

**ODV MEETING
2008**

**SUCCESSFUL CALF
AND HEIFER PROGRAMS**

SUDDEN CALF DEATH LOSS INVESTIGATION

Phil A. Lowe, DVM

- 375 Head Registered Holstein Herd
- 28,000 RHA 4.0% Fat 3.3% Protein
- 2X with BST



HISTORY

- October 2006- 2 calves died suddenly at 3-4 weeks of age.
- Gross post showed perforated abomassal ulcer
- Microbiology yielded Salmonella Muenster
- No other bacterial, viral or protozoal agents identified
- Started SRP vaccination program and cleaned up calving area and increased sanitation on colostrum handling

Calf Care

- Cows on well maintained loose housing
- Moved to corner well bedded pen when calving was close
- Removed from cow within 30 minutes to 4 hours depending on time of day
- Calves allowed to drink fresh colostrum from nipple bottle on own
- Navel dipped in 7% iodine
- 3ml B0-Se SQ
- Moved to clean dry hutch





January 2007

- Sudden Death Loss
- No difference between bulls or heifers
- No difference between calves from heifers and those from 2nd and older lactation cows
- No difference between single or multiple births

- Calves 7-8 days of age
- Slow to eat at one feeding but eventually ate all their milk replacer
- Dead within 12 hours
- Temperatures normal to slightly subnormal
- No diarrhea
- No respiratory signs

- Calves housed individually in hutches with open front pens
- Fed 1.5 pounds dry matter of 22/20 all natural milk replacer twice a day from bucket
- Free choice water
- Hutches bedded with 4 inch base of sawdust and covered with 4 inches of straw
- Starter pellets introduced free choice at 7 days of age



- Temperature Mid 30's in the day
- 15-25 at night
- All calves allowed to drink 1-1.5 gallons of fresh colostrum within 8 hours of life
- If calf did not drink at least 1 gallon then tubed with 1 gallon
- Calves fed pooled colostrum for next 3 days

- 10 calves in a row all die at 7-8 days of life
- First 3 posted by me – NO gross lesions
- Only remarkable finding was decreased abdominal fat
- Specimens sent to ODA
- Microbial Cultures- Negative
- FA's for Rota-Corona-BVD- Negative

- Next 2 posted at ODA
- 1st calf cultured non effacing E. Coli
- 2nd calf – 30% of one lung dark red and firm-cultured E. Coli and Strep Bovis
- All Viral tests Negative
- No other lesions seen

- Calf 6 posted by me again with no gross lesions
- Multiple samples submitted to Pennsylvania State Diagnostic Lab
- Isolated Cryptosporidia
- All other tests Negative

Recommendations

- Based on reduced fat stores and cold temperatures increase feeding to 2 pounds dry matter powder per day
- Check TP's on 1-5 day old calves
- Monitor rectal temperature twice daily
- Administer Immunoboost at 5 days of age

Results

- TP's Ranged from 5.6-6.2
- Mean 6.0
- Calves showed no spike in temperature
- Calves ate increased feeding easily

So What Happened ?

Calves started dying at 6-7 days instead of 7-8 days

FARM VISIT AT FEEDING TIME

- Checked scoop for measuring milk replacer with scale – weight right on
- Checked water temperature- 105
- All nipples replaced when problem first started
- All bottles, nipples , and buckets are washed in a disinfectant solution rinsed and hung to air dry between feedings
- Calves are bright alert active and ready to drink

- Next calf to appear slow was loaded up and hauled to another practice where the calf was noted to be dehydrated with no signs of diarrhea or respiratory disease, and was a febrile.
- Calf put on IV fluids and oral milk replacer
- Calf improved to normal state and sent home
- 48 hours later calf died

- Had owner draw CBC and serum sample from next calf that appeared slow to eat
- CBC within normal limits
- Serum profile within normal limits except for a serum sodium of 169.

Tests on Saved Tissues

- I had ODA run sodium levels on brain from saved tissue
- Level was 1930 ppm
- Toxic level is anything > 1800 ppm

Why were levels so high

- Not mixing the replacer properly?
- I watched and measured and it was being done correctly.
- Free Choice water BID.
- No histological changes in the brain indicative of sodium toxicity.

- Sample of as fed milk replacer sent to Dr. Sheila McGuirk's lab at Wisconsin and the total sodium concentration came back at 141 mmol/L
- Maximum Sodium concentration is to be < 120 mmol/L

- At this point I advised the owners that the sodium concentration was extremely high and we should check the sodium level in the well water used to mix the replacer.
- The Mother said that she had notice that she could not get enough water to drink and thought she was getting diabetes, because she was thirsty all the time and could not get enough water to drink.

- Test of well water showed sodium levels of 134 mmol/L
- We then started hauling water from another farm and the death losses immediately stopped
- Since this time we have ran city water to the milk house and have had no further problems
- Cows did not drink well water but waters in free stall barn were fed from a pond.

- About 2 weeks after we quit using the well water they called one night to say that they had accidentally mixed up milk replace for a premature calf with the old well water and now it was acting lethargic.
- They ran a serum sample to the local hospital and it came back at 160 ppm sodium

Why no histological signs of sodium toxicity in the brain

- The free choice water was the same high sodium water as was being used to mix the replace, therefore they were not receiving any pure water to cause the classic signs of perivascular cuffing as seen in true sodium toxicity/water deprivation syndrome.

- When we increased the feeding rate we actually made the sodium toxicity worse and started killing the calves earlier.
- The calves stayed on colostrum for the 1st 3-4 days of life and didn't start to receive any water till after that.

Sodium Source

- Local oil well company was pumping brine water down a dried up well which was leaching into the client's well water.

LESSONS LEARNED

- **DON'T** chase bugs all the time
- Don't forget the importance of basic diagnostics

East Holmes Veterinary Clinic, Inc.

Ohio Dairy Veterinarians 2008
Calf and Heifer Services



Professional Staff

- Eric M. Shaver, DVM '85 OSU
- Teresa Hoxworth, DVM '03 OSU
- Amity Wise, DVM '03 OSU
- Aaron Wise, DVM '07 OSU

13 Full & Part-time Technical,
Reception support staff



Practice Demographics

- 50/50 --- Large / Small
 - 20% Kennel
 - 30% Pet
 - 30% Dairy
- 120 dairies (4800 cows)
7000 heifers
 - 15% Equine
- 5% Exotics, small ruminant, swine, etc

Dairy Demographics

Countywide

- 550 dairies
- 17,000 cows
- 19,000 heifers



Dairy Demographics Herd Size

- Hand milking 6 to 600
- Most are 30-60 cow, family farms
- Many are of Amish or Mennonite backgrounds
- Most raise their own heifers and have heifers to market
- Organic grazers to total modern confinement



Countywide Demographics Calf Facilities on Dairies

- Many have adopted hutch concept
- A few have calf barns
- Some do as "Grandpa" did
- A few phase I or wet-calf facilities 20 – 60 head



Countywide Demographics

Heifer Facilities on Dairies

- Many have designated heifer facilities either new or renovated
- Most still use spring through fall pastures
- Some still rough their heifers through



Countywide Demographics

Multiple phase II, phase III, or grower facilities

- Most in the 20 – 80 head range
- A few larger facilities 200, 700, 1100 head
- About half are contract growers
- Most feed silages, hay, pasture, grain
- Only the larger few use a nutritionist and TMR
- Only one has a scale and height measurement capabilities



Our Calf and Heifer Services

Traditional

- Nutritional Counseling
- Diagnostic Services
- Disease prevention Programs
- Therapeutic programs
- Reproductive services
- Regulatory work

Nutritional Counsel

Colostrum Programs

- Quality, quantity, timeliness
- Enhancement – dry cow vaccine, IgG antibodies
- Supplements vs. replacers
- Additives --- deccox, gammulin
- Pasteurization
- Organic nurse cow selection
- IgG monitoring



Nutritional Counsel

Baby Calf

- Milk replacer quality, quantity
- Milk replacer vs. whole milk
- Accelerated feeding programs
- Starters



Nutritional Counsel

Growing Heifer to Springer

- Target weights/ages
- Additives – rumensin, deccox, etc
- Thumb rules / guidelines for quantity/quality



Diagnostic Services



- Necropsies
- Fecal work-ups
- BVD ear notching
- Respiratory cultures
- IgG
- CBC's and Serology

Diagnostic Service

Fecal Work-ups

- Outside Lab
- In house --- more rapid
 - Cultures – Ecoli, Salmonella
 - Giardia cite
 - Crypto stains
 - Centrifuged sugar floats and McMaster's



Diagnostic Services

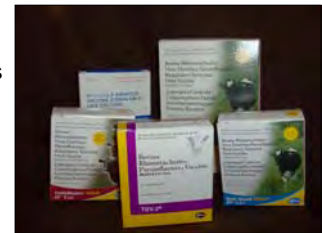
Respiratory Cultures



- Sent to outside lab for cultures
- Replaced transtracheal wash with tracheal swab using the speculum
- Recently started using pharyngeal swab passed through ventral meatus of nares
 - Technique taught by Dr. Socet of University of Wisconsin
 - Based on a British Study
- Collect 2 swabs – one for aerobic culture and one placed in viral transport media

Disease Prevention Programs

- Metaphylaxis
- Vaccine programs
- Parasite control & monitoring
- Biosecurity
- BVD notching



Therapeutic Programs and Pharmaceutical Supplies

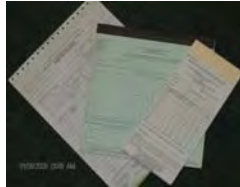
- Scour treatment protocols
- Respiratory disease treatment protocols
- Drop-ship programs to “ranchers”
- Many of the “ranchers” receive drugs and treatment programs from out-of-state sources

Reproductive Services

- Free-martin testing – tube, palpation, blood
- Synchronization programs
- Pregnancy checks – palpation, ultrasound, Bio-pryn
- Occasional bull BSE

Regulatory Services

- TB for Indiana
- Special Sale requirements
- Export
- A few still CHV



Less Traditional Services

- In house treatment
- Umbilical hernia repairs
- Pick-up delivery Bio-pryn
- Monthly disbudding
- Facility design / retrofits

In House Treatment Facility

- IV fluid therapy & monitoring
- Warmer environment
- Use bulk fluids with compounded electrolytes
- Offer pick-up and delivery



Large Umbilical Hernias

- Large umbilical hernias repaired with mesh
- Several area practitioners refer our way
- Use Bard Mesh



Pick-up and Delivery Bio-pryn Tests for "Small guy"

- Teach small producer to draw blood prior to spring/summer turn-out
- More willing to use AI for 1-2 cycles



Monthly Disbudding using the Butane Iron

- Convenient & effective
- Keeps them current
- Year round
- Should be 3/8" or less



Facility Design
And
Retrofits

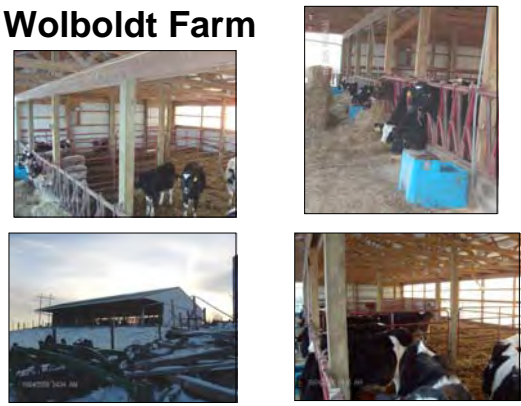
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Wolbolt Farm



Wolboldt Farm



**Hilltop Heifer Ranch
Farrowing Barn**



**Hilltop Heifer Ranch
Gestation Barn**



**Hilltop Heifer Ranch
Machine Shed**



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**Dalroy
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Mohler Farm



McDowell Farm



**Crilow Brother
Dry Barn**



**Crilow Brother
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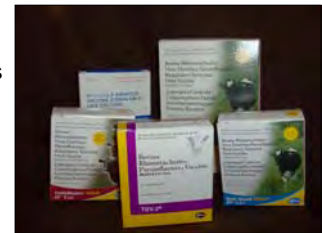
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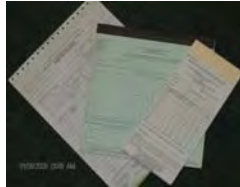
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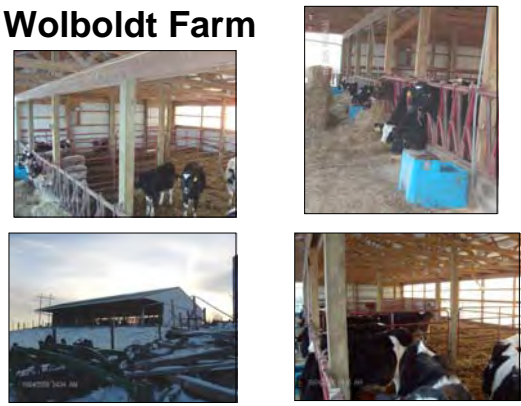
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Heifer Round Table

Richard E Wiley DVM

Ohio Dairy Vets
Columbus, Ohio
Jan. 11, 2008



Deep Tracheal Swab Collection

- AABP Practice tips
- Columbus Ohio 2003

Goals

- Etiology of respiratory disease
- Live animal collection
- Ease of multiple animal sampling

Wiley Speculum



Credit: Dr. Robert Holland





Equipment

- Oral Speculum
- 30" sterile, guarded culture swab
- Culture media-aerobic, anaerobic, viral
- Nose leads
- Restraint-chute or chemical

Recommendations:

- Contact Diagnostic Lab Prior
- Request aerobic, anaerobic viral cultures

Case Study

- 4-6 month old Holstein heifers
- History of respiratory dx.
- Isolated BVD, PM, H. somnus, myco
- Targeted BVD as primary pathogen
- Adjusted BVD vaccine schedule
- Problem resolved

Summary

- A diagnostic technique of respiratory disease
- Rapid collection of live calves



The
End



Wiley Speculum

NPVC Major Heifer Issues

- Colostrum management
- Salmonella typhmurium
- Salmonella dublin
- Mycoplasma bovis
- Contracts

Colostrum Management

- Monitor serum total proteins
- Optimum levels are >5.3g/dl
- Goal: 90% of calves >5.3g/dl
- This is *very achievable!*

Salmonella dublin symptoms

- Sick calves with a history of pneumonia
- Not typical diarrhea
- From 7 days to 4 months of age-weaning
- Difficult to treat, often very resistant to Ab
- Difficult to clean up a contaminated environment
- Animals can be sub-clinical carriers

dublin control measures

- Requires exceptional calf management
- Maintain clean maternity pens
- Remove calf from cow promptly
- Careful colostrum handling
- Feeding equipment sanitation
- Avoid feeding raw milk
- Max herd immunity via vaccination with SRP, dry cow nutrition

Dublin control (cont)

- Consider vaccination with Entervene-D

M. Bovis control

- Chronic pneumonia
- Poor response to antibiotic treatment
- Primary or secondary invader?
- Segregate till culled
- Investigate backward to source dairy
- Look at milk/colostrum/mastitis issues
- Consider autogenous vaccine

Contracts: ? +/-

- Calf facility-bankrupt
- Source calves:
 - salmonella
 - M bovis
 - raw milk
 - low TP



Who is the *MAN* In MANagement?

Facility-Spring Hill



Facility-Hi Hills



Facility: Jan-el Farm





The End

Sam Leadley, Calf & Heifer Management Specialist
sleadley@frontiernet.net www.atticacows.com
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7 REASONS WHY VACCINES FAIL

1. **Pickup-itis** – the vaccine after purchase remained in the pickup. It was never administered to the animals.
2. **Thrifty-itis** – the modified live vaccine bottle still has a few doses left in it. We can save it until the next animals need to be vaccinated. Modified live vaccines lose their effectiveness in only a few hours after being reconstituted. They cannot be saved for later use. Even killed vaccines that are already mixed are sensitive to storage conditions. They cannot be “saved” for future use unless stored according to label instructions.
3. **Windowsill-itis** – the bottle of vaccine after partial use was set down on a barn windowsill. Exposure to strong sunlight and heat destroyed all of the vaccine's ability to stimulate an immune response in an animal. Summer sunlight and heat on a truck tailgate, or up on a concrete wall where the heifers can't reach while we are vaccinating, will ruin vaccines in less than an hour.
4. **Too-much-water-itis** – The directions for reconstituting say to add only water that is supplied to the powder. But, if I add extra water, the bottle will vaccinate several additional animals. To be effective, vaccines depend on an accurate dose of the antigens.
5. **Store-the-syringe-in-the-bottle-itis** – Since we always use the injectable vaccine and a syringe at the same time, it's just a handy thing to stab the contaminated needle back into the bottle. After we have jabbed a dirty needle into the once-sterile vaccine several times we have pretty well contaminated the entire bottle.

6. **I can't-be-bothered-to-give-the-booster-injection-itis** – Doc recommended giving two doses two to three weeks apart. But, all the heifers look healthy so they are probably immune to whatever heifers get. Most vaccines require a first injection to promote strong immunity in naive animals. Once the initial reaction is completed in two to three weeks the booster injection of vaccine creates a stronger and longer lasting immunity.

7. **One-vaccine-fits-all-itis** – This vaccine seems to have prevented (fill in illness). Maybe it will work to prevent (fill in different illness). Wrong! It is true that a few vaccines do cross protect against more than one pathogen. But there are many different kinds of pathogens. Matching the vaccine and the pathogen is the best insurance for effectiveness.

9 REASONS WHY ANITIBOTICS FAIL

1. **Pickup-itis** – after purchase, the antibiotic remained in the pickup. It was never given to the sick animal.
2. **Windowsill-itis** – the bottle of antibiotic was set down on a barn windowsill. Exposure to strong sunlight and heat destroyed much of the antibiotic's potency. [For example, LA200, Oxytet100, Tetradure300, Draxxin, Naxcel, Polyflex] Alternatively, the product is labeled, "Do Not Freeze" and it requires thawing before it can be used. [For example, Excenel, Excede, Tetradure300] It is no longer strong enough to slow pathogen growth in an animal.
3. **Too-much-water-itis** – The directions for reconstituting: Add 79 ml water to the powder. However, if I add 105 ml, then the bottle will treat an extra animal! Yes, this procedure will create more volume. Nevertheless, if I use the original dose, then the medication may not work. Each injection carries too little of the active drug to do the job. That is, the minimum inhibitory concentration (MIC) of the drug in the blood will not be reached with the overly dilute product.
4. **Store-the-syringe-in-the-bottle-itis** – We always use the injectable antibiotic and a syringe at the same time. So, just stab the contaminated needle back into the bottle. That sends dirt into the antibiotic. Then, when the syringe tips to one side, the needle no longer fits tightly in the bottle stopper allowing more dirt to creep into the antibiotic, as well. This source of contamination is one reason we often keep open bottles of antibiotics refrigerated. Also, remember that contaminated needles potentially spread leukosis.
5. **Under-dosing-itis** – Doc recommended 20 ml daily. This is pretty expensive stuff. Maybe 10 ml would do the job. But, all antibiotics depend on a minimum level of concentration in the animal's tissues to work effectively. The technical term is "minimum inhibitory concentration."

If the correct dose per day is not used, it is better not to give any drug at all. Less than recommended doses might actually build resistance to the

drug. The next time this animal is treated, the drug will be even less effective.

6. **Frequency-of-dose-itis** - Doc recommended daily treatment but we decided to just double the dose and give it every other day. Unfortunately, there is a great deal of variation among drugs and the vehicles in which they are suspended. Some drugs are metabolized rapidly and require twice a day injection in order to maintain MIC (e.g., Polyflex). Other drugs are formulated for one, two, three and seven day treatment frequency.
7. **Quit-treating-too-soon-itis** – Doc recommended treating for 5 days. After three days she is “looking better” so I can quit treating her and save money. Not good.

All antibiotics depend on a minimum length of contact with the pathogen. First, the “minimum inhibitory concentration” must be reached. Then, it has to be sustained long enough to allow the animal’s immune system to kill off the remaining pathogens.

The treatment recommendations on common bovine antibiotics most frequently mention five to eight days. Field experience with veterinarians suggest that the guideline, "After she is looking better, continue treating for two more days," is common.

8. **One-drug-fits-all-itis** – This antibiotic worked to cure (fill in illness). Maybe it will work on (fill in different illness). Wrong! It is true; some antibiotics will effectively inhibit the growth of more than one pathogen. But there are many different kinds of pathogens.

Matching the antibiotic and the pathogen is the best insurance for effectiveness. Sometimes, laboratory analyses have to be used. They help determine which antibiotic is likely to be effective against the pathogens on a specific farm. Monitoring recovery rates when uniform treatment protocols are followed provides invaluable evidence about which drugs are most effective.

The best course of action? Get professional advice to match the drug to the pathogen. The most expensive antibiotic is the one that doesn’t work!

9. Virus-itis – Illnesses caused by viruses often have symptoms similar to those caused by bacteria or parasites. Administering antibiotics for illnesses caused by viruses is certain to be ineffective in treating the infection (assuming that only the virus causes the animal's illness).

Among calves, it is very important to monitor very closely any animal with a virus infection. The immunocompetence of sick calves is always compromised leaving them open to possible secondary bacterial infections. That is when antibiotics may be prescribed by your veterinarian.

Just as in humans, using antibiotics to treat viral illnesses can be a problem. Inappropriate use of antibiotics tends to select for more resistant strains of the bacteria. Then, future use of the same antibiotic for a bacterial infection will be less effective.

Note: The use of trade names of products in this article does not constitute an endorsement of the products. All names are owned by the manufacturer and are included here only as a means of illustrating the message of the article.

Calf Care Consistency Checklist

How do your procedures measure up? Do they provide the opportunity for your calves to grow into their genetic potential? Calves less than three weeks of age most urgently need consistency in their care. That time from birth to three weeks is when they transition from passive immunity to that which they make on their own.

Let's consider procedures for calf care. Compare your routines with the standards that follow. Try using these scores: 1=never, 2=seldom, 3=often, 4=usually, and 5=almost always.

_____ 1. We use a minimum number of persons to care for the calves. If more than one person works each shift, consider dividing the calves into care groups with one person assigned to the same group all the time. The goal is to have the same person caring for the same calves as much as possible.

_____ 2. We use the same routine for feeding bottles or buckets each feeding. Our goal is to present the feed consistently. The same racks are used all the time. If we have tethered calves, we approach and handle the calves consistently.

_____ 3. We feed calves at the same time each day. A few minutes either way is not an issue. However, variations over thirty minutes should be examined to see if greater consistency could be achieved.

_____ 4. We feed milk/milk replacer at the same temperature every feeding. The preferred feeding temperature is 102°, the same as calf body temperature.

_____ 5. We feed the same amount of milk/milk replacer every feeding. A half-cup either way is not an issue. However, variations over that should be examined to see if greater consistency could be achieved. When changes are required by a protocol, they are made gradually in small steps.

_____ 6. We limit the amount of variation in milk solids and composition of the milk/milk replacer part of the ration.

_____ 7. We provide free-choice water every day. During freezing weather when we must dump pails to prevent ice, water is fed at the same time each day. The preferred feeding temperature, especially for calves less than two weeks old, is 102°, the same as calf body temperature.

_____ 8. We provide free-choice, clean and fresh calf starter grain daily. During warm and/or damp weather, grain containers are changed often enough to avoid wet and/or moldy grain consistently.

Calf Risk Assessment Checklist

1. Calving Area

- **Cleanliness of the calving area**

Excellent 1 2 3 4 5 Poor

(clean, dry, well-bedded, bedding changed regularly)

- **Frequency of calving area observation**

Excellent 1 2 3 4 5 Poor

(heifers and cows are monitored, dystocia cases are assisted)

- **Post delivery procedures**

Prompt removal of calf from contaminated surroundings

Excellent 1 2 3 4 5 Poor

(calving pen, dirty dam, adult cow manure, and air-borne pathogens)

Navel dipped with 7% tincture of iodine

Excellent 1 2 3 4 5 Poor

(timing, tincture used, redipping as needed)

2. Colostrum management

- **Colostrum feeding schedule delivers 150g IgG within 12 hours**

Excellent 1 2 3 4 5 Poor

(1st feeding ASAP, quantity is related to quality & timing)

- **Colostrum quality is monitored regularly**

Excellent 1 2 3 4 5 Poor

(Colostrometer, 3-gallon rule, IgG estimates are recorded)

- **Colostrum bacteria content is monitored regularly**

Excellent 1 2 3 4 5 Poor

(quantity & species of bacteria, coliform count < 5,000 cfu/ml)

- **As needed, only colostrum from disease-free cows is fed**

Excellent 1 2 3 4 5 Poor

(Johne's, BVD, salmonella)

- **As needed, colostrum is chilled and stored properly to preserve quality**

Excellent 1 2 3 4 5 Poor

(clean, chilled, bacteria count monitored regularly)

- **Colostrum is warmed correctly and fed at calf's body temperature**
Excellent 1 2 3 4 5 Poor
(thawing frozen, warming, feeding temperature monitored)
- **Immunoglobulin (IgG) absorption is monitored regularly**
Excellent 1 2 3 4 5 Poor
(written records kept on BSTP values of sampled calves)
- **Colostrum supplements are used properly**
Excellent 1 2 3 4 5 Poor
(manufacturer's mixing instructions followed, given ASAP after birth)

3. Housing environment

- **Housing minimizes spread of pathogens from calf to calf**
Excellent 1 2 3 4 5 Poor
(individual pens or hutches, minimal contact, or small pen size)
- **Housing minimizes exposure to moisture and manure to keep calves hair coat clean and dry**
Excellent 1 2 3 4 5 Poor
(dry bedding, enough bedding, clean bedding, minimizes MUD exposure)
- **Housing minimizes exposure to airborne pathogens**
Excellent 1 2 3 4 5 Poor
(low ammonia levels, minimal exposure to adult cow air)
- **Housing is free of drafts**
Excellent 1 2 3 4 5 Poor
(calves are not hunched up, hair coat on end, shivering)
- **Housing minimizes passing pathogens from one generation to the next**
Excellent 1 2 3 4 5 Poor
(at least one week between calves, cleaned with 160 plus water)
- **Good biosecurity practices are followed consistently**
Excellent 1 2 3 4 5 Poor
(clean clothes, boots, hands; sick calves separated, sick calves cared for last, gloves for sick calves)

4. Nutrition

- **Free choice clean water is provided for all calves all the time**
Excellent 1 2 3 4 5 Poor

- **Feeding program provides adequate energy levels**
 Excellent 1 2 3 4 5 Poor
 (energy adjusted to deal with stresses of heat, cold, changing weather, sickness, and for developmental needs)
- **As needed, waste milk feeding practices minimize bacterial exposure**
 Excellent 1 2 3 4 5 Poor
 (monitor bacteria levels)
- **Equipment cleaning procedures minimize bacterial exposure**
 Excellent 1 2 3 4 5 Poor
 (feeding equip. scrubbed and allowed to dry between every feeding)
- **Milk or milk replacer is prepared consistently every feeding**
 Excellent 1 2 3 4 5 Poor
 (consistent feeding temperature, consistent dry matter content)
- **Calves are fed at the same time each day, youngest to oldest**
 Excellent 1 2 3 4 5 Poor

CALF WEANING CHECKLIST

1. How long has she been eating starter grain?

Has she been eating starter grain for at least 3 weeks?

Start counting days on grain when she regularly cleans up a measurable amount daily. That's roughly 1/2 cup.

Assuming she has access to water, after a calf begins to eat grain she takes about three weeks of fermentation in her rumen to develop papillae. They are tiny finger-like growths on the inside of the rumen wall. They are essential for absorbing nutrients from rumen fermentation.

2. How much starter grain is she eating?

Is she eating 2 to 2 1/2 quarts (that's about the same as pounds) daily?

If a 150-pound calf eats this much starter grain daily she can meet her maintenance needs and grow 1 pound a day in 50° weather. Bigger calves need more for maintenance. Higher growth goals require more. Colder weather conditions require more.

3. How regularly is she eating grain?

Is she eating at least a minimum of 2 quarts daily? That is different than an average of 2 quarts that may vary from less than a quart one day to 3 quarts two days later.

One characteristic of rumen maturity is regular feed intake. Irregular intake is associated with acidotic rumen conditions and undesirable digestion. Calves with greater rumen maturity tend to even out their grain intake (assuming they have free-choice access to starter grain and water).

4. Is the calf generally healthy and growing?

No matter how it is done, weaning is stressful for a calf. Even if calves continue to grow at weaning, the rate of growth falls off for about 5 to 7 days after weaning.

If a calf's immune system is in any way depressed (scours, respiratory illness, navel infection, dehorning, change in housing, exceptionally hot or cold weather, poor bedding), it's good management to delay weaning until conditions change.

RATE YOURSELF

	YES	NO
1. Nearly all my calves have been eating grain for at least three weeks before I <u>begin</u> weaning them.	—	—
2. Nearly all my calves are eating 2 quarts of starter grain a day before I wean them.	—	—
3. Nearly all my calves are eating enough starter grain every day before I wean them.	—	—
4. If a calf is stressed (depressed immune system) I wait until she has recovered before I wean her.	—	—

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REPORT ON CAYUGA MARKETING FARMS

1. Five farms currently participate in the colostrum quality control program.
2. Since January 2003 we have tested 233 colostrum samples.
3. Coliform contamination in all samples over the nearly three years was:
 - 22 percent contained greater than 10,000 cfu/ml - enough to put a calf at risk for extended scours, usually between 7-21 days.
 - 12 percent contained greater than 100,000 cfu/ml - enough to kill a calf, usually between 3-7 days.
4. **Progress on participating farms has been excellent.** Compare the results of the first three visits with the three most recent ones for all five farms:
 - Percent samples greater than 10,000 cfu/ml dropped from 51 percent in the first three visits to only 6 percent in the last three contacts.
 - Percent samples greater than 100,000 cfu/ml decreased from 19 percent in the first three visits to 5 percent in the last three contacts.
5. Why should a participating farm continue in the colostrum quality control program if sample results show little or no contamination for the last four visits (one year)?
 - The visitation schedule should be adjusted to reflect success in establishing a protocol and achieving a high level of compliance. For example, move from quarterly to semi-annual sampling.
 - Protocol compliance is always subject to drift. That is, with employee turnover and just the passage of time, there is a tendency for compliance to become less rigorous. That means coliform counts can creep up undetected until calves start to die or become seriously ill.
6. Why should a non-participating farm step up from good calf management to excellent management?
 - Contamination is more common than most of us want to admit. Five well-managed Cayuga Marketing farms had startup contamination levels in excess of 50 percent. A Wisconsin survey showed an 80 percent incidence of coliform contamination on 18 well-managed dairies.
 - The annual cost of the program (quarterly visits) is less than the value of one dead calf!
 - Cayuga Marketing dairies receive a ten percent discount for the program.

Contact either Sam Leadley (sleadley@rochester.rr.com) or
Diane Deleo (atticavettech@yahoo.com)

Coliform Bacteria Growth Demonstration

Materials required:

- 7 self-closing plastic bags
- supply of ground coffee
- measuring spoons and cups as used for baking

SMALL demo kit (easy to carry in overall pocket)

Use 7 one-quart size self-closing plastic bags (e.g., Zip-lock bags)

Using a permanent black marker first label the bags as shown below. Then, add the matching amount of ground coffee to each bag.

		Amount of ground coffee for each bag		
		Teaspoons	Tablespoons	1/4cup
Time after milking colostrum				
	Start: 00:00 (1 st bag)	1		
(20 mins.)	00:20	2		
	00:40	1	1	
(1 hour)	01:00	2	2	
	01:20	1	1	1
	01:40	2	2	2
	02:00 (7 th bag)	1	1	5

LARGE demo kit (big enough for group presentation)

Use 7 one-gallon size self-closing plastic bags (e.g., Zip-lock bags)

Using a permanent black marker first label the bags as shown below. Then, add the matching amount of ground coffee to each bag.

		Amount of ground coffee for each bag		
		Tablespoons	1/4cup	1cup
Time after milking colostrum				
	Start: 00:00 (1 st bag)	1		
(20 mins.)	00:20	2		
	00:40	0	1	
(1 hour)	01:00	0	2	
	01:20	0	0	1
	01:40	0	0	2
	02:00 (7 th bag)	0	0	4

Technical Notes about the demonstration:

- Assumes colostrum temperature in the range of 85-100 degrees. As temperatures fall closer to 60 degrees the time for bacteria population to double increases rapidly.
- Assumes no additives such as a bactericidal solution (chlorine solution) or growth inhibitor (potassium sorbate).
- Does not take into account the lag phase. Bacteria will take some time to accommodate to the environmental conditions of the colostrum prior to multiplication. To be more accurate, the first twenty or thirty minutes would represent the lag phase during which little or not growth occurs. Then, during the next twenty minutes, the first doubling would occur.
- Implications for enteric health:
 1. Less than 5,000 cfu/ml – low impact, minor scours problems in less than one-third of the calves.
 2. 5,000-20,000 cfu/ml – moderate scours problems in up to three-quarters of the calves, tend to last 7 to 10 days rather than only 2-4 days.
 3. 21,000-50,000 – occasional deaths at 3-5 days, usually severe scours between 7 and 21 days in nearly all the calves.
 4. 51,000-250,000 – very severe scours problems, enterotoxemia starting to be a problem causing rapid onset of death, bloated calves in 2-6 day range, scours problems that just won't stop up to three weeks of age affecting nearly all calves, respiratory illness frequently a secondary infection.
 5. Over one-quarter million – frequent mortality associated with enterotoxemia, nearly all the calves have severe scours, most of the calves require antibiotic treatment, many require IV or SQ fluids
 6. Over one million cfu/ml – mortality rates among preweaned calves commonly in thirty to fifty percent range.

COLLECTING CLEANING QUALITY CONTROL SAMPLES

- 1. Use sterile milk sample tubes. If the tubes have been opened or had prior use do not use them for quality control sampling**
- 2. Write the farm name and other sample identification on the top of each bottle (for example, bottle, bucket, tube feeder).**
- 3. Using a new syringe, needle and unopened bottle of sterile water, fill the syringe with 30 ml of water.**
- 4. Squirt sterile water into piece of equipment. Swirl water around to get good contact with as much of the inside surface as possible. For a tube feeder be sure to run the water out of the feeding tube.**
- 5. Pour water into the sterile sample bottle. If the bottle is more than half full, pour enough out so it is only one-half full. Overfilling will cause leakage when bottles are frozen.**
- 6. Freeze the sample as soon as possible after collecting. This prevents bacterial growth after sampling.**
- 7. Although this sample kit is free, lab fees are charged for all bacterial analyses.**
- 8. When the samples are all in the freezer contact the Attica Vet clinic office (585-591-2660) (fax 585-591-2898) (email atticavettech@yahoo.com).**

COLOSTRUM

Pasteurizing Guidelines

- **Start with clean colostrum**
 - Clean teats on fresh cows
 - Clean milker bucket
 - Rapid cooling to 60° before refrigerating
 - Keep refrigerated until ready to pasteurize
- **Keep the pasteurizer clean**
 - Always rinse before washing
 - Wash with recommended detergent at recommended temperature
 - Rinse with recommended acid or acid/sanitizer
 - Sanitize before each use
- **Keep the pasteurizer operating properly**
 - Check holding temperature regularly - 140°
 - Check holding time regularly - 60 minutes
 - Process only small to moderate sized batches - 15 gallons or less
- **Store pasteurized colostrum properly**
 - Use only clean, recently sanitized storage containers
 - Cool rapidly to 60° before refrigerating/freezing
- **Feed a clean, healthy product**
 - Warm/thaw in water not above 130°
 - Use only clean, recently sanitized bottles/tube feeders
 - Feed promptly once colostrum is up to calf body temperature (102°)
- **Monitor regularly (If anything can go wrong, it will!)**
 - Collect and analyze raw and pasteurized colostrum regularly
 - Collect and analyze "as-fed" colostrum samples regularly
 - Collect blood samples from young calves to check on antibody transfer

Additional Internet resources on colostrum management are available at www.atticacows.com. Type "colostrum" in the search box or click on Calf Facts in the left-hand menu. You may want to try www.calfnotes.com, too.

Colostrum Replacers

- **What are colostrum replacers?**
 1. Single dose package of dry powder.
 2. Mixed with warm water.
 3. Fed at the same time one would feed colostrum.
 4. Contain variable amounts of antibodies (depends on manufacturer). The antibody (globulin protein) content of one package may vary from 100 to 150 grams.
 5. The nutritional profile is highly variable depending on the manufacturer (fat may vary from 12 to 25 percent, crude protein from 40 to 45 percent on a dry matter basis).
 6. Cost is usually about three times that of a colostrum supplement.
- **Colostrum supplements** (for example: Lifeline, Colostrix, First Defense) are NOT colostrum replacers. They have little if any nutritional value. The antibody (globulin protein) content may be as little as 12 grams.
- **Tips for colostrum replacer use**
 1. Always mix thoroughly. I recommend a food mixer or blender for the best results rather than trying manually mix the replacer with a whip.
 2. Always use the amount of water recommended by the manufacturer. This gives the proper concentration of antibodies.
 3. Always use warm water. Follow the manufacturer's recommended temperature. Recommendations vary from 105°F to 130° (40° to 55°C).
 4. Do not mix with milk or colostrum regardless of the manufacturer's directions. The dry matter concentration of this mix will be too high for optimum antibody absorption and digestion.
 5. Always feed as soon as possible after birth.
 6. If using an esophageal feeder for calves that cannot suckle, be sure they are in an upright position.
- **Examples include** (this list is not inclusive and does not constitute endorsement):
 1. Acquire/Secure is manufactured by American Protein Corporation. It is made from plasma and labeled to contain 125 gm of globulin protein.
 2. Calf's Choice Total is manufactured by Saskatoon Colostrum Company and distributed by Alta Genetics USA. It is made from bovine colostrum and labeled at three levels, 100, 125 and 150 gm of globulin protein.
 3. Land O' Lakes colostrum replacer is manufactured by Saskatoon Colostrum Company and distributed through Land O' Lake marketing

channels. It is made from bovine colostrum and labeled to contain 100 gm of globulin protein.

4. Rite Start Complete calf colostrum replacer is manufactured by MS Specialty Nutrition. It is of bovine origin and labeled to contain 100 grams of globulin protein.

COLOSTRUM SUPPLEMENTS

1. They are supplements.

- They are not replacers.
- They do not provide nutrition for newborn calves.

2. What do they supplement?

- They do add immunoglobulins (or antibodies).
- They do NOT add maternal immune cells.
- They do NOT add minerals and vitamins.
- They do NOT add energy.

3. How well do they supplement antibodies?

- They vary in immunoglobulin (Ig) content. Many contain only about 40 to 50 grams of Ig.
- Successful passive transfer can be achieved with poor quality colostrum (30 gms/liter, red on Colostrometer®) when, in addition to four quarts of colostrum, one package of supplement is fed no later than four hours after birth. Or, depending on the brand used, one tube or bolus of supplement is fed.
- Very poor quality colostrum (less than 20 gms/liter) would require two, if not three, units of supplement to get the calf up to successful passive transfer level. Actual success is doubtful.

- Effective use depends on following the manufacturer's instructions carefully. For powdered supplements, dilute with water. Avoid adding directly to colostrum since this practice may substantially depress antibody absorption rates.

4. Strategies for using supplements

- **Most cost effective** – evaluate antibody levels in colostrum. Then, when poorer quality colostrum must be fed, use a supplement. If only cow colostrum is fed and supplies are tight this should only happen about one time out of seven. Predicted passive transfer failure rate is between five and ten percent.
- **Moderately cost effective** – no evaluation of antibody levels, feed only cow colostrum and supplement only when cows give more than three gallons at first milking. This should only happen about one time out of five. Predicted passive transfer failure rate is between ten and fifteen percent.
- **Less cost effective** – no evaluation of antibody levels, add supplement for every calf. Predicted passive transfer failure rate is between fifteen and twenty-five percent.

COMPARISON OF CONVENTIONAL AND INTENSIVE CALF FEEDING PROGRAMS

<u>Characteristic</u>	<u>Intensive Feeding</u>	<u>Conventional Feeding</u>
Average daily gain (49days)	1.7-2.0	1.0-1.5
Normal appearance of manure	Lighter, looser	Darker, more firm
Milk replacer protein level	Higher, 24-28%	Lower, 18-22%
Milk replacer fat level(winter)	18-20%	18-20% common
Milk replacer fat level(summer)	15%	18-20% common
M.R. mixing rate	10 oz./2 quarts	8 oz./2 quarts usually
Waste milk	Pasteurized only	Pasteurized preferred
Amount M.R. fed		
2-10 days	2-2.5 quarts 2X	2 quarts 2X
11-20 days	2.5-3 quarts 2X	2 quarts 2X
21-28 days	3-4 quarts 2X	2 quarts 2X
28-wean	2 quarts 1X	2 quarts 2X
Weaning	By grain intake	By age
Free-choice water	Essential, daily	Preferred
Starter grain, free-choice	Essential	Preferred
Starter grain, fresh daily	Essential for small calves Desirable for all calves	Preferred Preferred, not common
Starter grain, protein level	20% common	16-18% common
Equipment cleanliness	Very good to excellent	Average
Colostrum management	Very good to excellent	Average

Evidence-Based Care For Sick Calves

What's the difference between picking a number in the lottery and winning and the way many persons select a way to treat a sick calf and having her recover? The odds of winning the lottery are higher than the calf recovering!

In contrast, evidence-based care for sick calves depends on a trio of steps in sick calf care. The three steps are:

- 1. Diagnosing accurately,**
- 2. Prescribing for recovery, and**
- 3. Monitoring response.**

Diagnosing calfhood illness focuses appropriately on diarrhea and respiratory illness since they account for 62 and 21 percent respectively of all preweaned calf deaths. (APHIS: Dairy 2002). Current challenges beyond the perennial problems with cryptosporidiosis include three bacteria enteric illnesses in order of estimated frequency: (a) colibacillosis, (b) salmonellosis, and (c) clostridiosis type A.

Depending on the intensity of bacterial exposure, both enteric colibacillosis and clostridiosis have similar patterns of symptoms. Mortality is high among calves less than one week of age. Accurate diagnosis often depends on working closely with your veterinarian to submit fresh tissue samples for laboratory analysis.

Scours symptoms after one week of age frequently are traced back to fecal coliform, salmonella or clostridial bacteria. Breaking the fecal-oral transmission route is the primary means of preventing scours from all these three causes.

Prescribing treatment, however, depends on knowing which kind of bacteria are at the root of the problem. This is where laboratory analyses of fecal and tissue samples provide the key pieces of information for accurate diagnosis. In addition, farm-specific history of calfhood diarrhea is very important as the calf raiser and veterinarian seek an accurate diagnosis.

Bovine respiratory disease (BRD) accounted for 21 percent of preweaned calf mortality in the 2002 national dairy survey. Current respiratory

pathogen challenges in addition to the ever-present *pasteurella multocida* and *mannheimia haemolytica* bacteria are mycoplasma and bovine viral diarrhea virus (BVDV).

In many cases the presenting symptoms among calves two to six weeks of age for the bacterial illnesses are very similar to those caused by BVDV and mycoplasma. This similarity in symptoms causes consider confusion especially at early stages of both BVD and mycoplasma infections.

Farm-specific history of both BVD and mycoplasmosis is essential for distinguishing between bacterial BRD and these non-bacterial illnesses. Referring to mycoplasmosis, Gawthrop recently observed,

"The incidence of infection is high in calves that have been fed non-pasteurized waste milk or were fed contaminated colostrum.

Also, the infection can spread horizontally." (AABP 2005 p 11)

Thus, if there is a history of mycoplasma mastitis in the herd or mycoplasmosis among preweaned calves, the likelihood of a respiratory illness that is non-responsive to antibiotic treatment being mycoplasmosis is quite high.

In contrast, in the absence of a mycoplasma herd history and no testing program for BVD persistently infected (BVD-PI) animals on the farm, multiple cases of respiratory illness that are non-responsive to antibiotic treatment frequently can be traced back to a single BVD-PI calf.

Prescribing for recovery blends two strands of information. One strand is the diagnosis of illness as discussed above. The other strand is the general herd history of antibiotic efficacy.

The veterinarian's general knowledge of the minimum inhibitory concentration of the drug to be achieved for a specified length of time is essential for selecting the best drug, dose and duration of treatment. Then, the herd veterinarian must assess the overall farm-specific experience with individual antibiotics in terms of dose, duration of treatment and route of administration among all animals, both juvenile and adult.

Given several diagnoses for both scours and respiratory illness, the calf raiser and veterinarian can work out "best choice" treatment plans for each. The essential treatment component is sticking to the agreed-on plan.

For example, the calf raiser/veterinarian team might agree to treat all cases of rapid, shallow breathing accompanied by a temperature of 103.5° or greater with "X" sustained-release drug at the prescribed dose.

Missing, however, from this equation is the herd and disease specific experience among preweaned calves. Without this information, the veterinarian makes a "best choice" for a treatment regimen. The goal of evidence-based care is not yet possible.

Monitoring response is the missing step for evidence-based care to work. Given that diagnostic criteria are followed consistently and all calfcare persons stick to the treatment protocols, then monitoring treated calves will provide "evidence."

For example, how often does one treatment with "X" sustained release drug at the prescribed dose for calves with respiratory distress and a temperature of 103.5° or higher result in a decrease in respiratory distress and near normal temperature within twenty-four hours post treatment?

When setting up protocols for treatments and observing responses, the calf raiser and veterinarian need to agree on the threshold for acceptable response. For the respiratory illness example above, they might settle on an eighty-percent success rate in order to continue using the prescribed protocol.

Similarly, prescribed vaccination protocols can be monitored in the same way. It is very useful to collect morbidity information before making a vaccination protocol change as well as after the change if an unvaccinated or control group is not available for comparison.

(For additional health related resources, go to www.calfnotes.com, www.atticacows.com, www.das.psu.edu/dcn/CALFMGT/, www.ansc.purdue.edu/dairy/calves/calfpub.htm, or www.babcock.cals.wisc.edu/.)

FEEDING PREWEANED CALVES: Colostrum

How do your procedures measure up? Do they provide the opportunity for your calves to grow into their genetic potential?

Let's consider procedures for feeding colostrum. Compare your routines with the standards in this checklist. When making this evaluation I like to use these scores: 1=never, 2=seldom, 3=often, 4=usually, and 5=almost always.

- _____ 1. All feeding equipment that comes in contact with colostrum is scrubbed after every use.
- _____ 2. When periodically cultured for bacteria, colostrum as fed to calves is not contaminated with environmental bacteria thus reducing septicemia and scours. Very highly contaminated colostrum may substantially reduce the rate of antibody transfer as well.
- _____ 3. Colostrum contaminated with mastitis and blood is discarded.
- _____ 4. Colostrum quality (antibody concentration) is estimated and the best quality available fed to heifer calves. While only a very rough guide to quality, a Colostrometer® may be used to exclude the lowest quality colostrum. Feeding more of poor quality colostrum is not an effective substitute for a good quality product.
- _____ 5. Colostrum is fed to heifer calves no more than four hours after birth and to at least one-half of the heifer calves within one hour after birth. One-half of a heifer's ability to absorb antibodies is gone within six hours; three-quarters of this capability is gone within twelve hours after birth.
- _____ 6. Plenty of good quality colostrum is fed. Average and large calves are fed four quarts within the first six hours. Smaller calves are fed proportionately less but still more than two quarts.
- _____ 7. When only low quality colostrum (low antibody concentration) is available, an effective colostrum supplement is also fed to boost its antibody content.
- _____ 8. When possible, fresh or refrigerated colostrum is fed rather than frozen colostrum. Thus, the calf gets a full dose of maternal immune cells as well as the maternal antibodies.

FEEDING PREWEANED CALVES: Milk Replacer

How do your procedures measure up? Do they provide the opportunity for your calves to grow into their genetic potential?

Let's consider procedures for feeding milk replacer. Compare your routines with the standards in this checklist. When making this evaluation I like to use these scores: 1=never, 2=seldom, 3=often, 4=usually, and 5=almost always.

_____ 1. All feeding equipment that comes in contact with milk is scrubbed after every use.

_____ 2. Equipment sanitation procedures meet these standards:

- prewash rinse between 105-110°F;
- chlorinated, soapy hot water wash consistently over 120°F and includes manual brushing;
- acid rinse between 50-100°F
- equipment dries between uses.

_____ 3. Milk replacer is stored so that it remains both clean and dry to promote good mixing and reduce scours.

_____ 4. Milk replacer is mixed at the temperature recommended by the manufacturer to promote even distribution of fat and reduce denaturing of proteins.

_____ 5. Milk replacer is 100-105°F when drunk by the calves to promote intake and favorable feed conversion.

_____ 6. Milk replacer is fed regularly at the same time daily according to the same routine preferably by the same caretakers to promote good eating habits, effective esophageal groove closure and favorable feed conversion.

_____ 7. When periodically cultured for bacteria, the milk replacer mix as fed to calves is not contaminated by environmental bacteria thus reducing scours.

_____ 8. For farms feeding waste milk, when periodically cultured for bacteria, the waste milk as fed to calves is not contaminated by environmental bacteria thus reducing scours and improving feeding conversion rates. [Prefer that waste milk be pasteurized!]

Production Profit Starts with Colostrum Management

The Study: 1000 calves were evaluated for passive transfer immunoglobulins (IgG) at 1 to 2 days of age. They were followed through to first calving and 180 days into their first lactation.

The Results:

- Age at first calving (AFC): Average AFC was 26.5 months. Most calving took place between 24.5 and 28.5 months. NO EFFECT of calf IgG levels on AFC.

- Milk Production:

ME milk - As IgG levels in the calves went up the milk they gave as heifers went up. Each 100mg/dL increase in calf IgG predicted 18.7 pounds more milk. For example, a heifer with an IgG level of 1800mg/dL compared to one with an IgG level of 800 produced in the first 180 days 187 (18.7 x 10) pounds more milk.

ME fat – As IgG levels in the calves went up the fat they gave as heifers went up. Each 100mg/dL increase in calf IgG predicted .62 pounds more fat. For example, a heifer with an IgG level of 1800 mg/dL compared to one with an IgG level of 800 produced in the first 180 days 6.2 (.62 x 10) pounds more fat.

- Survival in the herd: Heifers with calf IgG levels below 1200mg/dL had combined death losses (1 percent) and culling losses (20.5 percent). These rates were 52 percent higher than heifers with higher calthood IgG levels.
- \$\$\$ Comparison: Comparison is between heifers that started out in life low in IgG's (less than 1200mg/dL) and heifers that started out in life high in IgG's (more than 1200mg/dL).

Net difference for this dairy, total = \$36,901.

Net difference for this dairy, per heifer = \$83.11.

Reference: S.K. DeNise, J.D. Robison, G.H. Stott and D.V. Armstrong, " Effects of Passive Immunity on Subsequent Production in Dairy Heifers." 1989 Journal of Dairy Science 72:552-554

Calculations: Net difference for this dairy, total = difference in death loss (\$14,000) plus difference in milk productions between groups (\$17,340). Net difference for this dairy, per heifer = net difference for this dairy, total divided by number of heifers post-culling with complete records (444). Death and culling losses were computed at 14 greater losses for the low group compared to the high group valued at a net loss of \$1,000 (herd value of \$1,500 less salvage value of \$500) or \$14,000 total. Milk production was computed for each group above 1200 mg/dL using average total protein levels and actual post culling heifer numbers. Higher IgG levels resulted in 144,503 extra milk pounds. Valued at \$20.00 per cwt. This equals \$22,901.

Abstract and interpretation prepared by Sam Leadley, Attica Veterinary Associates, 116 Prospect Street, Attica, NY 14011. (585) 591-2660 Fax (585) 591-2898 Mobile 585-356-0769 e-mail sleadley@frontiernet.net

Consequences of Feeding Free Choice Water to Pre-Weaned Heifer Calves

Improvement of free choice water over no water:

- **45 percent increase in grain intake in first four weeks.**
- **60 percent increase in weight gained in first four weeks.**

	Water Feeding	Method
	Free Choice	None
Number of calves	20	21
Calf starter grain intake (pounds) in first 4 weeks	25.8	17.8
Weight gain (pounds) in first 4 weeks	18.6	11.6
Water consumed (quarts) in first 4 weeks	47	None

Reference: Kurtz, A.F., L.F. Reutzler, and J.H. Mahoney, "ad libitum water intake by neonatal calves and its relationship to calf stater intake, weight gain, feces scores, and season." American Journal of Dairy Science 67:2964-2969.

**Estimated Gains Feeding 100 Pound calf
at 15% DM (10oz=2quarts) at 60°F
For three milk replacers
20-20, 28-15, and 28-20**

Top line each row describes calf, environment, milk repl. and mixing rate for each table.
BOLD type in each row indicates the best estimate of growth.

100 pound calf @ 60 F	20-20 MR mixed for	1.25#powder for 4 qts.
Amount fed	Allowable gain (lbs/da)	Allowable gain (lbs/da)
Daily	Energy limited gain	Protein limited gain
4 quarts (1.2#powder)	0.8	0.7
5 quarts (1.6#)	1.2	1.0
6 quarts (1.9#)	1.6	1.2
7 quarts (2.2#)	2	1.4
8 quarts (2.5#)	Over 2.3	1.7

100 pound calf @ 60 F	28-15 MR mixed for	1.25#powder for 4 qts.
Amount fed	Allowable gain (lbs/da)	Allowable gain (lbs/da)
Daily	Energy limited gain	Protein limited gain
4 quarts (1.2#powder)	0.8	1.1
5 quarts (1.6#)	1.3	1.5
6 quarts (1.9#)	1.7	1.8
7 quarts (2.2#)	About 2	About 2
8 quarts (2.5#)	Over 2.3	Over 2.3

100 pound calf @ 60 F	28-20 MR mixed for	1.25#powder for 4 qts.
Amount fed	Allowable gain (lbs/da)	Allowable gain (lbs/da)
Daily	Energy limited gain	Protein limited gain
4 quarts (1.2#powder)	0.9	1.1
5 quarts (1.6#)	1.4	1.5
6 quarts (1.9#)	1.8	1.8
7 quarts (2.2#)	Over 2	About 2
8 quarts (2.5#)	Over 2.3	Over 2.2

Estimated Gains Feeding 20-20 M.R. At 12.5% DM (8oz=2quarts)
For 100 pound calf at three environmental temperatures 20°F, 40°F and 60°

Top line each row describes calf, environment, milk repl. and mixing rate for each table.
BOLD type in each row indicates the best estimate of growth.

100 pound calf @ 60 F	20-20 Milk Replacer	8 Oz. = 2 quarts MR
Amount fed	Allowable gain (lbs/da)	Allowable gain (lbs/da)
Daily	Energy limited gain	Protein limited gain
4 quarts	0.5	0.5
5 quarts	0.9	0.8
6 quarts	1.2	1.0
7 quarts	1.6	1.2
8 quarts	1.9	1.4

100 pound calf @ 40 F	20-20 Milk Replacer	8 Oz. = 2 quarts MR
Amount fed	Allowable gain (lbs/da)	Allowable gain (lbs/da)
Daily	Energy limited gain	Protein limited gain
4 quarts	Weight loss	0.5
5 quarts	0.3	0.8
6 quarts	0.8	1.0
7 quarts	1.1	1.2
8 quarts	1.5	1.4

100 pound calf @ 20 F	20-20 Milk Replacer	8 Oz. = 2 quarts MR
Amount fed	Allowable gain (lbs/da)	Allowable gain (lbs/da)
Daily	Energy limited gain	Protein limited gain
4 quarts	Weight loss	0.5
5 quarts	Weight loss	0.8
6 quarts	0.4	1.0
7 quarts	0.8	1.2
8 quarts	1.2	1.4

Estimates based on 2001 NRC calf growth model.

INTENSIVE PREWEANED CALF FEEDING PROGRAM

Are you deciding whether or not to try an intensive feeding program for preweaned calves? Here are four key questions. They need to be answered, “Yes,” before jumping into an intensive feeding program. They deal with (1) Water, (2) Newborn management, (3) Feeding milk replacer, and (4) Feeding equipment sanitation.

- Water – Am I already feeding free-choice water or can I get set up to do so?

Fact #1. Providing free-choice water is not an option for intensive calf feeding programs; it is a must not only for efficient feed conversion rates but also for calf health and survival.

Fact #2. For calf hutches in non-freezing weather plan on adding one minute per day per calf to present feeding times if you are not already providing free-choice water (unless automated watering).

In freezing weather double that time. In calf barns about one-half these times needs to be added to present feeding times.

Fact #3. Plan on delivering at least four pounds of water for each pound of dry matter consumed.

Fact #4. Unpalatable water is not the same as free-choice water.

- Newborn Management – Is this already AAA quality?

Fact #1. The navel opening and umbilical cord on every calf must be dipped at birth with tincture of iodine.

Fact #2. The colostrum management (dry cow vaccination, colostrum collection, storage, feeding) must support blood serum total proteins of at least 50 percent 5.5 or greater and 80 percent 5.0 or greater.

Fact #3. No manure meals. Calves are removed from the calving area before they get adult cow manure in their mouths.

- Feeding Milk Replacer – Am I already feeding variable amounts of milk replacer or can I get set up to do so?

Fact #1. All intensive calf-feeding protocols recommend increasing the amount fed as the calf grows larger.

Fact #2. Not all calves will respond equally to the same feeding challenge.

Fact #3. The health status of calves may require variable feeding rates.

- Feeding Equipment Sanitation – How well does my sanitation program reduce the pathogens calves drink with their food?

Fact #1. Residual environmental bacteria (for example, *E. coli*), finding favorable growth conditions on milk feeding equipment, may cause bacterial scours.

Fact #2. Parasites, especially cryptosporidia, if not washed off equipment spread from calf to calf.

Fact #3. Just as important as pre-wash rinsing and washing are the steps of rinsing with acid (lower pH) and drying feeding equipment.

Transitioning Calves After Weaning

SPECIAL NEEDS

- Developing immune system needs lots of protein and energy.
- Developing rumen needs time to mature enough to supply the heifers' nutritional requirements.
- Developing bones and muscles need lots of protein and energy in the correct proportions to grow tall, lean heifers.
- Immature immune system needs to face only restricted pathogen challenges in the context of limited stress.

IMMUNE SYSTEM

- Provide a liberal amount of protein and energy above maintenance needs. Ask your nutritionist to help you feed for size and growth goals for your farm. The specific values for protein and energy are listed in NRC 2001, page 218.
- Provide an environment with restricted pathogen challenges. Coliforms and clostridial bacteria are fecal-oral pathogens. Viruses are airborne, pass sometimes in water. Parasites are usually passed by fecal-oral route.
- Provide management that spreads out stresses rather than stacking them. How many stresses can you name? You probably remembered changes in ration and housing. But did you think of extreme hot and cold weather, overcrowding in a pen, too large a difference between the largest and smallest heifers in a group, vaccinations and just being handled?
- Provide safe exposure to pathogens via vaccination to get both a primary and secondary immune response before the heifers are four months old.

NUTRITION

- Provide a feeding program that sustains nutrition throughout the weaning period. Rumen competence is promoted by encouraging starter grain consumption and supplying free-choice water.
- Milk is not withdrawn until the nutrients from ruminal digestion of starter grains can provide the protein and energy needs for both maintenance and growth. Remember the three-week, two-pound rule.
- Provide a post-weaning ration that has a high protein and energy density. Usually this means a high proportion of grain compared to roughages (dry hay, haylage).
- Provide enough feed during the post-weaning period to maintain not only health but also a rapid rate of maturation.
- Provide a feeding program that transitions the rumen to the next ration to be fed. Roughages that will be in the next ration should be introduced two to three weeks prior to the time when the heifer must depend fully on them for her nutrition.

HOUSING

- Provide pens that limit the number of heifers to five to seven calves in the post-weaning period. Or, if housed in larger groups, be certain that a competent person is present daily to identify calves in these pens that are adapting poorly to group life. Then put them temporarily into a less stressful environment.
- Provide enough pens in order that similar size heifers may be grouped together. If heifers are grouped so that they are about the same size the variation in growth rates within pens will be decreased.
- Provide enough space for the animals to walk around and lie down. If heifers are disturbed while lying down their stress level goes up. Stress is a precondition for illness and poor feed conversion efficiency.
- Provide a waterer that is easy to find and use. Those heifers that have never experienced group housing need adequate access to water. If the facility has a history of contagious diseases separate waterers for each pen may reduce morbidity rates.
- Provide enough space at grain and roughage feeders. If all the heifers have space to eat at the same time the variation in growth rates within the pens will decrease.

- Provide housing that reduces stress. The heifers at this age need to be clean, dry and out of the wind in the winter. Adequate bedding will reduce exposure to ammonia fumes that weaken the immune system's defenses against respiratory pathogens. In addition, plenty of dry bedding helps maintain clean hair coats. Clean heifers lose much less body heat in cold winter weather than those with dirty, matted coats do. Heifers will do better if they have shade in the summer, also.
- Provide housing that is well ventilated. Our goal is to reduce respiratory stress. This stress may be due to excessive moisture levels, exposure to ammonia fumes and aerosolized pathogens.
- Provide housing where heifers can be handled efficiently for routine tasks with a minimum of stress (such as sorting, vaccinating, bedding).
- Provide housing with storage for frequently used supplies to improve labor efficiency.

FOR YOUR INFORMATION

Cornell web site: www.ansci.cornell.edu/prodairy/facilities/facpub.html

click on the title: "Calf and Heifer Facilities" in order to choose from several publications by Curt Gooch.

Dr. Jim Quigley's web site:

www.calfnotes.com

click on "Archives" and then click on "Weaning Management" for six interesting notes.

Also, back on the main menu, click on "Calving Ease" and then click on November 2000 for "Feed Bunk Space for Heifers" and June 2004 for "Feeding Space for Heifers."

Grain Feeding in an Intensive Feeding Program

CHOICE OF STARTER GRAIN

While at Noblehurst Farms I tried feeding a pelleted starter rather than a textured feed with calves on an intensive growth program. It was a flop! For the calves consuming nearly three pounds of milk replacer powder daily, pelleted grain intake was nearly zero even at seven weeks of age.

For the same feeding program with textured grain, calves began eating substantial amounts around four weeks. We may force limit-fed calves (one pound of powder or less daily) to consume pelleted feed in order to survive. Our experience with calves fed milk replacer at two or three-pound levels daily clearly indicated better consumption with textured starter. But, remember, not all pelleted feed is the same so maybe you can find one that will work.

What makes the difference in rumen development is not the starter fed but starter consumed. Palatability seems to be the crucial factor for intensive feeding program calves.

FLUID INTAKE AND WEANING

All of us like to wean calves without any break in their daily gains. Also, we would like to limit the stress so that none of them get sick. So, without having heifers drop in rate of gain or get sick, how do we decrease the amount of milk fed in order to encourage greater consumption of starter grain?

One method of weaning high fluid intake calves is to reduce the dry matter content of the mix by one-half at weaning time while continuing to feed the same volume of fluid. For example, for calves receiving two pounds of powder daily in AM and PM three-quarter feedings preweaning, we would

continue two three-quart feedings but reduce the total powder per day to only one pound.

In order to evaluate this idea, I compared average age at weaning (calves weaned when over thirty five days old and eating two or more pounds of starter for three days in a row) for two groups of fifty calves.

Preweaning, both groups were fed approximately one pound of powder twice daily in three quarts of mix. One group at thirty-five days received only the morning milk replacer feeding (one pound of powder) and continuous free choice water along with starter grain. The other group at thirty-five days continued to receive both AM and PM milk feedings. But, they were half strength – one-half pound powder AM and PM for a total of one pound daily – a constant volume of liquid fed daily.

Calves were assigned to their group randomly. Each group ate the same amount of milk replacer powder each day. The constant-volume group weaned an average of ten days later than the AM-only group. I only weighed ten calves out of each group so it's hard to be certain of our growth results. But, we did not observe any significant differences in average daily gain.

REDUCING MILK TO PROMOTE GRAIN INTAKE

It is a pretty well established general rule that, given a choice, calves will drink milk rather than eat grain. If cost was not a factor, we could pour free choice milk into calves and get great gains. Then, at three months or so, we could work on getting rumen development. But cost is a factor.

My intensive feeding program's goal was to get optimum gains in the preruminant phase of growth. Then, at roughly four weeks of age I increased my emphasis on rumen development.

Abrupt weaning of rumen-incompetent calves results in weight losses even as high as two or more pounds daily as well as serious morbidity problems until competence is achieved. Clearly, most producers want to achieve rumen competence prior to weaning.

Some calf raisers feed enough energy and protein from milk replacer to meet most newborn calves' maintenance needs and genetically determined needs for growth. As calves grow these combined needs exceed the nutrients provided by milk replacer.

The calves will begin to eat starter grain as an alternative source of energy and protein. This assumes calves have discovered that grain is food!

If a calf raiser feeds a limited amount of milk, most calves by three or four weeks of age will discover starter grain. They will begin to eat substantial amounts of it. These calves do okay.

However, in this limited feeding situation, the calves that lag behind in beginning to eat starter grain get stressed out. And, they frequently are treated for pneumonia.

Alternatively, if a calf raiser feeds a large amount of milk replacer (2-3 pounds per day), most calves by three or four weeks of age will discover grain anyway and begin to eat small amounts of it. The difference in grain consumption between feeding programs is primarily in the amount rather than the timing.

During a recent feeding trial I fed some calves that were the same age 2.9 pounds of milk replacer daily. As you might have predicted, larger calves with higher maintenance requirements started digging into the starter grain sooner than smaller calves.

Among the larger calves (ninety-five pounds at birth and larger) significant starter grain intake (greater than one cup daily) began at an average of eighteen days. These same calves began regularly eating two pounds of starter grain daily at an average of thirty-nine days. The smallest calves took proportionately longer both to begin eating starter grain and to get up to two pounds daily.

Through the process of trial-and-error, I eventually worked out a feeding program that balanced:

- High dry matter intake from milk replacer early in life
- Need to encourage early rumen development.

I started reducing the amount of milk replacer fed around the fourth or fifth week depending on the level of milk replacer powder fed. I had a lot of experience with calves fed two pounds of powder daily.

At thirty-five days, nearly all of these calves were eating at least a pound of starter daily. At this time I cut out the PM milk feeding – remember they had continuous free choice water.

After this milk replacer reduction, starter grain consumption usually at least doubled within three to five days. Most of these calves were ready to wean between forty-four and forty-eight days. They averaged approximately 1.8 pounds daily gain birth through fifty-six days. Their pneumonia treatment rate was under five percent.

At rates higher than two pounds of milk replacer powder a day, I saw a wider spread among calves in rate of gain. It was pretty much related to birth weight.

I had to use a two-step reduction in milk feeding, starting at four weeks. Weaning was done based on starter grain intake rates. The largest calves weaned around forty-five days. The smallest ones weaned about fifty-five to sixty days.

Milk Feeding in an Intensive Feeding Program

While at Noblehurst Farms, I fed eight hundred calves on an intensive growth program. I have a few observations about the milk feeding part of calf care.

SELECTING A FEEDING LEVEL

At first, I wasn't just certain what I wanted to achieve. Prior to adopting higher levels of feeding milk replacer, I was getting about 1.5 pounds gain from birth to fifty-six days. This rate of gain varied quite a bit from summer (lower) to winter (higher).

The treatment rate for in-hutch pneumonia was ten to fifteen percent in the summer and over twenty-five percent in the winter quarter.

The first year I tried feeding more than one pound of powder daily my primary goals were (1) to reduce the pneumonia morbidity rate to fewer than ten percent, especially in the winter quarter, and (2) to increase the rate of gain to 1.8 pounds per day.

I continued to feed both water and textured starter grain free choice from the first day the calf was in the hutch. The ration continued to be both milk replacer and starter grain.

In order to increase the rate of gain in calves less than four weeks of age I increased the milk replacer feeding rate from sixteen ounces of powder to thirty ounces daily. During the first winter of this enhanced feeding program, the calves gained 1.8 pounds a day and the pneumonia treatment rate dropped to less than five percent.

The following year, as part of a feeding trial, I fed seventy-five calves at the rate of forty-six ounces of milk replacer daily.

FEEDING DIFFERENT AMOUNTS

I had to adopt a whole new attitude about "every calf get the same" kind of feeding procedures. For the thirty ounce ration, I fed half at 7:00 AM and the other half at 4:00 PM. It was fed as three quarts of milk replacer at each feeding.

For the forty-six ounce ration I fed at the same times. It was fed as four quarts of milk replacer mix each feeding. The larger calves (ninety-five pounds or larger at birth) just dug in and ate the full amount even before seven days.

Smaller calves were another story. As I went along, I discovered that sixty-pound calves would eat about two quarts AM and PM. This seemed to be true regardless of the concentration of the mix.

Larger calves (seventy-five to eighty pounds) ate more; roughly three quarts AM and PM by ten to fourteen days. If I fed too much in the AM the calves just drank less in the PM.

I tried feeding the full four quarts in the AM to small calves. They drank all of it. But, they didn't drink at all in the PM. They were not hungry. Many, but not all, of these small calves drank between one to four quarts of water overnight. I always checked on water consumption for any calf that didn't drink all her milk.

Sometimes I incorrectly estimated how much to feed. If I fed too much in the morning, the calf won't get up to eat in the afternoon. I had tether-style hutches so it was easy to do a health check for individual calves when this happened.

I'm not sure what to suggest for farms with wire cages in front of the hutches. I know it's a lot of work to get inside those hutches to check every calf that doesn't come running out to eat at feeding time.

I found that by three weeks of age, all of the calves on the thirty-ounce ration cleaned up all three quarts AM and PM without any difficulty. The forty-six ounce ration required another week before the smallest calves came up to the full four quarts AM and PM.

Different amounts need to be fed to achieve optimum growth. In order to keep track, I set up a feeding chart by hutch to show amount to be fed calves less than three weeks of age. Beyond three weeks, only one calf here and there needed special attention.

MANURE PATROL

I had a lot to learn about manure. All the calf raisers I know use consistency and color of feces as a way to diagnose diarrhea or scours.

But, when I started the higher rates of feeding, I had to take into account the potential for overfeeding in addition to pathogens (parasites, bacteria, and viruses) as a cause of diarrhea. I can't describe the difference in words but abnormal feces due to overfeeding have a different appearance than those due to pathogens.

By trial-and-error and overfeeding forty or fifty calves I finally learned to pick out abnormal feces due to overfeeding. Once I had that skill, fixing the problem was easy.

Just change the feeding chart and feed less for a few days. Presto! Feces change back to normal. As long as they had free choice water, I had very few calves that require special treatment for diarrhea.

At the highest feeding rate (forty-six ounces of powder daily) the definition of "normal" changed, too. For the first three weeks or so, the feces were more loose or softer than I

expected to see on calves at twenty or thirty ounces of powder. The calves were healthy and gained weight in spite of the seemingly loose feces. But, remember that all these calves had free choice water all the time.

WHAT TO FEED

Our goal was accelerated growth [more recently called “normal biological growth” rather than “restricted growth”]. We had to feed a highly digestible product. This meant either whole milk or an all-milk milk replacer. Our experience was with an all-milk milk replacer with all the fat from animal sources. Using an off-the-shelf product (twenty-percent protein and twenty percent fat) we fed up to thirty ounces of powder daily with no observable toxicity problems. [Looking back, these calves may have been somewhat on the chubby side, however.] That period of observation extended to nearly two years and nearly 1000 calves.

But, at higher feeding levels we fed an all milk milk replacer with all fat from animal sources specifically formulated for an intensive feeding program for dairy heifer calves. It was twenty-eight percent protein and twenty percent fat. [More recently we have seen 27-16 and 28-15 formulations on the market.]

The vitamin and mineral supplements were in proportion to the higher feeding levels (up to three pounds of powder daily). None of our milk replacers were medicated with antibiotics. A coccidiostat was added daily to the milk replacer ration.

We fed dry matter concentrations varying from twelve and one-half percent to nineteen percent. No problems such as scours or calves refusing to eat the reconstituted milk replacer were seen.

All calves, however, had continuous free choice water in the hutch. They were fed with clean pails at every feeding.

Monitoring Calf Care: Goals and Thresholds

1. Newborn care and feeding colostrum:

- **Quarterly – draw blood from all heifer calves between 2 and 7 days of age on herd check day.**
- **Goal for blood serum total protein is 80 percent 5.0 and greater, 50 percent 5.5 and greater.**
- **Quarterly – summarize the number of new navel infections requiring treatment.**
- **Goal for navel infections is less than 10 percent.**

1. Colostrum collection and storage:

- **Quarterly – collect “as-fed” sample of colostrum and culture for bacteria.**
- **Goal is less than 5,000 cfu/ml of coliform or other enterotoxigenic bacteria.**

2. Cleaning milk feeding equipment:

- **Quarterly – collect rinse samples from (a) nursing bottle and nipple, (b) esophageal tube feeder, and (c) buckets used to store colostrum and milk replacer mixing and feeding. Culture samples for bacteria.**
- **Goal is less than 5,000 cfu/ml of coliform or other enterotoxigenic bacteria.**
- **Quarterly – collect “as-fed” sample of milk replacer and culture for bacteria.**
- **Goal is less than 5,000 cfu/ml of coliform or other enterotoxigenic bacteria.**

3. Calf growth rates:

- **Within the first three days of life, using a heart girth weight tape, estimate birth weights on all even numbered calves.**
- **Using the same tape, estimate weaning weights of all calves taped at birth.**
- **Quarterly – summarize the amount of weight gained by these calves and estimate average daily gain.**
- **Goal is at least 1.7 pounds average daily gain at 42 days.**

TRANSITION CALF FEEDING MANAGEMENT CHECKLIST

1. Does the transition calf ration contain at least 18 percent crude protein?

The growing calf needs lots of good quality protein for muscle and immune system development. Usually the rate of post-weaning feed intake can be encouraged by continuing the same grain mix as was fed in the pre-weaning housing. In winter, a 180 lb. Heifer needs 7 pounds of grain mix daily to have enough protein for maintenance and growth in excess of 1.5 pounds a day.

2. Does the transition calf ration contain mostly grain and limited amounts of roughage for the first week after weaning?

Most just weaned calves have been living on grain and water (and in some cases a limited amount of milk). Before they can digest and use the nutrients in roughages like a cow, they need to grow a large number of fiber digesting microbes in their rumens.

This growth period is about 10 to 14 days. During this time they continue to live on protein and energy from grain. By eating a limited amount of roughage in addition to grain they encourage the multiplication of ruminal fiber digesting microbes.

3. Does the transition calf ration have enough energy per pound for both maintenance and to meet the farm's growth goals?

The relative size of a transition calf's rumen to her body size is still small compared to an adult cow. By feeding an energy dense ration to these small growing heifers, we compensate for this relatively small rumen.

That's why grazing heifers consuming high protein grass do so much better when a high-energy grain mix supplements the grass. That's why confined transition heifers consuming free choice high protein hay do so much better when supplemented by a high-energy grain mix.

4. Does the feeding program focus on feeding the rumen microbes rather than the heifer?

As transition heifers grow older changes in their ration are almost the rule rather than the exception. Often these changes involve introducing a new roughage source.

For example, changing from dry hay to haylage. Or, changing from haylage to a mix of corn silage and haylage. Or, changing from grazing grass to stored feeds in the fall. The microbial mix that most efficiently digests each of these roughages varies from one to another.

Introduce small amounts of a roughage that is going to be in the next ration a week or two before the change takes place. That is, before the transition age heifers have to depend heavily on the new roughage as their sole source of nutrition.

RATE YOURSELF

	YES	NO
1. The transition calf ration contains 18 percent crude protein.	_____	_____
2. Transition calves are fed free choice starter grain for the first week after moving into group housing.	_____	_____
3. Transition calves are fed free choice grain and limited hay the first two weeks after moving into group housing.	_____	_____
4. Transition calves are fed a ration with an energy Density of at least 3.0 Mcal of ME per Kg of DM until they are about four months old	_____	_____
5. Changes in roughages are preceded by feeding limited amounts of the new roughage for a week or two prior to the overall change.	_____	_____

Reference: National Research Council, Nutrient Requirement of Dairy Cattle, 2001. Chapter 10 "Nutrient Requirements of the Young Calf" Table 10 "Daily Energy and Protein Requirements of Weaned (Ruminant) Calves."

Monitoring Calf Care: **What to do when goals are not met**

1. **Newborn care and feeding colostrum:**
 - **Review colostrum feeding – timing, quantity, and antibody content. Check for bacteria in colostrum, less than goal.**
 - **Check to see that tincture of iodine is being used for navel dipping and that all calves are dipped.**

2. **Colostrum collection and storage:**
 - **Check rinse sample results on colostrum storage equipment.**
 - **Review procedures for chilling fresh colostrum to 40° ASAP.**

3. **Cleaning milk feeding equipment:**
 - **Check compliance with washing procedure protocol.**
 - **Check for bacteria in milk replacer, less than goal.**

4. **Calf growth rates:**
 - **Review milk replacer mixing protocol.**
 - **Review milk replacer feeding protocol.**
 - **Review starter grain feeding protocol.**
 - **Review water feeding protocol**
 - **Review health records of calves gaining less than goal adg.**

Monitoring Sanitation Procedures

A Checklist

Have you selected the most appropriate measures for monitoring sanitation procedures? Do these measures provide feedback for employees? Do these measures provide information for regular protocol evaluation and revision?

Let's consider how you monitor sanitation procedures. Compare your actions with the standards in this checklist. When the items below refer to "I," this is equivalent to an experienced employee. When making this evaluation, I like to use these scores:

1=never, 2=seldom, 3=often, 4=usually, and 5=almost always.

- _____ 1. Before I observe actual employee behavior, I go to the work site and determine that it is possible to perform the task correctly in that setting and with the tools and materials available.
- _____ 2. I observe actual employee behavior. (This is in contrast to just talking about doing the job.)
- _____ 3. I compare observed behavior to the training standards (these may be incorporated in the protocol).
- _____ 4. When deviations from the protocol are observed, I review these differences privately with the employee. (This is in contrast to "chewing out" the employee in front of her/his peers.)
- _____ 5. When deviations from the protocol are observed, I provide a training opportunity for the employee.
- _____ 6. When task performance results in an objective measurable outcome, I provide resources for collecting information to provide employee feedback.
- _____ 7. Employee feedback is related directly to the protocol.
- _____ 8. Employee feedback is given in straightforward, understandable terms.
- _____ 9. I actively solicit employee reactions to their evaluations, using this information to revise protocols when needed.
- _____ 10. Where outcomes are the result of more than one employee's work, I involve all employees in evaluation, retraining and/or protocol revision.

Consequences of "shock-loading" refrigerators on modified live vaccine temperatures

This document is a summary of a longer unpublished paper with the same title available upon request from Dr. Leadley.

Table 1. Diluent and refrigerator temperatures for selected loadings at 90°F in a five-gallon pail, Attica Vet August 2006

Load	Diluent First	Diluent Last	Diluent Peak	Interior Peak
Volume	45° Time	45° Time	Temperature	Temperature
Three gallons	None	None	38.7°	44.7°
Four gallons	None	None	39.5°	47.5 °
Five gallons	None	None	41.7°	48.3°

Table 2. Diluent and refrigerator temperatures for selected loadings at 90°F in two-quart nursing bottles, Attica Vet August 2006

Load	Diluent First	Diluent Last	Diluent Peak	Interior Peak
Volume	45° Time	45° Time	Temperature	Temperature
Three gallons	None	None	43.9°	50.4°
Four gallons	12:10	13:15	46.8°	54.6°
Five gallons	12:10	14:55	50.4°	59.4°

Table 3. Refrigerator interior temperature changes for selected loadings at 90°F in two types of containers, Attica Vet August 2006

Type of Container	Load	Lag Time	Duration at
	Volume	To >45°	>45°
Five Gal Pail	Four gallons	2 hrs 55 mins	0 hrs 20 mins
	Five gallons	2 hrs 30 mins	0 hrs 25 mins
Nursing Bottles	Four gallons	0 hrs 15 mins	1 hrs 45 mins
	Five gallons	0 hrs 5 mins	4 hrs 10 mins

It is important to remember that these trials were done in a refrigerator, although old, that was in very good working condition, with clean coils and located in an environment with good air exchange. Many dairy barn refrigerators have leaking gaskets and compromised refrigeration units [very dirty coils, positioned in places with poor air exchange, located in utility rooms where summer environmental temperatures often approach 100°F (38°C)].

It seems clear that when refrigerator interior temperatures are not elevated above 50°F (10°C), the risk of warming MLV diluent is minimal. However, only four gallons of warm colostrum in nursing bottles were required to create conditions for extended (over one hour) warming of the diluent.

By the simple process of pre-chilling the colostrum to 60°F, all of the combinations of loading volumes and types of containers resulted in minimal elevation of refrigerator interior temperatures. Thus, if one wants to reduce the risk of warming diluent in MLV stored in the same refrigerator used to chill colostrum, either: (1) only very small volumes (three gallons or less) should be loaded or, (2) the colostrum should be pre-chilled to 60°F.

Many large dairies store volumes of colostrum greater than five gallons at a time. Where large volumes are chilled repeatedly, it probably is a best management practice to store modified live vaccines in a dedicated refrigerator and use a different unit for colostrum chilling.

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Table 1. Recommended Air Exchange Rates per animal in cubic feet per minute (cfm).

Management Group	Weight in Pounds	Minimum Rate (cold weather)	Transition Rate (mild weather)	High Rate (hot weather)
Newborn	90-180	15	50	100
Transition	180-400	20	60	130
Adolescent	400-800	25	70	150
Bred heifer	800-1200	30	80	180

Minimum ventilation in the winter is designed to remove moisture produced by the animals, while the summer ventilation rates remove heat.

Source: Gooch, Curt A., P.E. “Existing Facilities for Replacement Housing – 4th in a Series: Providing a conducive environment for housing heifers may be possible in older facilities.” Pro-Dairy program of Cornell Cooperative Extension Service, Department of Agricultural and Biological Engineering, Cornell University.

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Links to Websites for Calves

- Go to www.atticacows.com and enter the word "checklist" in the search box. Alternatively, click on "Calf Facts" in the left-hand menu for over one hundred calf checklists, protocols, and resource papers. Some Calf Facts are available in French and Spanish. For teaching calf care skills there are instructional outlines for 38 basic and more advanced skills. Estimated gain tables are available for common milk replacers as well.
- Go to www.calfnotes.com and enter a word in the search box - such as blankets, scours, coccidiosis, colostrum, or Colostrometer. Alternatively, use one of the subject headings in the left-hand menu for over one hundred resource papers on calf management. All CalfNotes are available in Spanish.
- Go to www.das.psu.edu/dairynutrition/ for the Calf Track chore system, papers on colostrum replacers and electrolytes, and resource papers on calf care.
- For a broad array of links to subjects such as colostrum (16 links), feeding and nutrition (36 links), health (18 links) housing (6 links) and management (17 links), you may want to try www.ansc.purdue.edu/dairy/calves/calfpub.htm. All the links are to major university sites in the USA (twenty different institutions).
- Or you might want to go to the specialized dairy site www.babcock.cals.wisc.edu/downloads/de_html/ . There are five downloads dealing with calves from birth to weaning:
 - #27 Overview of sound management practices
 - #28 Importance of colostrum feeding
 - #29 Feeding hay, concentrates and water
 - #30 Neonatal diarrhea
 - #31 PneumoniaThese contain tables, charts and graphs and contain helpful technical information. They are in English, Spanish, French, Portuguese and Russian.
- Search options include Google, Yahoo, Metacrawler and Webmetasearch. For example, if you enter a term like dairy calf clostridial enteritis in any of these you will get Sheila McGuirk's summary of clostridial pathogens and practical methods of management, Franklin Garry's observations on managing clostridial diseases among dairy calves and Univ. of Arizona's case study report.

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