Beef Feedlot Research at Iowa State University
Stephanie Hansen, Assistant Professor

Background
- Hometown Sergeant Bluff, Iowa
- BS in Animal Science from ISU
- MS in Animal Science from NCSU
- PhD in Nutrition from NCSU
- Post Doctoral position in genomics lab at NCSU
- Started at ISU in August 2009

Beef Feedlot Nutrition
- 70% Research
  - Basic
    - Cellular mineral metabolism, mineral interactions, biological mechanisms related to feed efficiency
  - Applied
    - Digestibility of novel feedstuffs, gain and efficiency of cattle, shipping stress, health
    - 30% Teaching
      - Developing PhD mineral metabolism course
      - Team teach ANS 520
      - Team teach ANS 419
      - Graduate student seminar

Hansen Lab Group
- Erin Richter, MS student
  - October, 2009 as Nutritional Sciences student
  - Rumen microbiology interest
  - Bacterial DNA
- Danielle Pogge, MS student
  - February, 2010 as Nutritional Sciences student
  - General ruminant mineral interest
  - Zoo nutrition

Research Facilities
- Beef Nutrition Farm
  - Open front shed with 60 pens, 6 head capacity
  - Smaller shed with 16 pens, 6 head capacity
  - Feed mill with overhead storage, bag storage, grain processing, batch scale and two horizontal mixers
  - Covered animal handling facilities, supply room and shop area
  - A 58’x 72’ building used for commodities storage and feed mixing

Research Interests
- Feed efficiency
- Mineral nutrition of beef cattle
- Trace mineral metabolism
  - Iron, copper, manganese
- Sulfur metabolism
  - High levels of sulfate in ethanol co-products
  - Can be problematic in feedlot cattle
  - Performance and carcass characteristics
Periodic Table of the Elements

Trace Mineral Interactions

Iron Absorption

Effects of High Iron

Copper and Sulfur

Copper

- Function
  - Bone formation
  - Hemoglobin synthesis
  - Enzyme systems
  - Hair pigmentation
- Deficiency
  - Fading hair coat
  - Lameness
  - Anemia/poor growth
- Mo, Fe and S can cause absorption problems
Copper, sulfur and molybdenum

- High sulfur & molybdenum → thiomolybdates
- Cu + thiomolybdates → insoluble complexes
- Thiomolybdates can result in reduced Cu absorption and systemic metabolism

NRC, 1996

Effect of dietary sulfate on performance

<table>
<thead>
<tr>
<th>Dietary sulfate, %</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain at weaning</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Feed efficiency</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Weaned calves kg</td>
<td>360.2</td>
<td>358.9</td>
<td>360.5</td>
<td>37.6</td>
</tr>
<tr>
<td>Weight gain kg</td>
<td>4.55</td>
<td>4.55</td>
<td>4.55</td>
<td>4.55</td>
</tr>
<tr>
<td>Dry matter kg</td>
<td>47.1</td>
<td>47.1</td>
<td>47.1</td>
<td>47.1</td>
</tr>
<tr>
<td>Weaning weight kg</td>
<td>321</td>
<td>321</td>
<td>321</td>
<td>321</td>
</tr>
<tr>
<td>Feed conversion</td>
<td>2.23</td>
<td>2.23</td>
<td>2.23</td>
<td>2.23</td>
</tr>
<tr>
<td>Nutrient fed</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>95</td>
</tr>
</tbody>
</table>

Zinn et al., 1997

Effect of dietary sulfate on carcass characteristics

<table>
<thead>
<tr>
<th>Dietary sulfate, %</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcass weight, kg</td>
<td>305.9</td>
<td>305.9</td>
<td>305.9</td>
<td>305.9</td>
</tr>
<tr>
<td>Dowry percentage</td>
<td>35.8</td>
<td>35.8</td>
<td>35.8</td>
<td>35.8</td>
</tr>
<tr>
<td>loin conditions</td>
<td>82.1</td>
<td>82.1</td>
<td>82.1</td>
<td>82.1</td>
</tr>
<tr>
<td>Ribs, 4th-6th</td>
<td>1.10</td>
<td>1.10</td>
<td>1.10</td>
<td>1.10</td>
</tr>
<tr>
<td>Fat cover, 4th-6th</td>
<td>1.10</td>
<td>1.10</td>
<td>1.10</td>
<td>1.10</td>
</tr>
<tr>
<td>Backfat, 4th-6th</td>
<td>1.10</td>
<td>1.10</td>
<td>1.10</td>
<td>1.10</td>
</tr>
<tr>
<td>Carcass yield</td>
<td>48.5</td>
<td>48.5</td>
<td>48.5</td>
<td>48.5</td>
</tr>
<tr>
<td>Loin dressing</td>
<td>11.5</td>
<td>11.5</td>
<td>11.5</td>
<td>11.5</td>
</tr>
</tbody>
</table>

Zinn et al., 1997
Ongoing Project

- **Power Fund project**
  - Developing model of sulfur--induced PEM
  - Learning about biochemical changes during sulfur toxicity
  - Develop diagnostic tools for vets
    - On farm and in the lab

- **Second phase**
  - Testing of ways to reduce or prevent sulfur toxicity
  - *In vitro* testing of methods to limit $\text{H}_2\text{S}$ gas production
  - *In vivo* testing of successful compounds and management strategies