

**VMS 361 Agricultural Animal Health**

**Bovine Health Section**

Calf Scours

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**Scheme:** You manage a large livestock operation

- As manager, you need to be able to explain the “why’s” sufficiently to:
  - Establish standard operating processes (SOP’s)
  - Train, motivate, monitor and evaluate employees applying the SOP’s

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**My class PowerPoints & materials are on-line**

Google "wsu jmgay index"

http://www.vetmed.wsu.edu/courses-jmgay/

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**How much is problem costing (or could cost) the operation?**

First step for determining management strategy:

- **Total Calf Mortality (death) prior to weaning – USDA NAHMS**
  - 6% Beef
  - 11% Dairy
- **Scours as reason for Mortality:**
  - 18% Beef
  - 60% Dairy

*Calf Scours is a Big Deal!! $$$$$$

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**Diarrhea is the disruption of normal gut physiology**

- Body water cycles in and out of intestinal tract as part of digestion
  - 25% of body water cycles thru intestinal tract daily
- Two forms of disruption:
  - Normal secretion into intestine, reduced (malabsorption) back out
    - Most infectious diarrheal agents
    - Fermentative diarrhea
  - Excess secretion (hypersecretion) into intestine, overloaded reabsorption back out
    - *E. coli* K99, cholera

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**What is it? (the really simple version of “what?”)**

**Diarrhea: Loss of body water & salts (electrolytes)**
Balanced intake and output are essential to normal fluid balance.

Body Fluids are 60% of Body Wt: 
- Blood 5%
- Tissue 15%
- Cellular 40%

Water Intake is balanced with Fecal and Urine Loss.

Diarrhea causes dehydration and electrolyte imbalance:
- Body water loss => Dehydration
  - Circulation effects: Skin "tents", sticky mouth, cold limbs and ears, sunken eyes
  - Urine output drops and stops if severe
- Body electrolyte (salts) loss and imbalance
  - Affects heart and skeletal muscle function
    - If shifts are severe enough, heart stops
  - Depresses CNS

Depressed scouring calf:

Malabsorption causes diarrheal imbalance:

Hypersecretion causes diarrheal imbalance:

The most important treatment is replacement fluid:
- Detect scouring calf before fluid loss becomes profound so oral replacement works
- Replace both lost body fluid (water) and electrolytes (salts) in large enough quantity often enough that loss does not become profound
What to buy: Oral rehydration solutions (ORS) have 4 key ingredients besides water

- Dextrose (glucose) – for energy
- Glycine – for absorption
- Salts - potassium chloride, salt, dicalcium phosphate, magnesium sulfate
- Sodium bicarbonate - buffer

2.3% glycine and 44 grams dextrose (glucose)
- “high energy” label – required to fuel absorption
- Caution: Still only ½ the energy of milk!

Feeding only fluids too long leads to death by starvation / hypothermia

Use esophageal feeder to quickly transfer fluids

Must be inserted carefully and sanitized between calves

Use high energy electrolytes with glycine

Entrolyte H.E. Re-sorb

For several reasons, antibiotics are the least important treatment!

- Agents that cause calf scours are:
  - Viruses or protozoa that antibiotics have no effect upon
  - Bacteria that are usually resistant to the OTC antibiotics
- Antibiotics, particularly OTC (over the counter) oral antibiotics, are usually ineffective!
  - Antibiotics in scour boluses
  - Antibiotic-containing milk replacer
  - Antibiotic-containing starters

For several reasons, antibiotics are the least important treatment!

To be successful, treatment must be early!

Determine how to treat a scouring calf by classifying it into one of three categories

- **Degree of dehydration**
  - Early < 5% Body Wt – supplemental oral fluids
  - Moderate 7% Body Wt – high energy oral fluids
  - Severe > 9% Body Wt – emergency IV fluids

- **5 classification components - LOBES:**
  - L imbs
  - O ral membranes
  - B ody Position
  - E yes
  - S kin

Key to successful treatment!
Early Fluid Loss (<5% BW)

- Calf is:
  - Limbs - warm
  - Oral membranes - moist
  - Body position - bright, standing
  - Eyes - bright
  - Skin - "tents" for < 4 seconds

- Calf will suckle electrolyte solution from a bottle

- Leave calf on milk and add several 2 quart electrolyte feedings per day until scouring slows
  - Reason: If calf doesn't have adequate fat reserves, feed removal can cause death by starvation/hypothermia before scouring stops

Dehydration Sign — skin "tenting" pinch test

Loose skin of neck, chest

Eyelid

Moderate Fluid Loss (7% BW)

- Calf is:
  - Limbs - cold
  - Oral membranes - warm but sticky
  - Body position - dull, lying down but upright
  - Eyes - sunken slightly with a slight gap
  - Skin - "tents" for 5 secs

- RX: to survive 1/2 gallon of warm special "high energy" electrolyte solution (Enterolyte HE) by esophageal feeder twice several hours apart

- Move to warm area where calf can be monitored

Severe Fluid Loss (>9% BW)

- Calf is:
  - Limbs - cold
  - Oral membranes - cold, pale and dry to touch
  - Body position - lying flat in a coma
  - Eyes - deeply sunken with a big gap
  - Skin - stays "tented"

- RX: Only 1 gallon of special electrolyte fluids by IV drip will save the calf
  - SQ and oral fluids won’t be absorbed because circulation is too poor

- Unless you can do IV’s, take calf to veterinary clinic

Fluid volume must replace loss and keep up with continuing losses

- Enough balanced electrolyte fluids must be given to:
  - Replace % of body weight (BW) lost
  - Meet maintenance requirements (50 ml / kg BW per day)
  - Keep up with ongoing loss of 1 to 4 Liter per day in the diarrhea

- For a 7% dehydrated 80 lb calf, this is 6 to 9 quarts of electrolyte solution the first day
  - 1 Enterolyte H.E. pack is only 2 quarts! -> 4 packages
Commonest Infectious Diarrheal Agents

- **Bacteria**
  - *Escherichia coli* (*E. coli*) strains
  - *Salmonella* serotypes dublin, typhimurium, newport and others
- **Viruses**
  - Rotavirus
  - Coronavirus
- **Protozoa**
  - Cryptosporidia
  - Coccidia

Use a systematic, integrated approach to disease control:
Milk pasteurization model

**Pasteurization: Time vs. temperature thermal death curves**
for target organisms

Key *E. coli* characteristics

- Normal gut flora of all mammals so *E. coli* is ubiquitous (everywhere)
- Three disease forms:
  - Colisepticemia - any strain
  - Enterotoxigenic - specific strains
  - Enteropathogenic - specific strains
- A most common cause of calf death
- OTC antibiotics are usually not effective
- Some very effective ones are illegal to use!

Baytril cannot be used off-label, even by veterinarians

- “Federal law prohibits the extra-label use of this drug in food-producing animals”
- A complete veterinarian’s label doesn’t protect you from prosecution by the FDA

Colisepticemia is caused by any *E. coli*

- Spreads through calf’s body to cause abscesses in the brain, eyes, kidneys, and joints
- Occurs when calf ingests manure, mud or other material before or along with colostrum
- Virtually impossible to treat successfully
- Prevented by:
  - calving in clean, dry areas
  - cows having clean udders
  - Harvesting colostrum cleanly and keeping refrigerated or frozen
  - feeding 4 qts of high quality colostrum within 4 hours of birth

*E. coli* are everywhere in manure-contaminated mud!
Bad conditions > First mouthful is E. coli!

Low density, no mud > Excellent conditions!

Calving on Winter Feedground

High density, lots of manure > Very poor conditions!

**Enterotoxigenic E. coli (ETEC)**

- **Specific strain (K99)** attaches to intestinal cells and causes a hypersecretory diarrhea
  - Toxin turns on cell’s fluid pump
- Almost the only diarrhea that occurs within first 3 days of life, often in first day
  - Calf can die of dehydration before diarrhea appears!
- Prevented by feeding colostrum containing K99 antibodies
- Cow vaccine available

**Corona & Rotaviral Diarrhea**

- Virus kills cells of intestinal villi, causing malabsorption diarrhea
- Calf begins shedding $10^{11}$ virus per gram of feces 3 days after infection
- Carrier cows continually shed low numbers of virus
- Virus survives weeks in the environment
- Vaccines available
- Antibiotics are ineffective (virus)

3 Keys to Management
Cryptosporidial Diarrhea

- Ubiquitous organism that survives for months in the right environment
- No practical antibiotics are effective
- Not killed by most disinfectants
  - Chlorine dioxide at practical concentrations (?)
- Killed by complete drying
- This is a zoonotic disease, particularly for the immunocompromised

Salmonella Diarrhea

- Calves can shed it in feces, urine, saliva and nasal secretions, contaminating everything they touch and everything that touches them (hands, esophageal feeders, nipples, ...)
- Salmonella survive in the environment for months
  Only direct sunlight kills it in the environment
- Usually resistant to OTC antibiotics
The major Salmonella transmission cycle is typical of most enteric pathogens: fecal-oral with fecal exposure being the major risk

Salmonella Diarrhea

- **Antibiotics:**
  - Depress the normal bacterial flora, making the animal more susceptible to infection and prolonging the diarrhea
  - May be required if infection is systemic; use injectable
- Vaccines of questionable effectiveness
- This is a *zoonotic disease*, meaning that humans get it!
  - Practice careful personal sanitation with hands, boots, clothes

Low level Salmonella contamination can cause problems

Salmonella has superb survival abilities, surviving well under common farm environmental conditions

- Salmonella survives for months in materials that dried without heating, such as fecal pats and dust
  - Killed by exposure to direct sunlight
- Salmonella survives well in water
  - Killed by microbial predators in water
- Salmonella replicates in moist environments (<85% dry matter) even with scarce nutrients
  - Salmonella will grow on a wet board!
  - Moist feedstuffs
- Salmonella replicates in the intestinal tract of every species in the farm environment
  - Livestock, humans, domestic pets, vermin, wild animals