Feeding Strategies to Improve Calf Performance

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Northeast Iowa Community Based Dairy Foundation
Calmar, IA

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CalfStart
Initiated operations of CalfStart in 2009
Dairy discard milk and colostrum monitoring system. Specializing in microbiology, data logging and consulting on dairy on-farm pasteurization systems. Included but not limited to are the capabilities to test colostrum and/or serum for IgG levels along with total proteins (TP) levels in serum. Also handle batch and HTST pasteurization equipment and service.

Lewiston Veterinary Clinic
Lewiston, MN
Graduated from U of Minnesota 1983
Practicing veterinarian in home area for >25 yrs
Exclusive Production Dairy Medicine and Consulting

Century Family Dairy w/ brother, Originally purchased pasteurizer for home dairy in 2004, became dealer as two other clients wanted pasteurizers as well. Graduated into more work with Dairytech as I witnessed the benefits in systems.
Status U.S. Calf Health

• Between 8.4 and 10.8% of calves die before weaning.¹

• 62% of pre-weaning deaths occur in first three weeks of life.¹

• Scours accounts for 60% of pre-weaning disease.¹

• 40% of dairy calves have failure of passive transfer.¹

• 31% of dairy heifer deaths could be prevented through better colostrum management (Wells, Prev. Vet. Med, 1996 Vol. 29 Pgs. 9-19)
“Life in the day” of milk in an Automated Calf Feeder

Milking equipment & prep procedures
DairyTech
INCORPORATED

Platinum 10 Gal
# Reduced Pathogen Transmission (vs raw milk)

Does Pasteurization Kill Pathogens in Milk and Colostrum?

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Batch (140°F, 60 min)</th>
<th>HTST (161°F, 15 sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Salmonella</em> spp.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><em>Listeria monocytogenes</em></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><em>E. coli 0157:H7</em></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><em>Staph. aureus</em></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><em>M. bovis, M. californicum</em></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Crypto. parvum</td>
<td>Nav</td>
<td>Yes</td>
</tr>
<tr>
<td>Bovine Leukemia Virus</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><em>M. paratuberculosis</em> (Johne’s)</td>
<td>Yes</td>
<td>Yes (?)</td>
</tr>
</tbody>
</table>

* Studies ongoing
Introduction of the “perfect” solution to colostrum handling and feeding
Pasteurizing colostrum: the next step to controlling disease

Calves absorbed more immunoglobulins when colostrum was pasteurized.

by Jud Hohmichs and Coleen Jones

Pasteurization has been shown to be very effective at killing a variety of pathogenic bacteria including Salmonella, E. coli, Mycobacterium avium sub-species paratuberculosis, Mycobacterium avium, Mycobacterium leprae, and Listeria monocytogenes. With proper pasteurization, these bacteria are reduced in both waste milk and colostrum. If you are using pasteurization for waste milk to control the spread of disease, feeding fresh, unpasteurized colostrum represents a break in the system that could allow organisms to spread to your replacement heifers. Pasteurizing colostrum can eliminate this weak link and may also improve blood IgG levels and calf health.

Receivers can get into colostrum through contamination from milking dirty udders, reservoirs in dirty milking equipment or colostrum storage containers, and by direct shedding from the udder. We are learning that pasteurization can be used for colostrum in a similar manner as it is used for waste milk. However, there are distinct differences in the way colostrum is pasteurized compared to waste milk.

First, we must remember that the nutrient density of colostrum is different from whole milk. Solids such as fat and protein affect how heat is transferred through colostrum or milk. The fat content of colostrum can be as high as the two times that of milk and may be much greater. Protein is often four to more times greater in colostrum versus whole milk. In addition, colostrum has high levels of immunoglobulins that require different heat levels and treatments than those used for milk. Early attempts at pasteurizing colostrum using the same time and temperature used in pasteurizing whole milk were largely unsuccessful due to the large reduction in immunoglobulins levels or the creation of a thick, pudding-like mass that was hard to feed and even harder to clean out of pasteurization equipment.

In the past few years, research has studied how to best pasteurize colostrum while maintaining its quality. Since colostrum can be quite varied from cow to cow, it is unlikely that a single definition of time and temperature can be found for true pasteurization for all colostrum. However, a study using a wide variety of colostrum samples showed that IgG levels remained for the age. Absorption efficiency was found to be pasteurized colostrum and raw. In a second Penn State study, pasteurized colostrum had IgG levels of 26.7 mg/mL, compared to 0.6 mg/mL for calves fed unpasteurized colostrum. Efficiency of absorption was found to be 33.9 percent for pasteurized colostrum, respectively.

In these three studies, calves fed pasteurized colostrum increased IgG levels by 25 percent compared to 28 percent for raw colostrum. Improving IgG levels can have huge impacts on calf survival by increasing the percentage of live calves. Based on past research, feeding 24-hour blood IgG levels of calves fed pasteurized colostrum dropped. Therefore, a reliable pasteurizer that has good temperature control is recommended.

An unexpected finding of the research studying pasteurized colostrum was that calves fed pasteurized colostrum absorbed more IgG. In a Minnesota study, 24-hour serum IgG was 22.3 mg/mL in calves fed pasteurized colostrum compared to 17.3 mg/mL in calves fed raw colostrum. Apparent efficiency of IgG absorption was also improved in the calves fed pasteurized colostrum (35.6 versus 28.1 percent).

This phenomenon was observed in two different experiments at Penn State, as well. In one study, calves fed colostrum heated at 140°F for 20 minutes had serum IgG of 22.6 mg/mL, 24 hours after feeding. For calves fed raw colostrum, the higher blood IgG levels remained for the age. Absorption efficiency was found to be pasteurized colostrum and raw. In a second Penn State study, pasteurized colostrum had IgG levels of 26.7 mg/mL, compared to 0.6 mg/mL for calves fed unpasteurized colostrum. Efficiency of absorption was found to be 33.9 percent for pasteurized colostrum, respectively.

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On farm data; Apr-Nov 2009 (Schell, CalfStart.com)

Minnesota, 1,600 cow dairy

Colostrum; pasteurized vs. non-pasteurized.

Baby calf serum IgG levels at one week of age

Sample size; 1440 calves, 720 pre-pasteurized group 720 post-pasteurization group

Approx. 22% higher IgG levels pasteurized vs non-pasteurized Colostrum (P < .0001)
5 Q’s of Managing Colostrum

1. **Quality**
2. **Quantity**
3. **Quickness**
4. **SQueeky clean** (bacterial contamination)
5. **Quantifying passive transfer** (monitoring)
“Life in the day” of milk in an Automated Calf Feeder

What could go wrong? Possibilities...

1. Calving Pen

VS.

[Image 0x0 to 408x264]
[Image 18x425 to 600x530]
“Life in the day” of milk in an Automated Calf Feeder

4:00 AM, Treated and Fresh cow pen is milked

8:00 AM, Discard milk is loaded into the pasteurizer
“Life in the day” of milk in an Automated Calf Feeder

4:00 PM Milk transferred to the ACF (Automatic Calf Feeder) Bulk Tank

4:00 PM – 8:00 AM Pasteurized discard milk supplies ACF.
Standards

- Less than 5,000 cfu/ml coliforms
- Less than 50,000 cfu/ml total bacteria
“Life in the day” of milk in an Automated Calf Feeder

Automatic calf feeder, CIP
“Life in the day” of milk in an Automated Calf Feeder

Nipple apparatus
“Life in the day”
Monitoring
Data Logger from batch pasteurizer

About as close to perfect as you will see
Data Logger from batch pasteurizer

Cool down slowed, water off?
Data Logger from batch pasteurizer

Oops! Only happened once...this week
Brix refractometer

Used for “on Farm” and laboratory testing of the total solids content of milk or colostrum

Cost; Approx $75–$200
CalfStart was initiated in 2009 to assist dairy producers by providing a simple sampling process for routine monitoring of one of their most valuable resources:

milk & colostrum for baby calves.

Including:

- **Sampling Kits** (for Pasteurizer Bacteria counts, pH & total solids, also IgG test kits for colostrum or serum monitoring)
- **Routine monitoring** (lab sampling, data logging equipment and on farm consulting)
- **Member’s website**
- **Ongoing benchmarking**
So what do you need to do...

1. Maximize calf’s immune potential.
   Adequate volume of pasteurized colostrum to achieve high IgG levels as well as other immune enhancers.

2. Maximize calf’s growth potential.
   Be it with pasteurized discard milk or milk replacer, GET THE CALORIES INTO THE CALF

3. Monitor your system
   Good decisions require good data !!!

4. Return $$$ on your investment.
   You may not see it at first but follow the calf, it is waiting for you.