Effect of Direct-Fed Microbials on Weaned Calf Performance

Colby Hales\(^1\) and Scott Lake\(^1\)

Introduction
Direct-fed microbials (DFMs) are feed supplements that have been used as replacements to fed antibiotics that inhibit gastrointestinal infection (Seo et al., 2010). In addition, ruminant animals fed DFMs have been reported to have increased feed efficiency. DFMs create an optimal environment for microbial activity within the rumen. While there are several classes of DFMs in regard to their use, the main classes are lactic acid-producing bacteria and lactic acid-utilizing bacteria. These two classes of microbes have a drastic effect on reducing lactic acidosis when compared with calves fed diets without DFMs.

*Propionibacterium acidipropionici*, the primary ingredient in the direct-fed microbial Direct Pro™, is a lactic acid-utilizing bacteria that converts lactic acid to the volatile fatty acid (VFA) propionate and decreases acetate (Seo et al., 2010). This leads to an increase in efficiency due to the more efficient conversion of propionate to glucose. Additionally, when cattle are fed low-quality forages, *Propionibacterium acidipropionici* has been shown to increase digestibility, allowing DFMs to act similarly as ionophores through altering fermentation. Unlike ionophores, DFMs can be fed without a veterinary prescription and can be fed in an all-natural protocol.

Objectives
The objective of this study is to determine the effect of the direct-fed microbial Direct Pro on feed efficiency in weaned beef calves.

Materials and Methods
The study was established in 2017 at the James C. Hageman Sustainable Agriculture Research and Extension Center (SAREC). Calves (150 total; 75/treatment) were all fed a similar weaning ration consisting of corn silage, corn, and soybean meal. The two treatments were a control diet (no added DFMs) and a DFM group (with DFMs poured directly onto the standard ration in the bunk). Weights were taken on the first day of the study, again on day 21, and on day 42, the last day of the study (Table 1).

Results and Discussion
The hypothesis of this study was that Direct Pro as a supplement would increase the efficiency of weaned beef calves. There were no differences between treatments during the first 21 days. DFM-fed calves, however, had a greater \(p=0.04\) average daily gain (ADG) from days 21–42 of the study and tended \(p=0.12\) to have greater total weight gain over the course of the entire study (Table 1). It has been shown through this study that Direct Pro had significant impact on gain during the last 21 days of the study. Similar in response to ionophores, *Propionibacterium acidipropionici* reduces the acetate-to-propionate ratio and increases total VFA concentration, which is consistent with increased gain and the potential for increased efficiency as demonstrated in this study.

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Literature Cited

Contact Information
Scott Lake at scott.lake@uwyo.edu or 307-766-3892.

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PARP: V.1,2,7,10

\(^{1}\)Department of Animal Science.
### Table 1. Effects of DFMs on weaned calf performance.

<table>
<thead>
<tr>
<th>Item</th>
<th>Control</th>
<th>DFM&lt;sup&gt;1&lt;/sup&gt;</th>
<th>SEM&lt;sup&gt;2&lt;/sup&gt;</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial wt, lb</td>
<td>540</td>
<td>539</td>
<td>7.6</td>
<td>0.89</td>
</tr>
<tr>
<td>Final wt, lb</td>
<td>670</td>
<td>674</td>
<td>8.0</td>
<td>0.69</td>
</tr>
<tr>
<td>Days 1–21 ADG&lt;sup&gt;3&lt;/sup&gt;</td>
<td>78.6</td>
<td>77.7</td>
<td>2.6</td>
<td>0.80</td>
</tr>
<tr>
<td>Days 21–42 ADG</td>
<td>2.43</td>
<td>2.76</td>
<td>2.3</td>
<td>0.04</td>
</tr>
<tr>
<td>Total weight gain</td>
<td>129.8</td>
<td>135.7</td>
<td>2.7</td>
<td>0.12</td>
</tr>
</tbody>
</table>

<sup>1</sup>DFM=direct-fed microbial; <sup>2</sup>SEM=standard error of the mean; <sup>3</sup>ADG=average daily gain.