Utah Trial Measures Differences in Immune Markers and Neutrophil Function when Early Lactation Cows were Fed OmniGen-AF®

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OBJECTIVE
An experiment was conducted in 2007 to measure the changes in markers of immunity and neutrophil function in early lactation cows fed OmniGen-AF®.

METHOD
Twenty multiparous and ten primiparous lactating Holstein cows were paired by days in milk, parity and milk production and randomly assigned to one of two treatments (control-fed: 56g/h/d placebo or OmniGen-AF-fed: 56g/h/d). Cows within groups averaged 63 DIM, 2.6 lactations and 36.82 kg of milk at trial start. All cows were fed their respective diet for 61 days (Table 1). Blood samples were collected the day cows were assigned to a treatment (day 0), at feeding mid-point (day 33), at feeding period end (day 61) and at 36 days post-treatment (day 97). All samples were assayed for the markers of immunity, neutrophil L-selectin and interleukin 8 receptors (IL-8R). In addition, neutrophils harvested from blood samples collected on days 61 and 97 were subjected to Streptococcus uberis (bovine isolate*) in a 30:1 ratio (S. uberis:neutrophil) and assessed for phagocytosis (killing ability) via ELISA.

RESULTS
In this field trial, L-selectin level was significantly different \( (P < 0.01) \) between the groups at day 61 (Figure 1). At trial start, L-selectin values were similar between the groups however at day 61 the OmniGen-AF fed cows had L-selectin levels 2.5 times greater than the controls. Thirty-six days after OmniGen-AF was removed from the diet the levels of L-selectin were not different and were similar to those recorded at trial start (day 0). IL-8R values were similar on days 0, 33 and 97 but differed \( (P < 0.01) \) on day 61 (Figure 2).

Table 1. Cow Selection Summary by Group

<table>
<thead>
<tr>
<th></th>
<th>OmniGen-AF</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Cows*</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Days in Milk</td>
<td>63.8</td>
<td>62.3</td>
</tr>
<tr>
<td>Lactation No.</td>
<td>2.6</td>
<td>2.6</td>
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<tr>
<td>Milk, kg (day 0)</td>
<td>36.55</td>
<td>37.68</td>
</tr>
</tbody>
</table>

*10 multiparous and 5 primiparous cows per study group

Figure 1: Measurements for Neutrophil L-selectin mRNA Concentrations by Group

Neutrophil L-selectin values were different \( (P < 0.01) \) at day 61 of the experiment or when cows averaged 124 days in milk. OmniGen-AF was removed from the diet at day 61 of the experiment.

*Bovine isolate of Streptococcus uberis: In 2006, a clinical bovine isolate of Streptococcus uberis was obtained from a large animal veterinary clinic in Iowa. The organism was cultured until log phase growth was reached, then diluted and enumerated visually under a microscope and diluted again to a working concentration of 1 colony forming unit (cfu) per micro-liter (μl). This isolate was used as the challenge pathogen with neutrophils harvested from these commercial lactating dairy cows in this experiment.
Likewise, the rapid decline in L-selectin following OmniGen-AF withdrawal from the diet was similar to that observed in previous sheep (Puntenney et al., 2003) and dairy cow studies (Chapman et al., 2006, Wang et al., 2007). Neutrophils harvested from cows fed with OmniGen-AF exhibited a difference in the ability to phagocytize S. uberis as compared to neutrophils collected from control cows. In other studies using neutrophils from OmniGen-AF-fed sheep, similar results were reported when neutrophils were incubated with E. coli strain 847 (30:1 ratio) and killing efficiency was measured (Forsberg, 2007).

REFERENCES


Milk production was observed to be similar between the groups at the start of the study (day 0) at mid-point (day 33) and at the conclusion of the feeding period (day 61), however, was different at day 97 (P < 0.008), which was 36 days after OmniGen-AF was fed (Table 2).

### Table 2. Milk Production Summary by Study Group

<table>
<thead>
<tr>
<th>Milk, kg</th>
<th>OmniGen-AF</th>
<th>Control</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 0</td>
<td>36.55</td>
<td>37.68</td>
<td>ns</td>
</tr>
<tr>
<td>Day 33</td>
<td>43.96</td>
<td>41.29</td>
<td>ns</td>
</tr>
<tr>
<td>Day 61</td>
<td>44.38</td>
<td>43.64</td>
<td>ns</td>
</tr>
<tr>
<td>Day 97</td>
<td>47.56</td>
<td>41.02</td>
<td>0.008</td>
</tr>
</tbody>
</table>


### SUMMARY
Blood levels of L-selectin and IL-8R, indicators of innate immune function were observed to be different in the cows fed OmniGen-AF and the difference increased gradually throughout the 61 day feeding period. The data parallel similar findings reported by Oregon State University researchers, who observed significant changes in these markers over a 28 day feeding period in sheep (Wang et al., 2004, 2007).
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