

Timely diagnosis of dairy calf respiratory disease using a standardized scoring system

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Abstract

Respiratory disease of young dairy calves is a significant cause of morbidity, mortality, economic loss, and animal welfare concern but there is no gold standard diagnostic test for antemortem diagnosis. Clinical signs typically used to make a diagnosis of respiratory disease of calves are fever, cough, ocular or nasal discharge, abnormal breathing, and auscultation of abnormal lung sounds. Unfortunately, routine screening of calves for respiratory disease on the farm is rarely performed and until more comprehensive, practical and affordable respiratory disease-screening tools such as accelerometers, pedometers, appetite monitors, feed consumption detection systems, remote temperature recording devices, radiant heat detectors, electronic stethoscopes, and thoracic ultrasound are validated, timely diagnosis of respiratory disease can be facilitated using a standardized scoring system. We have developed a scoring system that attributes severity scores to each of four clinical parameters; rectal temperature, cough, nasal discharge, ocular discharge or ear position. A total respiratory score of five points or higher (provided that at least two abnormal parameters are observed) can be used to distinguish affected from unaffected calves. This can be applied as a screening tool twice-weekly to identify pre-weaned calves with respiratory disease thereby facilitating early detection. Coupled with effective treatment protocols, this scoring system will reduce post-weaning pneumonia, chronic pneumonia, and otitis media.

Keywords: bovine respiratory disease, dairy calves, scoring system, screening.

Introduction

As reported by producers in the most recent dairy study, respiratory disease was responsible for antibiotic treatment of 12.4% of pre-weaned dairy calves and 22.5% of the pre-weaned dairy calf deaths (USDA, 2008, 2009). In dairy calves examined by a veterinarian, the reported incidence and prevalence of pre-weaned dairy calf respiratory disease are even higher at 25.6 (Virtala *et al.*, 1996) and 14.3% (Lago *et al.*, 2006), respectively.

The economic costs attributed to respiratory disease of calves, including treatment expense, mortality, premature culling, reduced growth, impaired fertility, and reduced milk production in the first lactation on a typical Dutch farm ranges from \$21.37 to 66.32 (median: \$36.19) (van der Fels-Klerx *et al.*, 2001). An earlier US study (Kaneene and Hurd, 1990) reported the total cost, including prevention, of pre-weaned respiratory disease to be \$14.71 per calf.

Despite the prevalence and importance of respiratory disease in pre-weaned calves, the diagnosis is problematic and delayed diagnosis may result in prolonged use of antibiotics, a high recurrence rate, and the development of refractory sequelae such as chronic lung injury, pulmonary abscessation, ear infections, and endemic herd respiratory disease. The potential reasons for poor farm detection of dairy calf pneumonia are numerous and include the lack of veterinary input and training, poor knowledge of clinical signs of respiratory disease by farm staff, inaccurate detection methods, inappropriate timing of respiratory disease screening, lack of time, personnel limitations, poor equipment, limited animal contact, and other social pressures.

Regular on-farm screening for disease in pre-weaned dairy calves is rare. Instead, appetite-based observations or other empiric measurements all too frequently serve as the basis for identifying sick calves. Without regular screening for respiratory disease, dairy calf respiratory disease detection on farms is poor (McGuirk, unpublished data). Although the correlation between clinical signs of respiratory disease and lung lesions at

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Table 1. Clinical parameters and point scale used for respiratory clinical scoring.

Clinical parameter	Points and description			
	0	1	2	3
Rectal temperature (°F)	100–100.9	101–101.9	102–102.9	≥103
Cough score	No cough	Induce single	Induce repeated coughs or occasional spontaneous	Repeated spontaneous coughing
Nasal discharge score	Normal, serous discharge	Small amount of unilateral, cloudy discharge	Bilateral, cloudy, or excessive mucus	Copious, bilateral mucopurulent nasal discharge
Eye or ear score	Normal eye and ear	Mild ocular discharge or ear flicking	Moderate bilateral ocular discharge or slight unilateral ear drop	Heavy ocular discharge, severe head tilt, or bilateral ear droop

slaughter in young dairy calves may depend on severity of disease, timing of screening and duration of disease (Leruste *et al.*, 2012), an on-farm screening procedure performed on a regular basis by individuals trained to recognize and grade selective clinical signs associated with respiratory disease may help identify previously unrecognized respiratory problems. Early recognition by a respiratory-scoring system can prompt further diagnostic testing (ultrasound, other imaging, airway sampling, and blood testing) or treatment, depending on the farm protocol.

Respiratory-scoring system

The basis of the clinical signs-based respiratory-scoring system described here is that when two or more examination parameters are moderate or severely abnormal, respiratory disease is present. The examination parameters and graded scale evaluation criteria are summarized in Table 1 and available at: http://www.vetmed.wisc.edu/dms/fapm/fapmtools/8calf/calf_respiratory_scoring_chart.pdf

As characterized in Table 1, points range from 0 to 3 as clinical signs progress from normal (0), to mildly abnormal (1), to moderately abnormal (2), and to severely abnormal (3). Calves with a total respiratory score ≥5 or that have two or more clinical parameters with score 2 or 3 are considered to have respiratory disease. For calves in group pens, the respiratory-screening process can be modified: http://www.vetmed.wisc.edu/dms/fapm/fapmtools/8calf/group_pen_respiratory_scoring_chart.pdf

The respiratory-scoring system becomes one of the tools used in a farm's calf health-screening program. A successful screening program has three components: (1) daily observations; (2) twice weekly screening tests; and (3) a defined exam process. Respiratory scoring is part of the twice-weekly health-screening program, but it is also used when workers doing daily observations have marked an individual calf as needing a more detailed examination. Calves selected for daily examination may be high risk calves (assisted delivery, poor calf vigor score, and failure of passive transfer), recheck calves, calves found standing when 90% are sleeping, calves slow to stand at feed delivery, calves with diarrhea, calves with sunken eyes, calves with abnormal posture, calves that are coughing or breathing abnormally, or

calves that have blood visible externally (nose, mouth, skin, or feces). Respiratory disease prevalence increases with age in pre-weaned calves (Lago *et al.*, 2006) so strategic use of a standardized respiratory screening procedure to identify and treat-affected calves just prior to weaning can positively impact the common occurrence of post-weaning pneumonia.

With the regular implementation of a standardized scoring system to detect respiratory and other disease in pre-weaned calves, additional labor will be required. From a University of WI Extension study (<http://eauclair.uwex.edu/files/2013/07/ICPA-2013-PPT-Overview.pdf>), it has been estimated that, on average, 1 full time equivalent (FTE) employee is needed for each 100 calves to perform the routine daily chores. We estimate that an additional 0.5 FTE is needed for every 100 calves to perform daily and weekly health-screening procedures such as the standardized respiratory-scoring system described here. Initially, farms can expect increases in number of calves treated, treatment costs, respiratory morbidity, and calls to the veterinarian. At the same time, the mortality rate from respiratory disease is expected to decrease. Over time, decreases in the calf treatment rate, number of days of treatment, treatment relapses, treatment costs, and morbidity and mortality measures will all be appreciated. Long-range productivity and profitability of replacement heifers add value and worker satisfaction with performance of the calves, reduces employee turnover, and improves motivation and job performance. Individual calf-scoring results can be entered into a record system to track performance and cost, monitor disease incidence, analyze treatment efficacy, or create valuable health reports. When a change in prevalence of respiratory disease is detected, appropriate diagnostic testing can be focused on the most recent, untreated diseased calves.

Summary and conclusions

Individual respiratory-screening exams performed twice weekly can improve respiratory disease detection in pre-weaned dairy calves. Early detection with appropriate diagnostic testing and effective treatments will minimize antibiotic use, disease recurrence, chronic respiratory disease cases, and endemic dairy calf pneumonia.

References

- Kaneene JB and Hurd HS (1990). The National Animal Health Monitoring System in Michigan. 3. Cost estimates of selected dairy-cattle diseases. *Preventive Veterinary Medicine* **8**: 127–140.
- Lago A, McGuirk SM, Bennett TB, Cook NB and Nordlund KV (2006). Calf respiratory disease and pen microenvironments in naturally ventilated calf barns in winter. *Journal of Dairy Science* **89**: 4014–4025.
- Leruste H, Brscic M, Heutinck LF, Visser EK, Wolthuis-Fillerup M, Bokkers EA, Stockhofe-Zurwieden N, Cozzi G, Gottardo F, Lensink BJ and van Reenen CG (2012). The relationship between clinical signs of respiratory system disorders and lung lesions at slaughter in veal calves. *Preventive Veterinary Medicine* **105**: 93–100.
- USDA. 2008. Dairy 2007, Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007 USDA–APHIS–VS, CEAH. Fort Collins, CO #N482.0908.
- USDA. 2009. Dairy 2007, Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007 USDA: APHIS:VS, CEAH. Fort Collins, CO #N494.0209.
- van der Fels-Klerx HJ, Sørensen JT, Jalvingh AW and Huirne RB (2001). An economic model to calculate farm-specific losses due to bovine respiratory disease in dairy heifers. *Preventive Veterinary Medicine* **51**: 75–94.
- Virtala AM, Mechor GD, Grohn YT, Erb HN and Dubovi EJ (1996). Epidemiologic and pathologic characteristics of respiratory tract disease in dairy heifers during the first three months of life. *Journal of the American Veterinary Medical Association* **208**: 2035–2042.