Raising Healthy Calves -
Your Future Herd Profit Center

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Goals for the Replacement Heifer Program

- Goal: In an efficient and economical manner, produce a quality replacement heifer that has the genetics, size, health & immune function, body condition and management background to...
  - Breed at 13-15 months of age
  - Calve at 22-24 months of age
  - Freshen with minimal metabolic and reproductive disorders
  - Reach her potential for high 1st lactation milk yield
  - Yield the producer higher profits

Frequency of Calfhood Disease

Preweaning mortality = 7.8 - 11% (Goal < 5%)
Postweaning mortality = 1.9% (NAHMS, 1992-2007)

Impact of Calfhood Disease

- Short term losses:
  - Labor, drugs, mortality/replacement
- Long term losses:
  - Depressed gain by 6 mos. of age
  - Increased risk of death before calving
  - Increased risk of culling before calving
  - Increased age at first calving

Targets for Health / Gain

<table>
<thead>
<tr>
<th>Parameter</th>
<th>24 hrs – 60 days</th>
<th>61 – 120 days</th>
<th>121 to 180 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality Rate (%)</td>
<td>&lt; 5%</td>
<td>&lt; 2%</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Scours Rate (%)</td>
<td>&lt; 25%</td>
<td>&lt; 2%</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Pneumonia Rate (%)</td>
<td>&lt; 10%</td>
<td>&lt; 15%</td>
<td>&lt; 2%</td>
</tr>
<tr>
<td>Growth Rate (lb/day)</td>
<td>Double birth weight (approx. 1.6-1.8 lbs/b) (approx. born 90 lb =&gt; 180 lb at 8 weeks)</td>
<td>2.2 lbs</td>
<td>2.0 lbs</td>
</tr>
</tbody>
</table>

Dairy Calf and Heifer Association Gold Standards (www.calfandheifer.org)

Key Management Areas for Preweaned Calves

- Maternity pen management
- Care of newborn calf
- Colostrum management
- Preweaning nutrition
- Housing and sanitation
- Disease detection & treatment
MATERNITY PEN MANAGEMENT

Viruses & bacteria present in the dam’s environment (uterine & nasal secretions, manure, air, contaminated bedding, water, etc.)

Maternity Pen Management Goals

- Clean & dry
- Well-bedded
- Draft-free
- Remove bedding frequently and disinfect between uses
- Separate from sick pens
- Individual vs group pens?

Key Management Areas for Preweaned Calves

- Maternity pen management
- Care of newborn calf
- Colostrum management
- Preweaning nutrition
- Housing and sanitation

Care of the Newborn Calf

- Monitor calving process and assist if needed (get training)
- Remove calf from dam ASAP (30-60 min)
- Disinfect navel
- In winter, dry in warming box (sanitize warming box frequently)
- Use calf blankets in winter
- COLOSTRUM!!!

Preventing Umbilical Infections in Calves

- Incidence:
  - Incidence 1-14% (varies by study)
- Prevention:
  - Colostrum management
  - Clean maternity & calf pens
  - Dip navels shortly after birth
- Navel dipping:
  - 7% tincture of iodine widely used
  - Navel-Guard equally effective (SCG-Solutions, LLC, McDonough, GA)

Donovan, 1998; Rings, 2009; USDA, 2010; Virtala 1996; Grover & Gudden, 2011

Key Management Areas for Preweaned Calves

- Maternity pen management
- Care of newborn calf
- Colostrum management
- Preweaning nutrition
- Housing and sanitation
Colostrum Management
A critical determinant of calf health

Colostrum Management

A critical determinant of calf health

Why is Colostrum Important?
- Passive absorption of immunoglobulins (Ig)
- Nutrition

Successful passive transfer:
- Serum IgG > 10 mg/ml (24 – 48 hrs)
- Serum Total Protein > 5.0 or 5.2 g/dl

FPT rates:
- 19% of U.S. dairy heifers (NAHMS, 2007)
- 19% of calves on 15 Ontario farms (Windley, 2009)
- 31% of deaths in the first 3 weeks are due to FPT (Wells, 1996)

Relationship between Failure of Passive Transfer and Calf Health

(USDA: AHPIS: VS, 1992)

Benefits of Achieving Successful Passive Transfer of IgG

- Reduced treatment and mortality rates (NAHMS, Wells, 1996)
- Improved growth rates and feed efficiency
  (Fowler, 1999; Nocek et al., 1984; Robison et al. 1988; Faber, 2005)
- Decreased age at first calving
  (Faber et al. 2005)
- Increase 1st & 2nd lactation milk production
  (DeNise, 1989; Faber, 2005)

Overview of Colostrum Management

- Principles:
  - Quality
  - Quantity
  - Quickness
  - Cleanliness (bacterial contamination)
  - Monitoring

1. COLOSTRUM QUALITY

(Graph: IgG ≥ 50 g/L)

- Positive relationship between IgG in colostrum vs calf serum
- Colostrum quality is highly variable
Colostrum Quality

- **Goal:** > 50 g/L IgG in colostrum
- **Factors affecting quality:**
  - Dry cow vaccination program
  - Feed balanced dry cow ration
  - Avoid dry cow stress (heat, crowding)
  - Avoid short dry periods (< 21 days)
  - Milk cows within 1-2 hrs (max 6 hrs)
- **Monitoring:**
  - Colostrometer
  - Brix refractometer:
    - 22% TS = 50 g/L IgG

Effect of Delaying First Milking on Colostrum Quality

13 cows – 52 quarters

<table>
<thead>
<tr>
<th>Time to first milking (hrs)</th>
<th>IgG % of original</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 hrs</td>
<td>100</td>
</tr>
<tr>
<td>6 hrs</td>
<td>83</td>
</tr>
<tr>
<td>10 hrs</td>
<td>53</td>
</tr>
<tr>
<td>14 hrs</td>
<td>67</td>
</tr>
</tbody>
</table>

Colostrum Quantity

- **Goal:** Feed 150 - 200 g of IgG
- **Rec:** Feed 10% BWt at first feeding (3-4 L) within 6 hours
- **Bottle or tube:** work equally well if enough volume fed

Low Volume: 2 L (0 h) & 2 L (12 h)
High Volume: 4 L (0 h) & 2 L (12 h)
Morin et al., 1997

3. Quickness (time to first feeding)

- **Gut Closure:**
  - Progressive loss of ability to absorb Ig
  - Complete by 24 hrs
- **Goal:**
  - Feed within 1-2 hrs (6 hrs max)

Options for ‘Quick Colostrum Feeding’ on Real Farms

- It’s 11:00 PM and the calf was just born
- **Goal:** Feed within 1-2 hrs (6 hrs max)
- **Options:**
  - Milk cow and feed calf within 1-2 hrs
  - Feed calf refrigerated stored colostrum
  - Feed calf frozen stored colostrum (don’t overheat)
  - Feed a commercial colostrum replacer product
**Bottle vs Tube?**  
(Chigere et al. JAVMA. 2012. 241:104)

- **Design:** 26 newborn calves paired up: 1 bottle/1 tube  
  - Bottle calf: Fed as much as would consume in 20 min  
  - Tube calf: Fed same volume via tube  
  - Measured serum IgG at 48 hrs

- **Results:**
  
<table>
<thead>
<tr>
<th></th>
<th>Bottle</th>
<th>Tube</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume Consumed (L)</td>
<td>2.2 L (1 to 4)</td>
<td>2.2 L (1 to 4)</td>
<td>-</td>
</tr>
<tr>
<td>Serum IgG at 48 hr (mg/ml)</td>
<td>6.6</td>
<td>7.3</td>
<td>0.51</td>
</tr>
<tr>
<td>% with FPT (IgG &lt; 10 mg/ml)</td>
<td>85% (11 of 13)</td>
<td>85% (11 of 13)</td>
<td>1.0</td>
</tr>
</tbody>
</table>

- **Conclusion:** No effect of feeding method (volume signif.)

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**Approaches to reduce pathogen exposure through colostrum**

- Avoid pathogens from infected glands, fecal contamination from teat skin:  
  - Identify infected cows? (e.g. Johne’s)  
  - Don’t let calf suckle dam  
  - Udder prep  
  - Don’t pool raw colostrum

- Reduce other sources of contamination:  
  - Sanitation of milking, storage & feeding equipment

- Prevent bacterial proliferation in stored colostrum:  
  - Feed (< 1.2 hrs), refrigerate (< 48 hrs) or freeze ASAP  
  - Use of preservatives?

- **Additional tools:**  
  - Colostrum replacers (feed 150 - 200 g IgG, efficacy tested)  
  - Pasteurize colostrum

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**4. Colostrum Cleanliness**  
(Bacterial Contamination)

- **Concerns:**  
  - Bacterial pathogens (e.g. E. coli, Salmonella, MAP, Mycoplasma spp.)  
  - Bacterial interference with Ig absorption

- **Goal:**  
  - Total plate count < 100,000 cfu/ml  
  - Total coliform count < 10,000 cfu/ml

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**Colostrum Replacement Products**

- **Must provide:**  
  - Minimum of 100 gm IgG / dose (Recc. feed 150-200 g IgG)  
  - Cost: $25 to $30/dose (U.S.D.)  
  - Ig may be from colostrum or serum sources  
  - Convenient, consistent supply of IgG if sufficient clean, high quality maternal colostrum is not available

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**Dose response of serum IgG to IgG mass fed**  
(Godden et al., 2009. JDSci. 92:1750-1757)

<table>
<thead>
<tr>
<th>IgG mass fed (g)</th>
<th>100 g</th>
<th>150 g</th>
<th>200 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum IgG (mg/ml)</td>
<td>9.6</td>
<td>15.2</td>
<td>19.0</td>
</tr>
</tbody>
</table>

Conclusion: Producers wishing to reduce the risk of FPT may opt to feed higher doses IgG (150-200 g) in Colostrum Replacers

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**Role of Colostrum Replacers in Johne’s Disease Control Programs**  
(Pithua et al., 2009 J.A.V.M.A. 234(9):1167-1176)

- **Newborn heifer calves (N = 457)**
  - Maternal colostrum (n = 261)  
  - Colostrum replacer (n = 236)

- **Adult Period:** 1st calving to 54 mos:  
  - Fecal culture and serum ELISA for MAP at 30, 42 and 54 mos.  
  - DHIA records of milk production, reproduction, culling to 54 mos.
Calves fed the CR were at reduced risk for testing positive for MAP

Results

Heat-treating Colostrum:
Another management tool to reduce pathogen exposure to calves

Fresh colostrum → Heat-treat (60 °C x 60 min) → Refrigerate < 48 hr or Freeze → Warm and feed

Effects of on-farm heat-treatment of colostrum on colostrum characteristics and calf health

(Donahue et al., JDSci. 2012; Godden et al. JDSci. 2012)

Goal: Complete a randomized field study to describe the effect of feeding heat-treated colostrum on...
– Colostrum characteristics (IgG, bacteria counts)
– Calf serum IgG (mg/ml)
– Calf health

Methods: Calf Enrollment
- Summer, 2007
- 6 large commercial herds (MN, WI)

Fresh colostrum collected daily, pool & refrigerate → Heat-treat (60 °C x 60 min) → Fresh
Refrigerate (n = 266) → Feed 4 qts (n = 553)

Methods: Sample / Data Collection

Colostrum (TPC, TCC, IgG) → Heat-treat (60 °C x 60 min) → Refrigerate (n = 266) → Feed 4 qts (n = 553)
Blood @1-7 d (serum IgG) → Health Records

Results:

Heat-treatment of colostrum...

Significantly reduced colostrum Total Plate Count (TPC) and Total Coliform Count (TCC)

Had no overall effect on colostrum IgG (mg/ml)

Increased calf serum IgG (mg/ml)
Calf health was improved
Significant reduction in proportion of calves treated (all causes) or treated for scours

How does feeding heat-treated colostrum result in reduced scours/morbidity?
- Results of a Path Analysis

Monitoring the Colostrum Program using Serum Total Protein (TP)
- Successful passive transfer:
  IgG 10 mg/ml = TP 5.0 or 5.2 g/dl \( \text{[Calloway, Tyler et al., 2002]} \)
- How?
  - Bleed 12 clinically normal calves 24 hrs – 7 d old
  - Let blood clot
  - Test serum with refractometer
- Goal:
  > 90% of calves should have TP > 5.0 g/dl \( \text{[Tyler, 2003, pc]} \)
  > 80% of calves should have TP > 5.5 g/dl \( \text{[McGuirk, 2006]} \)

Overview of Colostrum Management
- Principles:
  - Quality: > 50 g/L IgG
  - Quantity: 10% Birth Weight (3 - 4 L)
  - Quickness: 1-2 hrs after birth (< 6 hrs max)
  - Cleanliness: < 100,000 cfu/ml total bacteria count
- Monitor serum total proteins

Key Management Areas for Preweaned Calves
- Maternity pen management
- Care of newborn calf
- Colostrum management
- Preweaning nutrition
- Housing and sanitation

Conventional Calf Milk Feeding Programs
- 10% of BWt in milk:
  - 1 lb. powder/day or one gallon milk/day
- 20% protein: 20% fat milk replacer
- Calf Starter: 16-20% CP
- WHY?
  - Cheap! (?)
  - Wean them early! (?)
**Plane of nutrition in preweaned calves affects...**

- **Calf:**
  - Growth
  - Ability to cope with cold stress
  - Immune function / health

- **Adult cow:**
  - Age at first calving
  - Milk production
  - Longevity
  - Lifetime economics

- **Goal:** Double birth weight by 56 days of age
  - 40 kg BWt ⇒ 80 kg at weaning
  - (ADG = 0.71 kg/day or 1.6 lb/d)

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**Milk or Milk Replacer Feeding Programs**

- **Conventional vs Intensified**
  - (or biologically normal growth)

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**How do we double birth weight by 8 weeks?**

- **Conventional:**
  - 10% of BWt: 1-1.25 lb DM/day or 1 gallon/day
  - Lower nutrient density MR: 20:20

- **Intensified:**
  - 20% of BWt: 2-2.5 lb DM/day or 2-2.5 gallons/day
  - Higher nutrient density:
    - Accelerated MR: 26:20
    - Whole milk: 26:30

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**Effect of Nutrient Intake on Health...**

- Calves fed a higher plane of nutrition have:
  - Increased weight gain
  - Improved immune function: Can resist infection and/or recover more quickly from infection
  - Lower sickness and death loss
  - Greater ability to deal with cold stress

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**Kidneys of two calves...**

- 20:20 Milk Replacer
- Whole milk or accelerated milk replacer program

Which of these two calves is in a better position to:
- Prevent an illness?
- Recover from an illness?
- Thrive and grow during cold weather?

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**Minnesota Field Study: Pasteurized Waste Milk vs Milk Replacer**

- 439 calves enrolled:
  - Dec., 2001 to Aug., 2002

- Treatment Groups:
  - Batch pasteurized non-saleable milk (DairyTech)
    - 1 gal/day summer
    - 1.5 gal/day winter
  - 20:20 milk replacer
    - 1 lb DM/day summer
    - 1.5 lb DM/day winter

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*From Bob James and Scott Bascom*
MN Field Study: Pasteurized Milk vs 20:20 Milk Replacer

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Milk Replacer</th>
<th>Pasteurized Milk</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calves enrolled (n)</td>
<td>217</td>
<td>222</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Serum Total Protein (mg/dl)</td>
<td>5.7</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td>Arrival Weight (lb)</td>
<td>88.3</td>
<td>87.5</td>
<td></td>
</tr>
<tr>
<td>Age at Weaning (d)</td>
<td>47</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Weaning Weight (lb)</td>
<td>133.9</td>
<td>146.3</td>
<td>*</td>
</tr>
<tr>
<td>Preweaning Gain (lb)</td>
<td>45.0</td>
<td>58.9</td>
<td>*</td>
</tr>
<tr>
<td>Avg. Daily Gain (lb/d)</td>
<td>0.76</td>
<td>1.04</td>
<td>*</td>
</tr>
</tbody>
</table>

Significant reduction in scours and pneumonia for all months

Preweaning Treatment Rate (%)

Significant reduction in death losses in winter months

Summary of preweaning performance

- Calves fed pasteurized non-saleable milk had...
  - Better ADG: + 0.25 lb/day – all months
  - Fewer treatments for pneumonia and scours – all months
  - Fewer death losses - in winter months
  - $34 advantage per calf weaned (or breakeven at 23 calves)

- Why? Calves fed milk received...
  - Approx. 18% more daily metabolizable energy intake
  - More protein, growth factors, non-specific immune factors

Impact of Plane of Nutrition on Future Performance

- Age at first calving
- Milk production

Field Data from Land O’Lakes

23 herds summarized – five with lactation data
Summary of Published Data – Milk Production

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment Response (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bar-Peled et al., 1998</td>
<td>+ 998 lb</td>
</tr>
<tr>
<td>Foldager and Krohn, 1994</td>
<td>+ 3,092 lb</td>
</tr>
<tr>
<td>Foldager et al., 1997</td>
<td>+ 1,143 lb</td>
</tr>
<tr>
<td>Ballard et al., 2005</td>
<td>+ 1,543 lb @ 200 DIM</td>
</tr>
<tr>
<td>Rinker et al., 2006</td>
<td>+ 1,100 proj. 305 d milk</td>
</tr>
<tr>
<td>Moallem et al., 2006</td>
<td>+ 2,500 lb</td>
</tr>
<tr>
<td>Drakley et al., 2007</td>
<td>+ 1,841 lb</td>
</tr>
</tbody>
</table>

Mean response + 1,745 lb

These responses were achieved by increasing pre-weaning milk intake by at least 75% over conventional intake.

Preweaning Gain Associated with First Lactation Milk Yield

(Soberon et al., 2012. J.D.Sci. 95:783)

- Cornell herd; 1,244 heifers:
  - For every 1 kg of preweaning ADG, heifers, on average, produced 850 kg more milk in the first lactation
- Commercial herd; 624 heifers:
  - For every 1 kg of preweaning ADG, heifers, on average, produced 1,113 kg more milk in the first lactation

Importance of Free Choice Water and Starter

- Provide free choice after 3 days of age
- Water and starter promote rumen development
- Water essential to maintain hydration status, especially during periods of:
  - Heat stress
  - Illness (e.g. scours)

Calf Starter Intake on ‘Intensified’ Milk Feeding Programs

“Intensified” Program showed slightly lower starter intake than the current MR Feeding system. However, intakes increased dramatically the last 2 weeks prior to weaning.

Weaning Strategy for ‘Intensified’ Milk Feeding Programs

- Weaning should be done in a step down manner
  - Reduce milk or milk replacer intake by 50% on a particular day (e.g. 35 or 42)
  - Feed once per day preferably in the evening
  - Do this for 7-10 days, then completely wean off of liquid feed
  - Don’t try to wean too early

Weaning Guidelines

(usually 7-9 weeks old)

- Starter intake before weaning:
  - Consuming starter for at least 3 weeks
  - Consuming ≥ 2 lbs of starter per day for 3 consecutive days prior to weaning
- Reduce stress by spreading out changes:
  - Feed changes (weaning)
  - Procedures: dehorning, vaccinations, tail docking
  - Socialization/grouping, Transport, environmental changes
- Moving to groups:
  - Keep in individual pen on same grain > 7 days after weaning
  - Move to small groups initially (6-8 calves)
  - Continue on same grain for 1-2 weeks after grouping
  - Introduce forages 3-4 weeks post-weaning
Nutrition Summary

• Early life nutrient intake has:
  – Short term impacts on health, growth
  – Long term impacts on productivity
    (and therefore economics)

• FEED THEM!!!

Key Management Areas for Preweaned Calves

• Maternity pen management
• Care of newborn calf
• Colostrum management
• Preweaning nutrition
• Housing and sanitation

Principles of Good Calf Housing

• No contact with older animals or their environment (air, water, bedding, feed, pasture)
• Avoid direct contact between calves
• Draft-free but well ventilated
• Bedding: Clean, dry, abundant
• Sanitation
  – Clean & sanitize pens between uses
  – All in-all out
• Ease of handling (stress & injury)

Hutches

• Advantages:
  – No calf-to-calf contact
  – All in – all out
  – Good air quality
  – Can move to new ground

• Disadvantage:
  – Operator comfort
    (esp in Northern climates)

Confined Housing – Naturally Ventilated Barns

• Advantages:
  – Operator comfort
  – Fresh air in summer when side curtains opened

• Disadvantages:
  – Can be direct contact
  – Often poor air quality in winter when curtains closed
  – Pathogen build-up

Solid Partitions Preferred
(vs open partitions)
Bedding Nesting Capability:
Use Deep-bedded Straw in Winter

- Nesting Score 1
- Nesting Score 2
- Nesting Score 3

Potential Pros:
- Labor savings?
- Allows use of free choice or computerized feeding systems
- Operator comfort

Potential Cons:
- Competition for resources (feed, space)?
- Direct contact between calves (nose-to-nose; cross sucking; shared nipple)

⇒ Increased disease!!!

Principles of calf autofeeders

“Sophisticated” Systems

- $20-$25,000 per machine (Coming down to $10-$15,000?)
- One machine can dispense to up to 4 nipples/pens
- 25-30 calves per pen (I disagree)
- Program desired meal sizes (no limit)
- CIP for dispenser / feeding hoses (not perfect; nipples?)
- Downloads intake records

“Basic” Systems

- $2,500 for 1 machine
- 1 nipple: 1 group
- 25 calves (I disagree)
- Max. 1 pint/meal (devel. for kids/lamb)
  - Calf leaves hungry
  - More standing around waiting
- Hopper holds 25 lbs powder
  - Must refill frequently
- No software to monitor intakes
- Manual cleaning, more difficult

What have we learned about group housing and computer feeders?
Virginia Tech Research
Machado and James, 2011

• 6 farms in VA and NC identified with autofeeders:
  – Survey of management
  – Visited monthly between June-Sept.
  – Measure:
    • Temperature
    • Standard Plate Count (SPC)
    • Brix refractometer: estimate total solids

Summary of Virginia Tech Survey Study:
Lack of precision, poor sanitation

• Total solids were variable: worse for ‘basic’ systems
• Feeding temperatures were variable:
  – Goal: 100-105°F
  – Averages OK, but minimum (81°F) and maximums (118°F) indicated a lack of precision in several systems
  – These temperature extremes could cause cold stress or decrease milk intake. Milk replacers don’t mix well at lower temperatures.
• Sanitation variable, often poor:
  – There is no goal for SPC for milk replacer.
    • Goal < 20,000 cfu/ml in pasteurized waste milk
  – These averages were all well over 100,000 cfu/ml

Mean standard plate count \((10^5)\), temperature (ºF), and refractometer (Brix) reading by machine type

<table>
<thead>
<tr>
<th>Machine type</th>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>SPC</td>
<td>89</td>
<td>69.25</td>
<td>73.71</td>
<td>0.00</td>
<td>500.00</td>
</tr>
<tr>
<td></td>
<td>Brix</td>
<td>35</td>
<td>12.00</td>
<td>2.10</td>
<td>7.00</td>
<td>18.00</td>
</tr>
<tr>
<td></td>
<td>Temperature</td>
<td>31</td>
<td>101.8</td>
<td>44.1</td>
<td>87</td>
<td>118</td>
</tr>
<tr>
<td>Sophisticated</td>
<td>SPC</td>
<td>44</td>
<td>13.39</td>
<td>22.03</td>
<td>0.00</td>
<td>88.00</td>
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<tr>
<td></td>
<td>Brix</td>
<td>15</td>
<td>10.37</td>
<td>1.68</td>
<td>7.00</td>
<td>13.00</td>
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<tr>
<td></td>
<td>Temperature</td>
<td>14</td>
<td>101.3</td>
<td>44.2</td>
<td>81</td>
<td>107</td>
</tr>
</tbody>
</table>

Sanitation and Equipment
Maintenance

• Cleaning steps generally inadequate (esp. hoses, nipples)
  – Switch out and disinfect nipples daily
  – Replace w new hoses and nipples weekly
• Monitor nipple condition and replace more frequently if needed
• Check total solids of mixture frequently
• Have distributor verify calibration frequently

Age at introduction:
Older is better (> 12 days)

• Day 6 compared to Day 14?
  – More restless 1st day after introduction
  – Needed more guidance to feeder
• Svensson et al., 2006. PVM 73:43
  – Randomized clinical trial evaluating group size: 892 calves in 9 Swedish herds
  – 50% Increased risk for respiratory disease if move into group at ≤ 12 days of age
**Group Sizes?**
Smaller is better (< 10 calves)
- More competition at feeder
  - Can all calves consume their daily allowance? (Jensen, 2004. JDS. 87:3428)
- Bigger groups => More disease
- Svensson et al., 2006. PVM 73:43
  - Randomized clinical trial: 892 calves in 9 Swedish herds
  - Calves randomized to small (6-9) vs Large groups (12-18)
  - 40% increased risk for respiratory disease in large groups
  - Reduced growth in large groups

**Health of Single Pen vs Group Housed Calves**
- Svensson et al., 2003. PVM 58:179
  - Observational study: 3081 calves in 122 Swedish herds
  - Incidence of respiratory disease(%)
    - Single pen: 3.5% a
    - Small groups (3-6 calves): 3.3% a
    - Large groups (8 to 30 calves): 7.4% b
- Losinger et al., 1997. J. Dairy Res. 64:1
  - USDA national study: 47,057 calves in 1685 US herds
  - Mortality risk was 40-52% higher in large groups (≥ 7/group) as compared to single pen or small groups (2-6/group)

**Milk Allowance?**
(more is better)
- If restrict intake, hungry calves, crowding feeder, intersucking, more stress, reduced health/growth
- Recommended:
  - 2 to 2.8 lbs DM per day (approx. 2 – 2.5 gallons/day)
  - 1.5 to 2.4 L per meal
- Most calves will consume around 3-5 meals per day (sophisticated systems)

**Summary of Best Management Practices for Group Housing**
- Excellent colostrum management
- Delay introduction (> 12-14 days)
- Small group sizes (<10 calves)
- Do not restrict milk intake
- Sanitation/monitoring/maintenance of feeding equipment
- Don’t overcrowd (> 35-40 ft²/calf)
- Excellent ventilation, no drafts
- Clean, dry, abundant bedding
- Don’t overcrowd (> 35-40 ft²/calf)
- Manage as all in – all out system
- Careful, frequent observation of calves

**Summary: Principles of Good Calf Housing**
- No contact with older animals or their environment (air, water, bedding, feed, pasture)
- Avoid direct contact between calves
- Draft-free but well ventilated
- Bedding: Clean, dry, abundant
- Sanitation
  - Clean & sanitize pens between uses
  - All in–all out
- Ease of handling (stress & injury)

**Key Management Areas for Preweaned Calves**
- Maternity pen management
- Care of newborn calf
- Colostrum management
- Preweaning nutrition
- Housing and sanitation
- Disease detection & treatment
- Is your veterinarian involved? If not, invite them in.
Summary

• Calf management has:
  – Short term impacts on health and growth
  – Long term impacts on productivity, longevity, economics

• Key management areas:
  – Maternity pen management
  – Care of newborn calf
  – Colostrum management
  – Preweaning nutrition
  – Housing and sanitation

• A successful calf program will yield dividends
  (and makes life more fun)