Metabolic Disorders and Reproduction in Dairy Cows Receiving a Folic Acid and Vitamin B\textsubscript{12} Supplement

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Introduction

- Ruminal microorganisms can synthetize B-vitamins (Bechdel et al., 1928 and NRC, 2001)

- However, ruminal synthesis was not sufficient to avoid serum fluctuations of folic acid and vitamin B$_{12}$ around parturition (Girard et al., 1989; Girard and Matte, 1999)
Introduction

- Previous studies showed that a combined supplement of folic acid and vitamin B$_{12}$:
  - Increased milk production
  - Improved energy balance in early lactation (Graulet et al., 2007 and Preynat et al., 2009)
- Vitamin B$_{12}$ is a coenzyme allowing propionate for its entry into the Krebs cycle
Objectives

Determine the effects of a supplement of folic acid and vitamin $B_{12}$ given around calving in 15 commercial dairy herds on:

- Incidence of metabolic disorders
- Reproduction performance of cows
- Culling rate
Materials and Methods

- 15 dairy herds
- 805 calvings from February 2010 to April 2011
  - 271 primiparous and 534 multiparous cows
- Treatments (weekly 5 mL IM)
  - Control: saline 0.9 % NaCl
  - Vitamins: 320 mg of folic acid and 10 mg of vitamin B$_{12}$
- Treatments began 3 wk before the expected calving date until 8 wk postpartum
Materials and Methods

Data collected on farms every other weeks:

- Calving dates and health status (ex. Displaced abomasum?)
- β-hydroxybutyrate (BHBA) level in milk through Keto-test between 3 and 21 days in milk (DIM)
- Reproduction and culling data were obtained from Valacta (DHI agency, Sainte-Anne-de-Bellevue, QC, Canada)
Materials and Methods

- Calving ease
  - No assistance
  - Light assistance
  - Difficult calving
  - Surgery
  - Non-favourable calf presentation
Materials and Methods

Keto-test results:
Up to 100 µmol/L = no ketosis
At or over 100 µmol/L = ketosis
At or over 200 µmol/L = ketosis, severe

Elanco Animal Health, Guelph, ON, Canada
Statistical analysis

- Mixed and GLIMMIX procedures of SAS were used.
## Results - Ketosis

### Ketosis Incidence According to Treatments

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Treatments&lt;sup&gt;1&lt;/sup&gt;</th>
<th>SEM&lt;sup&gt;2&lt;/sup&gt;</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Vitamins</td>
<td></td>
</tr>
<tr>
<td>Ketosis (%)</td>
<td>41.8</td>
<td>38.3</td>
<td>3.0</td>
</tr>
<tr>
<td>Ketosis, severe (%)</td>
<td>12.9</td>
<td>12.6</td>
<td>1.9</td>
</tr>
</tbody>
</table>

n=800

<sup>1</sup> Control: saline 0.9% NaCl; Vitamins: 320 mg of folic acid and 10 mg of vitamin B<sub>12</sub>

<sup>2</sup> SEM= Standard Error of the Mean
Results - Diseases

No treatment effect was found on incidence of displaced abomasum, metritis, retained placenta, mastitis, and milk fever ($P > 0.37$)
Results - Dystocia

Treatment x parity interaction ($P = 0.008$)
Results - Reproduction

DIM at first breeding

<table>
<thead>
<tr>
<th></th>
<th>Primiparous</th>
<th>Multiparous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Vitamins</td>
<td>a</td>
<td>b</td>
</tr>
</tbody>
</table>

Treatment x parity interaction ($P = 0.07$)
# Results - Reproduction

<table>
<thead>
<tr>
<th>Items</th>
<th>Primiparous</th>
<th>Multiparous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days open</td>
<td>130.7</td>
<td>135.5</td>
</tr>
<tr>
<td>Conception rate 1(^{st}) breeding (%)</td>
<td>40.1</td>
<td>36.6</td>
</tr>
<tr>
<td>Conception rate 1(^{st}) and 2(^{nd}) breedings (%)</td>
<td>71.1</td>
<td>65.1</td>
</tr>
<tr>
<td>Breedings/conception</td>
<td>2.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Pregnant at 150 DIM (%)</td>
<td>76.9</td>
<td>67.7</td>
</tr>
</tbody>
</table>

No treatment effect ($P > 0.05$)
### Results - Culling rate

<table>
<thead>
<tr>
<th></th>
<th>Primiparous</th>
<th>Multiparous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culling rate (%)</td>
<td>15.8</td>
<td>29.3</td>
</tr>
</tbody>
</table>

No treatment effect \( (P = 0.58) \)
Parity effect \( (P < 0.0001) \)

Primary culling reasons within 60 DIM:
- Diseases (27.7%)
- Injury (17.0%)
Conclusion

- Earlier first breeding date for supplemented multiparous cows could be caused by the supplement enhancing the energy metabolism efficiency in early lactation
  - Supported by cows receiving the supplement losing less body weight and body condition score, and having a reduced milk fat content and an increased milk protein content (Duplessis et al., 2012)
Acknowledgements

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Thank you!

Questions?