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Infectious Diseases in Calves – With An Emphasis on Respiratory Disease Detection and Intervention

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Overview

Respiratory disease in pre-weaning dairy replacements is second only to diarrhea as a cause of morbidity and mortality. The most recent survey by the United States Department of Agriculture (USDA-2002) places overall preweaning mortality at 8.7%, of which approximately two-thirds is due to scours and one-quarter due to respiratory disease. The incidence of respiratory disease in dairy heifers over the first 3 months of life has recently been estimated to be as high as 25% when weekly veterinarian evaluation of large numbers of calves is performed. As a significant consequence of preweaning morbidity and mortality, only 40% of US dairies are able to maintain herd numbers by home reared replacements, the remaining majority of dairies having to purchase replacement animals with the attendant risks that such a practice brings for biosecurity and infectious disease control. Although the clinical signs of diarrhea are obvious to producers and veterinarians alike, it is becoming increasingly evident that timely detection and early treatment of respiratory disease is more challenging. Frequently, by the time calves become symptomatic with tachypnea/dyspnea and/or coughing the disease may have been present for some time. Although we have historically focused on the group housing period immediately following weaning as a common “high risk” period for heifer calf pneumonia, the majority of the calf morbidity/mortality investigations with which the production medicine section are involved at the University of Wisconsin involve pre-weaned animals. The impact of pre-weaning respiratory disease on the costs of heifer rearing are not just felt in terms of treatment costs and animal losses but also decreased weight gains during the first 3 months of life. In fact pneumonia during this time frame appears to have a greater negative impact on height and weight gains than does diarrhea.

Etiopathogenesis

Historically we have been very focused, both as veterinarians and producers, on those agents that can cause respiratory disease in cattle. Viral agents such as BRSV, BVDV, and PI₃, alongside bacterial agents such as *Mannheimia haemolytica*, *Pasteurella multocida*, *Haemophilus somnus*, *Arcanobacterium pyogenes* and *Mycoplasma* spp have all been incriminated as significant respiratory pathogens either in isolation or more commonly as combined infections. Great interest has focused recently on the role that *Mycoplasma* spp (particularly *M. dispar* and *M. bovis*) may play not only in lower airway disease but as a significant cause of upper airway and middle/inner ear disease. The precise pathogenic role that *Mycoplasma* spp may play in preweaning respiratory disease is significantly complicated by its presence in transtracheal wash samples from up to one third of all healthy nursing calves.

As a consequence of the agent based approach to etiologic diagnosis, our therapeutic and preventative responses have similarly centered on antimicrobial treatment and vaccination, either of late pregnant dams or the new born calves themselves (or both). It would be fair to say that the majority of calf hood disease investigations with which we have been involved in recent years have been on farms that have aggressive vaccination programs and comparably aggressive antimicrobial usage. We have been underwhelmed with our ability to make a significant impact on these dairies when we limit ourselves to a purely agent based investigation of sick calves with either respiratory or enteric disease.

Diagnosis of Pre-Weaning Disease in Calves

There is little doubt that the timely identification of disease in calves is challenging for both producers and practitioners. Research in the last few years has shown that we may commonly miss early cases of respiratory disease in particular, and that many calves experience their first bout with pneumonia as early as the second week of life. A stethoscope in the hands of a practiced and experienced clinician is an undoubtedly sensitive and time honored means of evaluating the thorax of calves for early signs of respiratory disease. However, such attention to individual animal evaluation is no longer the norm for heifer rearers, most of the decision making with respect to therapeutics being done by lay personnel who are frequently skilled, usually well intentioned, but commonly over stretched with other responsibilities. It has become more and more common for veterinary input to be sought with respect to diagnostic and treatment protocols that are end-user friendly, and not overly reliant on skills that may take a DVM education and many years to perfect. Systems that rely on rectal temperature alone, or feed intakes alone, or the presence or absence of diarrhea are not as sensitive or specific as systems that take combinations of several factors into consideration, however the latter can become impractical and overly complicated. Dr. Sheila McGuirk has developed a scoring system that we use on problem dairies that attributes marks to temperature, fecal score/consistency, and the presence, absence and severity of cough, nasal discharge, and ear or eye abnormalities. This system has proven more reliable than other more traditional methods of evaluating calves as a means of identifying sick calves requiring intervention. It is not a protocol designed to purely address respiratory disease but we have used it to good effect for producers with respiratory disease problems. It involves a scoring system as outlined overleaf. This form can be used by producers to evaluate all individual nursing calves on a farm weekly - we advise treating any animal that registers a cumulative score of 5, and reevaluating within a few days any calf that has a cumulative score of 4. Some farms have taken to using this system daily.

Some of the other diagnostic procedures that we use during field investigations will be commonplace and second nature to most practitioners although we have moved away somewhat from transtracheal washes towards bronchoalveolar lavages in recent years. A BAL is simple and non-invasive to perform but the equipment can be a little costly unless you resterilize the catheters after each use. We find routine bloodwork and serology to be of very little to no value in our on-farm investigations of calfhoo respiratory disease. On rare occasions we may run either BVDV microplate ELISAs or skin biopsies for BVDV PI status evaluation but otherwise the only other bloodwork we routinely perform is for assessment of passive transfer.

	Temp	Nasal Discharge	Cough	Feces
0	100-100.9	None	None	Normal
1	101-101.9	Small or 1 sided	Induce 1	Semi-formed
2	102-102.9	Moderate	Induce several, spontaneous.	Loose, stays on bedding
3	>103	Excess, hanging	Several/spontaneous	Water

This, along with several other calf health forms can be accessed on line in downloadable format at <http://www.vetmed.wisc.edu/dms/fapm/calf.html>

TROUBLE-SHOOTING DISEASE OUTBREAKS IN PRE-WEANING CALVES:

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 for both respiratory and enteric disease. In a herd with respiratory disease problems in pre-weaned calves, the source of infection can be contaminated aerosols, 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.

Depending on the bacterial types and numbers, the source of colostrum 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 inches 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.

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. Always consider an evaluation of ventilation in calf barns associated with endemic calf pneumonia problems and be aware of potential seasonal limitations. Do not underestimate the importance of air hygiene during the evaluation of calf rearing facilities on farms with endemic respiratory disease.

Conclusion

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.

References

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