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
Francisco Peñagaricano
José Santos
Mary Sowerby

Proceedings compiled by Albert De Vries
Proceedings from past Florida Dairy Production Conferences are available at http://dairy.ifas.ufl.edu
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# 2016 Sponsors

## Gold Sponsors ($1500)

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<tr>
<td>ELANCO ANIMAL HEALTH</td>
<td>David Waagner (3721 Bermuda Run Dr., Valdosta, GA 31605)</td>
</tr>
<tr>
<td></td>
<td>229-506-0120</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:waagner_david_m@elanco.com">waagner_david_m@elanco.com</a></td>
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<tr>
<td>MILK SPECIALTIES GLOBAL</td>
<td>Joseph Gulick (21 Brookfield Dr., Elizabethtown, PA 17022)</td>
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<td></td>
<td>412-627-3623</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:jgulick@milkspecialties.com">jgulick@milkspecialties.com</a></td>
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## Silver Sponsors ($1000)

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<td>Fowler Branstetter (P O Box 29, Edmonton, KY 42129)</td>
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<tr>
<td></td>
<td>270-646-0432</td>
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<tr>
<td></td>
<td><a href="mailto:fowler.branstetter@churchdwight.com">fowler.branstetter@churchdwight.com</a></td>
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<tr>
<td>MERCK ANIMAL HEALTH</td>
<td>Greg Woodard (12940 Tom Gallagher Rd., Dover, FL 33527)</td>
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<tr>
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<td>813-918-2712</td>
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<td></td>
<td><a href="mailto:gregory.woodard@merck.com">gregory.woodard@merck.com</a></td>
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<tr>
<td>WESTWAY FEED PRODUCTS</td>
<td>Cathy Bandyk (6650 SE 150th Ave., Morriston, FL 32668)</td>
</tr>
<tr>
<td></td>
<td>608-553-0824</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:cathy.bandyk@westwayfeed.com">cathy.bandyk@westwayfeed.com</a></td>
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## Bronze Sponsors ($500)

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<td>BETASEED</td>
<td>Cindy Suplinski (PO Box 195, Shakopee, MN 55379)</td>
</tr>
<tr>
<td></td>
<td>952-288-2459</td>
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<tr>
<td></td>
<td><a href="mailto:csuplinski@betaseed.com">csuplinski@betaseed.com</a></td>
</tr>
<tr>
<td>MERAL LTD.</td>
<td>James Stice (PO Box 460, Highland City, FL 33846)</td>
</tr>
<tr>
<td></td>
<td>863-640-3843</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:james.stice@merial.com">james.stice@merial.com</a></td>
</tr>
<tr>
<td>PHIBRO ANIMAL HEALTH</td>
<td>Jacob Pieper (883 Big Mount Road, Thomasville, PA 17364)</td>
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<td></td>
<td>717-654-3216</td>
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<td></td>
<td><a href="mailto:jacob.pieper@pahc.com">jacob.pieper@pahc.com</a></td>
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<tr>
<td>SUWANNEE VALLEY FEEDS</td>
<td>Will Lloyd (P O Box 359, Trenton, FL 32693)</td>
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<td>352-463-2335</td>
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<td><a href="mailto:will.lloyd@svfeeds.com">will.lloyd@svfeeds.com</a></td>
</tr>
<tr>
<td>PHIBRO ANIMAL HEALTH</td>
<td>Joel Reed (3830 NW Brown Rd., Lake City, FL 32055)</td>
</tr>
<tr>
<td></td>
<td>(386) 755-5605</td>
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<tr>
<td></td>
<td><a href="mailto:joel.reed@mcness.com">joel.reed@mcness.com</a></td>
</tr>
<tr>
<td>H. J. BAKER &amp; BRO.</td>
<td>Jacob Sparkman (415 N. McKinley St., Ste 750, Little Rock, AR 72205)</td>
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<tr>
<td></td>
<td>501-400-0629</td>
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<tr>
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<td><a href="mailto:jsparkman@hjbaker.com">jsparkman@hjbaker.com</a></td>
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<tr>
<td>MYCOGEN SEEDS</td>
<td>Marvin Stewart (3162 Ferns Glen Drive, Tallahassee, FL 32309)</td>
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<td></td>
<td>850-545-3207</td>
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<tr>
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<td><a href="mailto:mpstewart@dow.com">mpstewart@dow.com</a></td>
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<tr>
<td>TECHMIX</td>
<td>Tami Merkins (600 Dale St SW, Hutchinson, MN 55350)</td>
</tr>
<tr>
<td></td>
<td>877-466-6455</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:tamimerkins@techmixglobal.com">tamimerkins@techmixglobal.com</a></td>
</tr>
<tr>
<td>ZOETIS</td>
<td>Heath Graham (22844 W Old Providence Rd., Alachua, FL 32615)</td>
</tr>
<tr>
<td></td>
<td>386-853-0954</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:heath.graham@zoetis.com">heath.graham@zoetis.com</a></td>
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</table>
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Program

52nd Florida Dairy Production Conference

Wednesday, April 6, 2016
Alto Straughn IFAS Extension Professional Development Center
Gainesville, Florida

8:30 AM Registration

9:30 Welcome and IFAS dairy update
- Geoffrey Dahl, University of Florida

9:40 What dairy farmers should know about genetic selection
- Francisco Peñagaricano, University of Florida

10:10 Opportunity costs when choosing service sires
- Ole Meland, past chair Council on Dairy Cattle Breeding

10:50 Minimizing costs of mastitis through enhancing antimicrobial protein production in the udder
- Corwin Nelson, University of Florida

11:20 Improving milk quality: Troubleshooting high laboratory bacteria counts on the farm
- Jamie Cantrell, Dairy Farmers of America

12:00 PM Luncheon

1:10 Warm-season perennial grass management in Florida
- Joao Vendramini, University of Florida

1:40 Current strategies to increase nutritive value of corn silage
- Luiz Ferraretto, University of Florida

2:20 Economic evaluation of dairy cow stocking density
- Albert De Vries, University of Florida

2:45 Update on Florida environmental regulations, including BMP manual release
- Ray Hodge, Southeast Milk

3:00 Break

3:30 Opportunities for making milk in the Southeast: Full Circle Dairy, FL
- Eric Diepersloot, Full Circle Dairy

4:00 Overcoming challenges during the adoption of new technologies: Abel Dairy Farms, WI
- Steve Abel, Abel Dairy Farms

4:30 Producer Panel
- Moderator: Jose Santos

5:00 Reception
What dairy farmers should know about genetic selection

Francisco Peñaagaricano
Department of Animal Sciences
University of Florida

OUTLINE

• Introduction
• Sire summaries: three key concepts
• Selection for multiple traits
• Take home messages

Genetic selection decisions
• one of the most important decisions that a dairy producer frequently makes
• represents a great opportunity to improve the profitability of the dairy production enterprise

Changes achieved through selection are:
- cumulative
- permanent
- cost-effective

Dairy bulls are genetically evaluated for several traits
• Production traits
• Fertility traits
• Health traits
• Type traits

This information is regularly compiled and published as sire summaries

Phenotypic Trend
Genetic Trend

Milk
1200
1400
1600
1800
2000
2200
2400
2600
YEAR

-100
0
100
200
300
400
500
600
700
800
-1000
-2000
-3000
-4000
-5000
-6000
-7000
-8000
YEAR

USDA
CDSB
NAAB
JERSEY
SUMMARY
SIRE
ENCYCLOPEDIA
SUMMARY
SIRE
ENCYCLOPEDIA
SUMMARY
Sire summaries: three key concepts

- Predicted Transmitting Ability (PTA; a measure of the genetic merit of the bull)
- Reliability (REL or %R; a measure of the degree of confidence in the PTA of the bull)
- Percentile Rank (a measure of the rank of the bull within the evaluated population)

What dairy farmers should know about genetic selection

Sire summaries

- There are at least three key concepts that appear in the sire summaries that we should consider in order to make proper sire selection decisions

Sire summaries: three key concepts

- Predicted Transmitting Ability (PTA) is a genetic prediction that we should always use when making sire selection decisions
- Reliability (REL or %R) is an estimate of the relative genetic superiority that a bull will pass to its offspring
- Percentile Rank is a measure of the degree of confidence in the PTA of the bull
- PTAs are exceptional tools for comparing and ranking available bulls

Predicted Transmitting Ability (PTA)

- PTAs are exceptional tools for comparing and ranking available bulls
- The difference between the PTAs of two bulls is an estimate of the difference we expect to observe in the performance of their progeny

Supersire daughters will produce 54 more pounds of protein than Wright daughters

Wright daughters will survive 1.6 more months than Supersire daughters

7HO11351 Supersire +71 PTA Protein
7HO11123 Wright +17 PTA Protein
7HO11351 Supersire +7.0 PTA Productive Life
7HO11123 Wright +8.6 PTA Productive Life
What dairy farmers should know about genetic selection

**Sire summaries: three key concepts**

**Reliability (REL %R)**
- It measures the accuracy or degree of confidence in the PTA.
- It is expressed as percentages and range from 1 to 99.
- REL is a function of the heritability of the trait and the amount of information available.
  - If heritability and the amount of information increase, then REL also increases.
  - A bull has a more reliable PTA for protein yield than for daughter pregnancy rate because protein yield has a higher heritability.
  - A bull with many daughters has a more reliable PTA for any given trait than a bull with no or just few daughters.

**Percentile Rank**
- Tables or graphs of PTA distributions.
- Useful information regarding the rank or position of a bull within the population evaluated.
- Interpretation:
  - If a bull ranks for a given trait at the 95th percentile, this means that the bull is genetically superior to 95 percent of all the evaluated bulls of its breed.

---

What dairy farmers should know about genetic selection

**Sire summaries: three key concepts**

**Reliability (REL %R)**
- It measures the accuracy or degree of confidence in the PTA.
- Although we should not select or exclude potential sires based only on reliability, we can use REL values as a guide to decide how intense we want to use a bull.

We might choose to purchase:

1. 120 units of semen from a progeny-tested bull with 95% REL.
2. 20 units of semen from each of 6 different young genomic-tested bulls with 70% REL (young bulls with better genetic merit than the progeny-tested bull).

---

What dairy farmers should know about genetic selection

**Sire summaries: three key concepts**

**Percentile Rank**

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<th>No. genomic-tested bulls</th>
<th>REL (average) genetic merit</th>
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<tr>
<td>3</td>
<td>90</td>
</tr>
<tr>
<td>6</td>
<td>95</td>
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<td>12</td>
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Percentile Rank

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<td>90th (TOP 10%)</td>
<td>32</td>
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<td>70th (TOP 30%)</td>
<td>21</td>
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<td>50th (TOP 50%)</td>
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[1] Twister ranks in the top 30% for PY
[2] Twister ranks in the top 5% for PL
[3] Twister ranks in the top 30% for DPR

What dairy farmers should know about genetic selection

Sire selection for multiple traits

- there are a large number of traits, including production traits (such as milk yield and milk composition) and fitness traits (such as longevity, fertility, udder health, and calving ability) that directly impact the profitability of the dairy production enterprise
- different methods for selecting sires considering multiple traits of economic importance

Independent Culling or Rejection Levels

- first choose minimum standards or cut-off values for each of the traits undergoing selection
- then select only those bulls that meet simultaneously all these criteria

we might decide that we will only use bulls with PTAs that are at least:

+31 for protein yield, +4.3 for productive life, and +2.5 for daughter pregnancy rate
Independent Culling or Rejection Levels

- simple method that allows to select simultaneously for multiple traits using simple rules
- this method has some important limitations:

1. minimum standards are in general chosen arbitrarily without using any formal approach
2. these values may vary over time due to genetic progress and changes in the genetic base:
   - cut-off values that are appropriate today may be too liberal or too restrictive in the near future
3. this method ignores the genetic relationships between traits of interest:
   - this impacts the efficiency of selection when we select for traits that are genetically correlated
4. the effectiveness of the method decreases as the number of traits under selection increases:
   - fewer bulls meet all the criteria, and these bulls are only marginally superior for each trait

Economic Selection Index

- better approach for selecting sires considering multiple traits
- combines multiple traits into a single value, greatly facilitating the identification of the best bulls
- individual traits are weighted based on relevant genetic information and economic importance

- these economic weights are based on current prices for both inputs (e.g., feed and veterinary costs) and outputs (e.g., milk prices) of a dairy farm
- these values are updated regularly to reflect current trends in the price of feed and milk

Economic Selection Indices: relative weights

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source: http://apl.arsusda.gov
Lifetime Net Merit Index (NM$)

- probably the most popular index
- represents the most appropriate breeding goal for the vast majority of US dairy farmers

- Protein and fat yield receive the highest weights (20% and 22%)
- Productive life has the highest weight (19%) among the fitness traits
- Female fertility traits receive a relative weight of 10%

Overall, NM$ has relative weights of
43% for production traits
41% for health and fertility traits
16% for functional type traits

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- NM$ is highly correlated with protein and fat yield, and also with productive life
- Milk is positively correlated with protein and fat yield, and hence, it is also correlated with NM$
- High NM$ values are associated with low somatic cell counts
- High NM$ values are associated with high daughter pregnancy rates

Alternative indices

- Three indices are available for producers with special milk markets or production systems

Cheese Merit Index (CMS)

For dairy farmers who are paid mainly for milk components

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<td>8</td>
<td>6</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Feet/Legs</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Body size</td>
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<td>-4</td>
<td>-5</td>
<td>-4</td>
</tr>
<tr>
<td>DPR</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>HCR</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>CCR</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>CA$</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Fluid Merit Index (FM$)

For dairy farmers who are paid mainly for milk volume

<table>
<thead>
<tr>
<th>Trait</th>
<th>NMS</th>
<th>CMS</th>
<th>FMS</th>
<th>GMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>20</td>
<td>24</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Fat</td>
<td>22</td>
<td>19</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td>Milk</td>
<td>-1</td>
<td>-9</td>
<td>23</td>
<td>-1</td>
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<tr>
<td>PL</td>
<td>19</td>
<td>16</td>
<td>20</td>
<td>10</td>
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<td>SCS</td>
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<td>-6</td>
</tr>
<tr>
<td>Udder</td>
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<td>6</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Feet/Legs</td>
<td>3</td>
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<td>3</td>
<td>3</td>
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<td>5</td>
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<tr>
<td>CA$</td>
<td>5</td>
<td>4</td>
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<td>5</td>
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</table>
Alternative indices

- Three indices are available for producers with special milk markets or production systems

<table>
<thead>
<tr>
<th>Trait</th>
<th>NM$</th>
<th>CM$</th>
<th>FM$</th>
<th>GM$</th>
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</thead>
<tbody>
<tr>
<td>Protein</td>
<td>20</td>
<td>24</td>
<td>0</td>
<td>18</td>
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<tr>
<td>Fat</td>
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<tr>
<td>SCS</td>
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<td>-7</td>
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<td>-6</td>
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</tr>
<tr>
<td>Feet/Legs</td>
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<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Body size</td>
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<td>-4</td>
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<td>19</td>
</tr>
<tr>
<td>MFR</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>CCR</td>
<td>1</td>
<td>1</td>
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<td>5</td>
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<tr>
<td>CAS</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Grazing Merit Index (FMS$)

Pasture-based dairy producers

Take Home Messages

Key points to consider when making selection decisions

- Sire selection represents a great opportunity to improve the profitability of the dairy enterprise
- "If breeding for profit is not your objective then I wish you all the very best with your hobby"
- Sire selection decisions should be based on PTA information
- The selection of sires considering multiple traits should be based on economic selection indices
- The percentile rank helps to see how genetically superior the bull in question is compared with the rest of the available bulls
- The reliability should be used for managing the risk associated with the imprecision in the estimate of the genetic merit

Thanks for your attention!

Contact Information:
Phone: (352) 392-1981
E-mail: fpnagaricano@ufl.edu
Website: fpnagaricano-lab.org
Opportunity Costs When Choosing Service Sires
2016 Florida Dairy Production Conference
University of Florida April 6, 2016

Dr. Ole Meland
Chairman of the Council on Dairy Cattle Breeding 2010-2015
Chairman of the National Association of Animal Breeders 2011-2013
Vice President of Genetics Accelerated Genetics 1984-2012
Director of Business Development Accelerated Genetics 2012-2014
Genetics Consultant Worldwide Sires 2015-present

U.S. dairy population and milk yield

Genetic Trend for Milk

Cow Milk BV Sire Milk BV

Holstein or Red & White Birth Year

Milk BV

-7,000 -6,000 -5,000 -4,000 -3,000 -2,000 0 1,000 2,000

Genetic Trend for Protein

Genetic Trend for PL

Genetic Trend for SCS

Genetic Trend for DPR
Dairy cattle traits evaluated by USDA/CDCB

<table>
<thead>
<tr>
<th>Year</th>
<th>Trait</th>
<th>Year</th>
<th>Trait</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926</td>
<td>Milk &amp; Fat Yields</td>
<td>2006</td>
<td>Stillbirth Rate</td>
</tr>
<tr>
<td>1978</td>
<td>Conformation (type)</td>
<td>2006</td>
<td>Sire Conception Rate^2</td>
</tr>
<tr>
<td>1978</td>
<td>Protein Yield</td>
<td>2009</td>
<td>Cow &amp; Heifer Con Rate</td>
</tr>
<tr>
<td>1994</td>
<td>Productive Life, NMS</td>
<td>2012</td>
<td>Mobility for Brown Swiss</td>
</tr>
<tr>
<td>1994</td>
<td>Somatic Cell Score (mastitis)</td>
<td>2012</td>
<td>Rear Leg Rear View and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Milking Speed for Milking</td>
</tr>
<tr>
<td>2000</td>
<td>Calving Ease^1</td>
<td>2016</td>
<td>Shorthorn</td>
</tr>
<tr>
<td>2003</td>
<td>Dau Pregnancy Rate</td>
<td>2018</td>
<td>Grazing Merit (GMS)</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>2020</td>
<td></td>
</tr>
</tbody>
</table>

What will be the next traits added? 2016, 2018, 2020

^1 Sire calving ease evaluated by Iowa State University (1976-99)
^2 Estimated Relative Conception Rate evaluated by DRMS@Raleigh (1986-2005)

Inheritance of traits of economic importance

- Most traits of economic importance in dairy cattle are controlled by additive genetics.
- You must continue to add superior genes ever generation to keep genetic trend moving up.

Opportunity costs when choosing service sires

- Why the service sires you choose for use in your herd, matters more now, than ever before.
- It is because, in the era of genomics, the rate of genetic gain is increasing at an increasing rate.

Opportunity costs when choosing service sires

- There are four pathways to increase genetic merit.
  - Dam of Sons
  - Sire of Sons
  - Dams of Daughters
  - Sire of Daughters
One Millionth genotype received

May 15, 2015 the one millionth genotype was received into the genotype table in the US.

As of August 2015 there were 184,659 sires that had a US genomic evaluation and 829,685 females for a total of 1,014,344.

Four major factors that affect the rate of genetic change in a population

1) Selection Intensity (SI)
2) Accuracy of Selection (AS)
3) Generation Interval (GI)
4) Additive Genetic Standard Deviation (AGSD)

With genomic selection, breeders are able to greatly affect 3 of the 4 factors.

Rate of Genetic Change = (SI x AS x AGSD)/ GI
Rate of Genetic Change in a Population

1) Selection Intensity: from moderately low to extremely high
2) Accuracy of Selection: from 35%R to 75%R
3) Generation Interval: from 85 months on sires and 48 months on females in 2007 to around 33 months for both sires and females in 2013.

With more extensive genomic selection in 2014 the age of parents will continued to decline in the future.

George Wiggans USDA/AGIL

Rate of Genetic Gain is increasing at an increasing rate

Genetic merit of marketed Holstein bulls

<table>
<thead>
<tr>
<th>Year</th>
<th>Ave NMS gain per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2004</td>
<td>$19.42</td>
</tr>
<tr>
<td>2005-2009</td>
<td>$47.95</td>
</tr>
<tr>
<td>2010-2014</td>
<td>$87.49</td>
</tr>
</tbody>
</table>

Rate of Genetic Gain is increasing at an increasing rate

In the Holstein breed the rate of genetic change from 2008-2013 was around twice the rate it was from 2005-2008 for milk, fat, protein yields and the three lifetime indexes (NM, FM, CM).

The rate of change was almost three times for some lower heritable traits like Productive Life (PL).

Duane Norman CDCB consultant

The level of US genomic evaluations for Young Genomic Holstein Sires

<table>
<thead>
<tr>
<th></th>
<th>1st eval April, 2015</th>
<th>1st eval Dec, 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number 1 sire for Milk</td>
<td>+2691 M *</td>
<td>+3327 M*</td>
</tr>
<tr>
<td>Number 1 sire for Fat</td>
<td>+109 F *</td>
<td>+121 F*</td>
</tr>
<tr>
<td>Number 1 sire for Protein</td>
<td>+83 P *</td>
<td>+83 P*</td>
</tr>
<tr>
<td>Number 1 sire for NMS</td>
<td>+951 NMS *</td>
<td>+991 NMS*</td>
</tr>
<tr>
<td>Number 1 sire for GTPI</td>
<td>+2825 GTPI *</td>
<td>+xxxx GTPI*</td>
</tr>
</tbody>
</table>

*These animals are too young to produce semen at this time
**What is possible?**

“Super cow”

A “Super Cow” constructed from best haplotypes in the Holstein population would have a GEBV NM$ value of $6173.

---

**What traits do you need in your cow herd to be most profitable?**

- Produce high volumes of fat and protein with relatively low SCS.
- Medium sized
- Well attached capacious udder
- Mobile and trouble free feet and legs
- Easy calving and breed back on time
- Cows that maintain adequate body condition

---

**What is the goal of sire selection?**

To efficiently select a group of service sires to use in your herd that will meet the goals you have established for your herd.
How do I go about choosing service sires for my herd?

Clearly the best and most efficient way to select service sires for your herd is to use a selection index that maximizes your herd’s profit potential 4-7 years from now. Selection index properly weights the value of all economical important traits. Are there any conditions that are likely to change in the next 4-7 years that you need to take into account when choosing a selection index that best fits your herd?

What can the use of a group of elite genomic young sires do for your herd?

Clearly, the use of a group of elite genomic young sires can greatly increase the genetic merit of your herd when compared to a group of top proven sires or even a group of not so elite genomic sires that were available to use at the same time.

2014 Indexes From CDCB

<table>
<thead>
<tr>
<th>Trait</th>
<th>LNMS2014</th>
<th>LCMS 2014</th>
<th>LFM52014</th>
<th>LGMS2014</th>
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</thead>
<tbody>
<tr>
<td>Protein</td>
<td>20</td>
<td>24</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Fat</td>
<td>22</td>
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<td>Milk</td>
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<td>-9</td>
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<td>PL</td>
<td>19</td>
<td>16</td>
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<td>UDC</td>
<td>-7</td>
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<td>FLC</td>
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<tr>
<td>CCR</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>CAS</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Change in use of genomic young sires over time in US herds on DHIA test

Young sire usage in 2006 was less than 30% Young sire usage in 2010 was more than 42% Young sire usage in 2012 was more than 50% On average in 2012, herds of 50-99 cows in Southwest region of the US exceeded 65% use of genomic young sires.
Accuracy of an individual compared to the accuracy of a group average

Reliability of an individual genomic young sire is 75% R.
Reliability of a group average of 10 genomic young sires is 97.5% R.
In other words, if the accuracy of an individual genomic estimate is 75%, the accuracy of a group average of 10 sires is much more accurate at 97.5%.

\[
\text{Group Ave R} = 1 - \frac{\text{Ave R of individual sire in the group}}{\# \text{ of sires in group}}
\]

Make sure you are using elite genomic sires

Just because a bull has a genomic evaluation, does not mean he is an elite genomic sire worthy of use in your herd.

How much can we pay for high-end bulls?

Chad Dechow reports in JDS (V 73:532-538) and Hoards Dairyman (p.130 February 25, 2016) for a herd with 35% CR they can justify the following semen price for a given NM$.

<table>
<thead>
<tr>
<th>Sire Type</th>
<th>Value/ NM$</th>
<th>600 NM$ Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genomic Young Sire</td>
<td>.1591</td>
<td>$95.46</td>
</tr>
<tr>
<td>DAU-Proven Sire</td>
<td>.1731</td>
<td>$86.55</td>
</tr>
<tr>
<td>No risk adjustment</td>
<td>.1872</td>
<td>$112.32</td>
</tr>
</tbody>
</table>

How much can we pay for high-end bulls?

Based upon $.15 to $.20 value for every $ of NM$; on farms with reasonably high reproductive management, semen from elite sires is most often reasonably priced compared to bulls with lower genetic merit.

Chad Dechow  Dairyman (p.130 February 25, 2016)
Other considerations

- Many registered herds are using a combination of genomic testing, ET and IVF. Some are utilizing sexed semen.
- Can a commercial herd justify Genomic testing?
- Can a commercial herd justify Sexed Semen?
- Can a commercial herd justify ET or IVF?

One area of concern in the genomics era is maintaining genetic diversity

Inbreeding in US Holstein cows in 2000 was 4.5%. In 2013 it was estimated to be around 6.25%.

The Expected Future Inbreeding in US Holstein cows was 4.8% in 2000. In 2013 it was estimated to be around 6.1. So the expected future inbreeding is not increasing as quickly as inbreeding and seems to be leveling off.

Other considerations

- The higher the conception rates are in your herd the more you can justify paying for semen.
- Heifers are higher conception than cows.
- Given you have used elite service sires in your herd, your heifers will be the highest genetic valued animals in your herd.
- In order to create the truly elite animals of the next generation you need to breed the best to the best.

An area of concern in the genomics era is maintaining the genetic diversity

The use a larger group of sires to sire the next generation as well as Genomic Mating programs will help manage genetic diversity and slow or possibly reverse the rate of genomic inbreeding in the future.
Recommendations

First step is to set your herd goals for the traits of economic importance that you want to improve in your herd. Consider the situation 4-7 years from now. Remember the more traits you select, the less progress you will make in any one trait.

Use a selection index that includes economically important traits you want to improve in your herd.

Then, based on your selection index, choose elite genomic bulls to use in your herd for the next 3-6 months.

In 3-6 months repeat this sire selection process and choose a group of bulls you are going to use in your herd for the following 3-6 months.

Use a group of elite genomic young sires.

In herds with 1000 cows or more I would recommend the use of 10-15 bulls to breed your herd.

I would recommend using elite genomic young sires on at least 75% of your herd.

Recommendations

I believe strongly in mating programs, especially genomic mating programs. After you have chosen the bulls to use in your herd, you should use a mating program to select which bull to breed to which cow!

Regardless of your herd size the extensive use of a group of elite genomic young sires will make significant progress in the economically important traits in your herd and will result in greater profitability from your dairy herd.

Thank you

Any Questions!
Transition Cow Health

Our goal: Minimize incidence of transition cow diseases.

Disease risk is minimized through proper nutrition and management.

But, nutrition and management are not always enough.

Vitamin D, Calcium and Immunity

Calcium

Improved Immunity

Disease Resistance

Vitamin D3

Calcium

Toll-like receptor

Vitamin D receptor

β-Defensins

25D3

Vitamin D3

Liver

Blood

RANTES

1,25D3
Hypothesis: Vitamin D contributes to activation of antimicrobial defenses in the mammary gland.

Objective: Determine the effects of intramammary 1,25D treatment on induction of host defenses in the udder to understand mammary immunity.

**Calcium**

- Improved Immunity
- Disease Resistance

Vitamin D, Calcium and Immunity

**Vitamin D** helps activate antimicrobial defenses

**Inducible Nitric Oxide Synthase** (iNOS)

**25D3**

**Vit D3**

**Liver**

**Blood**

Nature Reviews Immunology 3, 710-720 (September 2003)

Bovine β-defensins

---

**Merriman, 2015. J. Steroid Biochem. Mol. Biol.**

**Vitamin D helps activate antimicrobial defenses**

**25(OH)D3 dose (ng/ml)**

**[NO2-], mM**

**Relative fold increase**

**P < 0.001, n = 6**

**Nitric oxide production**

---

**1,25D3**

**LPS**

**LPS+1,25D**

**# Def transcripts/1000**

---

**1,25D3**

**Placebo**

---

**Merriman, 2016. J. Steroid Biochem. Mol. Biol.**
Hypothesis: Vitamin D contributes to activation of antimicrobial defenses in the mammary gland during mastitis.

Objective: Determine the effects of intramammary 1,25D treatment on induction of host defenses in subclinically infected glands.

**Responses to Intramammary 1,25D Treatment**

**Gene Expression in Milk Somatic Cells**

- **iNOS/103 RPS9**
  - Gene expression at different hours relative to treatment.
  - Significant change at hour 12.
  - \( P = 0.023 \)

- **bBD3/103 RPS9**
  - Gene expression at different hours relative to treatment.
  - Significant change at hour 0.
  - \( P = 0.179 \)

- **bBD4/103 RPS9**
  - Gene expression at different hours relative to treatment.
  - Significant change at hour 12.
  - \( P = 0.366 \)

- **bBD6/103 RPS9**
  - Gene expression at different hours relative to treatment.
  - Significant change at hour 0.
  - \( P = 0.757 \)

- **bBD7/103 RPS9**
  - Gene expression at different hours relative to treatment.
  - Significant change at hour 12.
  - \( P = 0.029 \)

**Methods**

- 15 cows
- Treatment repeated after each milking for 5 milkings (every 12 h)

**Team**

- Nelson, 2016 Florida Dairy Production Conference

**Conclusion**

- Vitamin D treatment may enhance antimicrobial defenses in the mammary gland during mastitis.

**Implications**

- Improved mastitis resistance in dairy cows.
Responses to Intramammary 1,25D Treatment: 
During Subclinical Mastitis

Gene Expression in Milk Somatic Cells

- **iNOS**
  - *P* = 0.013

Minimizing Costs of Mastitis Through Enhancing Antimicrobial Protein Production in the Udder

Conclusions:
- Activated vitamin D stimulates antimicrobial responses of cattle.

Implications:
- Vitamin D requirement for immunity
- Therapeutic potential for vitamin D compounds in treatment of mastitis
Vitamin D, Calcium and Immunity

Circulating calcium is tightly regulated by the body. Calcium is necessary for various physiological functions, including muscle contractions, nerve impulses, and blood clotting. When calcium levels are low, the body responds by releasing hormones to increase calcium absorption and reduce calcium loss from the body. This process helps maintain the normal range of calcium levels, which is crucial for bone health and overall bodily function.

Hypocalcemia Suppresses Immunity

Immune cells require calcium to detect and eliminate pathogens. Hypocalcemia, a condition characterized by low calcium levels in the blood, can suppress the immune system's ability to fight infections and diseases. This is because calcium is essential for the activation and proliferation of immune cells, such as T lymphocytes and B lymphocytes. When calcium levels are low, the immune system's effectiveness is compromised, making the body more susceptible to infections.

Onset of lactation causes transient decrease of calcium in circulation

As cows enter lactation, there is a temporary decrease in the circulating calcium levels. This is a natural response to meet the increased demands of milk production. However, if this decrease is severe and prolonged, it can lead to clinical hypocalcemia and other health issues. Proper management and supplementation strategies are necessary to ensure the health and productivity of dairy cows during this critical period.


Immune cells require calcium to detect and eliminate pathogens. When calcium levels are low, the immune system's ability to fight infections is compromised. This highlights the importance of maintaining adequate calcium levels in dairy cows, especially during the lactation period, to support optimal immune function and overall health.
Control of circulating calcium is complex. Hypocalcemia is not as simple as providing more calcium. Typically, calcium mobilization is tightly controlled endocrine mechanisms. Increases in calcium absorption, retention, and mobilization of calcium are required.

**Role of Vitamin D**

- Calcium mobilization
- Calcium absorption
- Calcium retention

Risk of metritis increases with decreased calcium.

**Use of 1,25 Vitamin D3 (Calcitriol) to Maintain Postpartum Blood Calcium (Ca) and Improve Immune Function in Dairy Cows**

- Achilles Vieira-Neto and Jose E.P. Santos
- University of Florida, Gainesville, USA
Fifty cows fed negative DCAD prepartum randomized to receive subcutaneous treatments given within 12 h of calving:
- Placebo
- 300 μg 1,25-vitamin D

Measured responses of:
- Feed intake,
- Milk yield,
- Energy balance,
- Blood minerals,
- Neutrophil function.

Effects of Post-Partum 1,25D on Minerals

Effects of Post-Partum 1,25D on Neutrophils

Effects of Post-Partum 1,25D on Minerals

Total Calcium

Phosphorous

Magnesium

% Phagocytosis

% Oxidative Burst

Phagocytosis Intensity

Oxidative Burst Intensity

Total Calcium

Dry Period

P < 0.05
Use of 1,25 Vitamin D3 (Calcitriol) to Maintain Blood Calcium (Ca) and Improve Immune Function

Conclusions:
• 300 ug of 1,25D given immediately post-partum prevents subclinical hypocalcemia
• The 1,25D treatment increased neutrophil phagocytosis and oxidative burst

Implications:
• Improved calcium and immunity status will lead to decreased transition cow diseases
• Potential adjunctive therapy to good transition cow management

Vitamin D Status of Dairy Cattle

Do dairy cattle get enough vitamin D?

Distribution of Serum 25(OH)D

YES
• Cows sampled from 10 herds fed 30,000 IU to 50,000 IU per day
• No benefit achieved beyond 50,000IU per day

Vitamin D Status of Dairy Cattle

Except: Whole milk-fed calves may be deficient

Calves fed replacer of enhancer providing 5,000 – 6,000 IU vitamin D per day

Calves fed pasteurized waste-milk and no sun

Summary

- Intramammary 1,25D treatment boosts immune responses of the udder
- Post-partum subQ 1,25D treatment prevents subclinical hypocalcemia and boosts neutrophil function
- Better knowledge of what factors contribute to a strong immune system
Acknowledgments

Funding: Southeast Milk Check-Off

Nelson Lab:
- Kathryn Meriman*
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- Jessi Powell
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- Wayne Garcia
- Christopher Colston

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- Fabio Lima
- Camilo Lopera
- I.R.P. Lima
- Francisco B. Lopes Jr.
- Roney Zimpel

Note: 2016 Florida Dairy Production Conference.
PI = Preliminary Incubation
PI is a bacteria that prefers temperatures between 50-60 degrees Fahrenheit
The bacteria lives through pasteurization and limits the shelf life of milk, before the expiration date.

Certified lab incubates the sample for 18 hours at 56 degrees Fahrenheit
Once complete, a Standard Plate Count (SPC) test will be conducted
Personally, I prefer to run a SPC before the PI is run to compare and eliminate other problems
A high PI count is not high unless it is double the SPC

First, PI is not the result of the cow
PI’s are the results of:
- Poor sanitation
- Poor cooling
- Poor cow prep
- Milking wet cows

Interesting factor:
The PI spores are air born, they can float around in the milking system, if you smell soured milk, you are smelling PI’s
Items needed to clean a milking system

- Water
- Detergent or chemicals
- Physical contact
- Temperature of the wash water

Air temperature is also a factor:
- Dirty equipment > 50-60 degree temperature = the bacteria growth rate will double every 20 minutes
  - In one hour a 10,000 doubles 3 times, and becomes 80,000.
  - In the second hour it becomes 640,000.
  - In the third hour it becomes 5,120,000.
- A milk tank that is not cooling correctly will have the same effect.

It takes all four together to work correctly!
Where to look for PI and LP problems

- Fresh cow pails
- Traps
- Vacuum reserve tank
- Udder prep
- Milking wet cows
- Washcloths
  - Not washed and dried properly
  - It requires 120 degrees for at least 12 minutes to kill the bacteria
  - Washing does not kill the germs, it requires heat from drying

Milk tanks – poor cooling

- Tanks are designed to cool the milk in four milking’s
- Tanks that are filled in two milking’s are working double the capacity
  - The tank cools slower than it should
  - Recommend to add pre-cooling
- Tanks that don’t automatically agitate every 20 minutes, will tend to have problems
  - The probe or temp sensor is at the bottom of the tank
  - Cool goes down and heat goes up
  - The probe reads that the milk is cool enough and doesn’t start the compressor and the milk at the top can be 60 degrees

Ice in a tank insulates the next milking from cooling

Milk lines

Dead ends
Spray ball
2 ¾ inches from floor to bottom of wand

Old rubber parts...rubber has memory

Tank washer and spray balls

Objects in wash line

Pulsator line and cracked inflations

Gainesville, FL, April 6, 2016
Other Points

- What is the heaviest organ in your body?
  - This can be a water temperature problem.
  - If the swing line is dirty, it is a water temperature problem.
  - Water temperature is the hottest as it leaves the vat and is the coolest when it returns.
  - The fat will redeposit as it cools.
- Milking around the clock? Should stop 3 times to wash.
- If system is down for more than 20 minutes, rinse and sanitize before milking resumes.
- When milk is left by hauler and more milk is added, it is the same as if you didn’t wash the tank.
- If hauler takes a sample from the valve, it will result in a high count.
- Received one good count and then received a bad count.
  - Possible build up and the hot water is sterilizing.
  - Bad count results when a build up chunk breaks off in the milk.
- Producer with two tanks.
  - One tank is high and the other is not.
    - Usually is an issue with that tank.
  - If both tanks are high.
    - Issue with the pipeline.
Sanitize before you milk

Milk filter and plate coolers

Should not be done more than 20 minutes prior to milking.

Chlorine is a gas and it leaks into the atmosphere.

Mechanical breakdowns

Tank filter – 800 cows
Warm-Season Perennial Grass Management in Florida

Joao Vendramini
University of Florida, IFAS Range Cattle Research and Education Center, Ona

2016 Florida Dairy Production Conference

The use of warm-season grasses is limited by the coldest temperature in the winter.
Species | Herbage Yield (lb DM/acre/yr)
---|---
Jiggs | 14200a
Florona | 14200a
Tifton 85 | 13000b
Okeechobee | 11500c

Stargrass x Bermudagrass – South Florida
### Forage Species – Summer Harvest

<table>
<thead>
<tr>
<th>Forages</th>
<th>Response Variable</th>
<th>Jiggs</th>
<th>Tifton 85</th>
<th>Florakirk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HA, lb/ac</td>
<td>2600c</td>
<td>3610b</td>
<td>3300b</td>
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<tr>
<td></td>
<td>CP, %</td>
<td>14.9</td>
<td>12.0</td>
<td>12.6</td>
</tr>
<tr>
<td></td>
<td>NDF, %</td>
<td>63.6</td>
<td>71.7</td>
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<tr>
<td></td>
<td>IVTD, %</td>
<td>61.7</td>
<td>67.0a</td>
<td>67.0a</td>
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<tr>
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<td>NDFD, %</td>
<td>53.2c</td>
<td>50.0b</td>
<td>52.8b</td>
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</table>

Adapted from Vendramini et al. (2010)

### Forage Species – Fall Harvest

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<th>Forages</th>
<th>Response Variable</th>
<th>Jiggs</th>
<th>Tifton 85</th>
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<tbody>
<tr>
<td></td>
<td>HA, lb/ac</td>
<td>2870a</td>
<td>1140b</td>
<td>2040a</td>
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<tr>
<td></td>
<td>CP, %</td>
<td>10.4</td>
<td>11.1</td>
<td>11.7</td>
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<td></td>
<td>NDF, %</td>
<td>63.2</td>
<td>67.7</td>
<td>63.1</td>
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<tr>
<td></td>
<td>IVTD, %</td>
<td>63.3</td>
<td>68.6</td>
<td>63.0</td>
</tr>
<tr>
<td></td>
<td>NDFD, %</td>
<td>51.5b</td>
<td>60.1a</td>
<td>55.9b</td>
</tr>
</tbody>
</table>

Adapted from Vendramini et al. (2010)
Mulato II trials in North-Central Florida

<table>
<thead>
<tr>
<th>Species</th>
<th>Yield Year 1 (lb/ac)</th>
<th>Yield Year 2 (lb/ac)</th>
<th>CP (%)</th>
<th>IVDOM (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mulato II</td>
<td>5,400</td>
<td>10,500</td>
<td>10.2</td>
<td>67</td>
</tr>
<tr>
<td>Tifton 85</td>
<td>4,900</td>
<td>10,900</td>
<td>10.7</td>
<td>56</td>
</tr>
<tr>
<td>Pearl Millet</td>
<td>6,300</td>
<td>5,200</td>
<td>11.4</td>
<td>65</td>
</tr>
<tr>
<td>Sorghum-Sudan</td>
<td>3,800</td>
<td>5,000</td>
<td>9.6</td>
<td>66</td>
</tr>
</tbody>
</table>

Vendramini et al. (2012)

On-farm study Dairy Check-off 2014

- Mulato outyielded Tifton 85 due to greater late-season production; Mulato had greater digestibility than Tifton 85

<table>
<thead>
<tr>
<th>Grass</th>
<th>Yield (tons/acre)</th>
<th>Digestibility (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mulato</td>
<td>4.8</td>
<td>65</td>
</tr>
<tr>
<td>Tifton 85</td>
<td>4.0</td>
<td>56</td>
</tr>
</tbody>
</table>

Jiggs x Tifton 85

- Jiggs was much easier to establish than either Mulato or Tifton 85 on three cooperating dairies in North Florida/South Georgia
- Jiggs began growth in spring earlier than Tifton 85 in Gainesville
Bermudagrass Fertilization

<table>
<thead>
<tr>
<th>Potash fertilizer rate (lb/acre/harvest)</th>
<th>Jiggs</th>
<th>Tifton 85</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lb DM/acre</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>2200</td>
<td>2100</td>
</tr>
<tr>
<td>20</td>
<td>2000</td>
<td>2000</td>
</tr>
<tr>
<td>40</td>
<td>1700</td>
<td>1700</td>
</tr>
</tbody>
</table>

Bermudagrass Fertilization

<table>
<thead>
<tr>
<th>Potash fertilizer rate (lb/acre/harvest)</th>
<th>Tissue K (%)</th>
<th>Yield (tons/acre thru September 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.4</td>
<td>3.09</td>
</tr>
<tr>
<td>20</td>
<td>1.8</td>
<td>3.66</td>
</tr>
<tr>
<td>40</td>
<td>1.9</td>
<td>3.84</td>
</tr>
</tbody>
</table>

Bermudagrass is historically considered “persistent” under defoliation; however, an interaction of defoliation intensity x frequency x fertilization plays a major role on persistence of bermudagrass fields.

“There are only two pastures in Florida, bahiagrass and the one that will be bahiagrass.”
Production of Tifton 85 and Mulato II in South Florida is limited due to poorly drained soils.

- Jiggs is well adapted to South Florida with greater Spring and Fall growth than Stargrass and Tifton 85.
- Mulato II has greater nutritive value than Tifton 85 or Jiggs but it is not perennial in North Florida.

Summary

- Jiggs has faster establishment and greater forage production than Tifton 85 in the Spring in North Florida. However, Tifton 85 has greater digestibility.
- Adequate potassium fertilization and taller stubble heights are essential to maintain the productivity of bermudagrass fields.
Current strategies to increase nutritive value of corn silage

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\textsuperscript{2}Department of Dairy Science, University of Wisconsin – Madison

Introduction

High quality whole-plant corn silage (WPCS) contributes greatly to supplying the energy, starch and forage NDF needs of high-producing dairy cows, reducing purchased feed costs from expensive grain and byproduct supplements, and generating milk revenues for dairy producers throughout the world. The purpose of this paper is to review selected recent developments and strategies that may influence the nutritive of WPCS.

Corn silage harvest practices

Meta-Analysis

Ferraretto and Shaver (2012) performed a meta-analysis to determine the impact of dry matter (DM) content, kernel processing (PROC) and theoretical length of cut (TLOC) of WPCS on intake, digestion and milk production by dairy cows. The dataset was comprised of 106 treatment means from 24 peer-reviewed journal articles from 2000 to 2011. Categories for DM content at silo removal and PROC and TLOC at harvest were: \(\leq 28\%\) (VLDM), >28\% to 32\% (LDM), >32\% to 36\% (MDM), >36\% to 40\% (HDM), and >40\% (VHDM) DM; 1 to 3 or 4 to 8 mm roll clearance or unprocessed; 0.48 to 0.64, 0.93 to 1.11, 1.27 to 1.59, 1.90 to 1.95, 2.54 to 2.86, and \(\geq 3.20\) cm TLOC. Data were analyzed using Proc Mixed in SAS with WPCS treatments as Fixed effects and trial as a Random effect.

Milk yield was decreased by 2 kg/d per cow for VHDM. Fat-corrected milk (FCM) yield decreased as DM content increased. Total-tract digestibility of dietary starch (TTSD) was reduced for VHDM compared to HDM and LDM. Processing (1 to 3 mm) increased TTSD compared to 4 to 8 mm PROC and unprocessed WPCS. Milk yield tended to be 1.8 kg/cow/d greater, on average, for PROC (1 to 3 mm) and unprocessed WPCS than 4 to 8 mm PROC. The TLOC of WPCS had minimal impact on any of the parameters evaluated. Starch digestibility and
lactation performance were reduced for dairy cows fed diets containing WPCS with >40% DM or WPCS with insufficient kernel processing.

An interaction was observed between DM content and kernel processing for TTSD. Kernel processing increased TTSD for diets containing WPCS with 32% to 40% DM. Also, an interaction was observed between TLOC and kernel processing for TTSD. Kernel processing increased diet TTSD when TLOC was 0.93 to 2.86 cm. Kernel processing WPCS to improve starch digestibility was effective across a wide range of DM contents and TLOC, but did not overcome adverse effects of very high DM content on TTSD and was ineffective at very long TLOC.

**Corn Shreddage**

Vanderwerff et al. (2015) evaluated in a feeding trial: 1) the response to corn shredlage (SHRD) in a brown midrib (BMR) WPCS hybrid, and 2) whether the greater TLOC setting on the SPFH for the harvest of SHRD increased the peNDF content of the WPCS.

A BMR WPCS hybrid (F2F627; Mycogen Seeds) was harvested in September 2013 with a Claas 940 SPFH equipped with either a Claas conventional processor or a SHRD processor on the same day at 50% kernel milk line stage of maturity. The conventional processor was set for a 2-mm roll gap and 40% roll speed differential with the SPFH set for a 19-mm TLOC for harvest of the conventionally-processed corn silage (KP). Harvest of the SHRD was done with the SHRD processor set at a 2-mm roll gap and 32% roll speed differential with the SPFH set for a 26-mm TLOC. The KP and SHRD were stored in separate silo bags until the bags were opened to begin the feeding trial in January, 2014.

Mid-lactation Holstein cows were used in a 16-week continuous-lactation experiment in our university dairy herd with 15 replicated pens of 8 cows each. The respective treatment TMR contained 45% (DM basis) from either SHRD or KP. Both TMR treatments (SHRD and KP) contained 10% alfalfa silage and 45% (DM basis) of the same concentrate mix comprised of dry ground shelled corn, corn gluten feed, solvent and expeller soybean meal, rumen-inert fat, minerals, vitamins, and monensin. Additionally, a third treatment TMR (KPH) was included in the experiment to focus on the peNDF question. This ration was formulated with 35% KP, 10%
alfalfa silage, 10% chopped hay, and 45% (DM basis) of the same concentrate ingredients adjusted in proportions in the mix to balance dietary crude protein and starch concentrations across the three treatments.

The SHRD and KP were similar in average DM (39%) content and pH (3.9). Corn silage processing scores on feed-out samples averaged 72% for SHRD and 68% for KP with less variation observed for SHRD over the duration of the experiment. The sample range (difference between maximum and minimum samples) was 10%-units for SHRD and 21%-units for KP. For SHRD, all processing scores were above 65%. However, for KP 43% of the samples obtained on a weekly basis throughout the feeding trial were at or below a processing score of 65%.

The proportion of coarse stover particles was greater for SHRD than KP for samples collected during feed-out from the silo bags throughout the feeding trial (18% versus 7% as-fed particles retained on the top screen of the shaker box). For the TMR fed throughout the trial, the proportion of as-fed particles on the top screen of the shaker box was greater for SHRD than KP or KPH. Our measurements of weigh-backs during the trial indicated minimal sorting and no differences in sorting among the three treatments.

Averaged over the treatment period, milk yield was 1.5 kg/day per cow greater for SHRD than KP in 6 out of the 14 weeks, with the SHRD cows averaging 51.3 kg/d; feed efficiency was similar for the two treatments. Milk yield was 3.4 kg/d per cow lower and feed efficiency was reduced for KPH compared to KP.

Milk fat content was greater for KPH (3.7%) than KP or SHRD (3.3%). Rumination activity measured using the SCR rumination collars averaged 8.4 hours per day and was not different among the treatments. Using milk fat content and rumination activity data to assess peNDF suggests that the peNDF content of SHRD was not improved despite its longer TLOC and increased percentage of as-fed particles on the top screen of the shaker box compared to KP. Milk fat yield was not statistically different among the treatments, but was numerically greatest for KPH and lowest for KP. Similar to the milk yield differences, milk protein and lactose yields were greatest for SHRD and lowest for KPH. Body condition score (3.1 on average) and body-weight change (0.6 kg/d per cow on average) were similar among the three treatments.

Total-tract DM and organic matter (OM) digestibility were greater for cows fed KP and SHRD than for cows fed KPH. Total-tract NDF digestibility (TTNDFD) tended to be greatest
for KPH and lowest for SHRD. Lower TTNDFD for SHRD may be related to increased dietary starch content for SHRD compared to KPH and increased kernel processing and ruminal starch digestibility for SHRD compared to KP and KPH. The ruminal in situ starch digestibility was greater for SHRD than KP (88.3 vs. 76.0%, respectively). Total-tract starch digestibility was greater for SHRD than KP. Differences in total-tract starch digestibility between SHRD and KP were, however, biologically small (0.5%-units) and starch digestibility was near 100% for all treatments. Small differences in total-tract starch digestibility along with much larger differences ruminally may be explained by post-ruminal compensatory digestion of starch. Nearly complete digestion of starch in the total-tract may be explained by the nearly 6 month lag between ensiling and the midpoint of the feeding trial.

Silage Fermentation

Hoffman et al. (2011) reported that ensiling high-moisture corn (HMC) for 240 d reduced zein protein subunits that cross-link starch granules, and suggested that the starch-protein matrix was degraded by proteolytic activity over an extended ensiling period. A reduction in zein protein over the ensiling period for HMC was observed when measured by high-performance liquid chromatography (Hoffman et al., 2011). Ammonia-N content increased, however, as high-performance liquid chromatography zein protein subunits in HMC decreased (Hoffman et al., 2011), and ammonia-N was used in combination with mean particle size for modeling the effects of corn maturity, moisture content and extent of silage fermentation on ruminal and total-tract starch digestibilities for HMC at feed out (Hoffman et al., 2012a, b). Ferraretto et al. (2014), using a data set comprised of 6,131 HMC samples (55 to 80% DM) obtained from a commercial feed analysis laboratory, reported that ammonia-N was positively related to ruminal in vitro starch digestibility at 7 h (ivStarchD; R² = 0.61) and combined, ammonia-N, DM, soluble-CP and pH provided a good prediction of ivStarchD (adjusted R² = 0.70).

In WPCS fermented for 0, 45, 90, 180, 270, and 360 d, ammonia-N and soluble-CP contents and ivStarch increased over time and soluble CP, but not ammonia-N, was highly correlated with ivStarchD (R² = 0.78 versus 0.24; Der Bedrosian et al., 2012). Young et al. (2012) and Windle et al. (2014) reported that increases in WPCS ammonia-N and soluble-CP
contents were accompanied by increases in ivStarchD in response to increased time of ensiling and exogenous protease addition.

Ferraretto et al. (2015b) evaluated the interaction between hybrid type and ensiling time on a study where 8 WPCS hybrids (4 BMR and 4 leafy) were ensiled for 0, 30, 120 and 240 d. Fermentation profile, ammonia-N and soluble-CP contents, and ivStarchD were similar for the 2 hybrid types and there was no hybrid type × time of ensiling interaction detected. Increases in WPCS ammonia-N and soluble-CP contents were accompanied by increases in ivStarchD in response to increased time of ensiling. Positive relationships between ivStarchD and ammonia-N ($R^2 = 0.67$) and soluble-CP ($R^2 = 0.55$) were observed. Ammonia-N and soluble-CP were both good indicators of ivStarchD in WPCS in this study. It appears that ammonia-N and soluble-CP can be used in models to predict starch digestibility for WPCS as has been done for HMC, however, more research is needed especially with regard to combining the particle size of the kernels in WPCS along with these N measures into predictive models.

The effects of ensiling time and exogenous protease addition on fermentation profile, N fractions and ivStarchD in WPCS of various hybrids, maturities and chop lengths were evaluated by Ferraretto et al. (2015a). Extended time in storage increased ammonia-N, soluble CP and ivStarchD in WPCS of various hybrids, maturities and chop lengths. However, contrary to our hypothesis, extended ensiling time did not attenuate the negative effects of kernel vitreousness and maturity at harvest on ivStarchD. Exogenous protease attenuated but did not overcome negative effects of maturity on WPCS ivStarchD.

**Corn silage hybrid types**

Ferraretto and Shaver (2015) performed a meta-analysis to evaluate the effects of WPCS hybrid type on digestion, rumen fermentation and lactation performance by dairy cows using a dataset of 162 treatment means from 48 peer-reviewed articles published 1995-2014. Categories for hybrids differing in grain and stalk characteristics, respectively, were: conventional dent (CONG), nutridense (ND), high oil (OIL), and waxy (WAXY); conventional, dual-purpose, isogenic or low-normal fiber digestibility (CONS), brown midrib (BMR), high fiber digestibility (HFD), and leafy (LFY). Genetically-modified (GM) hybrids were compared
with their genetically similar non-biotech counterpart (ISO). Data were analyzed using Proc Mixed in SAS with hybrid as fixed and trial as random effects.

Silage nutrient composition was similar, except for lower CP and ether extract for CONG than ND and OIL. Milk fat content and yield and protein content were lowest for OIL. Intake, milk production and total tract nutrient digestibilities were unaffected by grain hybrid type. Except for lower lignin for BMR, and a trend for lower starch for HFD than CONS, silage nutrient composition was similar among hybrids of different stalk type.

Dry matter intake, milk yield, and protein yield were 1.1, 1.5, and 0.05 kg/d per cow, respectively, greater for BMR than CONS and LFY on average. Total tract NDF digestibility was greater and starch digestibility reduced for BMR and HFD compared to CON or LFY. No differences in lactation performance were observed for GM compared to ISO. Research does not suggest any cause for concern about feeding WPCS produced from genetically-modified seed corn when the traits make agronomic and economic sense to the grower.

Except for negative effects of OIL on milk fat and protein percentages, differences were minimal among WPCS hybrids differing in grain type. Except for positive effects of BMR on DMI and milk and protein yields, differences were minimal among WPCS hybrids differing in stalk type. However, reduced ruminal and total tract starch digestibilities for BMR merit further study.

References


Acknowledgments

- Wageningen University (the Netherlands):
  - Haile Dechassa (MSc student)
  - Dr. Henk Hogeveen
- University of Tennessee (USA):
  - Dr. Peter Krawczel
  - Southeast Milk Inc., Milk Check-off Program
- Partial funding

Economic evaluation of dairy cow stocking density

Stocking density

- Cows / stall
- Feed bunk space / cow
- Total area / cow
- Shade / cow

Transition cows

Lactating cows

USDA-NAHMS Dairy Survey 2007

<table>
<thead>
<tr>
<th>Cows per Stall</th>
<th>Density</th>
<th>Percent</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 0.95</td>
<td>38.9</td>
<td>(4.2)</td>
<td>34.9</td>
</tr>
<tr>
<td>0.95 to 0.98</td>
<td>7.4</td>
<td>(1.5)</td>
<td>8.1</td>
</tr>
<tr>
<td>0.99 or more</td>
<td>12.0</td>
<td>(2.2)</td>
<td>16.2</td>
</tr>
<tr>
<td>1.00 to 1.09</td>
<td>10.7</td>
<td>(3.7)</td>
<td>26.8</td>
</tr>
<tr>
<td>1.10 or more</td>
<td>30.4</td>
<td>(1.7)</td>
<td>28.6</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td></td>
<td>100.0</td>
</tr>
</tbody>
</table>

USDA-NAHMS (2010) N = 2500 dairy farms

USDA-NAHMS Dairy Survey 2007: Percentage of freestall operations by current, maximum, and average number of

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52nd Florida Dairy Production Conference, Gainesville, FL, April 6, 2016
Wisconsin survey 1999

- 4-row barns: 111% stocking density
- 6-row barns: 104% stocking density

Bewley et al., 2001

Basic concepts

- Overstocking reduces cow’s ability to practice natural behaviors (Wechsler, 2007)
- Response to overstocking depends on facilities and grouping (P. Krawczel)
- Overstocking improves economic returns on investments in facilities (Bewley et al., 2001)
- How much overstocking is most profitable?

Typical time budget for lactating dairy cow

- Basic behavioral needs:
  - 3 to 5 h/d eating
  - 10 to 14 h/d lying (resting)
  - 2 to 3 h/d standing/walking in alley (grooming, agonistic, estrous activity)
  - ~0.5 h/d drinking
  - **20.5 to 21.5 h/d total needed**
  - 2.5 to 3.5 h “milking”
  - 24 hours / day

Slide Peter Krawczel, U of Tennessee
1.65 lbs per 0.1 greater stalls/cow

Bach + Fregonsi + Grant studies:
1.2 lbs less milk/day per 10% greater stocking density in range 100% to 150%

Conception rate decreases
Per 1%-unit greater stocking density, a loss of 0.1%-unit conception rate

-3.7 lb/d more milk for each extra hour
Economics

Marginal economics

- Marginal profit = profit from the additional cow - decrease in profit from all other cows already in the pen
- Add cows to pen until marginal profit/stall = $0

Approach

- Stall stocking density = cows / stall
- Includes effects of stocking density on:
  - Milk production
  - Fertility
- Calculate changes in herd measures
  - Herd budget model
  - Vary stocking density 100% → 150%
  - Measure profit/stall/year

Effect of milk loss

<table>
<thead>
<tr>
<th>Milk loss per 10% more cows/stall (lbs/day)</th>
<th>Δ Profit ($/stall/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>0%</td>
</tr>
<tr>
<td>1.5</td>
<td>108%</td>
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Effect of milk price
Δ Profit ($/stall/year)

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<th>Milk price ($/cwt)</th>
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<td>$23</td>
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Milk loss 1.5 lbs/day per 10% overstocking

Reproduction has smaller effect
Δ Profit ($/stall/year)

Email exchange with dairy consultant
April 2015

... In this case, the farmer’s decision to overstock by over 30% resulted in very large milk checks due to milk prices even though his milk per cow remained level. I’ve learned that overstocking is not necessarily a bad thing when it comes to profitability.
Welfare Assessment

- **Lying time** (Hill et al., 2009)
  Hours / day
- **Stall use index** (Overton et al., 2003)
  # cows lying / # cows not eating
- **Feeding activity** (Huzzey et al., 2006)
  % Cows eating simultaneously

Overstocking reduces welfare of cows

**Take home messages**

- Quantitative measures of overstocking on factors that directly affect cow cash flow (milk yield, fertility, culling) are **scarce**
- Some overstocking is **profitable** under plausible economic conditions (say 120% stocking density)
- To maximize profitability per stall, stocking density should be **reduced** when milk sales - feed cost per cow decreases (low milk price, high feed price)
- Tradeoff between profitability and welfare in some situations
- Journal of Dairy Science (in press); paper + spreadsheet

Thank you
devries@ufl.edu
FULL CIRCLE DAIRY STATS

- AVG MILKING ANIMALS—3050
- DRY—375
- AVG DAILY MILK—87 LBS.
- AVG SCC—210,000
- TEAM MEMBERS—48

NEW MATERNITY ADDITION
WHERE ANIMAL COMFORT STARTS
ANIMAL COMFORT BEGINS AT DAY ONE

SANITIZED PEN FOR NEWBORNS

NEW CALF BARN 0-70 DAYS OLD

CONSTRUCTION OF NEW HEIFER FACILITIES

SAND BEDDED PENS FOR COWS IN LABOR

SANITIZED PEN FOR NEWBORNS

CONSTRUCTION OF NEW HEIFER FACILITIES
NEW WEANED BARN 70-180 DAYS OLD

BACKGROUND AREA FOR CALVES 1-4 DAYS OLD

EXTRA CAPACITY FOR AUTO FEEDERS

COVERED STORAGE FOR MILK POWDER
FIRST CALF PUT ON AUTOFEEDER

CALF BARN OPEN FOR AIR QUALITY AND SAND BEDDING FOR CALF COMFORT

SHADE CLOTH FOR NORTH SIDE DURING COLD WEATHER

FEED TROUGHS FOR WEANING CALVES
EXCELLENT FREESTALL USAGE IN PREGNANT HEIFERS

5-13 MONTH OLD HEIFER FREESTALL BARN

ULTRASOUND AT 30 DSB

BODY WEIGHTS MONTHLY
WHO KNEW SANTA HAS SO MANY DISGUISES

CLEAN COWS COMING IN FROM FREESTALLS

IMPROVED COOLING IN HOLDING AREA

72 STALL ROTARY PARLOR MILKING 450-500 PER HOUR
COMFORTABLE COWS MAKE MORE MILK

CLEAN, DEEP BEDDED FREESTALLS

COOLING COWS IS A DAILY ROUTINE
FANS AND SPRINKLERS CHECKED DAILY

CLEAN FLOORS
MINIMAL STRESS

COMMODITY BARN RENOVATION

FEEDING MILKING HERDS 3 TIMES A DAY

PUSHUPS FOR FEED 7 TIMES A DAY

DECREASE FEED SHRINK
FEED DISTRIBUTION AND PUSHUPS ARE PRIORITY

CLEAN WATER IS NOT A GOAL IT IS A NECESSITY

NOTES FROM BRUNO

NEW DIRECT LOAD AREA

CLEAN WATER IS NOT A GOAL IT IS A NECESSITY

CLEAN WATER IS NOT A GOAL IT IS A NECESSITY
MY FIRST SUMMER AT FULL CIRCLE
I KNEW THIS WAS GOING TO BE AWESOME!!

AT FULL CIRCLE WE ARE ALL FAMILY
Challenges In The Adoption of New Technologies For Animal Management/Monitoring

Steve Abel
Abel Dairy Farms

Started in 1857 in Eden, Wisconsin
Owned by: Allen, Steve, & Bill Abel
Crop 3300 acres
Milk 1600 Holstein Cows
100 lb. Bulk tank Ave., 10x Sand bedding
Heifers Raised in Nebraska (Oshkosh Heifer Development)
We do all harvesting, manure hauling, & milk hauling
Young stock raised to 6 months

52nd Florida Dairy Production Conference
Gainesville, FL, April 6, 2016
Winter Wonderland?  Not Really!

Things We Do To Monitor Cows:
- Daily Milk Weights
- Monthly DHI Testing
- Daily Comp 305
- Feed Watch
- Heatime
- Weekly Urine ph’s on Transition Cows
- Weekly Bulk Tank Cultures

Cover All Freestall Barn

Oshkosh Heifer Development
My Wish List

- Activity Monitor
- Rumination Capability
- No Portals
- Reliable
- No Batteries to Change
- Affordable
- Good Technical Service

Reasons For Purchasing Heatime System

- 24/7 Heat detection and health monitoring
- Reduce the dependency on reproductive hormones
- Detect health problems before we see a drop in milk
- Track the effects of ration changes
- Track the effectiveness of treatments

Two Antennas Cover The Entire Farm
How efficiently are eligible cows becoming pregnant?

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**Total** | **5125** | **3189** | **62** |

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**Total** | **6353** | **3448** | **54** |
What We’ve Learned So Far

- We can’t eliminate all repro hormones
- Off-feed cows are typically found 12 hours sooner
- ~ 5-10% of treatments changed based on rumination
- Addition of rumination data has made our herdsmen better cow people
- Heifer repro performance improved quickly

Unintended Consequences

- Need to upkeep collars at a 100% level
- Collars can and do fail.
- Spend around 260 hours/year changing and maintaining collars
- $5,000/year to change collars

Cloud Based Records System

Cattle Records On Your Smart Phone!!!
Economic evaluation of dairy cow stocking density

Albert De Vries¹, Haile Dechassa¹,², Henk Hogeveen²

¹ Department of Animal Sciences, University of Florida, Gainesville, FL
² Business Economics Group, Wageningen University, the Netherlands

Year awarded: 2014

Stocking density is a quantitative measure of the area occupied by cows. One measure is the number of cows per stall in a pen. Adding another cow to the pen may reduce each cow’s performance, such as lowering lying time or milk yield, but also adds the net revenue of the additional cow. The economic optimal stocking density is reached when the marginal return of the pen equals the marginal cost of the pen. At this stocking density, the profit per stall is maximized. It is not clear how variations in stocking density affect profit per stall. Therefore, the objectives were to 1) Quantify the effects of stocking density on cow performance using literature review, 2) Perform an economic evaluation of stocking density, and 3) Make a spreadsheet available for custom evaluations. The study focused on lactating cows and not transition cows. Many studies exist that document the effects of (short term) stocking density on cow behavior but quantitative measures of stocking density on factors that directly affect cow cash flow (such as milk yield, fertility, lameness) are scarce. Lying time is reduced when stocking density >100% and starts to really be affected when stocking density >120%. Studies from Spain and New York both showed decreases of approximately 0.55 kg/day per 0.1 greater cows/stall in the range from 100% to 150% stocking density. Wisconsin data showed a loss of 0.01 conception rate per 0.1 greater cows/stall. Economic analyses of stocking density are therefore hampered by a lack of good performance data. The effect of stocking density on conception rate implies that the herd demographics change when stocking density is varied. Therefore a comprehensive herd budget spreadsheet was used to capture the combined effects of milk production loss and changes in demographics. The effects of milk losses of 0.50, 0.70 and 0.90 kg/cow per day on gain in profitability for each 0.1 greater #cows/stall were calculated. The level of milk loss had a large effect on the optimal stocking density and the gain in profitability. At a loss of 0.50 kg/cow per day, the maximum profit per stall was at a stocking density greater than 150%. The profit per stall per year at 150% stocking density was $145 greater than at a 100% stocking density. At a loss of 0.70 kg/cow per day, the optimum stocking density was at 122% and the profit per stall per year was $43 greater than at 100% stocking density. At a loss of 0.90 kg/cow per stall, the optimum stocking density was at 107% and the profit per stall per year was only $6 greater than at a 100% stocking density. Changes in prices had large effects on the optimum stocking density. The optimum stocking density was very sensitive to changes in cow performance and prices. Some overstocking typically was economically warranted. A spreadsheet has been developed to easily and quickly perform custom evaluations.


The state of Georgia offers numerous youth and undergraduate programs that foster the development of young people in the dairy industry. The fundamental concept of these programs is to increase exposure of young people to the various aspects of the dairy industry through a wide variety of activities. In 2014, youth in the state of Georgia competed in national dairy quiz bowl as well as dairy judging competitions. The team from Morgan Co. 4-H competed in the national dairy quiz bowl competition held in conjunction with the North American International Livestock Exposition (NAILE) in Louisville, KY. The top state dairy judging team from Carroll Co. competed at national dairy judging competition at World Dairy Expo in Madison, WI while the second place 4-H team from Houston Co. competed at the All American Dairy Show in Harrisburg, PA. In addition to these competitive events, six Georgia youth with two chaperones attended the Southeast Dairy Youth Retreat held in Blacksburg, VA while three youth and one chaperone attended the National 4-H Dairy Conference in Madison, WI as the Georgia delegation. The most successful program of 2014 for Georgia youth was the Commercial Dairy Heifer Project. At the 2014 State Show there were just over 235 youth members competing with over 300 heifers in the project. Monica Schaapman of Wilcox Co. 4-H was named Master Showman while Jacie Babb of Houston Co. FFA was named Supreme Showman. Jacie Babb from Houston Co. had the highest ranking heifer in conformation classes.

Students enrolled in undergraduate programs at the University of Georgia have the opportunity to compete and represent UGA in a number of different events. The UGA Collegiate Dairy Judging Team competed at the Maryland State Fair, All American Dairy Judging Contest, World Dairy Expo Dairy Judging Contest, and the NAILE Contest in Louisville. The team was 6th in reasons in Harrisburg and 8th high team overall at World Dairy Expo. The UGA Dairy Challenge team (three students) attended the national Dairy Academy in Fort Wayne, IN and a second group (six students) attended the regional Dairy Challenge event in Salisbury, NC. Finally, four students and two advisors served as the representatives from UGA at the 2014 National American Dairy Science Association Meetings held in Kansas City, MO on July 19-22nd. One student was named 3rd Vice President on the national board, the UGA scrapbook was awarded 3rd place, and the Chapter from UGA was named third most outstanding in the country. These programs are made possible through dollars generated by such programs as the SMI Milk Check-off. Georgia 4-H, FFA, and the University of Georgia thank producers that contribute to this program and the opportunities it provides to the young people in the state of Georgia.
Florida’s Dairy Youth Development Program

Chris Holcomb
Department of Animal Science
University of Florida
2013-15

Objectives

Our youth are often exposed to many different draws on their time, many of which can be very detrimental to their development. The Florida youth dairy program has designed a curriculum and many activities to stimulate these youth and expose them to the dairy industry. These events are also designed to help the youth hone their skills in public speaking, critical decision making, leadership, career development, and develop valuable future industry connections.

Methods

The youth are given the opportunity to compete in many events that will help accomplish the program objectives. In the past three years there have been over three hundred (300) different youth that have attended multiple events throughout the state and country. These events include state, regional, and national dairy judging events in over thirteen (13) states, and state and national quiz bowl competitions in over nine (9) states. There have been over sixty (60) different youth that have traveled to the Southeast Dairy Youth Retreat and National 4-H Dairy Conference which covers six (6) different states. There have also been over fifty (50) different adult leaders trained through the youth dairy programs volunteer leader training.

Results

The youth dairy program continues to grow at a large rate. This is demonstrated by the number of both cattle and exhibitors at shows, events, and workshops throughout the state and country. In 2015 there were over one hundred sixty (160) unique exhibitors and over three hundred (300) head, with over fifty (50) unique participants in events beyond the state level. At the national competitions, Florida had national winners in many competitions as well as being the most recognized state in the country at the National Guernsey Convention in 2013 through 2015 and added the National Holstein Convention to that astounding resume in 2015. We also added a new contest for 2015, The Jr. Dairyman Contest which is located in Harrisburg, Pennsylvania and tests students on feeding, management, and records evaluation. The Florida team placed first overall in their first ever entry. There is a marked increase in knowledge of the dairy industry and improvement in life skills such as public speaking and decision making.

Implications/Conclusions

The overall numbers of animals and exhibitors is growing exponentially throughout the state as demonstrated by participation throughout the many fairs and events. The most impactful results are seen through the development in both communication skills and personal confidence. Thus the youth that are graduating from the youth dairy project are much better communicators, are more decisive, and have a much increased amount of knowledge in the dairy industry. This makes them more marketable and is developing a new group of leaders and ambassadors for the dairy industry and agriculture in general.
Minimizing costs of mastitis though enhancing antimicrobial protein production in the udder

Kathryn E. Merriman, Mercedes F. Kweh, O. Monika Trejos Kweyete, Michael B. Poindexter, Jose E.P. Santos, and Corwin D. Nelson

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

Year awarded: 2014

The innate immune defenses of the mammary gland are critical for elimination of bacterial pathogens that cause mastitis. Laboratory experiments have demonstrated that the active form of vitamin D, 1,25-dihydroxyvitamin D\textsubscript{3} (1,25D), enhances the expression of multiple host defense genes, such as, β-defensin antimicrobial peptides, inducible nitric oxide synthase (iNOS), and the chemokine RANTES. Previous work using an experimental model of mastitis in dairy cattle also has shown that CYP27B1, the enzyme that catalyzes 1,25D production from 25-hydroxyvitamin D\textsubscript{3} (25D) is activated in the mammary gland during mastitis, and that intramammary 25D treatment inhibited experimental Streptococcus uberis infection. The objective of this study was to determine the effects intramammary 1,25D treatment on mammary host-defense gene expression. In the first experiment, contralateral quarters of 14 healthy Holstein cows (SCC ≤ 200,000 cells/mL) were treated intramammary with 10 μg of 1,25D or placebo (10 mL of phosphate buffered saline with 10% fetal bovine serum). Milk samples were collected at 0, 2, 4, 8, and 12 h relative to treatment, and somatic cells were collected for analysis of host-defense gene expression. At 2, 4, 8, and 12 h post 1,25D infusion CYP24A1, a positive control gene for 1,25D activity, was increased in the infused quarters relative to the control quarters (P < 0.0001). The 1,25D treatment increased iNOS expression >2-fold in milk somatic cells at 8 h and 12 h post infusion relative to the control quarters (P < 0.05), and β-defensin 7 (DEFB7) expression >2-fold at 4 h post infusion relative to the control quarters (P < 0.05). In addition, macrophages isolated from milk somatic cells using fluorescence-activated cell sorting had 2-fold greater iNOS expression in response to 1,25D treatment (P < 0.05). In the second experiment, the effects of 1,25D treatment on mammary immunity during subclinical mastitis were investigated. Fifteen cows with SCC > 500,000/ mL were selected and infected quarters were treated with 10 μg 1,25D or placebo after 5 consecutive milkings. Expression of iNOS and DEFB4 were upregulated 2-fold from 12 to 48 h relative to the start of treatments in the 1,25D-treated quarters demonstrating that 1,25D can enhance mammary immunity during naturally occurring infection. However, there was not an effect of 1,25D on SCC or bacteria counts in milk from infected quarters. The effects of 1,25D on clinical mastitis are also being investigated along with the effects of 25D, the precursor of 1,25D, on mammary immunity. The current Milk Check-Off project (2015-2016) is investigating the effects of dietary 25D on mammary immunity and mastitis resistance, which potentially offers a very practical and affordable means to improve mastitis resistance. In conclusion, 1,25D enhances expression of critical host-defense genes in mammary macrophages and indicates 1,25D or its precursors may be useful therapeutics or adjuvants to minimize the cost of mastitis in dairy cattle. Further work is needed to determine effects of 25D treatments on clinical and subclinical mastitis, and to understand how dietary vitamin D influences mammary immunity.
Impact of the IBR MLV on Ovarian Dynamics and Subsequent Breeding Success in Holstein Heifers

J. Bohlen, C. Widener, and W. Graves

Concerns regarding the modified live vaccine (MLV) for Infectious Bovine Rhinotracheitis (IBR) have recently resurfaced regarding its impact on the reproductive success of dairy animals. Previous research has focused primarily on pregnancy loss in naive animals following vaccination with a MLV vaccine. The same mechanism by which the IBR vaccine induces abortion in pregnant animals may have implications on the reproductive success of non-pregnant females. To investigate this concept, 28 Holstein heifers between the ages of 11.5 and 13 months housed at the University of Georgia Teaching Dairy in Athens, Georgia were selected for enrollment in this trial. Four animals were removed for either lack of synchrony or pre-existing immunological challenge. All animals were calf-hood vaccinated with an available bovine respiratory disease complex (BRD) with a modified live IBR component. Heifers were housed in the same pen and maintained on the heifer TMR used by the UGA Teaching Dairy to meet their maintenance, growth, and reproductive needs. Heifers were synchronized for estrus using a 7-day CIDR protocol with 2 injections of PGE2α, one at CIDR removal and a follow-up injection 16 hours later. Heifers were observed for one complete estrous cycle to establish a baseline of normal cyclicity for each animal. At approximately Heat 2 of the project, heifers were vaccinated with either the calf-hood MLV or a BRD vaccine with a Killed IBR component. One week prior to and 3 weeks post vaccination blood was collected and analyzed for titers against IBR and bovine viral diarrhea to ensure previous exposure to the BRD vaccine and to examine the efficacy of the vaccine types. The heifers were tracked for two complete treatment cycles and bred on Heat 4 of the trial. One week before vaccination, a baseline immune profile was established for each animal utilizing a complete blood count (CBC) and an assay to measure neutrophil activity as indicated by the presence of reactive oxygen species (ROS). The CBC was used to evaluate relative proportions of different white blood cells as an indicator of response to the vaccine. Neutrophils are an abundant circulating population of white blood cells and an early mediator of inflammatory response. These cells produce ROS when they engulf and destroy antigen. This oxidative burst contributes to the immune function of these cells but is also linked to damage to surrounding host tissues, which could include the reproductive tract and associated structures. Blood was drawn for this immunological profile on days 1 and 3 post vaccination and then weekly until the week of breeding (Heat 4). Preliminary examination of the CBC data, particularly the granulocyte counts and the granulocyte to lymphocyte ratio, indicate that the MLV animals had a stronger initial response to the vaccination but a faster return to baseline. Meanwhile, the Killed animals experienced a lower initial response but an extended duration of elevated cell counts. Peak endogenous neutrophil activity (ROS) was delayed to day 3 for the MLV vaccinated animals versus day 1 for the Killed vaccinated animals. Early post vaccination, the MLV heifers appeared to have more white cells in circulation while the Killed vaccinated heifers’ ROS results indicated more active neutrophils in circulation. Early observations indicate a prolonged inflammatory response, as indicated by white cell counts, in Killed vaccinated heifers but less antibody (titer) production. Although the neutrophil response was delayed and the overall inflammatory response had a shorter duration in the MLV vaccinated heifers, there is no apparent difference in estrous cycle length or duration of estrus between the two groups. Blood was drawn every-other-day of the study for progesterone (P4) and estradiol (E2) analysis accompanied by trans-rectal ultrasound for ovarian structures. Every fifth day blood was sampled for for Anti-Mullerian Hormone (AMH). Ultrasound of ovarian structures was used to determine the cycle parameters of the heifers and is currently being validated by P4 and E2 concentrations. Changes in AMH concentrations will be used as an indicator of changes in the population and viability of the follicular pool. Alterations or reductions in these small follicles may temporarily diminish a heifer’s fertility.
Use of 1,25 Vitamin D3 (Calcitriol) to Maintain Postpartum Blood Calcium (Ca) and Improve Immune Function in Dairy Cows

Objectives were to determine the effect of a slow-release injectable formulation of 1,25(OH)\(_2\) D\(_3\) (calcitriol) on mineral metabolism and measures of immune function in dairy cows. Cows were blocked based on parity (2 vs. >2) and sequence of calving and, within each block, randomly assigned to either a control (CON = 25) or 1,25(OH)\(_2\) D\(_3\) (VitD = 25) within 6 h of calving. Treatments were administered subcutaneously and CON cows received 1 mL of vehicle whereas VitD cows received 300 μg 1,25(OH)\(_2\) D\(_3\). Cows were milked twice daily and milk samples were collected during both daily milkings until day 5 postpartum and then twice a week until 35 days in milk (DIM). Milk samples were analyzed for true protein, fat, lactose and somatic cells count by the DHI Laboratory. Blood was sampled immediately before administration of treatment, 12 h after treatment, and on days 1, 2, 3, 5, 7, 9, 12, and 15 postpartum. Samples were analyzed for total and ionized Ca (iCa), magnesium (Mg), phosphorus (P), nonesterified fatty acids (NEFA), beta hydroxybutyrate (BHBA), glucose. Urine collected in the first days postpartum was analyzed for concentrations of creatinine and urine and milk samples were analyzed for concentrations Ca, Mg, and P. Complete blood cell count and assays for neutrophil function were performed in the first week postpartum. Dry matter intake was measured daily from 6 to 35 DIM. Data were analyzed by ANOVA with mixed models using the MIXED procedure of SAS. Treatment with VitD increased (P < 0.001) concentrations of 1,25(OH)\(_2\) D\(_3\) within 4 h of application from 24 to 420 pg/mL and concentrations returned to baseline within 3 d. Blood iCa and total Ca took between 12 and 24 h after treatment to increase in VitD compared with CON. Concentrations of iCa (CON = 1.10 vs. VitD = 1.25 mM), total Ca (CON = 2.12 vs. VitD = 2.44 mM), and P (CON = 1.51 vs. VitD = 2.22 mM) remained elevated (P < 0.01) in VitD compared with CON, whereas concentrations of plasma Mg (CON = 0.74 vs. VitD = 0.64 mM) decreased (P < 0.01) with VitD in the same period. Concentrations of plasma minerals equalized after d 7 postpartum. Cows treated with VitD excreted more urinary Ca (0.6 vs. 1.7 g/d; P < 0.01) in the first 5 DIM and Mg (3.6 vs. 5.5 g/d; P = 0.02) only on d 1 postpartum. Concentrations of glucose (CON = 58.3 vs. VitD = 59.5; P = 0.74), NEFA (CON = 0.57 vs. VitD = 0.61 mM; P = 0.47), and BHBA (CON = 0.84 vs. VitD = 0.95 mM; P = 0.21) in plasma did not differ between treatments. Yields of milk (CON = 34.1 vs. VitD = 34.2; P = 0.94), 3.5% fat-corrected milk (CON = 38.2 vs. VitD = 38.1 kg/d; P = 0.88) and of milk components did not differ between treatments in the first 35 DIM. Dry matter intake in the first 35 DIM did not differ (P = 0.50) between treatments and averaged 19.9 and 19.4 kg/d for CON and VitD. Ongoing analyses of innate immune function are ongoing. In conclusion, administration of 300 μg of 1,25(OH)\(_2\) D\(_3\) increased concentrations of calcitriol in blood within 4 h up to 3 d, and those of iCa, total Ca, and P after 12 h of treatment and maintained elevated concentrations for up to 5 d. No differences in productive performance were observed with calcitriol treatment. The dose of calcitriol used in the current experiment was effective and safe at increasing blood concentrations of Ca in early lactation dairy cows.
Title: Jiggs Bermudagrass and Mulato II Brachiariagrass: Are They Viable Options for Use on North Florida/South Georgia Dairies?

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Abstract:

Productive and high quality forages are critical to the success of dairy operations, but the combination of high yield and excellent quality has been difficult to find among warm-season perennial grasses adapted to the Gulf Coast region. Mulato II brachiariagrass and Jiggs bermudagrass have characteristics that make them attractive to dairy enterprises, but additional research station and on-farm evaluation is needed before they can be recommended to producers. Jiggs bermudagrass establishes rapidly, has fine stems for rapid wilting/drying, is persistent under frequent defoliation, and tolerates poorly drained soils. Mulato II is a productive grass with high nutritive value, but persistence in cooler climates is not documented. For both grasses, it is important to know if they provide advantages over currently used hybrid bermudagrasses in North Florida/South Georgia, environments that are cooler than where they have been most widely tested and used.

The objective of this project was to assess the potential of Jiggs and Mulato II for use as warm-season forages on dairies by measuring yield, persistence, and nutritive value in research station experiments and on-farm demonstrations carried out at three dairies. At each dairy, Jiggs and Tifton 85 bermudagrasses and Mulato II brachiariagrass were planted in side-by-side 0.5-acre strips between July 24 and August 6, 2014. Establishment was monitored during the 2014 growing season. On-station, one experiment compared Jiggs and Tifton 85 bermudagrasses, harvested every 28 days during summer at two stubble heights (3 and 6 inches) and fertilized at three levels of K\textsubscript{2}O (0, 20, and 40 lb/acre/harvest). The second experiment compared Jiggs and Mulato II harvested every 28 days and fertilized at two nitrogen rates. The on-farm demonstrations showed that under producer conditions Jiggs bermudagrass consistently established easier and faster than Tifton 85 or Mulato II. Through two years, on-station experiments showed no evidence that Jiggs is less cold tolerant than Tifton 85 in North Florida, but Jiggs forage is less digestible than Tifton 85 and Mulato II. Mulato II stands survived the first winter after planting with virtually no stand loss and produced higher yields than Tifton 85 in the year after planting due to strong late-season production. However, an average to slightly colder than average second winter killed most of the Mulato II stand indicating that it will not function as a long-lived perennial in North Florida. Based on these studies, we conclude that Jiggs provides rapid establishment and earlier spring growth than most bermudagrasses. Additionally, it has persisted under frequent cutting in North Florida for at least two years, but its forage is less digestible than Tifton 85. Mulato II is not well suited to systems requiring a long-lived perennial, but because it is a seeded forage, it may have some potential as a high digestibility, short rotation forage crop. It could be seeded in spring of one year and produce high yields of high quality forage that growing season and the next.
Progress Report. Dairy Milk Checkoff Program

Development of tools to select cattle that are genetically resistant to heat stress.

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Objectives: Dairy cows with increased rectal temperature experience lower milk yield and fertility. Rectal temperature during heat stress is heritable so genetic selection for body temperature regulation could reduce effects of heat stress on production. The long term goal of the research is to identify genetic markers (called single nucleotide polymorphisms or SNPs) that can predict a cow’s genetic ability to resist negative effects of heat stress. For the current project, the goal was to validate 26 SNPs previously shown to be related to rectal temperature regulation during heat stress.

Methods: A total of 2273 lactating dairy cows located in 11 farms in Florida and California were genotyped for 77 SNPs that had been previously related to body temperature, fertility or milk production. Farm records were retrieved and used to determine reproductive function for each cow. It was hypothesized that seasonal variation in days open and services per conception would be reduced in cows inheriting copies of SNPs previously related to regulation of body temperature. This would be indicated statistically as a genotype (0, 1 or 2 copies of the minor allele of the SNP) by season of breeding interaction.

Results: Several SNPs were found that were significantly associated with reproductive traits. In particular, there were 20 SNPs that affected days open, 17 for services per conception and 12 for pregnancy rate at first service. There were significant genotype x parity interactions affecting days open for 6 additional genes. However, there were no interactions between genotype and season of breeding for any SNP.

Conclusions: These data fail to support the hypothesis that SNPs previously related to rectal temperature during heat stress affect the physiology of the cow in a way to reduce effects of heat stress on reproductive function.

Future Research: Interactions between season and genotype will also be determined for milk production traits.
Long term comparison between individual housing and group feeding with cooling on calf performance in Georgia

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Abstract

Group housing with computerized automatic feeding is gaining in popularity because of improved labor efficiency and other advantages. For example, group housed animals have improved social skills which benefit the transition during weaning and minimize related stress. Compared with individual hutch, group housing of 12 neonatal calves with automatic feeder has similar animal growth during preweaned period, but improves average daily gain (ADG) during post-weaning period, which may be due to a smoother transition during weaning. Additionally, group feeding reduces the medication cost during the first month of animal’s life relative to individual housing. However, a long-term study to compare animal’s growth, health and producer’s economic return between individual hutch and group feeding of preweaned calves is still not available. Such study probably is more important for producers in Southeast because hot and humid weather is longer than other regions; and group housing may be an effective approach to overcome negative impacts of heat stress on calf. Thus, the overall objectives are to compare individual hutch with group housing equipped with automatic calf feeder and cooling during preweaned period on calf growth, feed efficiency and health in Georgia during a year and to evaluate the economic return between different management systems. This project is still ongoing. The remodeling the calf barn for the project was completed. One automatic calf feeder (DeLaval CF1000) equipped with two sucking stations plus two scale units that measure the calf’s body weight at feeder have been purchased and installed in the calf barn. Two DeLaval concentrate stations which automatically measure starter intake were kindly donated by a Georgia Dairy producer and were installed. The animal study is expected to start at the beginning of 2016.