Introduction

While nutritionists are typically concerned with the effect of protein source on ration cost, there is a growing appreciation of the cost of inefficient crude protein (CP) usage. As a result, nonprotein nitrogen (NPN) is used in dairy rations as a less expensive alternative to protein of plant or animal origin.

Objectives

To determine the effect of Optigen® (blended, controlled-release urea), as a source of dietary nitrogen on milk composition, milk production, and economics in commercial dairy herds in Wisconsin.

Materials and Methods

Animals and experimental design

- 16 commercial Wisconsin dairy herds (average 148 cows/herd; range 58 – 550 cows/herd).
- Crossover experimental design using two 30-d feeding periods.
- Within herds, cows were fed a single-diet TMR.
- Across the 16 herds, TMR contained 56±3% forages composed of 43±9% corn silage and formulated for 17.1±0.4% CP and 30.5±1.7% NDF (DM basis).

Treatments

- Control – TMR
- Optigen® – TMR with 114 g/cow/d Optigen® replacing an equivalent amount of supplemental CP, primarily from SBM.
- Treatments were isonitrogenous.
- Diet formulation space created by Optigen® was filled with DM from either corn grain or corn silage.

Measurements

- Weight and composition (fat, protein, MUN) of bulk tank milk shipments per herd were recorded.
- Number of cows with milk in the bulk tank per shipment was recorded.
- Average daily milk yield and milk component yields were calculated.
- A spreadsheet economic simulation was performed using the Optigen® feeding rate and milk yield response from the field trial and monthly (as-fed) prices for SBM-48 ($0.373±0.054/kg), dry corn ($0.188 ±0.020/kg), corn silage ($0.059±0.005/kg), and high-moisture corn ($0.149 ±0.016/kg) and milk prices ($0.38±0.03/kg) for January – December, 2008. Local pricing for Optigen® was used. A total of 32 combinations of varying feed and milk prices were simulated.

Data analysis

- Mixed model procedure of SAS with period, sequence and treatment as fixed effects and herd as a random effect.

Results

- Milk yield was 0.5 kg/d/cow greater (P<0.01) for Optigen® compared with the control (Table 1).
- Optigen® reduced feed cost only when corn silage was used to fill the formulation space. However, milk income minus feed cost was increased by Optigen® for all forms of dry corn used to fill the formulation space. This difference was greatest for the corn silage treatment at $0.21/cow/d.
- A decision tool spreadsheet was developed to allow additional economic simulations. The tool allowed for varying the following: milk yield response to Optigen®, cost of Optigen®, and the CP and energy supplements evaluated (Table 2).

Conclusions

- Under the conditions of this study, Optigen® reduced feed cost only when corn silage was used to fill the formulation space, however milk income minus feed cost was increased by Optigen® for all forms of corn used.
- A decision tool spreadsheet was developed to help producers, consultants, and extension agents compare and select feed supplements in diets of lactating cows.

Acknowledgements

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Table 1. Milk production and milk composition in response to Optigen®.

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Optigen®</th>
<th>SEM</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk yield, kg/d</td>
<td>35.4</td>
<td>35.9</td>
<td>0.2</td>
<td>0.01</td>
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<tr>
<td>Fat, %</td>
<td>3.72</td>
<td>3.69</td>
<td>0.02</td>
<td>0.07</td>
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<tr>
<td>yield, g/d</td>
<td>1317</td>
<td>1322</td>
<td>8</td>
<td>NS</td>
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<tr>
<td>Protein, %</td>
<td>2.98</td>
<td>2.97</td>
<td>0.01</td>
<td>NS</td>
</tr>
<tr>
<td>yield, g/d</td>
<td>1055</td>
<td>1065</td>
<td>6</td>
<td>0.13</td>
</tr>
<tr>
<td>MUN, mg/dL</td>
<td>12.4</td>
<td>13.2</td>
<td>0.3</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Table 2. Economic impact of Optigen® use in dairy herd diets.

<table>
<thead>
<tr>
<th>Crude protein supplement replaced by Optigen®</th>
<th>Ingredient used to fill formulation space</th>
<th>Feed cost OPT - CON ($/cow/d)</th>
<th>Milk income OPT - CON ($/cow/d)</th>
<th>Milk income minus feed cost ($/cow/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBM-48</td>
<td>Dry corn</td>
<td>0.047 (± 0.027)</td>
<td>0.192 (± 0.016)</td>
<td>0.145 (± 0.039)</td>
</tr>
<tr>
<td>SBM-48</td>
<td>Corn silage</td>
<td>-0.020 (± 0.039)</td>
<td>0.192 (± 0.016)</td>
<td>0.212 (± 0.051)</td>
</tr>
<tr>
<td>SBM-48</td>
<td>High-moisture corn</td>
<td>0.042 (± 0.028)</td>
<td>0.192 (± 0.016)</td>
<td>0.150 (± 0.040)</td>
</tr>
</tbody>
</table>