

Eighty-Four-Study Summary of the Effects of Bovatec[®] on Weight Gain of Cattle Grazing Pasture

Abstract

A summary of published data was used to evaluate the effect of Bovatec (lasalocid) on growth rate of cattle grazing pasture. A database with 84 observations was developed from 58 studies evaluating Bovatec vs non-medicated control. To be included in the summary, a study needed to contain a comparison between a non-medicated control supplement and the same supplement medicated with Bovatec. Replication of treatments and randomization of cattle to pastures and pastures to treatments were also requirements for inclusion in the database. Studies included in the summary were conducted between 1980 and 2000. The database includes 61 observations where Bovatec was supplemented at 150 mg/hd/d or above and 23 where Bovatec was supplemented at less than 150 mg/hd/d. A mean improvement in ADG of 0.14 lb/hd/d or 9.82% for cattle fed Bovatec-containing supplements compared with cattle fed non-medicated supplements was noted. Including Bovatec at levels above 150 mg/hd/d resulted in a 0.15 lb/hd/d or 10.7% improvement in ADG, whereas, supplying less than 150 mg of Bovatec per day only resulted in a 0.11 lb/hd/d or 7.5% improvement. In addition to growth response, criteria such as palatability and safety continue to make Bovatec the ionophore of choice for use in pasture supplementation programs.

Introduction

Formulation of diets for cattle requires balancing the levels of dietary nitrogen, energy, minerals, and vitamins to achieve optimal conditions for ruminal fermentation and to meet the animal's nutrient requirements for productive purposes. With grazing cattle, assessing nutrient intake is complicated by seasonal changes in forage quality. Productivity and profitability can be impaired by inadequate nutritive intake from forage alone. Supplemental feeding of cattle maintained on rangeland or pasture has commonly been used to correct nutrient deficiencies

occurring in forage, and sustain profitable levels of production. Ionophores, such as Bovatec, that are incorporated into supplements, alter ruminal fermentation and promote more efficient utilization of forages to subsequently improve growth rate and productivity from pasture. Research has also indicated that Bovatec has other beneficial effects, such as promoting health of grazing cattle by reducing incidence and severity of coccidiosis and other health-related problems. Growth response is only one consideration used for medicated feed additive selection for pasture cattle. Differences between palatability within a supplement and safety for cattle and other non-target species should also be included in selecting a medicated feed additive.

The objective of this Technical Bulletin was to compare the growth response of pasture cattle that were provided Bovatec-containing supplements to that of cattle fed non-medicated supplements.

Summary of the Experiments

Data used in this analysis were obtained from published research studies reported between 1980 and 2000 (individual data not shown) and developed into a database to compare Bovatec with non-medicated control. The Bovatec database was developed from 58 studies that incorporated 84 comparisons between control and Bovatec. Within the database, average Bovatec consumption was 179 mg/hd/day with a range of 100 to 325 mg/hd/day (Table 1). The database was divided into studies where Bovatec was fed at or above 150 mg/hd/d and those where Bovatec was fed at less than 150 mg/hd/d. Bovatec was provided in medicated supplements which were either hand-fed (76.5% of observations) or self-fed (23.5% of observations). Control cattle were fed the same type and level of supplement without Bovatec. Hand-fed

TABLE 1. Bovatec database-summary of experimental parameters.

Total number of studies	59
Total number of observations	84
Avg. Bovatec dose, mg/hd/d (\pm std dev)	179 (\pm 57.8)
Range in Bovatec dose, mg/hd/d	100 to 325
Avg. initial weight, lb (\pm std dev)	570.8 (\pm 89.8)
Avg. duration of studies, days (\pm std dev)	105 (\pm 21.8)
Observations with Bovatec > 150 mg/hd/d	61
Avg. Bovatec dose, mg/hd/d (\pm std dev)	208 (\pm 39.0)
Range in Bovatec dose, mg/hd/d	148 to 325
Avg. initial weight, lb (\pm std dev)	576.3 (\pm 90.0)
Avg. duration of studies, days (\pm std dev)	106 (\pm 24.5)
Observations with Bovatec < 150 mg/hd/d	23
Avg. Bovatec dose, mg/hd/d (\pm std dev)	102 (\pm 6.7)
Range in Bovatec dose, mg/hd/d	100 to 122
Avg. initial weight, lb (\pm std dev)	556.6 (\pm 90.0)
Avg. duration of studies, days (\pm std dev)	102 (\pm 13.0)
Hand-fed supplement studies, # (% of total)	62 (76.5%)
Self-fed supplement studies, # (% of total)	19 (23.5%)
Cool-season observations, # (% of total)	19 (24.7%)
Warm-season observations, # (% of total)	16 (20.8%)
Mixed-season observations, # (% of total)	25 (32.5%)
Winter-annual observations, # (% of total)	17 (22.1%)

supplements were typically grain or protein-based, while self-fed supplements were generally mineral only.

Forage types across all studies consisted of a variety of cool season (24.7% of observations), warm season (20.8% of observations), mixed season (32.5% of observations), and winter annual (22.1% of observations) species. Mixed season pastures generally consisted of either a combination of warm and cool season species or cool season species mixed with clovers or alfalfa. Winter annual pastures were predominantly wheat pasture but also included oat and rye pastures. Cattle across all studies were either stockers (steers or heifers) or replacement heifers.

To evaluate treatment means within the database, an F-test for equal variance was conducted. Within the database, across study means, the assumption of equal variance was demonstrated ($P \leq 0.01$) for control and Bovatec treatments, so that rate of weight gain (ADG) for control and Bovatec-fed cattle were compared within the database using a two-sample t-test. Confidence intervals (95%) were computed for the difference in ADG between control and Bovatec cattle. Confidence intervals were used to identify a range of expected results for each variable evaluated where one would expect results within confidence intervals caused by Bovatec treatment in 95% of observations. Conversely, results within the confidence interval are expected to occur due to random chance in 5% of observations. Means used in all statistical analyses were based on individual studies within the database with each study given equal weight.

Results and Discussion

Eighty-three observations were used for all variables except percentage improvement in ADG where 84 observations meeting data set requirements were available (Table 2). Percentage improvements and absolute differences in ADG were calculated from individual studies; consequently, subtracting control performance from Bovatec performance values or calculating percentage improvements in ADG from summary data provided may result in slightly different values. In the database, there was a consistent, positive difference in ADG between Bovatec-treated and control groups expressed on a percentage improvement and absolute basis. This observation confirms previous research that the use of Bovatec in pasture supplements contributes to an enhancement of growth rate in pasture cattle.¹

Mean percentage improvement in ADG was 9.82% for Bovatec surrounded by a 95% confidence interval of 7.88% to 11.75% (Table 2). The interval is interpreted to mean that one would expect to observe results in this range in 95% of observations due to Bovatec supplementation. The absolute mean improvement in growth rate noted from Bovatec inclusion in supplements was 0.14 lb/hd/d. The mean response was identical to that reported in the 15-study pasture summary originally published in 1984 to establish the Bovatec dose range appropriate for grazing cattle (Technical Bulletin CD 0352¹). The 95% confidence interval surrounding the mean absolute improvement was 0.11 to 0.16 lb/hd/d.

TABLE 2. Summary of data for Bovatec database.

Parameter	Bovatec Database		Difference ^a	% Change
	Control	Bovatec		
Number of observations	83	83	83	84
Mean ADG, lb/day	1.53	1.66	0.14	9.82
Standard error	0.06	0.07	0.01	0.66
Upper confidence level ^b	1.64	1.78	0.16	11.75
Lower confidence level ^b	1.41	1.54	0.11	7.88

^a Values are the mean of Bovatec - Control obtained from each study. Consequently, differences calculated from Bovatec and control values in this table may not match means shown in the Difference column.

^b 95% confidence level

Because the approved range of Bovatec for cattle on pasture is 60 to 300 mg/hd/d the data set was subdivided into studies where Bovatec was fed at less than 150 mg/hd/d versus studies where Bovatec was fed at more than 150 mg/hd/d. The natural break in the doses fed occurred at 148 mg/hd/d. The mean dose for studies where Bovatec was fed at or above 150 mg/hd/d was 208 mg/hd/d, while the mean dose when Bovatec was fed at less than 150

mg/hd/d was 102 mg/hd/d (Table 1). For simplicity these groups will be referred to as 200 and 100 mg Bovatec, respectively. Performance of cattle fed 200 mg of Bovatec was improved by 11.7% over non-medicated cattle, 2 percentage units greater than noted in the overall data set. The absolute improvement in ADG was 0.15 lb/hd/d, similar to the overall database mean noted above. However, performance of cattle fed 100 mg of Bovatec was

TABLE 3. Summary of data for cattle fed Bovatec at greater than or less than 150 mg/hd/d.

Parameter	Bovatec Database		Difference ^a	% Change
	Control	Bovatec		
<i>Bovatec ≥ 150 mg/hd/d</i>				
Number of observations	60	60	60	61
Mean ADG, lb/hd/day	1.56	1.71	0.15	10.70
Standard error	0.07	0.07	0.015	1.23
Upper confidence level ^b	1.70	1.85	0.18	13.11
Lower confidence level ^b	1.43	1.57	0.12	8.28
<i>Bovatec < 150 mg/hd/d</i>				
Number of observations	23	23	23	23
Mean ADG, lb/hd/day	1.42	1.53	0.11	7.49
Standard error	0.10	0.10	0.02	1.44
Upper confidence level ^b	1.61	1.74	0.15	10.32
Lower confidence level ^b	1.24	1.33	0.06	4.67

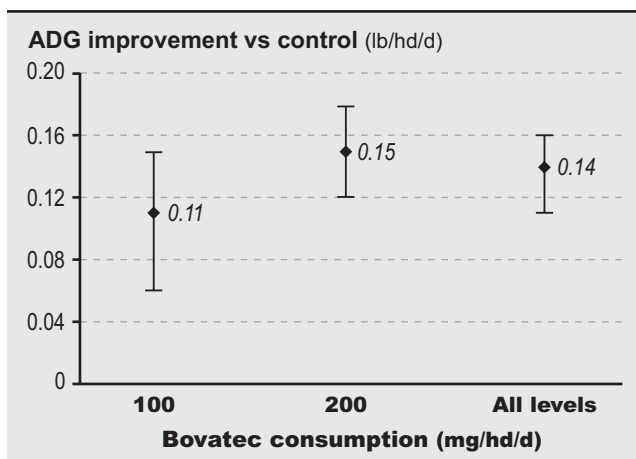
^a Values are the mean of Bovatec - Control obtained from each study. Consequently, differences calculated from Bovatec and control values in this table may not match means shown in the Difference column.

^b 95% confidence level

improved by only 7.5% over non-medicated cattle. The absolute improvement in ADG was 0.11 lb/hd/d (Table 3). Based on initial dose titration information reported in Technical Bulletin CD 0352¹, one would expect ADG responses to decrease as Bovatec levels are decreased.

Not only does Bovatec level affect overall performance, it also influences the variability of ADG response. Variability was greater when 100 mg of Bovatec was supplied than that noted with 200 mg as evidenced by a larger standard error and wider confidence interval (Figure 1). Feeding 200 mg of Bovatec results in enhanced performance and decreases variability in growth rate responses when compared with 100 mg of Bovatec. The greatest and most consistent Bovatec response occurs when 200 mg of Bovatec is supplemented (Figure 1).

FIGURE 1: Average daily gain improvement for Bovatec compared with non-medicated controls (\pm 95% confidence intervals).



Summary

The consistency in both direction and magnitude of the response shown in this Technical Bulletin demonstrates the ability of Bovatec to improve productivity of forage-based beef production under a wide variety of conditions. The results of this analysis indicated a positive effect on growth of cattle resulting from the inclusion of Bovatec into a pasture supplement. The magnitude of the mean increase in performance was 0.14 lb of additional daily weight gain. Performance enhancement was influenced by the amount of Bovatec fed, with higher doses resulting in greater weight gain and less variable improvements in growth rate.

Because of the inherent variation associated with this type of evaluation, the use of a single mean value may not be the best indicator of Bovatec response, because the true mean can never be determined. The use of 95% confidence intervals probably gives a truer estimate of the range of potential responses that might be expected from feeding Bovatec in a pasture supplement. The 95% confidence interval determined in this study indicated that the true mean response from Bovatec would be within the range of 0.11 to 0.16 lb or a 7.8 to 11.8% improvement in ADG when including all doses of Bovatec. However, the true mean response from supplementing 200 mg of Bovatec/hd/d, the recommended Bovatec level, would be within the range of 0.12 to 0.18 lb or an 8.3 to 13.1% improvement in daily weight gain.

Growth response is only one facet to consider when using a feed additive as a component of pasture supplementation programs. Other factors such as palatability in a variety of supplement types and at a variety of concentrations, as well as safety to cattle and other species also must be considered. When all these factors are taken into consideration, Bovatec remains as the ionophore of choice for supplementation programs for cattle grazing pasture and rangeland.

Literature Cited

1. Bovatec for pasture cattle. Alpharma Animal Health. Technical Bulletin CD 0352.