Strategies and Ideas on Calf Health & Management

Calf Rearing Essentials
Dr. Gordie Jones
• colostrum
• alone
• clean & dry
• well ventilated
• (must always do at least 3 of the 4)

Dr. Sheila McGuirk
• colostrum
• calories
• comfort
• cleanliness
• consistency

Overview
• Baby calf management
• Colostrum management & feeding
• Scours
• Housing and feeding management

Calf Program Goals
(Van Amburgh, Cornell University)
1. Double birth weight by 56 days (1.6 lb ADG) and add 4" of frame height
2. Less than 5% mortality
3. Less than 10% morbidity (treatments)

Why??
• Reach breeding weight earlier
• Reduce AFC, increase body wt. at calving
• Increase potential for internal herd growth
• Increase milk yield and/or productive herd life

How Do We Do Nationally on Health?
• 1 out of 10-12 calves die before they are weaned
  • A few outstanding producers lose around 1%
• 50% of calf deaths result from scours
• 4 out of 10 calves do not get enough immunity from their mother at birth

The Race(s) is(are) On!!
• Born in a clean, dry pen
• Remove from cow ASAP
• Dip navel with 7% tincture of iodine ASAP
  • alternative: Navel Guard ("tincture of chlorhexidine")
• Colostrum ASAP
  • Quality
  • Quantity
  • Timing, number of feedings
What’s the Big Deal About Removing the Calf from the Cow ASAP?

<table>
<thead>
<tr>
<th>Hours Spent with Dam</th>
<th>Number of Herds</th>
<th>Average Death Loss % (thru 6 mos. of age)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-6</td>
<td>13</td>
<td>5.2</td>
</tr>
<tr>
<td>7-12</td>
<td>35</td>
<td>9.3</td>
</tr>
<tr>
<td>13-24</td>
<td>32</td>
<td>10.7</td>
</tr>
<tr>
<td>25-48</td>
<td>24</td>
<td>20.5</td>
</tr>
</tbody>
</table>

Source: Clemson University

Do Producers Really Need to Dip Navels?

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Number of Calves</th>
<th>% Mortality</th>
<th>% Treated for Scours</th>
<th>% Treated for Pneumonia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navels Dipped</td>
<td>269</td>
<td>7.1</td>
<td>30.5</td>
<td>5.2</td>
</tr>
<tr>
<td>Navels NOT Dipped</td>
<td>132</td>
<td>18.0</td>
<td>22.0</td>
<td>18.9</td>
</tr>
</tbody>
</table>

Source: University of Wisconsin

Heifers with umbilical infections have lower rates of gain and a 13% greater chance of contracting pneumonia (Bach, 2007, PDHGA)

Just How Important is Colostrum?

Passive Immunity: Colostrum

Give a gallon and give it early!

- Focus on Collection
- Look at Storage
- Feed it Early
  - One feeding or two?

So, how are we doing?

Calf Survival as Influenced by Passive Immune Status

Percentage of Calves Expected to Provide Adequate Passive Transfer

Source: Gay, 1994, Hoard’s Dairyman.
Management 8 – Strategies & Idea on Calf Health & Management

Collection of Colostrum

• First Milk from the Udder
  – NOT second or third milking
  – 18 pound rule (?)
• No Contamination
  – Blood
  – Urine
  – Manure
• Disease-free Animals
• Do not pool colostrum!

How important is timely colostrum collection?

<table>
<thead>
<tr>
<th>Hours Post-Calving</th>
<th>Decrease in Antibody Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>---</td>
</tr>
<tr>
<td>6</td>
<td>17 percent</td>
</tr>
<tr>
<td>10</td>
<td>27 percent</td>
</tr>
<tr>
<td>14</td>
<td>33 percent</td>
</tr>
</tbody>
</table>

Normal variation in colostrum quality is HUGE

• Targeted IgG dose for calves: 100 g minimum(?); 150-200 g preferred
• Good quality colostrum = 50+ g/L IgG

Recent Studies on Colostrum variability:

– 2011, CA, (7 dairies) range: 0.5 – 115 g/L IgG (avg. = 36 g/L)
– 2010, WA, (56 dairies) range: 9 – 121 g/L IgG (avg. = 41 g/L)
– 2007, PA, (55 dairies) range: 14 – 95 g/L IgG (avg. = 41 g/L)

What about ration formulation to improve colostral quality??

• “There is little evidence that nutrition plays a large role in either the volume of colostrum synthesized or in colostrum quality in cattle.”
• “While inadequate supply of metabolizable protein is often suspected or implicated in low colostrum production, there do not appear to be any scientific studies that demonstrate such an effect.”
• “Differences in nutrient supply during the dry and transition periods are neither likely to have important effects on colostrum supply or quality.”

Excerpts from paper by JK Drackley, 2011 Tri-State Nutr Conf

Nutritional effects? ...per Dr. Jim Quigley...

• Greater potential for influencing colostrum indirectly– if nutrition has a positive, longer-term impact on immune function
  – Chelated Zn, Cu, and Mn may increase colostral IgG concentration
  – Feeding PUFAs/CLAs may improve colostral quality
  – Dry period mastitis & heat stress can reduce colostral quality (disease & stress reduce IgG)
  – Short dry periods don’t hurt colostral quality; NO dry period will

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How valid is the 18 pound rule?

Copyright 2005– Calf Management Services by Alliance Milk Products

University of Missouri study
**Measuring Colostrum Quality On-Farm**

- **Immunoglobulin content**
  - Target: >50 g/l Ig content
- **Colostrometer**
  - Temperature-dependent
- **Brix scale refractometer**
  - More accurate than a colostrometer
  - Temperature independent
  - ≥ 22% good
  - 19-21% fair (probably good enough if feeding 4 qts. ASAP)

**Storage of Colostrum**

- Fresh is Best
  - <40°F
  - 2 quart containers
- Frozen OK
  - Thaw Slowly

**What about bacteria?**

- Bacterial contamination reduces antibody (Ig) absorption by the calf
- Goal: feed colostrum with <100,000 cfu/ml TPC
- 60/60 (or 60/30) rule
  - Bacteria #s double in 20 minutes at 95°F; at 60°F it takes 150 min.
  - Garbage in, garbage in, garbage calf
  - Bacteria vs. IgG
- 48 hrs. maximum refrigerated storage
  - Heat treating will extend storage approx. another 2 days
  - Na+ citrate or K+ sorbate treatment will too (K+ sorbate “dose”: 10 ml of a 50% soln. per QUART of colostrum)
- Colostrum can be successfully pasteurized
  - Another 60/60 rule (60°C for 60 minutes)

**Feeding of Colostrum**

“Give a Gallon and Give it Early”

**Colostrum Absorption**

(before 12-24 hours of age)

- Blood vessel
- Intestinal tract

(after 12-24 hours of age)

- Blood vessel
- Systemic effect
- Localized gut effect
- IgG
- Intestinal tract
Calf Performance and Health at 4 Weeks of Age (2016 calves)

Versus calves with adequate passive immunity, calves with low IgG status (<1000 mg/dl) were:

- 2.2 pounds lighter
- 12% higher mortality rate
- 1.3 more days with scours
- $3.47 more in treatment costs
- Required 21% more feed per pound of gain

$23 more expensive to raise through 4 wks of age

Source: Fowler, 1999 PDHGA, pp. 31-35

Relationship between passive immunity and mortality

AGWAY TSPF Heifer Facilities:
- Calves with a serum total protein (STP) <5.0 g/dl had 5X the death rate of calves with adequate passive transfer!

- Colorado Study: Calves w/STP <5.0 g/dl had roughly double the sickness and death rate of calves w/adequate passive transfer.

“OK, but the sick calves that survive fully recover, right?”

<table>
<thead>
<tr>
<th>Calves fed 2.1 qts of colostrum within 1 hr of birth (n=37)</th>
<th>Calves fed 4.2 qts of colostrum within 1 hr of birth (n=31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veterinary cost per calf</td>
<td>$24.51</td>
</tr>
<tr>
<td>Average daily gain (through pregnancy exam)</td>
<td>1.76 lb</td>
</tr>
<tr>
<td>First lactation milk yield (305-day adj.)</td>
<td>19,739 lb</td>
</tr>
<tr>
<td>Second lactation milk yield (305-day adj.)</td>
<td>21,261 lb</td>
</tr>
</tbody>
</table>

- With a milk price of $14/cwt, “treated” animals each generated an additional $170 in actual income over two lactations.

adapted from Faber et al., 2005

“OK, but the sick calves that survive fully recover, right?”

- Every pound of weight loss (from scours) results in 7 lb of lost milk per lactation for the life of the animal (Schering-Plough Animal Health)
- Respiratory disease and scours in calves reduced first lactation milk production by 2.3 to 10 lb/day (Miller and Faust, 2000)

Measures of Calf Immunity

- Serum immunoglobulin
  - >1000 mg/dl OK, >1500 mg/dl even better
- Total serum protein
  - >5 g/dl OK, >5.5 g/dl even better
  - Brix Refractometer: ≥7.4
- Calf-side tests, other tests
- Confounding factors
  - Hydration status
  - Use of colostrum substitutes/supplements

- The other side of the coin...
"The relative immunological status of the calf depends on the burden of infection in the environment." - Jim Roy

**Summary of Colostrum and Adequate Passive Immunity**

- Substantial body of evidence supporting both shorter-term and longer-term performance effects
  - Baby calf health
  - Improved feed efficiency, lower rearing costs
  - Increased milk production

- Colostrum calculated to be worth $423/gallon, based on reduced death rate and treatment costs, improved ADG and milk production (J. Olson, DVM, Pfizer Animal Health)

- Colostrum appears to facilitate a rate of nutrient partitioning independent of disease occurrence

**Take Homes: Colostrum and Adequate Passive Immunity**

- If you’re not already feeding **4+ qts. by 6-8 hours of age**, strongly consider it
  - Collect and feed ASAP

- Enhanced passive immunity in calves may improve dairy profitability with minimal added inputs

**Enhanced Nutrition and Adequate Passive Immunity are Additive** (Osorio & Drackley, 2010)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Conventional Feeding</th>
<th>Accelerated Feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FPT</td>
<td>Adequate Pass. Imm.</td>
</tr>
<tr>
<td># of Calves</td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td>Serum IgG, mg/dL</td>
<td>558&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1793&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>ADG, lb/day</td>
<td>1.17&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.09&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>(thru 5 wks. of age)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a,b,c</sup> differ at P < 0.10

**Cold Stress**

- Maintenance energy requirements increase
  - Primarily a problem for younger calves (< 3 wk old)
  - Feed more... but more what?

**Thumb rule:** ↑ MR feeding rate by 0.1 lb for each 10°F temp. drop below 50-55°F

**Cold Weather Feeding Guidelines**

<table>
<thead>
<tr>
<th>Avg. Daily Temp. (°F)</th>
<th>Vol. per Feeding (Qts)&lt;sup&gt;*&lt;/sup&gt;</th>
<th>Feedings per Day</th>
<th>Weight Change w/ 4 qt. Feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 50°</td>
<td>2</td>
<td>2</td>
<td>+ 0.5 lb</td>
</tr>
<tr>
<td>15° - 50°</td>
<td>2.5</td>
<td>2</td>
<td>- 0.2 lb</td>
</tr>
<tr>
<td>0° - 15°</td>
<td>3</td>
<td>2</td>
<td>- 0.5 lb</td>
</tr>
<tr>
<td>&lt; 0°</td>
<td>2.5</td>
<td>3</td>
<td>- 0.75+ lb</td>
</tr>
</tbody>
</table>

<sup>*</sup> 10 oz. MR powder/2 qt., assumed calf wt. = 100 lb
Cold Stress

Other Strategies
• Protect against heat loss
  – Calf coats
  – Deep, dry STRAW bedding
• Target calves <1 month of age
• Be wary of reducing air exchange!!
• Don’t forget water!

| Source: M. Van Amburgh |

Amount of Milk Replacer/Milk Dry Matter Required to Meet Maintenance Requirements and Gain One Pound per Day

<table>
<thead>
<tr>
<th>Temperature</th>
<th>68</th>
<th>50</th>
<th>32</th>
<th>15</th>
<th>5</th>
<th>-5</th>
<th>-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bodyweight, lb</td>
<td>60</td>
<td>1.1</td>
<td>1.2</td>
<td>1.4</td>
<td>1.5</td>
<td>1.6</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>1.2</td>
<td>1.4</td>
<td>1.6</td>
<td>1.7</td>
<td>1.9</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>1.4</td>
<td>1.6</td>
<td>1.8</td>
<td>2.0</td>
<td>2.2</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>1.6</td>
<td>1.8</td>
<td>2.1</td>
<td>2.2</td>
<td>2.5</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Source: M. Van Amburgh

Milk Replacer Feeding Studies:
1.25 versus 2-2.2 lb of milk replacer powder per day for 42-49 days

<table>
<thead>
<tr>
<th>Study</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miner Inst. &amp; Zenoh (JD S Abstr., 2005)</td>
<td>+ 1760 lb</td>
</tr>
<tr>
<td>Michigan State (JD S Abstr., 2006)</td>
<td>+ 1100 lb</td>
</tr>
<tr>
<td>U. of Minnesota (currently in progress)</td>
<td>+ 1800 lb</td>
</tr>
<tr>
<td>U. of Illinois (JD S Abstr., 2007)</td>
<td>+ 1841 lb</td>
</tr>
<tr>
<td>Average response</td>
<td>+ 1625 lb</td>
</tr>
</tbody>
</table>

Adapted from M. Van Amburgh

Cornell Dairy Herd
• Have been feeding for enhanced pre-weaning growth (target: ≈2 lb/hd/day) for over 10 years
• Over 1000 weaning wts. and 725 completed first lactations from this data
• How well do calf growth measures (pre-weaning) relate to 1st lactation milk yield?
  – 9 variables measured. Also tested for effects of year, season, genetics, management variation

Adapted from M. Van Amburgh

Cornell Dairy Herd
• Every 1 lb of gain above 0.5 lb per day increased milk yield by 850 lb in the first lactation, and 2280 lb over their first 3 lactations
• So, a pre-weaning ADG of 2 lb versus 0.5 lb was worth 1275 lb of milk in the first lactation
• 12 study meta-analysis: each additional pound of gain before 2 mos of age was associated with + 1550 lb of milk in the 1st lactation
  – *BUT* not every study has shown this production advantage in association with higher pre-weaning ADG

Adapted from M. Van Amburgh
Accelerated Feeding - Take Home Messages:

- If nothing else, increase feeding rates during cold weather
- No negative effects evident in currently available data for pre-weaned calves
- We can’t explain all the variables yet...
- Higher pre-weaning growth rates should translate into higher 1st lactation milk production
  - Aim for 1.5 to 2 lb/head/day gain before weaning
  - Use young calves’ propensity for lean tissue gain to your advantage
  - Higher protein, lower fat milk replacers more appropriate for these programs

Heat Abatement Ideas

- Shade
- Water (intake can double from 70 to 90°F)
- Ventilation

Calves born to heat-stressed cows have:

- Lower birth weights
- Reduced IgG absorption
- Compromised T-cell function
- Produce significantly less milk once they begin lactating (Montiero, et al, 2013)

Reflective Hutch Covers

Water is your friend...

- Increases starter intake
- Improves weight gain
- Enhances rumen development
- Will be consumed at an average rate of 2.3 L per day (APC data)
- Helps maintain hydration in scouring calves
- Consumption increases as environmental temperature increases (up to 5 gal./day)
- Reduced risk for abomasal bloat?

Free Choice Water:

- Increases starter intake
- Improves weight gain
- Enhances rumen development
- Will be consumed at an average rate of 2.3 L per day (APC data)
- Helps maintain hydration in scouring calves
- Consumption increases as environmental temperature increases (up to 5 gal./day)
- Reduced risk for abomasal bloat?

...Moisture is your enemy

- Wet bedding
  - Increased challenge with accelerated feeding programs
- High(er) humidity
  - Reduced air exchange, air quality, and increased risk of respiratory disease
- Wet feeding equipment

Routes of Disease Transmission to Calves

<table>
<thead>
<tr>
<th>Bug/Disease</th>
<th>Fecal/ Oral</th>
<th>Fecal/ Novel</th>
<th>Nasal/ Saliva</th>
<th>In Utero</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Coli*</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotavirus &amp; Corona</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cryptosporidia</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. coli</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>John’s Disease</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Salmonella*</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>BVDV</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Mycoplasma bovis</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infectious Mastitis</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
* Potentially treatable w/antibiotics

Source: Adapted from L-O-L* Potentially treatable w/antibiotics
Calf Scours

- The story’s the same… only the names and faces change
- Manure vs. management
- Every pound of weight loss results in 7 lb of lost milk per lactation for the life of the animal
- GI disease doubles the risk for pneumonia

Goals of Scours Therapy

- Maintain nutrition!
- Maintain hydration
  - Oral, IV, SubQ fluids
- Replace lost electrolytes
- Correct acidosis
- Treat low blood sugar concentrations
- Antibiotics?

Electrolyte Considerations

- Na⁺ and K⁺ to offset fecal losses
- Glycine to enhance Na⁺ absorption
- Alkalizing agents:
  - Acetate or propionate preferred over bicarbonate (less risk of abomasal pH getting too high)
- What about gelling agents (psyllium)?
  - Contraindicated because they reduce glucose absorption
- Feed separately from milk/milk replacer!
- Consider TheraCaf™ Electrolyte (#2920)
Coccidiosis

• Coccidia are protozoan parasites affecting calves from 3 weeks to 8+ months of age
• Infect the small intestine
• Susceptible to a limited number of medications
• Extremely hardy/persistent in the environment
• Cause diarrhea (sometimes w/blood), reduced gain and performance
• Can be difficult to prevent or treat successfully
• Greater risk of clinical disease during stressful periods (e.g. weaning, etc...) 

Proposed Coccidia Strategy

• Feed MR containing Deccox *
• Feed good quality starter containing 36-42 grams Rumensin /ton (50-60g Bovatec /ton)
• Include Deccox “M in colostrum if needed
• Wean when consistently consuming 2.5+ lb of starter daily
• Separate and minimize stressors
• Minimize exposure to manure
• Don’t commingle older and younger animals
• Keep feeding the same ionophore in grower feed
• KEEP CALVES EATING!

Five Rules to Help Reduce Pathogen Load

Rule No. 1
Follow All-In All-Out Principles

All-In All-Out applies to Everything on the Calf Operation

Rule No. 2
Clean ...and.... Disinfect

• Warm Soapy Water
• Rinse
• Disinfect
• Rinse
PROTOCOL FOR CLEANING AND SANITIZING ALL COLOSTRUM AND MILK HANDLING EQUIPMENT (Bottles, Buckets, and Esophageal Feeders)
Adapted from Dr. Sam Leadley, Attica Veterinary Associates

After EACH AND EVERY USE, clean ALL equipment according to the following directions:

1. Rinse in lukewarm water to remove milk proteins and dirt before washing.
2. After rinsing, wash in water that never drops below 120° F, even at the end of the wash cycle (temperature checked with a thermometer).
3. After the hot water wash, clean with a 0.5-1.0% chlorine solution (use either bleach or chlorinated cleaning powder).
4. Rinse with an acid solution to retard bacteria growth.
5. Dry all equipment INVERTED, on a rack, to encourage rapid and complete drying.

** Ensure that the water used to wash equipment and mix milk replacer does not contain significant numbers of bacteria (e.g. coliforms). Verify this by periodic testing of water quality.

Rule No. 3: Keep it Dry

Rule No. 4: Move Everything from Young to Old

Rule No. 5: Make it easy...
What about group housing & feeding?
(adapted from Dairy Herd Mgt., Aug. 2014)

**Autofeeding Pointers:**
- 20-25 calves max. per nipple station
- ≥35 ft² bedding area per calf
- 3 week max. age spread for calves in a pen
- Transition calves onto autofeeder by 5-14 days of age
- 4-6 meals per day

- Target 1.8 – 2.7 lb of milk solids (6-11 qts.) /calf/day
- 7 weeks min. weaning age
- Reduce milk volume for 7-14 days in preparation for weaning
- 3 lb. min. daily starter consumption at weaning

**Management Recommendations**
- Good air quality and ventilation are critical
- Keep bedding clean, dry and abundant at all times
- Locate feeding stalls w/in 3 ft. of machine to keep milk transfer lines cleaner
- Ensure milk replacer solids content is calculated correctly
- Clean and or replace nipples at least once daily
- Re-calibrate machines at least once a week
- Follow manufacturer’s recs. for automatic cleaning & sanitizing
- Clean manually according to mfr’s recs.
- Offer fresh, clean water free-choice
- Separate stressors
- Clean & sanitize pens btw groups

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**Rules of ONE for Baby Calves**

- **ONE** cleaning of the calving area for each calf born
- **ONE** gallon of colostrum and at least **ONE** dipping of the navel ASAP after birth
- **ONE** calf per housing unit(?)
- **ONE** bottle and set of buckets per calf
- F/C H₂O and starter by **ONE** week* of age
- **ONE** cleaning of feeding equipment per use
- **ONE** cleaning of the housing area between calves
- **ONE** stressor at a time

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**Thank You!!**

![Photo courtesy of Ray Morrison](Image)