**INTRODUCTION**

The newborn calf is provided protection from disease and infections early in life through two means. First is through the “passive transfer” of antibodies and other immune cells via the colostrum from the dam and the second is the calf’s own innate immune system (Chase, et al., 2008). Colostral antibodies are absorbed easily through the calf’s small intestine within the first few hours after birth, however this ability diminishes rapidly and is nonexistent by 24 hours of age (Guigley, 1998). As the acquired immune system is developing over the first 4 to 6 months of age, the innate immune system is the calf’s primary protection against infection (Chase, et al., 2008).

The cells of the innate immune system include neutrophils and other phagocytes which can ingest and kill infectious agents and release cytokines that aid in the development of the acquired immune system (Chase, et al., 2008). Immunologists assess innate immune cell activity through the use of “immune markers”. Useful markers for determining normal neutrophil function are neutrophil L-selectin and interleukin 8 receptor (Wang, et al., 2007, 2009).

A recent USDA National Animal Health Monitoring Systems survey reported that preweaning mortality of heifers alive at 48 hours of age was 7.9% (USDA, 2007). In special-fed veal commercial facilities where calves are purchased from several locations these figures may be higher depending on environment and housing, nutrition, health and stress (Stull and McDonough, 1994). In 2009, a trial was conducted to investigate changes in health, growth and innate immune cell markers in commercially reared veal calves supplemented daily with OmniGen-AF®.

**FACILITY**

A central Pennsylvania commercial veal operation was used in this trial. Calves are received at this facility within 48 to 72 hours of birth and placed in well-ventilated non-heated barns in individual stalls. All calves are weighed at receiving and at shipment. A commercial veal-specific milk replacer is fed to all calves along with supplemental water. Health is monitored daily and treatments and treatment costs are recorded on each animal. Calves normally are 20 weeks of age when harvested.

**METHOD**

Two hundred Holstein bull calves were used in the study with 50 assigned to the control diet and 150 assigned to the OmniGen-AF supplemented diet. At trial start, all calves assigned to the OmniGen-AF diet were fed 10 grams per head per day, added by hand to the commercial milk replacer. The total amount of OmniGen-AF fed daily was incrementally increased at a rate of 4 grams/100 lb of body weight gain over the course of the 137-day study, with calves fed approximately 22 to 24 g/h/d by the conclusion of the trial.

The trial began on October 8, 2009 and ended February 22, 2010. Starting weights and final weights were recorded and rate of gain calculated. Blood was sampled five times during the study, at trial start and
monthly thereafter, and analyzed for immune markers. Treatments and treatment costs were also recorded and an economic value of the supplementation program was calculated using actual on-farm medication costs. Data were analyzed by SAS using least square means for unequal cell sizes and the Proc GLM procedure was used to compare means for main effects. Significance was tested to the 0.05 significance level.

**GROWTH AND HEALTH**

Starting weights, final weights and total weight gain are shown in Table 1. No differences were detected in starting or final weights (P>0.05). Although there was a wide variation in final weights among calves in both groups, calves supplemented with OmniGen-AF averaged 4.3 lbs heavier than the control fed calves.

**TABLE 1**

OmniGen-AF on performance and health of veal calves during a 20 week trial.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Starting weight (lbs)</th>
<th>Slaughter weight (lbs)</th>
<th>Net gain (lbs)</th>
<th>Treated calves/50 calves¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>104.2</td>
<td>278.1</td>
<td>173.9</td>
<td>29</td>
</tr>
<tr>
<td>OmniGen-AF</td>
<td>104.6</td>
<td>282.7</td>
<td>178.2</td>
<td>18</td>
</tr>
<tr>
<td>Difference</td>
<td>---</td>
<td>---</td>
<td>4.3</td>
<td>-11*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Treatment cost/ head¹</th>
<th>Number of severe calves/50 calves²</th>
<th>Number of severe calves &gt; 30 days of age²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>$2.58</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>OmniGen-AF</td>
<td>$1.46</td>
<td>5.6</td>
<td>3</td>
</tr>
<tr>
<td>Difference</td>
<td>-$1.12*³</td>
<td>-2.4</td>
<td>-4</td>
</tr>
</tbody>
</table>

*Designates a statistically-significant difference between treatments (P<0.05).

¹Treatment costs included all treatments associated with respiratory, scours and health.

²Severe treatments were those treatments that required use of Naxcel, NuFlor and Draxxin.

³Treatment costs were averaged over all calves.

The most common health issues recorded during the study were related to scours and respiratory problems. The number of treatments, treatment cost per calf and incidence of severe cases for groups fed OmniGen-AF or the control diet is also shown in Table 1. In the OmniGen-AF fed group, 57 calves or 38% of the total, were treated during the study as compared to 30 calves or 60% of the control-fed group. Compared as treated calves per 50 calves, this resulted in 11 fewer calves experiencing health problems from the OmniGen-AF fed groups than the controls (P<0.05) resulting in a savings of $1.12 per calf in medication costs (P<0.05). The number of severe cases and severe cases treated after 30 days of age among the study calves was observed to be less in the OmniGen-AF fed group than the controls (5.6 vs. 8 and 3 vs. 7).

**IMMUNE MARKERS**

Two “immune markers”, L-selectin and interleukin 8 receptor, commonly used to assess neutrophil function were evaluated. L-selectin is an adhesion molecule which enables the neutrophil to attach to the endothelial lining of the blood vessel and to thereby monitor for sites of infection in adjacent tissues. Neutrophils use specific cell surface receptors to detect signals from other immune cells at sites of infections and changes in interleukin 8 receptors is an indication of neutrophil responsiveness to these signals.

Changes in neutrophil L-selectin and interleukin 8 receptor for the OmniGen-AF and control fed-calves during the trial period are shown in Figures 1 and 2. Previous studies in sheep and dairy cattle demonstrated a gradual increase in neutrophil L-selectin levels during the first 30 days after OmniGen-AF was included in diets. (Wang, et al., 2007 and 2009). A similar trend was observed in this trial where neutrophil L-selectin values were similar between the groups at the start of the trial with observable differences exhibited after 75 days of the study. These observations may coincide with the reported differences in severe treatment cases in calves 30 days of age or older fed OmniGen-AF as...
compared to the control fed groups (3 vs. 7). Because weather extremes can influence animal performance and health, daily high and low temperatures were recorded during the previous two days before blood samples were collected (Figure 3). In this study, neutrophil interleukin 8 receptor was observed to be different between the groups in the last 60 days of the study (P<0.05).

FIGURE 1
Blood concentrations of L-selectin mRNA. Values are expressed as a proportion of a housekeeping mRNA (β-actin) and as a proportion of the beginning of the study.

FIGURE 2
Effects of OmniGen-AF on blood concentrations of interleukin 8 receptor (IL8R) mRNA. Values are expressed as a proportion of a housekeeping mRNA (β-actin) and as a proportion of the beginning of the study.

FIGURE 3
Temperature variation during the two days prior to and on the day of blood collection.

SUMMARY
Compared to adult cattle, young calves have less developed immune systems which heightens susceptibility to disease. To evaluate an OmniGen-AF feeding strategy for young calves on overall health, growth and profitability, two-hundred calves from a commercial veal calf operation were used. In this study, veal calves supplemented with OmniGen-AF from arrival through grow-out were heavier at harvest and were also more profitable as a result of reduced treatment costs. In addition neutrophil L-selectin and interleukin B receptor, “markers of immunity” used to assess innate immune function, were observed to be different (P<0.05).

REFERENCES


