ASI 2014: US Sheep Experiment Station Update

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A Dash of Salt a Day, Could Keep the Scours Away

- **Neonatal scours**: Classic dysentery in lambs, <8 days following birth, that are most likely due to bacteria
  - *E. coli* (EHEC, ETEC), *Salmonella* spp.

**Although mortality is generally low,**

- **Anderson et al., 2003**: Calves (n = 3,637) that were diagnosed with scours early in life weighed 21 lbs less at weaning
- **Dorè et al., 1987**: Lambs that contracted diarrhea soon after birth gained less weight from 50 to 100 d of age than did healthy lambs
Searching for solutions: Defining the parameters

- **Strategy/product to minimize scours:**
  - Affordable
  - Efficacious
  - Complements the producers system
  - Preventative
  - Easily administered to the masses
  - Safe
  - Widespread application
Searching for the right product: Chlorate salts

- Given as a one-time single oral dose, chlorate salts reduced the presence of fecal *E. coli* (generic and pathogenic) and *Salmonella* spp. by 90 to 99.9% within 24 hours
  - Slaughter sheep, cattle, pigs, turkeys, and chickens, and weanling pigs

Chlorate salts: Utility and safety

- The bactericidal effects of chlorate salts seem short lived (Anderson et al., 2001).
  - In 26- to 29-d-old pigs, cecal *Salmonella* Typhimurium numbers were reduced 16 h after a single oral chlorate treatment, but by 24 h, numbers rebounded.

- We hypothesize that short-term, repeated treatment with chlorate salts will suppress intestinal pathogenic bacteria for several days and, thus, reduce incidence of scours in neonatal lambs.
Chlorate salts: Utility and safety

- Continuous, low-dose treatment of livestock with chlorate salt has not been investigated.

- Chlorate salts can be toxic to livestock (Steyn, 1933; Smith and Taylor, 2012); however, lethal doses were 5 to 100 times greater than we plan to evaluate.

- Nevertheless, we must determine the tolerance of lambs and ewes to various doses delivered over extended periods.
Chlorate salts: Utility and safety of continuous, low-dose oral treatment of neonatal lambs

- 36 neonatal lambs (<12-h-old)
- Chlorate salt treatment, placed in milk replacer, for 5 days
  - 0, 12, 24, 36, and 48 (mg.kg BW)^{-1}/day
- Measurements
  - Efficacy – fecal generic *E. coli*
  - Health – methemoglobin, BW
Chlorate salts: Effect on neonatal lamb health indicators after 5 days of continuous exposure

<table>
<thead>
<tr>
<th>Item</th>
<th>0</th>
<th>12</th>
<th>24</th>
<th>36</th>
<th>48</th>
<th>SE</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain, lbs</td>
<td>0.77</td>
<td>0.77</td>
<td>0.94</td>
<td>1.24</td>
<td>0.74</td>
<td>0.20</td>
<td>0.36</td>
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<tr>
<td>Methemoglobin, %</td>
<td>0.34</td>
<td>0.34</td>
<td>0.38</td>
<td>0.30</td>
<td>0.34</td>
<td>0.04</td>
<td>0.73</td>
</tr>
</tbody>
</table>

Chlorate salt intake, (mg.kg BW)$^{-1}$/day
Chlorate salts: Effect on neonatal lamb fecal *E. coli* after 5 days of continuous exposure

<table>
<thead>
<tr>
<th>Concentration (mg/kg BW/day)</th>
<th>Log10 generic *E. coli/g</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0MG</td>
<td>8.9</td>
<td></td>
</tr>
<tr>
<td>12MG</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>24MG</td>
<td>7.7</td>
<td>*</td>
</tr>
<tr>
<td>36MG</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>48MG</td>
<td>7.8</td>
<td></td>
</tr>
</tbody>
</table>
What’s next?

- 2011, 2012, and 2013 – Validated dose, dose strategy, and safety
- Spring 2014 – Test in the production system
- 2014 and 2015: Industry partnership
  - Further dose development
  - Product “package”
  - FDA clearance