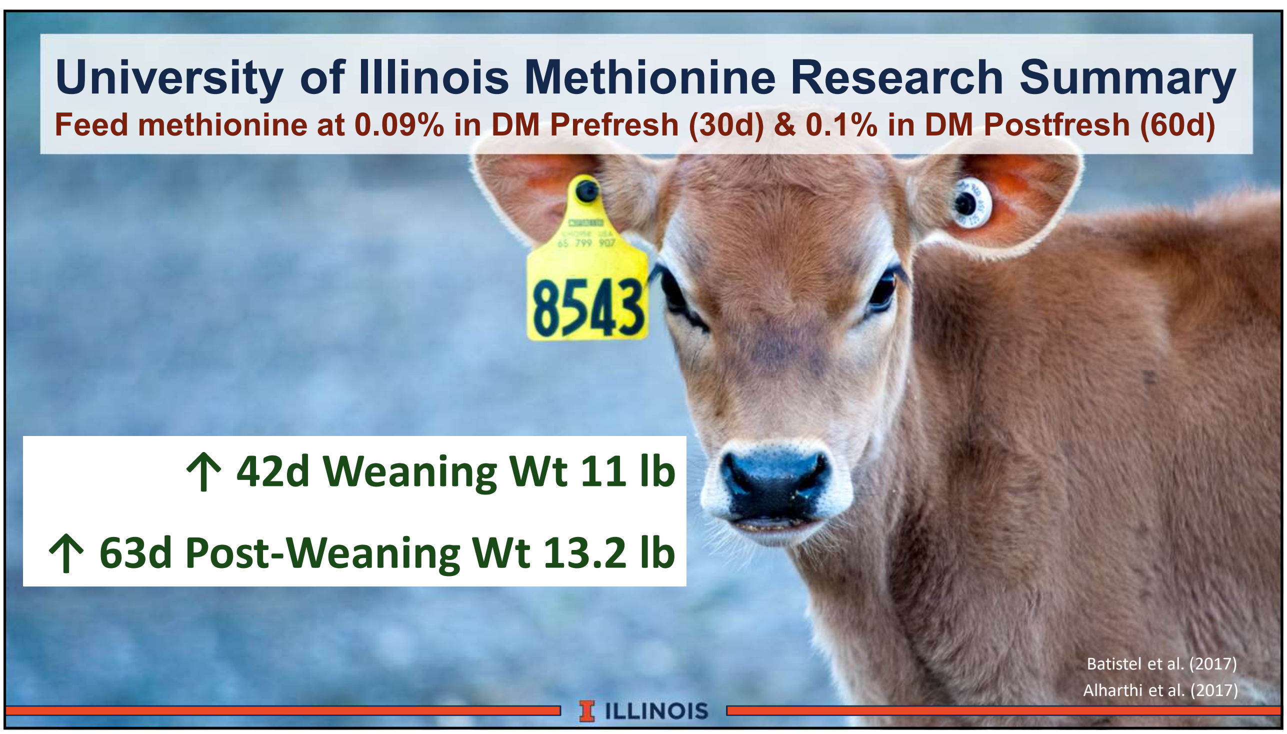
University of Illinois Methionine Research Summary
Feed methionine at 0.09% in DM Prefresh (30d) & 0.1% in DM Postfresh (60d)
8543
↑ 42d Weaning Wt 11 lb
↑ 63d Post-Weaning Wt 13.2 lb
Batistel et al. (2017)
Alharthi et al. (2017)
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## University of Wisconsin
## Cornell University

**Energy Balance and Subclinical Ketosis**

Risks and Rewards

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## Negative Energy Balance

- Negative energy balance (NEB) is when the sum of the energy needs is greater than the amount of energy supplied to the cow.
- Cows in NEB make up the difference between energy needs and energy required by mobilizing body reserves (losing weight and body condition).

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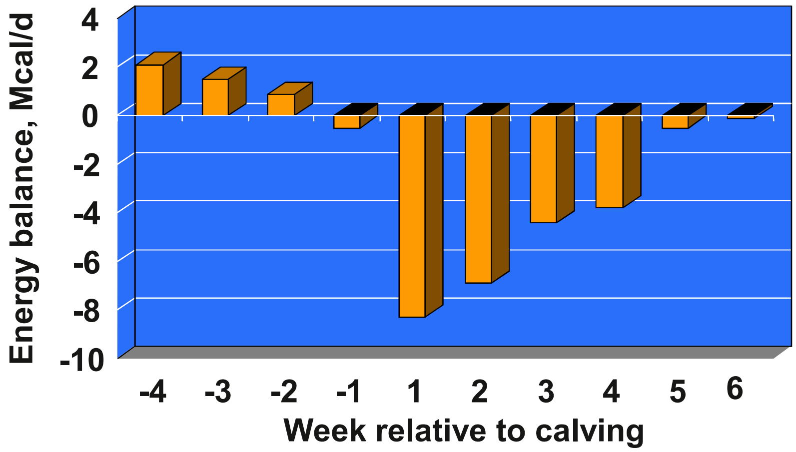
## Typical Energy Balance for Transition and Early Lactation Dairy Cows




adapted from Putnam, 1998

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## Impact of BHBA on Cows

- Estimated 30% of cows experience ketosis
- Impact on milk yield and reproductive success are important
- Subclinical ketosis is > 1.2 mmol/liter
- Can use Precision Xtra system cow side / DHI monitoring
- Check cows from 3 to 16 days in milk
- Drench with propylene glycol

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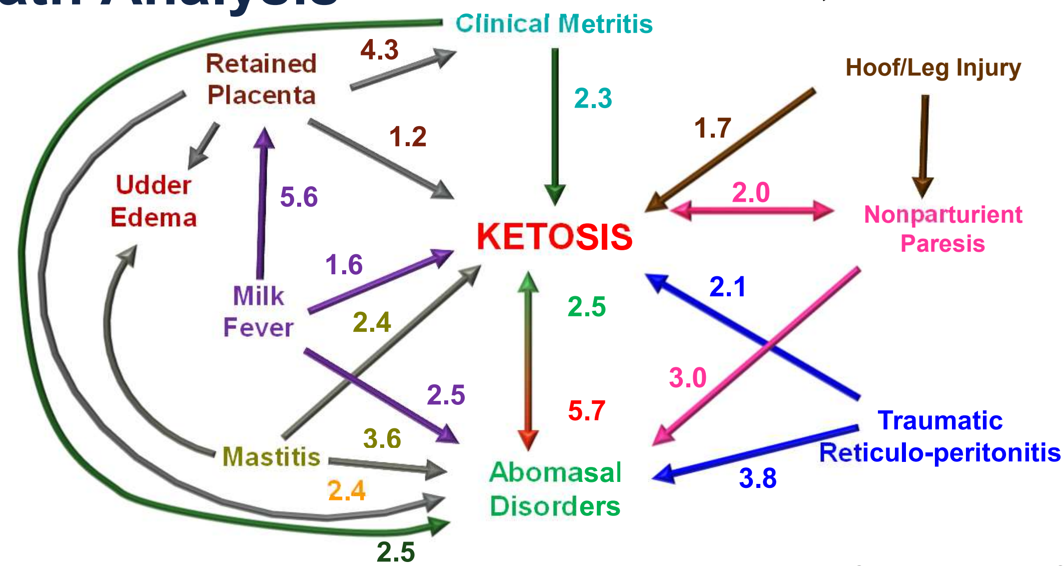
## Path Analysis

**61,124 cows**
**5,661 herds**




Grohn, et al 1989 JDS 72:1876

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## Subclinical Ketosis (Fourdraine, AgSource)

- 3400 herds and 215,000 cows over three years
- Milk KetoMonitor test at 5 to 20 days postpartum
- If 1st lactation cow have ketosis, 22% chance this cow may have ketosis in the next lactation
- If older cows have ketosis, 45% chance she may be ketosis in her next lactation

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# Impact of Ketosis (Fourdraine, AgSource)

- Lower conception rate
  - 6% in 1st lactation cows/heifers
  - 2% in older cows
- Higher culling rate
  - 6% in heifers
  - 5% in older cows
- Cost of ketosis per case
  - $375 for 1st lactation cows/heifers
  - $256 for older cows

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# Ketosis incidence observed and measured

| Location | # of cows | Milk, lbs/d | Ketosis observed, % | Ketosis measured*, % |
|---|---|---|---|---|
| NY | 1,890 | 92.0 | 13.2 | 41.3 |
| NY | 1,827 | 92.0 | 14.9 | 27.3 |
| WI | 2,794 | 86.7 | 4.2 | 40.7 |
| WI | 4,106 | 77.0 | 35.2 | 57.2 |

Overall measured ketosis = 46%
* Cows with BHBA > 1.2 mmol/L in at least one test (Precision –Xtra meter)
Highest incidence at 5 DIM

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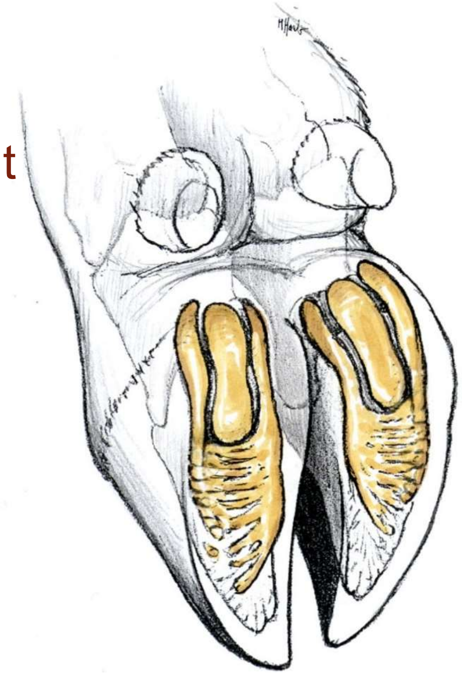
Oetzel, 2012: Hoards Dairyman webinar series, Feb. 13 2012

## Digital Cushion in Cows

- Cushions contain a higher amount of fat in mature cows compared to heifers
- Fat content is softer - contains a larger amount of MUFA (mono-unsaturated fat)

Ch. J. Lischer and P. Ossent,
12th International Lameness Symposium,
Orlando, FL, 2002.



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## Impact of Changing Body Condition Score

- Digital cushion thickness (DCT) provides cushion to the hoof structure.
- Cows with the highest DCT had 15% lower lameness scores compared to lowest DCT scored cows.
- DCT continues to drop after calving with the lowest level at 120 days after calving
- Target:  Avoid dropping more than 0.5 BCS after calving (reflects dry matter intake and environment)

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## Indicators of Energy Balance

- Change in body condition score (BCS)
  - Drop of > 0.75 BCS in 60 days
- Non-esterified fatty acids (NEFAs)
  - Levels over 1000 mg/dl
- Fat test in early lactation
  - Milk fat tests over 4.5 (Holstein) or > 1.4 ratio of milk fat to true milk protein

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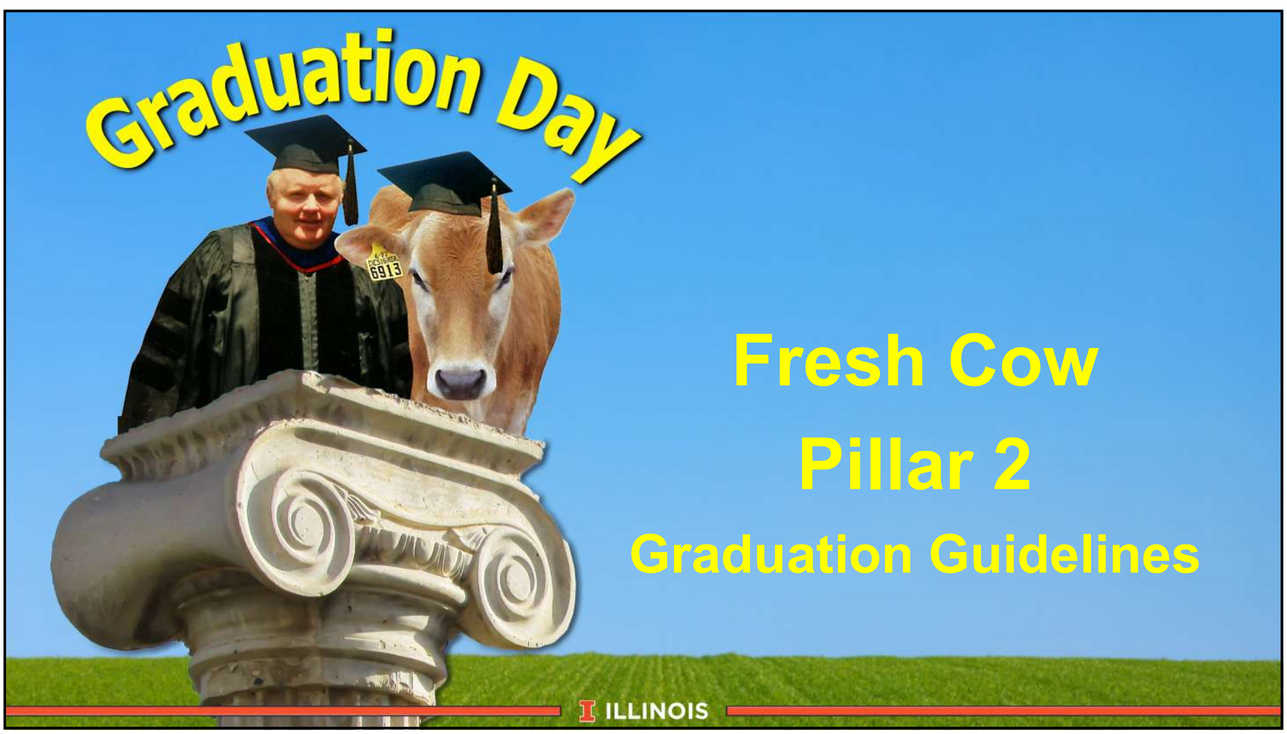

## National Jersey Survey of High Herds

**Do you have a fresh cow group? (n=38)**

**Yes 47% No 53%**

**How days are fresh cows kept in the fresh group? (n=17)**

**Average: 30.7**

**Max: 100**

**Min: 10**

**SD: 24.1**

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## Jersey Study: Determining when fresh cows are ready to move to the high group. (n=26)

54% Days in milk

31% Cows general appearance

31% Other

23% Whenever there is a group of cows to move

**19% Milk production**

**8% Feed intake**

**4% Body temperature**

**4% Rumination activity**

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## Determining Days In the Fresh Cow Pen

- The range varies from 3 to 45 days.
- The factors reported for moving fresh cows include the need for space, days in milk, milk yield, and health status.
- Minimum of 10 days to monitor health
- Move the cow when health to allow intake of the high cow ration

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## FATMUD Tools

***Dr. Dick Wallace Approach***

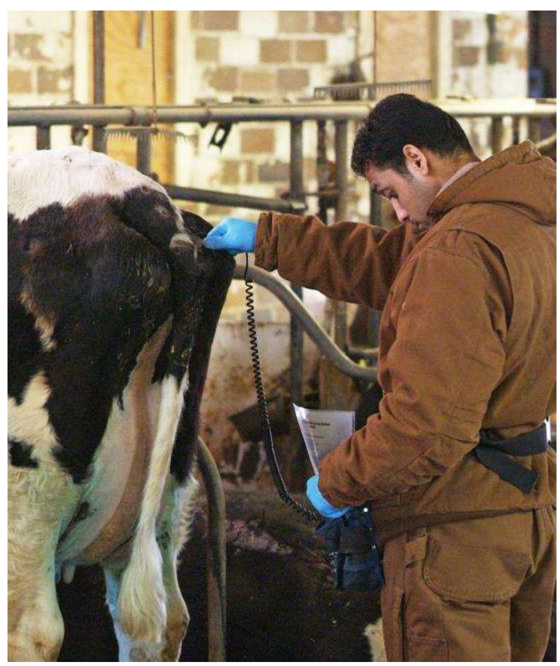
**F**eed

**A**ttitude

**T**emperature

**M**anure

**U**terine **D**ischarge



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## Feed


Monitor feed intake

Scoring:

1. Off feed
2. Decreased or declining feed intake
3. Stable intake or good appetite
4. Increasing intake or excellent appetite

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## Attitude

Visually observe cow; eyes, ears, movements

Scoring:

1. Downer; reluctant to rise
2. Depressed; sunken eyes, droopy, slow
3. Slightly off; just don't look quite right
4. Bright and alert

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## Temperature

- Record rectal temperature with digital thermometer
- Evaluate trend from day to day and between other cows in barn or pen
- Action point:
  - Summer >104.0 for two or more days
  - Winter >103.0 for two or more days

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## Manure

Observe feces in gutter, behind cow at lock-up, or passed during exam

**Score 1** **Thin, fluid, arcs, green**
Example: Sick cow, off feed, cows on pasture

**Score 2** **Loose, splatters, little form**
Example: Fresh cow, cows on pasture

**Score 3** **Stacks up 1 to 1 1/2 inches, dimples, 2 to 4 concentric rings, sticks to boot**
Example: Recommended

**Score 4** **Stacks up 2 to 3 inches, dry**
Example: Dry cow, low protein, high fiber

**Score 5** **Stacks up over 3 inches**
Example: All forage, sick cow

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## Uterine Discharge

Check tail or stall for uterine discharge

Scoring:

1. Fluid, foul smelling; brown, red to yellow
2. Thickened mucous, foul odor
3. Thick white discharge, minimal odor
4. Thick, gelatinous, no odor; dark red to clear

N. None observed

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## Additional Monitoring Tools

- Rumination monitoring (> 450 minutes per day)
- Mastitis status
  (CMT number after clearing colostrum)
- Milk yield increase / change
  (an indication of health)
- Blood or milk ketone levels

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## Factors To Consider

- Heifer grouping (prepartum and postpartum)
- Bunk space(30 inches for Holsteins)
- Cows per stall (less than 90 percent)
- Sand freestall (gold standard)
- Stress factors

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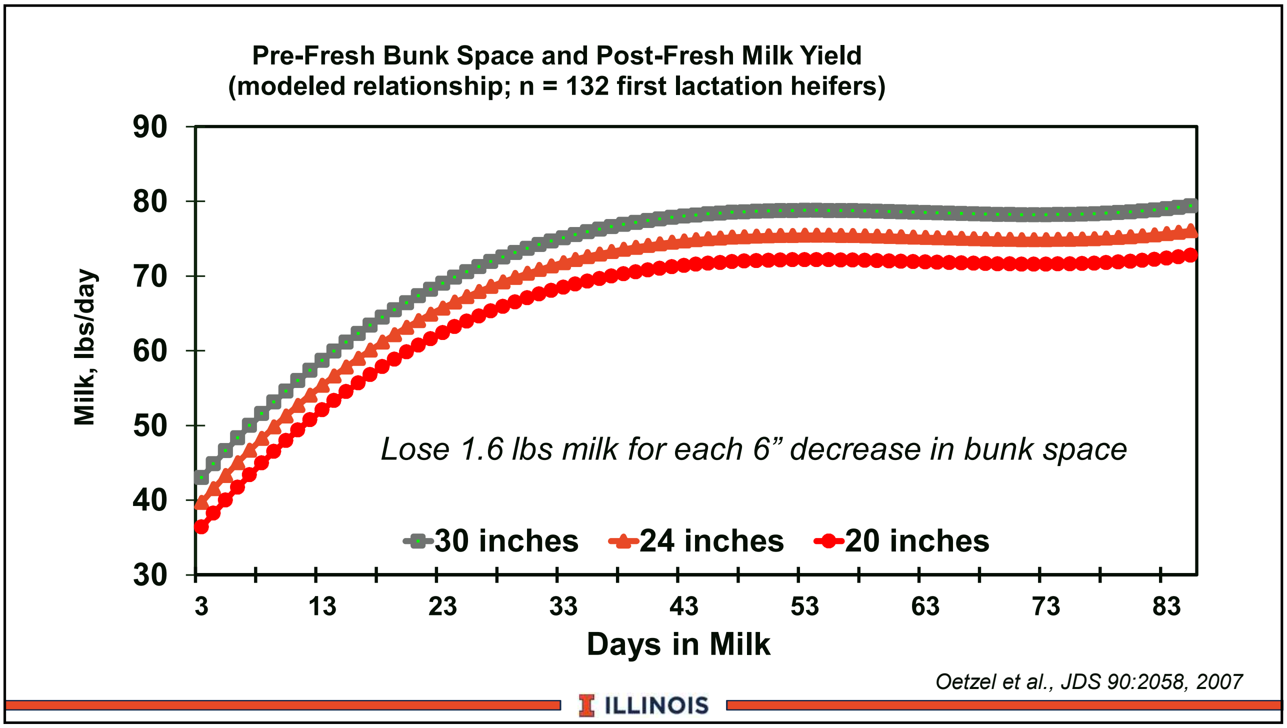
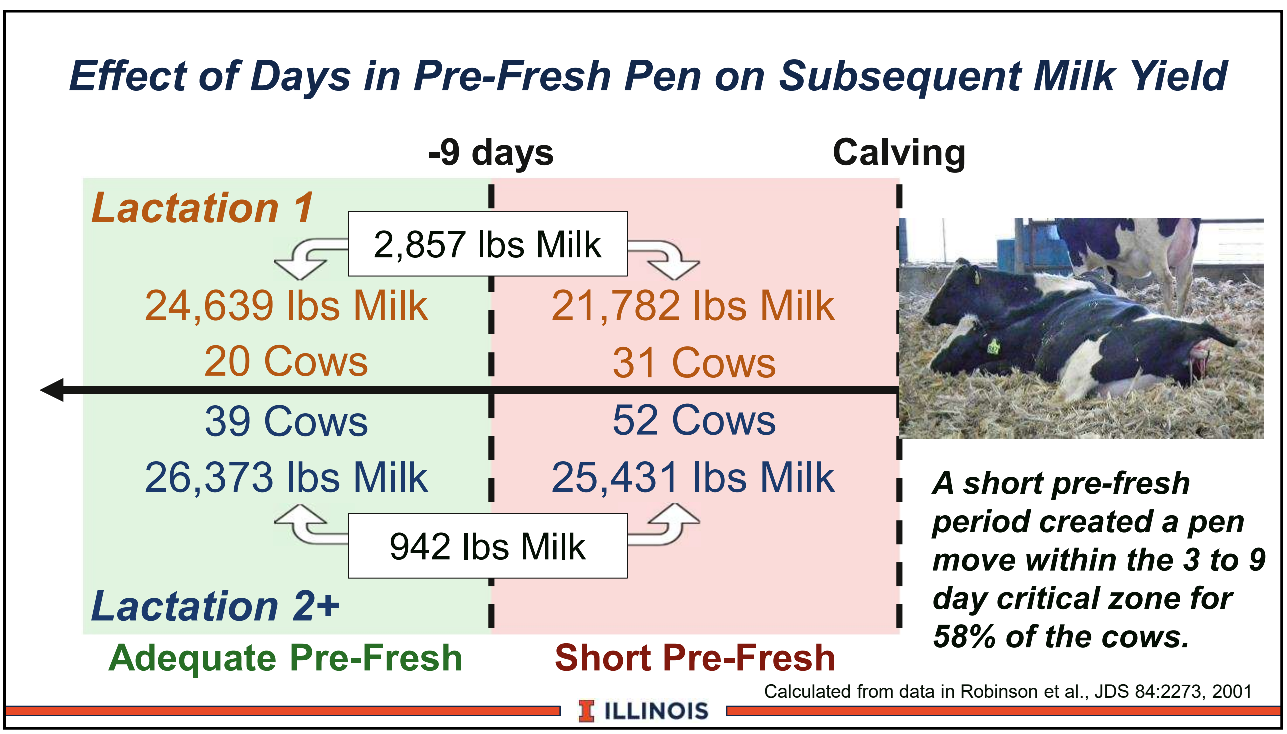

Pre-Fresh Bunk Space and Post-Fresh Milk Yield
(modeled relationship; n = 132 first lactation heifers)
Milk, lbs/day
90
80
70
60
50
40
30
3
13
23
33
43
53
63
73
83
Days in Milk
Lose 1.6 lbs milk for each 6” decrease in bunk space
30 inches
24 inches
20 inches
Oetzel et al., JDS 90:2058, 2007
ILLINOIS


Effect of Days in Pre-Fresh Pen on Subsequent Milk Yield
-9 days
Calving
Lactation 1
2,857 lbs Milk
24,639 lbs Milk
20 Cows
21,782 lbs Milk
31 Cows
39 Cows
26,373 lbs Milk
52 Cows
25,431 lbs Milk
942 lbs Milk
Lactation 2+
Adequate Pre-Fresh
Short Pre-Fresh
A short pre-fresh period created a pen move within the 3 to 9 day critical zone for 58% of the cows.
Calculated from data in Robinson et al., JDS 84:2273, 2001
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## Reducing  Stress (Dr. Drackley)

- <90% stocking rate in close-up pen
- Training (lock-ups and waterers)
- Avoid excessive pen movement
- Separate cows and heifers
- Avoid drastic ration changes (10%)
- Minimize feed sorting and selection
- Manage heat stress
- Three feet of bunk space

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## Hutjens KPI

**Key**
**Performance**
**Indicates**
**For Transition Cows**

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## KPI #1

### Number of culled cows before 60 days in milk:

1st lactation cow < 4%

Cows < 7%

## KPI #2

### Dry matter intake in close up pens

>30 lb in mature cow pen

> 28 lb in mix pen

> 25 lb in springing heifer pen

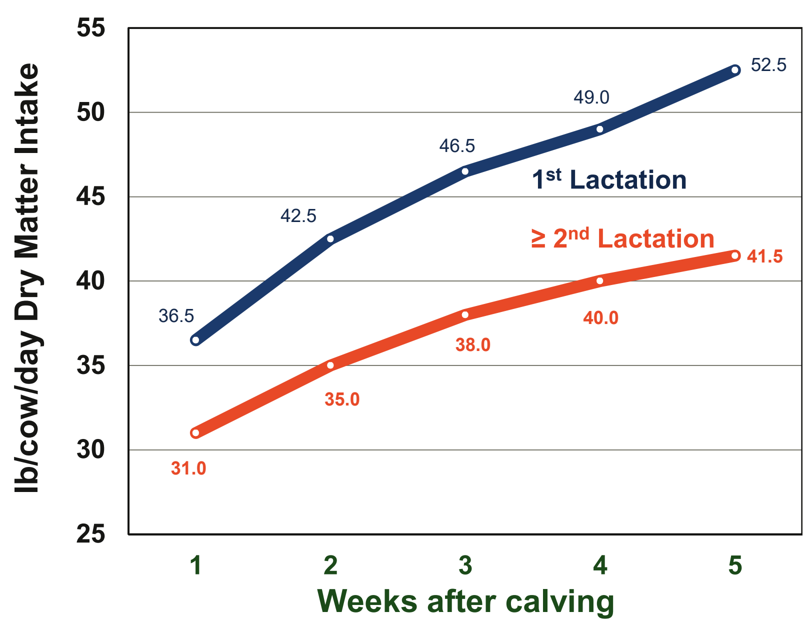
# KPI #3

## Metabolic disorders goals

| | |
|---|---|
| Milk fever | < 3% |
| Ketosis | < 2% |
| DA | < 5% |
| Retained placenta | < 8% |

# KPI #4

## Meeting dry matter intake goals after calving



# KPI #5

## Strategic Use of Additives

| | |
|---|---|
| Yeast culture (20 to 120 grams) | YES |
| Propylene glycol (300 to 500 ml) | YES |
| Calcium propionate (1/3 lb) | YES |
| Rumensin | YES |
| Anionic products (- 50meq/kg) | AS NEEDED |
| Protected choline (15 grams) | AS NEEDED |
| Niacin (protected) | AS NEEDED |
| Direct feed microbes | WATCH LIST |

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# KPI #6

## Drench Strategies

1. **Which cows ?**
   *treat/prevent/parity*
2. **Which product?**
   *calcium and glucose precursors*
3. **How much water?**
   *10+ gallons*

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# KPI #7

## Solid Trace Mineral Program

| Close Up Dry Cows | |
|---|---|
| Trace Mineral | mg/cow/day |
| Chromium | 6 to 8 |
| Cobalt | 2 |
| Copper | 200 |
| Iodine | 12 |
| Iron | 500 (varies) |
| Manganese | 800 |
| Selenium | 3 to 4 |
| Zinc | 800 |

*part / all from organic sources*

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# Take Home Messages

- Need a fresh cow approach
- Develop early warning system
- Detect little problems before they become **BIG** problems
- Treat timely and appropriately
- Reduce the number of cows that leave the herd in early lactation
- Keep profitable cows profitable

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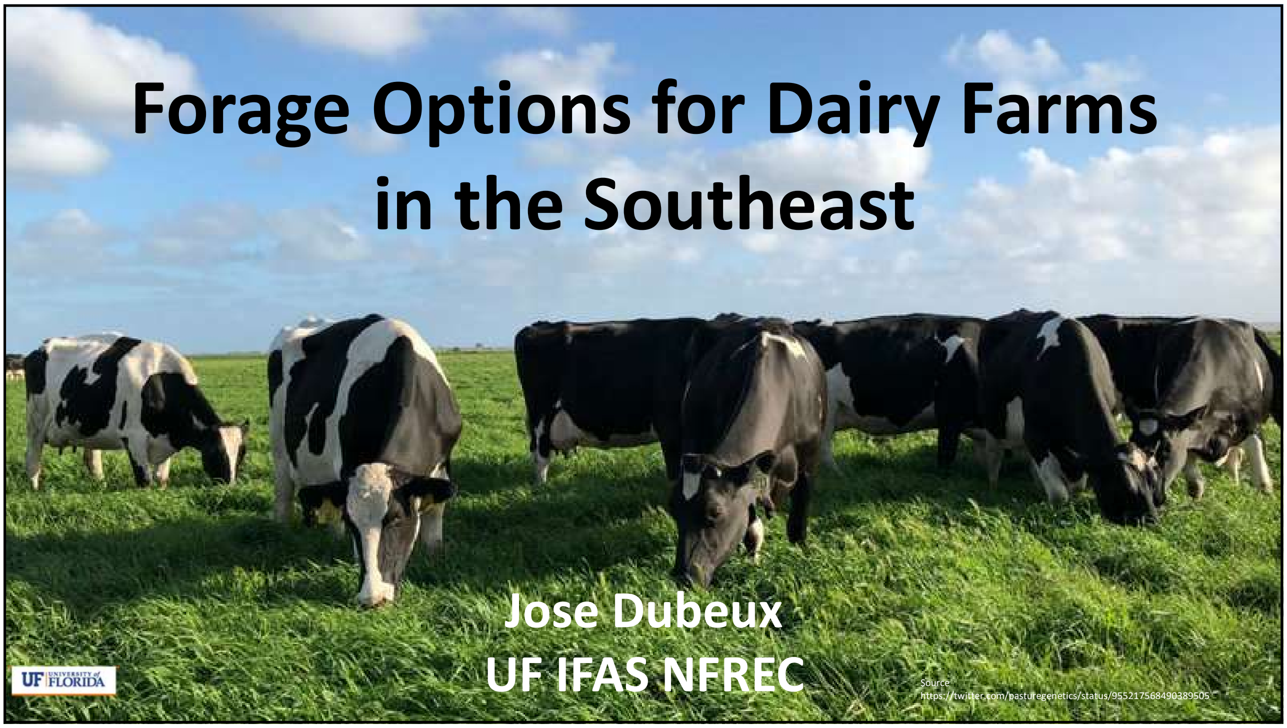
# NOTES



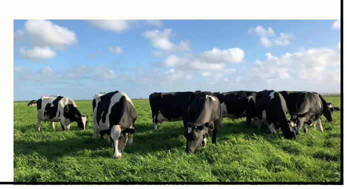
# Forage Options for Dairy Farms in the Southeast

**Jose Dubeux**
**UF IFAS NFREC**

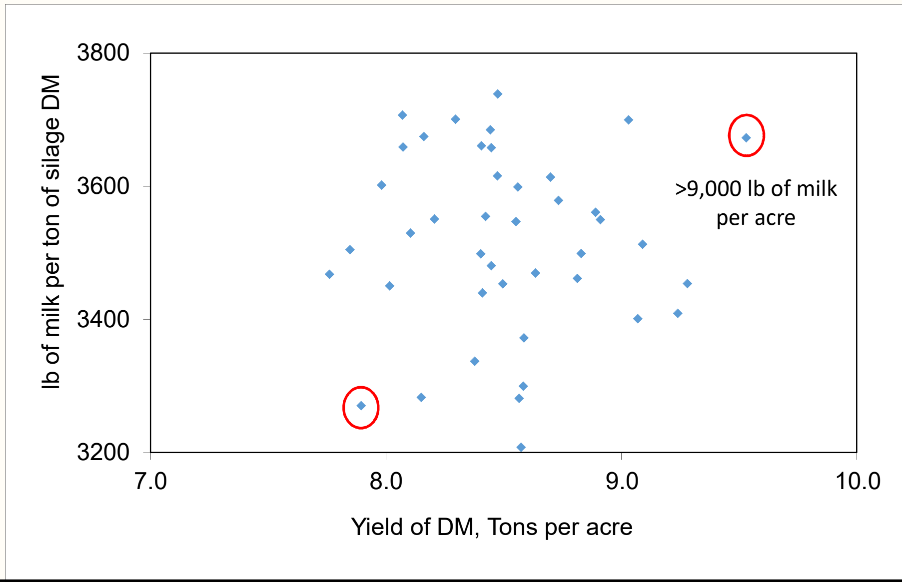
Source
https://twitter.com/pasturegenetics/status/955217568490389505

## Introduction

- 123,000 dairy cows producing 2.34 billion lb of milk per year in FL representing more than US$ 700 million annually
- Feeding costs are among the highest costs in milk production
- Forages with superior productivity and quality can reduce feeding costs



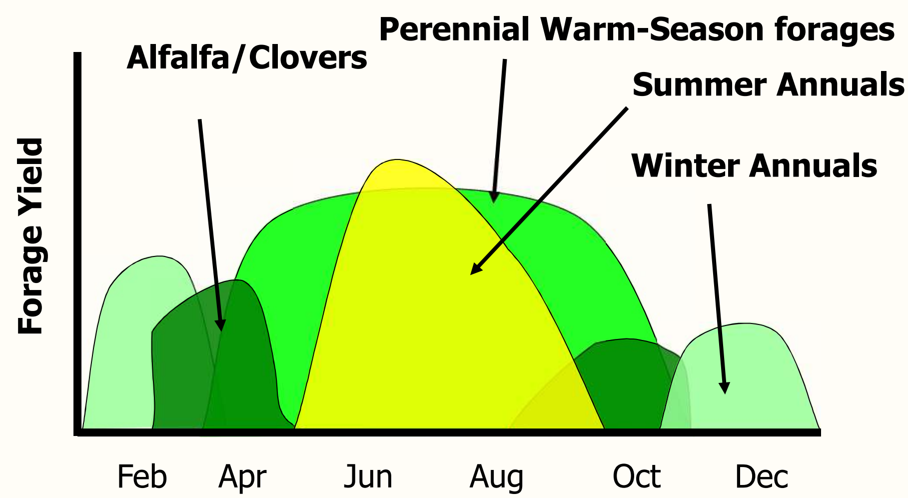
# Milk productivity per ton of silage DM
# Pick the right variety




# Introduction

- Assuming a dairy cow with 1,500 lb, intake 4% BW, 35% forage in the diet
- This represents 21 lb DM of forage intake
- If we increase forage TDN from 55 to 65%, this would represent 2.1 lb of extra TDN, enough to produce an extra 7.4 lb milk/d (or 2,220 lb during the lactation), assuming no change in intake
- Multiply this by the number of lactating cows in your herd… This might represent the profit…

## Forage Distribution in the Southeast

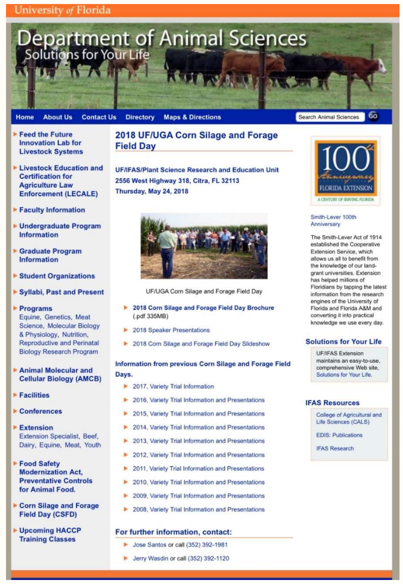



Source: D. Harmon

## Introduction

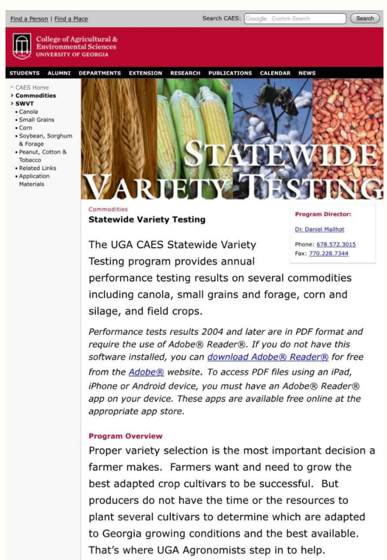
- Information from research is important
- Implement the changes in the dairy
- Record keeping is essential not only in the cow herd, but also in the field crops
- Measure the yield and test forage quality!!!

**Make sure you take advantage of the excelent information available at the website with data from the UF/UGA Corn Silage and Forage Field Day**




http://animal.ifas.ufl.edu/corn_silage_forage_field_day_extension/2017/index.shtml

**Make sure you also take advantage of the information available at the UGA with data from different variety trials of summer annuals and cool-season forages**



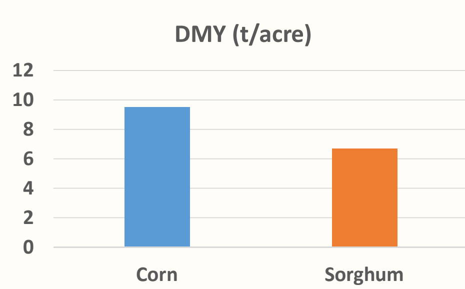

http://www.swvt.uga.edu/

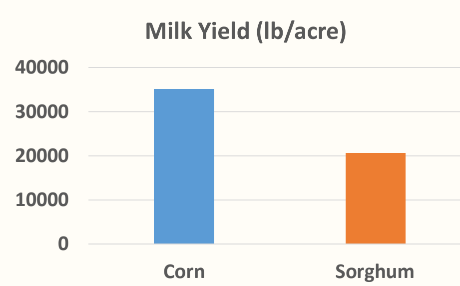
# Forage Options

## The "King" Corn

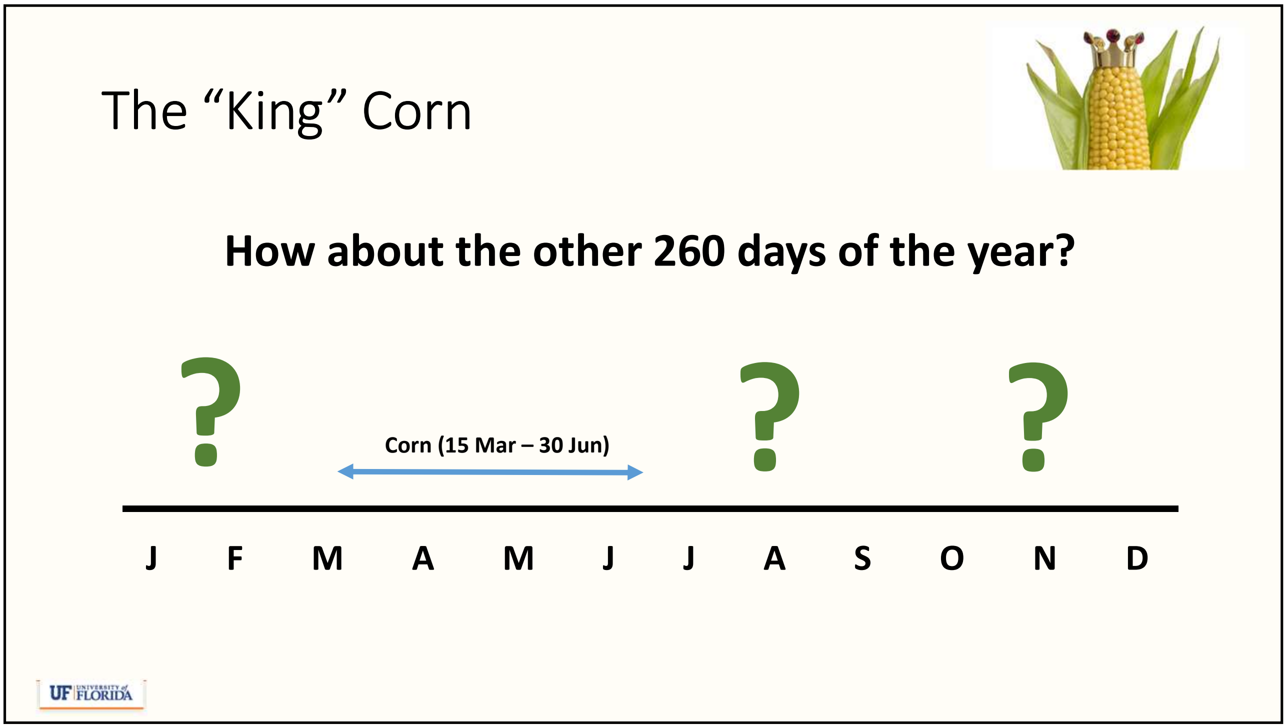
✓ <u>Hard to beat in the spring planting</u>: high productivity and good nutritive value

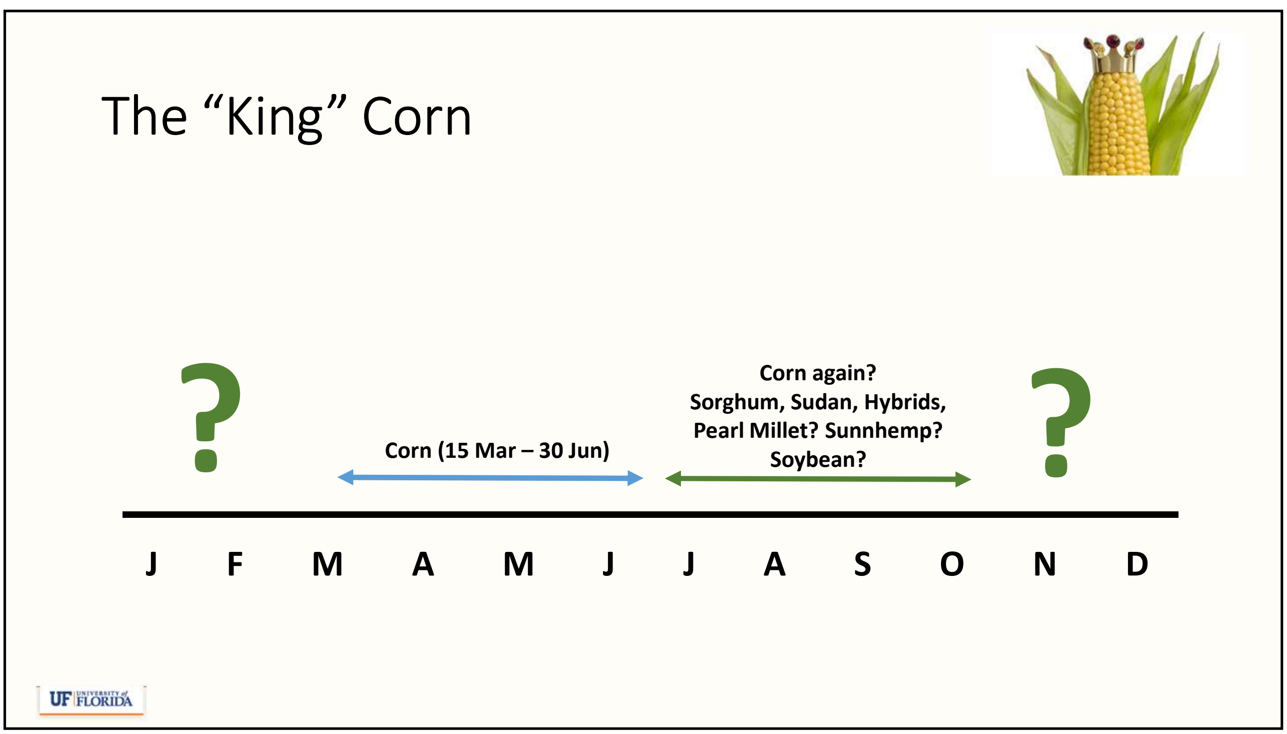
✓ 2017 FL test average: 8.6 t DM/acre and 71.9% TDN, 7.3% CP, 39.6% NDF, 53.9% NDF-dgy, 36.2% starch



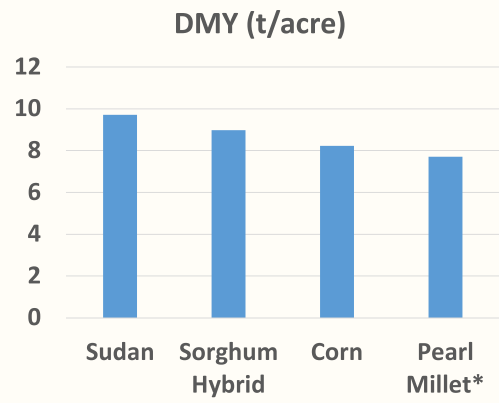



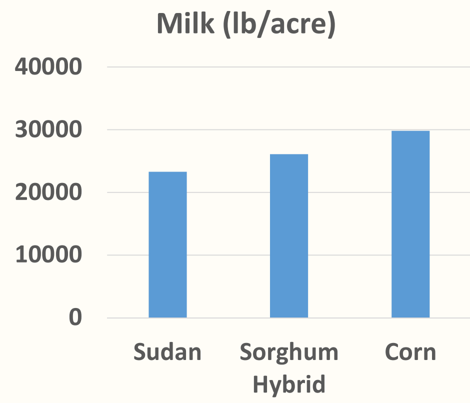

**Top-varieties of corn and sorghum – FL 2017 Variety test**


The "King" Corn
How about the other 260 days of the year?
?
Corn (15 Mar – 30 Jun)
?
?
J F M A M J J A S O N D
UF FLORIDA

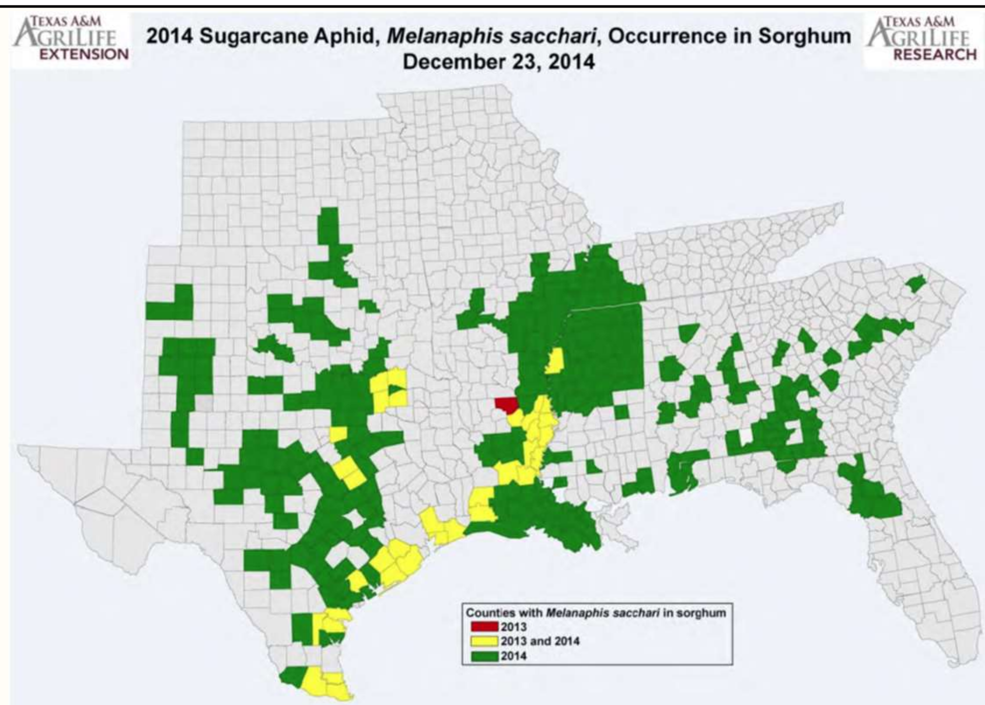

The "King" Corn
?
Corn (15 Mar – 30 Jun)
Corn again?
Sorghum, Sudan, Hybrids,
Pearl Millet? Sunnhemp?
Soybean?
?
J F M A M J J A S O N D
UF FLORIDA

# Summer Planting Options




Top varieties within each group from 2015 UF Corn Silage and Forage Field Day; Pearl Millet data from UGA trial in Tifton

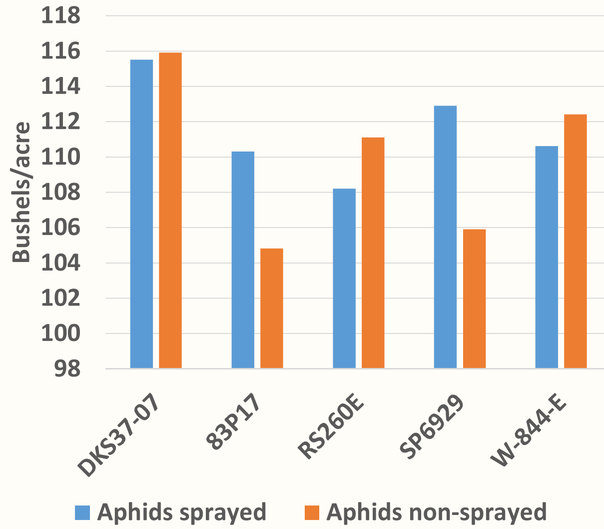


# Sugarcane aphids

- Sugarcane aphids might be a problem for sorghum and hybrids
- Resistant varieties coming to the market

UF UNIVERSITY of FLORIDA

**Resistance of sorghum hybrids to sugarcane aphids**




Source: Brown (2016); LSU Ag Center (avg. yield across 3 locations in LA)

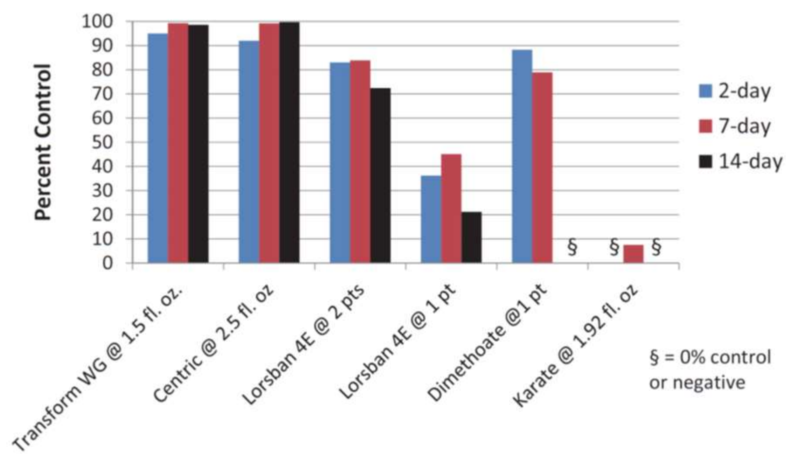
Sugarcane aphid-tolerant sorghum planted at UF IFAS NFREC in Marianna, FL August-2018

Experimental line not available in the market (ADV XFO33)

Losses can be high

http://animal.ifas.ufl.edu/corn_silage_forage_field_day_extension/2016/presentations/buntin.pdf

## Insecticide Control of Sugarcane Aphid Control on Grain Sorghum, Marion County, GA 2014



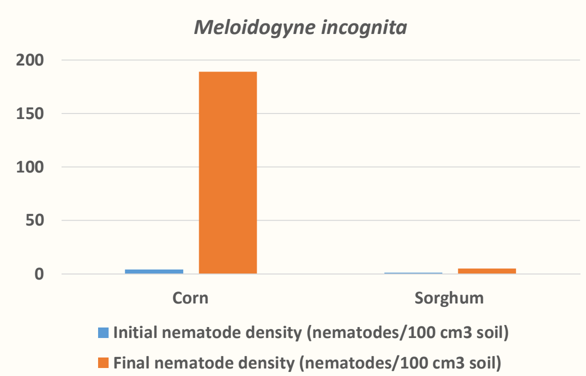

**Transform WG**

- Rate: 0.75 – 1.5 oz
- Max per crop: 3 oz per acre and 2 appl. per crop
- 14 d for grain; 7 d for grazing, forage, and hay

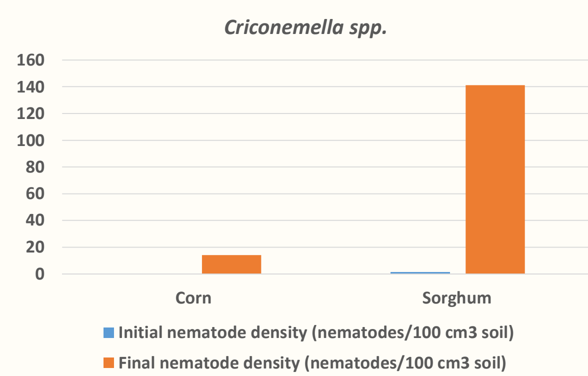
http://animal.ifas.ufl.edu/corn_silage_forage_field_day_extension/2016/presentations/buntin.pdf

# The value of crop-rotation

Avoid crop rotation with other grass species

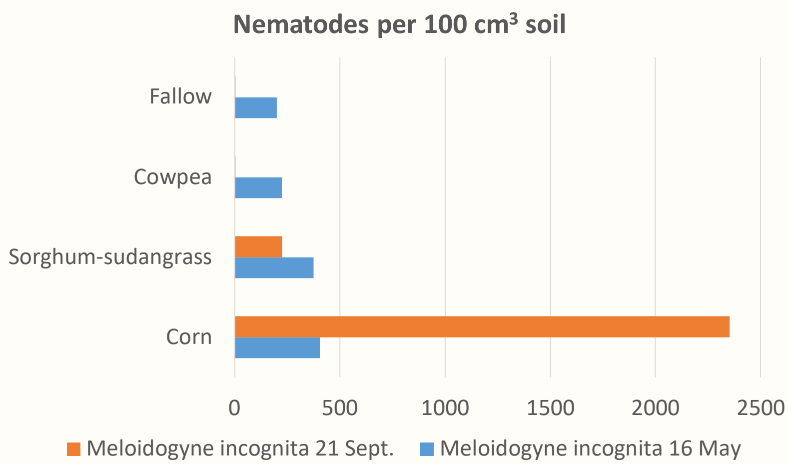



Gallaher et al. (1991)




Gallaher et al. (1991)

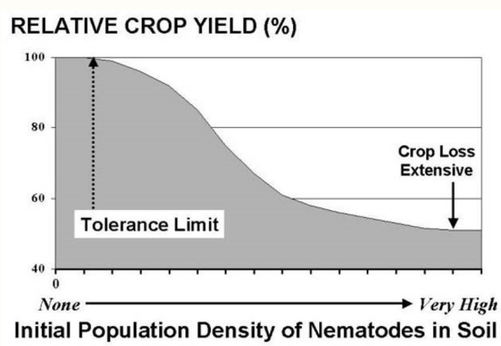
# The value of crop-rotation




Adapted from McSorley and Dickson (1995)

# Yield losses caused by nematodes

Check EDIS ENY-001 with excellent information on how nematodes affect corn production in Florida
http://edis.ifas.ufl.edu/pdffiles/NG/NG01400.pdf

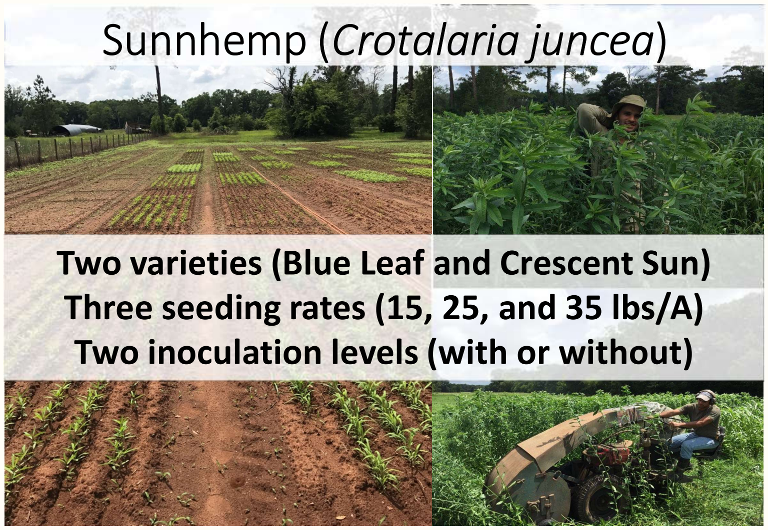



Noling (2016)

A corn field with patchy stunting and reduced stand from sting nematode. Photo credit: T. Jackson-Ziems, UNL.

# Other non-grass options for crop-rotation

- **Summer annuals**




# Sunnhemp

Biomass productivity, nutritive value and biological $N_2$-fixation (BNF) of sunnhemp cultivars in Marianna, FL

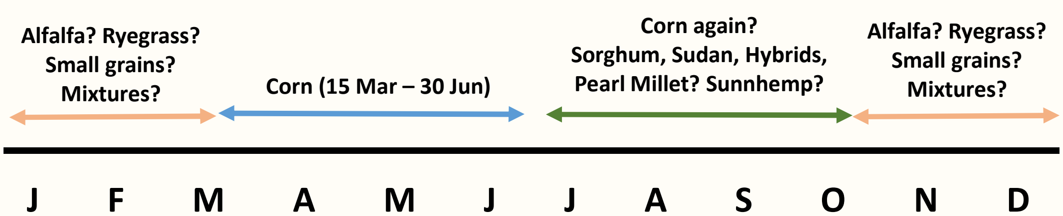
| Variety | Herbage Accumulation (lb DM/acre) | IVOMD (%) | CP (%) | %Ndfa | BNF (kg N/ha) |
|---|---|---|---|---|---|
| Crescent Sun | 2820 a | 56.6 a | 19.1 a | 40 b | 39 a |
| Blue Leaf | 876 b | 57.5 a | 20.0 a | 52 a | 15 b |
| SE | 218 | 1.5 | 0.6 | 4 | 4 |

LSMEANS followed by similar letter within the same column do not differ by PDIFF procedure adjusted by Tukey (P > 0.05). IVOMD = In vitro organic matter digestibility; CP = crude protein; %Ndfa = percentage of N derived from atmosphere; BNF = biological N fixation.

## Soybean

- Optimum planting dates range from late April until mid-June
- It may be planted through July into early August with narrow rows (10-20 inches) and irrigation
- Later maturing varieties should be planted if planted late
- Excellent information available at http://edis.ifas.ufl.edu/ag185
- Check last variety updates for late-planted soybean (planted in 3 August and harvested in 30 Nov) at http://www.swvt.uga.edu/2017/SYSR17/AP103-9-sy-ULP.pdf
- Best variety for late planting in Midville (GA) and Attapulgus (GA) was S58-Z4 from Syngenta

## The “King” Corn



# Other non-grass options for crop-rotation

- **Alfalfa or alfalfa/bermudagrass mixture**

Bulldog 805 in High Springs, FL (2015)

Alfalfa hay field in Bascom, FL

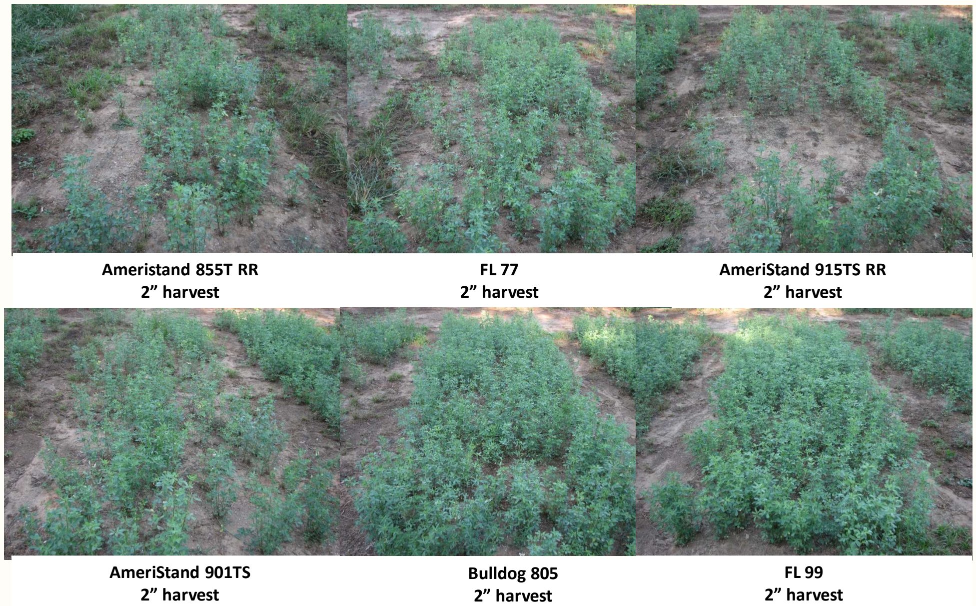
Alfalfa plots in Marianna, FL (2015)

# Corn – Sorghum – Alfalfa in the Fall (1-2 yr)

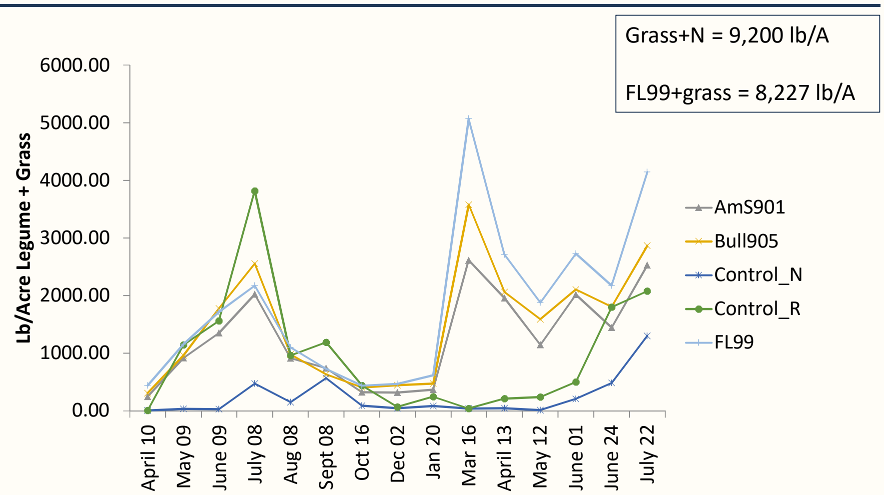
On-farm data from Jackson County, FL, 2014
Irrigated alfalfa

| Cultivar | Average/cut (lb/acre) | Cumulative yield (lb/acre/yr) |
|---|---|---|
| **ABT 805 Bulldog** | 1352 | 10817 |
| **Ameristand 803 T** | 1636 | 13089 |
| **WL Research 535 HQ** | 1594 | 12751 |
| **WL Research 550 RR** | 1742 | 13935 |
| **WL Research 656 HQ** | 1782 | 14256 |
| **WL Research 660 RR** | 1639 | 13114 |
| **WL Research 662 HQ RR** | 1799 | 14390 |

## Alfalfa stands after two years in Marianna, FL
## Picture taken in August 27th, 2015

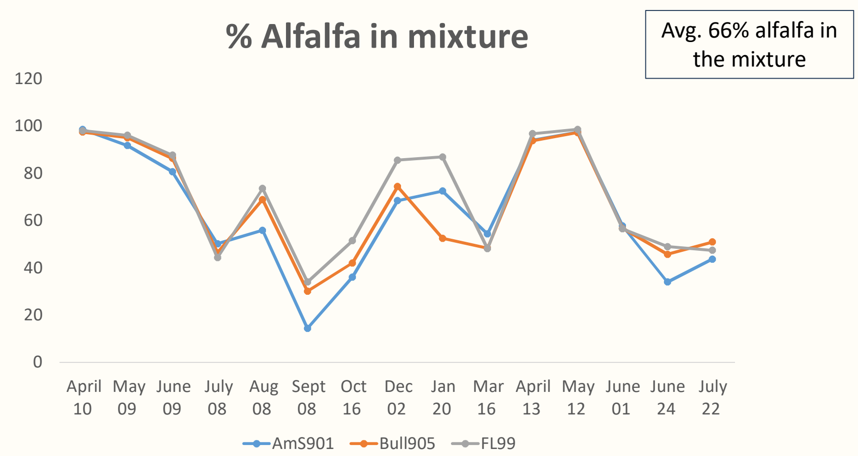



## Alfalfa and grass mixtures




Total yield in Alfalfa/bermudagrass mixtures and controls (+/- N); Citra, 2014-2015.
Source: Dr. Patricio Munoz, UF/IFAS

# Alfalfa and grass mixtures




Percentage of alfalfa in alfalfa/bermudagrass mixtures; Citra, 2014-2015.
Source: Dr. Patricio Munoz, UF/IFAS

# Alfalfa and grass mixtures

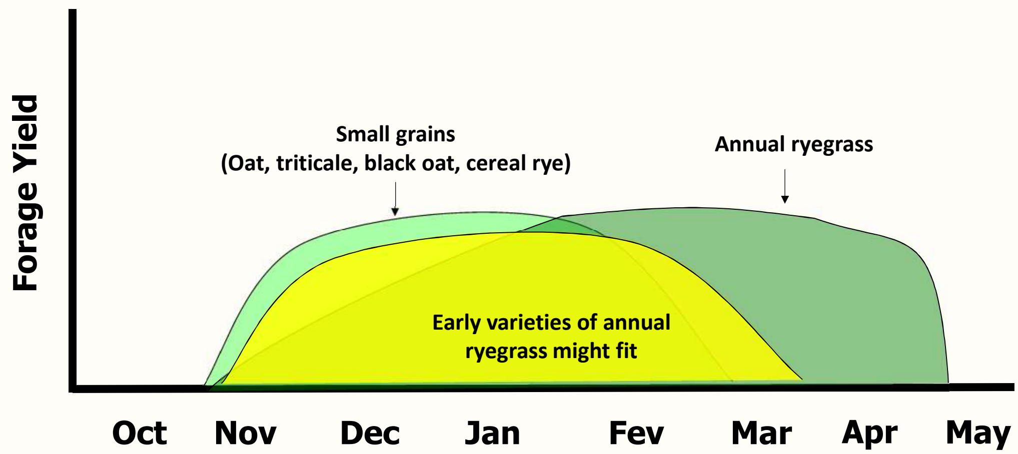
- Hay, Haylage, or grazing Alfalfa-bermudagrass are possible options

**Bulldog 505 Alfalfa on Alicia bermudagrass**

**Bulldog 805 Alfalfa/Tifton 85 Haylage**

Photo credit: Dennis Hancock

# Annual ryegrass, small grains, or both??




# How about black oats?

- Black oats (*Avena strigosa*) has greater heat tolerance than regular oats
- This allows earlier planting and extended growth into the Spring
- Excellent nutritive value and high leaf-to-stem ratio
- Baleage, greenchop, or grazing
- Genetic diversification is important on forage resources – **reduce risks of disease outbreak**

**Seed increase of black oat experimental lines in Marianna; 2018**

# How about black oats?

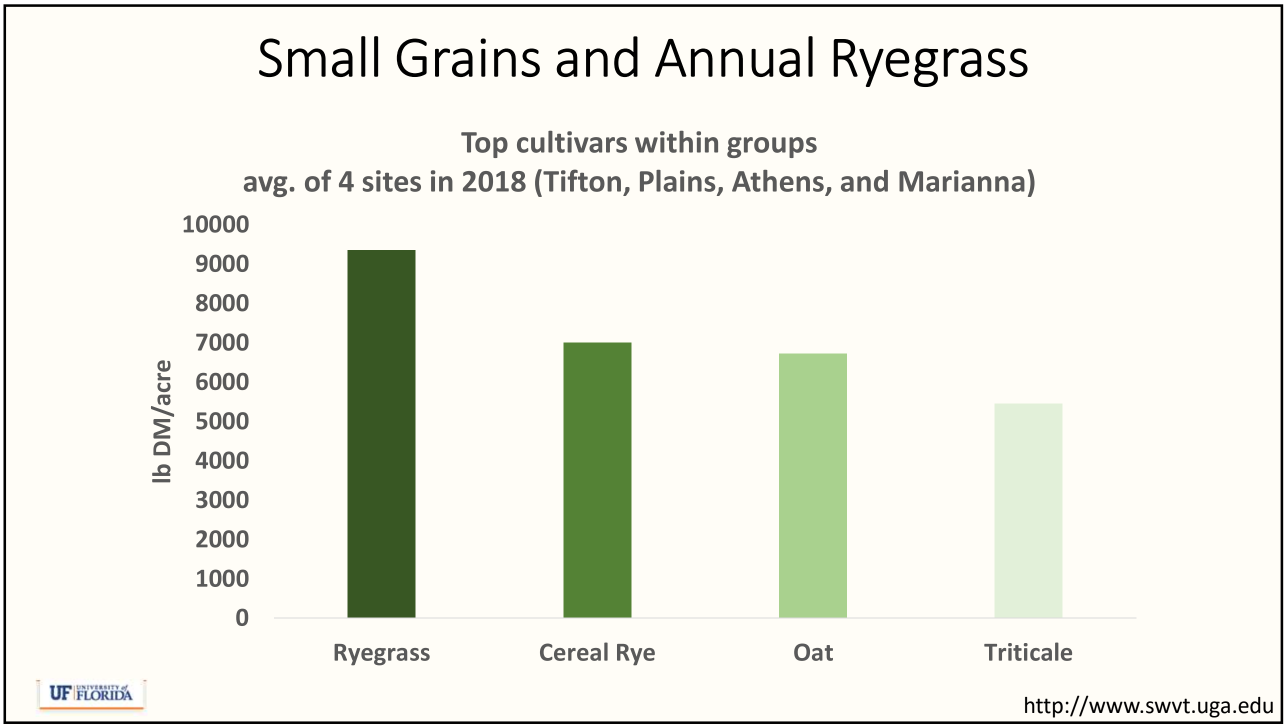
| Marianna | Shenandoah | UF Dairy | Silver Spurs | Ona |
|---|---|---|---|---|
| UF-9 | FL 401 | UF-10 | UF-6 | FL 401 |
| Legend 567 Oats | Earlyploid | UF-8 | UF-7 | UF-10 |
| Earlyploid | UF-1 | UF-2 | UF-2 | UF-9 |
| FL401 Rye | UF-25 | UF-3 | UF-8 | UF-4 |
| UF-27 | UF-8 | UF-7 | FL 401 | UF-3 |
| UF-2 | UF-7 | UF-1 | UF-3 | PST P-1020 |
| UF-8 | UF-3 | Legend 567 | UF-24 | UF-6 |
| UF-4 | UF-24 | UF-9 | UF-9 | UF-1 |
| UF-7 | UF-4 | UF-4 | Trical 342 | UF-2 |
| UF-5 | UF-26 | FL 401 | UF-5 | Legend 567 |

**IVOMD 75 – 80%**
**CP 18 – 22%**

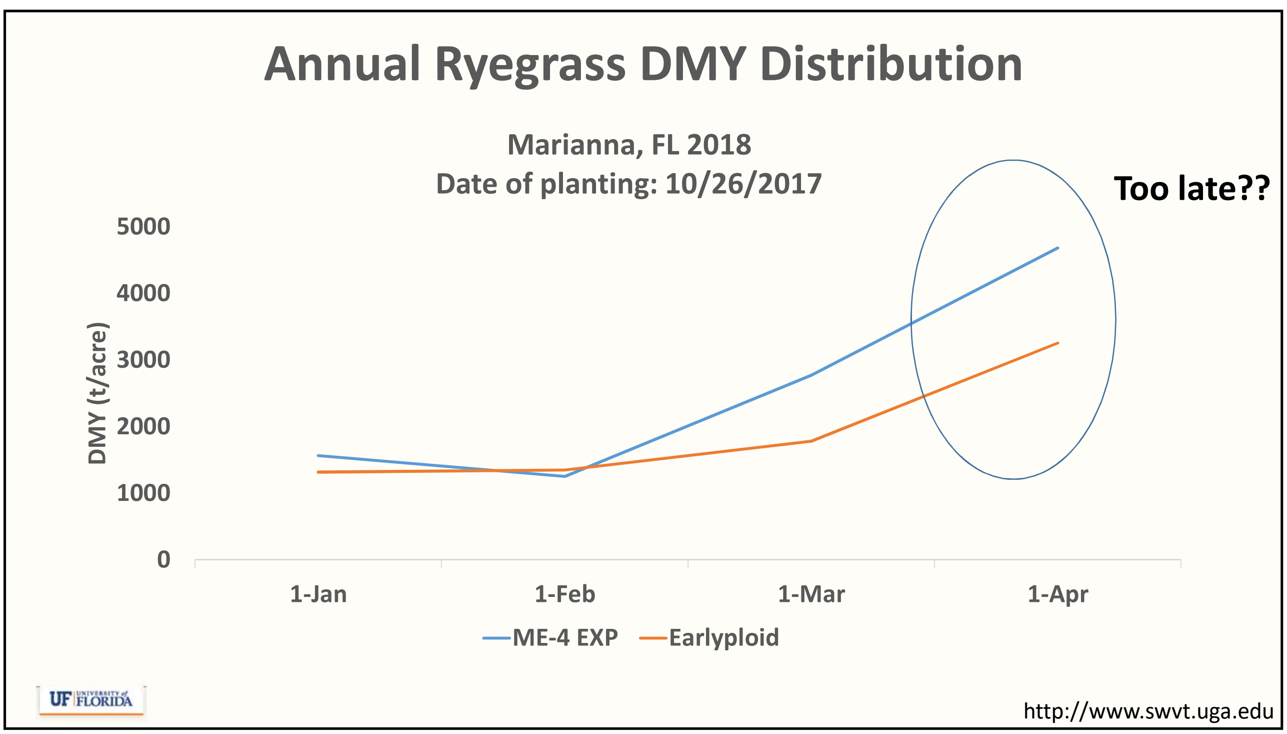
# Black Oats DMY – UF Dairy

| Treat | lb/acre |
|---|---|
| UF-10 | 4708 |
| UF-8 | 4668 |
| UF-2 | 4593 |
| UF-3 | 4559 |
| UF-7 | 4537 |
| UF-1 | 4481 |
| Legend 567 | 4362 |
| UF-9 | 4323 |
| UF-4 | 4310 |
| FL401 | 4111 |
| UF-6 | 4076 |
| UF-23 | 4004 |
| UF-27 | 3992 |
| Trical 342 | 3896 |
| UF-25 | 3870 |
| UF-26 | 3805 |
| UF-5 | 3704 |
| UF-24 | 3696 |
| 01143 Triticale | 3547 |
| Soil Saver | 3476 |
| Earlyploid | 3051 |
| SE | 429 |

*Preliminary data from UF Dairy 2018. Orthogonal contrast black oat vs. others P = 0.0285



Small Grains and Annual Ryegrass
Top cultivars within groups
avg. of 4 sites in 2018 (Tifton, Plains, Athens, and Marianna)
lb DM/acre
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Ryegrass
Cereal Rye
Oat
Triticale
http://www.swvt.uga.edu

Annual Ryegrass DMY Distribution
Marianna, FL 2018
Date of planting: 10/26/2017
Too late??
DMY (t/acre)
5000
4000
3000
2000
1000
0
1-Jan
1-Feb
1-Mar
1-Apr
ME-4 EXP
Earlyploid
http://www.swvt.uga.edu

# How about mixing ryegrass and small grains?

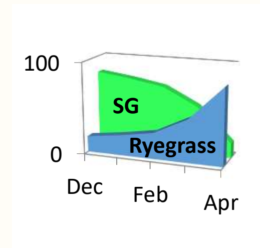
- Within cool-season, there are different forage options
- Mixing forages with complementary growth curves have potential to increase forage production during the cool-season, and reduce risks!

**Small grains grow earlier in the season**

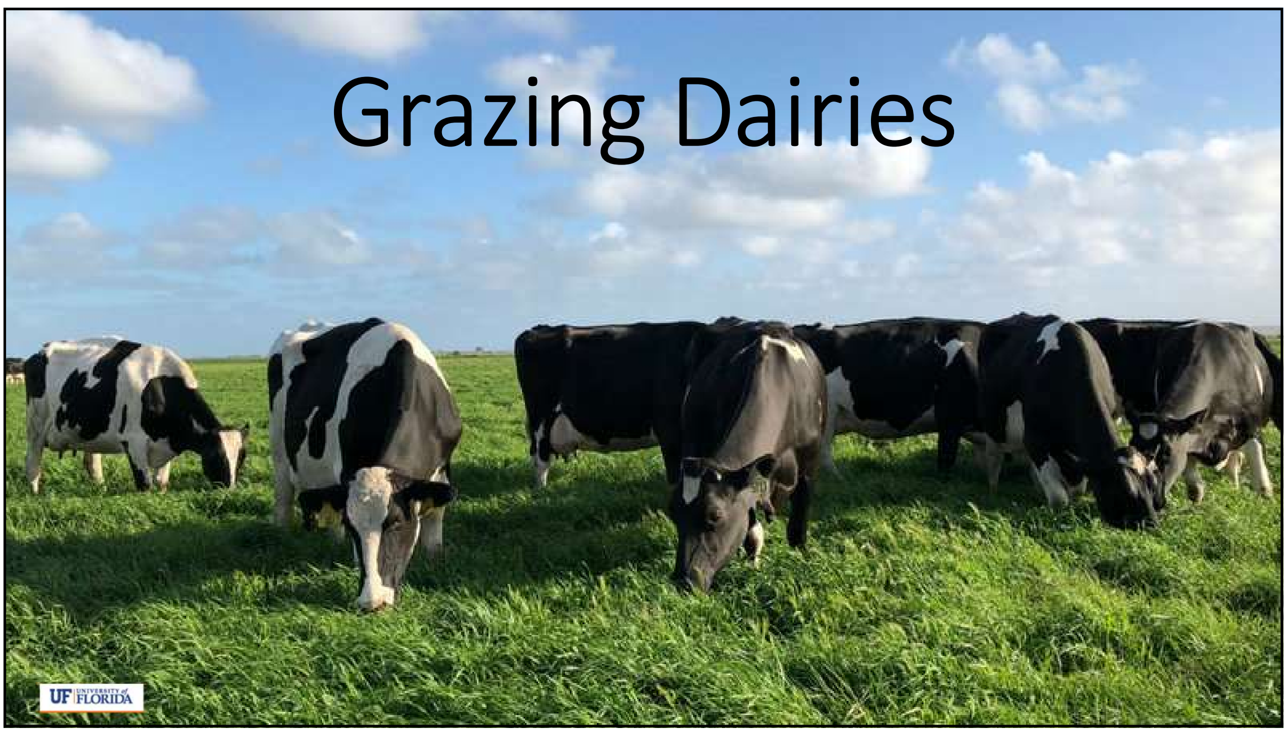
**Cereal Rye FL 401** | **Oat Horizon 201** | **Triticale Trical 342**

**Ryegrass grows later in the season**

**Prine Ryegrass**



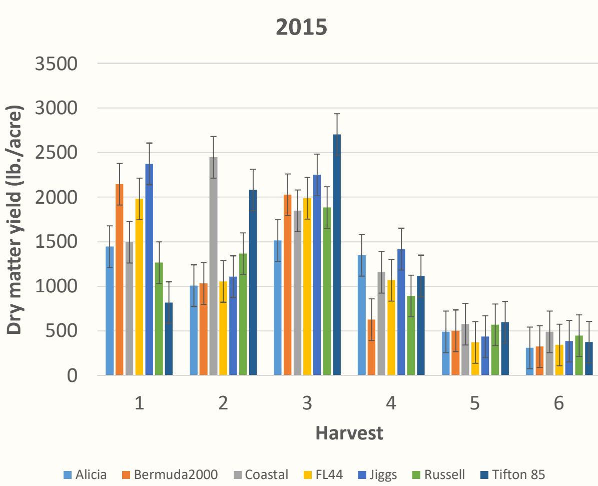

**Dubeux et al. 2016**



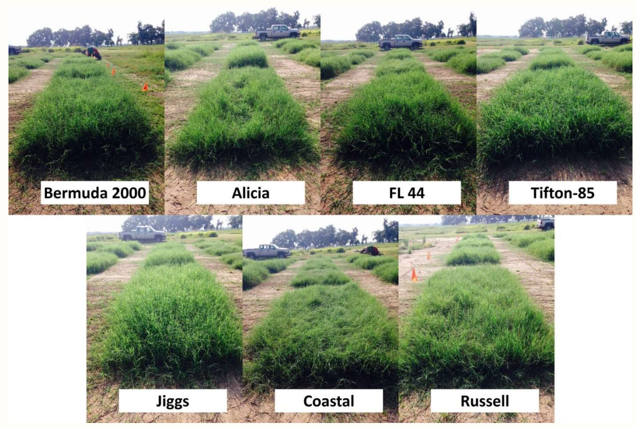
# Perennial Warm-season Grasses

- Bermudagrass (Tifton-85, Jiggs, and new promising lines)
- Stargrass for south Florida
- Cool-season forages (small grains and ryegrass)

# Bermudagrass

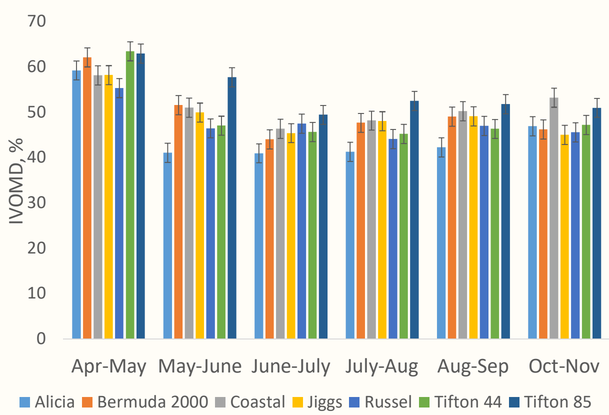



Dubeux et al. (2017)

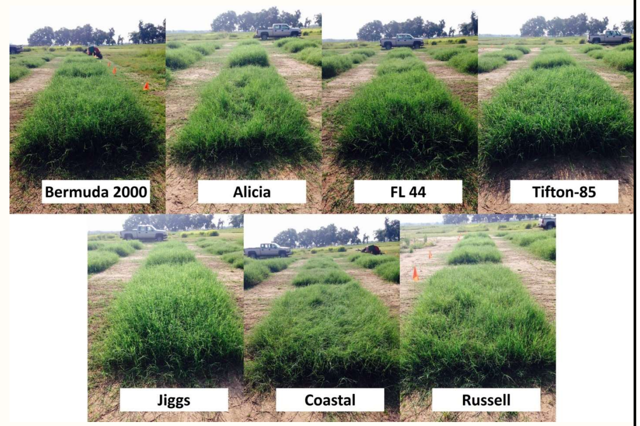



Bermudagrass variety trial at UF-IFAS NFREC, Marianna, FL.
Photo credit: Jose Dubeux

# Bermudagrass




Dubeux et al. (2017)




Bermudagrass variety trial at UF-IFAS NFREC, Marianna, FL.
Photo credit: Jose Dubeux

UF FLORIDA

# Stargrass

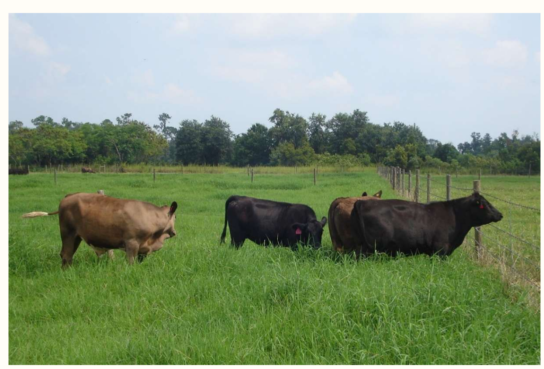
**Advantages:**

- High DMY when well-adapted to the site
- High forage quality when grazed at 4-week intervals (or less)

**Disadvantages:**

- Rapid decline in forage quality after 6 weeks
- Less cold tolerance than bermudagrass **(recommended for south of I-4)**

**Varieties:** Ona, Florona, Florico



Animals grazing stargrass in Ona, FL
Photo credit: J. Vendramini

Vendramini and Mislevy (2017)

UF FLORIDA

## Overseeding warm-season grass pastures

- Warm-season perennial grasses can be overseeded during the cool-season
- Options are small grains, annual ryegrass, and clovers

## Take Home Messages

- Forages are the base for a sustainable dairy production
- Improvements in forage quality might represent the profit
- Crop-rotation is important to sustain corn productivity; ideally rotate it with non-grass forages
- Florida has unique opportunities to produce forages! Take advantage of it!!

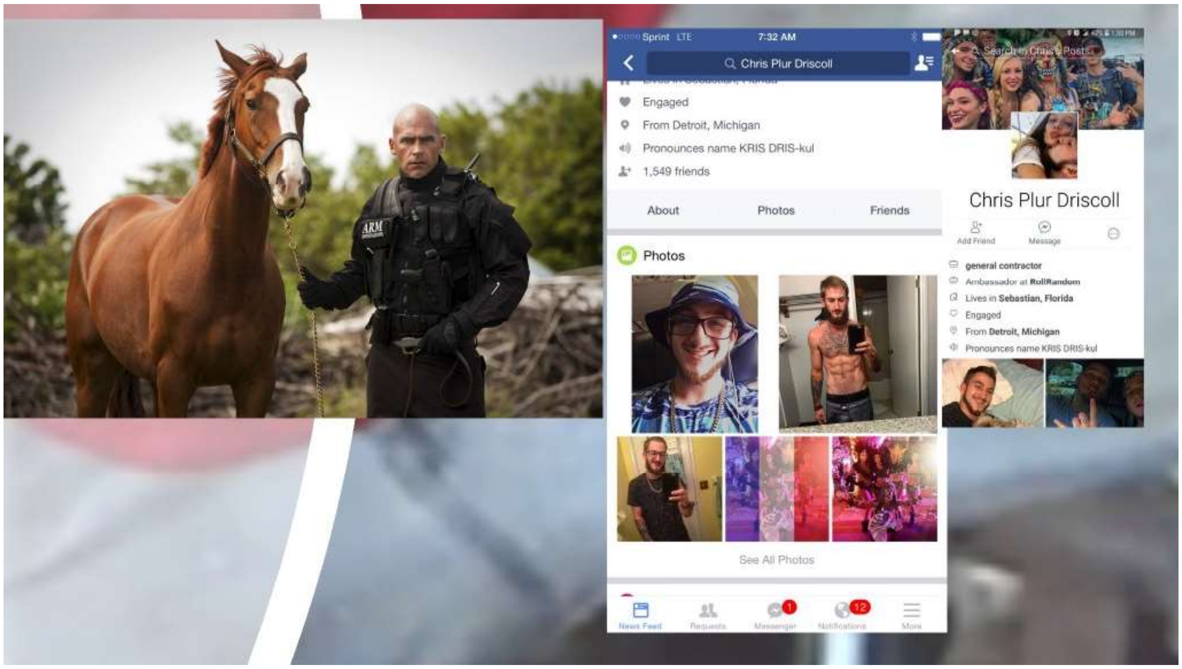
**NOTES**


My experience with undercover activists
My Story
Improving for the future.
Background
LARSON DAIRY FARM

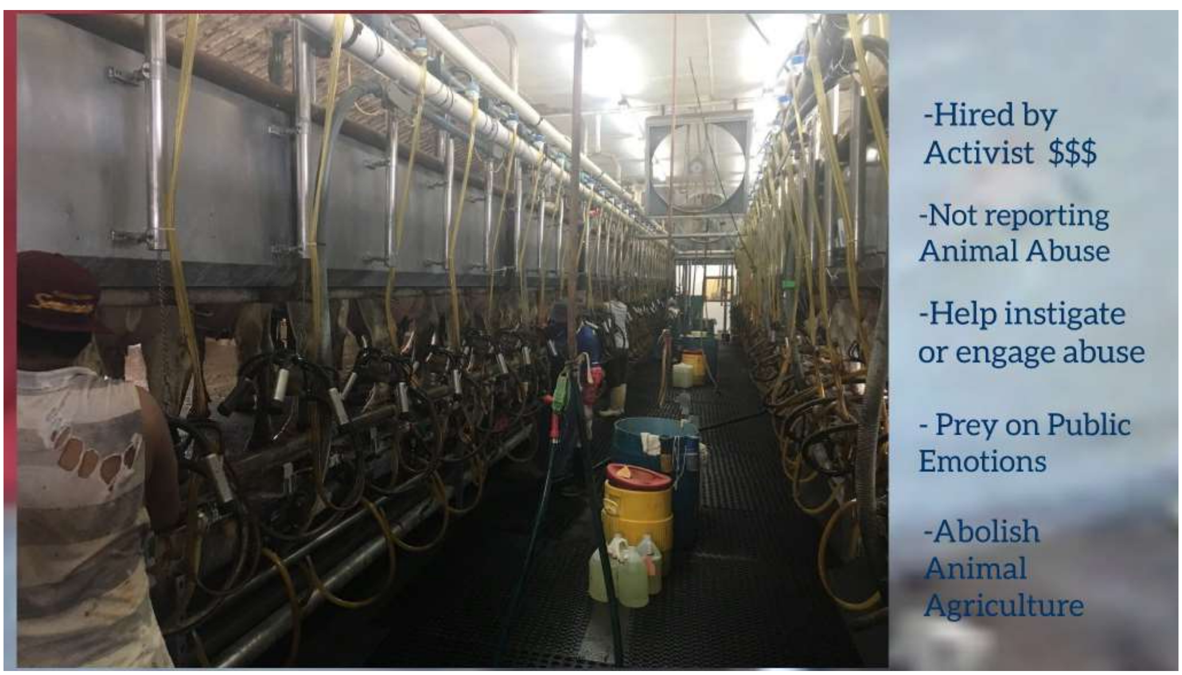
1.


Larson Dairy Inc.
Strengths
Weaknesses
- Herd Health Protocol
- Trust
- Good Employees
- Employee Hand Book
- Public Perception
- Defensive Response
- Employees
Opportunities
Threats
- Share your Good Story
- Animal Welfare Guidelines
- HR Management
- Animal Activists
- Environmentalist
- Natural Disasters
- Marketability
SOUTHEAST MILK

2


ARM
Sprint LTE
7:32 AM
Chris Plur Driscoll
Engaged
From Detroit, Michigan
Pronounces name KRIS DRIS-kul
1,549 friends
About
Photos
Friends
Photos
See All Photos
News Feed
Requests
Messenger
Notifications
More
Chris Plur Driscoll
Add Friend
Message
general contractor
Ambassador at RollRandom
Lives in Sebastian, Florida
Engaged
From Detroit, Michigan
Pronounces name KRIS DRIS-kul

3.


-Hired by Activist $$$
-Not reporting Animal Abuse
-Help instigate or engage abuse
- Prey on Public Emotions
-Abolish Animal Agriculture


My experience with undercover activists
Background
My Story
Improving for the future.
LARSON DAIRY FARM

5.


CONTINUING COVERAGE
INSIDE LARSON DAIRY FARMS
OKEECHOBEE COUNTY
LIVE
BREAKING NEWS
ARM: NEW VIDEO OF COW ABUSE AT DAIRY FARM
OKEECHOBEE COUNTY

6


LIVE
BREAKING NEWS
ARM: NEW VIDEO OF COW ABUSE AT DAIRY FARM
OKEECHOBEE COUNTY
WPTV
11:57 60°

7.


My experience with undercover activists
Background
My Story
Improving for the future.
LARSON DAIRY FARM

8


-Remain Diligent
- Hire Right People
- Communicate with other farmers
- Non- Disclosure Agreement
-Video Surveillance
- 3rd Party Audit

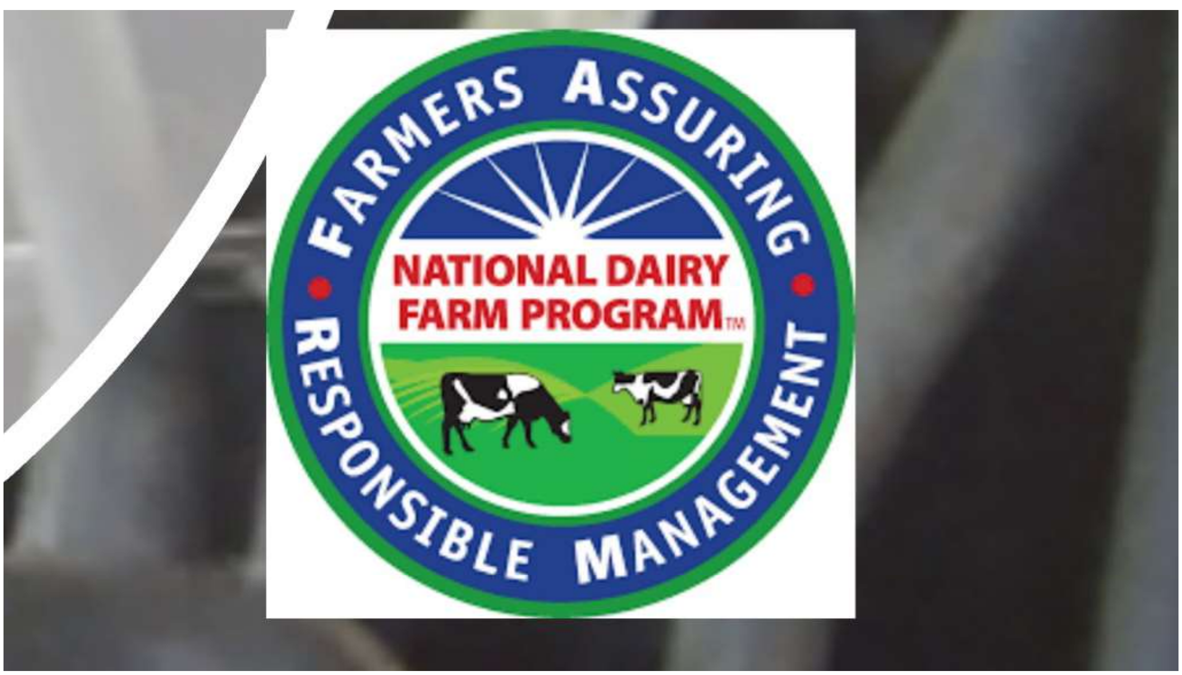
9.


NABISCO
BARNUM'S ANIMALS
CRACKERS
NEW LOOK
Same Great Taste!
PER 14 CRACKERS
130
CALCIUM

10


Animal Agriculture Alliance
Connect | Engage | Protect

11.


FARMERS ASSURING RESPONSIBLE MANAGEMENT
NATIONAL DAIRY FARM PROGRAM™

12.


My experience with undercover activists
Background
My Story
Improving for the future.
LARSON DAIRY FARM

13.

# NOTES


# Presentation Outline

- Dairy History & Operational Overview
- Picture Tour
- Key Dairy Metrics & Challenges
- Optimizing Performance & Welfare
- Q&A During Producer Panel
- GOAL – CONVEY OUR PASSION

## About Royal Farms Dairy

- Established in November of 2000
- Located in the Western Kansas (Middle of USA)
- Ownership Consists of 6 Partners
- Expanded the Operation to 2 Sites in 2014
- Milking 9200 Cows
- 9500 Self-Raised Heifers

## Operating Model

- Open Lot Facilities with Shades
- Parallel Parlors
- Combination 2X (80%) & 3X Milking (20%)
- 92 Employees – AWESOME PEOPLE!!
- Utilize DC305, RFID, EZ Weights, & FeedWatch
- 100% AI Bred - Utilize Top End Holstein Genetics In Combination With Beef Genetics
- Corral & Manure Management
  - Scrape, Harrow, & Pile Manure to Maintain Soft Beds
  - Land Applicate Dry Manure and Pivot Irrigate Effluent on Crop Ground

## Key Operational Metrics

- 82 Pounds of Energy Corrected Milk
- ECM:DMI Feed Efficiency of 1.45
- 150K Somatic Cell Count
- 43% Replacement Rate
- Heifer Program Supports 47% Replacement Rate
- 27% Annualized 21 Day Pregnancy Rate
- Biggest Challenge – Managing Climate in Open Lots

## Key Operational Challenges

- Climate – Heat Stress/Blizzard Risk
- Maintaining Corrals for Excellent Cow Care
- Clinical Mastitis
- Efficiency of Converting Feed Into Milk
- Changing Herd Demographics With Growing Heifer Inventories
- Changing Demographic of Labor Pool

## Glass Balls for Royal Farms Dairy

- Take Great Care of our Cows
- Take Great Care of our People
- Control our Costs
- Execute on Basic Principles with Perfection
- Operate with a High Level of Integrity, Transparency, & Humility

## Optimizing Performance & Welfare

- Royal "Need To Be Better" List
  - Down Cow Handling
  - Timely Euthanasia
  - 1st Lactation Parlor Cow Handling
  - Timely Marketing of Lame Cows
  - Pen Conditions During Inclement Weather
  - Heat, Cold, & Wind Stress on Animals
  - Holding Pen & Exit Alleys
  - Rendering Trucks

## Optimizing Performance & Welfare

- High Level Thoughts & Strategies
  - Farm Culture
  - Training & Documentation
  - Cow Comfort & Facilities
  - Nutrition
  - Genomics
  - Robotics

## Optimizing Performance & Welfare

- High Level Thoughts & Strategies
  - 3rd Party Verification Programs – FARM Program
  - Milk Marketing Contingency Plan
  - Outside Perception & Reality


JOHN DEERE
Thank You!

**NOTES**

# PRODUCER PANEL

# SUMMARIES OF SOUTHEAST MILK CHECK-OFF PROJECTS FUNDED IN 2016

# Continuation of the Evaluation of Cool-Season Forages to Improve Nutrient Management, Forage Productivity and Quality for Southeastern Dairies

***Lead Investigators***: Ann Blount, Forage Breeder and Forage Extension Specialist, UF-NFREC-Marianna
Cheryl Mackowiak, Nutrient BMP and Water Quality Specialist, UF-NFREC-Quincy
Jose Dubeux, Forage Management Specialist, UF-NFREC-Marianna
Nicolas DiLorenzo, Livestock Nutritionist, UF-NFREC-Marianna
Ali Babar, Small Grains Breeder, UF-Agronomy-Gainesville

***County Faculty Investigators***: James McWhorter, Livestock and Forage Agent, Highlands County
Anthony Drew, County Director and Agricultural Agent, Levy County
Doug Mayo, County Director and Livestock Agent, Jackson County
Mary Sowerby, Dairy Agent, Suwannee County, FL
Elena Toro, Livestock and Forage Agent, Suwannee County, FL

***On-Farm and Supporting Cooperators***: UF-Dairy Unit, Hague, FL-field day and forage evaluation site
North Florida Holsteins, Bell, FL-forage evaluation site
Shenandoah Dairy, Live Oak, FL-field day and forage evaluation site
Butler Dairy, Highlands County, FL-forage evaluation site
Bill Smith/Dr. David Worrell, Product Development Managers, Northern Seed-collaborators
Dr. Mathews Paret/Fanny Iriate, Plant Pathologists, NFREC-disease diagnosticians

We have identified that an early application of dry N fertilizer (30 lbs. N/acre) resulted in greater cool-season forage growth under spray effluent. The short production period (often 90 days or less) supports the need to have plant nutrients immediately available for use early in the growth cycle. The early nitrogen applications improved establishment and early growth of cool-season forages where soil nitrogen was low, particularly on sandy soil sites at several dairies' sites. Where dairy soils were already well-fertilized, little differences in N rates and/or timing was found.

Demonstration seed (20 different varieties) were distributed to a number of extension agents in Florida and South Georgia to support local education events and was planted at four Florida dairies. The demonstration plantings included monocultures and blends of small grains and ryegrass varieties. The demonstrations also served as sentinel plantings, which alerted us to any new disease outbreaks or potential production problems.

At the present time, resulting from dairy supported funding, two new crown rust resistant oat varieties, Legend 567 and Horizon 720 are on the commercial market. A new triticale, FL01143, is on the commercial market, and FL 08128 triticale will soon follow. Both work extremely well in dairy silage operations, FL01143 as the earlier variety and FL08128 with a similar maturity to Trical 342, but higher yielding. Both were developed and tested under our 2016-2017 Dairy Research funding at dairy farms that participated as our cooperators in developing dairy end-user forages.

The 2016-2017 Cool-season Forage Variety Recommendations were submitted to on-line EDIS and updated at the Georgia Forages site (UGA), distributed through list-serves to our GA and Florida county agents, and published in the September 2016 issue of the Florida Cattlemen Magazine. We continue to work closely with our dairy producers through farm visits, and regularly invite producers to attend on-farm field days and related programs.

# Georgia Youth Programs

**Jillian Bohlen**

Department of Animal and Dairy Science, University of Georgia, Athens, GA

## 4 – H Dairy Activities and Youth Events

- At the 2016 State Commercial Dairy Heifer Show, there were a total of 279 heifers that were weighed in from 239 exhibitors. The number of exhibitors was up by 20 compared with 2015 (program continues to grow).
- Sixteen youth delegates and three chaperones represented the state of Georgia at the Southeast Dairy Youth Retreat. The event for 2016 was hosted by NC State in Maggie Valley, NC.
- The Morgan Co. 4-H Team won the State 4-H Dairy Judging Contest and represented GA in the 2016 National 4-H Dairy Cattle Judging Contest at World Dairy Expo in Madison, WI. They were 9th in Ayrshires, 8th in Guernseys, 12th high team overall, and had one team member receive 9th high overall in placings.
- Three youth and one chaperone served as the delegation from Georgia for the 2016 National Dairy 4-H Conference in Madison, WI. In 2016, there were a record number of applicants to attend the conference.
- The Oconee Co. Dairy Quiz Bowl Team won the state competition and represented GA at the 2016 National Contest at the NAILE in Louisville, KY.

## Southeast Milk Scholarship Award

- Kayla Alward of Guyton, GA was the 2016 SMI scholarship recipient. Prior to her award, she was recognized as UGA's (out of 5,000) as well as the Southern regional (this includes 12 states) student employee of the year for her work on the UGA Dairy Farm. This work and her many accomplishments, including two winning national American Dairy Science Association presentations, have her also named as UGA's Amazing Student (out of 32,000).

## Dairy Challenge

- The University of Georgia (5 students) attended the North American Intercollegiate Dairy Academy in Syracuse, NY. Two received internships at this event. Additionally, the University of Georgia hosted and had 6 students in attendance at the 2016 Southern Regional Dairy Challenge in Cordele, GA. Host Farms are those of Mr. Pete Gelber and Mr. Adam Graft.

## ADSA Student Affiliate Division

- The University of Georgia hosted the Southern Regional ADSA-SAD events in Athens, GA in February of 2016. Farm visits included the Coble's Dairy, Birdsville Dairy grazing, and Hillcrest Dairy. UGA's top accomplishments in competitions were: Kayla Alward won the Original Research Presentation with her talk titled "Correlation between teat end scores and presence of mastitis in the UGA dairy herd", Nathan Webb was elected president of Southern ADSA-SAD, the team was 2nd in Quiz Bowl, 1st placed website, 2nd in scrapbook, and 2nd place chapter overall.

- Six students and one advisor served as the representatives from UGA at the 2016 National American Dairy Science Association Meetings held in Salt Lake City, UT. Top accolades for UGA: Kayla Alward won the national undergraduate research competition and was also elected First Vice President to the National ADSA-SAD organization. The UGA Dairy Quiz Bowl Team was named 4th high nationally. Top three included Penn State, Cal Poly, and Virginia Tech. UGA won against Cornell to receive 4th place. Three students were recognized for high academic scholarship in Dairy Science. Dr. Jillian Bohlen was named 2nd year advisor to the national ADSA-SAD organization and as secretary for the southern branch of the Southern American Dairy Science Association.

## Optimization of Fertility of Dairy Heifers Inseminated with Sex-sorted Semen

**Ricardo C. Chebel**

Department of Large Animal Clinical Sciences, University of Florida, Gainesville, FL
Department of Animal Sciences, University of Florida, Gainesville, FL

The hypothesis of the current experiment was that by delaying the time of insemination with sex-sorted semen (from 12 to 24 h) there would be an increase in pregnancy per insemination (**P/AI**) of dairy heifers. Therefore, the objectives of this experiment were to improve reproductive efficiency and profitability of dairy herds by optimizing the use of sex-sorted semen in heifers. One thousand and seven heifers were enrolled in the experiment from December 2017 to April 2018 in a commercial dairy herd located in Quitman, GA. Heifers were fitted with a collar containing an automated estrous detection (**AED**; Heat and Rumination Long Distance System, SCR Inc., Netanya, Israel) monitor 30 d prior to the start of the ovulation synchronization protocol. Once heifers had > 370 kg of body weight they were enrolled in an ovulation synchronization protocol (5-d CIDRSynch: d 0 – GnRH and CIDR insert, d 5 – PGF2α and CIDR removal, d 6 – PGF2α, d 8 – fixed time insemination). From d 6 to 8, study personnel recorded heifers in estrus according to the AED monitor twice daily (0600 and 1500) to determine the time of insemination. Heifers not detected in estrus by the morning of d 8, were inseminated at fixed time according to treatment. On d 0, heifers were balanced according to estrous cycle phase (according to the interval from the last estrous to d 0) and randomly assigned to one of three treatments: 1. Conventional (**COV**), 2. Sex-sorted semen early (**SE**), and 3. Sex-sorted semen late (**SL**). Heifers enrolled in the COV treatment were inseminated with conventional semen (20 x $10^6$ cells/straw) 12.8 ± 0.3 h of onset of estrus and 0.006 ± 0.08 h relative to the GnRH injection. Heifers enrolled in the SE treatment were inseminated with sex-sorted semen (2 x $10^6$ cells/straw) 12.8 ± 0.3 h of onset of estrus and -0.008 ± 0.08 h relative to the GnRH injection. Heifers enrolled in the SL treatment were inseminated with sex-sorted semen (2 x $10^6$ cells/straw) 23.5 ± 0.3 h of onset of estrus and 10.3 ± 0.08 h relative to the GnRH injection. For all treatments, semen from the same three sires were used. Percentages of heifers pregnant 32 (COV = 65.2 ± 3.1, SE = 45.0 ± 3.3, SL = 44.8 ± 3.2%) and 60 (COV = 63.8 ± 3.6, SE = 44.2 ± 4.1, SL = 46.5 ± 3.5%) d after insemination were ($P < 0.01$) greatest for heifers in the COV treatment, but P/AI 32 and 60 d after insemination did not ($P \geq 0.23$) differ between heifers enrolled in the SE and SL treatments. The results of the current experiment refute our initial hypothesis that it would be possible to increate P/AI following insemination with sex-sorted semen by delaying insemination in approximately 12 h.

# Florida 4-H Dairy Youth Program

**Chris DeCubellis**
4-H Dairy/Animal Science State Specialized Agent, UF/IFAS Extension

## 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 2017-18, over 1,500 Florida youth participated in some aspect of youth dairy programs, including farm tours, clinics, dairy product clinics, and dairy projects. Over 150 youth participated in a 4-H dairy project, exhibiting over 300 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 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.

# Black Oats as a Forage Option for Dairy Cows in Florida

**Jose Dubeux[1*], Ann Blount[1], Stephen Harrison[2], Lynn Sollenberger[3], Joao Vendramini[4], Cheryl Mackowiak[1], Nicolas DiLorenzo[1], Erick Santos[1], David Jaramillo[1], Liza Garcia[1]**

[1]University of Florida – North Florida Research and Education Center; * dubeux@ufl.edu
[2]Louisiana State University – LSU AgCenter
[3]University of Florida – Agronomy Department
[4]University of Florida – Range Cattle Research and Education Center at Ona

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 than Florida. Compared to annual ryegrass or other cool-season small grains, black oats are more heat tolerant and disease resistant, allowing an early planting. Black oats are not cold hardy, but they are recommended for the USDA Plant Hardiness Zones 8b-10a. Therefore, black oats could be a forage option in most of the Florida territory regarding winter temperatures. The objective of this study was to evaluate the performance of black oat entries contrasting with other cool-season grasses in four locations in Florida. Black oat entries included CI6858, SAI SELN, CI7280, CD3280, SAIA2, SAIA4, PI436103, PI436109, and Soil Saver. In addition, we included as cool-season controls the following forages: oats (Legend 567, Horizon 201, FL0720, and Cosaque), triticale (FL08128, FL01143, and Trical 342), cereal rye (FL401), and Ryegrass (earlyploid ryegrass). These 18 treatments were allocated in a randomized complete block design with four replications and established in four locations: UF IFAS NFREC Marianna, North Florida Holstein – Bell, UF Dairy – Gainesville, and RCREC – Ona. Response variables included herbage accumulation and nutritive value (crude protein and IVOMD). Early-planting dates were 9/7/16, 8/28/16, 8/29/16, and 8/30/16 for Marianna, Bell, Gainesville, and Ona, respectively. Black oats and other cool-season forages planted in this period were affected by hurricanes Hermine and Matthew and we could not collect data. Plots were re-planted in 9/30/16. In all trials we applied 300 lb/acre of 10-10-10 at planting. Plots measured 5 x 10 ft., with six rows. Plots were harvested twice in Bell and Gainesville, three times in Ona, and four times in Marianna, at 4-inches stubble height, with application of 50 lb N/acre after each harvest. 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, reaching up to 6,000 lb DM per acre in the multiple harvests. In Ona, the plant introduction (PI) CI7280 showed the best results, being a promising cultivar for future release. Nutritive value of black oats was high, comparable to other cool-season forages. Average IVOMD ranged from 75 to 80% and crude protein from 20 to 24%. 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 also in all cool-season forages planted. Summer planting was also problematic regarding weed management and presence of leaf spot. Fall planting seems more adequate for black oat establishment. Black oats are one important forage alternative for Florida. This project will continue to select the best black oat entries adapted to distinct Florida environments aiming future cultivar release for producers.

# Solutions for Mastitis Caused by Antimicrobial Resistant Microorganisms

Zhengxin Ma[1,2], Jaehyun Lim[1,2], Klibs N. Galvao[3,4], Corwin Nelson[1], and K. Casey Jeong[1,2]

[1]Department of Animal Sciences, University of Florida, Gainesville, Florida
[2]Emerging Pathogens Institute, University of Florida, Gainesville, Florida
[3]Department of Large Animal Clinical Sciences, University of Florida, Gainesville, Florida
[4]D. H. Barron Reproductive and Perinatal Biology Research Program, University of Florida

Intramammary bacterial infections causing mastitis is the most costly disease in dairy cattle in the US. Ceftiofur, a third generation cephalosporin, is commonly used to treat mastitis, but it has a high treatment failure rate. The objective of this study was to investigate the prevalence of antimicrobial resistant bacteria in mastitic milk samples and evaluate antibiograms, a profile of antimicrobial susceptibility test, of bacterial isolates to provide better treatment options. We collected 169 milk samples from cows with mastitis; 14.3 and 19.4% of the cows were not cured by ceftiofur treatment in the research and commercial farms, respectively. The milk samples were plated on MacConkey agar and tryptic soy agar with 4 µg/mL cefotaxime to select cephalosporin resistant bacteria (CRB). The prevalence of CRB in milk was 72.0 and 42.1% in the research and commercial farms, respectively. CRB were isolated and speciated by 16s rRNA gene sequencing. In the research farm, 19 genera and 34 species of CRB were identified. The most abundant genus in CRB was *Staphylococci* (27.1%), followed by *Acinetobacter* (17.9%). In the commercial farm, 9 genera and 11 species of CRB were isolated. The predominant CRB genus was *Bacilli* (63.5%), followed by *Pseudomonas* (11.5%). In the case of species, the most prevalent was *B. pumilus* (57.7%), followed by *P. aeruginosa* (11.5%). Antibiograms and minimal inhibitory concentration testing were conducted with representative strains of each species. 95.3% of selected strains were multidrug resistant. All the strains selected showed resistance to ceftiofur (MIC $\geq$ 4 µg/mL), but a majority of the isolates were susceptible to gentamycin, suggesting a potential combination therapy. Taken together, the high prevalence of CRB was detected in mastitic samples that might have challenged antibiotic treatment, but combination therapy of antibiotics may solve this phenomenon.

# Effects of the Level and Duration of Dietary Cation-Anion Difference in Prepartum Diets on Calf Growth, Immunity and Mineral Metabolism

**Jimena Laporta and Jose E. P. Santos**
Department of Animal Sciences, University of Florida, Gainesville, FL

Feeding anionic salts to dairy cows precalving is a common management practice to induce a metabolic acidosis and prevent the incidence of hypocalcemia at the onset of lactation. However, there is limited information on how the maternal metabolic acidosis might impact the growing calf in-utero and postnatally. The objectives of this project were to evaluate measures of innate immunity, mineral and energy metabolism, and growth of calves born from cows fed different negative dietary cation-anion difference (**DCAD**) diets prepartum. The experimental design was a randomized block design with a 2x2 factorial arrangement of *two levels* of -DCAD: **-70** or **-180** mEq/kg; and *two feeding durations:* 21 d (short, **S**) or 42 d (long, **L**) prepartum. Calf body weight was recorded at birth (0 h, before colostrum feeding), 21 and 42 d, and at weaning (52 d). Blood was collected on days 0, 1, 2 and 3 days after birth to measure ionized calcium (**iCa**) and measures of acid base status (pH, $pCO_2$, and $HCO_3$) using the iSTAT® System. On days 0, 1, 2, 3, 21 and 42, concentrations of total Ca and Mg (atomic absorption), non-esterified fatty acids and beta-hydroxybutyric acid (NEFA and BHBA, colorimetric and enzymatic assays), and hematological analyses (IDEXX ProCyte Dx®) were measured to assess the mineral metabolism, energy metabolism, hematology and immune parameters of the calves. Measures of growth and health were also evaluated through the experiment. Data was analyzed by ANOVA, with d as repeated measures (PROC MIXED, SAS). At birth, calves born from L cows weighed less compared with those born from S cows (40 *vs*. 42.8 kg ± 0.8). This effect was mainly caused by shorter gestation length for L cows compared with S cows (274 *vs*. 277 ± 0.8 d). Similarly, calves born from L cows weighed less at weaning (76.7 *vs*. 81.5 ± 1.8 kg), however BW was not different at 3 and 6 months of age. All calves were healthy throughout the experiment. There were a few instances of respiratory problems and scours, however there were no differences attributed to maternal DCAD duration or level. Calves born to -180 DCAD cows increased iCa concentrations from day 0 to 3, whereas calves born to -70 DCAD cows did not. Calves born from cows fed -180 DCAD diets tended to have higher total Ca concentrations compared to calves born to -70 cows. Concentrations of Mg, Na and K were not affected by DCAD level, duration or their interaction, but they were dynamic over time. At birth, calves born to -180 DCAD cows had a higher blood pH and lower pCO2 compared with calves born to -70 DCAD cows, however at 3 d their levels were similar. There were no differences between the level and duration of maternal DCAD diets on the percentage of apparent efficiency if immunoglobulin absorption (AEA %) of the calves. Calves born to -180 DCAD cows had lower BHBA (specifically at 24 h and 6 weeks after birth) and a tendency for lower NEFA concentrations compared with calves born to -70 DCAD cows. Calf circulating red blood cells (RBC) counts did not differ between duration and level of maternal DCAD diets treatments but they varied across days after birth. However, calves born to cows fed DCAD diets for L duration tended to have higher reticulocytes (immature RBC) and had less platelets compared to those born from cows fed DCAD for S duration. Calf circulating white blood cell counts (WBC, leukocyte) did not differ between treatments, however, the % of neutrophils was decreased and the % of lymphocytes was increased in calves born from L cows compared to those born to S cows. There were no differences between the level and duration of the maternal DCAD diets on the % or counts of monocytes, eosinophils and basophils of their calves. In summary, extending the duration or exacerbating the level of maternal DCAD diets prepartum appears to impact the offspring's growth, their acid-base status, and the mineral and energy metabolism during early life. However, regardless of subtle differences in measures of innate immunity, the health of the calves born to these cows was not impacted by DCAD diets.

# Developing Genomic Tools for Reducing the Effects of Heat Stress on Dairy Cattle Performance

**Anil Sigdel and Francisco Peñagaricano**
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Heat stress reduces milk production, depresses fertility and increases the incidence of health disorders in dairy cows. Genetic selection for heat tolerance is an attractive alternative for reducing the effects of heat stress on animal performance. The main objective of this study was to dissect the genetic basis underlying thermotolerance in Holstein cattle. Specifically, our first goal was to estimate genetic components of milk yield (MY) and somatic cell score (SCS) across lactations considering heat stress. Our second goal was to reveal genes responsible for thermotolerance. Data included 254k MY and 356k SCS test-day records of 20k Holstein cows. Multi-trait repeatability test-day models with random regressions on THI values were used to estimate variance components. The models included herd-test-date and DIM classes as fixed effects, and generic and heat tolerance additive and permanent environmental as random effects. Genetic variances for MY under-heat stress increased 3.9 and 6.5% between consecutive parities, suggesting that cows become more sensitive as they age. Heritability estimates for MY at THI 78 were between 0.17 to 0.32. Genetic correlations between general merit and heat tolerance ranged from -0.30 and -0.55, indicating production and thermotolerance are antagonistic. For SCS, heritability estimates for SCS at THI 78 were between 0.10 and 0.16. For this trait, genetic correlations between general merit and thermotolerance were always positive, ranging from +0.10 to +0.43. Whole-genome scans were performed using ssGBLUP. For MY, as expected, the region on BTA14 that harbors DGAT1 was associated with general merit in all three parities. One region on BTA15 was associated with thermotolerance across lactations; this region harbors PEX16, MAPK8IP1, and CREB3L1, genes implicated in thermogenesis and cellular response to heat stress. For SCS, regions on BTA6 and BTA29 were implicated in general udder health in all parities. These regions harbor genes, such as CXCL13, SCARB2, and FAT3, that are involved in immune response. Notably, genes DLX1 and DLX2 which downregulate cytokine signaling pathway were associated with SCS thermotolerance in all lactations. Overall, this study contributes to better understanding of the genetics underlying heat stress and point out novel opportunities for improving thermotolerance in dairy cattle.

# Milk Check-Off Veterinary Student Scholarship

**D.O. Rae, Galvao, F.P. Maunsell, and R. Bisinotto**
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 made to senior students who has shown outstanding leadership qualities, scholastic abilities and proficiency in dairy cattle production medicine. Special consideration is given to students that have an interest to practice food animal medicine in Florida after graduation.

**Granted:** $1,000.00
**This is an on-going, annual scholarship supported by the Milk Check-off.**

**Recipient for 2018:** Kelly J. Mills (Class of 2019)

# Use of Calcitriol to Reduce Subclinical Hypocalcemia and Improve Postpartum Health in Dairy Cows

**Achilles Vieira-Neto and José E.P. Santos**
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Milk fever can be minimized by dietary interventions and the use of acidogenic salts usually reduce the incidence to < 2% in multiparous cows. Nevertheless, up to half of postpartum cows still present some degree of subclinical hypocalcemia (**SCH**), which is usually defined as serum/plasma total Ca concentrations below 8.0 or 8.5 mg/dL in the first 3 days postpartum. Research conducted by our group with funding from the Southeast Milk Inc. Dairy Checkoff program has demonstrated that cows with SCH have increased risk of uterine diseases, morbidity, and depressed reproductive performance (Martinez et al. 2012). We also demonstrated that the active vitamin D metabolite, calcitriol [1,25 (OH)2 D3] administered within 2 h of calving increased blood Ca, markedly reduced the risk of SCH, and improved measure of innate immunity (Vieira-Neto et al., 2017).

The present abstract summarizes data of a follow up experiment also funded by the Southeast Milk Inc. Dairy Checkoff program conducted to determine the effects of calcitriol on Ca concentrations, risk of SCH, and health in dairy cows. Holstein cows from a 5,000-cow commercial herd were blocked by lactation number (1 vs. ≥2) and calving sequence and, within block, randomly assigned to receive subcutaneously, within 6 h of calving, vehicle (**Control**, n=450), 200 µg (**Cal200**, n=450), or 300 µg of calcitriol (**Cal300**, n=450). Blood was sampled before treatment administration, and on days 1, 2, 3, and 5, and plasma analyzed concentrations of Ca and Mg. Vaginal discharge (**VD**) was evaluated on days 4, 6, and 8 postpartum, and cows with VD reddish/brownish foul smell were diagnosed with metritis. Cows with metritis and fever were classified as puerperal metritis. Morbidity (metritis, mastitis, displaced abomasum, digestive and/or respiratory disorders) was evaluated until 60 days postpartum. Treatment with Calcitriol improved blood concentrations of ionized Ca (Control = 4.48 vs. Cal200 = 4.88 vs. Cal300 = 5.08 mg/dL) and serum concentrations of total Ca (Control = 9.24 vs. Cal200 = 10.6 vs. Cal300 = 10.8 mg/dL). Subclinical hypocalcemia affected 28.2% (381/1350) of the cows. Calcitriol reduced the incidence of SCH 5 fold compared with Control cows (Control = 53.5 vs. Cal200 = 10.4 vs. Cal300 = 8.9 %). Within cows with calving problems (dystocia, stillbirth, twins, or retained placenta), Cal300 reduced the incidence of metritis compared with Control cows (Control = 76.3 vs. Cal200 = 70.9 vs. Cal300 = 57.0 %), whereas no effect was observed in cows without calving problems. Within cows with body condition ≥ 3.75, Cal300 reduced the incidence of puerperal metritis compared with Control cows (Control = 19.7 vs. Cal200 = 9.1 vs. Cal300 = 3.9%). Within cows with body condition BCS ≥ 3.75, Calcitriol reduced morbidity compared with Control cows (Control = 71.5 vs. Cal200 = 55.6 vs. Cal300 = 58.7%). Calcitriol treatment was effective to increase blood concentrations of Ca in the first 3 d in milk and reduce the risk of diseases in cows having calving problems and those overconditioned at calving.

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

Vieira-Neto et al. (2017) J. Dairy Sci. 100:5805-5823.