Newborn Calf Scours

Franklyn Garry, DVM, MS

Neonatal Calf Losses

- Death < 2 days old
  - Typically non-infectious
  - Associated with physiological derangements
    - Birthing trauma, difficult postnatal adaptation, etc.
- Death ≥ 3 days old
  - Likely infectious in nature
  - Potential physiologic problems that don’t kill may predispose to infectious problems

Calf Infectious Disease

- Localized / superficial
- Focal / inflammatory
- Septicemic

Calf Scours

- Rotavirus
- Coronavirus
- Cryptosporidium
- E. coli - K99
Calf Scours Enteritis

- Localized infection
- Minimal inflammation
- Minimal invasion
- Disturbed GI function

Calf Diarrhea Agents from Neonatal Calves

Cryptosporidium parvum

- Most common agent causing diarrhea, usually between 7 and 14 days of age
- During average infection
  - Calves shed oocysts for six to nine days
  - Calves scour for average of three days
  - 50 million oocysts per gm feces
  - Average calf sheds 40 billion oocysts
- Primary infection route is fecal-oral
  - Infective dose is between 10 and 100 oocysts
Rotavirus

- One of the most common agents causing diarrhea
- Usually seen 7 to 14 days of age
- Infectious dose is about 10 particles
- Within 48 hr post-infection, 1 billion viral particles per gm of feces
- Infects and destroys cells of small intestine

Coronavirus

- Typically causes disease between 7 to 30 Days of Age
- Similar type of damage to intestinal villus as Rotavirus, but more severe
- More severe
  - More severe damage to intestinal villi
  - Affects both small and large intestine

Normal Microvilli

Microvilli Blunted by rotavirus

Microvilli Destroyed by corona virus

Mechanisms of Diarrhea

- Hypersecretion
- Maldigestion
- Malabsorption
Influenza Enteritis

- Salmonellosis
- Invasive E. coli
- Clostridial enteritis

**E. coli diarrhea**
- Attaching and effacing E. coli: usually between 3 and 21 days

**Focal Inflammatory Disease**
- Inflammatory response and damage
- Disrupt organ function
- Toxin production / systemic effects
Septicemia

- Distribution through blood
- Multiple organ involvement
- Inflammation – widespread
- Multiple mediating factors

Most Scours in Calves are Mixed Infections

- Most common combination of agents are Cryptosporidium and Rotavirus
- Crypto and rotavirus are the most common mixed agents
- 30% of calves with diarrhea that are systemically ill are septicemic
- Most septicemic calves have had FPT
Learning issues

- The most common causes of calf diarrhea are crypto, rota and corona virus = calf scours.
- These occur most commonly between 1 and 2 weeks of age.
- These hurt or kill calves by causing fluid and electrolyte loss.
- Antibiotics do not affect these bugs, and the infection resolves on its own if the calf survives.

Learning issues

- Bacterial infections – Salmonella, E coli and clostridium CAN cause diarrhea, but also invade other tissues.
- These occur over a broader time range - like 4 to 30 days.
- These kill calves by invading and causing bad tissue inflammation and damage.
- Antibiotics may be useful against these bugs.

Diagnosis

- History
- Physical examination
- Laboratory testing
- Response to treatment
- Necropsy

Physical Examination

- Skin tent
- Strength and Activity
- Eyeglobe position
- Peripheral perfusion
- Diarrhea

= evidence of dehydration
Physical Examination

**Diagnosis**
- TPR
- M M perfusion
- Mentation
- Suckle response
- Abdominal fill
- Extra-GI involvement

**Findings Suggestive of Septicemia**

**Physical findings**
- Red / inflamed mucous membranes
- Prominent scleral blood vessels
- Depression > dehydration
- Profound depression w/o severe diarrhea
- Multiple organ system problems

**Physical diagnosis**
- Must compare groups of observations
  - Depression, diarrhea, hydration
  - Diarrhea, extra-GI, inflammation
  - Age, clinical course, history

**Treatment**

**Scours**
- Fluid Therapy - critical Oral, subcutaneous, intravenous
- Antibiotics - very limited efficacy May be deleterious
- Adjunctive treatments - may have value
It is crucial to know the cause of calf scouring to treat it effectively.

**Clinical signs**
- Mildly depressed, increased urination
- Sunken eyes, tight skin, dry mouth, and nose, but still standing
- Previous signs worsen: cold ears and legs, unable to stand
- Shock and death

**Loss of body water (%)**

<table>
<thead>
<tr>
<th>Loss of body water (%)</th>
<th>Milk (lb/d)</th>
<th>ORS (lb/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>12</td>
</tr>
</tbody>
</table>

**Diet (lb/d)**

- ORS = Oral Rehydration Solution; amount needed to restore fluid balance in addition to the daily milk allotment for 100 lb calf

**Diagnosis**
- Physiologic parameters
- Fecal analysis
- ELISA, EM, Parasitologic, Bacteriologic Culture
- Hemogram
- Blood culture
- Viral isolation

**Response to treatment**
- IF you are treating calves with simple scouring, where the main problem is diarrhea and dehydration
- IF you treat scouring calves early, when they have mild or moderate fluid loss
- IF you use oral fluids and electrolytes with the right amount and composition
- THEN response to treatment will be very good

**Figure 1: Dehydration is the primary cause of death when a calf has diarrhea.**

*ORS = Oral Rehydration Solution amount needed to restore fluid balance in addition to the daily milk allotment for 100 lb calf
Response to treatment

- IF you use oral fluids and electrolytes with the right amount and composition
- And the calf response to treatment is POOR

- OR—
- IF calves have a more complex problem with bacterial infection
- IF calves are very depressed or have fever and signs of disease besides diarrhea

- THEN you need your veterinarian

Necropsy

- VERY underutilized in cattle medicine
- Most valuable diagnostic step if calves are dying

- Coordinate with your local diagnostic lab
- Provide thorough information to the lab
- Send the right samples for the right reason

Newborn Calf Oral Fluid Therapy

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**Eye Globe Position**

Fig. 1. Calf on the left (A) has a normal hydration status. There is no space between the eyelid and the eyeball. The calf on the right (B) is severely dehydrated. The eye is sunken at least 7 to 8 mm into the orbit. (Courtesy of Peter Constable, BVSc, MS, PhD, MRCVS, West Lafayette, IN.)

**Assessing Hydration Status**

Table 1
Guidelines for assessment of hydration status in calves with diarrhea

<table>
<thead>
<tr>
<th>Dehydration</th>
<th>Demeanor</th>
<th>Eyeball Recession</th>
<th>Skin Tent Duration (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5%</td>
<td>Normal</td>
<td>None</td>
<td>&lt;1</td>
</tr>
<tr>
<td>6%-8% (mild)</td>
<td>Slightly depressed</td>
<td>2-4 mm</td>
<td>1-2</td>
</tr>
<tr>
<td>8%-10% (moderate)</td>
<td>Depressed</td>
<td>4-6 mm</td>
<td>2-5</td>
</tr>
<tr>
<td>10%-12% (severe)</td>
<td>Comatose</td>
<td>6-8 mm</td>
<td>5-10</td>
</tr>
<tr>
<td>&gt;12%</td>
<td>Comatose/dead</td>
<td>8-12 mm</td>
<td>&gt;10</td>
</tr>
</tbody>
</table>

Severity of diarrhea / dehydration vs Loss of base with Scours

- Normal: 0 - 5 mEq/L
- Mild: 10 mEq/L
- Moderate: 15 mEq/L
- Severe: 20 mEq/L

Goals of Scours Therapy

- Maintain / improve hydration
- Correct acid - base imbalance
- Supplement appropriate electrolytes
- Judicious antimicrobials
- Help damaged gut / stop diarrhea

Rehydration is the key to saving the life of a severely diarrheic calf.

Clinical signs
- Mildly depressed, increased urine output
- Sunken eyes, tight skin, dry mouth and nose, but still standing
- Previous signs worsen; cold ears and legs, unable to stand
- Shock and death

Loss of body water (%)

Diet (lb/d)

Milk ORS

0 10 0
10 2 10 5
10 7 10 10
10 12

Figure 1: Dehydration is the primary cause of death when a calf has diarrhea.

* ORS = Oral Rehydration Solution; amount needed to restore fluid balance in addition to the daily milk allotment for 100 lb calf
**Treatment of Scours**

**Fluid Therapy !!!**

**Fluid Imbalances From Scours**

- Hypotonic dehydration
- Metabolic acidosis

- **HCO\textsubscript{3}**
- **Na\textsuperscript{+}**
- **Cl\textsuperscript{-}**
- **K\textsuperscript{+}**

**Oral fluid products**

- Need to have sufficient sodium to make up for losses
- Need to also have chloride and potassium
- Need to have alkalinizing ability
- Glucose and glycine promote sodium absorption
- Must continue milk feeding – electrolyte products do not have enough nutrition
Oral fluid products

- Alkalinizing agents
  - Bicarbonate (HCO3)
  - Acetate
  - Propionate

Alkalinizing agents
- Bicarbonate increases blood pH but also increases pH in abomasum
- Increasing abomasum pH may allow bacteria to move to lower bowel
- Acetate and propionate increase blood pH but do not affect abomasum

Oral fluid products
- Resorb
  - Sodium too low
  - No alkalinizing agent
  - Poor choice for scours
**Additional products without alkalinizing agent**
- Bovine bluelite
- Blue Ribbon
- Renew
- Calf Restart
- Sav-A-Calf
- One Day Response

**Additional poor choices**
- Advance Arrest
  - Low sodium, low alkalinizing
- Deliver
  - Low sodium, poor alkalinizing

**Oral fluid products**
**Good choices**
- Hydrafeed
- Entrolyte and Entrolyte HE
- Revitilyte
- All have high levels of Bicarb

**Oral fluid products**
**Very good choices**
- Land O Lakes Base plus Add Pack
- Diaque
- HydraLyte
- Epic Calf Electrolyte
- All have acetate instead of bicarb
Infectious disease prevention

- Minimize exposure - maximize resistance
- Colostrum
- Nutrition
  - Cold weather
  - Physiological ‘strength’
- Warm / dry/ protected
  - Thermoneutral zone
- Fresh water
- Low stress