Evaluation of Long-acting Moxidectin and Ivermectin in the Development of Replacement Beef Heifers

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Story in Brief

An experiment was conducted to assess the efficacy and benefit of ivermectin and long-acting moxidectin in replacement heifers. Recently weaned replacement heifers carrying naturally acquired parasite infections (n = 105) were evaluated for 149 d. Heifers were weaned on May 15, 2006, and assembled at the University of Arkansas Beef Research Unit near Fayetteville, AR. Heifers were randomly allocated to 1 of 3 treatments: Ivomec® Plus injectable (IVO), Cydectin® Long-Acting injectable (MXD), and a negative control (CON). Treatments were administered on d 0, each animal was weighed, and a fecal sample was taken on d 0, 14, 64, and 149. Hip heights and pelvic area measurements were recorded for each heifer on d 29 and d 149, respectively. Statistical analyses were conducted using a general linear mixed model procedure. Average BW was 478 ± 47.6 lb on d 0. Results identified no significant differences for BW or strongyle eggs per gram of feces on d 0. Fecal egg counts (FEC) were lower (P < 0.01) for MXD-treated calves on d 14, 64, and 149 compared to the IVO and CON groups. The FEC for the IVO group was lower (P < 0.01) compared to the CON on d 14. Mean BW was only greater (P < 0.05) for MXD-treated calves compared to CON group on d 149. Average daily gains were greater (P < 0.01) for MXD and IVO compared to CON for gains made from d 0 to d 149. No differences were identified for pelvic area or hip height among treatment groups.

Introduction

The development of replacement heifers is a major economic burden to the beef cattle industry and is considered a costly and intensive process. Intestinal parasitism can significantly decrease growth and performance of grazing animals (Perry and Randolph, 1999). Heifers that are selected for replacements can suffer from poor development due to intestinal parasite burdens.

The most widely used class of anthelmintic today is the macrocyclic lactones. This class of drug includes ivermectin, doramectin, eprinomectin, and moxidectin. A prime target of these pharmaceuticals is the glutamate-gated chloride channels of the parasite’s nervous system (Wolstenholme and Rogers, 2005).

New formulations of long-acting macrocyclic lactones have been shown to be more effective in controlling parasite burdens and more beneficial to growth performance than conventional formulations (Yazwinski et al., 2006). The objective of this study was to compare long-acting moxidectin treatment to ivermectin plus closurson treatment for efficacy of parasite control and benefits to growth performance in beef replacement heifers for a 149-day period.

Experimental Procedures

In total, 131 beef replacement heifers of predominately Angus breeding were delivered on May 15, 2006, to the University of Arkansas Beef Research Unit near Fayetteville, AR. All heifers were born between September 3 and December 27, 2005, and were carrying naturally acquired parasite infections upon entering the study. Following their arrival, study animals were given a 30-day acclimation period during which BW and fecal egg counts (FEC) were measured. Based on the above BW and FEC measurements, 105 heifers were selected to be used during the 149-day study.

Animals were housed and cared for in compliance with the Animal Care Protocol #06052 for cattle experimentation issued by the University of Arkansas Animal Care and Use Committee. All study animals were managed in one group and were given ad libitum access to pasture forage, water and mineral supplementation. A soy-hull ration was fed daily at the rate of 1% animal BW, and animals were observed daily for general health and well-being.

For treatment allocation, heifers were blocked into 5 blocks based on d -2 FEC and ranked within each block by d -1 BW. Blocks contained 21 animals that were bracketed by 3’s into replicates. Each of the 3 heifers within each replicate was randomly assigned 1 of 3 treatments: Ivomec® Plus injectable (IVO), Cydectin® Long-Acting injectable (MXD), and a negative control (CON).

Treatments were administered on d 0. Treatment MXD was a 10% solution administered subcutaneously into the left ear with a 1-inch, 18-gauge needle at the rate of 1mL/100kg BW. Treatment IVO was administered subcutaneously into the left side of the neck with a ¾-inch, 16-gauge needle at a rate of 1mL/50kg BW. Control animals received no placebo treatment.

Body weight and FEC were measured on d 0, 14, 64, and 149. Hip heights and pelvic area measurements were recorded for each heifer on d 29 and d 149, respectively. Throughout the 149-day study, the heifers were comimgled and managed as one group.

Statistical analyses were determined using general linear model of SAS (SAS Inst., Inc., Cary, N.C.). Traits of BW, FEC, ADG, pelvic area, and hip height were analyzed for significant differences at P < 0.05. The FEC were transformed [Y = log10 (x + 1)] prior to analysis.

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Results and Discussion

Geometric means of FEC by treatment are shown in Table 1. All treatment groups had similar FEC on d 0. The FEC was lower ($P < 0.01$) for MXD-treated calves on d 14, 64, and 149 compared to the IVO and CON groups. The FEC for the IVO group was lower ($P < 0.01$) compared to the CON on d 14. These data show that MXD treatment provided far greater fecal egg count reductions than did IVO treatment for the entire study.

Mean animal BW was similar among treatments on d 0; however, by study d 149, MXD-treated calves had a higher mean BW ($P < 0.05$) when compared to CON (Table 2). Average daily gains for the study period were greater ($P < 0.01$) for animals on MXD and IVO treatments compared to CON (Figure 1). Pelvic area and hip height were not different ($P > 0.10$) among all treatment groups. These data show that even though average daily gains were statistically similar for the MXD and IVO treatment groups, only the MXD-treatment provided significant improvement for mean body weight when compared to the control group on d 149 of the study.

Implications

Results indicate that Cydectin® LA has superior efficacy and extended activity against intestinal nematodiasis when compared to Ivomec® Plus and a negative control. Replacement heifers treated with Cydectin® LA and Ivomec® Plus had similar average daily gains as measured from d 0 to d 149, but only Cydectin® LA treatment significantly improved gains relative to negative controls.

Acknowledgments

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Literature Cited


Table 1. Strongyle fecal egg counts (FEC), geometric means by treatment group and study day.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Day 0</th>
<th>Day 14</th>
<th>Day 64</th>
<th>Day 149</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cydectin® LA</td>
<td>31.2a</td>
<td>1.4c</td>
<td>7.4b</td>
<td>16.6b</td>
</tr>
<tr>
<td>Ivomec® Plus</td>
<td>35.5a</td>
<td>8.7b</td>
<td>73.9a</td>
<td>68.1a</td>
</tr>
<tr>
<td>Control</td>
<td>35.0a</td>
<td>65.7a</td>
<td>115.8a</td>
<td>56.5a</td>
</tr>
</tbody>
</table>

*abc Means on the same day with no superscript in common differ ($P < 0.01$).

Table 2. Mean animal body weights (lb) by treatment group and study day.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Day 0</th>
<th>Day 14</th>
<th>Day 64</th>
<th>Day 149</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cydectin® LA</td>
<td>527.9</td>
<td>578.3</td>
<td>661.3</td>
<td>739.9a</td>
</tr>
<tr>
<td>Ivomec® Plus</td>
<td>533.5</td>
<td>580.5</td>
<td>668.1</td>
<td>733.5ab</td>
</tr>
<tr>
<td>Control</td>
<td>533.1</td>
<td>579.6</td>
<td>655.5</td>
<td>707.4b</td>
</tr>
</tbody>
</table>

**ab** Means on the same day with no superscript in common differ ($P < 0.05$).
Fig. 1. Mean average daily gain (lbs) by treatment group between d 0-149. 
\(^{a,b}\) Means with no superscript in common differ \((P < 0.01)\).