

Effect of Deccox[®] on Growth Performance of Dairy and Beef Cattle When Compared to Non-Medicated Cattle in the Absence of Clinical Coccidiosis

Introduction

Deccox (decoquinate) is typically utilized in conditions where cattle are at high risk for developing clinical coccidiosis. Improvements in growth performance are noted when clinical coccidiosis is prevented or controlled, and under clinical coccidiosis conditions these improvements are a direct result of disease prevention and control.

Challenge studies are the true test of an anticoccidial's ability to maintain performance when exposed to disease, and Deccox has been shown to effectively prevent coccidiosis in those situations.¹ The ability of Deccox to prevent coccidiosis under conditions of natural exposure has also been proven.²

Subclinical bovine respiratory disease can have a negative impact on performance^{3,4} and carcass quality⁴ of beef cattle. There are few data, however, to quantify the effect of subclinical coccidiosis on performance. Subclinical coccidiosis occurs when cattle shed coccidia but clinical signs of coccidiosis (i.e. bloody diarrhea) are not detected.⁵ Deccox lends itself to such an evaluation because research has demonstrated that decoquinate does not affect ruminal microflora or nutrient digestibility.⁶ Therefore, when control cattle did not exhibit signs of clinical coccidiosis but cattle receiving Deccox had increased growth performance, control of subclinical coccidiosis may be assumed to be the mode of action.

The objective of this Technical Bulletin is to evaluate the impact of Deccox on animal performance when clinical coccidiosis is not observed in nonmedicated or Deccox-fed cattle.

Procedure

A mixed model analysis was used to combine the data from several different types of studies in a meta-analysis approach.⁷ Meta-analysis is a process for obtaining results from many different sources and then combining those results into a "meta" for an overall comparison. The process is used to determine the "effect size" from each study and then combine those effect sizes into a mean by weighting the inverse of the sample sizes from each study. The process uses the effect-by-source interaction as the measure of error, which is used to compute the standard error of the resulting weighted mean. Using this error term enables one to make a broad inference across the range of studies included in the meta-analysis.

The purpose of the analysis was to obtain an idea of the effect of Deccox on average daily gain (ADG), feed-to-gain (FG), and dry matter intake (DMI) when nonmedicated control and Deccox cattle did not experience clinical coccidiosis. The mixed model analysis was conducted with a different variance based on publication type or equal variance across publication types. Publication types included internal company bulletins, reports in popular press, peer-reviewed articles, and university bulletins. Akaike's Information Criteria (AIC) was used to select the variance model, and the model with the smallest AIC was chosen for the analysis. Variance models identified using AIC for each variable were: ADG, unequal variance; FG, equal variance; and DMI, equal variance (Deccox compared to controls with no evidence of clinical coccidiosis).

The meta-analysis approach weights each item of data based on sample sizes. $Weight = n_c \times n_d / (n_c + n_d)$, where

TABLE 1. Description of data included in ADG, intake, and feed efficiency analyses.

Parameter	No. of studies	Study type ^a	Trial type ^b	Head Deccox	Head Control	Average weight (lb)
<i>ADG</i>						
Beef Long	7	5(F) 2(P)	3(X) 4(D)	2808	1868	618
Dairy Long	12	2(MR) 10(S)	12(D)	279	275	95
Beef Short	25	18(F) 7(P)	7(X) 18(D)	2684	2628	497
Dairy Short	7	2(MR) 5(S)	5 (X) 2(D)	151	151	148
<i>DMI</i>						
Beef Long	2	2(F)	2(X)	88	88	675
Dairy Long	3	3(S)	1(X) 2(D)	90	89	102
Beef Short	15	15(F)	5(X) 10(D)	1555	1521	517
Dairy Short	3	1(MR) 2(S)	2(X) 1(D)	85	85	256
<i>F/G</i>						
Beef Long	4	4(F)	2(X) 2(D)	2547	1614	664
Dairy Long	3	3(S)	1 (X) 2 (D)	90	89	102
Beef Short	15	15(F)	5(X) 10(D)	1555	1521	488
Dairy Short	2	2(S)	1(X) 1(D)	70	70	256

^a F = feedlot study; P = pasture study; MR = milk replacer study; S = calf starter and starter/grower studies

^b X = experimental study; D = demonstrational study

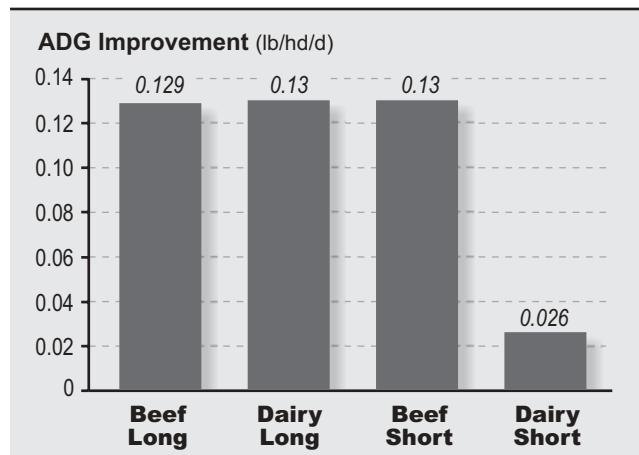
n_d and n_c are the number of animals in the Deccox and control groups, respectively. Differences between Deccox and control observations were evaluated in the analyses. Mean values are Deccox minus control. Therefore, a positive value for ADG and DMI represents a Deccox advantage, whereas a negative value for FG represents a Deccox advantage.

If the number of animals assigned to controls was missing, weighting could not be computed; therefore, data from the study could not be included in the analysis. Some of the studies were quite large, raising concern about the impact of a single study with a large number of cattle on results. However, when an analysis was conducted restricting the maximum allowable weight to 100, results were not significantly altered. Based on this analysis, results using actual weightings are presented.

Results

The number of beef and dairy studies included in analysis of ADG, FG, and DMI, segregated by study length, are displayed in Table 1. Beef and dairy studies were maintained as independent groups because of the obvious differences in initial animal weight and management systems employed in the studies. Beef and dairy “long” studies were defined as those greater than 96 days in duration. Beef and dairy “short” studies were defined as those with duration of 96 days or less. The 96-day period was selected because it was the most natural “break” in the groupings of the trials. Beef studies represented a combination of feedlot and pasture studies; dairy studies were a combination of milk replacer and calf starter studies. Deccox was generally provided during the early portion of the study with a common treatment employed for the remaining portion of the study. However, a few studies (particularly in the short category) compared Deccox to nonmedicated control for the entire study. Studies were further

FIGURE 1: Effect of Deccox on ADG of cattle naturally exposed to coccidia with no evidence of clinical coccidiosis.^a



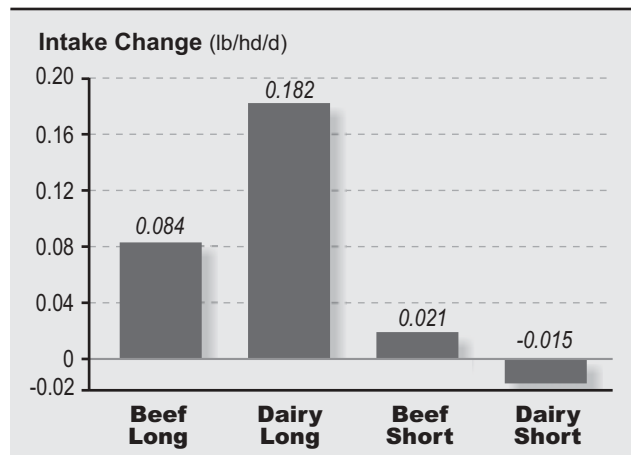
^a Beef long, $P < 0.0001$; Dairy long, $P = 0.05$;
Beef short, $P < 0.0001$; Dairy short, $P = 0.83$.

defined as experimental or demonstrational based on details provided in written reports. If a report did not provide information about randomization of cattle to pens, and pens to treatment, the study was deemed demonstrational. However, if details about randomization were provided in the written report, the study was considered experimental. Performance information presented in this Technical Bulletin is the result of pooled analysis of demonstrational and experimental studies.

Data availability for all categories were greatest with ADG and least with DMI. The number of studies has an obvious effect within the analysis on the ability to identify significant differences and one's confidence in numerical observations. Beef studies tend to be more heavily represented in the data pool and are consequently more likely to demonstrate significant effects of Deccox on animal performance.

Deccox improved ADG in beef long ($P < 0.0001$), dairy long ($P = 0.05$), and beef short ($P < 0.0001$) studies but not dairy short studies (Figure 1). Results among study types with significant improvements in ADG were very consistent (0.13 lb/hd/d). Deccox has no demonstrated growth promoting effects in the absence of coccidial challenges. Therefore, results suggest that coccidial challenges inadequate to cause clinical disease negatively

FIGURE 2: Effect of Deccox on intake of cattle naturally exposed to coccidia with no evidence of clinical coccidiosis.^a



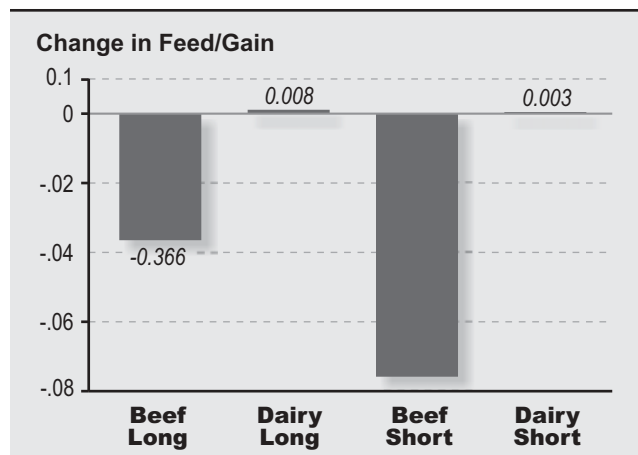
^a Beef long, $P = 0.90$; Dairy long, $P = 0.79$;
Beef short, $P = 0.90$; Dairy short, $P = 0.98$.

impact cattle ADG. Using clinical evidence of coccidiosis (i.e., bloody diarrhea and oocyst shedding) appears to substantially underestimate the occurrence and impact of coccidiosis on cattle performance.

Deccox had no effect ($P > 0.78$) on DMI for beef long, dairy long, beef short, or dairy short categories (Figure 2). Effects of Deccox on DMI have typically been noted when clinical coccidiosis occurs in non-medicated control treatments. Because the comparison within the current data review was with cattle that did not display signs of clinical coccidiosis, differences in DMI were not anticipated.

Feed efficiency was improved by feeding Deccox in beef long ($P = 0.03$) and short ($P = 0.0002$) studies, but not in dairy studies (Figure 3). Lack of significance for dairy long and dairy short studies is largely a reflection of the small number of studies incorporated into the analysis. Beef study observations suggest that subclinical coccidiosis negatively affects feed efficiency. Coccidial challenges below a clinical threshold may affect performance by increasing energy and nutrient needs for body weight maintenance and disease resistance.

FIGURE 3: Effect of Deccox on feed efficiency of cattle naturally exposed to coccidia no evidence of clinical coccidiosis.^a



^a Beef long, $P = 0.03$; Dairy long, $P = 0.99$
 Beef short, $P = 0.0002$; Dairy short, $P = 0.99$

Summary

The data analyses summarized in this bulletin indicate that growth performance benefits (improved ADG and/or FG) occur when Deccox is fed to dairy and beef cattle, even when clinical signs of coccidiosis are not detected in nonmedicated cattle. Growth improvements caused by Deccox in the absence of clinical coccidiosis are presumed to result from the control of subclinical coccidian infection. The negative impacts of subclinical coccidiosis on growth performance may be extensive and long term. These findings support previous theories that as much as 95% of the economic loss from coccidiosis may be due to the subclinical aspect of the disease. Subclinical coccidiosis may increase nutrient loss or gut turn-over rate due to intestinal damage caused by coccidia or increased nutrient needs to fight coccidial infection.

Most cattle are exposed to coccidian oocysts while young and remain carriers of the parasite. In addition to its value in understanding the benefits of clinical coccidiosis prevention, these data analyses suggest that the use of Deccox may offer economic advantages when the risk of clinical coccidiosis is low.

Literature Cited

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