

Diarrhea in calves has relationship to starter intake, daily gain

DIARRHEA (scours) in calves is endemic and is a major health issue, with the National Animal Health Monitoring System (2014) finding that 21% of preweaned heifer calves had this issue, and 56% of heifer mortality is due to diarrhea.

The etiology of this health issue is many-fold. I delineate that there are three critical periods for calves: (1) around calving, which includes the cow, environment and colostrum management; (2) the first two weeks of life, when most diarrhea occurs and deaths result, and (3) the weaning transition period, which is the two weeks before and two weeks after full weaning.

The first two critical periods are closely related because a contaminated cow, environment and colostrum will often be the cause of diarrhea within the following two weeks. While diarrhea is commonly scored in many published studies, much variation often makes it difficult to establish a significant quantitative relationship with performance.

Several years ago, a fellow dairy scientist asked if I knew of any data covering the impact of diarrhea on starter intake and daily gain. I did not, but then I got involved in a master's degree project with a graduate student in China on a large dairy farm in the Beijing, China, area.

We found that calves scored with diarrhea by the farm veterinarian ate an average of 5.5 lb. less starter over the 70-day study (Chao et al., 2017). However, the incidence of diarrhea was low, which made it more difficult to develop a relationship between diarrhea and intake and daily gain.

Thus, it was timely and fortuitous when a group at the University of Illinois published a study utilizing data from four experiments done with calves transported (294 miles over five hours) and purchased from a dealer who had collected calves from multiple farms and had commingled the calves before transport to the research facility. Calves in the other three experiments originated from a single local farm (transported only 24 miles over 30 minutes), and research personnel selected them for inclusion in each experiment (Morrison et al., 2019).

This summary encompassed a total

Bottom Line

with
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of 313 Holstein calves, with 253 of them male and 60 female. Data available and used were: milk replacer intake, free water intake, electrolyte solution provided, starter intake, weekly bodyweight and weekly frame measurements. All calves were housed in individual, south-facing calf hutches. Only calves with total serum protein concentrations greater than 5.5 g/dL were included in the study.

Fecal scores were: one = normal and well formed, two = soft but still holds form, three = loose without form and four = the consistency of water. Calves with scores greater than two were considered as having diarrhea, but pathogens associated with diarrhea were not determined. Further details and statistical analyses can be found in the published article. Only data from the first 21 days were used, since that is the time period when most diarrhea occurs.

Overall, healthy calves had lower ($P < 0.01$) fecal scores, fewer days of refused milk replacer and fewer days administered electrolytes (Table 1). There was a difference among experiments, as the proportion of calves classified as diarrheic (ranging from 11.1% to 27.3%) was much lower than in the first experiment (1) that used calves transported the greatest distance and from a sale barn.

In general, there was a lower incidence of diarrheic calves on the initial day after arrival in experiments 2, 3 and 4, but over the course of the 21 days studied, the incidence increased from day 10 to day 15.

In this study, the average ambient environmental temperature in the first 21 days after arrival was higher ($P < 0.01$) for diarrheic calves than for healthy calves: 63°F versus 56°F \pm 0.3°F (Table 2). However, serum total protein was not a good predictor for the development of diarrhea in calves after arrival in this study. Free water intake was numerically, but not statistically, significantly different for diarrheic versus healthy calves. Significant difference was precluded by the high variation in water intake.

However, it follows that as calves begin to become dehydrated due to diarrhea, they would begin to drink more water. On the other hand, in the past, as diarrhea ensued and calves were observed to drink more water, this led many studies to conclude that drinking more water causes calves to be diarrheic, when, in fact, the opposite is true. As was found when looking closely at the data (Kertz et al., 1984), drinking more water followed diarrhea — not the other way around.

While water intake is directly related to dry matter intake (DMI), in this short, 21-day period, with much variation in water and starter intake, the ratio of water to starter DMI was much greater than the 4:1 ratio found in other calf, heifer and lactating cow studies (*Feedstuffs*, March

1. Parameters of healthy and diarrheic calves

	Healthy	Diarrheic	Std. error	P-value
Fecal score ≥ 2 , days	1.88	6.84	1.19	< 0.01
Milk replacer refused, days	1.20	2.59	1.64	< 0.01
Electrolytes, days	0.22	2.05	1.34	< 0.01

2. Parameters of healthy and diarrheic calves for first 21 days

	Healthy	Diarrheic	Std. error	P-value
Initial total serum protein, g/dL	5.9	6.0	0.3	0.20
Avg. ambient temperature, °F	56	63	1.1	< 0.01
Free water intake, liters	43.9	47.9	6.5	0.26
Electrolyte intake, liters	0.5	4.2	0.4	< 0.01
Milk replacer water intake, liters	108.1	104.0	3.4	0.03
Total water intake, liters	151.1	154.0	10.9	0.50
Starter DMI, lb.	3.30	1.98	1.10	< 0.01
Milk replacer DMI, lb.	36.6	35.0	1.32	0.02
Total DMI, lb.	39.4	37.0	2.42	< 0.01
Initial bodyweight, lb.	92.5	91.6	1.10	0.49
Final bodyweight, lb.	123.3	115.8	4.40	< 0.01
Avg. daily gain, lb./day	1.47	1.08	0.26	< 0.01

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10, 2014).

As would be expected, eight times more liters of electrolytes were administered to diarrheic calves than to healthy calves. Milk replacer and starter intakes were less for diarrheic calves, since when calves do not feel well, they do not eat as well. Not surprisingly, this resulted in 27% lower daily gain for diarrheic versus healthy calves. Diarrheic calves also had lower feed efficiency and lower measures of gains in wither and hip height, heart girth, body length and hip width.

The Bottom Line

Diarrheic calves will exhibit a multitude of reduced performance and growth pa-

rameters. These include reduced milk replacer and starter intakes, more free water intake and reduced feed efficiency, daily gain and body growth measurements. Given all of this, it lends credence to the value of instituting practices and protocols to reduce or eliminate the occurrence of diarrhea in calves.

References

Chao, D., Y.G. Zhen, L. Ma, A.F. Kertz and D.P. Bu. 2017. Effects of different physical starter forms on health, growth, rumen parameters and selected blood metabolites in dairy calves. *J. Dairy Sci.* 100(Suppl. 1):112 (abstr. T222).

Kertz, A.F., L.F. Reutzel and J.H. Mahoney.

1984. *Ad libitum* water intake by neonatal calves and its relationship to calf starter intake, weight gain, feces score and season. *J. Dairy Sci.* 67:2964-2969.

Morrison, S.Y., P.A. LaPierre, K.N. Brost and J.K. Drackley. 2019. Intake and growth in transporting imported Holstein calves classified as diarrheic or healthy within the first 21 days after arrival in a retrospective observational study. *J. Dairy Sci.* 102:10997-11008.

National Animal Health Monitoring System. 2014. Dairy 2014: Health & Management Practices on U.S. Dairy Operations, 2014. Pub. No. 696.0218. U.S. Department of Agriculture. Animal & Plant Health Inspection Service, Veterinary Services, Centers for Epidemiology & Animal Health, Ft. Collins, Colo. ■