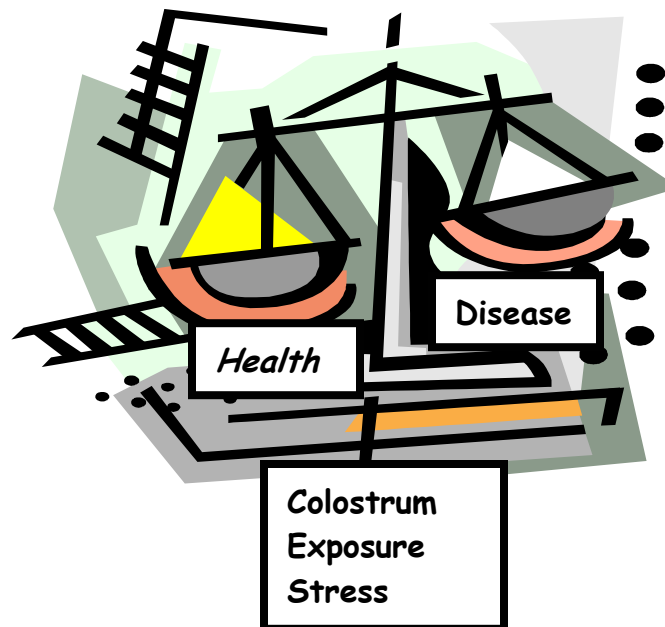


What's New in Baby Calf Health?

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Introduction

The health of young calves should be a priority on the dairy. With annual herd turnover rates close to 35%, having healthy, genetically superior replacement heifers to fill the void is a necessity. Despite the importance of calf health, the USDA Dairy 2002 study¹ shows a preweaned heifer calf mortality rate of 8.7% and reports that less than 40% of farms can supply an adequate number of replacements from their own herd. Inevitably, calves are exposed to viruses, bacteria, and parasites in their environment that are capable of causing scours, respiratory problems or other diseases. If the number of organisms to which the calf is exposed is minimized by good management practices, only a limited number of calves will be infected. Infected calves may not develop disease signs if they have good resistance and little stress. The purpose of this paper is to take a new look at the way calves are exposed to disease and how management practices can minimize their susceptibility to disease.



Colostrum

Inadequate colostrum production, late collection of colostrum, failure to ingest or absorb adequate colostrum leads to a condition known as **failure of passive transfer**

(FPT) in calves. Calves with FPT are at an increased risk of illness but also shed organisms into the environment to a much greater extent than calves that have adequate colostrum absorption. If several calves in the group have FPT, the number of pathogens in the environment will escalate rapidly. Dairy producers should strive towards a goal of 100% of calves with adequate colostrum absorption. Towards that end, early intervention is the key to success. Colostrum donor cows should be milked within a few hours of calving before dilution of the important immune elements occurs with time and/or suckling. To preserve the quality of colostrum, fresh cow udder preparation as well as the sanitation and function of the milking equipment is critical. Colostrum that is not fed to calves within 2 hours of collection should be chilled in 2-quart containers in the refrigerator. The most important aspect of feeding colostrum is **volume**. A minimum of 3-quarts of colostrum is recommended for Jerseys, Guernseys and Ayrshires, while 4-quarts is the recommended volume for Holsteins, Red and Whites and Brown Swiss. If 2 meals of colostrum are given, both should be given by the time the calf is 12 hours of age. If there is any delay in feeding a newborn calf, the entire colostrum meal should be given at the first feeding.

The only way to know that there is a colostrum problem is to test the calves. Regular (monthly) testing provides good feedback to calf feeders and focuses appropriate attention on calf health. To get an adequate assessment of how the herd is doing, 12 calves should be tested. Testing can be done as soon as 6 hours after feeding colostrum but no later than 1 week of age. The test usually used is measurement of serum total protein concentration. Using a total protein concentration of 5.5 g/dl as the cut point, we expect no more than 3 of the 12 calves tested to fall below the cutpoint unless there is a herd problem with FPT. For smaller herds, accumulate test results until 12 calves have been sampled. When an FPT problem is found, the list of potential pitfalls below may clarify the source of the problem.

- ❑ Unobserved calvings occur on a regular basis, e.g. night time
- ❑ Calves remain with dam for ≥ 90 minutes
- ❑ Colostrum administration occurs ≥ 4 hours after calving
- ❑ Fresh cows are milked ≥ 6 hours after calving
- ❑ Calves do not routinely receive either 4 quarts (3 quarts for Jerseys, Ayrshires, Guernseys) of first milk colostrum or 1 package of colostrum replacer within 4 hours of **birth**
- ❑ Colostrum replacement or supplement are mixed in with colostrum
- ❑ There is a shortage of colostrum from appropriate donors without a back-up supply of colostrum replacement product or frozen colostrum readily available
- ❑ There is more than a 2-hour lapse between colostrum milking and either feeding or refrigeration of colostrum
- ❑ Refrigerated colostrum is > 7 days, frozen colostrum is > 1 year or has been through more than 1 freeze-thaw cycle
- ❑ Bacterial contamination of colostrum is excessive (total bacterial count $> 1,000,000$ cfu/ml and/or fecal coliform count $> 10,000$ cfu/ml)
- ❑ Colostrum is routinely pooled

- ❑ Fresh cow health is poor
- ❑ Transition cow management (nutrition, group changes, bedding, density, vaccinations, medications) is a concern

Can a colostrum replacement product solve the problem? Studies indicate that the feeding a colostrum replacement product can be a safe and effective alternative to colostrum when colostrum supply is limited. Similar to colostrum, timely feeding of newborn calves is necessary to make colostrum replacement products work. Some advantages and disadvantages of a colostrum replacement product are shown:

Advantages of feeding colostrum replacement product

- ❑ Readily available and conveniently packaged
- ❑ Ease of mixing in 2-qt of water
- ❑ Above 2 reasons frequently resulted in administration at a younger age than colostrum
- ❑ No bacterial contamination or transfer of contagious disease
- ❑ Adequate antibody levels can be acquired
- ❑ Calf health is not compromised

Disadvantages of feeding colostrum replacement product

- ❑ Immunoglobulin levels are lower than colostrum
- ❑ Though the product has nutritional supplements added, it is not like colostrum
- ❑ Non-specific immune factors and immune cells are not present
- ❑ The high carbohydrate content could result in an enhanced risk for enterotoxemia if it is mixed with colostrum, rather than water.

Exposure: Where is the Problem or Infection Source(s)?

Where are the calves exposed to the source of the problem? For a diarrhea outbreak, the source of the problem is usually manure (manure to mouth transmission), but secretions from the mouth, eyes and nose as well as contaminated air can be sources of infection for calves. In a herd with respiratory disease problems in pre-weaned calves, the source of infection can be contaminated aerosol, other calves or adult cattle, waterers, feeding utensils or feed. For calves, exposure to infection usually occurs as shown below:

- ❑ “Manure meals”
 - Calving pen bedding
 - Calving cows – manure on the udder and legs
 - Manure-contaminated colostrum - when fresh cow preparation, milking equipment sanitation, milking equipment function and/or colostrum storage is not optimum.

We have found that colostrum bacterial contamination is a significant problem on farms with calf health problems. Total colostrum bacterial counts > 100,000

cfu/ml are associated with poor colostrum absorption and usually have heavy loads of fecal coliform counts in excess of 10,000 cfu/ml. While colostrum bacteria establish the normal gastrointestinal flora of the newborn calf, the presence of fecal coliforms suggests that colostrum may also be a source of infection (fecal oral transmission) of such important pathogens as *Mycobacterium paratuberculosis*, *Salmonella Dublin*, *Cryptosporidium parvum* and other enteric pathogens. To my knowledge, colostrum cultures are not routinely performed in laboratories doing bulk tank milk cultures because of the technical difficulty of the process.

Depending on the bacterial types and numbers, the source of contamination may be from inadequate udder preparation, improper sanitation or malfunction of fresh cow milking equipment, the cleanliness of the milk collection bucket or containers, inadequate cooling and storage of colostrum or mastitis. High numbers of fecal bacteria usually incriminate udder preparation, while environmental bacterial numbers go up with equipment sanitation, malfunction or storage. Fecal bacterial populations will increase by a log every 30 minutes if storage and cooling is not appropriate. Dirty calf bottles and nipples represent the final source of bacterial contamination of colostrum with other gram-negative bacteria or environmental bacteria.

- Manure in communal warming area for calves
 - Manure in calf transport vehicles – wheelbarrows, carts, trucks or trailers
 - Calf pen bedding – when there is manure retention in the bedding between calf occupants (inadequate cleaning or disinfection, hutches in same location, or inadequate time between successive occupants), when there is < 3” of dry bedding between the calf and manure, when there is calf to calf contact or continuous bedding base, milk, water or feed refusals are dumped in the calf pen, and/or calf barns are warm and damp
 - Contamination of liquid or dry feed – when milk or milk replacer storage is inadequate, when feed preparation or the area where feed is prepared is not clean, when feeding equipment is contaminated, or when unpasteurized waste milk is fed to calves
 - Contact animals – when there are non-immune shedders (FPT), crowding, commingled stressed (weaned calves, calving cows), sick or lame adult cows
- Aerosolized source of infection for calves
- Commingled adults or weaned heifers
 - Calf housing – when ventilation, humidity, temperature, dampness, animal density or air quality are issues or when shedding animals are present in a shared air space. Shedding animals are FPT calves, stressed calves, chronically sick or poor doing calves.

Calves that are in close contact with manure or other liquid runoff will have continuous exposure to pathogens in the environment. Warm, damp, humid calf housing will compound bedding contamination problems, especially when there is calf to calf contact, inadequate sanitation between successive occupants of an individual pen, accumulation of waste in porous stall base, or dumping feed refusals into calf pens. Pneumonia or diarrhea pathogens from the bedding can be aerosolized. *Goal: At all times, calves have 3" of clean, dry bedding between them and a clean stall base or pack. Feed refusals and contaminated bedding are removed from calf housing.*

Calf to calf contact increases the number of pathogens in the environment. This is rarely the most important risk factor but distancing calves or creating barriers that prevent cross suckling, licking or manure contact can reduce the rate of exposure. Between successive occupants of an individual calf pen, there should be adequate time for removal of all bedding (to the level of the ground or stall base), removing organic material from stall walls, cleaning and disinfection of feeding utensils, drying and addition of fresh bedding. Rapid succession of calf occupants increases the survival time of pathogens in the environment. *Goal: have 15% more calf pens than required at maximum occupancy to allow a minimum of 7 days between successive occupants of the same pen.*

Pre-weaned calves that share the housing facility with adult cows, sick cows or recently weaned calves have a much greater risk of exposure to pneumonia and fecal pathogens. Stressed and calving cows shed bacteria at a much higher level than their unstressed peers. *Goal: Move dairy calves to an individual pen before they stand (30 min) and suckle (90 min).*

Inadequate ventilation, humidity, dampness and high animal density create conditions conducive to a high number of aerosolized organisms, noxious gases and other contaminants that may compromise calf health. Power washing may enhance aerosolization of organisms for contact calves. *Goal: Evaluate ventilation in calf barns associated with endemic calf pneumonia problems and be aware of potential seasonal limitations.*

Sources of Stress

Limiting stress is an undervalued approach to solving calf health problems. Calf stress can be imposed by inconsistencies in diet or presentation of feed, limited availability of water or solid feed, inadequate feeding during cold or illness, frequent management interventions, and failure to provide clean, draft-free housing.

Evaluating management and health prevention practices during the timeframe that puts calves at risk for diarrhea (5 to 14 days) or respiratory disease (weaning time) is a valuable step towards reducing stressful interventions. Avoid changes in liquid feed in the first 2 weeks of life. Feed colostrum in a single meal and begin the preweaning liquid feed diet at the second meal. Avoid prolonged colostrum or transition milk feeding. Make sure that all calf feeders adhere to consistent feeding times, feed temperature, mixing protocol and feeding order. Dispose of feed refusals daily so that feed presentation encourages optimal intakes.

Health prevention practices like antibiotic administration (preventive or therapeutic), antibody administration and vaccinations should at the very least do no harm. Health

protocols and treatment records should be reviewed regularly with your veterinarian. Where colostrum feeding is optimal, vaccination of preweaned calves should be avoided. When vaccination is deemed necessary, strategic timing is necessary. Vaccination responses in young calves are, at-best, inconsistent. Colostrum deprived calves may respond earlier than calves with adequate colostrum immunity but vaccinations that combine several products or several agents frequently result in more inflammation than immunity in preweaned calves.

Milk or milk replacer additives should be used sparingly and protocols for use should be evaluated frequently by nutritionists and veterinarians. Oral products may affect intestinal flora, digestibility and transport of milk or milk replacer. Products vary in efficacy, quality and cost so conservative use is recommended. Use products from reputable companies with good research records in calf trials. Make sure that all calf feeders are following appropriate protocols. Calf treatments or medications used inappropriately (dose, route, frequency, timing, storage, wrong condition) can be the problem source in some herd calf health problems.

Occasionally, milk replacer and oral electrolyte solution sodium concentration or osmolality put calves at risk for conditions associated with poor intestinal motility, bloat, *Clostridium* enterotoxemia, diarrhea and/or medication failure, especially when there is limited availability of water. Colostrum replacement or supplement products, when they are added to colostrum or oral electrolyte powders when added to milk or milk replacer pose similar concerns. Following product labels is essential to reduce additional stress or risk of medications.

Calf health is a priority that makes good economic sense for the dairy industry. While knowledge, products and technology continue to expand, it is a focus on the traditional concepts of adequate colostrum, reducing environmental exposure to disease-producing organisms and moderating stress to reduce susceptibility that will make calf health a reality.