Drought Concerns for Cattle Producers

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Drought Effects

• Water
  – Quantity
  – Quality

• Feed
  – Quantity
  – Quality
Drought Effects: Water

- Reduced *quantity* and *quality*
Drought Effects

• Concentration of non-volatile toxins:
  – Salts
  – Nitrates/nitrites
  – Toxic runoff or point-source components
Total Dissolved Solids

- < 3000 ppm • Satisfactory
- 3000-5000 ppm • Poor FE; loose stools
- 5000-7000 ppm • Unsafe for pregnant or lactating animals
- 7000-10,000 ppm • May cause brain damage or death
Drought Effects

• Altered pH
  – Alters toxicity of contaminants
  – Alters bioaccumulation
  – Alters biodegradation
Remember

Water = first limiting nutrient

Water intake drives feed intake
Major Livestock Concerns

• Loss of performance due to lack of water
  – Decreased milk production
  – Decreased gain
  – Decreased BCS

• Increased urinary calculi
Drought Effects: Feed

- Reduced *quantity* and *quality*
Drought Effects

- Decreased rangeland productivity
- Decreased livestock productivity
Drought Effects

- Decreased crop productivity
- Increased plant toxin accumulation
  - Nitrates
  - Aflatoxins
Nitrate Toxicity

• Problem primarily in ruminants
• Rumen microflora convert nitrate (NO$_3^-$) to nitrite (NO$_2^-$)
• Reduces Fe in hemoglobin to form methemoglobin (chocolate brown blood)
• NO$_2^-$ shuts down O$_2$-carrying capacity of hemoglobin
  – Asphyxiation
  – Abortion in sub-lethal doses
Nitrate Accumulators

- Sorghum
  - Sudangrasses
  - Forage Sorghums
  - Grain Sorghums
  - Johnsongrass
- Pearl Millet
- Pigweed
- Corn (volunteer)
Nitrate Levels

• Vary by location in the plant
  Stalks > Leaves >> Grain

• Vary by age of plant
  Young/actively growing > maturing/mature

• Vary with soil moisture levels
  – Drought-stressed
  – Drought ending rain

• Vary with fertilization
Nitrate Accumulators

• Cover crops
  – Turnips
  – Radishes
Nitrate Levels

- Can increase with cloudy, overcast days
- Does not dissipate when harvested as hay
Managing Toxicity

• Test plants before grazing or harvesting
  – Diphenylamine spot test – qualitative
  – Quantitative testing
Testing Labs

- Agronomy Dept
- SDK – Hutchinson
- ServiTech – Dodge City, Hastings, Amarillo
## Interpretation of Forage Nitrate Test

<table>
<thead>
<tr>
<th>ppm NO₃ (dry matter basis)</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3,000</td>
<td>Generally safe for all cattle.</td>
</tr>
<tr>
<td>3,000-5,000</td>
<td>Generally safe for non-pregnant beef cattle. Low risk or reduced breeding performance and early term abortions.</td>
</tr>
<tr>
<td>5,000-10,000</td>
<td>Some risk for all cattle. May cause mid to late term abortions and weak newborn calves. May decrease growth and milk production.</td>
</tr>
<tr>
<td>&gt;10,000</td>
<td>Potentially toxic for all cattle. Can cause abortions, acute toxicity symptoms, and death.</td>
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</tbody>
</table>
Managing Toxicity

• Test plants before grazing or harvesting
• Don’t graze or harvest “hot spots”
• Raise cutter bar when harvesting
• Ensiling will reduce NO$_3$ ≈ 20-50%
• Control weedy accumulator species
• Do not turn hungry cattle in on suspect forages
• Cattle can partially adapt over time
# Fungal (Myco)toxins

**Fungus:**
- Aspergillus flavus
- Fusarium graminearum
- Fusarium spp.
- Aspergillus & Penicillium spp
- Fusarium verticillioides

**Toxin:**
- Aflatoxins
- Trichothecenes
  - Vomitoxin (DON)
  - T-2
- Zearalenone
- Ochratoxin
- Fumonisins
Mycotoxins

- Dose-dependent response
  - Death
    - Sudden
    - Gradual onset
  - Organ damage
    - Performance loss
  - Reduced feed intake
    - Performance loss

- Young animals most susceptible
Mycotoxin effects

• Hepatotoxic
• Nephrotoxic
• Impaired protein synthesis
• Carcinogenic
• Embryotoxic
• Impaired immune function
• Pulmonary edema
• Ovarian dysfunction
## Aflatoxin

FDA guidelines for acceptable aflatoxin level in corn based on intended use ([www.fda.gov](http://www.fda.gov)).

<table>
<thead>
<tr>
<th>Intended use</th>
<th>Max. legal aflatoxin level</th>
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</thead>
<tbody>
<tr>
<td>Milk (dairy calf feed)</td>
<td>None detected</td>
</tr>
<tr>
<td>Corn of unknown destination</td>
<td>&lt;20 ppb</td>
</tr>
<tr>
<td>Corn for young animals</td>
<td>&lt;20 ppb</td>
</tr>
<tr>
<td>Corn for dairy cattle</td>
<td>&lt;20 ppb</td>
</tr>
<tr>
<td>Corn for breeding beef cattle, swine, and mature poultry</td>
<td>&lt;100 ppb</td>
</tr>
<tr>
<td>Corn for finishing swine</td>
<td>&lt;200 ppb</td>
</tr>
<tr>
<td>Corn for finishing cattle</td>
<td>&lt;300 ppb</td>
</tr>
</tbody>
</table>
Fumonisin

- Equine Leukoencephalomalacia
- “Moldy corn poisoning”
Toxic Plants

• Lack of available forage will force cattle to eat toxic plants that they would normally ignore.
Drought Effects: Summary

• **Water**
  – Quantity
  – Quality

• **Feed**
  – Quantity
  – Quality
Questions?