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MANAGING TO ALLEVIATE CALF SCOURS: THE SANDHILLS CALVING SYSTEM

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INTRODUCTION

Diarrhea remains an important cause of illness and death of young beef calves. The economic effects of calf scours can be profound. Some beef cattle herds annually experience death rates of 5 to 10 percent or greater, sometimes with up to 100 percent of calves being ill. Economic costs to the disease include loss of performance, mortality, and the expense of medication and labor to treat sick calves. In addition, herd owners and their employees often become disheartened after investing long hours to treat scouring calves during an already exhausting calving season.

Management practices can have a profound effect on the health of cattle. Our objective was to prevent neonatal calf diarrhea in ranch systems typical of the Nebraska Sandhills by designing and testing calving systems that would prevent calves from making effective contacts with scours pathogens. An effective contact is an exposure to pathogens of a dose-load or duration sufficient to cause disease. Effective contacts can be prevented by physical separating animals, reducing the level of exposure (e.g. through the use of sanitation or dilution over space), or minimizing contact time. These actions have been successfully applied in calf hutch systems to control neonatal diseases in dairy calves. The management actions we defined as the Sandhills Calving System (Figure 1) were designed to prevent effective contacts by:

1) Segregating calves by age to prevent direct and indirect transmission of pathogens from older to younger calves

2) Routinely moving pregnant cows to new calving pastures to minimize pathogen dose-load and contact time

CASE STUDIES

Case Herd #1 was an 800-900-cow beef herd. Calving began each year in early March. Cows typically calved in calving lots and the calf and dam were "paired-out" into larger pastures. The mortality rate due to scours was 14 percent and 6.5 percent in 1995 and 1996, respectively. In 1999 the scour mortality rate was 8.2 percent. Medical records were not available for 1997 and 1998 but the ranch owner reported that losses due to scours were also within this range. Veterinary expenses during the calving season averaged $3114.18 per year from 1995 to 1999. Veterinary expenses were primarily for antibiotics and fluids for the care of scouring calves. Calf scours mortality rates were unaffected by supplementing the cow herd with trace minerals.

The Sandhills Calving System was adopted in 2000 and this plan was continued in 2001 and 2002. In the new system large contiguous pastures were used as calving pastures. Cows were turned into the first calving pasture (Pasture 1) as soon as the first calves were born. Calving continued in Pasture 1 for two weeks. After two weeks the cows that had not calved were moved to Pasture 2. Cow-calf pairs remained behind in Pasture 1. After a week of calving in Pasture 2 the cows that had not calved were moved to Pasture 3 and cow-calf pairs born in Pasture 2 remained in Pasture 2. Each subsequent week cows that had not calved were moved to a new pasture and pairs remained in their pasture of birth. The result was multiple pastures each with calves within one week of age of each other. Cattle from different pastures could be commingled after the youngest calf was four weeks of age.

In the three years since implementing the Sandhills Calving System illness and death due to calf scours decreased significantly ($p<0.01$). No calves died from neonatal calf scours since beginning the system. Four calves were treated for scours in 2000 and no calves have been treated for scours since. Veterinary expenses incurred during the calving seasons of the past 3 years have averaged $128.83 per year, a 24-fold reduction from previous years ($p<0.01$). The owner estimated savings of $40,000 to $50,000 per year attributable to greater numbers of weaned calves, improved calf performance, and reduced expenses for treatment.

Case Herd #2 was a 400-cow beef herd using rotational grazing and early summer calving. Calving in this herd occurred as the cows moved through a series of pastures every two to four days. This herd experienced 6.5 percent (28 deaths /433 births) and 11.9 percent (48 deaths/402 births) mortality in 1999 and 2000, respectively. Deaths were primarily due to neonatal calf scours.

The Sandhills Calving System was adopted in 2001 and continued in 2002. The system differed slightly from that of Case Herd #1 to meet the requirements of the intensive pasture grazing system. Groups of cattle moved to different pastures throughout the calving season as appropriate for forage utilization. However, every 10 days or whenever 100 calves were born the herd was divided by sorting cows that had not calved from the cow-calf pairs of the preceding group. In this manner the number of calves within any pasture group never

exceeded 100 and all calves within a group were within 10 days of age of each other. Pasture groups were commingled after the youngest calf was four weeks of age.

Death loss was significantly reduced in 2001 and 2002 compared to previous years ($p<0.01$). No calves died of neonatal scours in 2001 or 2002. Total death loss was 2.3 percent (8 deaths /398 births) and 1.5 percent (5 deaths /340 births) in 2001 and 2002, respectively.

DISCUSSION

Neonatal calf scours is a multifactorial disease. Agent, host, and environmental factors play important roles in the occurrence of disease and knowledge of these factors become the basis for management intervention to control the disease. Numerous infectious agents have been recovered from scouring calves. Common agents of neonatal calf scours include bacteria such as *Escherichia coli* and *Salmonella*, viruses such as rotavirus and coronavirus, and protozoa such as cryptosporidia. Bovine rotavirus, bovine coronavirus and cryptosporidia are ubiquitous to most cattle populations and can be recovered from calves in herds not experiencing calf diarrhea. Further, multiple agents can be recovered from herds experiencing outbreaks of calf diarrhea suggesting that even during outbreaks more than one agent may be involved.

Calves acquire passive immunity against the common agents of calf scours after absorbing antibodies from colostrum or colostrum supplements. The quality and quantity of colostrum ingested largely influences the level of passive protection. The presence of antibodies in colostrum directed against specific agents requires prior exposure of the dam to the agent. Vaccines are often used to immunize the dam against specific agents and some commercially available colostrum supplements contain polyclonal or monoclonal antibodies directed against specific agents. Vaccination or the use of colostrum supplements has not been universally successful for controlling neonatal calf scours.

The age of the host appears to be an important factor of neonatal calf scours. Calves become ill or die from scours within a small range in age (Figure 2). Age-specificity may not be explained solely by the incubation period of the agents, because disease is observed in colostrum-deprived calves within 48 hours of virus inoculation regardless of age. It is possible that calves become more susceptible to disease as the amount of antibodies bathing the gut wanes.

The conditions of the environment may influence both the level of pathogen exposure and the ability of the calf to resist disease. Ambient temperature (e.g. excessive heat or cold) and moisture (e.g. mud and snow) are important stressors that impair the ability of the calf to resist disease. Environmental exposure to pathogens may occur through direct contact with other cattle or contact with contaminated environmental surfaces. The exposure level (i.e. dose-load) of pathogens in the environment is a function of both animal density and the multiplier effect of sequential infections. Crowded conditions facilitate the number of effective contacts with infected animals or contaminated surfaces. Over time environmental

pathogen contamination may increase especially when conditions favor survival of the agent such as during wet, cool weather common to springtime calving. Further, with sequential infections (e.g. dam to calf, older calf to younger calf…) the level of pathogen shedding may increase to greater levels. Eventually the dose-load of exposure may exceed the calf's ability to resist disease. These factors alone or in combination may explain observations that calves born later in the calving season are at greater risk for disease or death (Figures 3 and 4).

The Sandhills Calving System as applied to these herds was designed to prevent effective contacts by using clean calving pastures, preventing direct contact between younger calves and older calves, and preventing later born calves from being exposed to an accumulation of pathogens in the environment. However, the actions taken to implement the system differed slightly between herds to meet the specific needs of each production system. Key component of the systems in both herds was age segregation of calves and the movement of gravid "heavy" cows to new pastures rather than "pairs". Age segregation prevents the serial passages of pathogens from older calves to younger calves. The design of the system to routinely move heavy cows to new calving pastures prevents the build up of pathogens in the calving environment over the course of the calving system and the resultant exposure of the latest born calves to an overwhelming dose load of pathogens.

The Sandhills Calving System afforded some additional benefits to management. For example Herd #1 realized some labor efficiency because cattle movement could be scheduled once a week when additional labor was available. Moving cattle without calves to a new pasture was easier than moving individual cow-calf pairs. Also, the workload was partitioned between pasture groups such that cows at risk for dystocia were together in one pasture while the calves at risk for scours were in another. Information from pregnancy examination, when available, enabled sorting cows into early and later calving groups. Cows expected to calve later in the season can be maintained elsewhere and added to the calving pasture as appropriate, thereby reducing the number of cattle moving through the initial series of pastures.

After implementing the Sandhills Calving System in these two ranch herds we observed important reductions in the morbidity and mortality due to neonatal calf diarrhea. The reduction in illness and death has been consistent over five calving seasons. We concluded that the Sandhills Calving System effectively prevented illness and death due to neonatal calf diarrhea.

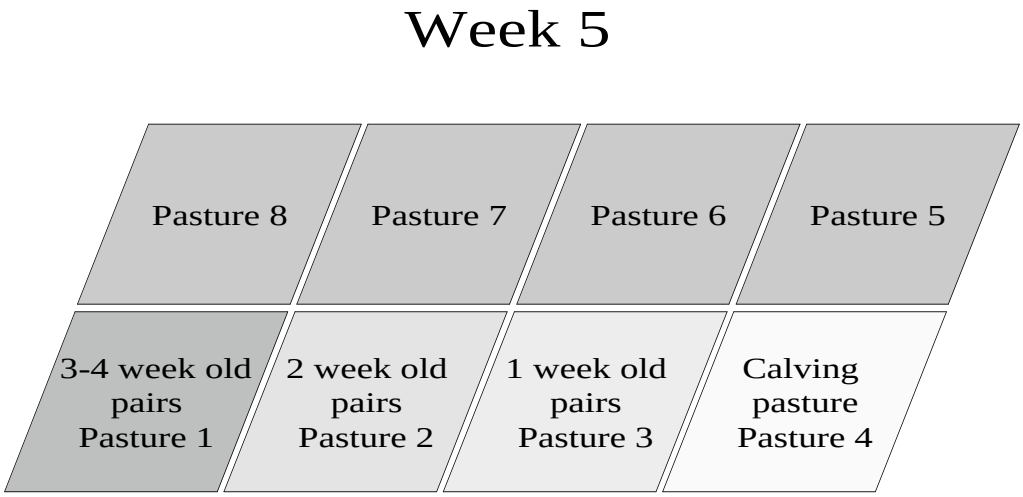

Figure 1. Schematic of the Sandhills Calving System in the fifth week of the calving season. During Week 5 cows are calving in the 4th pasture and calves born in the previous pastures remain behind in age-related groups.

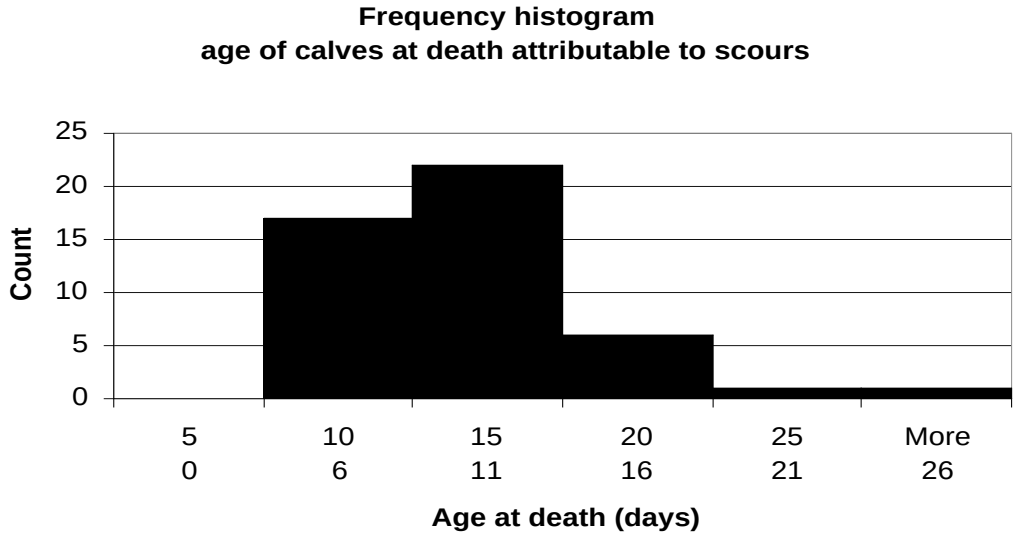

Figure 2. Frequency distribution of the age calves died from scours. Most calves died between 6 and 15 days of age. Data are from Case Herd #2 prior to implementing the Sandhills Calving System.

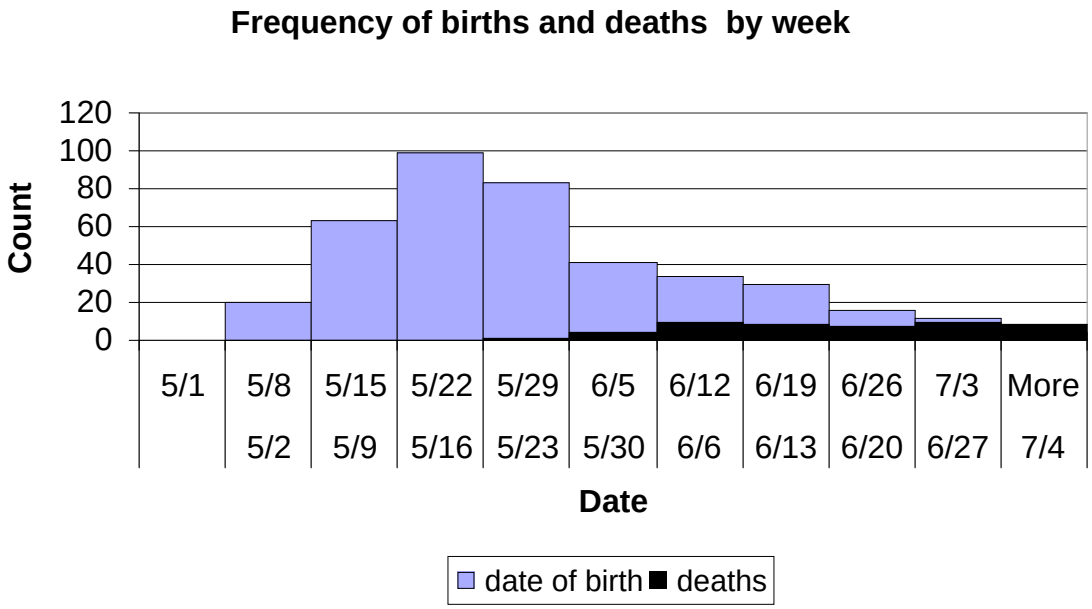

Figure 3. The number of calf births (gray bars) and the number of calf deaths to scours (black bars) recorded for each week of the calving season. Data are from Case Herd #2 prior to implementing the Sandhills Calving System.

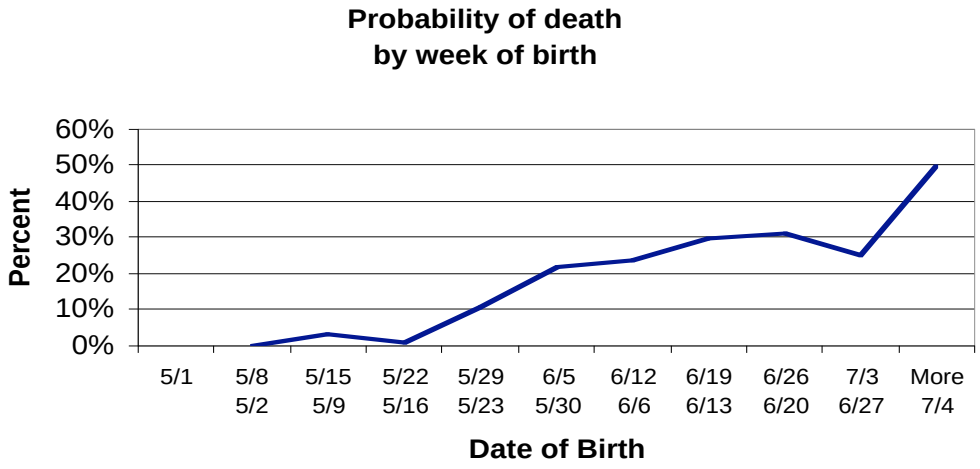

Figure 4. The proportion of calves born each week that subsequently died due to scours. Calves born later in the calving season had increasingly greater risk of death. Data are from Case Herd #2 prior to implementing the Sandhills Calving System.