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**Effect of monensin on weight gain, growth traits, and semen characteristics in yearling beef bulls**

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Effect of monensin on weight gain, growth traits, and semen characteristics in yearling beef bulls

Abstract
Feeding the ionophore monensin to yearling beef bulls improved (P<.05) weight gain by 4.2%. Final hip height was similar between treatments, but bulls fed monensin had almost 1 cm greater (P<.01) scrotal circumference and more than 10 cm 2 larger (P<.01) pelvic area. Semen characteristics generally were unaffected by treatment. However, bulls fed monensin had less (P<.01) semen motility than controls. Approximately 30 sperm morphology traits were evaluated; values were similar between treatments except for those traits listed. Collection date tended to influence (P<.15) volume, concentration, motility, and postfreeze characteristics.

Keywords
Cattlemen's Day, 1994; Kansas Agricultural Experiment Station contribution; no. 94-373-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 704; Beef; Bulls; Performance; Monensin; Semen; Ionophore; Morphology

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EFFECT OF MONENSIN ON WEIGHT GAIN,
GROWTH TRAITS, AND SEMEN CHARACTERISTICS
IN YEARLING BEEF BULLS 1

C. W. Peters, S. B. Lauder 2, L. R. Corah,
D. A. Nichols, and C. L. Krehbiel

Summary

Feeding the ionophore monensin to
yearling beef bulls improved (P<.05) weight
gain by 4.2%. Final hip height was similar
between treatments, but bulls fed monensin
had almost 1 cm greater (P<.01) scrotal
circumference and more than 10 cm 2 larger
(P<.01) pelvic area. Semen characteristics
generally were unaffected by treatment.
However, bulls fed monensin had less
(P<.01) semen motility than controls.
Approximately 30 sperm morphology traits
were evaluated; values were similar between
treatments except for those traits listed.
Collection date tended to influence (P<.15)
volume, concentration, motility, and
postfreeze characteristics.

(Key Words: Bulls, Performance, Monensin,
Semen, Ionophore, Morphology.)

Introduction

The ionophore monensin has been used
widely to improve gain and feed conversion
by beef cattle. The vast majority of finishing
cattle and many stocker cattle are fed an
ionophore to improve performance. Previous
research has suggested that the onset of
puberty is hastened in developing heifers fed
monensin. The objective of this trial was to
evaluate the impact of monensin on weight
gain, growth traits, and semen characteristics
in yearling beef bulls.

Experimental Procedures

Forty-four, spring-born, yearling bulls
were allotted by weight, breed, sire, and
birthdate and assigned randomly to each of
two dietary treatments: 1) a 13.5% crude
protein control supplement consisting of
corn, oats, and soybean meal (CON); or 2)
the control supplement plus the ionophore
monensin (Rumensin®) fed at 200 mg per
head per day (RUM). Each treatment group
contained 15 Angus, five Hereford, and two
Polled Hereford bulls. Bulls averaged 838 lb
at the beginning of the trial. They were
weaned approximately on September 15 and
fed the control supplement and hay ad libitum
until 2 weeks prior to the start of the trial
(December 14). Bulls fed monensin were
allowed a 4-day warm-up period with
monensin fed at 100 mg per head per day.
All bulls were housed in dry lot; the
remainder of the diet was native prairie hay
fed ad libitum.

Data collection. Averages of two
weights on consecutive days at the beginning
and end of the trial were used as initial and
final weights. Hip heights and scrotal
circumferences were measured at the
beginning and end of the trial. Measures of
pelvic area and breeding soundness
evaluations were made at the end of the trial.
Semen was collected twice during the last 3
weeks of the trial using restrained cows and
an artificial vagina. Bulls whose semen was

1Appreciation is expressed to Kansas Artificial Breeding Service Unit, Manhattan, KS, for
semen collection and evaluation and Select Sires, Inc., Plain City, OH for assessment of sperm
morphology.

2Senior Lilly Scientist, Lilly Research Labs, 804 Anderson, Garden City, KS.
not collected successfully on the first attempt were tested again 21 days later; bulls whose semen was not collected successfully with the artificial vagina were subjected to electro-ejaculation. Raw semen was processed on site, and ejaculate volume, sperm motility, and sperm concentration were determined. At the Kansas Artificial Breeding Service Unit, cryopreservation was attempted with all successful collections. Semen remained frozen for 24 hours before sperm morphology was further evaluated immediately postthaw and after incubation for 2 to 4 hours.

Results and Discussion

Overall weight gain and average daily gain were greater ($P=.03$) for bulls fed RUM compared to CON (Table 1). At the beginning of the trial, hip height and scrotal circumference were similar between treatments. Final hip height did not differ between treatments, but measurements of scrotal circumference and pelvic area were greater ($P<.01$) for bulls fed RUM.

Semen collection data are presented in Table 2. Semen was collected from more ($P=.06$) bulls fed CON on the first attempt than from bulls fed RUM. However, no differences existed in the number from each treatment whose semen was collected successfully by artificial vagina.

The morphological abnormalities that approached significance ($P<.15$) are listed in Table 3. Detailed are the number of bulls from each treatment that possessed each particular abnormality. Also presented is the percentage of abnormal sperm for traits that approached significance ($P<.15$). No consistent differences were present between treatments. Further analysis revealed that collection date (first or second attempt) had a greater ($P<.10$) influence on semen characteristics than dietary treatment. Feeding RUM promoted greater weight gain and enhanced growth traits in yearling bulls, with no general effect on semen traits.

Table 1. Effect of Monensin on Weight Gain and Growth Traits in Yearling Beef Bulls

<table>
<thead>
<tr>
<th>Item</th>
<th>Control</th>
<th>Monensin</th>
<th>SE</th>
<th>Significance $^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final wt, lb</td>
<td>1208</td>
<td>1222</td>
<td>8</td>
<td>.23</td>
</tr>
<tr>
<td>Total wt gain, lb</td>
<td>371</td>
<td>386</td>
<td>5</td>
<td>.03</td>
</tr>
<tr>
<td>Avg daily gain, lb/d</td>
<td>3.64</td>
<td>3.78</td>
<td>.05</td>
<td>.03</td>
</tr>
<tr>
<td>Initial hip height, in</td>
<td>46.3</td>
<td>46.1</td>
<td>.1</td>
<td>.39</td>
</tr>
<tr>
<td>Hip height change, in</td>
<td>+ 4.1</td>
<td>+ 4.3</td>
<td>.1</td>
<td>.12</td>
</tr>
<tr>
<td>Initial SC$^b$, cm</td>
<td>29.2</td>
<td>29.2</td>
<td>.2</td>
<td>.95</td>
</tr>
<tr>
<td>Final SC, cm</td>
<td>34.8</td>
<td>35.7</td>
<td>.2</td>
<td>.01</td>
</tr>
<tr>
<td>Pelvic width, cm</td>
<td>11.0</td>
<td>11.4</td>
<td>.1</td>
<td>.01</td>
</tr>
<tr>
<td>Pelvic height, cm</td>
<td>14.4</td>
<td>14.8</td>
<td>.1</td>
<td>.01</td>
</tr>
<tr>
<td>Pelvic area, cm$^2$</td>
<td>158.9</td>
<td>169.1</td>
<td>1.1</td>
<td>.01</td>
</tr>
</tbody>
</table>

$^a$Probability associated with treatment effect.

$^b$SC=scrotal circumference.
Table 2. Effect of Monensin on Collection and Semen Characteristics in Yearling Beef Bulls

<table>
<thead>
<tr>
<th>Item</th>
<th>Control</th>
<th>Monensin</th>
<th>SE</th>
<th>Significance $^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSE$^b$</td>
<td>84.6</td>
<td>86.8</td>
<td>2.9</td>
<td>.59</td>
</tr>
<tr>
<td>Volume, ml/ejaculate</td>
<td>2.69</td>
<td>3.11</td>
<td>.26</td>
<td>.27</td>
</tr>
<tr>
<td>Concentration, %</td>
<td>64.0</td>
<td>69.9</td>
<td>2.9</td>
<td>.16</td>
</tr>
<tr>
<td>Motility, %</td>
<td>45.8</td>
<td>34.6</td>
<td>3.3</td>
<td>.02</td>
</tr>
<tr>
<td>Collected on first date</td>
<td>11/22</td>
<td>5/22</td>
<td></td>
<td>.06</td>
</tr>
<tr>
<td>Collected by AV $^c$</td>
<td>19/22</td>
<td>18/22</td>
<td></td>
<td>.68</td>
</tr>
</tbody>
</table>

$^a$Probability associated with treatment effect.

$^b$BSE=breeding soundness examination score.

$^c$AV=artificial vagina.

Table 3. Effect of Monensin on Sperm Morphology in Yearling Beef Bulls

<table>
<thead>
<tr>
<th>Item</th>
<th>Control</th>
<th>Monensin</th>
<th>SE</th>
<th>Significance $^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of bulls producing sperm with respective abnormality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tapered heads</td>
<td>15</td>
<td>18</td>
<td></td>
<td>.04</td>
</tr>
<tr>
<td>Asymmetrical heads</td>
<td>12</td>
<td>12</td>
<td></td>
<td>.82</td>
</tr>
<tr>
<td>Diadem (equatorial craters)</td>
<td>6</td>
<td>2</td>
<td></td>
<td>.13</td>
</tr>
<tr>
<td>Head and tail separated</td>
<td>19</td>
<td>16</td>
<td></td>
<td>.14</td>
</tr>
<tr>
<td>Protoplasmic droplets</td>
<td>11</td>
<td>15</td>
<td></td>
<td>.09</td>
</tr>
<tr>
<td>Percentage of sperm possessing abnormality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tapered heads</td>
<td>3.27</td>
<td>4.89</td>
<td>.70</td>
<td>.11</td>
</tr>
<tr>
<td>Asymmetrical heads</td>
<td>2.42</td>
<td>1.50</td>
<td>.43</td>
<td>.14</td>
</tr>
<tr>
<td>Diadem (equatorial craters)</td>
<td>4.67</td>
<td>1.00</td>
<td>1.5</td>
<td>.15</td>
</tr>
<tr>
<td>Head and tail separated</td>
<td>4.16</td>
<td>5.19</td>
<td>.88</td>
<td>.42</td>
</tr>
<tr>
<td>Protoplasmic droplets</td>
<td>6.36</td>
<td>10.73</td>
<td>4.05</td>
<td>.45</td>
</tr>
</tbody>
</table>

$^a$Probability associated with treatment effect.