Dietary Anionic Mineral (CAD-MATE®) Addition Increases Body Pools of Readily Exchangeable Ca in Prepartum Sows

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Abstract
Increased milk production by "elite" sows is associated with an increase in unexplained sow mortality during the prepartum and early lactation periods. This is believed to be due to the increased demands for Ca in the mobilization of bone Ca reserves and/or increased Ca excretion from the kidneys. In a previous study using a commercial diet containing 0.4% CAD-MATE® anionic mineral salt, it was found that increases in Ca excretion correlated with increases in milk production. However, a subsequent study that matched intakes of Ca and water from the previous experiment found that increased milk production was associated with increased urinary Ca excretion but not with increased Ca intake. To further investigate the role of Ca excretion in prepartum sows on milk production, a novel anionic mineral diet (CAD-MATE®) was added to a commercial diet containing 1.0% Ca at 3.5% increments for 10 sows in 5 treatments. Sows were fed a diet containing 0.35% Ca and 0.3% dietary acid load (1.0% Ca + 0.35% dietary acid load) prior to feeding the anionic mineral diet. Urine samples were collected from 24-h urine collections for 7 days. For the urine samples, pH (range 7.41-7.33) and base (range 7.37-7.47) were measured. Venous blood was sampled daily to measure hormones, including that at least 2.0% CAD-MATE® addition is required to increase mobilization of body Ca reserves in prepartum sows.

Dietary CAD-MATE, %
Urine pH, mEq/d
Ca, mEq/d
Cl, mEq/d
SO4, mEq/d

<table>
<thead>
<tr>
<th>CAD-MATE %</th>
<th>0</th>
<th>0.5</th>
<th>1.0</th>
<th>1.5</th>
<th>2.0</th>
<th>2.5</th>
<th>SEM</th>
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<tbody>
<tr>
<td>pH</td>
<td>7.41</td>
<td>6.23</td>
<td>5.61</td>
<td>6.08</td>
<td>5.74</td>
<td>5.52</td>
<td>0.3</td>
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<tr>
<td>Ca</td>
<td>38.3</td>
<td>39.9</td>
<td>32.3</td>
<td>46.3</td>
<td>66.1</td>
<td>67.6</td>
<td>6.0</td>
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<tr>
<td>Cl</td>
<td>196</td>
<td>183</td>
<td>230</td>
<td>290</td>
<td>360</td>
<td>300</td>
<td>30.0</td>
</tr>
<tr>
<td>SO4</td>
<td>171</td>
<td>192</td>
<td>239</td>
<td>314</td>
<td>316</td>
<td>443</td>
<td>39.9</td>
</tr>
</tbody>
</table>

Methods

Animals and Diets
Thirty multiparous gestating sows (Large White x Landrace) were fed one of six dietary treatments (n=5) containing 0.35, 0.7, 1.0, 1.5, 2.0, and 2.5% CAD-MATE® sows prior to bladder catheterization. A standard 24-h gestation diet was supplemented with CAD-MATE® to an anionic mineral salt blend to provide excess choline and calcium. Dietary Ca levels were between 0.35 to 0.7% CAD-MATE® expressed in mEq/kg diet. Animals were fed 2.5 g diet/day and were allowed continuous access to water.

Bladder Catheterization
A Foley catheter was inserted into the bladder to allow for complete 24-h urine collections. Successful catheterizations were confirmed by the appearance of urine in the collection pail. Urine samples were collected for 7 days.

Urine Sampling and Analysis
For both 24-h collections, total urine excreted was recorded and sub-sampled. A pH measurement was taken. Fresh and acidified urine samples were collected and stored at 4°C until analysis. Urine was acidified (pH < 2) by adding H2SO4 to prevent loss of ammonia and bacterial release of urea.

Results
Incremental additions of CAD-MATE decreased pH but did not affect urinary Mg and Cl.

Conclusions
CAD-MATE induced a metabolic acid load based on urinary ion excretion. The dietary acid loads were compensated as blood bicarbonate increased and ECF phosphorus decreased. The results consistently indicate that at least 2.0% CAD-MATE® addition is required to increase mobilization of body Ca reserves in prepartum sows.