INFLUENCE OF LASALOCID LEVEL ON FORAGE INTAKE, DIGESTIBILITY, RUMINAL FERMENTATION, LIQUID FLOW AND PERFORMANCE OF BEEF CATTLE GRAZING WINTER RANGE

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ABSTRACT

Three experiments were conducted to study the effects of lasalocid level on performance, intake, digestibility, ruminal fermentation and fluid flow of beef cattle grazing dormant, tallgrass prairie. In Exp. 1, 120 pregnant, mature beef cows of primarily Hereford breeding (avg wt = 471 kg) were randomly assigned to received 0, 100, 200 or 300 mg lasalocid·head⁻¹·d⁻¹ in an 1.82 kg supplement. Weight changes at 30, 60 or 90 d, condition score change and calf birth weight were not affected (P>.10) by lasalocid level. In Exp. 2, estimates of intake and digestibility were obtained with 40 pregnant, mature Hereford cows (avg wt = 474 kg) and 12 esophageal-cannulated, Hereford X Angus steers (avg wt = 225 kg), using Yb and indigestible acid detergent fiber as markers for fecal output and digestibility, respectively. Levels of lasalocid provided to cows and steers were similar, on a body weight (BW) basis, to those in Exp. 1 and corresponded to approximately 0, .22, .44 or .66 mg lasalocid/kg BW. Total diet and forage organic matter digestibility for beef cows decreased (P<.01) at the .22 mg/kg BW level, but increased at the .44 and .66 mg/kg BW levels. Organic matter intake was not influenced (P>.10) by lasalocid addition. In Exp. 3, 16 ruminal-cannulated, Hereford X Angus steers (avg wt = 227 kg) were given the same lasalocid dosages per kg BW as in Exp. 2, and were used to study the effects of lasalocid on ruminal fermentation and fluid flow characteristics. Lasalocid did not influence (P>.10) ruminal pH, ammonia N, total volatile fatty acid (VFA) concentrations, molar proportions of individual VFA or fluid flow measurements. In conclusion, providing lasalocid in a range supplement to pregnant beef cows grazing poor-quality winter forage did not significantly alter performance; in addition, lasalocid did not significantly improve forage utilization characteristics in steers grazing similar pasture.

(Key Words: Lasalocid, Ionophores, Beef Cows, Range Pastures, Digestibility.)

Introduction

The polyether ionophore antibiotic, lasalocid, improved weight gain and feed efficiency in feedlot studies (Brethour, 1979; Berger et al., 1981; Funk et al., 1986), but comparatively little information is available concerning lasalocid in high-forage diets, especially diets of grazing, pregnant beef cows. Improvements in performance of growing animals fed high-forage, basal diets (Gutierrez et al., 1982; Spears and Harvey, 1984) suggest an application for beef cows, but reports have been inconsistent (Berger et al., 1981). Studies evaluating efficacy of lasalocid differed in forage quality, sex, physiological status and lasalocid level, thus making generalization difficult. The objectives of this research were to investigate the effect of lasalocid level on weight and condition change of pregnant beef cows grazing poor-quality winter range. In addition, influence of lasalocid level on forage intake, organic matter digestibility, ruminal fermentation and fluid flow characteristics were evaluated.

Experimental Procedures

Exp. 1: Beef Cow Performance. One hundred twenty beef cows of primarily Hereford breeding (avg initial wt = 471 kg) were allotted by weight...
TABLE 1. CHEMICAL COMPOSITION OF SUPPLEMENTS CONTAINING DIFFERENT LEVELS OF LASALOCID

<table>
<thead>
<tr>
<th>Item</th>
<th>Lasalocid level, g/t</th>
<th>% of dry matter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>110</td>
</tr>
<tr>
<td>Organic matter</td>
<td>91.15</td>
<td>92.81</td>
</tr>
<tr>
<td>Acid detergent fiber</td>
<td>9.91</td>
<td>8.96</td>
</tr>
<tr>
<td>Crude protein</td>
<td>20.12</td>
<td>21.17</td>
</tr>
</tbody>
</table>

to treatments of either 0, 100, 200 or 300 mg lasalocid·head⁻¹·d⁻¹ during the last trimester of pregnancy. Dosage levels corresponded to approximately 0, .22, .44 or .66 mg lasalocid/kg body weight (BW). Ten cows from each treatment were randomly assigned to each of three dormant, tallgrass-prairie pastures in a randomized complete block design. Cattle were gathered each morning, separated into treatment groups and bunk-fed the desired lasalocid dosage in 1.82 kg of a commercially prepared range cube. The principal components of the range cubes were cottonseed meal (28%), wheat middlings (45%) and corn (20%). Chemical composition of the cubes is shown in table 1. Supplementation began at trial initiation in mid-December and continued until calving (approximately 97 d average supplementation period across treatments).

Initial cow weight was the average of full weights taken in the early morning on two consecutive days. Subsequent full weights on d 30, 60, 90 and 3 d post-calving (single weights) were recorded at a similar time of day. All cows were scored for condition using a 9-point scale (1 = extremely emaciated, 9 = extremely obese; Whitman, 1975) at the start of the trial and following calving. Initial pregnancy status was determined by rectal palpation at weaning. Six cows were removed from their treatment regimens during the course of the study because of sickness, extremely late calving date or having been found open after a follow-up rectal palpation. None of the cow removals appeared directly related to treatment. Five calves were found dead at or shortly after birth. Calf death appeared to be primarily related to dystocia. Information obtained at necropsy did not suggest any relationship between calf death and treatments.

Total weight and condition change, average daily gain (ADG) and calf birth weight were evaluated by analysis of variance appropriate for randomized complete block designs. The model included terms for block (i.e., pasture) and treatment (i.e., lasalocid level). For tabular presentation, standard errors for unbalanced treatment group size were approximated as described by Milliken and Johnson (1984). Treatment sums of squares were partitioned into linear, quadratic and cubic effects of lasalocid level using orthogonal polynomials.

Exp. 2. Intake and Digestibility. Total diet and forage organic matter (OM) intake and digestibility were estimated in mid-February using 10 cows and three esophageal-cannulated steers per treatment (avg initial wt = 474 and 225 kg for cows and steers, respectively). All cows and steers grazed a single, tallgrass-prairie pasture. Cows represented a complete replicate of Exp. 1 and received the same levels of lasalocid and range cubes, with the exception that Yb was added to the supplement as an external marker to estimate fecal output. Ytterbium was applied before cubing the supplement by dissolving 500 g YbCl₃ in 6 liters of water and spraying it on the supplement as it rotated in a mixer. This procedure provided a Yb dosage of 1.5 g/d for the cows. Esophageal-cannulated steers were also randomly assigned to receive 0, .22, .44 or .66 mg lasalocid/kg BW. Lasalocid was offered in the same carrier used for the cows and the carrier was fed at the same level relative to body weight. Because the esophageal-cannulated steers were approximately half the size of the cows, the absolute quantity of supplement offered was .91 kg/d, which provided .75 g Yb/d. Marked supplements were
individually fed once daily at 0900 for a 14-d period. Rectal grab samples of feces (approximately 200 to 300 g) were collected immediately after the daily supplement was fed during the last 7 d of the period. Zero-hour fecal samples (no Yb) were collected before the 14-d period during which marked supplements were fed. Fecal samples were dried at 50 C in a forced-air oven and ground through a Wiley mill to pass a 1-mm screen. Subsamples of equal weight from each of the seven collections were composited by animal.

Chemical composition of forage selected by grazing cattle was measured by collecting extrusa from 12 esophageal-cannulated steers on four consecutive days; two collections were taken in the morning, immediately after steers were supplemented, and two collections were made shortly before nightfall. Steers were not withheld from pasture or water before sampling. Extrusa was dried at 50 C in a forced-air oven and ground through a Wiley mill to pass a 1-mm screen. An equal weight of dried-ground extrusa from each day was used to form the composited sample for each steer.

Ytterbium concentrations in supplements and fecal samples were determined by neutron activation analysis. One- to 2-g duplicate samples were placed in 3.5-g polyethylene vials, heat-sealed, then irradiated for 7 h at 225 kW. The reactor had a thermal flux at this power of 1.6 \times 10^{12} \text{ neutrons cm}^{-2} \text{s}^{-1}. A standard curve, prepared by adding known amounts of YbCl\text{subscript}3 to 1-g samples of 0-h fecal material, was activated at the same time. Fluence monitors (iron wires) were placed on all samples and standards to correct for variation in neutron flux at the different positions in the rotary specimen rack surrounding the reactor core. Following a 10-d decay period, quantities of the isotope \text{\textsuperscript{174}}Yb (half-life 4.2 d) were measured using a lithium-drifted, germanium gamma ray detector interfaced with a Canberra 8180 multichannel pulse height analyzer (4,096 channels used). The spectrum was collected for 100 s (400 s for Fe wires), sufficient to permit collection of >10,000 counts under each peak.

Peak areas were corrected for neutron flux and decay time using the following equation (Higginbotham, 1983):

\[
P = \frac{P_a \left[ M \left( e^{\lambda t} - e^{\lambda t} \right) \right] [1 - e^{-\lambda t}]}{M \left[ e^{\lambda t} - e^{\lambda t} \right] [1 - e^{-\lambda t}]}.
\]

where \( P \) = corrected peak area, \( P_a \) = peak area (counts), \( M \) = mass, \( \lambda \) = decay constant, \( t_r \) = irradiation time, \( t_s \) = time at which counting began and \( t_e \) = time at which counting ended. The superscript "\( w \)" denoted values for fluence monitors (iron wire). Variables without superscripts denote values for the parent element. For standards, \( P \) was plotted against the known mass of Yb added to the nonlabeled samples. Estimation of mass of Yb in unknown samples was derived by comparison of \( P \) with the standard curve.

Total diet and forage organic matter intake and digestibility were calculated as described by Kartchner (1980). These characteristics and chemical composition of extrusa samples were statistically evaluated by analysis of variance for completely randomized designs. One cow calved during the fecal collection period and therefore, was excluded from the analysis. Because of an unequal number of cows among treatments, approximated standard errors (Milliken and Johnson, 1984) were used for tabular presentation. Treatment sums of squares were partitioned into linear, quadratic and cubic effects of lasalocid level using orthogonal polynomials.

Exp. 3: Ruminal Dilution Rate and Fermentation Characteristics. Sixteen ruminal-cannulated steers (avg wt = 227 kg) were randomly assigned to receive lasalocid dosages of 0, .22, .44 or .66 mg lasalocid/kg BW. The quantity of range cubes used as a carrier for lasalocid was the same as used for steers in Exp. 2. Steers were gathered each morning and individually fed supplements for 14 d before sampling ruminal fluid. To measure ruminal fluid dilution rate and liquid volume, steers were given a pulse-dose of cobalt ethylenediamine tetraacetate (Co:EDTA, prepared according to Uden et al., 1980) immediately before supplementation on d 15. Each dose of 1.8 g Co in 300 ml distilled water was injected using a repeating syringe at various sites in the rumen to aid in mixing. Zero-hour ruminal fluid samples were
collected by suction strainer before dosing with Co:EDTA to provide background matrix for Co analysis and baseline values for pH, ammonia N (NH₃-N) and volatile fatty acids (VFA) concentrations. Following supplementation, steers were released to graze. Subsequent ruminal fluid samples were removed at 2, 4, 6, 8 and 24 h post-dosing. Ruminal pH was determined immediately, using a battery-powered pH meter. Samples for NH₃-N and VFA analysis were frozen (--20 C) following treatment with 1N HCl (4 ml plus 1 ml ruminal fluid) and 25% metaphosphoric acid (1 ml plus 4 ml ruminal fluid), respectively. Ruminal fluid samples were centrifuged before analysis at 39,000 x g for 20 min. Ammonia N concentrations were determined on an autoanalyzer using the hypochlorite method. Ruminal VFA were analyzed on a gas chromatograph fitted with a 2-mm (id) x 2-m column containing 10% SP 1200/1% H₃PO₄ on 80/100 W AW Chromsorb. The column was maintained at 130 C with inlet and detector at 200 C and a carrier gas (N₂) flow of 20 ml/min. Concentrations of Co were determined by atomic absorption spectrophotometry. Calculations of ruminal fluid volume and dilution rate were as described by Warner and Stacy (1968).

Ruminal pH, NH₃-N and VFA data were subjected to multivariate analysis (Milliken and Johnson, 1984). The model included evaluations for treatment, time and the treatment x time interaction. Wilks' Criterion was used to evaluate the treatment x time interaction. Where this interaction was nonsignificant, data were pooled over time and means presented. Ruminal fluid dilution and volume data were evaluated by analysis of variance for completely randomized designs. Treatment sums of squares were partitioned into linear, quadratic and cubic effects of lasalocid level using orthogonal polynomials.

Results and Discussion

Exp. 1. All cows calved by April 20. Level of lasalocid had no effect (P>.10) on total weight change; ADG at 30, 60 and 90 d; or calf birth weight (table 2). Cows gained .29, .27 and .16 kg/d for the 30, 60 and 90-d periods, respectively. Weight change for the total trial (initial wt — post-calving wt) showed that cows lost an average of 55 kg, which appears to represent loss of tissue as well as conceptus loss.

Previous reports regarding the influence of lasalocid on beef cattle performance have been contradictory. Increases in gain and(or) feed efficiency have been reported for grazing steers (Paterson et al., 1983; Spears and Harvey, 1984) for stocker calves fed whole plant grain sorghum silage (Gutierrez et al., 1982), and for steers fed alfalfa cubes ad libitum (Thonney et al., 1981). Similarly, Kiser et al. (1985) found that 200 mg lasalocid/d enhanced weight gain of cows fed sorghum silage, and Martin et al. (1984) reported that lasalocid added to a corn silage diet increased rate and efficiency of gain. In contrast, no performance response was seen when 200 mg lasalocid/d was fed in a grain carrier to fall-calving beef cows (Hopman and Weber, 1986), or when lasalocid was added to protein-supplemented, corn silage diets fed to growing animals (Horton and Brandt, 1981; Berger et al., 1981). Differences in forage quality, sex, physiological status, supplementation practices and dosage of lasalocid are confounding factors that make interpretation of these studies difficult. However, results in this study agree with those of Lemenager et al. (1978b) for beef cows receiving monensin supplements while grazing poor quality winter range.

Lasalocid did not affect (P>.10) condition score change (table 3), which supports results of Hopman and Weber (1986). Cattle declined an average of .83 condition score points between trial initiation and post-calving. Since initial condition scores averaged only 5.5, loss during the study left cattle below the minimum condition score of 5 at calving, described by Dziuk and Bellows (1983) as necessary for a prompt return to estrus.

Exp. 2. Lasalocid level had no effect (P>.10) on diet selection by esophageal-cannulated steers (table 4). Extrusa samples averaged 84% OM, probably reflecting salivary mineral contamination. Crude protein levels averaged 6% of extrusa OM. Percentages of NDF, ADF and IADF averaged 83, 56 and 25% of extrusa OM, respectively. Lasalocid had no effect (P>.10) on total or forage OM intake of either cows or steers. Marker-based estimates of total OM intake (forage plus supplement) for cows (table 5) averaged 9 kg/d or 1.9% of BW, whereas steers consumed an average of 4.9 kg/d or 2.2% of BW (table 6).
TABLE 2. EFFECT OF LASALOCID LEVEL ON WEIGHT CHANGE AND AVERAGE DAILY GAIN OF PREGNANT BEEF COWS AND BIRTH WEIGHT OF CALVES

<table>
<thead>
<tr>
<th>Item</th>
<th>Lasalocid mg/kg body wt</th>
<th>0</th>
<th>.22</th>
<th>.44</th>
<th>.66</th>
<th>SEa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animals, no.</td>
<td></td>
<td>29</td>
<td>27</td>
<td>29</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Initial wt, kg</td>
<td></td>
<td>472</td>
<td>468</td>
<td>470</td>
<td>476</td>
<td>10.0</td>
</tr>
<tr>
<td>30-d gain, kgb</td>
<td></td>
<td>8.8</td>
<td>10.7</td>
<td>7.3</td>
<td>5.1</td>
<td>2.4</td>
</tr>
<tr>
<td>30-d ADG, kg/dc</td>
<td></td>
<td>.29</td>
<td>.35</td>
<td>.24</td>
<td>16</td>
<td>.08</td>
</tr>
<tr>
<td>Animals, no.</td>
<td></td>
<td>28</td>
<td>27</td>
<td>29</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>60-d gain, kgb</td>
<td></td>
<td>14.7</td>
<td>17.4</td>
<td>14.3</td>
<td>13.4</td>
<td>2.9</td>
</tr>
<tr>
<td>60-d ADG, kg/dc</td>
<td></td>
<td>.25</td>
<td>.30</td>
<td>.25</td>
<td>.23</td>
<td>.05</td>
</tr>
<tr>
<td>Animals, no.</td>
<td></td>
<td>17</td>
<td>16</td>
<td>20</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>90-d gain, kgb</td>
<td></td>
<td>8.2</td>
<td>19.8</td>
<td>15.3</td>
<td>11.1</td>
<td>4.9</td>
</tr>
<tr>
<td>90-d ADG, kg/dc</td>
<td></td>
<td>.09</td>
<td>.22</td>
<td>.16</td>
<td>.12</td>
<td>.05</td>
</tr>
<tr>
<td>Animals, no.</td>
<td></td>
<td>29</td>
<td>27</td>
<td>29</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Final wt, kg</td>
<td></td>
<td>412</td>
<td>418</td>
<td>414</td>
<td>419</td>
<td></td>
</tr>
<tr>
<td>Total wt change, kg</td>
<td></td>
<td>-53.4</td>
<td>-50.2</td>
<td>-56.2</td>
<td>-59.9</td>
<td>5.2</td>
</tr>
<tr>
<td>Calf birth wt, kg</td>
<td></td>
<td>36.0</td>
<td>36.9</td>
<td>36.2</td>
<td>35.4</td>
<td>1.1</td>
</tr>
</tbody>
</table>

aApproximated standard error of means.

bIntermediate weight – initial weight. Cows that had already calved were excluded from analysis.

c(Intermediate weight – initial weight) / days on trial. Cows that had already calved were excluded from analysis.

dPost-calving weight – initial weight.

TABLE 3. EFFECT OF LASALOCID LEVEL ON CHANGE IN PALPATED CONDITION SCORE OF BEEF COWS

<table>
<thead>
<tr>
<th>Item</th>
<th>Lasalocid, mg/kg body wt</th>
<th>0</th>
<th>.22</th>
<th>.44</th>
<th>.66</th>
<th>SEa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animals, no.</td>
<td></td>
<td>29</td>
<td>26</td>
<td>27</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Initial condition scoreb</td>
<td></td>
<td>5.7</td>
<td>5.5</td>
<td>5.4</td>
<td>5.6</td>
<td>.1</td>
</tr>
<tr>
<td>Animals, no.</td>
<td></td>
<td>27</td>
<td>25</td>
<td>26</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Final condition scorec</td>
<td></td>
<td>4.8</td>
<td>4.5</td>
<td>4.7</td>
<td>4.8</td>
<td>.1</td>
</tr>
<tr>
<td>Animals, no.</td>
<td></td>
<td>27</td>
<td>25</td>
<td>26</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Change in condition scored</td>
<td></td>
<td>-.9</td>
<td>-1.0</td>
<td>-.7</td>
<td>-.8</td>
<td>.2</td>
</tr>
</tbody>
</table>

aApproximated standard error of means.

b1=extremely emaciated, 9=extremely obese.

cAll cows had calved prior to final measurement.

dFinal condition score – initial condition score.
Forage OM intake for cows averaged 7.5 kg/d or 1.5% of BW, whereas steers consumed an average of 4.1 kg/d or 1.8% of BW. Other investigators have reported that lasalocid, decreased intake of forage-based diets fed to growing animals (Bartley et al., 1979; Brown and Davidovich, 1979; Gutierrez et al., 1982) and feedlot diets (Davis, 1978). However, Berger et al. (1981) found no difference in dry matter intake when steers were given 100 mg/d in either an 85% corn silage, grower diet or a 68% high-moisture corn, finishing diet. Similarly, Thoney et al. (1981) saw no effect on intake of steers fed alfalfa cubes ad libitum. The variable intake response to lasalocid in these studies for similar classes of livestock may reflect important differences in diet quality.

Total and forage OM digestibility in beef cows responded to lasalocid level in a quadratic fashion (P<.01). Digestibility data from esophageal-cannulated steers numerically followed a similar quadratic response pattern (table 6), but was not significant. Similarly, Poos et al. (1979) and Faulkner et al. (1985) reported significant modification of digestibility when monensin was added to high roughage diets. In contrast, Ricke et al. (1984) and Paterson et al. (1983) did not observe changes in DM or fiber

### Table 4. Effect of Lasalocid Level on the Chemical Composition of Forage Organic Matter Selected by Esophageal-Cannulated Steers

<table>
<thead>
<tr>
<th>Diet constituent</th>
<th>Lasalocid, mg/kg body wt</th>
<th>0</th>
<th>.22</th>
<th>.44</th>
<th>.66</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic matter, %</td>
<td></td>
<td>83.36</td>
<td>83.69</td>
<td>84.40</td>
<td>84.34</td>
<td>.96</td>
</tr>
<tr>
<td>Crude protein</td>
<td></td>
<td>6.01</td>
<td>6.22</td>
<td>6.01</td>
<td>6.07</td>
<td>.26</td>
</tr>
<tr>
<td>Neutral detergent fiber</td>
<td></td>
<td>84.27</td>
<td>82.52</td>
<td>82.87</td>
<td>83.95</td>
<td>.77</td>
</tr>
<tr>
<td>Acid detergent fiber</td>
<td></td>
<td>60.03</td>
<td>58.19</td>
<td>55.09</td>
<td>55.00</td>
<td>2.14</td>
</tr>
<tr>
<td>Indigestible acid detergent fiber</td>
<td></td>
<td>24.74</td>
<td>25.40</td>
<td>25.54</td>
<td>24.98</td>
<td>1.80</td>
</tr>
<tr>
<td>In vitro organic matter disappearance</td>
<td></td>
<td>55.48</td>
<td>52.59</td>
<td>52.56</td>
<td>53.08</td>
<td>1.62</td>
</tr>
</tbody>
</table>

*Three steers per treatment collected on four consecutive days.

*SE = standard error of means.

### Table 5. Effect of Lasalocid Level on Organic Matter (OM) Intake and Digestibility in Pregnant Beef Cows

<table>
<thead>
<tr>
<th>Item</th>
<th>Lasalocid mg/kg body wt</th>
<th>0</th>
<th>.22</th>
<th>.44</th>
<th>.66</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animals, no.</td>
<td></td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Total OM intake, kg/d</td>
<td></td>
<td>9.1</td>
<td>9.2</td>
<td>8.9</td>
<td>8.9</td>
<td>.40</td>
</tr>
<tr>
<td>Total OM digestibility, %b</td>
<td></td>
<td>41.3</td>
<td>37.8</td>
<td>39.0</td>
<td>43.7</td>
<td>1.03</td>
</tr>
<tr>
<td>OM intake, % of body wt</td>
<td></td>
<td>1.87</td>
<td>1.94</td>
<td>1.87</td>
<td>1.80</td>
<td>.10</td>
</tr>
<tr>
<td>Forage OM intake, kg/d</td>
<td></td>
<td>7.6</td>
<td>7.6</td>
<td>7.4</td>
<td>7.4</td>
<td>.40</td>
</tr>
<tr>
<td>Forage OM digestibility, %b</td>
<td></td>
<td>36.2</td>
<td>32.3</td>
<td>33.3</td>
<td>38.9</td>
<td>1.25</td>
</tr>
<tr>
<td>Forage OM intake, % of body wt</td>
<td></td>
<td>1.55</td>
<td>1.61</td>
<td>1.54</td>
<td>1.49</td>
<td>.10</td>
</tr>
<tr>
<td>Fecal OM output, kg/d</td>
<td></td>
<td>5.4</td>
<td>5.7</td>
<td>5.5</td>
<td>5.0</td>
<td>.26</td>
</tr>
</tbody>
</table>

*Approximated standard error of means.

*bQuadratic effect (P<.01).

*cFecal OM output from the forage portion of the diet was calculated as described by Kartcher (1980).
TABLE 6. EFFECT OF LASALOCID LEVEL ON ORGANIC MATTER (OM) INTAKE AND DIGESTIBILITY IN ESOPHAGEAL-CANNULATED STEERS

<table>
<thead>
<tr>
<th>Item</th>
<th>Lasalocid, mg/kg body wt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Animals, no</td>
<td>3</td>
</tr>
<tr>
<td>Total OM intake, kg/d</td>
<td>4.8</td>
</tr>
<tr>
<td>Total OM digestibility, %</td>
<td>40.7</td>
</tr>
<tr>
<td>OM intake, % of body wt</td>
<td>2.14</td>
</tr>
<tr>
<td>Forage OM intake, kg/d</td>
<td>4.0</td>
</tr>
<tr>
<td>Forage OM digestibility, %</td>
<td>36.1</td>
</tr>
<tr>
<td>Forage OM intake, % of body wt</td>
<td>1.80</td>
</tr>
<tr>
<td>Fecal OM output, kg/d&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.9</td>
</tr>
</tbody>
</table>

<sup>a</sup>Standard error of means.

<sup>b</sup>Fecal OM output from the forage portion of the diet was calculated as described by Kartchner (1980).

digestibilities when lambs receiving an ionophore were fed 56% alfalfa hay and 76% fescue diets, respectively. Similarly, Berger et al. (1981) found that inclusion of 100 mg/d lasalocid in growing or finishing diets fed to steers did not alter DM digestibility. Observed changes in OM digestibility in this study appear to have been of insufficient magnitude to alter beef cow performance. However, it is interesting to note that the numerical trend for intake expressed as a percentage of body weight was the opposite of that for digestibility. In the event that numerical trends in intake were real, changes in intake and, subsequently, digesta passage possibly could explain the noted patterns in digestibility and the lack of performance response for diets with lower digestibility. To clarify potential intake, digestibility and performance relationships with poor-quality range diets, intake and digestibility evaluations under conditions more controlled than is possible with grazing animals may be required.

Exp. 3. Lasalocid level had no effect (P>.10) on fermentation characteristics (table 7). Ruminal pH ranged between 6.50 and 6.60. Both NH<sub>3</sub>-N and total VFA concentrations were low (2.06 to 3.45 mM and 75.79 to 81.75 mM, respectively), reflecting the low fermentability of the dormant pasture species. Molar proportions of acetate were between 70.4 and 71.0%, whereas propionate ranged between 18.4 and 19.7%. A tendency toward decreasing acetate-to-propionate ratio with increasing lasalocid dosage did not produce a significant linear response.

The failure of lasaloid to influence significantly ruminal VFA proportions in the present study contrast with some previous reports for cattle fed high-forage diets. Increases in the proportion of propionate with corresponding decreases in acetate and/or the acetate-to-propionate ratio have been observed by Bartley et al. (1979), Gutierrez et al. (1982), Paterson et al. (1983), Ricke et al. (1984) and Spears and Harvey (1984). In contrast, Fuller and Johnson (1981) suggested that increases in propionate proportion were generally not observed when ionophores were evaluated with in vitro fermentations of high-roughage substrates. The quality of forage consumed in this study was extremely poor and may partially explain the lack of influence by lasalocid on VFA proportions. Limited fermentability of the dormant, winter forage in this study may have reduced availability of the major propionate precursors, such as succinate, and thereby limited the potential for seeing a propionate increase in response to lasalocid addition.

Results of the present study agree with previous reports on effects of lasalocid on ruminal NH<sub>3</sub>-N (Spears and Harvey, 1984; Funk et al., 1986), but conflict with earlier in vitro studies (Fuller and Johnson, 1981). Similar ruminal pH among treatments concurs with results of Paterson et al. (1983), who found no change in pH of lambs fed a 50% roughage diet with lasalocid addition. Thonney et al. (1981) reported a quadratic trend in pH with lasalocid dosages similar to those used in the present study, but the narrow range of values was not thought to be biologically significant. It is possi-
TABLE 7. EFFECT OF LASALOCID LEVEL ON MEAN RUMINAL pH, NH₃-N CONCENTRATION, TOTAL CONCENTRATIONS AND MOLAR PROPORTIONS OF VOLATILE FATTY ACIDS (VFA)

<table>
<thead>
<tr>
<th>Item</th>
<th>Lasalocid, mg/kg body wt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Animals, no.</td>
<td>4</td>
</tr>
<tr>
<td>pH</td>
<td>6.57</td>
</tr>
<tr>
<td>NH₃-N, mM</td>
<td>2.06</td>
</tr>
<tr>
<td>Total VFA, mM</td>
<td>79.04</td>
</tr>
<tr>
<td>Acetate</td>
<td>71.03</td>
</tr>
<tr>
<td>Propionate</td>
<td>18.40</td>
</tr>
<tr>
<td>Butyrate</td>
<td>8.75</td>
</tr>
<tr>
<td>Isobutyrate</td>
<td>.55</td>
</tr>
<tr>
<td>Valerate</td>
<td>.76</td>
</tr>
<tr>
<td>Isovalerate</td>
<td>.51</td>
</tr>
<tr>
<td>Acetate:propionate</td>
<td>3.88</td>
</tr>
</tbody>
</table>

\(^a\) Standard error of means.

TABLE 8. EFFECT OF LASALOCID LEVEL ON RUMINAL FLUID DILUTION, VOLUME AND FLOW RATE

<table>
<thead>
<tr>
<th>Item</th>
<th>Lasalocid, mg/kg body wt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Animals, no.</td>
<td>4</td>
</tr>
<tr>
<td>Dilution rate, %/h</td>
<td>8.09</td>
</tr>
<tr>
<td>Ruminal volume, liters</td>
<td>47.63</td>
</tr>
<tr>
<td>Flow rate, liters/h (^b)</td>
<td>3.87</td>
</tr>
</tbody>
</table>

\(^a\) Standard error of means.
\(^b\) Quadratic effect (P=.10).

It is likely that any influence of lasalocid on ruminal pH would most likely be expressed when dietary concentrate levels are high, since lasalocid has been found to inhibit the major, ruminal lactate-producing species (Dennis et al., 1981). Lasalocid dosage did not influence (P>.10) ruminal fluid dilution rates or liquid volume (table 8). Rate constants and volume measurements averaged 8.0%/h and 56.7 liters, respectively. Ruminal liquid flow rate tended (P=.10) to vary in a quadratic manner as level of lasalocid increased. Although influence of lasalocid on liquid volume was not significant, numerically the values followed the same trend as liquid flow rate. Values for both traits increased at the .22 mg lasalocid/kg BW level; however, as level of lasalocid continued to increase, values for liquid volume and flow rate decreased back to values similar to those of control animals. These observations conflict with results reported for monensin fed to steers grazing poor quality range (Lemanager et al., 1978a). In that study, liquid turnover and ruminal liquid volume decreased with the addition of 200 mg monensin/d to the diet. However, the authors also reported that monensin decreased intake of poor-quality range grass. Lack of influence of lasalocid on forage intake in the present study may explain the moderate responses observed in fluid flow characteristics.

Results from this study were interpreted to indicate that addition of lasalocid to a “protein”
supplement did not significantly affect performance of pregnant beef cows grazing poor quality winter pasture. Similarly, intake of forage organic matter was not influenced for beef cows or steers grazing similar pasture. Although forage organic matter digestibility varied with lasalocid level, the magnitude of differences was not sufficient to influence weight or condition change. Ruminal fermentation and fluid flow characteristics in beef steers grazing similar pasture were not altered by lasalocid level.

Literature Cited


