A Retrospective Case Study Implicating Foster Calves in a Calf Diarrhea Epidemic

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Introduction

Calf diarrhea (scours) is the most common infectious condition affecting beef calves in early life. Surveys of the upper midwest estimate that calf scours affects 11% of calves born (Grotelueschen et al, 1996).

Generally, mortality rates associated with calf scours are low. However, producers incur high medical and labor costs when calf scours cases increase. In addition to immediate costs, calves affected with scours have lower weaning weight (Wittum et al,1994).

A number of general management recommendations, aimed at infection/exposure control, have been forwarded in an attempt to limit calf scours on the herd level. Among these are modification of cow/calf flow, gestating cow nutrition and body scoring, separation of heifers and cows, use of vaccination, isolation of scouring calves, and limitation of additions during the calving season (Clement et al, 1993; Clement et al, 1995; Epperson, 1995; Grotelueschen et al, 1996; Heath, 1992a; Heath, 1992b; Pare et al, 1993; Toombs et al, 1998; Wittum et al, 1994). Cattlemen have been reluctant to adopt these management suggestions, probably because they feel they historically have had little problem with calf diarrhea. This report is a retrospective case study of a herd that experienced a severe calf scours epidemic in 2000. The objective of this study was to determine risk factors at work in this epidemic.

Materials & Methods

The cooperating herd is a commercial cow-calf operation located in eastern South Dakota. The herd features Angus cross females, bred to Angus (heifers) or Charolais (cows) bulls. Cows were moderately large framed. Heifers started calving 3/5/2000. Cows began calving 3/25/2000. More than 80% had calved within 55 days. Date of last calving was 6/1/2000, for a total calving season length of 88 days. With the exception of bulls, and an occasional foster calf, no animals had been added to the herd within the previous 3 years. All replacement heifers were born and raised exclusively at the home operation. Rations were balanced by a consulting nutritionist. The nutritionist periodically did body condition scoring, and body scores prior to calving were judged to be adequate.

A total of 223 calves were born, 63 to heifers (28.3%), and 160 to cows. Heifers were gestated and calved separately from cows. Near the time the first heifer was expected to calf, all heifers were moved from the gestation area to a 25 acre calving pasture (2.52 heifers/acre) with access to a covered calving shed. Pairs were generally maintained in this area following calving. Cows were gestated and fed on 25 acres of cornstalks (6.4 cows/acre). Cows were calved in this area, with no access to shelter. Cow-calf pairs were moved as needed from the calving area to an adjacent 25-acre grass pasture. Both cow and heifer calving areas shared a common water fountain, and had fenceline contact.

The cow herd was on a complete and timely vaccination program with yearly booster of BVD/IBR/PI_3/BRSV/5 way Leptospirosis. Scours vaccination (E. coli/Rotavirus/Coronavirus/Clostridia) was administered to heifers at 6 weeks and again at 10 days prior to anticipated arrival of the first calf. Cows received scours vaccination in April and again in mid-May. No recent history of a severe scours epidemic had occurred on this farm. In years past, only "several calves" had required treatment.

Data were obtained from written production records and interviews with farm personnel. Production records included birthdate, birthweight, dam ID, sex of calf, age of dam

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(2 yr. old vs. older), date of treatment, illness diagnosis, and treatment. All legible data was entered into a computer spreadsheet for descriptive analysis.

Results

A large calf scours epidemic occurred during the 2000 calving season. Records from this outbreak were used to conduct an epidemiological evaluation to attempt to explore risk factors for scours in this outbreak. A limited number of calf mortalities did occur, but were not recorded. Necropsy was not performed on any mortalities. Fecal samples from 2 affected calves were sent for diagnostic assessment, with only *Cryptosporidium parvum* in moderate number found in 1 sample. Calves were not systemically ill, but developed watery scours without blood, became dehydrated and could die if untreated. Calves were treated with multiple antibiotics and supportives. One antibiotic appeared to effect a positive response in scouring calves. The producer used this antibiotic regimen and limited calf mortality to near zero. However, the calf scours epidemic continued, and many calves required treatment.

Of the 223 live calves born, 163 (73.1%) were affected with scours (Table 1). Most calves were affected between the ages of 6 – 10 days (Figure 1). It appeared there was an increase in cases that started between the 30th and 40th day of the calving season (April 7 – April 17, 2000) (Figure 2).

Figure 1 suggests that calf susceptibility to the agent was not limited to the first 2 weeks of life, and could have extended beyond the 3rd week of life. Assuming susceptibility extended to 21 days of age, calves born between 3/22/2000 and 4/12/2000 would be susceptible to the scours agent if the agent was introduced on 4/12/2000 (day 35 of calving season). This assumption is supported in Table 2, as 50% of calves of heifers born in week 3 were affected with scours, and the proportion rose from that time forward. It appears that the agent(s) was/were transferred to the cow herd very near the beginning of cow herd calving, as a large portion of calves of cows born early in the cow calving season were affected.

As calving progressed, there was a clear trend for a greater risk of scours, and for calves to be affected at a younger age, as reported in Table 2. It is important to note that in weeks 7-9, in the middle of the cow calving season, that 80 – 90% of calves were affected. This suggests near perfect exposure of calves to the scours agent(s). The median age of calves from cows that were affected was 7 days. Assuming exposure within the first 3 days of life, the incubation period for agent(s) in this outbreak is between 4 and 6 days.

Though fewer calves of heifers appeared to be affected (Table 1), this is attributed to introduction and propagation of the agent(s) after the third week of calving, when 25/63 calves of heifers had been born. There was no indication that sex of calf influenced susceptibility (p = 0.57).

Records indicate that 3 foster calves were purchased on April 4, 2000. Records are not clear how or when all these calves entered the cow herd. Records do indicate that one calf was fostered onto a cow on April 7. Farm personnel believed that at least 1 of the other 2 was fostered onto a heifer.

Discussion

Because this is a retrospective investigation of an outbreak that took place one year earlier, a full and extensive herd evaluation is impossible. Management in this herd allowed the accumulation of a large number of calves in the relatively small turnout areas. This facilitates agent transmission, thus fueling a scours outbreak. However, historically this herd had used this calf flow scheme with little problem.

Herd nutrition was difficult to evaluate retrospectively. However, the statements and records of a consulting nutritionist, who cooperated with this investigation, suggested that protein, energy, trace mineral, and vitamin nutrition were unlikely to be deficient. Further, body condition scoring was done periodically by the nutritionist and cow body scores were regarded as adequate (i.e. 5-7 on a 9 point scale). Weather conditions in the 2000 winter were not considered severe. Other conditions that would decrease calf viability, such as an increase in dystocias (difficult births) were not observed by the producer.

The only outside additions to this herd were bulls and foster calves. Bulls were not in contact with cows except during the breeding season, so it is unlikely they would alter the calf scours agents in the herd. However, foster calves are associated with an increased risk of scours (Grotelueschen et al, 1996).

The calf scours epidemic was clearly in swing by the 45th day of the calving season (4/19/2000) and the first cases of the epidemic were observed between the 31st and 40th days (4/5/2000 – 4/14/2000). Prior to 4/5/2000, no scours cases had been observed, despite 39 calves being born. Following 4/5/2000, apart from the birth of more calves, was the introduction of at least 2 foster calves.

Introduction of foster calves into the herd, and contact with other calves could have occurred as early as April 4 (day 30), and did occur by April 7 (day 33 of calving season). Assuming an incubation of 4 – 6 days, one would expect an increase in calf scours cases to commence in the period April 8 – 13 (day 34 – 39 of calving season). This coincides well with the observed increase in calf scours cases in Graph 1. Therefore, it is reasonable to suggest that introduction of foster calves was associated with the initiation of the calf scours epidemic in this herd. Four cases of scours were recorded between April 5 and April 7. It is not known if these were associated with the foster calves or were just sporadic cases. If associated with the introduction of foster calves, these cases had a short incubation time (1 – 3 days). Between April 8 and April 15, no scours cases were observed, then the number increased quickly. It is likely the scours cases on April 5 through 7 were sporadic cases, not associated with the outbreak. However, this is speculative.

The high scours incidence suggests that a “new” agent (or agents) was introduced into this herd. However, the diagnostic investigation performed was unable to support this speculation. The age at onset (7 days) and the response to systemic antibiotics suggests a bacterial agent in this outbreak. Among the likely possible agents is a non-enterotoxigenic *Escherichia coli* (non-ETEC). Diagnosis of non-ETEC often requires intestinal tissue from a recently dead calf. A reliable diagnosis of non-ETEC cannot be made from fecal samples alone. Unfortunately, diagnosis was attempted using only fecal samples in this case. Results of the 2 submitted fecal samples did tend to rule out the presence of other common calf scours agents.

The calf age at first treatment (Table 2) shows a pattern often observed in calf scours outbreaks, moving from older to younger calves as the calving season progresses. The age range observed in this outbreak is very large, and supports speculation that the causative calf scours agent(s) was introduced partway through (i.e. week 5) the heifer calving season and very near the start of the cow calving season. If an agent were introduced in week 5, one would expect some of the calves present to be affected with scours. The proportion affected would be partially dependent on age – the older the calf, the lower the expected risk (expected proportion), and the older those calves would be at first treatment. This is seen very clearly in the heifer data in Table 2. As the epidemic progresses, calves typically become exposed to the agent(s) at progressively earlier times, eventually being exposed within days after birth. These animals all go through a somewhat standard incubation period, and develop clinical scours at a progressively earlier age, due to the fact they were exposed earlier. As age at exposure decreases, one expects a greater proportion of affected calves, and more severe disease.

Summary

Results of this retrospective, records-based investigation suggest that introduction of foster calves was associated with the calf scours outbreak. The outbreak commenced shortly after the introduction of foster calves. Foster calves can introduce pathogens to a herd, and can shed calf scours pathogens in their feces even when feces appear normal. Because of this risk, the introduction of foster calves is not usually recommended. If introduced into a herd, foster calves (with their foster dam) should be isolated from the remainder of the herd until all calves are at least 4 weeks old. At that time, it is generally regarded as safe to commingle foster calf pairs with the remainder of the herd.

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Tables

Table 1. Demographic data

	Heifers		Cows	
Total calves born	63		160	
Total affected with scours	37	(44.4%)	126	(78.8%) *
Mean birthweight (SEM)	75	(1.2)	83	(.9)

*Proportions differ (P < 0.002).

Table 2. Scours risk by week of birth

	Heifers			Cows			Calf age at first treatment (days)	
Birthweek (dates)	Born	Scours	Affected proportion	Born	Scours	Affected proportion	Heifers	Cows
1 (3/5 – 3/11)	3	1	.33	-	-	-	59	-
2 (3/12 – 3/18)	10	2	.20	-	-	-	31.5	-
3 (3/19 – 3/25)	12	6	.50	2	0	0	27.3	-
4 (3/26 – 4/1)	8	5	.63	-	-	-	19.4	-
5 (4/2 – 4/8)	10	6	.60	2	1	.50	13.2	32
6 (4/9 – 4/15)	1	1	1.0	10	5	.50	6.0	9
7 (4/16 – 4/22)	8	8	1.0	34	27	.79	4.6	8.3
8 (4/23 – 4/29)	5	5	1.0	46	39	.85	6.8	8.1
9 (4/30 – 5/6)	3	2	.67	39	36	.92	7.0	8.6
10 (5/7 – 5/13)	-	-	-	11	9	.82	-	6.6
11 (5/14 – 5/20)	1	1	1.0	9	7	.78	6.0	4.9
12 (5/21 – 5/27)	-	-	-	11	9	.82	-	6.6
13 (5/28 – 6/2)	2	0	0	2	0	0	-	-
Totals (mean)	63	37	(.44)	160	126	(.79)	(15.1)	(8.2)

Figures

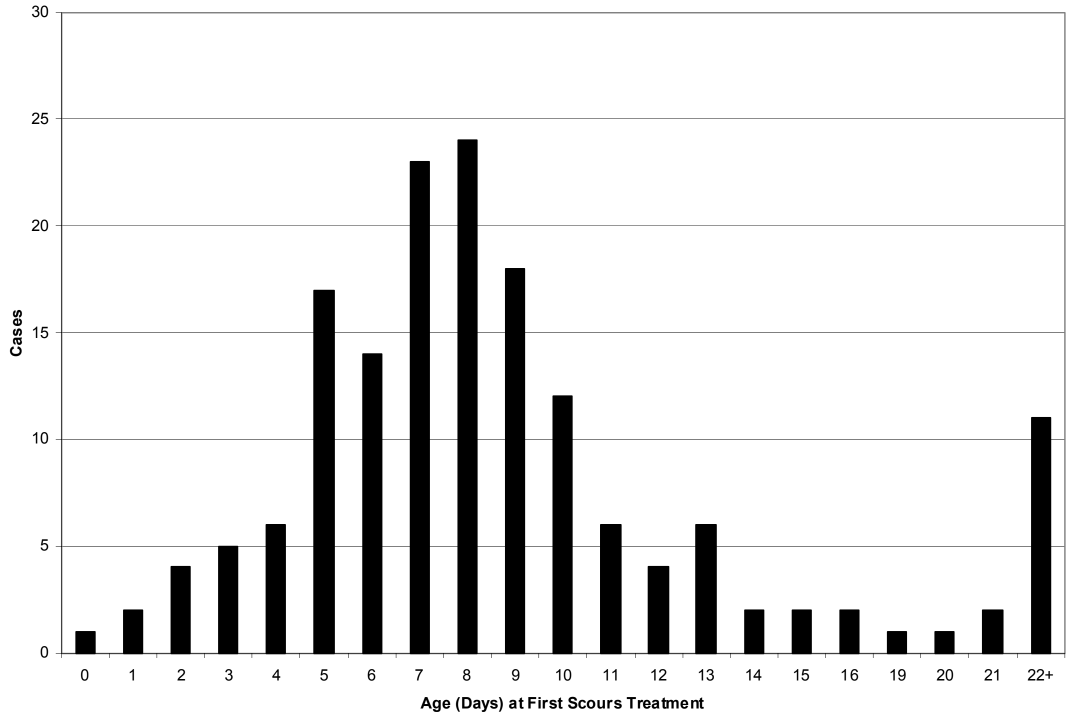

Figure 1. Age at first scours treatment

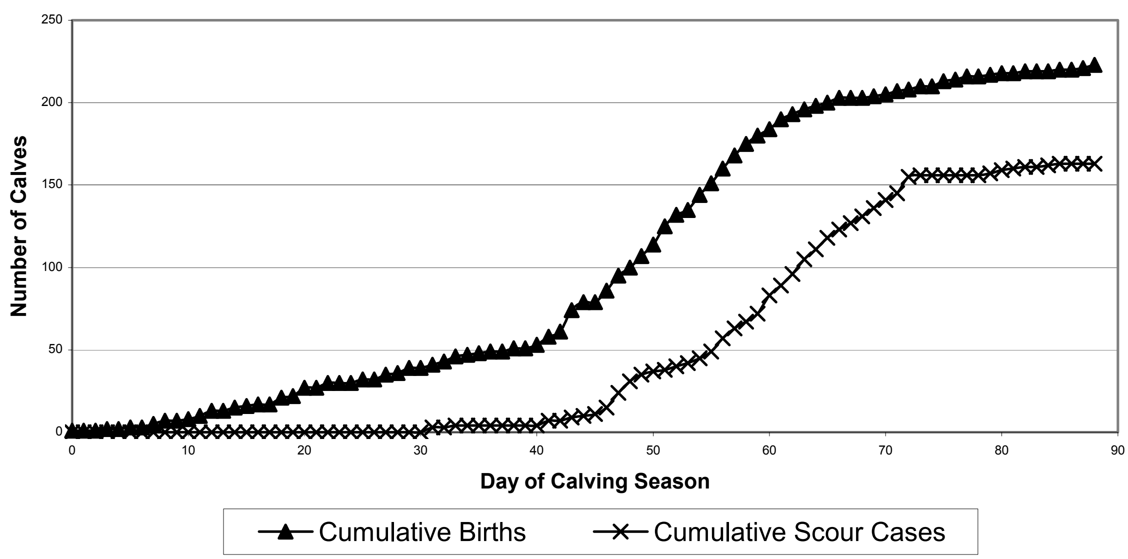

Figure 2. Cumulative calf scour cases by day into calving season