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Trouble Shooting Calf Health Concerns

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Introduction

Investigation of calf health concerns begins with problem definition. In the early stages, the problem frequently is one of increased morbidity and/or mortality but the definition gains precision and specificity as data is collected. Resolution of calf health problems is possible when the investigation identifies the factors that create susceptibility, locates the problem source(s) and yields a prioritized plan for remediation. In general, pre-weaned calf morbidity rates that exceed 25% or death losses greater than 5% warrant a thorough investigation.

Problem Identification

Use records to obtain accurate morbidity and mortality data. Calf problems are seasonal and can be temporally related to management events. If possible, record mortality data for the most recent 12 months. At a minimum, record 3 months of individual calf treatment interventions, diagnosis and outcomes. With these records, establish the at-risk age group, time of disease onset, and/or seasonality of illness. Examination of calves considered to be typical of the problem and in the appropriate age group updates and refines your understanding of the problem. Amongst the at-risk group of calves, obtain diagnostic samples from a minimum of 6 calves or 10% of the group. To investigate a diarrhea problem, submit feces in appropriate enrichment media for *Salmonella sp.* culture, make fecal smears for *Cryptosporidium parvum* detection and have electron microscopic examinations performed for rota- and corona virus. In a calf pneumonia work-up, 2 nasal swabs from each calf are submitted – 1 for bacterial and the other for *Mycoplasma* culture. Nasal swabs are used, not so much for pathogen identification but to identify abnormal nasal flora and the antibiotic susceptibility pattern. Proper sample preparation and submission is essential for accurate assessment of results. When more than 20% of the calves sampled are shedding any one of the potential fecal pathogens listed in the table below or have *Mycoplasma bovis* isolated from the nasal swab, an infection source is identified and addressed. The fecal results shown below from a dairy with scours in 7 to 10 day old calves identifies exposure to *Cryptosporidium parvum* as a problem.

Animal ID	Age	Fecal Consistency	EM for Virus	Smear for *C. parvum*	*Salmonella* culture
740	10 days	2	None	+	Negative
742	9 days	0	None	++	Negative
743	9 days	2	Corona virus	+++	Negative
744	9 days	2	None	+++	Negative
747	8 days	1	None	++	Negative
749	7 days	3	Rotavirus	+++	Negative
750	7 days	1	None	++	Negative

Problem or Infection Source(s)

Where are the calves exposed to the source of the problem? For a diarrhea outbreak, identify the sites for fecal-oral transmission of pathogens. For calf pneumonia problems, focus on aerosol contamination. Feed refusals, water, bedding, feeding equipment, other animals and people may introduce infection in a group of calves. The source of diarrhea may be any or all of these:

- 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.
- 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, or when feeding equipment is contaminated
- Contact animals – when there are non-immune shedders (FPT), crowding, commingled stressed (weaned calves, calving cows), sick or lame adult cows

The aerosolized source of infection for calves may be any of the following:

- 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.

The search for a problem source is not complete until you have observed calf treatments or medications being administered. Inappropriate or untimely treatments (dose, route, frequency, timing, storage, wrong condition) can be the problem source in a calf disease problem.

Risk Factor Assessment

Each of the following risk factors could play a significant role in a calf disease problem and should be evaluated.

- *Failure of passive transfer (FPT).* Non-immune shedders contaminate the calf environment and an FPT problem will increase the number of pathogens to which calves are exposed. *Set a goal of 100% of calves with adequate absorption of colostral immunoglobulins).*
- *Bedding Management.* 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.*
- *Spatial Density***.** Calf to calf contact increases the number of environmental pathogens. 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*.
- *Temporal Density.* 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.*
- *Commingled Age Groups.* 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).*
- *Air Hygiene***.** 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 seasonal limitations.*
- *Other stressors* may play a role in calf health problems. Review and observe feeding, water availability and assure that medications and vaccinations are strategically timed.

Herd Based Testing for Passive Transfer in Calves

Investigation of calf morbidity or mortality requires an accurate assessment of the colostrum-feeding program. Herd-based testing to assess colostral immunity is quite different than testing individual calves. Frequently, conclusions regarding colostrum feeding are made based on assurances of spoken word, rather than observation of colostrum feeding practices or testing calves. Conclusions that incriminate or overlook problems can occur without substantive data.

Accurate conclusions require appropriate sample size, a discriminating test and an appropriate population of calves to test. In our herd investigations, we use a total protein concentration of 5.5 g/dl as the cut point and we are interested in the proportion of calves that fall below the cutpoint. We set an alarm level of 20%. That is, greater than 20% of calves falling below the cutpoint is indicative of a herd problem of failure of passive transfer. Using a proportional outcome based test, a minimum of 12 calves should be sampled to yield a 75% confidence interval. For smaller herds, accumulate test results until 12 have been run. If the results in any herd are close to the cut-point, more tests should be done.

A herd problem of FPT can frequently be traced to unobserved calvings, especially during the night. Calves that remain with their dam for more than 90 minutes suckle but fail to ingest an adequate immunoglobulin mass. Suckling hastens gut closure and results in immunoglobulin dilution in the cow. When colostrum is finally collected and administered, the quality is poor and absorption efficiency is declining. To preserve colostrum quality, milk fresh cows within a few hours of calving. Calves should be given colostrum from a single, healthy colostrum donor and the volume that insures delivery of 100 to 200 g of immunoglobulin is administered as soon after birth as possible but not later than 12 hours of birth. When colostrum replacement or supplement products are used, they should be mixed in water and delivered as a separate meal. Dairies that have a shortage of colostrum from appropriate donors struggle with herd FPT unless they have refrigerated or frozen colostrum or a satisfactory colostrum replacement product readily available. Avoid the negative effect of bacterial contamination of colostrum on absorption of immunoglobulins by refrigerating colostrum that is not fed within an hour of milking and by implementing strict protocols for preparation of fresh cow udders, function and sanitation of colostrum milking equipment. Bacterial contamination of colostrum is excessive when the total bacterial count exceeds 1,000,000 cfu/ml and/or the fecal coliform count is greater than 10,000 cfu/ml. Other causes of herd FPT may be colostrum pooling, poor health in fresh cows or inadequate transition cow management (nutrition, group changes, bedding, density, vaccinations, medications).

Environmental Assessment

To evaluate the relative risk of infection from bedding in the maternity pen, calf transport vehicles or calf housing, bedding material can be submitted for *Salmonella* culture and quantitative bacterial counts. The presence of *Salmonella* in calf bedding poses a significant risk of infection since calves spend a significant amount of time in recumbency where fecal-oral contact is likely. The standards for the level bacterial contamination in calf bedding has not been established but some farm results follow along with goals that are consistent with the level of risk cited for environmental mastitis. In a clean environment that is ready to accept a newborn calf, the total bacterial count should be < 5,000 colonies/ml. During occupancy, the count should remain < 2,000,000 colonies/ml.

Assessment of Feeds and Feeding Practices

Bacterial contamination of liquid feeds – milk or milk replacer – may be a source of infection for calves. In most herds, the concern is fecal coliform contamination but milk or milk replacer refusals may also contain an abundant concentration of respiratory pathogens that have accumulated as calves hold their head in the bucket for prolonged periods during illness, expelling oral and nasal secretions. The total bacterial count in milk or milk replacer fed to

calves should be less than 10,000 cfu/ml with 0 fecal coliforms or *Mycoplasma bovis*. Milk replacer and oral electrolyte solution sodium concentration and osmolality measurements are made if there are concerns about calf illness associated with ileus, bloat, enterotoxemia, and/or medication failure. When colostrum replacement or supplement products are added to colostrum and when oral electrolyte solution (OES) is added to milk or milk replacer, samples are processed by a serum chemistry analyzer and freezing point depression osmometer, respectively. Osmolality refers to the number of osmoles per kg of water. One osmole is one gm molecular weight (1 mol) of any nondissociable substance such as glucose or lactose. The freezing-point depression method of measuring osmolality measures all solutes in relation to their concentration, even though they may be ineffective osmoles (solutes that are able to cross membranes). The number of osmoles in solution will reflect lactose or other sugars, proteins and sodium concentration. Normal serum osmolality is 280-290 mOsm/kg. Milk as fed is isosmotic, the osmolality increases in the duodenum and then declines as it traverses the gut. As the osmolality of milk, milk replacers or oral electrolyte solutions increase (up to 600 mOsm/L), gastric emptying is progressively more rapid and complete. Delayed gastric emptying may enhance absorption of some substances like glucose in OES fed to calves.

Depending on protein source and processing, sodium concentration in milk replacers can be high. If calf disease signs are consistent with hypernatremia, measure it. Fluids with sodium concentrations > 120 mEq/L or osmolalities > 600 mOsm/L should be fed with caution and should **NEVER** be fed if fresh water is not made available to calves twice daily. In feeding milk replacer, oral electrolyte solutions and/or other liquid calf feeds with osmolalities in excess of 600 mOsm/L, there may a greater risk for enterotoxemia.

Abstract
La solution des problèmes de santé des veaux passe par une définition précise du problème. Il est nécessaire de bien cibler les animaux selon leur âge dans le but de faire un examen et d'utiliser les analyses appropriées. Il faut évaluer les problèmes potentiels comme la privation du colostrum, une gestion défaillante, une alimentation inadéquate ou de mauvaises conditions environnementales dans le but d'identifier les facteurs de susceptibilité. Finalement, la source du problème est identifiée et éliminée ou des solutions sont trouvées pour éviter de mettre les veaux à risque d'être malades.