Effective transition cow management to maximize Internal Herd Growth

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Our charge

- Devise and employ nutritional management strategies and nutritional tools to support metabolic adaptation to lactation
  - Macromineral metabolism (manage DCAD)
  - Glucose metabolism (provide fermentable carbohydrate)
  - Fat metabolism (minimize BCS loss)

- Minimize potential negative effects of nonnutritional factors on metabolic adaptation to lactation
  - Overcrowding
  - Environmental stress (temp., ventilation)
  - Infectious challenge/hygiene
  - Grouping/regrouping
  - Comfort
Big rocks from the nutritional side (common themes in our case farms)

- Manage DCAD
  - Start with including low potassium forages in dry period diets
- Sufficient energy and protein intake from a dry period diet of moderately high nutrient density
- Thinner (within reason) is better
- Trends toward shortened dry periods and one-group nutritional strategies for dry cows
Effects of multiple stressors accumulate...

- Heat stress
- Overcrowding
- Social stress
- Poor housing
- Metabolic stress

Drackley, 2002
Transition period indices relating to Internal Herd Growth

- Nondairy cull rate during first 60 days in milk

- Incidence of metabolic disorders
  - Related to likelihood of high milk production
  - Tied to reproductive performance
When Cows Leave the Herd
(MN DHIA 10/96 - 10/01) Godden et al., 2003
Nondairy cull rate during the first 60 days in milk

- Captures dead cows and cows sold for nondairy during first 60 days in milk
- Crude index of overall transition management
- Minnesota workers (previous slide) reported that 25% of cows that leave herds leave during the first 60 days in milk
- We look at the number of cows dead and sold for nondairy as a percentage of the number of calvings
Fresh cow loss as a percentage of calvings

- Typical values in well-managed herds are 10 to 12% (unacceptable)
- Best herds consistently average 5 to 6%
- Can be as high as 25% during train wrecks
<table>
<thead>
<tr>
<th></th>
<th>Farm</th>
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<tbody>
<tr>
<td></td>
<td>Hanehan</td>
</tr>
<tr>
<td>Dead and sold/calvings</td>
<td>74/605</td>
</tr>
<tr>
<td>Percentage</td>
<td>12.2%</td>
</tr>
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</table>
Incidence of metabolic disorders

- Combination of objective (retained placenta, displaced abomasum) and subjective (hypocalcemia, ketosis, metritis)

- Goals for each usually set by survey data
Transition cow survey

- Conducted by Buzz Burhans and colleagues
- 27 herds in Vermont and New Hampshire
- Over 600 cows in the dataset
## Occurrence of Disorders at the Herd Level

| Event                  | Holsteins |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
|------------------------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|                        | N         | min      | p50      | max      | N         | min      | p50      | max      | N         | min      | p50      | max      | N         | min      | p50      | max      | N         | min      | p50      | max      |
| Ketosis                | 13        | 2.10%    | 14.70%   | 50.00%   | 4         | 6.30%    | 8.30%    | 15.80%   | 17        | 2.10%    | 13.20%   | 50.00%   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Milk Fever             | 14        | 2.60%    | 10.10%   | 26.30%   | 6         | 8.10%    | 37.70%   | 60.00%   | 20        | 2.60%    | 11.10%   | 60.00%   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Off Feed               | 7         | 2.30%    | 4.80%    | 21.40%   | 4         | 2.70%    | 6.50%    | 10.50%   | 11        | 2.30%    | 6.30%    | 21.40%   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Displaced Abomasum     | 10        | 3.60%    | 8.10%    | 14.30%   | 2         | 2.70%    | 2.90%    | 3.10%    | 12        | 2.70%    | 7.30%    | 14.30%   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Digestive/Diarrhea     | 9         | 2.10%    | 5.60%    | 11.80%   | 2         | 3.10%    | 4.20%    | 5.30%    | 11        | 2.10%    | 5.30%    | 11.80%   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Mastitis               | 10        | 2.60%    | 7.10%    | 15.80%   | 5         | 5.30%    | 10.00%   | 13.50%   | 15        | 2.60%    | 7.10%    | 15.80%   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Edema                  | 7         | 5.10%    | 7.10%    | 40.90%   | 2         | 22.20%   | 25.20%   | 28.10%   | 9         | 5.10%    | 13.20%   | 40.90%   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Dystocia               | 13        | 2.10%    | 5.60%    | 16.70%   | 2         | 2.70%    | 4.70%    | 6.70%    | 15        | 2.10%    | 5.60%    | 16.70%   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Twins                  | 12        | 2.10%    | 5.70%    | 18.80%   | 1         | 3.10%    | 3.10%    | 3.10%    | 13        | 2.10%    | 5.60%    | 18.80%   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Stillbirths            | 8         | 2.60%    | 6.50%    | 12.50%   | 3         | 3.10%    | 5.40%    | 6.70%    | 11        | 2.60%    | 5.90%    | 12.50%   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Retained Placenta      | 13        | 2.90%    | 11.80%   | 23.70%   | 1         | 3.10%    | 3.10%    | 3.10%    | 14        | 2.90%    | 11.20%   | 23.70%   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Metritis               | 14        | 4.30%    | 11.20%   | 39.30%   | 3         | 3.10%    | 5.40%    | 15.80%   | 17        | 3.10%    | 11.10%   | 39.30%   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Abortions              | None      | None     | None     | None     | None      | None     | None     | None     | None      | None     | None     | None     | None      | None     | None     | None     | None      | None     | None     | None     | None     | None     | None     | None     | None     | None     | None     | None     | None     | None     |

Burhans et al., 2003
**Problem Cow**: Any problem (Dystocia, Mastitis, Abortion, Twinning, Stillbirths, Retained Placenta, Milk Fever, Digestive, Ketosis, Metritis, Edema, Displaced Abomasum, Off Feed)

**Metabolic Problem**: (Milk Fever, Retained Placenta, Digestive, Ketosis, Displaced Abomasum and Off Feed)

**Infectious Problem**: All cows with Mastitis, Metritis

**Energy Problem**: (Digestive, Ketosis, Off Feed, Displaced Abomasum)

**Bad Calving**: (Dystocia, Abortion, Twinnings, Stillbirths)

**Preventables**: (Mastitis, Retained Placenta, Milk Fever, Digestive/Diarrhea, Ketosis, Metritis, DA, Off Feed)
Achievable goals for metabolic disorders

- Milk fever -- < 5%
- Retained placenta/metritis -- < 9%
- Displaced abomasum -- < 5%
- Clinical ketosis (blood BHBA > 27 mg/dl) -- < 5%
- Subclinical ketosis (blood BHBA > 14.4 mg/dl) -- < 15%
## Our case farms

<table>
<thead>
<tr>
<th></th>
<th>Farm</th>
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<tbody>
<tr>
<td></td>
<td>Hanehan</td>
<td>Durfee</td>
<td>Adams</td>
<td></td>
</tr>
<tr>
<td>Milk fever</td>
<td>2.8</td>
<td>&lt; 5</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>RP</td>
<td>11.7</td>
<td>~ 10</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>Metritis</td>
<td>2.6</td>
<td>~ 5</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>DA</td>
<td>5.6</td>
<td>~ 5</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Ketosis</td>
<td>11.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fresh Cow Protocol

Check Temperatures for 10 Days

Fever
- Looks Sick
  - Pump 10 gal. for 5 days
  - Tube of Ca day 1 in pump
  - Hypersaline for 2 days
  - Banamine for 3 days
  - Polyflex for 4 days
  - Dextrose w/100 cc oxy-tet
  - If fever not down 2nd day
  - ECP (3cc) on day 3
  - Check for DA
- Looks OK
  - Recheck temp next day
  - Talk to Pat®
  - ECP (3cc) on day 3
  - Check for Mastitis
  - Check for DA

No Fever
- Looks Sick
  - Pump 10 gal. for 5 days
  - Tube of Ca day 1 in pump
  - Hypersaline for 2 days
  - ECP (3cc) on day 3
  - Check for DA
- Looks OK
  - Recheck temp next day

All Fresh Cows Get Pumped for 3 days
- 5 gal. water
- 3½ cups fresh cow mix
- 16 oz. propylene glycol

Sick Pump
- 10 gal. water
- 7 cups fresh cow mix
- 16 oz. propylene glycol

Vacas Frescas

Cheque la Temperatura por 10 días

Tiene Fiebre
- Parece Enferma
  - Bombee 10 galones por 5 días
  - Agregue tubo de Calcio el primer día
  - Hipersalino por 2 días
  - Banamine por 3 días
  - Polyflex por 4 días
  - Dextrose con 100 cc de oxy-tet si sigue el fiebre 2º día
  - ECP (3cc) el 3º día
  - Chequee para un Abomaso Desplazado (DA)
- Parece Bien
  - Chequee la temperaturas el siguiente día
  - Hable con Pat
  - ECP (3cc) el 3º día
  - Chequee para la Mastitis
  - Chequee para un Abomaso Desplazado (DA)

No Tiene Fiebre
- Parece Enferma
  - Bombee 10 galones por 5 días
  - Agregue tubo de Calcio el primer día
  - Hipersalino por 2 días
  - ECP (3cc) el 3º día
  - Chequee para un Abomaso Desplazado (DA)
- Parece Bien
  - Chequee la temperaturas el siguiente día

Todas las vacas frescas son bombeadas por 3 días
- 5 galones de agua
- 3½ tazas de la mezcla para vacas frescas
- 16 oz glicol

Para vacas enfermes
- 10 galones de agua
- 7 tazas de la mezcla para vacas frescas
- 16 oz glicol
Framework for actualizing “optimum” nutritional management strategies on commercial dairy farms in the context of shortened dry periods
What are our nutritional goals and how do we achieve them?

- The Goals
  - Moderately high DMI of well-formulated close-up diets while attempting to minimize extent of DMI decrease during the prepartum period

- How do we achieve them?
  - Many herds still struggle to get ENOUGH dry matter intake in close-up cows (goal Holstein 26 to 28 lb/d of suggested close-up cow diet)
  - In herds where close-up cows are consuming large amounts of DM ( > 30 to 33 lb/d), limit grain-type forages and other very palatable feeds to control intake within goal and complement with a consistent, low potassium forage source (preferably bulky)

- The challenge – extent of DMI decrease extremely difficult to characterize in group-fed animals
Far-Off Dry Cows

• Dry-off until ~ 3 weeks pre-freshening

• Ration considerations
  – \( \text{NE}_L \) 0.59 to 0.63 Mcal/lb for maintenance BCS
  – Do not want to overfeed (Dann et al., 2003)
General goals for diet formulation for closeup cows and one-group dry cow systems up to 40 days

<table>
<thead>
<tr>
<th></th>
<th>Partial anionic</th>
<th>Full anionic</th>
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<tbody>
<tr>
<td>$\text{NE}_L$, Mcal/lb</td>
<td>0.68 to 0.70</td>
<td></td>
</tr>
<tr>
<td>Metabolizable protein, g/d</td>
<td>1100 to 1200</td>
<td></td>
</tr>
<tr>
<td>NFC, %</td>
<td>34 to 36</td>
<td></td>
</tr>
<tr>
<td>Starch, %</td>
<td>19 to 21</td>
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</tr>
<tr>
<td>Dietary Ca, g/d</td>
<td>100</td>
<td>140</td>
</tr>
<tr>
<td>Dietary Ca, %</td>
<td>0.90</td>
<td>1.2</td>
</tr>
<tr>
<td>Dietary P, %</td>
<td>0.30 to 0.35</td>
<td></td>
</tr>
<tr>
<td>Mg, %</td>
<td>0.40 to 0.42</td>
<td></td>
</tr>
<tr>
<td>Cl, %</td>
<td>0.3</td>
<td>0.8 to 1.2</td>
</tr>
<tr>
<td>K, %</td>
<td>&lt; 1.3</td>
<td>&lt; 1.3</td>
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<tr>
<td>Na, %</td>
<td>0.10 to 0.15</td>
<td></td>
</tr>
<tr>
<td>S, %</td>
<td>0.20</td>
<td>0.3 to 0.4</td>
</tr>
<tr>
<td>Vitamin A (IU/d)</td>
<td>100000</td>
<td>100000</td>
</tr>
<tr>
<td>Vitamin D (IU/d)</td>
<td>30000</td>
<td>30000</td>
</tr>
<tr>
<td>Vitamin E (IU/d)</td>
<td>1800</td>
<td>1800</td>
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Prefer use of organic trace elements, including organic Se
Advantages of shorter dry period

- Avoid forfeiting milk during late lactation
- Simplify dry cow management and decrease cost of dry cow housing (one dry cow group)
- Decrease sociological stress associated with multiple group changes, etc.
- More closely match dry period length with biologically required length (~ 25 days)
Summary of research on planned shorter dry period length

- Milk yield similar between cows managed for 40 vs. 60 days dry – 65 herds in NY
  - Coppock et al., 1974

- Milk yield after 49- or 70-d dry periods comparable; 28-d dry reduced subsequent milk yield
  - Sorensen and Enevoldsen, 1991

- Milk yield comparable for cows managed for 60 vs. 30 to 35 d-dry periods
  - Shairer, 2001; Bachman, 2002; Gulay et al., 2003

- Comparable milk yield for 60 vs. 30-d dry; continuous lactation decreased subsequent milk yield (differences greater in primiparous cows)
  - Annen et al., 2003; Rastani and Grummer, 2003
Cornell study

- Two commercial dairy farms (cows over 27 kg/d at 60 d before expected calving)

  - Treatments
    - 60 d dry period, label bST (two group dry cow management)
    - 40 d dry period, label bST (moved to closeup group at 40-d dry)
    - Continuous lactation, label bST (stop bST at calving and resume during 9th week of lactation) – remained on lactating cow ration for the duration

  Fernandez et al., 2004
Least squares means for milk yield and milk composition during the first 6 months of the subsequent lactation for cows managed for 60, 40, or zero days dry.¹

<table>
<thead>
<tr>
<th>Treatment</th>
<th>60-d dry</th>
<th>40-d dry</th>
<th>0-d dry</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td># of cows</td>
<td>22</td>
<td>23</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Average days dry</td>
<td>57</td>
<td>41</td>
<td>1</td>
<td></td>
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<tr>
<td>Milk yield, kg/d</td>
<td>47.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>46.3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>37.1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.8</td>
</tr>
<tr>
<td>Fat, %</td>
<td>3.51</td>
<td>3.62</td>
<td>3.40</td>
<td>0.14</td>
</tr>
<tr>
<td>Fat yield, kg/d</td>
<td>1.68&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.62&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.28&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.09</td>
</tr>
<tr>
<td>True protein, %</td>
<td>2.74&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.84&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.83&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.06</td>
</tr>
<tr>
<td>True protein yield, kg/d</td>
<td>1.31&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.30&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.06&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.04</td>
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¹Means within a row with different superscripts differ, P <0.05.

Fernandez et al., 2004
The Economics – 60 versus 40 days dry

<table>
<thead>
<tr>
<th>Item</th>
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<tbody>
<tr>
<td><strong>Marginal income</strong></td>
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<tr>
<td>Milk ($0.14/lb)</td>
<td>$140</td>
<td>$168</td>
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<tr>
<td><strong>Marginal expense</strong></td>
<td></td>
<td></td>
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<tr>
<td>Lactating diet</td>
<td>$48</td>
<td>$56</td>
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<tr>
<td>Closeup diet</td>
<td>$14</td>
<td>$14</td>
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<tr>
<td>Variable cost</td>
<td>$15</td>
<td>$15</td>
</tr>
<tr>
<td>Total expenses</td>
<td>$77</td>
<td>$85</td>
</tr>
<tr>
<td><strong>Net per cow</strong></td>
<td>$63</td>
<td>$83</td>
</tr>
</tbody>
</table>
Current thinking on management considerations for 40-d dry period

- Either two-group or one-group nutritional strategies acceptable
  - Marginal feed cost approximately $15 per cow for 20 additional days fed close-up diet
  - One-group dry cow program fits better with shortened dry period

- Moderate NFC/energy close-up diet acceptable to feed for 40 d dry, regardless of DCAD strategy

- Continue to require far-off type diet to feed to cows with dry periods longer than 40 days