



Feeding Strategies to Improve Calf Performance

November 10, 2010

**Northeast Iowa Community Based Dairy Foundation
Calmar, IA**

Robert J. Schell DVM



Robert J. Schell DVM

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





Platinum 10 Gal



Reduced Pathogen Transmission (vs raw milk)

Does Pasteurization Kill Pathogens in Milk and Colostrum?



Pathogen	Batch (140°F, 60 min)	HTST (161°F, 15 sec)
<i>Salmonella</i> spp.	Yes	Yes
<i>Listeria monocytogenes</i>	Yes	Yes
<i>E. coli</i> 0157:H7	Yes	Yes
<i>Staph. aureus</i>	Yes	Yes
<i>M. bovis</i> , <i>M. californicum</i>	Yes	Yes
Crypto. parvum	Nav	Yes
Bovine Leukemia Virus	Yes	Yes
<i>M. paratuberculosis</i> (Johne's)	Yes	Yes (?)*

* Studies ongoing

Colostrum Pasteurization



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 Heinrichs and Coleen Jones

PASTEURIZATION has been shown to be very effective at killing a variety of pathogenic bacteria including: *Salmonella*, *E. coli*, *Mycobacterium avium* subspecies *paratuberculosis*, *Mycobacterium californicum*, *Mycobacterium bovis*, 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 herd. Pasteurizing colostrum can eliminate this weak link and may also improve blood IgG levels and calf health.

Bacteria 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 often be at least two times that of milk and may be much greater. Protein is often four or more times greater in colostrum versus whole milk. In addition, colostrum has high levels of immunoglobulins that require different heat levels and treatment 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 immunoglobulin 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 sam-

ent in the colostrum, heating to 140°F for 60 minutes will give a more reliable kill of these harmful bacteria; however, slightly more IgG may be lost in the process.

Based on the different characteristics of colostrum compared to waste milk, researchers have determined that batch pasteurization is the only way to successfully pasteurize colostrum. In addition, consistent heating is critical, because once temperatures get over 140°F (60°C), IgG proteins coagulate and IgG levels in the processed colostrum drop. Therefore, a reliable pasteurizer that has good temperature controls 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 18.1 mg/mL in calves fed raw colostrum. Apparent efficiency of IgG absorption was also improved in the calves fed pasteurized colostrum (35.6 versus 26.1 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 30 minutes had serum IgG of 22.6 mg/mL at 24 hours compared to 19.6 mg/mL for calves fed raw colostrum. The higher blood

HEAT-TREATING COLOSTRUM does offer advantages in providing cleaner colostrum for calves along with improved IgG absorption.



IgG levels remained for the same age. Absorption efficiency was higher for pasteurized colostrum and lower for raw. In a second Penn State study, 24-hour serum IgG was 26.7 mg/mL compared to 20.7 mg/mL for calves fed raw colostrum. Efficiency of absorption was 33.9 percent for pasteurized colostrum, respectively.

In these three studies, pasteurized colostrum increased 24-hour serum IgG levels by 25 percent and absorption efficiency by 28 percent compared to raw colostrum. Improving colostrum quality can have huge impacts on calf health. Being able to attain significantly higher levels of IgG when fed the same quantity of colostrum. Based on past research, we know that feeding 24-hour blood IgG levels can have significant positive effects on calf health. On a practical basis, colostrum that calves today will have pasteurized, and cooled down. As a result, most calves receive colostrum from the

“In these three studies, feeding pasteurized colostrum increased 24-hour serum IgG level by 25 percent and absorption efficiency by 28 percent compared to feeding raw colostrum.”

pasteurized colostrum will be used if a large herd, frozen colostrum will still be fed colostrum from your herd which shows bacteria specific to the farm are passed to calves.

Results of colostrum pasteurization suggest that heat-treated colostrum present an excellent opportunity to increase IgG absorption. The percentage of dairy calves born with passive antibody deficiency is why IgG absorption

colostrum is pasteurized, although changes in colostrum when they are exposed to reduced temperatures for absorption of proteins for absorption.

Past research has shown that bacteria introduced into colostrum feeding can reduce the amount of IgG absorbed. But, in a recent study, calves fed colostrum with high bacterial load (standard plate count) absorbed significantly more IgG as calves fed colostrum with low bacterial load.

Although further research is needed to explain why this happens, it seems clear that pasteurizing colostrum

HOARD'S DAIRYMAN

The National Dairy Farm Magazine



“In these three studies, feeding pasteurized colostrum increased 24-hour serum IgG level by 25 percent and absorption efficiency by 28 percent compared to feeding raw colostrum.”

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. **SQueekey 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.



“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.



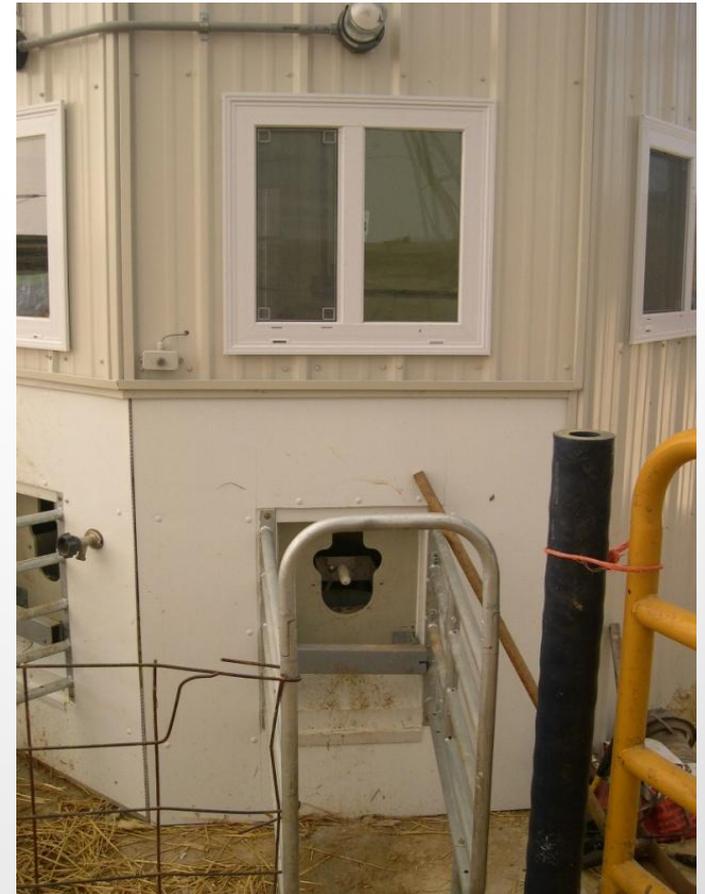
Standards

- ▶ 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

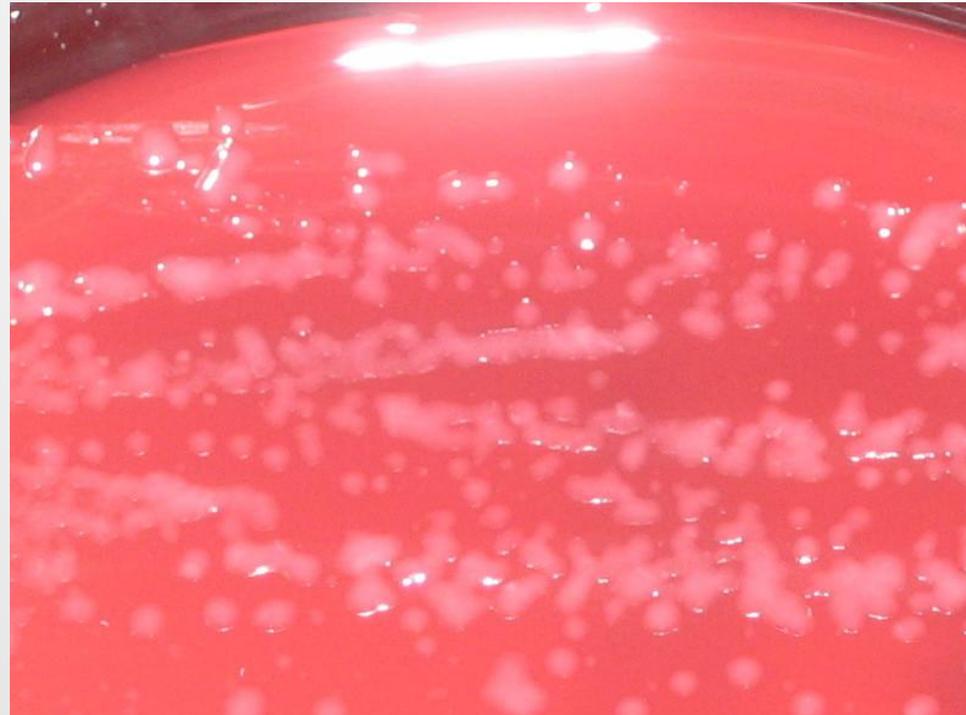
Nipple apparatus



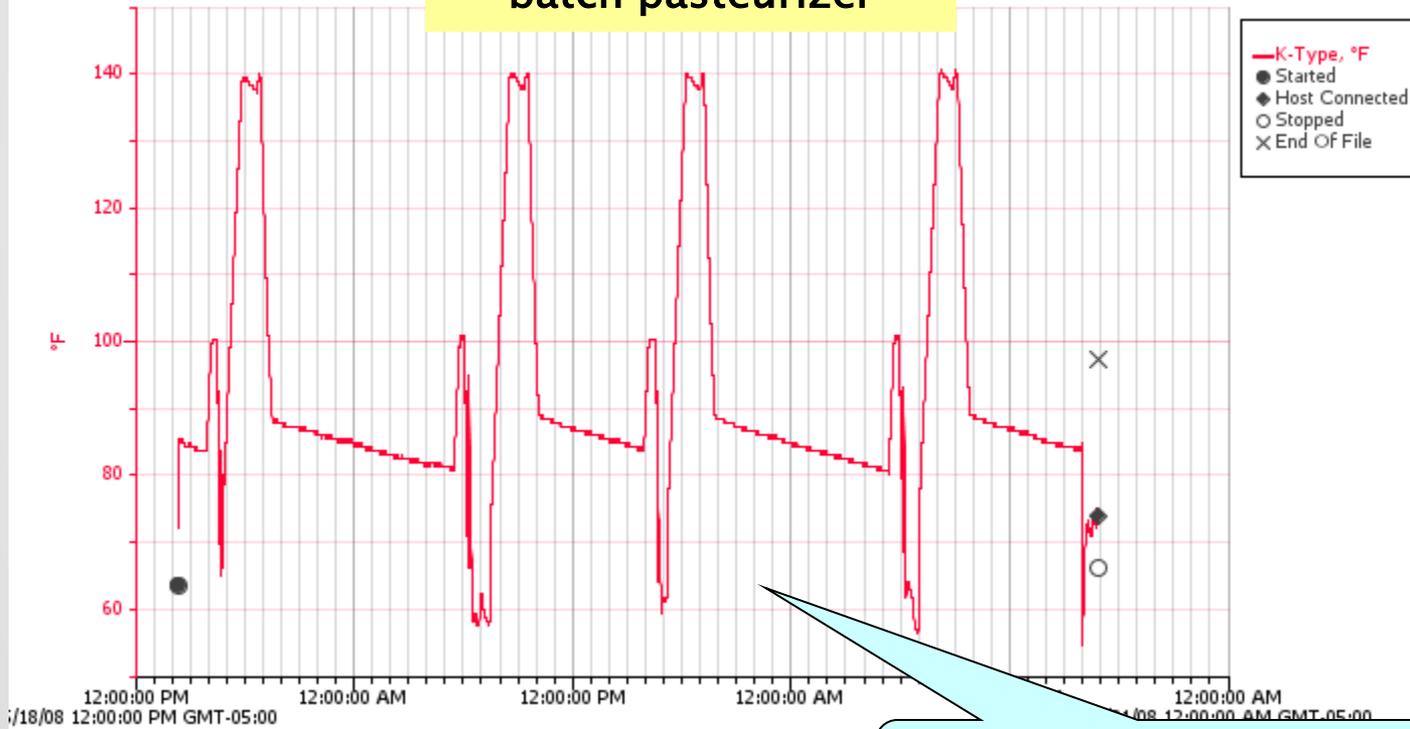
“Life in the day”



Monitoring

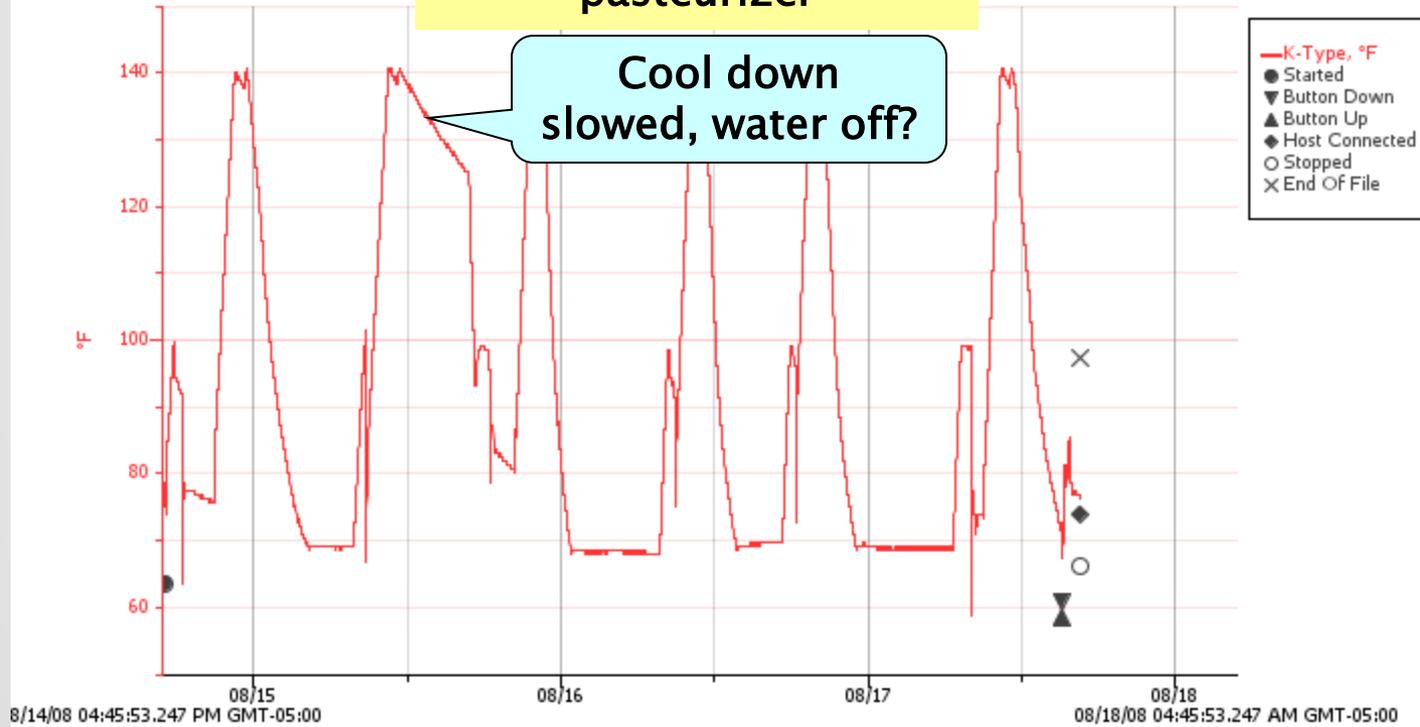


Data Logger from batch pasteurizer

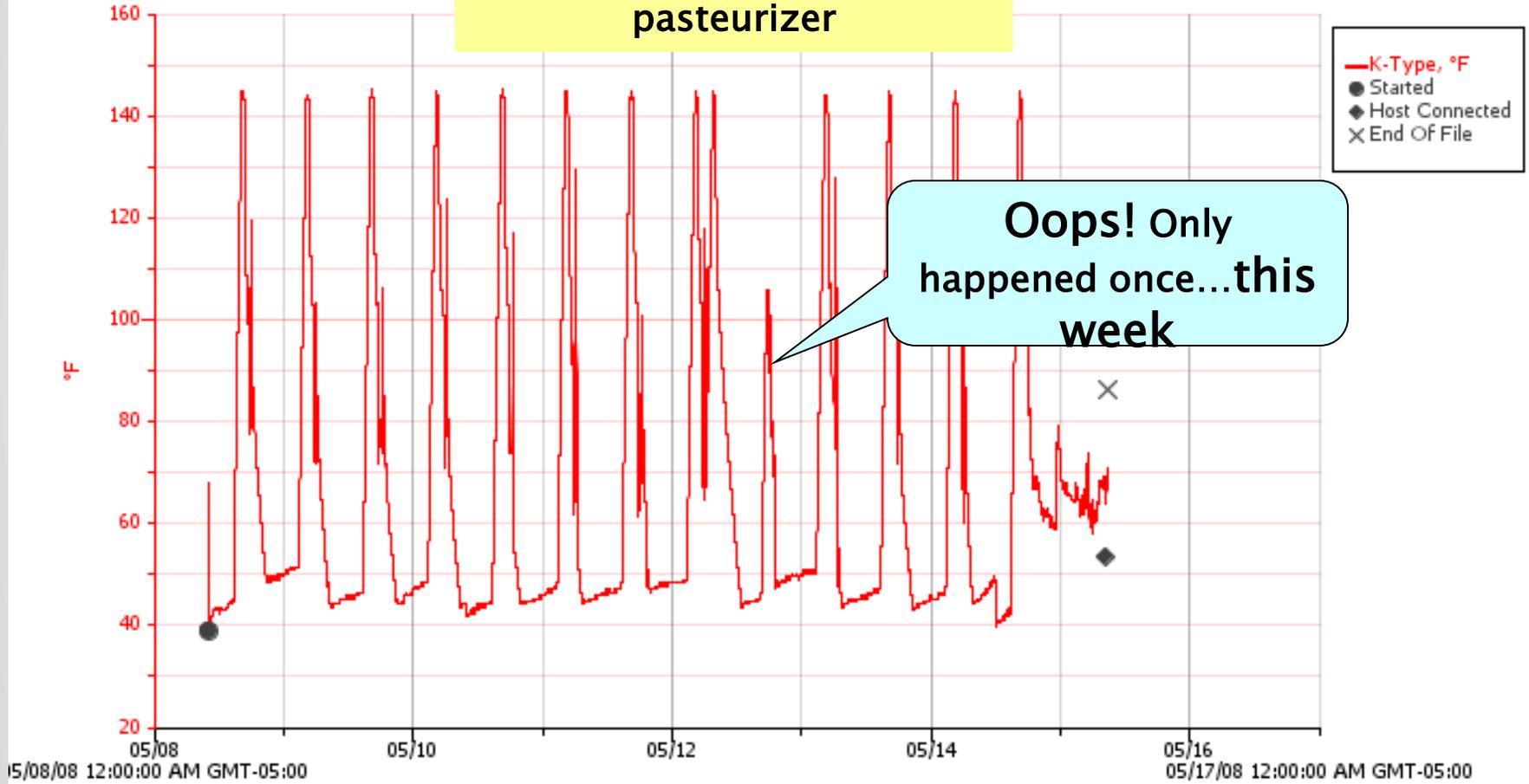


About as close to perfect as you will see

Data Logger from batch pasteurizer



Data Logger from batch pasteurizer



Brix refractometer



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

Cost; Approx \$75–\$200

About:



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.