Managing Calves: The Five “C’s” and More...

Sheila M. McGuirk, DVM, PhD
School of Veterinary Medicine
University of WI

The Future is Here
- Intensive
- Challenging
- Expensive
- Opportunity
  - Grow from within
  - Make genetic process
  - Improve productivity
  - Minimize biosecurity risks

Calf Costs Are High
(From WI 2007 Study)
- Labor and management (47%)
  - Efficiencies with custom operations
- Feed cost (34%)
  - Ave weaning age
  - Number of days on feed
  - Source of liquid feed
- Variable cost
  - $5.31/day ($3.16-5.78)
  - After weaning $2.04/day ($1.31-2.93)
Health problems haven't changed much.

Reduce costs by lowering weaning age

Opportunity: Reduce deaths that occur within 48 hours of birth.
(8.1% of calves born in 2006)

- 78.6% born dead
- 21.4% born alive, die within 48-hr
Reducing Losses in First 48-hours

• Transition cow management
• Supervision prior to and during calving
• Vaginal delivery is important for survival
• Proper procedures for assisting delivery
  - Timing
  - Methods
  http://www.cvmbs.colostate.edu/ilm/proinfo/calving/notes/whentocallophelp.htm
• Resuscitation protocols
• Calling before it’s too late

Calving Assistance is Bad!

• Reduced calf survival
• Calf injury
• Increased odds for calf disease
• Lower milk production in first 60-days

Assist when needed, not to speed up delivery.

Moderate Calving Assistance

• Thoracic and abdominal bleeding
• Fractured ribs
• Torn diaphragm
• Ruptured liver
• Swollen head and tongue
• Yellow staining
• Aspiration of amniotic fluid
• Delayed brain development
• FPT
• Increased disease
• Death
**Lower Dystocia Risks**

- Monitor body condition scores
- Monitor dry matter intake
- Optimize sire selection
- Age at first calving
- Dry period length
- Stall comfort and bunk space
- Reduce stress
- Herd testing for NEFA’s

**Know Normal Calf Behavior**

- Head righting in minutes
- Sitting in 5 minutes
- Attempts to stand within 15 minutes
- Standing within 1 hour
- Temp high at birth, declines to 101-102 by 1 hour
- Suckling within 2 hours

**Mark High Risk Calves**

- Complete exam
- Regular health screening
  - Prolonged time standing after feeding
  - Appetite change
  - Temperature change more than 1.5°F
  - Calf health scoring system
  - Navel exam

**Anti-inflammatory drugs**
- Antibiotics
- Oral fluids
Time, training and a process for regular health screening

Healthy Calves

The Basic Care Package For Calves

- Colostrum
- Calories
- Consistency
- Cleanliness
- Comfort
The immune status of the cow impacts calf health.

- Vaccination or disease exposure
- Colostrum production - 15 days pre-fresh
- Genetic and hormonal influences on variation in production and transfer of antibodies

Colostrum quality and quantity
- Antibodies
- Maternal immune cells
- Nutritional, growth and development factors

Colostrum Composition

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat (%)</td>
<td>6.7</td>
<td>2.0</td>
<td>26.5</td>
</tr>
<tr>
<td>Protein</td>
<td>14.9</td>
<td>7.1</td>
<td>22.6</td>
</tr>
<tr>
<td>Lactose</td>
<td>2.5</td>
<td>1.2</td>
<td>5.2</td>
</tr>
<tr>
<td>Total Solids</td>
<td>27.6</td>
<td>18.3</td>
<td>43.3</td>
</tr>
<tr>
<td>IgG (mg/ml)</td>
<td>41.0</td>
<td>14.5</td>
<td>94.8</td>
</tr>
</tbody>
</table>

- Milk early
- Don't discard heifers

PA survey by Heinrichs, et. al.

It’s not just the antibodies

- Immunoglobulins - antibodies
- Growth factors
  - Immune regulation
  - Development of the intestinal tract
  - Mammary development
- Maternal cells in colostrum
  selectively absorbed and functional
Proper Use of Esophageal Feeder

- Calf standing or sitting
- Nose below the ears
- Gentle and slow
- 4-qt container for colostrum

Colostrum Equipment

- 3 qt
- 1 gallon

Colostrometer Use

- Calves need 150-200 gm IgG
- Poor quality is poor quality
- > 1.070 to insure 50 gm/L
- Warm underestimates IgG
Contaminated Colostrum

- Udder preparation
- Clean milking and feeding equipment
- Proper chilling and storage
If there isn’t enough colostrum, there must be a back up plan

150-200 gm of IgG

You don’t know until you test!

Herd Testing Protocol
- Measure serum protein concentration in 10-12 calves
  - < 7 days
  - > 18 hours from feeding
- Separate non-hemolysed serum
- Serum at room temperature (65-75 F)

• Goal:
  - 90% are above 5.2 g/dl
  - 80% are above 5.5 g/dl

Colostrum Summary
- Calves need 150-200 gm of IgG
- Colostrum should test at 50 gm IgG/L
- Fresh colostrum is best for all the nutritional and
- IgG status of calves is most important variable in predicting health, growth and feed efficiency

- If the esophageal feeder is used, give
  - 4 qt
  - 3 qt may be ok if calf sucks all of it
  - Bacteria in colostrum inhibit absorption of

- Herd Testing Protocol
- Colostrum Summary
- IgG status of calves is most important variable in predicting health, growth and feed efficiency
Improvements Still Needed

- Accurate, affordable field tool to measure IgG concentration in colostrum
  - Animal variation
  - Colostrum milking time
  - Water dilution effects
- Better equipment for colostrum delivery
  - 4 qt esophageal feeders (single passage)
  - 3 qt bottles for suckling colostrum
- Preservation of colostrum quality without loss of the nutritional, developmental and immune factors
- Effective colostrum replacement
  - IgG delivery
  - Packaging, cost, volume fed
  - Other immune, nutritional and developmental components

The Basic Care Package For Calves

- Colostrum
- Calories
- Consistency
- Cleanliness
- Comfort

A Basic Care Package

- Colostrum
- Nutrition
Feeding Calves Has Changed

Growth Objectives

- Double birth weight by 56 days
  - 90 lb calf is 180 lb by 56 days
  - Equals 1.6 lb per day average!
- Decrease liquid feed days 49-56 by 50%
- No liquid feed after 56 days
- 6-10 days to recover starter intake
- Forages fed at 5 lb starter intake
- TMR before 5 months must be done with care
- Feed 1.8 to 2.5 lb of milk solids/day

With more milk consumed, calves have fewer health problems

Comparing Liquid Feeds

<table>
<thead>
<tr>
<th></th>
<th>Protein</th>
<th>Fat</th>
<th>Total Solids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole milk</td>
<td>27%</td>
<td>30%</td>
<td>12.7% (1.1 lb/gal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.285 lb prot/gal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.317 lb fat/gal)</td>
</tr>
<tr>
<td>Milk replacer</td>
<td>20%</td>
<td>20%</td>
<td>11.4% (1 lb/gal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.190 lb prot/gal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.190 lb fat/gal)</td>
</tr>
<tr>
<td>Milk replacer</td>
<td>28%</td>
<td>20%</td>
<td>15% (1.25 lb/gal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.333 lb prot/gal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.238 lb fat/gal)</td>
</tr>
</tbody>
</table>
Traditional Calf Feeding
80 lb Calf

**Minimum Mixing/Feeding**
- Fed at 8% body weight
- Mixed at 10% solids
- 0.64 lb mr solids/day

**Maximum Mixing/Feeding**
- Fed at 12% body weight
- Mixed at 12.5% solids
- 1.2 lb mr solids/day

87.5% increase in daily solids from minimum to maximum

Dairy Calves Eating
< 0.5 lb Starter are the Problem

1-wk, 86 lb calf, 4 qt whole milk/day, 0.1 lb starter

<table>
<thead>
<tr>
<th></th>
<th>65 F</th>
<th>32 F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>0.98</td>
<td>0.35</td>
</tr>
<tr>
<td>Protein</td>
<td>0.98</td>
<td>0.89</td>
</tr>
</tbody>
</table>

Winter feeding: 6 qt per day by day 3
8 qt per day by 2 weeks

Dairy Calves Eating
< 0.5 lb Starter are the Problem

1-wk, 95 lb calf, 20:20 all milk mr
Goal: 0.8-1 lb/day gain

<table>
<thead>
<tr>
<th></th>
<th>60 F</th>
<th>32 F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powder</td>
<td>24 oz</td>
<td>28 oz</td>
</tr>
<tr>
<td>Water</td>
<td>6 qt</td>
<td>7 qt</td>
</tr>
</tbody>
</table>
**Cold Weather Feeding**

- Add another meal of the same mix 2 extra meals if 0°F
- Increase total solids 15-18% (requires adjustment of 1% per day)
- Add additional fat
- Calves still need water and deep straw bedding
- Always have fresh, clean starter in front of the calf to encourage intake

**Feeding Consistency**

- Total solids
- Osmolality
- Sodium
- Temperature
- Measuring, mixing and delivery

**Total Solids**

- 1< 1% change per day
- Never > 18%

**Watch the Total Solids Variation**

**Calculate**

- 10 oz powder = 0.625 lb
- 2 qt water = 4.17 lb

\[
0.625 + 4.17 = 13\% \text{ solids}
\]

**Measure**
Variability in MR Diet – Total Solids

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12.2</td>
<td>15.6</td>
</tr>
<tr>
<td>2</td>
<td>11.5</td>
<td>17.0</td>
</tr>
<tr>
<td>3</td>
<td>12.5</td>
<td>19.3</td>
</tr>
<tr>
<td>4</td>
<td>8.8</td>
<td>16.0</td>
</tr>
<tr>
<td>5</td>
<td>10.9</td>
<td>14.4</td>
</tr>
</tbody>
</table>

Koepnick and McGuirk, 2010

MR Winter Feeding – Percent Solids Increased

<table>
<thead>
<tr>
<th></th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calf 1</td>
<td>16</td>
<td>19</td>
<td>21</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Calf 2</td>
<td>17</td>
<td>17</td>
<td>19</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>Calf 3</td>
<td>20</td>
<td>18</td>
<td>18</td>
<td>22</td>
<td>17</td>
</tr>
</tbody>
</table>

- No more than 1% per day
- Never over 18%

Inconsistencies Invite Problems

- Additives
- Medications
- Infection
- Carbohydrates and Protein Substrate
- Abnormal mobility
- Proliferation
- Sporulation
- Toxins
Other Nutrition Issues

- Salt poisoning
- Added ingredients may affect abomasal emptying, intestinal transport or intestinal flora
- Bovatec (Lasalocid) > 2X
- Electrolyte powder in milk or mr
- Limited water in cold weather

The Basic Care Package For Calves

- Colostrum
- Calories
- Consistency
- Cleanliness
- Comfort

A Basic Care Package

- Colostrum
- Nutrition
- Environment
Cleanliness Reduces Exposure

- Maternity pen
- Cows in maternity pen
- Transport cart
- People moving and handling calves
- Warming, holding or drying area
- Calf housing
- Feeding equipment
- Feeds

Time and Management Between Occupants

15% more pens than calves at maximum occupancy

During Occupancy: Remove feed refusals
Find the Site of Exposure...

- By-pass
- Dilute
- Distance them from it.
Calf Warming Rooms

Bedding Contamination Can Be Measured

<table>
<thead>
<tr>
<th>Location</th>
<th>Coliforms</th>
<th>Salmonella</th>
<th>Total cfu/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternity</td>
<td>1,000</td>
<td>Negative</td>
<td>576,000</td>
</tr>
<tr>
<td>Holding pen</td>
<td>500</td>
<td>Negative</td>
<td>150,825</td>
</tr>
<tr>
<td>Truck</td>
<td>6,900,000</td>
<td>Positive</td>
<td>6,921,750</td>
</tr>
<tr>
<td>Clean hutch</td>
<td>750</td>
<td>Negative</td>
<td>11,500</td>
</tr>
<tr>
<td>5-day hut</td>
<td></td>
<td></td>
<td>7,500</td>
</tr>
<tr>
<td>Repeat test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goals:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacterial types</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmonella culture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean pen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupied pen</td>
<td>&lt; 500,000</td>
<td>Negative</td>
<td>&lt; 2,000,000</td>
</tr>
</tbody>
</table>

Housing Factors

- Seasonal challenges
- Individual or group pens
- Indoor or outdoor
- Pen design, size, number
- Bedding type
- Filling and emptying patterns
**Comfort**

- Straw for newborns
  - Critical temperature range is 55-75 F
  - Use less energy to stay warm and have more to grow and fight disease
- Deep, dry bedding, deep enough to cover the legs when calf is lying down

**Deep Bedding**

Distances calves from exposure Reduces prevalence of respiratory disease and scours

**Comfort**

Blankets help.
Comfort

Calves should be sleeping 75% of the day.

Housing Changes that Reduce Respiratory Disease

- Decrease calf to calf contact
  - Barriers between calves
- Increase nesting score
- Decrease aerosol bacteria
  - Increase pen size > 24 sq ft
  - Limit barriers surrounding the calf
  - Colder temperatures
  - Supplemental outside air

The deeper the straw, the less respiratory disease

- Calories not diverted to warming but used to fight infection
Solid Panel Between Calves
But Not Boxed In

Remove feed refusals from
calf housing area

Calf Housing Solutions
- Naturally ventilated barns in winter (Lago, 2006)
  - Solid panels between calves
  - Increased bedding depth
  - Low airborne bacterial counts
- Group pen housing
  - Small, stable groups
  - Preconditioned period
  - At least 28 sq ft / calf
  - Increased milk allowance or ad-lib feeding
  - All in-all out management
Group Housing

Resting Space  Feeding Space and Water

Space Requirement: Bedded Pack with Feeding Area

<table>
<thead>
<tr>
<th>Weight (lb)</th>
<th>135</th>
<th>220</th>
<th>330</th>
<th>440</th>
<th>660</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area/heifer (sq ft)</td>
<td>21</td>
<td>25</td>
<td>29</td>
<td>37</td>
<td>45</td>
</tr>
<tr>
<td>Bedded area/heifer (sq ft)</td>
<td>17</td>
<td>21</td>
<td>24</td>
<td>29</td>
<td>35</td>
</tr>
</tbody>
</table>

Other Topics

- Vaccinations
- Dehorning
- Screening for health problems
- Treatment protocols
Goals of a Calf Vaccination Program

- Protect from disease or agents that they are likely to encounter before they are challenged
  - Septicemia at birth
  - Scours 3-14 days
  - Respiratory disease 3 weeks to 4 months
- Cost efficient (cost vs risk vs protection)
- “At least do no harm!”

Septicemia

- Infection before, during or shortly after delivery
- Gram negative bacteria
- Cows vaccinated - J Vac, J5, Endovac Bovi, Salmonella SRP
- Clean colostrum before exposure

Scours Protection

- Primer and booster in lact 1 and an annual booster in older cows
  - Vaccinate dry cows: ETEC, Rota, corona, Clostridium perfringens C, Salmonella
    - Scour Guard 4KC
    - Guardian
    - Scour Bos
    - Salmonella SRP
  - Vaccinate newborns
    - Calf Guard
  - Provide monoclonal antibodies
    - First Defense - ETEC, coronavirus
    - Ecolizer + C
  - Timing: booster needs to be at least 3 weeks prefresh, meaning that primer has to go at 75 to 60 days pre-fresh
Respiratory Disease Protection

- Colostrum
- Nutrition
- Housing
- Intranasal vaccine to protect calves with maternal antibodies
  - Birth
  - 3 weeks
  - Before group housing

Avoid Calf Vaccination Pitfalls

- Vaccinating sick/stressed calves
- Multiple vaccines at once
- Gram negative bacterial components
  - Pasteurella and Mannheimia
  - Salmonella
- Mycoplasma bovis
- Half-dose vaccinations

Dehorning: Pick the right time and dehorn with pain management
Screening for Health Problems

Detection depends on...
- Plane of nutrition
- Management
- Housing type
- Group size
- Timing of exam
- Type and quality of screening

From Outside of the Calf Pen
- Nasal Discharge
- Eyes
- Ears
- Spontaneous coughing
Determine a Respiratory Score

Calves with total respiratory score > 5 have more than 2 signs of respiratory disease and are treated.
One Time Treatment Protocols
5-Days of Coverage

- Baytril (Enrofloxacin)
- Draxxin (Tulathromycin)
- Excede (Ceftiofur)
- Nuflor Gold (Florfenicol)

Work with your veterinarians

More Than One Dose Protocols
5 Days of Coverage

- Adspec (Spectinomycin)
- Baytril (Enrofloxacin)
- Excenel or Naxcel (Ceftiofur)
- Nuflor Gold (Florfenicol)

Work with your veterinarians

Signs of Detection
Problems
Diarrhea

2 Loose
3 Watery

2 qt of OES solution once daily
2 qt of OES solution twice daily

Diarrhea Treatment

- Feed them
- Oral electrolyte solution
  - Fecal score 2: 2 qt OES once daily
  - Fecal score 3: 2 qt OES twice daily

Sick Calves Get Antibiotics
- High temp (> 103): Low temp (< 100)
- Reduced intake or feed refusal
- Arched back, hair standing up
- More than a streak of blood
- Another body system involved – lungs, navel or joints

Antibiotics
- *Salmonella* suspects or “sick” calves
- 3 days of coverage
- Gram negative spectrum
  - Consult your veterinarian