Fifty-Fourth Annual
North Carolina Dairy Conference
Proceedings

The Dairy Conference is held in conjunction with the meetings of the Dairy Food Safety & Quality Conference North Carolina Dairy Youth Foundation Board Meeting SUDIA/American Dairy Association of North Carolina and the North Carolina Dairy Producers Association

February 22-23, 2005
Holiday Inn
Salisbury, North Carolina
The Dairy Conference Is An Educational Program For North Carolina’s Dairy Herd Managers And Dairy Industry Personnel

The annual conference is sponsored by the North Carolina Dairy Producers Association, and is conducted with the assistance of Dairy Extension Specialists in the Department of Animal Science at NC State University

Permission to reprint material contained in this proceedings is granted, provided the meaning is not changed. Please give credit to the author and this publication as the source.

Edited by Dr. Donald E. Pritchard, Extension Dairy Specialist, Department of Animal Science, North Carolina State University Box 7621, Raleigh, NC 27695-7621

NC STATE UNIVERSITY
A&T STATE UNIVERSITY
COOPERATIVE EXTENSION
Helping People Put Knowledge to Work

College of Agriculture and Life Sciences, NC State University School of Agriculture and Environmental Sciences, NC A&T State University
Conference Exhibitors and Supporters
Primary financial support for the North Carolina Dairy Conference is provided by the businesses listed below. Their generous assistance is greatly appreciated.

ABS Global, Inc.
Alltech, Inc.
Automated Farm Systems, Inc.
Bartlett Milling Co.
Cargill Malt
Carolina Farm Credit
Dairymaster USA, Inc.
Deal-Rite Feeds, Inc.
Elanco Animal Health
Grower’s Nutritional Solutions
Hubbard Feeds
Land O’ Lakes Purina Feed
MD & VA Milk Producers Association, Inc.
Merial
Mid-Atlantic Agri Systems
Pfizer Animal Health
Piedmont Agri-Systems, Inc.
Select Sire Power
Southern States Co-op, Inc.
Southeastern Silo Co. of VA, Inc.
SUDIA/ADA of North Carolina
Sunset Feeds
West Central/SoyPlus
Westfalia-Surge LLC
Zinpro Corporation

Dairy Records Management Systems
NC Dairy Producers Association
NC Dairy Youth Foundation
NCSU Dairy Science Club
NCDA&CS Agronomic Division
### Table of Contents

**North Carolina Dairy Conference Proceedings:**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Exhibitors and Supporters</td>
<td>3</td>
</tr>
<tr>
<td>Welcome letter from Mr. Norman Jordan, Jr.</td>
<td>6</td>
</tr>
<tr>
<td>President of the North Carolina Dairy Producers Association</td>
<td></td>
</tr>
<tr>
<td>Welcome letter from Dr. Roger McCraw</td>
<td>7</td>
</tr>
<tr>
<td>Head of the Department of Animal Science, North Carolina State University</td>
<td></td>
</tr>
<tr>
<td>Dry Cow Udder Health Management</td>
<td>8</td>
</tr>
<tr>
<td>Dr. Bruce A. Beachnau, Dairy Veterinary Operations, Pfizer Animal Health</td>
<td></td>
</tr>
<tr>
<td>Managing Acidosis in Dairy Cattle</td>
<td>18</td>
</tr>
<tr>
<td>Dr. Richard Grant, President, W.H. Miner Agricultural Research Institute, Chazy, NY</td>
<td></td>
</tr>
<tr>
<td>Dairy Cattle Health Concerns for North Carolina Producers</td>
<td>23</td>
</tr>
<tr>
<td>Dr. David T. Marshall, State Veterinarian, NCDA&amp;CS</td>
<td></td>
</tr>
<tr>
<td>Resting: Do Your Cows Get Enough?</td>
<td>27</td>
</tr>
<tr>
<td>Dr. Richard Grant, President, W.H. Miner Agricultural Research Institute, Chazy, NY</td>
<td></td>
</tr>
<tr>
<td>Using Rumensin in Dairy Rations</td>
<td>33</td>
</tr>
<tr>
<td>Mr. Howard Green, Elanco Animal Health</td>
<td></td>
</tr>
<tr>
<td>Dairy Situation and Outlook for 2005</td>
<td>44</td>
</tr>
<tr>
<td>Dr. Geoff Benson, NCSU Associate Professor and Extension Specialist</td>
<td></td>
</tr>
<tr>
<td>Milking and Mastitis Management Articles for 2004</td>
<td>46</td>
</tr>
<tr>
<td>Dr. Donald E. Pritchard, NCSU Adjunct Professor and Extension Dairy Specialist</td>
<td></td>
</tr>
<tr>
<td>Cottonseed Hull Based Diets for Calves and Heifers</td>
<td>59</td>
</tr>
<tr>
<td>Dr. Brinton A. Hopkins and Dr. Lon W. Whitlow, NCSU Department of Animal Science</td>
<td></td>
</tr>
<tr>
<td>Highlights from the 2004 North Carolina 4-H Dairy Youth Program</td>
<td>64</td>
</tr>
<tr>
<td>Dr. Brinton Hopkins, NCSU Professor and Extension Dairy Specialist</td>
<td></td>
</tr>
<tr>
<td>Effects of Milk Feeding Period and Anthelmintic Treatment on Fecal Egg Counts and Growth in Pastured Dairy Steers</td>
<td>66</td>
</tr>
<tr>
<td>B. M. Thompson¹, S. P. Washburn¹, J.-M. Luginbuhl¹, B. A. Hopkins¹, H. M. Glennon¹, C. Brownie², ¹Department of Animal Science, ²Department of Statistics, NCSU</td>
<td></td>
</tr>
<tr>
<td>Pest Management Using Push-pull Strategies to Control Horn Flies in Pastured Dairy Heifers and Steers</td>
<td>69</td>
</tr>
<tr>
<td>D. W. Watson¹, M. H. Poore², S. P. Washburn², J. P. Mueller³, and E. Lastro⁵</td>
<td></td>
</tr>
<tr>
<td>¹Department of Entomology, ²Department of Animal Science, and ³Department of Crop Science, NCSU</td>
<td></td>
</tr>
</tbody>
</table>
Dairy Research and Extension Activities at NCSU - An Update .................................................. 71
Dr. Lon Whitlow and Dr. Geoff Benson, Extension Specialists, NCSU

North Carolina Dairy Foundation Grants for 2004-2005 to Department of Animal Science
Faculty: Interim Reports ...................................................................................................................... 74

North Carolina Dairy Organizations and Awards:

North Carolina Dairy Producers Association Officers and Directors for 2004............................... 78
Members of the North Carolina Dairy Youth Foundation Board of Directors For 2004-2005 .... 80
SUDIA/American Dairy Association of North Carolina 2005 Board of Directors ......................... 81
The United Federation of DHIA......................................................................................................... 82
Dairy Records Management Systems (DRMS) ............................................................................... 82
Marvin E. Senger Distinguished Dairy Farmer Award Program: Previous Recipients ................. 83
Don Wesen Quality Milk Producer Award Program and Past Recipients ...................................... 84
North Carolina Dairy Producers Association Distinguished Service Award Recipients ............... 85
Agenda for the February 23, 2005 Dairy Conference .................................................................... 86
February 23, 2005

Dear Dairy Producers and Dairy Industry Representatives,

The North Carolina Dairy Producers Association is pleased to be sponsoring the 54th Annual Dairy Conference. Working with the Extension Dairy Specialists from North Carolina State University, I feel that we have designed an educational program that will be beneficial to North Carolina dairy producers. I hope that you find the conference beneficial, and that you will gain some new knowledge from the speakers, published proceedings, and the various exhibitors that will be of value to you and your dairy operation.

The NCDPA thanks the agribusiness exhibitors and supporters for their financial assistance in conducting this conference. Their support of this conference and the state’s dairy industry is greatly appreciated. I encourage all producers to take the time to visit the exhibitors and talk with the company representatives.

The N.C. Dairy Producers Association continues to represent the state’s dairy industry in a variety of areas and issues, both at the state and national level. I would like to thank the members for their support, and encourage others to show their support by joining the N.C. Dairy Producers Association.

Again, I hope you gain some helpful knowledge from the Dairy Conference, and that you enjoy your time here.

Sincerely yours,

Norman Jordan, Jr.
President, NCDPA
Dear NC Dairy Producers and Industry Leaders:

On behalf of the Department of Animal Science and the College of Agriculture and Life Sciences at NC State University, I welcome you to the 54th Annual North Carolina Dairy Conference. The program committee has planned an exciting educational program for you. Time has been included in the schedule to allow you to visit sponsors and their exhibits and to have opportunities to visit other producers, educators, and industry leaders. Please take advantage of this opportunity. This conference will definitely be a highlight of the year.

Your industry, and other livestock industries in the state, continue to face challenges. In a short ten-year period, your NC Dairy Producers Association has become a powerful voice on your behalf with legislators and the general public. It is important that you attend these types of events and become actively involved with the Association. The Association can effectively represent you only when it has your input and support.

Milk prices have remained at a good level throughout 2004. Although the number of dairy herds in the state continues to decline, it is doing so at a much slower rate than in the recent past. Your industry will continue to progress and contribute to the economy and well being of the state and its citizens. The Department of Animal Science continues to provide quality research, teaching, and extension programs to support you and your industry. After having been disbanded for many years, we have reorganized a Dairy Science Club with about 30 members and re-initiated the collegiate dairy judging team. We consider it a privilege and an honor to help you provide a nutritious, safe, economical product to consumers and to educate young people about the dairy industry and its products.

Thank you for attending the conference--and for the contributions you make to our department, to the college, and to the citizens of North Carolina.

Sincerely,

Roger L. McCraw
Professor and Department Head

Dry Cow Udder Health Management
Dr. Bruce A. Beachnau, DVM
Dairy Veterinary Operations, Pfizer Animal Health
Portland, MI

The material that Dr. Beachnau discussed on this topic is shown on the slides printed on the following pages.
Welcome
Dr. Bruce A. Beachnau

Introduction
- What is Orbeseal?
- Why recommend Orbeseal?
- Research trials
- Economics
- How to use
- Summary
- Experiences
- Questions

What is Orbeseal?
- An inert paste that is infused at drying off.
- Retains its paste characteristics (doesn't set or harden up).
- Mimics the keratin plug by immediately forming a physical barrier in the teat canal.
- It persists through the entire dry period

Mastitis—An Open Drain on Profits
Losses are associated with:
- Decreased milk production
- Reduced milk quality premiums
- Discarded milk
- Increased costs from drug therapy and associated labor
- Deaths and culling
- Replacement cost
Mastitis infections begin during the dry period.

Dairy cows are most susceptible to new mastitis infections:
  - The first three weeks after dry off.
  - Two weeks prior to freshening.

More than 50% of early lactation clinical E. coli mastitis cases begin during the dry period.*

---

The Dry Period and Mastitis Control

**Strep. spp**
- 36% of clinical cases at calving come from IMI during the first half of dry off.
- 51% of all new environmental strep IMI occurred while dry — Tryshak, 1991
- 56% of clinical mastitis cases due to *Streptococcus uberis* originated in the dry period.
- 33% of clinical mastitis cases due to *Streptococcus dysgalactiae* originated in the dry period.
  - Tryshak, 1991

**Coliform**
- 63% of clinical coliform infections through the first 100 DIM originated in the dry period.
  - Tryshak, 1991
- 61% of all new Gram-negative IMI occurred while dry — Tryshak, 1991

---

Two High Risk Periods — Environmental

Immediately after dry off (Involution)
  - Lose milk flushing effect
  - No more teat dipping
  - Keratin plug not yet in place

Around calving (Colostrogenesis)
  - Pressure in udder builds
  - Dilution of protective components

---

Why the dry period?

Cows remain vulnerable because teats stay open throughout much—sometimes all—of the dry period.*

---

Why the dry period?

Almost half of all teats remained open during the first week of dry off*
  - Over 23% remain open six weeks after dry off.
**Why the dry period?**

Research has shown:
- New mastitis infections nearly double when quarters fail to seal.
- Teats of high-producing cows are most likely to remain open.
  - Teat canals of cows milking 46+ lbs (20.9+ kg) were nearly twice as likely to remain open than lower producing cows.
  - This puts the most valuable cows at the greatest risk.

---

**Current mastitis management tools don't do enough.**

Dry cow treatment programs don't offer:
- Persistent prevention of new mastitis infections.
- Protection from Gram-negative pathogens throughout the entire dry period.

External teat sealants last only 3 to 7 days.*

<table>
<thead>
<tr>
<th>Varnish/Teat Sealants</th>
<th>Dry Period Persistence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varnish/Teat Sealants</td>
<td>3-7 days</td>
</tr>
</tbody>
</table>

---

**New Orbeseal: The next step in mastitis prevention.**

*Orbeseal:*
- The first and only product of its kind.
- A new and unique antibiotic-free paste.
  - Bismuth subnitrate (65% w/w) in an oil base.
- Fills the fissures and folds of the teat canal and lower teat sinus (does not set or solidify).
- Acts as a physical barrier against mastitis-causing bacteria.
- Locks bacteria out for the entire dry period.
Orbeseal Features and Benefits

Feature: Mimics the cow's natural first line of defense, the keratin plug, providing a physical barrier between the cow and the environment.

Advantage: Provides immediate protection that lasts throughout the entire dry period.

Benefit: Fewer cases of mastitis; cost and labor savings; optimal production; and higher milk premiums.

Additional Benefits

- Studies have shown Orbeseal is effective irrespective of the cow's yield at dry off.
- Orbeseal can be readily removed by hand stripping or by the calf suckling.
- Compatible with conventional dry cow management practices.

Testimonials from Industry Experts

Dr. Andy Johnson
Total Herd Management Services

"A unique and innovative supplement to dry cow therapy that will significantly reduce new infections at calving and early lactation."

Dr. Nigel Cook
University of Wisconsin School of Veterinary Medicine

"We found cows treated with Orbeseal and a dry cow treatment have an overall reduction of infection rate of 30% at first SCC test post-calving compared to treatment with dry cow therapy alone."

Orbeseal Results

A recent trial* was conducted by the University of Minnesota.
- Transition management facility

Orbeseal Results

A recent trial* was conducted by the University of Minnesota.
- High-producing herds
- Evaluated two groups:
  - Control Group: Mastitis vaccine + dry cow treatment
  - Orbeseal Group: Mastitis vaccine + dry cow treatment + Orbeseal

Table 1: University of Minnesota Study – Effectiveness of Orbeseal when Used with an Intramammary Antibiotic

<table>
<thead>
<tr>
<th>Test Group</th>
<th>Orbeseal</th>
<th>Antibiotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
<td>No. Infected</td>
<td>% Infected</td>
</tr>
<tr>
<td>IMI at 1-3 DIM</td>
<td>187/1321</td>
<td>22.8%</td>
</tr>
<tr>
<td>Non-IMI before dry-off and 1-3 DIM</td>
<td>156/221</td>
<td>20.2%</td>
</tr>
<tr>
<td>Clinical mastitis between dry-off and 80 DIM</td>
<td>518/622</td>
<td>8.4%</td>
</tr>
<tr>
<td>Clinical mastitis due to environmental exposure</td>
<td>309/622</td>
<td>4.9%</td>
</tr>
</tbody>
</table>

*Values on the same row with different letters are significantly different (P < 0.05) different.

Orbeseal Results

The Orbeseal Group showed statistical significance over the Control Group by improving three economic parameters as follows:

- 20% improvement in incidence of new infections at calving.
- 26% improvement in clinical mastitis between dry-off and 60 days in milk.
- 19% improvement* in somatic cell count at 6-8 days in milk.

* Somatic cell count derived from linear assay.

Wisconsin New IMI

Herd A | Herd B | Herd C | Overall
---|---|---|---
New IMI at calving | Orbeseal | 17/139 (12.2) | 34/488 (7.0) | 29/375 (7.7) | 80/1002 (8.0)
Control | 45/152 (29.6) | 42/453 (9.3) | 75/366 (20.5) | 162/971 (16.7)
% decrease IMI | 59 | 22 | 62 | 52
P Value | 0.0057 | 0.1216 | 0.0001 | 0.0790

Wisconsin New IMI

<table>
<thead>
<tr>
<th>Dry Cow Housing</th>
<th>Herd A</th>
<th>Herd B</th>
<th>Herd C</th>
</tr>
</thead>
<tbody>
<tr>
<td># Cows</td>
<td>350</td>
<td>1500</td>
<td>2000</td>
</tr>
<tr>
<td>Far Off</td>
<td>Dirt Lot</td>
<td>Bedded Pack</td>
<td>Bedded Pack</td>
</tr>
<tr>
<td>- hi SR</td>
<td>Sand freestalls</td>
<td>Bedded Pack</td>
<td>Bedded Pack</td>
</tr>
<tr>
<td>Close Up</td>
<td>Bedded Pack</td>
<td>Sand freestalls</td>
<td>Bedded Pack</td>
</tr>
<tr>
<td>% decrease IMI</td>
<td>59</td>
<td>22</td>
<td>62</td>
</tr>
</tbody>
</table>
Wisconsin SCC (First test)

<table>
<thead>
<tr>
<th>SCC (GM)</th>
<th>Herd A</th>
<th>Herd B</th>
<th>Herd C **</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treated</td>
<td>54,573</td>
<td>69,988</td>
<td>63,340</td>
<td>64,299</td>
</tr>
<tr>
<td>Control</td>
<td>128,617</td>
<td>75,405</td>
<td>76,702</td>
<td>84,894</td>
</tr>
<tr>
<td>% decrease</td>
<td>58</td>
<td>7</td>
<td>17</td>
<td>24</td>
</tr>
<tr>
<td>P Value</td>
<td>0.0036</td>
<td>0.2216</td>
<td>0.6797</td>
<td>0.1868</td>
</tr>
</tbody>
</table>

Wisconsin Clinical Mastitis (<100DIM)

<table>
<thead>
<tr>
<th>No cases (%)</th>
<th>Herd A</th>
<th>Herd B *</th>
<th>Herd C</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orbeseal</td>
<td>6/36 (16.7)</td>
<td>32/106 (30.2)</td>
<td>33/162 (20.4)</td>
<td>71/304 (23.4)</td>
</tr>
<tr>
<td>Control</td>
<td>11/40 (27.5)</td>
<td>37/109 (33.9)</td>
<td>44/159 (27.7)</td>
<td>92/308 (29.9)</td>
</tr>
<tr>
<td>% decrease</td>
<td>40</td>
<td>11</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>P</td>
<td>0.3758</td>
<td>0.0892</td>
<td>0.4958</td>
<td>0.19</td>
</tr>
</tbody>
</table>

How to Use Orbeseal

After your current dry cow treatment program procedures, perform the following steps...

- **An inert paste** that is infused at drying off.
- Retains its paste characteristics (does not set or harden up).
- Mimics the **keratin plug** by immediately forming a physical barrier in the teat canal.
- It **persists** through the entire dry period.

How to Use Orbeseal

- Tests should be disinfected with alcohol pads.
- Inject all contents of the Orbeseal tube into the teat. Do not massage.
- Mark the cow and dip each teat with a quality teat dip.
- If Orbeseal becomes difficult to administer in extremely cold weather, it should be warmed to room temperature. Individual tubes should not be immersed in water.
**How to Use Orbeseal**

Remember:
*Labeled withdrawal should be followed when Orbeseal is used in conjunction with a dry cow treatment program.*

**Freshening**

Manually strip out the udder following calving.
Orbeseal flakes may show up after the first milking.
Flakes will be caught by the milk filter.

**Safety**

Orbeseal (bismuth subnitrate) is an inert material and has no effect on a calf if ingested.

**Industry Safety**
- no bismuth in blood after imm infusion
- bismuth not orally absorbed by humans
- has no effect on dairy starter cultures
- neonatal calves unaffected by 16g of bismuth po

**Cow Tolerance**
- 1x and 2x dose result in a small (<82,000) transient increase in SCC
- No impact on milk production

**Economics**
- How many cows to break even
- Reproduction
- Short on data
Economics

Quarter vs. Cow study
69/862 = 8.0% quarters
69/216 = 32% cows
69/??

100 cows
Costs $800 to treat
Clinical case costs $200 (average, early lactation)
Prevent 4 cases of clinical mastitis is "breakeven"

Economics

Lost milk production (IMI)
Premiums (SCC)
Clinical mastitis
- Milk production decrease
- Milk discard
- Cost of therapy – vet/labor/drugs
- "Overhead" – facilities/protocols/palor flow
- Reproduction – decreased fertility/increased abortion
- Residue risk
- Culling
- Culling and Death

Economics

Heifers Prepartum treatment
- Lower SCC
- Persistence
- More milk
- 1168 lbs.
- $184.54/heifer more $15.80/cwt

Reproduction

Clinical Mastitis
No Clinical Mastitis

<table>
<thead>
<tr>
<th>Number of days to first AI</th>
<th>93.6</th>
<th>71.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of AI</td>
<td>2.9</td>
<td>1.6</td>
</tr>
<tr>
<td>Days to conception</td>
<td>136.6</td>
<td>92.1</td>
</tr>
</tbody>
</table>

Summary

New Orbeseal is the first and only product of its kind.
Orbeseal locks out new mastitis infections for the entire dry period.
- Mimics the cow's natural first line of defense, the keratin plug.
- Provides a safe, antibiotic-free, physical barrier between the cow and the environment.

Summary

Orbeseal is easy to use.
- Orbeseal is compatible with conventional dry cow management practices.
Orbeseal works.
- Orbeseal significantly reduces new mastitis infections during the dry period.
- Orbeseal reduces clinical mastitis in first 60 days by 26%.
Break-even – four fewer cows
**Experiences**

- No Orbeseal at calving
- Accumulating on milk system
- Milk meters
- Milkers – mastitis
- Train proper technique
  - Administration – completely depress
  - Removal

**Questions**

- Should I keep using JS?
- Will it stop cows from leaking?
- What happens if I “seal in” an infection?
- Can I use it on heifers?
- My dry period is only 40 days long, do I still need Orbeseal?
- Can I use it on my organic cows?
- Its cold out. What does that do to Orbeseal?

**Questions**

I don’t handstrip my cows after calving, is that a problem?
I am seeing clots on the filter after my Orbeseal cows have calved. Is that a problem?
What if a calf sucks out the Orbeseal?
My cow get mastitis 2 days after calving. Did Orbeseal fail?
Can I use 2 tubes per cow?
Managing Acidosis In Dairy Cattle

Dr. Richard Grant, President
W.H. Miner Agricultural Research Institute
Chazy, NY

The material that Dr. Grant discussed on this topic is shown on the slides printed on the following pages.
Managing Acidosis in Dairy Cattle

Rick Grant
W.H. Miner Agricultural Research Institute
Chazy, NY

Off-balance situation: Acidosis
- Reduced and variable DMI
- Reduced rumination
- Reduced NDF digestibility
- Reduced microbial yield
- Reduce milk and fat yield
  - Fat:protein inversions
- Loose manure
- Laminitis and abnormal hoof growth
- Poor body condition
- Reduced feed efficiency

Highly Digestible Diets: Balancing Act

- How does feeding environment affect this balance??

Forage & Ruminal Acidosis

- Reduced ruminal acetate concentration
- Reduced ruminal pH
- Reduced ruminal fermentation
- Reduced fiber concentration
- Reduced feed digestion
- Reduced food efficiency

Current CHO recommendations to avoid acidosis and optimize productivity

<table>
<thead>
<tr>
<th>CHO fraction</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total NDF, % of DM</td>
<td>28-32</td>
</tr>
<tr>
<td>pNDF, % of NDF</td>
<td>22-26</td>
</tr>
<tr>
<td>Fermentable NDF, % of NDF</td>
<td>35</td>
</tr>
<tr>
<td>NFC (calculated), % of DM</td>
<td>30-40</td>
</tr>
<tr>
<td>Soluble fiber, % of DM</td>
<td>4-10</td>
</tr>
<tr>
<td>Starch, % of DM</td>
<td>23-28</td>
</tr>
<tr>
<td>Fermentable starch, % of starch</td>
<td>83-86</td>
</tr>
<tr>
<td>Sugars, % of DM</td>
<td>4-8</td>
</tr>
</tbody>
</table>

(Snedecor, 2004; NRC, 2001)

Salivary buffer flow and fermentation acid production

Allen (1997)
**Positive Impacts of Digestible NDF**
- Sources of dNDF:
  - High-quality forage
  - Nonforage fiber sources
  - Increased DMI
  - Higher ruminal pH
  - Increased A:I
  - No lactic acid
  - Greater MCP production
  - More constant supply of absorbed nutrients

**NRC (2001) NDF and NFC Recommendations**

<table>
<thead>
<tr>
<th>Minimum forage NDF</th>
<th>Minimum diet NDF</th>
<th>Maximum diet NFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>25</td>
<td>44*</td>
</tr>
<tr>
<td>18</td>
<td>27</td>
<td>42</td>
</tr>
<tr>
<td>17</td>
<td>29</td>
<td>40</td>
</tr>
<tr>
<td>16</td>
<td>31</td>
<td>38</td>
</tr>
<tr>
<td>15*</td>
<td>33</td>
<td>36</td>
</tr>
</tbody>
</table>

*Diets with <15% forage NDF and more than 44% NFC should not be fed.

**Recommended Particle Size Distributions**

<table>
<thead>
<tr>
<th></th>
<th>Corn silage</th>
<th>Hay crop silage</th>
<th>TMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top sieve</td>
<td>2-4% (not only forage; 19 mm)</td>
<td>10-15% (sealed silo)</td>
<td>8-10%&lt;8% (watch FNDP)</td>
</tr>
<tr>
<td>Middle</td>
<td>40-50%</td>
<td>30-40%</td>
<td>30-50%</td>
</tr>
<tr>
<td>Bottom (&lt;8 mm)</td>
<td>40-50%</td>
<td>40-50%</td>
<td>40-60%</td>
</tr>
</tbody>
</table>

**Practical Considerations for NDF Requirements**
- Feeding Management affects NDF requirement:
  - TMR: < NDF
  - Slug-feeding grain: >NDF
  - Buffers: <NDF
  - Added lipid: > or < NDF
  - Poor feeding strategy: >NDF
  - Variable forage quality: >NDF
  - NFFS: >NDF
Factors Influencing Cow Response to Dietary Carbohydrates
- Poor bunk management
  - Allows sorting (increased grain) or slug feeding (acid load)
- Improper mixing and feed delivery
  - Poor particle distribution
- Overcrowding & competition
  - Subordinate cows
- Anything that alters normal time budget behaviors
  - Feeding, resting, ruminating

Management and Slug Feeding
- Pen size too large
- Restricted feed access
- Misuse of headlocks
- Commingled groups
- Overcrowding

Restricted versus Ad Libitum Feeding
- Cattle fed to a clean bunk have reduced meal frequency vs ad libitum feeding
  - 4.5 vs 8.2 meals per day
  - 3.5 vs 1.6 kg per meal
- Deviations of 2 h from normal feeding schedule increased risk of acidosis with restricted feeding
- Doesn’t solve sorting on cow basis

Management and Sorting
- Long particles
  - High DM%
- Poor quality forage
- Infrequent feeding & push-up
- Limited manger space
> Reverse sorting?

Feed Sorting by Cows
- Sorting can lead to:
  - Ruminal acidosis
  - Cows consuming different TMR within a pen
  - Range in fecal consistency within a pen
  - Range in rumen pH within a pen
  - Subordinate cows usually get higher fiber diet
  - Highest producers sort most

TMR Mixing Time and Effective Fiber
(Chase et al., 1999)
Mixing Time and Effective Fiber (cont.).
- 46% forage TMR
  - 55:45 corn silage:haylage
  - 50% dry matter TMR
- 5-wk feeding trial
  - Looked at 5 min vs 30 minutes mixing
  - Fat % was reduced from 3.5 to 2.7%

Heat Stress and Acidosis
- Cool = 64F, 50% RH; Hot = 85.1F, 85% RH
- HR = 65% HG = 35% R

Mishra et al. (1970)

Stocking Density and Response to Diet
- 0 vs 30%
  - overcrowding of stalls and manger
    (Batchelder, 2000)
    - switchback design
  - All cows fed same diet: NDFd & pNDF!
  - Measured impact on eating, ruminating, and resting

Overcrowding & Rumination
- % cows ruminating in overcrowded group averaged 28% (high of 32%)
- % cows ruminating with no overcrowding was 37% (high of 55%)

Overcrowding and Rumination (cont.)
- In a 24-h period:
  - Nearly 2 h/d difference in ruminating
  - 9.4 gal/d more saliva production
  - 209 g/d more bicarbonate
    - Recommended level of bicarb is 170-200 g/d
  - Impact on ruminal pH?
  - What about FNDF:NFC?
Dairy Cattle Health Concerns for North Carolina Producers

Dr. David T. Marshall, DVM
State Veterinarian, NCDA&CS

The material that Dr. Marshall discussed on this topic is shown on the slides printed on the following pages.
Dairy Health Issues Update

North Carolina Dairy Conference
February 23, 2005
Salisbury, N.C.

David T. Marshall, DVM
State Veterinarian
North Carolina Department of Agriculture
and Consumer Services

Overview

• BSE surveillance and trade issues
• N.C. Johnes Disease program update
• The National Animal Identification System (NAIS) and NCFarmID

BSE (Mad Cow Disease)

• Three positive Canadian cases- May, 2003, Jan. 2, 2005 and Jan. 11, 2005
• U.S. case on Dec. 23, 2003- imported Canadian dairy cow in Washington state
• Prohibition of beef exports by numerous trading partners (Japan, etc.)
• Banning of “downers” to slaughter, removal of specified risk materials (SRM’s)

BSE Enhanced Surveillance Program

• Began June 1, 2005
• Targeting 268,000 samples from high risk cattle (deads, downers, CNS)
• 99% confidence in detecting one infected animal in 10 million population
• 231,450 samples as of 2/17/05- all negative

BSE Minimal-Risk Region Final Rule

• Establishes regions with “effective BSE prevention and detection measures” consistent with OIE guidelines
• Canada will be first region to meet requirements

BSE Minimal-Risk Region Final Rule

• Allows importation of live cattle < 30 mos. of age, as well as certain other animals and products
• Permanent animal ID, movement in sealed containers direct to feedlot or slaughter, no movement between sites while in U.S., slaughtered prior to 30 mos. of age
• DOES NOT APPLY TO DAIRY REPLACEMENT HEIFERS
• American Meat Institute (AMI) supports reopening
• R-Calf USA has filed suit to overturn the rule
Johnes Disease

- Estimated 30-45% herd infection rate nationally
- Decreased milk production, pounds of milk fat, and days in milk
- Strong Elisa test positive animals - $720 decrease in potential milk revenue per lactation
- Link to Crohn’s disease still being debated

N.C. Johnes Disease Control Program

- Funded at $150,000 in FY 2004
- Funding reduced to $64,300 this year
- Risk Assessment and Herd Management Plan
- Subsidized testing reimbursement suspended pending additional funding

N.C. Johnes Disease Control Program

- 33 certified Johnes Disease veterinarians
- 113 enrolled herds as of Jan 1, 2005-19 dairy, 94 beef
- 47 herds in Test Negative phase
- 58 in Management phase
- 8 in Test Positive phase

The National Animal Identification System (NAIS)

- What is the NAIS?
  - A national system capable of tracing an animal or group of animals back to their herd of origin during disease outbreak or event
  - Trace potentially exposed animals that have moved from the affected premises
  - Trace back to all locations where a suspect animal has been within 48 hours of request
  - Provide information on all other animals that came in contact with the subject animal

The National Animal Identification System

- Why is it important to track animals?
  - Enhanced disease preparedness
  - Provide the ability to quickly trace animals exposed to disease
  - Permit rapid detection, containment, and elimination of disease threats
  - Tracking is essential to preserving the domestic and international marketability of our nation’s animals and animal products

BSE Discovery: Impact on NAIS

- Due to BSE confirmation in a Washington dairy cow on December 24, 2003, the USDA has accelerated implementation of a nationwide animal ID plan: the NAIS

  - Limited success of tracing involved animals of interest (52 of 81 never found)
  - Domestic companies now requiring origin verification for liability purposes
Complicating Issues

- Confidentiality
- State vs. Federal vs. private third party
- Technology neutral (RFID tags, retinal images, DNA, etc.)
- Voluntary vs. mandatory

Implementation Plan

NCFarmID is North Carolina’s voluntary part of the national project to implement premises registration with NAIS.

NCFarmID

Premises Registration Information

NCFarmID will be using USDA’s National Premises Repository System

Premises registration will be available:
- At NCDA&CS office with appointment
- Mail-in form to NCDA office

COMING SOON:
- www.ncfarmid.com
- links to our website are available

NCFarmID

Premises Registration Information

Information to be submitted to NAIS:
Name of farm, owner’s name, type of operation (farm, market, etc.), physical 911 address, phone number, species types

NCDA&CS will also record data in our confidential database, including GPS coordinates

Three Implementation Phases for NCFarmID

- **Phase I**: January – December, 2005 GOAL: Make national premises registration available for all North Carolinians
- **Phase II**: CY 2006, Individual or group/lot identification of animals for movement tracking
- **Phase III**: CY 2006-2007, Retrofit processing plants, markets, and other industry segments with appropriate technology to track animals through the marketing chain

NCFarmID

Contact information:

State Veterinarian:
david.marshall@ncmail.net
919-733-5657

NCFarmID Program Manager:
maryana.mcbride@ncmail.net
919-807-4340

Registration information:
www.ncfarmid.com
Resting: Do Your Cows Get Enough?

Dr. Richard Grant, President
W.H. Miner Agricultural Research Institute
Chazy, NY

The material that Dr. Grant discussed on this topic is shown on the slides printed on the following pages.
Vitamin R: Do Your Cows Get Enough?

Rick Grant
Miner Agricultural Research Institute
Chazy, NY

Three Major Activities
- Eating
- Rumination
- Resting
- All 3 are interconnected

Resting and Eating
- When lying and eating are restricted simultaneously
  - Cows choose to rest rather than eat (Hetz, 1982)
  - 1.5 h extra standing time associated with 45-60 min reduction in feeding time
- Milk yield and DMI on day 8 was significantly affected by resting on day -6 (Daniels et al., 2003)
- Implications for transition cow management?

Time Budgets

QUESTION:
How often do we take advantage of natural cow behavior versus simply taking advantage of the cow?

Examples: Ignoring Natural Behavior

Behavior
- Eating with head down
- Grooming
- Reaching for feed
- Rumination
- Resting

Management
- Elevated bunk
- Excessive lock-up time
- Infrequent push-up
- Overcrowding
- Limited access to comfortable stalls
**Time Budgets**

What does a cow need to accomplish every 24 hours?
* 70-180 cows/pen
* Commingled groups

---

**Baseline Behavioral Data by Scan Sampling**

---

**Time Budget: Dairy A**

- Tally up number of hours each day to satisfy basic behavioral needs:
  - 5.5 h/d eating
  - 11.8 h/d lying (resting)
  - 1.4 h/d standing in free stall
  - 2.1 h/d standing or walking in the alley (grooming, agonistic, estrous activity)
  - 0.5 h/d drinking
  - 23.3 total hours needed
  - + 2.7 h milking = 24 h/d

---

**Implications of Time Budget**

- Cow needs to accomplish certain behavioral activities each day
- We cannot allow management routines to interfere
- Resting behavior is critical!
Benefits of Resting
- Reduced stress on feet
- Reduced lameness
- Increased blood flow to mammary gland
- Increased feeding & ruminating activity
- Less fatigue stress & greater overall health

Requirement for Resting
- 3-h deprivation of lying: observe a 50% recovery of missed lying time within 10 h
  - 9:00-12:00: -102.2 min loss in lying
  - Noon-10:00: +54.2 min extra lying
- Cows attempt to achieve a fixed amount of lying (Metz, 1985)
- "Vitamin R?"

Economical Benefits of Resting (7 vs 12 h/d)
- Increased blood flow: 1.5-2.2 lb/d more milk (?)
- Increased ruminating (efficiency of digestion): up to 2 lb/d more milk
- Less stress on hoof and lameness: 3 lb/d more milk
- Less fatigue stress: 2 lb/d more milk
- Greater feed intake: 5 lb/d more milk
- Optimal immune function: long-term?
- 1 hour resting > 7 h: 2 lb/d more milk

On-Farm Application
- Measure time away from pens
- "Standard" times
  - 5.5 h/d manger (eating)
  - 0.5 h/d drinking
  - 3.0 h/d other activities (grooming, agonistic, estrous, etc)
- "Behavioral overhead"

On-Farm Application (cont)
- Example: 4 h/d away from pen
  - 4 h/d + 9 h/d "standard budget" = 13 h/d non-resting activity
  - 11 h/d resting provided vs 12 to 14 h/d required
- Consider:
  - 1 h = -2 lb milk
  - 1 h = -0.30 lb/d body weight
  - 1 h = -0.25 BCS change in 100 days

What Keeps Cow from Lying?
- Poorly designed and/or maintained stalls
- Overcrowding
- Improper grouping
- Too much time away from stalls
Excessive time away from pen and stalls

Effect of Splitting Group on Lying Activity

<table>
<thead>
<tr>
<th></th>
<th>MP</th>
<th></th>
<th>PP</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 pen</td>
<td>2 pens</td>
<td>Diff</td>
<td>1 pen</td>
</tr>
<tr>
<td>Lying, h</td>
<td>10.4</td>
<td>13.0</td>
<td>2.6(^{a})</td>
<td>9.2</td>
</tr>
</tbody>
</table>

\(^{a}\) Means differ \((P < 0.05)\).

In commingled groups, resting activity of PP cows more negatively affected than MP cows (105% stocking rate)

Comfortable Cow

- Should we consider resting posture?
- Head-on-flank associated with REM sleep
  (Girard et al., 1993)

Resting Rumination: More than Salivation

- Very little REM "true" sleep
- 2-8 min periods
- "rest" for nervous system
- EEG patterns during recumbent rumination similar to REM
- Physiological rest & rejuvenation
  (Ewbank, 1978)
Effect of empty manger on eating and resting: Bare Bunk Disease

Eating and resting behavior: Problem solved

Elite Cows vs Average Cows

Elite (top 10%) Pen Average

Elite Cows vs Beecher Arlinda Ellen
- Elite Cows
  - Eating time = 5.5 h
  - Lying = 14.1 h
- Beecher Arlinda Ellen
  - Eating time = 6.25 h
  - Lying = 13.9 h

Should we design facilities and management routines for 14 h/d resting? - analogy to ration formulation

**Produced 50,000 lb milk in 1978

Vitamin R: Summary
- Cows have daily activities they need to accomplish
  - Management routines should not perturb or constrain time available
- Resting affects feeding behavior (and vice versa) and milk production
  - Requirement for resting
- Resting influences rumination
- Cow needs 12-14 h/d – Do Your Cows Get Enough?
Using Rumensin in Dairy Rations

Mr. Howard Green
Elanco Animal Health Technical Consultant

The material that Mr. Green discussed on this topic is shown on the slides printed on the following pages.
Rumensin®
(mamonol sodium)

More milk per pound of feed

Rumensin delivers more milk per pound of feed

The only FDA-approved feed ingredient for lactating and dry cows that increases milk-production efficiency by economically delivering more milk per pound of feed while maintaining the natural wholesomeness of milk

Now Approved for Dairy Cows: Rumensin

- Delivers more milk per pound of feed for pennies per head per day
- Improves milk-production efficiency throughout lactation and the dry period
- Meets U.S. Food and Drug Administration's stringent standards for effectiveness and safety
- On average, returns 5:1 on your investment

What is production efficiency?

- An emerging metric of performance in the dairy industry

Production Efficiency = \frac{Output}{Input}

Milk-Production Efficiency

Practical calculation = \frac{\text{Milk production (pounds/day)}}{\text{Dry matter intake (lbs/day)}}

FDA claim for Rumensin = \frac{\text{Marketable solids-corrected milk}}{\text{Total NE\textsubscript{r} intake (adjusted for body-weight change)}}

Bottom line = More milk per pound of feed

The Rumensin Label

- Increased milk-production efficiency
  - Increased production of marketable solids-corrected milk per unit of feed intake
  - More milk per pound of feed
- Dose range: 11 to 22 g/lb (dry matter basis)
- Feed throughout lactation and the dry period
- "You may notice"
**Efficacy Data**

**How was this Claim Obtained?**
- Nine trial sites
  - 6 in US
  - 3 in Canada
- 818 Holsteins
  - 290 Primiparous (35% 1st calvings)
  - 528 Multiparous (65% cows)
- Trial Length
  - 21 days before expected calving
  - Treatment continued through full lactation to 7 days post calving (all or 200 DM [3 sites])
- Levels of Rumensin
  - 0, 7, 15, or 22 g/d
  - 100% DM basis

**Monensin Dairy Trial Sites**

**What Is Our Claim?**
- Increased Milk Production Efficiency
  - Production of marketable solids-corrected milk per unit of feed intake
- What is this?
  - More milk per pound of feed

**Rumensin delivers more milk per pound of feed**
During transition and early lactation

- More milk per pound of feed
- No change in dry matter intake while cows are in negative energy balance

During the dry period

- More efficient use of feed to maintain body condition
  - 0.7 lb/day less dry matter rate at 11 g/day
  - 1.7 lb/day less dry matter rate at 22 g/day

Rumensin improves milk-production efficiency

<table>
<thead>
<tr>
<th>Parameter</th>
<th>0 g/day</th>
<th>11 g/day</th>
<th>15 g/day</th>
<th>22 g/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average dry matter intake (lb/day)</td>
<td>43.8</td>
<td>43.4</td>
<td>42.8</td>
<td>42.3</td>
</tr>
<tr>
<td>Daily milk yield (lb)</td>
<td>56.0</td>
<td>56.7</td>
<td>56.6</td>
<td>57.5</td>
</tr>
<tr>
<td>Body wt %</td>
<td>3.65</td>
<td>3.03</td>
<td>3.49</td>
<td>3.89</td>
</tr>
<tr>
<td>Daily solids yield (lb)</td>
<td>2.34</td>
<td>2.34</td>
<td>2.33</td>
<td>2.27</td>
</tr>
<tr>
<td>Protein %</td>
<td>3.15</td>
<td>3.13</td>
<td>3.13</td>
<td>3.10</td>
</tr>
<tr>
<td>Daily milk protein yield (lb)</td>
<td>2.03</td>
<td>2.09</td>
<td>2.07</td>
<td>2.00</td>
</tr>
<tr>
<td>Daily solids-corrected milk yield (lb)</td>
<td>58.2</td>
<td>58.6</td>
<td>58.0</td>
<td>58.0</td>
</tr>
<tr>
<td>Improvement in milk production efficiency*</td>
<td>2%</td>
<td>2.5%</td>
<td>4%</td>
<td></td>
</tr>
</tbody>
</table>

* Rumensin 120 mg per day, entire day, twice daily.

Value throughout the lactation cycle

Body Weight and Body Condition Score

- Body Weight
  - Was not changed for the different treatments

- Body Condition
  - Maintained higher body condition compared to controls. However, these differences (less than 0.10 units) are not biologically meaningful because they are below the smallest discernible difference in BCS which was 0.25 units (1-5 scale).
**Mode of Action**

**Rumensin Improves Rumen Fermentation**
- Changes microbial populations in the rumen
- Promotes the growth of more efficient naturally-occurring bacteria
  - More efficient carbohydrate metabolism
  - From 2 to 4 percent more energy from feed

**Monensin Mode of Action on Gram Positive Bacteria**

**Monensin Mode of Action on Gram Positive Bacteria**

**How Does Rumensin Work In the Rumen?**

- 20% C3 DAY - 7
- 29% C3 DAY 14

Adapted from Dawson and Boling, 1983
Energy from Rumen Fermentation

- Within the rumen, feed carbohydrates are converted to glucose
- Rumen microorganisms change glucose to volatile fatty acids (VFAs) and waste products
- Usable energy derived from glucose varies significantly

"You May Notice:" Section

- What is this?
  - New way of communicating trial observations
  - Used to inform of potential production issues when using a product
  - "...likely a manageable effect of monensin use in dairy cows"

On the Label

"You May Notice:"

- Reduced voluntary feed intake in dairy cows fed monensin. This reduction increases with higher doses of monensin fed. Rule out monensin as the cause of reduced feed intake before attributing to other causes such as illness, feed management or the environment.
- Reduced milkfat percentage in dairy cows fed monensin. This reduction increases with higher doses of monensin fed.
- Increased incidence and treatment of cystic ovaries and metritis in dairy cows fed monensin.
- Reduced conception rates, increased services per animal, and extended days open and corresponding calving intervals in dairy cows fed monensin.

Have a comprehensive and ongoing nutritional, reproductive and herd health program in place when feeding monensin to dairy cows.

Managing for Milk Composition

Key Messages

- There are many factors that impact yield of milk, milk components, and dry matter intake
- Rumensin will be an additional factor, and we need to understand its impact
- Milkfat and protein yields begin with well balanced diets, and Rumensin provides more energy from these diets
### Factors Affecting Milk and Component Yields

- **Manageable Factors**
  - Diet composition
  - Dry matter intake
  - Feed management
  - Cow comfort
  - DIM
  - Health
  - Genetics
- **Other factors:**
  - Breed
  - Season

### Dietary Factors Affecting Milk and Component Yields

- **Fat**
  - Forage to concentrate ratio
  - Source and level of neutral detergent fiber (NDF)
  - Level of effective fiber
  - Fermentation rate of concentrates
  - Dietary fat type and inclusion rate

- **Protein**
  - Crude protein (16-18%)
  - Rumen degradable protein (RDP) (ca 60-65%)
  - Rumen undegradable protein (RUP) (ca 40% of CP)
  - Rumen fermentable NSC and ammonia
  - AA composition of metabolizable protein

### Dietary Factors (Chemical) Affecting Milkfat Percent

<table>
<thead>
<tr>
<th>Factor</th>
<th>Effect on Milkfat Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forage to concentrate ratio in diet</td>
<td>Reduced as proportion of concentrate is increased</td>
</tr>
<tr>
<td>Low fiber intake (low NDF in diet; poor forage quality)</td>
<td>Reduced milkfat percent; Yield may not change early</td>
</tr>
<tr>
<td>Fat level in diet (&lt; 6% in diet)</td>
<td>Unchanged/slightly increased High risk for decreased fat</td>
</tr>
<tr>
<td>(&gt; 6% in diet)</td>
<td></td>
</tr>
<tr>
<td>Fat type</td>
<td>Unchanged/increased slightly High risk for decreased fat</td>
</tr>
<tr>
<td>By-pass</td>
<td></td>
</tr>
<tr>
<td>Saturated</td>
<td></td>
</tr>
<tr>
<td>Ununsaturated</td>
<td></td>
</tr>
</tbody>
</table>

### Dietary Factors (Physical) Affecting Milkfat Percent

<table>
<thead>
<tr>
<th>Factor</th>
<th>Effect on Milkfat Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeding Method: TMR</td>
<td>Increased, esp with low F.C Decreased if 1X/d or 2X/d</td>
</tr>
<tr>
<td>Slug feeding of concentrate</td>
<td></td>
</tr>
<tr>
<td>Particle size, esp forages from over-</td>
<td></td>
</tr>
<tr>
<td>mixing, processing, etc</td>
<td>Reduced because of lack of ruminating or chewing cud</td>
</tr>
<tr>
<td>Grain characteristics: ROF*</td>
<td></td>
</tr>
<tr>
<td>Wheat/barley/rye/wheat</td>
<td>Fine grinding, High moisture and heat – reduced</td>
</tr>
<tr>
<td>Oilseds: Intact</td>
<td></td>
</tr>
<tr>
<td>Extrusion</td>
<td>Little change for intact seeds High risk for decreased fat</td>
</tr>
<tr>
<td>Damaged</td>
<td></td>
</tr>
</tbody>
</table>

### Factors (Other) Affecting Milkfat Percent

<table>
<thead>
<tr>
<th>Factor</th>
<th>Effect on Milkfat Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow</td>
<td>Breed, stage of lactation, genetics</td>
</tr>
<tr>
<td>Season</td>
<td>Milkfat percent begins to decline in spring-lasts till fall</td>
</tr>
<tr>
<td>High somatic cell count</td>
<td>Decreased</td>
</tr>
<tr>
<td>Miscellaneous: Improper handling, e.g agitation, temperature of milk, milking equipment, day to day</td>
<td>All of these may lead to a mechanical-induced reduced milkfat percent.</td>
</tr>
</tbody>
</table>

### Role of Nutrition
**Dietary Factors Known to Affect Milk Fat**
- High Grain Diets
- Forage particle size
- Vegetable oils
- Marine oils
- Buffers

**Milk Fat Depression Mechanism**
- Unsaturated Plant Oils
  - 18:3 cis-9, cis-12, cis-15 (linolenic acid)
  - 18:3 cis-9, trans-11, cis-15 (CLA) → isomerization
- Low Rumen pH
  - 18:1 trans-11 (vaccenic acid)
- Milk fat depression → Normal milk fat

**Rumen pH is important**
- Feeding unsaturated fatty acids to cows did not result in reduction of milk fat until pH in the rumen was lowered

**Milk Fat Reduction**
- Historically, milk fat reduction has been associated with feeding
  - Low fiber high grain rations
  - Low acetate:propionate ratio
  - Rapid passage rate
  - Low rumen pH
  - Reduced cellulolytic activity
- Oils, e.g. fish and soybean oil in the diet

**Effect of Rumensin Dose on Milk Fat Percent by Trial Site**

![Bar chart showing the effect of Rumensin dose on milk fat percent by trial site](image)
**Milk Component Yield Analysis**

- **3 High Protein**
  - Low Fat

- **4 High Protein**
  - High Fat

- **1 Low Protein**
  - Low Fat

- **2 Low Protein**
  - High Fat

**Fat and Protein Yields (g/d) of Cows Fed Rumensin Compared to Control**

<table>
<thead>
<tr>
<th></th>
<th>Fat</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1414</td>
<td>969</td>
</tr>
<tr>
<td></td>
<td>1140</td>
<td>972</td>
</tr>
<tr>
<td>4</td>
<td>189</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>112</td>
<td>1003</td>
</tr>
<tr>
<td>22</td>
<td>1048</td>
<td>957</td>
</tr>
<tr>
<td></td>
<td>1051</td>
<td>1011</td>
</tr>
</tbody>
</table>

**Ration Evaluation Process**

- Trials extended through 2 years
- Feeds changed throughout
- Estimated “average diet composition”
- Diets evaluated with Cornell program (CNCSP)

**NDF AND NFC of Diets: Effect of Yield Groups**

<table>
<thead>
<tr>
<th></th>
<th>NDF, % DM</th>
<th>NFC, % DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFHP</td>
<td>32.9</td>
<td>38.7</td>
</tr>
<tr>
<td>LFHP</td>
<td>28.9</td>
<td>42.3</td>
</tr>
<tr>
<td>LFLP</td>
<td>31.4</td>
<td>41.7</td>
</tr>
</tbody>
</table>

**CHO Fractions in the Diet: Effect of Yield Groups**

- **A** = Sugars, **K1** = Fast (P>0.16)
- **B1** = Starch and pectins
- **K2** = Intermediate (P<0.07)
- **B2** = Digestible cell wall, **K3** = Slow (P<0.20)
- **C** = Unavailable cell wall
- **Total Degradable CHO** (P<0.20)

**Metabolizable Protein (g) and Component Yield**

<table>
<thead>
<tr>
<th></th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFHP</td>
<td>1324</td>
</tr>
<tr>
<td>LFHP</td>
<td>1360</td>
</tr>
<tr>
<td>LFLP</td>
<td>1217</td>
</tr>
<tr>
<td>MP Bact, g</td>
<td>0.004</td>
</tr>
<tr>
<td>MP Feed, g</td>
<td>0.848</td>
</tr>
</tbody>
</table>

N.A. Rumensin Daily 9-trials
### Chemical Composition of Diets from Different Yield Groups

<table>
<thead>
<tr>
<th></th>
<th>HF HP</th>
<th>LF HP</th>
<th>LF LP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Protein, % DM</td>
<td>17.9</td>
<td>17.9</td>
<td>18.6</td>
</tr>
<tr>
<td>Bacterial Protein, % CP</td>
<td>34.1</td>
<td>34.1</td>
<td>32.7</td>
</tr>
<tr>
<td>By-Pass Protein, % CP</td>
<td>31.8</td>
<td>30.4</td>
<td>28.9</td>
</tr>
<tr>
<td>Metabolizable Protein, % CP</td>
<td>66.9</td>
<td>64.5</td>
<td>61.5</td>
</tr>
<tr>
<td>NDF, % DM</td>
<td>32.9</td>
<td>29.8</td>
<td>28.4</td>
</tr>
<tr>
<td>NFC, % DM</td>
<td>38.7</td>
<td>41.8</td>
<td>41.7</td>
</tr>
<tr>
<td>Fat, % DM</td>
<td>5.6</td>
<td>5.3</td>
<td>6.0</td>
</tr>
</tbody>
</table>

N.A. Rumensin Dairy 9-trials

### Recommendations

- What is the target level of NDF in a dairy ration?
  - 28 to 32% (32.5% HF HP in EAH 9-trials)
- What is the recommended level of NDF from forage sources?
  - 21 to 27% (12 lb to 12.25 lb NDF from forage sources)
- What is the recommended level of NFC in a dairy ration?
  - 35 to 39% (38.7% HF HP in EAH 9-trials)

N.A. Rumensin Feeding Guide 2nd Edition

### Key Takeaways

- Effective fiber is the key factor impacting milk fat.
- Physically effective fiber (peNDF) stimulates chewing and buffer secretion which is needed to maintain desired ruminal pH.
- NDF is a measure of chemical fiber but does not address the physical properties

### When trouble shooting milk fat issues:

- Follow same procedures nutritionists have always used
  - Check for adequate effective fiber
  - Check NFC levels
  - Evaluate "added fat sources"
  - Check for added buffers

Dave Maurers Dairy Forage Research Center, Madison, WI

### Summary Recommendations

- Feed 11 g/t  (DMB) during the dry period and during lactation
- Insure adequate inclusion of physically effective NDF in the diet (11 to 12.25 lb NDF from forages)
- Maintain desirable ruminal pH by avoiding high levels of NFC (minimize "slag" feeding of concentrates, finely ground corn, sorting)
- Include a buffer
- If fat added good sources for minimizing MFD include: tallow, whole cotton seed, protected fat
- Minimize unsaturated oils
- Deliver Rumensin in an adequate amount of carrier to insure a homogeneous mixing
**Milk and Component Yields**

**Key Message**

- Milk and component yields are impacted by many factors with complex relationships. One should consider all factors when striving to optimize yields.

---

**Food Safety and Quality**

- Meets FDA’s stringent standards for
  - Effectiveness
  - Animal, environmental and human-food safety
  - No withdrawal required
  - Backed by extensive research
  - Approval in more than 20 countries
  - Natural wholesomeness and quality of milk maintained throughout lactation
  - No significant differences in cheese-processing characteristics or yogurt-starter cultures

---

**Recommended Use**

<table>
<thead>
<tr>
<th>Rumensin feeding rate (g/ton)</th>
<th>11 g/ton</th>
<th>15 g/ton</th>
<th>22 g/ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in Carboxylic Activity (%)</td>
<td>2%</td>
<td>3%</td>
<td>6%</td>
</tr>
</tbody>
</table>

- Start feeding Rumensin to all cows at 11 g/ton
- 100 percent dry matter, total mixed ration
- Provides greatest economic return, based on Elanco data
- Work with nutritional advisors to determine the feeding level that’s right for your herd

---

**Every Dairy Animal Right from the Start**

**Rumensin feeding to heifers on pasture and calves**

- Increases average daily gain (0.2 lb/day)
- Prevents and controls e.coli/diarrhea
- Provides 7:1 ROI

---

**Questions**
Dairy Market Outlook Update

Dr. Geoff Benson
NCSU Associate Professor and Extension Specialist

A look back at 2004

2004 was certainly one for the record books with record high milk prices and strong prices for the year as a whole. This certainly helped dairymen recoup some of the losses they suffered because of low prices in 2003 and 2004. I expected 2004 prices would be a big improvement over 2002 and 2003 but I must admit I didn’t expect prices to set a record. I must also admit I am not sure why they did. Total milk production was pretty flat and increased only 0.1% over 2003 because a reduction in cow numbers almost offset higher production per cow. Sales through November 2004 were up but only by 0.4% over 2003, so the supply demand balanced tightened but not enough to explain these record prices. Perhaps it will become clearer as we get more information.

Federal Dairy Policy

Dairy policy will get a lot of attention in 2005 as efforts are made to extend the Milk Income Loss Payment program past its scheduled expiry date of September 30, 2005. Legislation has already been proposed and some alternative proposals have been developed. It is early days but the size of the federal deficit and competition for federal funding for other programs suggest a tough fight is in store. Since it began in December, 2001, the MILC program has accounted for the largest component of federal spending on dairy programs.

The dairy policy debate may be influenced by two recent government reports, one by USDA’s Economic Research Service and one by the US General Accountability Office. The ERS report says that federal dairy programs have had only a small effect on milk prices and, therefore, on dairy farm incomes. The analysis does not delve deeply into the MILC program but notes that these payments have only had a small impact on the structural adjustments occurring in the dairy industry. Also, in common with other price support measures, MILC payments tend to support higher levels of milk production which then puts downward pressure on milk prices. The main focus of the GAO report is the relationship among farm, wholesale and retail milk prices. However, it also includes a discussion of a wide variety of federal dairy programs and the general nature their impact on farm income, milk production, government costs, price volatility, economic efficiency and consumer prices. This discussion vividly illustrates that there are multiple policy goals and that no single policy or program can achieve all of them.

Outlook

The production outlook for 2005 represents a balance between several factors that favor higher milk production and some which would impede it. Factors favoring more production include low feed costs, the increased availability of Posilac, milk production per cow that seems to be returning to the long term trend, the momentum of cow numbers that were higher than year earlier levels in many months of 2004, and a dairy heifer inventory that is above year ago levels and in the normal range relative to the size of the dairy herd. Offsetting factors include Round 2 of the CWT voluntary supply management program and higher energy costs that are expected to persist through 2005. Higher energy costs have
both a direct effect on farm costs and an indirect effect because most farm inputs have an energy component. One additional factor is the low culling rate observed in 2004 which is unlikely to be sustained, suggesting a return to more normal rates in 2005.

USDA projects the US average farm price for corn at $1.95 per bushel (midpoint) for the current marketing year. The average 48% soybean meal price is pegged at $157.50 per ton (midpoint). These prices translate into a milk-feed price ration that is high and expected to stimulate production.

The CWT herd reduction program is expected to remove approximately 51,000 cows early in 2005, or 0.55% of the national milk supply. 4,300 cows will come out of the southeast, including one North Carolina herd. CWT will also continue to subsidize cheese exports in an effort to support milk prices.

Continued sales growth is expected in 2005, based on an expectation of continued economic growth. Cheese likely will continue to carry most of the load, with small increases in butter and flat fluid milk sales. In recent months the export market has absorbed the domestic surplus of nonfat dried milk and raised prices. This is expected to continue during the first part of the year.

The average US All Milk price was just over $16.00 per 100 lb. in 2004, substantially above the long run average. The Federal Order 5 minimum blend price in the base zone was $1.00 more than this, on average, and the average mailbox price for 2004 is estimated at $16.25.

USDA’s latest forecast for 2005 is for milk production to increase by 2.1% to 174.1 bil. lb. The midpoint forecast for the US All Milk price is $14.40 per 100 lb., which is $1.60 below 2004. The midpoint Class III forecast is $12.95. The current Class III futures market presents a more optimistic picture and suggests a Class I mover close to $13.80 per 100 lb. This implies a US All Milk price around $15.25, $0.85 more than USDA’s forecast and a $0.75 drop from 2004. If North Carolina prices track national prices as they have in the past, NC dairymen should see prices that are $1.60 to $0.75 lower than in 2004. Monthly prices will remain above the MILC payment trigger and no payments are expected under the current program.

These projections are based on “normal” weather and milk production this spring will be critical. Given the tight supply-demand balance, an abnormally large spring flush would likely send milk prices lower for the rest of the year but a smaller than expected amount of spring production would have the opposite effect and could send prices sharply higher. A repeat of 2004 prices is unlikely but so is the kind of price “crash” we have seen in the past. Overall, 2005 is shaping up to be a reasonably good year for prices.

A word of caution is in order, however. I see no reason to believe that there has been a fundamental change in the dairy economy and it would be prudent to continue to use sound financial management. This includes measuring and monitoring financial performance, including cost of production. Contact me if you would like to participate in the NC Dairy Farm financial Performance Project and, if not, take advantage of the summary information provided on my web page at http://www.ag-econ.ncsu.edu/ faculty/benson/benson.html.
During 2004 I wrote several articles about various milking management and mastitis management topics. I have compiled them in the following article for people to read who perhaps did not see them previously, or to read again. I hope they will assist people do a better job of managing the aspects of their dairy operations that have been addressed in the articles.

Mastitis Management In Heifers

When it comes to managing mastitis, most dairy producers direct their efforts to dealing with prevention and treatment practices used on lactating and dry cows. The implementation and use of new practices and products during the last twenty years have significantly reduced intramammary infections (IMIs). While this progress has been of great importance in producing high quality milk and increasing the profitability of producers, the issue of mastitis in heifers continues to be an unrecognized problem (or at least an avoided problem) in many herds.

Throughout the last two decades researchers have conducted numerous studies dealing with mastitis in heifers. Studies have been done to determine the incidence level and to develop various prevention and treatment regimes that can be used to reduce the level of IMIs in heifers. Unfortunately, the recommendations that have come from those studies have received only passing attention by most producers.

I understand that there are many reasons why little attention is given to mastitis in heifers. Cows with IMIs produce less saleable milk, and this has a direct economic effect on the dairy producer. Mastitis in prepartum heifers usually doesn’t have an immediate economic impact. Producers see the udders of their milking cows several times a day, and thus new clinical IMIs can easily be observed. The udders of heifers usually aren’t looked at until after freshening. Restraining cows to check or treat their udders is a lot easier than catching and checking the udders of heifers. Cows are accustomed to having their udders touched, whereas heifers are not. And the list of reasons goes on.

Because heifers are the future of each dairy herd, I encourage producers to give more attention to investing in prepartum mastitis prevention practices that can return large dividends. One suggested practice that can have a significant effect on future productivity of heifers is based on studies done at the University of Tennessee. The researchers showed that heifers which were given intramammary infusions of a lactating cow mastitis antibiotic in all quarters between 7 and 14 days prepartum produced more than 1100 pounds additional milk the first lactation. Eleven hundred pounds more milk per heifer the first lactation should be worth some extra effort to obtain. The study also showed that only
about one-third as many of the treated quarters were infected during the lactation as were the non-treated quarters. This lower quarter infection rate could certainly have an effect on the productivity in subsequent lactations. While this practice may not be appropriate for all herds, it could be a very important one to use in herds that have a significant IMI rate in heifers.

As producers strive to incorporate management practices that will make their businesses fiscally sound and sustainable, I encourage them to give more attention to mastitis management in heifers. I suggest they discuss heifer mastitis management practices that would be appropriate for their herd with an Extension person, veterinarian, co-op fieldmen, or other knowledgeable consultant.

Milk Quality and Future Dairy Foods Marketing

At the recent National Mastitis Council annual meetings, Dr. Dave Barbano from Cornell University gave a very interesting and challenging keynote address. His message was that for U.S. dairy producers and processors to be competitive in the rapidly expanding global economy, the quality of the dairy products they produce must be improved.

There are some people who contend that the U.S. isn’t much of a player in the world dairy products market, so we don’t need to be concerned about product quality improvement. We export only a small amount of our total milk production, so why be concerned with changing the quality standards. Furthermore, some people contend that the importation of dairy products from other countries is regulated, so having to compete with foreign produced products that perhaps might have slightly better quality is not a serious concern.

However, new trade agreements will possibly permit more dairy products to be imported, so there should be serious concern about imports. Case in point is the current trade negotiations with Australia. What might possibly be agreed to in those negotiations has many people concerned about the potential impact of unrestricted, or at least relaxed, regulations on the importation of dairy products from that country. If larger or unrestricted quantities of dairy products are imported from Australia (and maybe other countries in the future), and if the quality of those dairy products is as good as or better than what is produced domestically, what will that do to the U.S. dairy industry?

As the U.S. companies that use or sell dairy products increase their international marketing, they will demand higher quality in the products they handle. They will want dairy products that have a longer shelf life, taste better, and have better processing qualities. They will want products that can be shipped to other parts of the world and be stored for extended time periods. Where will they get those products, from the U.S. dairy industry or from foreign suppliers? Will the U.S. dairy industry be ready to be competitive in supplying the dairy products that companies will be buying?

While the global marketing of dairy products by U.S. companies will necessitate higher quality products, domestic marketing will also demand higher quality products.
Transportation, storage, and handling costs, consumer preferences, and other business concerns will require higher quality dairy products that have lower marketing costs. So, producing higher quality dairy products is going to be expected from the U.S. dairy industry, regardless of where in the world the products are sold or used.

Dr. Barbano emphasized that producing higher quality dairy products starts at the farm. Milk with the lowest possible somatic cell and bacteria counts is imperative to producing the highest quality dairy products. The dairy industry can’t be content with the current levels in milk, or in just meeting the legal standards. Maintaining the status quo will not make the U.S. dairy industry competitive in the world market environment we are now in. We can do better. We must do better! Our industry’s future is at stake!

Overmilking and Teat Condition

Over the last few years there have been several articles published on the relationship of overmilking and teat condition. Overmilking occurs when the milking unit remains on the teat after milk flow has dropped below a predetermined amount, often in the 0.4 – 0.8 lb milk/minute rate. Presentations at past National Mastitis Council (NMC) annual meetings have discussed how teat condition can be improved by shortening the time the milking unit is attached. Recommendations have been given for adjusting the automatic milker detaching units so overmilking does not occur. Since overmilking continues to occur in many herds, the following material may be helpful to producers.

In scoring the effects of overmilking on teats, the duration of the overmilking time must be considered. The time period can be divided into short-term (single milking), medium-term (a few days or weeks), and long-term (more than several weeks) overmilking. Short and medium term overmilking usually results in an increased incidence of discolored teats, ringing at the base of the teats, and firm or hard teats. Long term overmilking often results in hyperkeratosis. Besides the duration of overmilking, the amount of time (minutes) that cows are overmilked at each milking is also a factor that affects teat condition.

At the 2004 NMC meeting there was again a presentation on overmilking and teat condition. Dr. Morten Dam Rasmussen, a researcher from Denmark, reported on studies that looked at overmilking (milk flow rate below 0.4 lb/minute) for 2 or 5 minutes on teat condition. Overmilking resulted in more teats that were discolored, an increased incidence of visible and palpable ringing at the base of the teats, and an increase in the number of teats that were firm or hard to the touch. There was also an effect from the type of liner used on the condition of the teats. Vacuum level and the amount of massage provided to teats during milking also affected the teat condition scores. The researchers stressed that producers should be sure they are using the correct type of liner for their milking system operation settings (i.e. vacuum level and massage duration) and herd teat characteristics (teat size). Improper liner type, a high vacuum level and inadequate teat massage can increase the effect of overmilking on teat condition.

Dr. Rasmussen offered two important suggestions for reducing the incidence of
overmilking. The first is applicable when automatic milker detachers are used. He recommends producers increase the milk flow rate threshold for activating the milker detachers. Additionally, decreasing the delay time from when the threshold milk flow rate is reached until the vacuum level is turned off and the milking unit is removed is recommended. These procedures should result in better teat condition scores, faster milking times, and no loss in milk production. Producers should discuss making these changes with a knowledgeable consultant, and have the milking equipment supplier make any desired changes to the equipment settings.

The second suggestion Dr. Rasmussen offered was to be sure proper premilking teat preparation procedures are followed. Adjusted detacher settings, as mentioned in the first suggestion, are only going to be effective if milk flows continuously shortly after the milking unit is attached. Consequently, cows must be properly stimulated so the milk ejection response is fully evoked before attaching the milking unit. A review of the milking procedures being followed by the people who milk cows is an important part of adjusting detacher settings, and should be done by a knowledgeable consultant.

Overmilking can definitely have an adverse affect on the condition of teats, and damaged teats are more likely to lead to an increased incidence of udder infections. Producers should evaluate their milking equipment and milking practices, and make the changes needed to minimize or eliminate overmilking and the problems that can result from this practice. Consult with your veterinarian, milk handler fieldman, extension agent, or other knowledgeable consultant about this topic.

**Treating Clinical Mastitis**

A few months ago I wrote and article about reviewing your clinical mastitis treatment protocol. The article reported on the findings of a field study which evaluated the practice of withholding antibiotic treatment for clinical mastitis cases for 24-hours, so milk culture information could be obtained and used as the basis for what treatment procedure to use. By delaying the automatic intramammary infusion of an antibiotic when a clinical mastitis case was observed, the large herd in the study reduced the use of intramammary antibiotics by about 80%. The reduction occurred because most of the clinical mastitis cases were caused by environmental organisms which are usually non-responsive to antibiotics.

Another study that evaluated different clinical mastitis treatment methods has recently been published in the Journal of Dairy Science. In this study the researchers looked at four procedures for treating mild to moderate clinical mastitis infections. The methods studied were intramammary infusion of amoxicillin, frequent milk-out, a combination of intramammary infusion of amoxicillin and frequent milk-out, and no treatment (control). Clinical cases were considered cured if there were no clots or flakes in the milk for three consecutive days or two consecutive weeks without a relapse.

While the authors emphasized that the results should be considered preliminary and serve as the basis for further larger studies, the results reported are nevertheless interesting. The
overall finding was that there was no significant difference in cure rate between the four groups. The small number of samples in each treatment group may have contributed to the non-significant finding. The researchers noted that the coliform intramammary infections, especially E. coli, appeared to be more likely to cure than environmental streptococci caused infections. Clinical cases caused by environmental streptococci were treated most effectively with intramammary amoxicillin. Frequent milk-out was not as effective as no treatment or amoxicillin infusion, and probably of no or limited value.

Another interesting finding was the effect of the treatments on milk production following the clinical mastitis cases. Cows in the no treatment (control) group had similar daily milk levels before and after the mastitis event, while cows in the other three treatment groups had decreases in daily milk of from four to nearly seven pounds. The researchers offered no possible reasons for this finding, but noted that other studies have reported similar as well as contrasting results.

The researchers noted what most producers already know, that intramammary amoxicillin may be beneficial in treating Gram-positive organisms such as environmental streptococci and coagulase-negative staphylococci, but of little value in treating Gram-negative (coliform) and fungal pathogens. Additionally, the best approach to use in treating clinical mastitis cases should be based upon culture results that are obtained within a timely manner (within 24 hours of sampling). This suggestion is the same approach to use in treating clinical cases that I reported on in the previous article I wrote.

I again encourage producers to establish a milk culture program (either with their veterinarian, a private or state lab, or set-up a culture lab on their farm) that will allow them to treat according to culture information. Rather than just routinely infusing all clinical mastitis cows, limit infusions to only the cases when the antibiotic may be effective. Greater profit and reduction in the use of antibiotics are likely benefits. Producers should discuss this mastitis treatment approach with their veterinarian, milk handler fieldman, extension agent, or other knowledgeable consultant.

**Early Mastitis Detection Is Important**

All dairy producers know that early detection of intramammary infections is important for selecting and implementing proper therapy. Unfortunately, most infections are not detected until they become clinical, and by then extensive and costly damage can result. About 2½ years ago I wrote an article about research that had looked at using the California Mastitis Test (CMT) on fresh cows as an early lactation screening tool for detecting subclinically infected quarters. Another cow-side somatic cell count (SCC) monitoring method is now available to help producers detect subclinical udder infections.
To use the California Mastitis Test (CMT), a sample of milk from each quarter is squirted into a four compartment paddle, a measured amount of blue reagent is added to the milk sample, and then the degree of gelling that occurs in the sample of milk is subjectively scored. While each test does not cost much to run, it has some limitations. Since only subjective ratings are made instead of obtaining actual SCCs, the CMT may not be accurate enough for some producers, and the CMT requires a small amount of time to conduct which can slow down parlor throughput. These limitations can be especially important in large herds.

The new cow-side screening method uses an electronic device that actually counts the somatic cells in the milk sample, thus providing an objective rating (rather than subjective as with the CMT). This testing method requires about the same amount of time to run as the CMT, and can be used just as the CMT to check the milk of all fresh cows on day 3 or 4 of lactation for early detection of subclinical udder infections. The electronic device can also be used for testing the milk from strings of cows or the bulk tank for somatic cell levels, checking the recovery status of treated quarters, checking cows at time of dry-off for udder infection status, or to periodically check the milk of every cow in the herd. (Having SCCs run on the entire herd through the DHIA program is another, and I think more preferable, way of obtaining monthly entire herd SCC information.) While the CMT can also be used in the ways listed, the electronic device should provide more usable information because it reports actual SCC numbers. Since the cost of the new electronic device and the supplies required for each sample test are considerably higher than for the CMT, the device may be more applicable for use in large herds in which the investment cost is spread over more animals.

Dairy producers need to continually monitor the udder health status of their cows. By using the CMT or a more accurate electronic device, timely on-farm udder infection information can be obtained quickly for use in making management decisions. Both methods can be effective management tools for helping producers realize more profit from their dairy business. I encourage producers to discuss early mastitis monitoring methods with their veterinarian, extension agent, milk handler field representative, equipment supplier or dairy consultant.

**Milk Somatic Cell Count Levels Trend Downward**

How has your herd’s monthly milk somatic cell count (SCC) values changed over the last few years? Have the values trended downward, upward, or stayed fairly flat? While there have most likely been seasonal changes, hopefully the overall trend has been downward.

Over the last 3 years the national SCC values reported by DHI show a gradual downward trend. For 2003, the average DHI herd SCC value was 319,000 cells/ml. The values have ranged from 304,000 to 322,000 between 1995 and 2002. The long term trend over these 8 years, however, has been for a yearly average increase of 1,700 cells/ml. Supporting the DHI SCC downward trend for the last 3 years is information from four federal marketing
orders which produce about 46% of the milk produced in the U.S. The data from those marketing orders for 1997 through 2002 shows a downward trend from 331,000 to 320,000. These values were weighted for amount of milk produced by herd from the 50,000 herds included in the data set.

North Carolina DHI herds have also shown a general downward trend in SCC values from year to year since 1995. Values in 1995 showed monthly weather related fluctuations that ranged from a low of 341,000 to a high of 533,000. Monthly values in the intervening years until the present have continued to show weather related fluctuations. Values for 2004 have ranged from 334,000 to 367,000. While these values continue to be above national DHI and marketing order values, they show that our state’s dairy producers are following the national downward trend and producing high quality milk for consumers.

So, how do your herd’s SCC values compare with the state and national values stated above? How closely do you monitor and use the SCC information you receive from either DHI, or your milk handler, or the state health department? Do you make herd management decisions based upon the milk quality information you have available to you? As a dairy producer, if you are not using the SCC information you receive to improve the quality of milk you are producing and selling, I suspect you are not maximizing the economic potential from your herd.

I encourage all dairy producers to review their management practices that affect udder health and the quality of milk produced. Involve your veterinarian, extension person, milk handler field representative, and other qualified consultants in your review process. Develop a mastitis management program for your herd that will help you attain the goals you and your team of consultants establish. Your herd’s profitability can be greatly affected.

**Take Another Look at Free Stall Bedding**

For years dairy producers have been told about the importance of keeping free stalls clean and well bedded. Dirty, poorly maintained stalls expose the teat ends of cows to a greater bacterial challenge, which often results in more mastitis. The type of bedding material used in the stalls has been an important consideration in reducing the population of bacteria that can cause mastitis, with most advisors recommending sand as the material of first choice. A research report published recently in the Journal of Dairy Science suggests that producers should perhaps take another look at the type of bedding material used in free stalls.

Environmental bacteria are the prevalent cause of udder infections in most dairy herds. These types of organisms are present in soil, manure, and bedding. The number present in the bedding depends on the type of material, the cleanliness of the stalls, the pH of the
material, and the moisture level of the material. People have generally contended that inorganic bedding (sand) is less supportive of bacteria growth than is organic bedding (wood products or straw). However, regardless of the bedding type, the cleanliness of the stalls can greatly affect the number of bacteria present.

Researchers at the University of British Columbia in Canada found that the predominant environmental bacterial populations in the bedding and on the teat ends of cows housed in free stalls varied by bedding type. Sawdust bedded stalls contained considerably more Klebsiella species and coliforms than did sand bedding. Additionally, there were 6 times more Klebsiella species and 2 times more coliforms on the teat ends of cows housed in stalls containing sawdust compared with those housed in sand bedded stalls. The correlation between the counts of these types of bacteria in the sawdust bedding and the counts on the teat ends was reported as being moderate.

While Streptococcus species bacteria counts were about the same in both sand and sawdust bedded stalls, there were 10 times more Streptococcus species bacteria on the teat ends of cows housed on sand versus those housed on sawdust. This finding does not agree with an earlier published research report. The correlation between the Streptococcus species counts in the sand bedding and on the teat ends was relatively weak, suggesting that the way teat ends become contaminated when cows use sand bedded free stalls is different. While the rear udders of the cows in the study were dirtier when the cows were housed in sand stalls compared to those of cows housed in sawdust stalls, the correlation between cow udder cleanliness and bacteria counts on the teat ends was not consistent. Teat cleanliness was not measured, so a correlation with bacteria types and counts on teat ends was not possible.

So, what does this study suggest to producers about the type of free stall bedding material to use to minimize the transfer of bacteria from the bedding to teat ends? To me it suggests that free stall cleanliness is still very important and should continue to be a high priority, regardless of the type of bedding material used. Clean stalls are a must for reducing udder infections. Sand bedding has some advantage over sawdust with certain types of bacteria, but sand also has some limitations. Besides maintaining clean stalls, teats must be clean at time of milking and proper milking procedures must be followed. There is not just one practice or product that will result in healthy, infection free udders. A total mastitis management program must be developed and followed. Producers should discuss this issue with their technical advisors.

### Environmental Mastitis

Environmental bacteria are the main type of pathogens causing mastitis in many dairy herds. While most producers know what they should be doing to minimize environmental mastitis in their herds, it can be helpful to periodically review recommended practices. In the proceedings of the 2004 regional meeting of the National Mastitis Council, faculty from the College of Veterinary Medicine at the University of Minnesota gave their suggestions for controlling environmental mastitis. They presented the following information.
Most critical factors to pay attention to:
1. keep cows’ udders, feet, legs, and flanks clean at all times
2. use consistent and effective pre-milking cow preparation procedures
   - completely cover the teat skin with pre-dip
   - have direct contact of teat skin with pre-dip (not over top of manure)
   - target teat ends for cleaning
   - have complete and thorough drying of teats prior to unit attachment
3. reduce levels of bacteria in bedding material
   - use adequate amounts of bedding material
   - for organic bedding: clean daily the back one-half of the stall and add fresh bedding to that area only. Do not move bedding from the front to the back of the stall.
   - for sand bedded stalls: groom and clean 3 times daily. Only groom (rake) 1-2 inches down). Ensure good air movement to facilitate drying.
4. scrape alleys 3 times per day – make sure cows do not walk through manure while going to or coming from the parlor
5. give close attention to dry cow housing, maintain bedding at least twice daily and make sure the animals have adequate nutrition

Other factors to give attention to:
1. consistent use of an approved teat dip for post-dipping – 80% of teat covered each time
2. have appropriate vaccination programs, including J5 core antigen vaccines
3. provide appropriate nutrition with vitamin E and selenium supplementation
4. proper use of teat sealant and barrier dips during the dry period
5. appropriate use of dry cow therapy
6. limit over crowding

Monitor these records:
1. bulk tank environmental bacteria counts – should be in the low range
2. clinical mastitis records
3. clinical cases and other individual cow culture information
4. cleanliness scoring of udders and cows

Producers should be able to focus their attention on prevention practices, rather than on treating environmental mastitis cases. A more economical approach to managing environmental mastitis should be realized by following the above listed guidelines. I encourage producers to discuss environmental mastitis management practices with their veterinarian, extension person, milk handler field representative, or other competent consultant.

What Milk Quality Practices Do You Use?

The quality of milk produced is a concern of all dairy producers. However, the practices used or followed on the farm to produce high quality milk sometimes do not get reviewed
and updated as often as needed. Dairy Herd Management magazine published in June 2004 the results of a survey it conducted of the various milk quality practices used by its readers. The questions asked and the responses received are reprinted below with the permission of the magazine.

1. Do you believe the U.S. should adopt a 400,000 somatic cell count standard to replace the 750,000 standard currently in place? Yes: 65.9%  No: 43.1%

2. What is your udder preparation procedure? Please mark all appropriate answers:
   Wiping: 88.3%  Post-dipping: 85.7%  Pre-dipping: 81.8%  Fore-stripping: 72.7%

3. How often do you check somatic cell counts?
   Daily: 38.5%  Weekly: 26.9%  Twice per week: 11.5%  Monthly: 11.5%
   Quarterly: 3.8%  Never: 7.7%

4. Where do you get your somatic cell count measurements?
   DHIA: 52.8%  Creamery/processor: 47.2%  Cooperative: 27.8%  On-farm parlor management system: 11.1%  Other (cmt, milk company, etc.): 8.3%

5. Do you provide Milk Quality and somatic cell count feedback to your employees?  
   Yes: 81.2%  No: 18.8%

6. When you find a substantial rise in somatic cell count, which do you do?
   Check more thoroughly for mastitis: 76%
   Check milking equipment: 62%
   Discuss with milkers to help identify the problem: 60%
   Check pre- and/or post-milking teat dipping and effectiveness: 52%
   Bring your management team together: 36%
   Call your veterinarian to investigate the problem: 22%
   Ignore it and hope it goes away: 8%

7. What type of mastitis and milk quality training tools do you use?
   Magazine articles: 64.7%  Mentoring by an experienced milker/manager: 52.9%
   Internet: 52.9%  Outside consultant: 29.4%  Video tapes: 17.6%  Brochures: 17.6%
   None: 17.6%  Posters: 11.8%

8. What percentage of your employees require training tools translated into Spanish?
   0-15 percent: 54.4%
   61-75 percent: 18.2%
   76-90 percent: 18.2%
   40-60 percent: 9.1%

9. How frequently do you perform regular maintenance and service on your milking equipment? Monthly: 29.5%  Quarterly: 27.3%  Weekly: 25%  Annually: 11.4%
   Less often: 6.8%  Daily: 4.5%

As a producer, how would you have answered the questions? How do your milk quality
practices compare with those found in the survey? What practices should you implement or modify to support your goal of producing the highest quality milk possible? Contact your extension dairy or agriculture agent, veterinarian, milk handler fieldman, or other competent consultant to discuss how you can do the best job possible of producing high quality milk.

**Monitoring Bulk Tank Milk**

A report in the October 2004 issue of the Journal of Dairy Science by an extension veterinarian group from the Department of Veterinary Science at Pennsylvania State University presented some interesting findings on the relationship between bulk tank milk somatic cell and bacteria counts. Additionally, the correlations between the various laboratory methods used to measure the bacteria counts in milk, as well as the correlations of the lab methods and the somatic cell counts were determined.

To conduct the study, bulk tank milk (BTM) samples from 126 dairy herds ranging in size from < 50 to >200 cows were sampled twice a month for two months. The somatic cell counts of all the milk samples (BTSCC) were measured. Bacteriological analysis of the milk samples were examined for standard plate count (SPC), preliminary incubation count (PIC), laboratory pasteurization count (LPC), coagulase-negative staphylococci (CNS) count, environmental streptococci (ES) count, coliform count (CC), gram-negative noncoliform (NC) count, and contagious mastitis pathogens (SA staphylococcus aureaus, SAG streptococcus agalactiae, and Mycoplasma). The effect of herd size and numerous management practices on somatic cell and bacterial counts were also examined.

A brief summary of the main findings is listed below.

- The paired correlation analyses between BTSCC and the different bacterial count methods listed above were all low (<0.37), suggesting that BTSCC can't be estimated by just looking at the bacterial analyses results from a bulk tank milk sample.
- The correlations from paired analyses between SPC and ES, PIC, CNS, and LPC were all >0.5, suggesting a fairly good relationship between the results from SPC when compared individually with each of the other test methods in measuring bacteria in milk.
- There was a low correlation (<0.5) between bacteria counts (CNS, ES, CC, and NC).
- The SPC and ES counts were significantly lower in BTM when cows received both pre- and post milking teat dipping.
- The BTSCC, SPC and PIC counts in BTM were significantly higher when teat dip was applied as a spray compared to when a dip cup was used.
- None of the management practices examined had any significant effect on the LPC in BTM.
- The CNS counts were significantly lower in BTM when cows were milked using automatic milk detachers, perhaps because those cows had less subclinical mastitis.
- BTSCC were the lowest in herds >100 cows.
- In most cases an increase in the SPC was associated with unclean udders before milking, poor teat and teat-end sanitation, improper cleaning and sanitation of the milking equipment, and improper cooling of milk.
- Herds that used sand as bedding had significantly lower BTSCC compared with herds
using organic bedding.

- Pre- and postmilking teat dipping reduced the number of environmental mastitis pathogens (CNS, ES), the number of thermoduric bacteria (measured by LPC), and the number of psychrotrophic bacteria (measured by PIC).
- The isolation rates in BTM of SA and SAG increased as the BTSCC values increased, and also as the number of times the BTM milk was sampled and examined for bacteria content. This suggests that caution must be used in interpreting the bacteria findings of BTM analysis when only one or two samples are taken.

This study supports previous studies that show the importance of sanitation and cleanliness in keeping BTSCC and bacteria counts low. As more attention is given to the practices that promote high quality milk, lower BTSCC and bacteria count milk is produced. Dairy producers should contact their Extension agent, milk handler field representative, veterinarian, or other competent consultant for herd specific suggestions for producing higher quality milk.

**Management Factors That Affect Herd SCC Values**

It is always interesting to read different research reports that have studied the effects of various dairy management practices on herd somatic cell counts (SCC). The results of another study conducted about 5 years ago in France were recently published in the Journal of Dairy Science. What made this report interesting to me was how low the SCC values were in the two groups of herds that were studied.

The researchers used DHIA records from 208 herds classified as having medium SCC values, and 326 herds with low SCC values. The SCC values were the averages from the 36 months prior to the study. Various management practices used by the dairymen were recorded through questionnaire surveys, and then statistically evaluated with the SCC values to see which practices might potentially explain why the SCC scores were what they were.

The mean milk SCC was 270,000 cells/ml for the 208 herds in the medium group, versus only 125,000 cells/ml in the 326 low group herds. There were 2.7 times more cows in the medium group herds with a monthly SCC value greater than 800,000 cells/ml than there were in the low group herds. Surveyed farmers declared that their present SCC levels had been stable for 7 years (5.2 years in the medium herds versus 8.1 years in the low herds). The SCC values for both the medium and low groups would be considered very acceptable by most U.S. dairy producers.

The results of the regression analysis of the answers to the management practices surveys with the herd SCC values showed that herds in the *low group* were associated primarily
with the following: 1) teat spraying was used regularly (teat dipping is preferred in the U.S.); 2) herdsman was precise in his techniques used at milking time; 3) use of disinfection before and use of teat dip after mammary infusion at dry off time; 4) heifers were kept in a calving pen around the time of parturition; 5) cows were locked in feed-line lockups after milking; 6) heifers were kept on a non-damp pasture; and 7) cows were culled when having at least one damaged teat.

These results should not be surprising, since they are all associated with reducing the bacteria load that the teat ends of both cows and heifers are subjected before freshening, both before and after milking, and at the time of dry-off. Herds in the medium group were associated with practices that were not as protective or helpful in preventing udder infections from occurring.

Dairy producers should not be content with their herd’s SCC values, unless they are already under 200,000/ml. Producers desiring a review of their management practices that can have an effect on herd udder infection level and SCC values should contact their Extension agent, veterinarian, milk handler field representative, or other knowledgeable consultant for assistance.
**Introduction**
Proper feeding and management of dairy calves and heifers will ensure that heifers are large enough to breed at an age that allows them to enter the milking string when needed. At NC State University, we have developed several complete feeds, including a calf starter; a self-fed total mixed ration (TMR) for 2 to 6 month old heifers; and a self-fed TMR for yearling heifers. The key ingredient in these rations is cottonseed hulls (CSH) that serve as the primary source of fiber. These rations have supported excellent growth and health while reducing labor expenses. Because cottonseed hulls are high in fiber, and low in energy, the cottonseed hull based TMR's can be self-fed, with ad libitum intake providing appropriate energy requirements.

**Nutrient Composition of Cottonseed Hulls**
The 2001 NRC lists the nutrient value of cottonseed hulls as 6.2% crude protein, 34.3% TDN and 64.9% ADF. Cottonseed hulls are an excellent source of "effective" fiber and can have the associative effect of increasing dry matter intake. As a byproduct of the cotton industry, hulls are normally available in the market, especially in the Southeast, and are easily transported and handled in bulk, but are not easily handled by auger systems.

**Evaluation of a Calf Starter with 15% Cottonseed Hulls:**
The development of a functional rumen is related to the intake of solid feed. A goal of conventional calf feeding programs is for the calf to increase intake of calf starter with age. The calf should be consuming enough starter at weaning to easily transition off of liquid feed. The starter should also stimulate rumen development. As part of a recent research study (S.R. Hill, NCSU Masters Degree Thesis), a calf starter was formulated that contained 15% cottonseed hulls. Calves received experimental treatments from birth through 63 days of age. The effects of feeding this starter on starter intake, growth, health measures and rumen development were compared to a standard calf starter with no cottonseed hulls. The ingredient composition of the two starters is shown in Table 1 and the nutrient composition is shown in Table 2.

It is important to formulate calf starter diets with enough protein. Notice that the cottonseed hull based starter fed in this study contained 18% crude protein. Starters should also contain vitamins, including B vitamins, appropriate mineral levels, and a coccidiostat.

**Results from the Calf Starter Study:**
Results from this study are presented in Table 3. Holstein calves fed the cottonseed hull based calf starter had significantly greater daily intakes of starter dry matter and fiber than calves fed the starter without cottonseed hulls. Calves fed the cottonseed hull based starter also had greater average daily body weight gains and lower fecal scores. Average daily gains were 1.32 and 1.19 pounds per day for calves fed the cottonseed hull based starter and those fed the starter without cottonseed hulls, respectively. Feed efficiency was lower for calves fed the cottonseed hull based starter because they had greater intakes.
Calves fed the cottonseed hull based starter weighed significantly more during weeks 7, 8 and 9 of the trial and had a final average body weight about 10 pounds greater than calves fed starter without cottonseed hulls.

**Table 1. Ingredient Composition of Calf Starter Diets (% of diet DM)**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Starter with CSH</th>
<th>Starter without CSH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cottonseed hulls</td>
<td>15.0</td>
<td>0</td>
</tr>
<tr>
<td>Corn grain, ground</td>
<td>54.6</td>
<td>64.2</td>
</tr>
<tr>
<td>Soybean meal - 48%</td>
<td>20.4</td>
<td>24.1</td>
</tr>
<tr>
<td>Soybean hulls</td>
<td>4.4</td>
<td>5.1</td>
</tr>
<tr>
<td>Dried cane molasses</td>
<td>3.4</td>
<td>4.1</td>
</tr>
<tr>
<td>Salt</td>
<td>0.47</td>
<td>0.56</td>
</tr>
<tr>
<td>Dicalcium phosphate</td>
<td>0.61</td>
<td>0.73</td>
</tr>
<tr>
<td>Calcitic limestone</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Vitamin-TM Premix</td>
<td>0.048</td>
<td>0.057</td>
</tr>
</tbody>
</table>

**Table 2. Nutrient Composition of Calf Starter Diets**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Starter with CSH</th>
<th>Starter without CSH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter (DM), %</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Crude protein (CP), %</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>Acid-detergent fiber (ADF), %</td>
<td>15</td>
<td>6</td>
</tr>
</tbody>
</table>

**Table 3. Calf Starter Intake, ADG, Feed Efficiency and Fecal Scores**

<table>
<thead>
<tr>
<th></th>
<th>Starter with CSH</th>
<th>Starter without CSH</th>
<th>P &lt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily DM intake, lb.</td>
<td>1.90</td>
<td>1.65</td>
<td>0.01</td>
</tr>
<tr>
<td>Daily CP intake, lb.</td>
<td>0.375</td>
<td>0.375</td>
<td>0.70</td>
</tr>
<tr>
<td>Daily ADF intake, lb.</td>
<td>0.265</td>
<td>0.088</td>
<td>0.01</td>
</tr>
<tr>
<td>ADG, lb.</td>
<td>1.32</td>
<td>1.19</td>
<td>0.02</td>
</tr>
<tr>
<td>Feed Efficiency*</td>
<td>0.65</td>
<td>0.71</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Score**</td>
<td>1.25</td>
<td>1.34</td>
<td>0.03</td>
</tr>
</tbody>
</table>

* ADG/DM intake  
** Based on a 1 to 5 score where 1= normal

**Self-Fed Cottonseed Hull Based TMR for 2 to 6 Month Old Heifers:**

We have also developed a self-fed TMR for post-weaned 2 to 6 month old heifers that contains 30% cottonseed hulls. This TMR was based on the original work done in this area by Dr. A.H. Rakes at NC State University. The formula for this TMR is presented in Table 4. This TMR can be fed through gravity-flow self-feeders so heifers have the feed available at all times. The level of 30% cottonseed hulls provides an amount of fiber which limits intake due to rumen fill and is low enough in energy content to avoid overfeeding of energy. Therefore with 30% cottonseed hulls and ad libitum intake, the heifer's energy needs for appropriate growth are met.

Before the weaned calves are removed from their individual hutch or pen, they are gradually changed over a period of about a week from the calf starter to the heifer TMR.
Calves are then moved into a small group lot where they have access to a gravity flow self-feeder for ad libitum access to the ration until about 6 months of age. Bloat or other digestive problems have not been noted. Nutrient intake is consistent and similar for all heifers in a group. The heifers are fed this TMR through a self-feeder and grow very well, while labor costs have decreased. As calves reach 6 months of age, they should be offered hay in addition to the TMR, or the amount of cottonseed hulls in the TMR must be increased to avoid too much weight gain.

Table 4. Self-Fed TMR for Post-Weaned Heifers 2 to 6 Months of Age

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Pounds per Ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground corn grain</td>
<td>986</td>
</tr>
<tr>
<td>Cottonseed hulls</td>
<td>600</td>
</tr>
<tr>
<td>Soybean meal - 48%</td>
<td>369</td>
</tr>
<tr>
<td>Calcitic limestone</td>
<td>18</td>
</tr>
<tr>
<td>Tricalcium phosphate</td>
<td>10</td>
</tr>
<tr>
<td>Plain white salt</td>
<td>10</td>
</tr>
<tr>
<td>Bovatec® or Rumensin® *</td>
<td>*</td>
</tr>
<tr>
<td>Vitamin- trace mineral premix *</td>
<td>*</td>
</tr>
</tbody>
</table>

* = Add according to manufacturers directions

Intake and Growth of Heifers fed a Cottonseed Hull Based TMR compared with Hay and Grain Fed Separately:
We conducted a study to compare the performance of 2 to 6 month old heifers fed a TMR containing 30% cottonseed hulls with heifers fed hay and grain separately. Both diets were formulated to contain 16% crude protein and 21.5% acid detergent fiber (ADF). The amount of grain offered in the hay and grain treatment diet was limited to a maximum based on the amount of grain consumed by calves fed the cottonseed hull based TMR treatment. Calves fed hay and grain separately tended to consume less grain even though it was available. The chopped grass hay in the hay and grain diet was offered free-choice. Feed intake on an as-fed basis; average daily gain; and feed efficiency are presented in Table 5. Feed efficiency was greater for calves fed the hay and grain separately. However, heifers fed the cottonseed hull based TMR had greater intakes and average daily gains than heifers fed the hay and grain diet.
Table 5. Average Daily Intake, Average Daily Gain and Feed Efficiency

<table>
<thead>
<tr>
<th></th>
<th>TMR with 30% CSH</th>
<th>Hay and Grain Fed Separately</th>
<th>P &lt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed intake, lbs.*</td>
<td>11.0</td>
<td>7.9</td>
<td>.03</td>
</tr>
<tr>
<td>Grain intake, lbs.**</td>
<td>7.6</td>
<td>6.2</td>
<td>.17</td>
</tr>
<tr>
<td>ADG, lbs.</td>
<td>2.44</td>
<td>2.15</td>
<td>.05</td>
</tr>
<tr>
<td>Feed Efficiency***</td>
<td>0.24</td>
<td>0.28</td>
<td>.02</td>
</tr>
</tbody>
</table>

*Average daily intake of the TMR or hay and grain diet on an as-fed basis
** Average daily intake of the grain portion of the diet on an as-fed basis
***ADG/Feed Intake

Advantages of Feeding a Self-fed Cottonseed Hull Based TMR to Heifers

At the Piedmont Research Station, we have observed several advantages to using a TMR that contains 30% cottonseed hulls for post-weaned 2 to 6 month old heifers including:

Consistent nutrition: This blended TMR is formulated for the correct nutrient balance and is always available to the heifers.

Competition among heifers is minimized: Since the feed is always available, the problem with boss heifers is minimized and each heifer can consume what she needs.

Uniform heifer growth: Nutrient intake is consistent. Feeding this TMR post-weaning helps to reduce the "growth slump" that often occurs when heifers are placed in a group feeding situation following weaning.

Average Daily Body Weight Gains: Heifers fed this TMR normally gain about 2 pounds per day. The level of cottonseed hulls in the diet can be adjusted to maintain the desired rate of gain.

Labor savings: This TMR is mixed about once per week and placed in the covered gravity-flow self-feeder. This eliminates having to mix and deliver feed to the heifers every day which saves a large amount of labor.

Development of a Cottonseed Hull Based TMR for Yearling Heifers:

We have also developed a cottonseed hull based TMR for yearling dairy heifers. Examples of two TMR formulas that can provide excellent results are shown in Table 6. Formula 1 contains dried brewers grains while Formula 2 contains soybean meal.

Notice that cottonseed hulls comprise 75% of these diets. Heifers fed these TMR’s should average about two pounds of daily body weight gain. In addition, because of the increased dry matter intake associated with feeding cottonseed hulls, ration crude protein levels in these TMR’s for yearling heifers have been reduced to about 9% without affecting desired growth rates.

Since these rations in Table 6 contain 75% cottonseed hulls, they are very bulky and will not flow readily though conventional gravity-flow feeders. However, they can still be self-fed to heifers through a covered feeder where the heifers have free-choice access to the TMR. Supplemental pasture and/or hay for these yearling heifers is recommended.
Table 6. Two Self-fed Cottonseed Hull Based TMR for Yearling Heifers

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Formula 1</th>
<th>Formula 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cottonseed hulls</td>
<td>1500</td>
<td>1500</td>
</tr>
<tr>
<td>Corn grain, ground</td>
<td>98</td>
<td>325</td>
</tr>
<tr>
<td>Soybean meal - 48%</td>
<td>0</td>
<td>150</td>
</tr>
<tr>
<td>Dried brewers grains</td>
<td>380</td>
<td>0</td>
</tr>
<tr>
<td>Dicalcium phosphate</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Plain white salt</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Calcitic limestone</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Vitamin - TM Premix</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Rumensin® or Bovatec®</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

* = Add according to manufacturer's directions

Cottonseed Hull Based TMR for 6 to 12 Month Old Heifers:
High cottonseed hull based diets have not yet been developed for this age group. This is a period where the amount of cottonseed hulls needs to be transitional from 30% up to 75% of the ration so that ad libitum intake of the TMR provides proper amounts of energy.

Summary:
The key ingredient in these diets is cottonseed hulls that are high in fiber, and low in energy. The cottonseed hull based TMR's can be self-fed, with ad libitum intake providing appropriate energy requirements. In our studies, a calf starter with 15% cottonseed hulls increased intake and average daily gains in preweaned calves. We also found that a self-fed TMR that contains 30% cottonseed hulls provides consistent nutrition and growth for 2 to 6 month old heifers while reducing labor expenses. In addition, excellent growth rates in yearling heifers have been obtained by feeding rations containing 75% cottonseed hulls. Consider including cottonseed hull based TMR's in your calf and heifer feeding management program.
Highlights from the 2004 North Carolina 4-H Dairy Youth Program
by
Dr. Brinton A. Hopkins
Professor and Extension Dairy Specialist

North Carolina Dairy Youth Foundation Provides Funding Support:
The funding provided by the North Carolina Dairy Youth Foundation for statewide 4-H Dairy Youth Program activities and many statewide FFA dairy activities fills a critical need and is greatly appreciated. This funding support is what makes these opportunities possible for North Carolina youth.

2004 North Carolina State 4-H Dairy Judging Team:
Congratulations to the 2004 North Carolina State 4-H Dairy Judging Team for an outstanding judging season. Team members were: John Hoffner (Rowan County); Erin Morgan (Forsyth County); Drew Pressley (Haywood County) and Holly Parkins (Haywood County). Ken Vaughn, County Extension Director in Iredell County, and J. D. Brooks, volunteer from Alleghany County, served as coaches.

As in past years, we traveled to Maryland and joined other teams in on-farm practice sessions on the way to the contest in Harrisburg, PA. Unfortunately, while we were at the last practice session in Maryland, we received word that the officials at Harrisburg, PA had canceled their contest and the All-American show because the Pennsylvania Farm Show Building was flooded due to the hurricane. So, instead of heading north to Pennsylvania, we returned to North Carolina that Saturday night.

The following week, the team competed at the National 4-H Dairy Judging Contest held at the World Dairy Expo in Madison, Wisconsin. They placed 8th in total overall score and 14th in total reasons score out of 30 U.S. teams.

2004 North Carolina Alternate State 4-H Dairy Judging Team:
Congratulations to the following youth who earned positions on the 2004 Alternate State 4-H Dairy Judging Team. Team members were: Megan Mann (Alamance County); Brittany Thompson (Alamance County); Travis Cate (Alamance County); and Travis Anderson (Iredell County). Coaches were Ken Vaughn, J. D. Brooks, and Robin Mann, volunteer from Alamance County. At the North American 4-H Dairy Judging Contest held in Louisville, Kentucky, our alternate state team placed 12th in total overall score and 9th in total reasons score out of 21 teams.

2004 State 4-H Dairy Quiz Bowl Team:
Congratulations to the 2004 State 4-H Dairy Quiz Bowl Team. Team members were: Erin Morgan (Forsyth County), Brenda Crouse (Alleghany County), Travis Anderson (Iredell County), and Landon Hunter (Yadkin County). The team was coached by Nancy Keith, Area Specialized Dairy Agent. At the North American 4-H Dairy Quiz Bowl Contest in Louisville, KY, our North Carolina state team competed very well and finished among the top teams.
**National 4-H Dairy Conference:**
Congratulations to Catherine Mitchell from Alamance County and Jessica Sillmon from Randolph County who were selected, through an application/interview process, to represent North Carolina at the National 4-H Dairy Conference held at the University of Wisconsin-Madison.

**2004 Dairy Category 4-H Cumulative Records Winners:**
Congratulations to Katie McCain from Randolph County for winning the State Gold Medal and Kerri Beth Frazier from Randolph County for winning the State Silver Medal in the 13-15 age group. Aaron McCain from Randolph County won the State Gold Medal in the 16-18 age group.

**Southeastern Dairy Youth Retreat:**
North Carolina, Virginia, South Carolina, Georgia and Florida cooperate in this multi-state educational retreat for youth. North Carolina 4-H youth participated in the Southeastern Dairy Youth Retreat held in Virginia in 2004. The 2005 retreat will be held in South Carolina.

**District Junior Dairy Shows:**
District Junior Dairy Shows were held in Statesville, Greensboro, Central Carolina, Northwest and Western districts. Youth exhibited their animals at these 5 district junior dairy shows across North Carolina as well as the junior dairy show at the state fair.

**4-H Dairy Skillathon Contest:**
The 4-H Dairy Skillathon Contest is new activity that was held for the first time in 2004. It is designed to help youth learn more about our dairy industry. Youth compete as a member of a team or as individuals in a fun and interesting contest format that includes identification of dairy products; identification of feedstuffs; identification of milking and dairy equipment; evaluation of forage samples; evaluating and judging dairy cattle; and problem-solving.
Effects of Milk Feeding Period and Anthelmintic Treatment on Fecal Egg Counts and Growth in Pastured Dairy Steers

B. M. Thompson¹, S. P. Washburn¹, J.-M. Luginbuhl¹, B. A. Hopkins¹, H. M. Glennon¹, C. Brownie², ¹ Department of Animal Science, ² Department of Statistics, North Carolina State University, Raleigh.

For more information, contact Steve_Washburn@ncsu.edu

A 2 x 2 factorial trial with 2 phases was conducted to evaluate the effects of weaning age (6 wk vs 12 wk) and anthelmintic treatment (none vs dewormed) on fecal egg counts and weight gains in 36 Holstein and Jersey x Holstein crossbred steer calves (Table 1). Calves were born in Fall 2003 (Oct-Nov) and Winter (Dec-Feb) of 2003-2004 at the Center for Environmental Farming Systems (CEFS) in Goldsboro, NC. Steers were assigned to the 4 treatment groups of 9 calves each and balanced by birth weight and breed composition (25, 50, 75, or 100% Holstein).

For 1 to 2 weeks after birth, calves were individually fed whole milk at 1 gallon/head/day while in calf hutches until they were readily consuming the milk. Then, calves of similar age were managed together in pastures regardless of treatment and group-fed 1 to 2 gallons of whole milk per calf per day in troughs until respective weaning times at 6 or 12 weeks of age. A calf starter was provided while the calves were still receiving milk and a growing ration supplement was provided after weaning to complement pasture or hay being consumed.

Table 1. 2x2 Factorial arrangement of treatments

<table>
<thead>
<tr>
<th>Deworm Treatment</th>
<th>Weaning Age (weeks)</th>
<th>6 weeks</th>
<th>12 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (+)</td>
<td>9 calves</td>
<td>9 calves</td>
<td></td>
</tr>
<tr>
<td>None (-)</td>
<td>9 calves</td>
<td>9 calves</td>
<td></td>
</tr>
</tbody>
</table>

Phase 1 (P1) extended from birth to July 15, 2004 and included the spring parasite season. Phase 2 (P2) started on July 15 and ended on Nov 18, 2004 and included the fall parasite season. Dewormed calves received 1mL ivermectin/10kg BW (in the form of an ivermectin pour-on formulation) at 12 and 20 weeks of age in Phase 1. The same treated calves were also dewormed again in Phase 2 on July 15 and September 23, regardless of age.
Fecal samples and body weights (birth to Nov 18, 2004) were taken from each calf at 4-wk intervals. Fecal egg counts (FEC - Table 2), body weights (Table 3), and average daily gains during both phases separately and combined were compared among the following variables: deworm, wean age, percentage Holstein, birth season, and interactions among those variables.

Although fecal samples were analyzed for parasites from each calf starting at 4 weeks of age, parasite eggs were not detected until April. These results are logical when one considers that the most prevalent times for cattle parasites, namely Ostertagia ostertagia, are in the spring and fall. Fall-born calves would not have had sufficient exposure to pasture contaminated with parasite larvae to get infected during the fall. Fecal egg counts were also lower (P<.001) in dewormed calves after July and September treatments. The deworming effect of ivermectin based on lower fecal egg counts actually persisted for 8 weeks after the July treatment, which may be a better guideline for deworming pasture-based calves. Fall-born calves usually had lower (P < 0.05) fecal egg counts than Winter-born calves which suggests the possibility of increasing resistance to parasite as calves age.

Average daily gains during Phase 1 were higher (P < 0.01) for fall-born calves. In Phase 2 from July to November, dewormed calves actually had a higher ADG (P < 0.05) than non-dewormed calves. Gain across P1 and P2 were higher in Fall-born calves and tended to be higher (P = 0.06) in calves weaned at 6 wk. Gains and body weight generally were higher with increasing %Holstein.

Although steers that were not dewormed had higher fecal egg counts and differing daily gains during parts of the trial, their overall performance was similar to calves that had received 4 doses of ivermectin. These results are encouraging for the possibility that dairy animals could be raised in North Carolina without use of synthetic anthelmintics. Such findings could lead to the possibility of organic dairy and dairy-beef production in North Carolina and elsewhere in the southeastern US.
Table 2. LS Mean fecal egg counts (FEC) from April 1 until November 18.

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Deworm Weanage*Deworm Birth Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 1-April 22</td>
<td>2a 20b 3 11 0 29 19c 2d</td>
</tr>
<tr>
<td>April 29-May 20</td>
<td>34 39 30 48 37 34 50a 2b</td>
</tr>
<tr>
<td>May 27-June 17</td>
<td>80 61 92 66 68 55 87 53</td>
</tr>
<tr>
<td>June 24-July 15</td>
<td>256 377 309ab 229ab 203a 526b 252 381</td>
</tr>
<tr>
<td>Phase 2</td>
<td></td>
</tr>
<tr>
<td>July 15*</td>
<td>397 529 488ab 359ab 305a 698b 437 489</td>
</tr>
<tr>
<td>July 29</td>
<td>87a 362b 115 291 59 432 138a 311b</td>
</tr>
<tr>
<td>Aug 26</td>
<td>102a 224b 111 229 93 220 100a 226b</td>
</tr>
<tr>
<td>Sept 23*</td>
<td>272 200 264 164 280 237 308a 164b</td>
</tr>
<tr>
<td>Oct 21</td>
<td>100a 515b 103 436 97 593 166a 448b</td>
</tr>
<tr>
<td>Nov 18</td>
<td>84a 212b 86 159 82 264 82a 213b</td>
</tr>
</tbody>
</table>

All FEC values reported in eggs per gram (epg). Significance: a vs b = P-value < 0.05, c, c vs d = P-value < 0.10.

*Represent days on trial when treated calves were dewormed. Treated calves were also dewormed at 12 and 20 weeks of age.

Table 3. LS Mean Weights (pounds) at birth, July 15, and November 18.

<table>
<thead>
<tr>
<th>Deworm</th>
<th>Wean Age (weeks)</th>
<th>Breed (% Holstein)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Birth</td>
<td>78.1</td>
<td>77.7</td>
</tr>
<tr>
<td>July 15</td>
<td>405.1</td>
<td>414.9</td>
</tr>
<tr>
<td>Nov 18</td>
<td>536.4</td>
<td>519.2</td>
</tr>
</tbody>
</table>

All values reported in pounds of body weight
Significance: a vs b = P-value < 0.05, c vs d = P-value < 0.10
Pest Management Using Push-pull Strategies to Control Horn Flies in Pastured Dairy Heifers and Steers

D. W. Watson¹, M. H. Poore², S. P. Washburn², J. P. Mueller ³ and E. Lastro¹
¹Department of Entomology, ²Department of Animal Science, and ³Department of Crop Science, NCSU

In integrated fly management the need to conserve beneficial arthropods often requires the use of creative pest management strategies. Developing a sustainable pest control program may employ a push-pull strategy that uses repellants, attractants, antifeedants, pheromones, and trap crops (Pickett et al. 1997). These strategies are used to manipulate the target pest to achieve management goals.

To better understand the push-pull concept of fly management, we used Neem, a repellant/antifeedant and Ivermectin to manage horn flies in pastured dairy heifers and steers. One animal in a group of six was designated as the trap animal and was treated with ivermectin. A different animal was selected as a trap animal every 2-weeks. At 2-week intervals the remaining 5 animals were treated topically with 250 cc of 2% azadiractin (Neem) applied to each side of each animal (500 cc/animal). A separate control group was left untreated through the study period.

Repellency effects of 2% Neem on the horn flies was immediate. Abandoning flies sought alternate hosts and were observed swarming the ivermectin-treated animal. Lasting repellency was not observed and the fly densities gradually increased on all Neem-treated cattle between treatment dates.

Mean horn fly densities on the control group (917 ± 196) were significantly greater than the treated group (269 ± 88) during the 8-week test, F = 10.10, df = 1, 12, P = 0.009). Horn fly densities were reduced to below 50 flies per animal by week 7 as shown in Figure 1.

Although these results may have promise as a horn fly control strategy this may have a negative impact on dung beetles. For example, the presence of ivermectin in cattle manure may attract dung beetles (Wardhaugh and Mahon 1991, Lumaret et al. 1993). These and other researchers also observed no apparent attraction among some dung beetle species (Holter et al.1993, Floate 1998). Conflicting evidence of dung beetles displaying repellency/attraction behaviors to treated manure suggests the impact of ivermectin on dung beetles is unresolved requiring further study (Floate 1998). Factors limiting the distribution of dung beetles in NC are not clear but likely involve a complex of chemical events influencing beetle behavior.
Figure 1. Comparison of untreated control to combined Neem/Ivermectin pour-on for the management of the horn fly, *Haematobia irritans*.

**References:**


Dairy Research and Extension Activities at NCSU - An Update
Dr. Lon Whitlow and Dr. Geoff Benson
Extension Specialists, NCSU

The states total milk production in 2004 was 1,006 mil. lb. This production came from 56,000 cows on approximately 360 dairy farms. A typical dairy farm in North Carolina had approximately 160 milk cows, on average.

The Department of Agriculture sold two of the four research herds that are managed for research use by NCSU. Remaining are the research herds at the Center for Environmental Farming Systems at Goldsboro and the Piedmont Research Station at Salisbury, plus the NCSU owned herd in Raleigh. The veterinary college also maintains a 20 cow dairy on site.

A statewide Dairy Success effort initiated in 2003 is continuing as a coordinated, multifaceted educational program to meet the needs of the North Carolina dairy industry to be competitive and sustainable. This includes partnerships with industry representatives to deliver subject matter information and to provide technical assistance through the state dairy conference, milk quality conference, five area conferences, newsletters, and other delivery methods. Support is provided in part by the NC Dairy Foundation. Programs for NC dairy youth continue to be very strong with substantial support from the NC Dairy Youth Foundation. Emphasis has been placed on silage management, reproduction, management of replacements and biosecurity. Committees working under the authority of the state veterinarian are active in the areas of Johne’s Disease, BSE and biosecurity. A biosecurity manual was developed by Dairy Extension, sponsored by the North Carolina Dairy Producers Association and distributed by the milk cooperatives.

Efforts are being made to assist producers interested in value-added products. There has been significant cooperation with the Food Science Department to develop training programs for on-farm processing of dairy products. A program was held in November, 2003 for agent training and for introduction of the concepts to dairy producers. Another on-farm processing program was conducted by the Food Science Department for 25 producers in April, 2004. Because of the great interest at that time, a follow-up cheesemaking shortcourse was conducted in December for 14 prospective cheese makers. That shortcourse conducted by the Food Science Department was designed to convey the basic concepts of Farmstead cheese production including basic sanitation and milk processing, basic and cheese microbiology, hands-on cheesemaking and packaging / labeling issues. Of 14 participants in that cheese-making shortcourse, 6 plan to be making cheese from cow's milk or goat's milk within the next year and the other participants are seriously considering starting into cheese-making enterprises. The NC Department of Agriculture and Consumer Services is assisting with these efforts by loaning milk pasteurizers to producers for one year to help producers interested in making value-added products. In addition, there have been inquiries about possibilities for organic dairy production in NC and a few producers have been provided information to help them determine if transitioning to organic is a viable option for their farms. Educational efforts continue with dairy processing plants and others in the food chain to keep them informed of FDA sanitation regulations, food safety and quality issues. Work on strategies to rear dairy calves
organically have been initiated through funding from the Cooperative Extension IPM program.

NCSU is participating in a regional and national project: "Genetic Selection and Crossbreeding to Enhance Reproduction and Survival of Dairy Cattle." As part of the project, a long-term dairy crossbreeding study using Jerseys, Holsteins and reciprocal crosses has begun in collaboration with Virginia Tech and the University of Kentucky.

NCSU is collaborating with Virginia Tech and Clemson on a multi-year project: An evaluation of pasture-based dairy systems to optimize profitability, environmental impact, animal health, and milk quality. This work is funded through the USDA SARE program and is based at the Center for Environmental Farming Systems in Goldsboro, NC. Student internships are available for an 8-week summer session or at other negotiated times associated with this project.

Work continues to characterize the occurrence of mycotoxins, their effects on dairy cattle, ways to prevent their occurrence and methods to prevent toxicity when they are present in dairy cattle feeds. Current work in cooperation with Texas A&M University is aimed at regulatory approval of preventative products for commercial use as feed additives.

Nutritionists are studying microbial fermentation in the rumen to increase nutrient utilization by the animal, reduce the amount of waste and minimize negative impact on the environment. They are also investigating the impact on metabolism, performance and health of supplementing rumen-protected forms of betaine, choline and methionine in diets of lactating dairy cows with limited methionine. This work will help define the role, interactions and requirements of these nutrients. Other nutrition projects have also been conducted to evaluate effect of diets on milk composition. Projects are also being conducted to a) look at altering milk composition to increase its nutritional value to consumers, and b) address a systems approach to supplementing with total mixed rations with limited pasture as feeding systems for lactating dairy cows.

With the calf, nutritionists are investigating the effect of supplementing lactoferrin to early-weaned Holstein calves on growth and health during the milk feeding and post-weaning periods. Lactoferrin is an iron binding glycoprotein found in milk that has antimicrobial and therefore may improve calf health and growth while reducing days on medication.

Research is showing that mastitis not only causes a decrease in milk production, but that the disease state directly impacts reproductive processes of dairy animals. Cows with clinical mastitis have increased days open (not pregnant), increased days until first estrus, and increased number of inseminations for pregnancy to be achieved. A bacterial challenge model has been developed to induce Strep. uberis mastitis in lactating dairy animals. Research efforts, using this model, are aimed to delineate mechanism by which clinical infection and other stressors negatively impact ovulation and pregnancy. Treatments to decrease the negative luteolytic effect of bacterial mastitis pathogens may help maintain better reproductive performance.
To better understand the effects of heat stress on reproduction and lactation researchers are examining the effects on hormonal patterns and investigating possible benefit of supplemental progesterone on reproductive performance.

NCSU has established with Cornell University a collaborative project to develop and implement a cost effective pasture fly management program with widespread utility throughout the eastern US. Funded through the USDA CSREES Crops at Risk program, this three-year project seeks to identify reliable, effective, non-pesticidal, alternative pasture fly management technologies for producers.

Dairy Records Management Systems (DRMS), Lancaster DHIA, Dairy One, and National DHIA are participating in a cooperative agreement administered by the Pennsylvania Department of Agriculture to develop a system that electronically captures and transfers farm premises and animal identification utilizing RFID. The Pennsylvania agreement is one of 29 to receive funding from the USDA as part of an initiative to advance the National Animal Identification System (NAIS). Their web site at www.drms.org/ can be accessed for further information and other programs.
**North Carolina Dairy Foundation Grants for 2004-2005 to Department of Animal Science Faculty: Interim Reports**

**PROJECT:** (Continuation) Travel and Operating Funds Support for Administration of the North Carolina 4-H Dairy Youth Program - Dr. Brinton Hopkins - awarded $2,043

**Interim Report:** These funds provided travel and operating support for the State Dairy Extension Specialist or his designate to administer the statewide 4-H Dairy Youth Program in 2004. Activities included: dairy cattle judging, district junior dairy shows, dairy quiz bowl, Southeastern dairy youth retreat, 4-H dairy cumulative records, National 4-H Dairy Youth Conference, and other 4-H dairy events and activities.

These funds are critically needed because, as outlined in the bylaws of the NC Dairy Youth Foundation, funds from the NC Dairy Youth Foundation are not to be used for specialist’s support or travel or for administration costs of program activities. In addition, because of budget cuts, there were limited travel funds from the Department of Animal Science for the State Dairy Extension Specialist to use to administer this program in 2004.

**PROJECT:** Assistantship support: The Ability of Rumen-protected Methionine and Methyl Donors to Affect Ketosis and Lactation Performance in Early Lactation Holstein Cows - Dr. Brinton Hopkins - awarded $20,300

**Interim Report:** This experiment was conducted at the Piedmont Research Station in Salisbury, NC from September 2003 through November 2004. The objective was to investigate the impact of supplementing rumen-protected forms of betaine, choline and methionine to diets with limited methionine content on performance and metabolism of early lactation Holstein cows. From 28 to 91 days in milk, eighty Holstein cows received one of four experimental diets. Treatments were assigned randomly at calving within either primiparous or multiparous blocks. All cows received the same TMR formulated to meet all NRC (2001) requirements, but the Met content was limited so that the TMR supplied approximately 47g Met and 171g lysine (lysine to Met ratio of 3.7:1) according to the Mepron Ration Evaluator (Version 2.6). Four supplements that contained equal amounts of fat were blended into the Met-limited TMR to produce four treatments: 1.) control supplement (fat only), 2.) rumen-protected methionine (20 g/d Met), 3.) rumen-protected betaine (45 g/d betaine), or 4.) rumen-protected choline (40 g/d choline). Daily feed allocation and orts were recorded for each cow. Body weights and body condition scores were recorded weekly. Blood was collected every three weeks and will be analyzed for urea nitrogen, nonesterified fatty acids, cholesterol, lipoproteins, triglycerides, β-hydroxybutyric acid, and acetoacetate. Milk samples were collected weekly and will be analyzed for milk fat, milk protein, milk urea nitrogen, betaine and choline. Feed samples were collected weekly and will be analyzed for DM, CP, NDF, ADF, NSC, protein fractions, minerals, amino acids, choline, and betaine.

The information gained from this project will be used to help define the role of betaine and choline in methionine (Met) metabolism. In particular, it is intended to help determine if supplementing either choline or betaine to limited methionine diets can result in similar milk yield and composition when compared to supplementing methionine to limited methionine diets.
**PROJECT:** Continuation Study of Mycotoxin Occurrence, Effects, Prevention and Treatment in Dairy Herds - Dr. Lon Whitlow - awarded $5,000

**Interim/Final Report:** This final report will provide an overall summary of the mycotoxin project to date. At the time when this project began, there was little or no data suggesting that mycotoxins were of much concern for dairy cattle. Most specialists believed that cattle were fairly immune to mycotoxins. The first indication of mycotoxin concerns in North Carolina dairy herds began with the identification of herds with atypical symptoms where management, nutrition and veterinary care were acceptable and yet herds were struggling to reach average levels of milk production and/or had a high incidence of disease. A large proportion of these herds had feeds that were positive for mycotoxins and this suggested the possibility that mycotoxins were related with these observed performance problems. Follow-up surveys of 300 herds confirmed this idea when deoxynivalenol (DON) was significantly correlated with losses in rolling herd average milk production. Individual feeds analyzed for mycotoxins over the subsequent years have shown an association of mycotoxins with problems existing on individual farm operations. Treatment of the cows with effective feed additives has resulted in numerous positive results. Analyzes of feeds over the years has provided us with a unique data set indicating that mycotoxin contamination of feeds is routine, but varies by year (weather) and by type of feedstuff. Our data set tells us that fumonisin occurs primarily in corn grain or silage. Aflatoxin occurs more commonly in corn than in other dairy feeds, but can occur in a variety of feedstuffs. DON and T-2 occur at similar frequency and concentrations in a variety of feeds. Controlled experiments at both the Piedmont Research Station (PRS) and the Lake Wheeler Road Dairy Educational Unit (LWRDEU) have provided data identifying the toxicity of individual mycotoxins and data on use of feed additives as a method for treating toxicity or preventing milk residues. In one experiment, moldy cottonseed expected of causing reproductive problems on a beef cattle operation was acquired and then fed to breeding age dairy heifers in comparison to clean cottonseed. Pregnancy rate was reduced with the moldy cottonseed and it was associated with abortions. In another study, breeding age dairy heifers were fed hay contaminated with low levels of zearalenone (500 ppb). The study was repeated at the PRS and LWRDEU with similar results showing an increase of 0.5 services per pregnancy. Zearalenone has also been associated with mammary gland enlargement (fluid accumulation) in our case studies. Our research has showed that cows consuming deoxynivalenol contaminated diets produced significantly more milk when mycotoxin absorbants are added to the diet. DON at levels as low as 700 ppb also tends to reduce weight gain in dairy heifers. Ours is the first dairy cow study to look at effect of fumonisin on performance. Our work showed that fumonisin at 100 ppm in the diet reduced milk production by over 20%. Fumonisin was associated with lower feed intake, and also with mild liver damage indicated by increases in enzyme concentrations in the blood.

Our research with mycotoxin binders has shown that in vitro methods of evaluation of binders does not predict their effectiveness in vivo. We have shown that mycotoxin binders are effective at treating problems and are particularly valuable in reducing aflatoxin concentrations in milk. Many different clay type feed additives bind aflatoxin, but sodium based clays may be better binders than calcium based clays. Certain organic polymers...
such as beta-glucans are excellent mycotoxin binders that function at very low rates of dietary inclusion. In our work, activated carbons were not effective mycotoxin binders.

This year we have assisted in the analyses of feeds from the flood stricken areas of Western North Carolina, to determine the toxic potential of damaged feedstuffs. We are presently working on two cooperative studies. The first is a study with the University of Delaware looking at the potential for various silage treatments to reduce the mycotoxin levels in silage. The second cooperative study is with Texas A&M University in which we are evaluating eight different mycotoxin binders for their potential to reduce aflatoxin residues in milk. The results of this study is intended to be used by the Texas Department of Agriculture in evaluation of products for approval of claims as approved feed additives in Texas.

This work at North Carolina State University has provided the leadership for an emphasis on mycotoxin management on dairy farms throughout the country and internationally.

**Potential Scientific, Economic, and/or social impacts:** This work has led the nation in the understanding of mycotoxin effects on dairy cattle. It has contributed to development of better prevention and treatment of mycotoxicoses. In North Carolina it has been estimated that mycotoxins reduce dairy profitability by many millions of dollars yearly. This project has helped the dairy industry to reduce this cost and to be more competitive. Reduction in aflatoxin contamination of milk helps insure a safer food supply, helps to retain a wholesome image for milk, and reduces a heavy economic burden to those dairymen who lost milk because of a contamination problem.

**PROJECT:** Identification and Mapping of Genes Affecting Disease Resistance and Reproduction on Bovine Chromosome 18 - Dr. Melissa Ashwell - awarded $13,400

**Interim Report:** Bovine chromosome 18 has been reported to possess genetic loci affecting somatic cell score (related to mastitis incidence), daughter pregnancy rate, stillbirth and dystocia, milk yield, milk protein yield and milk fat yield. The genetic map of this chromosome is approximately 84 cM long, but reports place the putative quantitative trait loci (QTL) between 40-84 cM on the map. Mapping studies in the U.S. identified several QTL on this chromosome that appear to segregate in one popular U.S. Holstein bull.

In the previous study, six DNA markers were evaluated in this popular bull. To date an additional thirteen DNA markers have been selected from this chromosome to help refine the locations of the genes responsible for the observed effects on productive life, somatic cell score and daughter pregnancy rate. All available descendants of this popular Holstein bull were obtained from the Dairy Bull DNA Repository and the Cooperative Dairy DNA Repository. Semen was acquired and DNA extracted from 914 male descendants. Nine microsatellite markers located throughout the length of the chromosome have been genotyped in this family. Sons of the original sire as well as six grandson and six great-grandson families were selected from this complex pedigree.

To date only a preliminary regression interval analysis has been completed. Analysis of the sons’ genotypes detected a QTL affecting daughter pregnancy rate at 58 cM. Analysis across all the son, grandson and great-grandson families detected a putative QTL affecting
productive life at 32 cM but no significant QTL was detected affecting daughter pregnancy rate. Analysis of the individual families identified ten putative QTL affecting somatic cell score, milk yield and milk protein yield. These results are preliminary and additional analysis is required.

Evaluation of five additional DNA markers is ongoing. After genotyping is completed in the 914 individuals, a more complex analysis, including linkage disequilibrium methods, will be conducted.

In addition, the first draft of the bovine genome sequence was recently released. Sequence data from bovine chromosome 18 and the comparable regions of the human and mouse genomes are being examined to identify any positional candidate genes. If any likely candidates are identified, each will be sequenced and evaluated for mutations that may explain the differences observed in daughter pregnancy rate, somatic cell score, or the milk traits.

**PROJECT:** Continuation of Support to Produce Quarterly A Dairy Extension Newsletter - Dr. Don Pritchard - awarded $2,300

**Interim Report:** Two of the quarterly newsletters have been published and distributed to about 630 individuals. Printing and mailing costs have amounted to about $825, while the costs of production and distribution supplies, etc. have been about on budget. With mailing costs continuing to increase, we anticipate that the balance of the grant will be spent on producing the remaining two issues. The two issues published have contained subject matter articles, youth program activity reports, announcements of future dairy meetings, and an update report of the activities of the North Carolina Dairy Producers Association from its president. The remaining two issues to be published in March and June will contain similar types of articles.

**PROJECT:** Continuation of Support for Making Dairy Farm Visits and Conducting Other Educational Activities - Dr. Don Pritchard - awarded $3,000

**Interim Report:** Grant support for dairy extension educational activities so far this fiscal year has been for the expenses associated with conducting two quarterly industry and agent update inservice meetings, conduct five area dairy educational meetings, provide individual counseling to several producers at their farms, and support the production of a Dairy Farm Security Resource Materials Manual. For the balance of this fiscal year, the grant will be used to provide on-farm/on-site council as requested, support additional inservice training opportunities for agents and specialists, and provide resource materials to producers, industry representatives, and agents as requested.
North Carolina Dairy Producers Association
Officers and Directors for 2004

Officers and Directors

President
Norman A. Jordan, Jr., Siler City, North Carolina 27344

Vice President
Leigh Lane, Blanch, N. C. 27212

Secretary
Reid Smith, Lexington, NC 27929

Treasurer
Neal Gross, Harmony, NC 28634

Tern Ends February, 2005:
Fenton Covington
Neal Gross
Leigh Lane
Wayne Lutz
Dr. Ben Shelton

Tern Ends February, 2006:
Darryl Fullam
Doug Holland
Norman A. Jordan, Jr.
Dennis Leamon
Susan Proctor

Tern Ends February, 2007:
Jeff Bender
David Coltrane
Bobby Gambill
Linda Poovey
Reid Smith

Ex-Officio Directors
Dr. Geoff Benson
Dewitt Hardee
Chester Lowder
Dr. Lon Whitlow
The North Carolina Dairy Foundation, Inc.

2004-2005 Board Members
(For more information call 919-515-2000)

Mr. Rex Bell
Mr. Jeff Bender
Mr. Ricky Bennett
Mr. David Bowman
Ms. Terry Bowman
Ms. Muffin Brosig
Mr. Robert Ernest Burrage
Mr. W. Britt Cobb, Jr.
Mr. John Collins
Mr. Keith Collins
Mr. Branson Coltrane
Mr. Bob Cook
Mr. T. Roy Cook
Mr. Michael Richard Corn
Mr. David Correll
Mr. Malcom Crawford
Mr. W. Clyde Daniels
Mr. G.K. Davis
Mr. Darryl Fullam
Mr. Charles L. Gaither, Jr.
Mr. Jimmy Gentry
Mr. Neal Grose
Ms. Kathy Hart
Mr. Doug Holland
Mr. Huston Honeycutt
Mr. Kenny Howe
Mr. Stewart Howell
Mr. Jim Howie
Ms. Stevie Hughes
Mr. Dan Hunsucker
Mr. Chris Jackson
Mr. Gary Jarmon
Mr. Norman Jordan, Jr.
Mr. Lee Roy Keck
Mr. Charles King
Mr. Clifford Loflin
Mr. Corey Lutz
Mr. Jesse L. Mann
Mr. Bruce Matson
Mr. Eric McClain
Mr. Richard A. McKellar
Mr. Barney Meredith
Mr. David Meredith
Mr. Dwight Moore
Mr. Robert B. Murphy
Mr. Dwayne Myers
Mr. Keith Pardue
Mr. Robert Paxton
Mr. Thomas Price
Mr. Vance C. Proctor, Jr.
Mr. Kenneth Reesman
Mr. Forest Michael Reid
Mr. Bill Scott
Mr. Michael Sherrill
Mr. Smith Hase
Mr. Mike Strickland
Mr. George Teague
Mr. Mike Todd
Mr. Aubrey Wells
Mr. Larry Wooten
Mr. Kenneth Wright
Mr. Will Wright
Members of the North Carolina Dairy Youth Foundation
Board of Directors For 2004-2005

Mr. Mike Helms (2006)                Dr. Lon Whitlow (Ex-officio)
Dr. Brinton Hopkins (Ex-officio)     Mrs. Clair Wylie (2007)
Mr. Jim Howie (2005)                 Mr. Keith Oakley (Dairy Foundation)
Mrs. Jill Karriker (2007)
SUDIA/ADA of NC
Southeast United Dairy Industry Association, Inc.
American Dairy Association of North Carolina
2004 Board of Directors

Directors
Jerry Anderson, Granite Falls, NC
Rex Bell, Statesville, NC
Eugene Blackwell, Oxford, NC
Bill Chapman, Taylorsville, NC
Chuck Carland, Fletcher, NC
David Coltrane, Pleasant Garden, NC
Sam Correll, Cleveland, NC
William Covington, Mebane, NC
G.K. Davis, Crouse, NC
J. A. Dobson Jr., Statesville, NC
Rusty Eaker, Cherryville, NC
Alvis Fleming, Littleton, NC
Jon Gladden, Vale, NC
Andy Gray, Stony Point, NC
Kent Herman, Taylorsville, NC
Norman Jordan, Jr., Siler City, NC
Clifford Loflin, Sophia, NC
Bridgette Lutz, Lincolnton, NC
Lynn Mann, Pittsboro, NC
Zach Myers, Jonesville, NC
Donald Payne, Taylorsville, NC
Wayne Robertson, Statesville, NC
Carl Smith, Ennice, NC
Tim Smitherman, East Bend, NC
Ricky Talley, Olin, NC
Franklin Teague, Elon, NC
Darrell Wright, Franklinville, NC
Alternate: Cory Lutz, Lincolnton, NC

Advisory Committee
Dr. Roger McCraw, Raleigh, NC (NCSU Department of Animal Science)
Robert Caldwell, Greensboro, NC (NC State Grange)
Dr. Todd Klaenhammer, Raleigh, NC (SE Dairy Foods Research Center)
Chester Lowder, Raleigh, NC (NC Farm Bureau Federation)
Dr. Joe Zublena, Raleigh, NC (NC Coop. Extension Service)
Jim Howie, Waxhaw, NC (MD/VA MPA)
Carlyle Teague, Raleigh, NC (Coop. Council of NC)

For more information about NC advertising, promotion and nutrition education programs, please contact:
Mr. Eric McClain, SUDIA Northern Area Manager
9201 Bunsen Parkway, #100
Louisville, KY 40220, phone: (502) 495-7760
The United Federation of DHIA

General Manager:

Mr. Sam Chapin  
Address: 2300 Litton Reaves Hall, Blacksburg, VA 24061-0315  
Phone number: 1-800-367-3442

Officers and Directors:

President: Glenn Easter, Laurens, SC, (864) 682-2003  
Vice President: Rex Bell, Statesville, NC, (704) 872-9638  
Secretary/Treasurer: Lloyd Phillips, Radford, VA, (540) 639-0739  
Director: Coy Reese, Taylorsville, NC, (828) 632-5548  
Director: Robert Pemberton, Ashland, VA, (804) 798-2648  
Director: George Rohrer, Dayton, VA, (540) 867-5168  
Director: George Teague, Elon, NC, (336) 449-4883

Dairy Records Management Systems (DRMS)

Director: Dr. John Clay

Address: 313 Chapanoke Road, Suite 100, Raleigh, NC 27603  
Administrative support/main telephone number: (919) 661-3100  
Computer support telephone number: (919) 661-3120
Marvin E. Senger Distinguished Dairy Farmer Award Program
and Past Recipients

The Marvin E. Senger Distinguished Dairy Farmer Award is a program that was established by the Department of Animal Science at North Carolina State University in 1974 to honor Dr. Marvin E. Senger, long-time and highly respected dairy Extension specialist in the department. The award is presented yearly at the NC Dairy Conference to an outstanding dairy leader, family, or farm business. Nominations are submitted to the Department by anyone who cares to. An anonymous committee from the Department reviews the applications and selects the recipient. Criteria used in evaluating the applications and selecting the winner include 1) leadership in dairy, farm and community organizations at the local, area, state, regional and national levels, 2) leadership in business and production management practices used, and 3) leadership in the use of modern technology.

Previous Winners Have Been:

1974 - Franklin Teague
1975 - S. F. Nesbit
1976 - Thomas L. Reeves
1977 - S. E. Johnston, Jr.
1978 - Douglas Darch
1979 - G.C. Palmer
1980 - J. Woodley Wallace
1981 - Albert M. Clark
1982 - W. Glen Caruthers
1983 - Robert J. Davis
1984 - Charles Spurgeon Brooks
1985 - David C. Knox
1986 - William F. Covington
1987 - J. B. Stroup
1988 - Eston S. Stokes
1989 - H. L. "Doc" Hill
1990 - C. M. "Mac" Ivey
1991 - Charles and Ethel Lutz and Family
1992 - Beecher H. Gross, Sr.
1993 - Bobby R. And Sara Atkins
1994 - Jim and Charles Eaton
1995 - James M. Cook
1996 - Sam and Eubert Correll
1997 - Robert and Lucy Crowell
1998 - Daniels and Daniels Dairy, Inc.
1999 - Maple View Farm, Inc.,
       Robert and Chris Nutter
2000 - Norman Jordan, Jr.
2001 - Dwayne Myers
2002 - Keck's Dairy, Inc.
2003 - G.K. and Ken Davis Dairy
2004 - Branson, Kay, David, Amy & Will Coltrane
2005 – George L. Pless, Sr. and Sons Dairy, Inc.
Don Wesen Quality Milk Producer Award Program and Past Recipients

The Don Wesen Quality Milk Producer Award is a program sponsored by the North Carolina Dairy Producers Association to recognize producers in three herd size categories who have consistently produced the highest quality milk the previous calendar year. Yearly average bulk tank somatic cell count and bacteria count values, as well as the ranges in the monthly values, are reviewed to select the recipients. The award is named after Dr. Don Wesen who was a widely known and well respected milk quality dairy extension specialist in the Department of Animal Science at NC State University.

Previous Winners Have Been:

1996
<100 cows: H. Durayne Hood, Vale, NC
100-250 cows: Carroll and William Roper, Morganton, NC
>250 cows: Tony Nesbitt, Fletcher, NC

1997
<100 cows: Wayne Stout, Stony Point
100-250 cows: Triple R Dairy, Waynesville
>250 cows: Dwayne Myers Dairy, Jonesville

1998
<100 cows: Wayne Stout, Stony Point
100-250 cows: Triple R Dairy, Waynesville
>250 cows: Dwayne Myers Dairy, Jonesville

1999
<100 cows: Wayne Stout, Stony Point
100-250 cows: Ralph Ross and Sons Dairy, Waynesville
>250 cows: Dwayne Myers Dairy, Jonesville

2000
<100 cows: Ruffus Holland and Sons, Olin
100-250 cows: T.C. and Charles Williams, Union Grove
>250 cows: Dwayne Myers Dairy, Jonesville

2001
<100 cows: Wayne Stout, Stony Point
100-250 cows: Ralph Ross and Sons Dairy, Waynesville
>250 cows: Dwayne Myers Dairy, Jonesville

2002
<100 cows: Wayne Stout, Stony Point
100-250 cows: H. Dean Ross, Waynesville
>250 cows: H.C. Meyers, Jr. (Myers Farms, Inc.), Union Grove

2003
<100 cows: Randy Lewis, Snow Camp
100-250 cows: Triple R Dairy, Waynesville
>250 cows: H. Dean Ross, Waynesville

2004
<100 cows: Randy Lewis, Snow Camp
100-250 cows: Triple R Dairy, Waynesville
>250 cows: H. Dean Ross, Waynesville
North Carolina Dairy Producers Association
Distinguished Service Award Recipients

The North Carolina Dairy Producers Association, which was officially organized in February 1996, each year recognizes at their annual meeting one or more individuals for their outstanding contributions to the dairy industry of the state. Below is a listing of the past recipients.

1997 – Dr. Fred Knott

1998 – W. Clyde Daniels

1999 – Dr. Frank D. Sargent


2001 – J. D. Brooks

2002 – Dewitt Hardee and W. Chester Lowder


2004 – Dr. Lon W. Whitlow

2005 - Franklin Teague
54th Annual North Carolina Dairy Conference Agenda

Tuesday, February 22
1:00 - 5:00 p.m.
Dairy Foods Safety and Quality Conference
- Ellis/Overman Room
3:00 p.m.
NC Dairy Youth Foundation Board Meeting
- Suite 102
7:00 p.m.
North Carolina Dairy Producers Association
10th Annual Meeting and Board
Reorganization Meeting
- Steele Room

Wednesday, February 23
54th Annual North Carolina Dairy Conference Program
8:30 a.m.
Registration and View Exhibits
9:30 a.m.
Morning Session: Steele Room
Chair: Norman Jordan Jr., President
NC Dairy Producers Association
9:30 a.m.
SUDIA Annual Report - Robert Earle, General Manager, and Eric McClain, Northern Area Manager
10:00 a.m.
Presentation of Don Wesen Quality Milk Producer Awards - Kay Sigmon, NC Milk Sanitation Program Asst. Branch Head, and Norman Jordan Jr., NCDPA President
10:10 a.m.
“Dry Cow Udder Health Management”
- Dr. Bruce A. Beachnau, Dairy Veterinary Operations, Pfizer Animal Health
10:40 a.m.
“Managing Acidosis in Dairy Cattle”
- Dr. Richard Grant, President, W.H. Miner Agricultural Research Institute, Chazy, NY

11:10 a.m.
Presentation of the Marvin E. Senger Distinguished Dairy Farmer Award
- Dr. Roger McCraw, Head, Department of Animal Science, NCSU

11:25 a.m.
- View Exhibits
- ADA of North Carolina Annual Board Meeting - Suite 102

Noon Luncheon Session:
- Jackson & Overman Rooms
Chair: J.D. Brooks, President, NC Dairy Youth Foundation
- Buffet Lunch
- Dairy Youth Foundation Report

“Dairy Cattle Health Concerns for North Carolina Producers”
- Dr. David T. Marshall, State Veterinarian, NCDA&CS
- View Exhibits

1:30 p.m.
Afternoon Session: Steele Room, Chair: Reid Smith, Secretary, NC Dairy Producers Association
1:30 p.m.
“Resting: Do Your Cows Get Enough?”
- Dr. Richard Grant, President, W.H. Miner Agricultural Research Institute, Chazy, NY

2:00 p.m.
“Using Rumensin in Dairy Rations”
- Mr. Howard Green, Elanco Animal Health Technical Consultant

2:30 p.m.
“Dairy Market Outlook Update”
- Dr. Geoff Benson, NCSU

3:00 p.m. Adjourn