HEIFER HEALTH & DISEASE
tipping the scale in our favor

HEALTH
Newborn
Immunity
Weak Nutrition
Pathogens
Environment
DISEASE
Pathogen load
Changes
Stress
Environment

CORNELL UNIVERSITY

EXTENSION
Presentation collaborators

Jerry Bertoldo, DVM
Dairy Specialist
Cornell University Extension/PRO-DAIRY

Julie Smith, DVM
Extension Dairy Specialist
University of Vermont

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Health Triad

Environment

Disease Agent Immunity

“If you always do, what you’ve always done,
You’ll always get, what you’ve always got.”
You have a starring role!

- Develop SOP’s, train and check for compliance
- Identify and record key observations & treatments
- Investigate direct and indirect factors including the use of diagnostics and necropsies!
- Implement appropriate practices and procedures for treatment and prevention
The Picture of Calf Health

Health Status

Pathogen Exposure

Environment Stress

Resistance Nutrition
The Reality

9% of unweaned calves nationwide (excluding the DOA’s) die, primarily of diarrhea diseases

Dystocia calves (3/5 score or higher) are 3.8 times more likely to get sick and 4.5 times more likely to die than ones having a normal birth

These represent 60% of all calf deaths
Most wanted calf killers

The most common findings on a young stock necropsy?

- Dehydration
- Under-nutrition
Metabolic Impact of Dystocia

poor awareness & underrated

- Physical trauma, inactivity and congestion
- Low blood oxygen levels
- Hypothermia (<101°F)
- Respiratory acidosis
- Transient hypoglycemia
- Poor IgG absorption
- Poor innate response
The Source of Disease

- Adult cattle are “hotels” for most disease pathogens
- Sick calves and stressed adults are the “factories”
In Utero Diseases

- BVD (PI or persistently infected)
- Leptospira hardjo-bovis
- Neosporosis
- Brucellosis
- Johnes
- Leucosis
Diseases from Adults around calving

- **BRSV** - nasal discharge
- **Mycoplasma** - nasal and vaginal discharge, colostrum
- **Leukosis** - colostrum, in utero
- **Johnes** - colostrum, manure, in utero
- **Salmonella** - manure, colostrum, saliva
- **E. coli, Rotavirus, Coronavirus, Coccidia, Cryptosporidia** - manure
Understanding Pathogen Risk

- Adult world bugs present a risk to young stock which decreases with age.
- *Scour* microbes infect via the organic matter/feces to mouth route.
- *Respiratory* ones rely on nose to nose or aerosol transmission.
- Mutations guarantee pathogen change despite a closed herd situation.
Disinfectants

- Work better after dirt and organic material has been removed
- Effect logarithmic reduction in pathogen load
- Affected by temperature, concentration, pH, water hardness, presence of organic material
Characteristics of Disinfectants

- Iodophors active at acid pH but not alkaline
- Sodium hypochlorite (bleach) most active at pH 6
- Increase in temperature rapidly increases effectiveness of alcohols
- Dilution of phenolics significantly decreases strength of activity
Household bleach

- **Sanitizing strength**
  - 200 ppm, 1 Tbsp/gal
  - 10 min contact, rm. temp., pH 6-7

- **Disinfecting strength**
  - 2400 ppm, 6 oz (3/4 C)/gal; 2 min

- **Tuberculocidal (hospital) strength**
  - 5000 ppm, 1 ½ C/gal
  - 1 min contact, rm. temp., pH 6-7
The Everyday Challenge

- “Wet” calves followed by weaned ones present the majority of replacement health issues on the dairy.
- 80% of calfhood disease is enteric with respiratory problems majority of the rest
- Local, surface lung immunity is good by 6 weeks of age, the gut takes several months to get to the same stage
Passive Immunity from Colostrum

- Immediate
- Short-lived Ig (11.5-16 day half-life)
- Antigen specific

Birth

3 weeks old

calf Ig response
colostrum Ig
Active Immunity

- Newborns have 20-25% of the adult level of immune "machinery"
- Only limited response possible in first 7-10 days of life
- Natural exposure and vaccines use same pathway to protection
- Age is no guarantee of immune progress
Primary and Secondary Immune Response

(Anamnestic Response)

Time in days from 1st antigen exposure

0 14 21 28 35

Titer Response

Memory Cells

2nd exposure
How to Ruin a Good Immune Response

- Increase stressors - cortisol release
  - Dystocia
  - Discomfort
  - Excessive heat (>85°F) or cold (<°F)
  - Rough handling/increase fear
  - Isolation from other calves
  - Mingling of wide range of age and sizes
  - Multiple procedures at one time
How to Ruin a Good Immune Response

✦ High endotoxin exposure
  - Vaccines from gram-negative bacteria such as E. coli, salmonella, pasteurella, hemophilus, moraxella, leptospira
  - Coliform laden milk whether pasteurized or not

✦ Chronic disease exposure
  - Coccidia
  - Parasitism
  - BVD PI’s in herd
Got scours?
Scour Facts

- Most prevalent between 5-14 days
- 2/3 of preweaned deaths
- Colostral protection in gut last only 5-7 days, but can be prolonged with whole milk feeding
- Always a “mixed bag” of pathogens
- Calving pen hygiene and prompt calf removal is key to control
Age - Clue to agents involved

Adapted from Navarre CB, 2000 Vet Clinics N. Am. FAP p37

- **Enteropathogenic E. coli**
  - < 5 days: Acute Enterotoxigenic
  - 5 to 30 days: days to 3+ wks

- **Clostridium perf C**
  - 3 to 7 to 14 days

- **Salmonella**
  - 1 to 5 wks

- **Rotavirus**
  - 14 days to 6 mos

- **Corona-virus**
  - 21 days to 2 years

- **Cryptosporidium**
  - 14 days to 6 mos

- **Giardia**
  - 1 to 5 wks

- **Coccidia**
  - 5 to 30 days

Mixed infections common
## Common ‘agents’ incriminated in calf scours

1. **Enterotoxigenic E. coli**  
   Gram (-) bacteria

2. **Salmonella** (typhimurium, newport)  
   Cousin to *E. coli*

3. **Clostridium perfringens type C, B (A?)**  
   Gram (+) spore-former - *Sarcina* - oddball

4. **Non-specific ‘environmental’ bugs**  
   *E. coli*, Gram (+) *Staphs, streps* - drain on immune system?

5. **Rotavirus**  
   Ubiquitous *Viruses*

6. **Coronavirus**

7. **Cryptosporidia parvum**

8. **Giardia**

9. **Eimeria coccidia**

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**Bacteria**

**Protozoal Parasites**

**Viruses**
1. “Non-specific” bacterial scours

Feeding Sam Leadley’s “Bacterial Soup”
- Contaminated colostrum, milk, feeding utensils, etc
- Streps, staphs, **E. coli** - from cows and feces

Persistent, mild to moderate scours, slow calves

We can feed calves overwhelming levels of bugs
- Room temp milk - *E. coli* generation time is ~ 20 minutes.
- Millions in a couple of hours is easy.
2. Enterotoxigenic *E. Coli*

- Acute death in healthy calf at 1-5 days.
  - Often before scours appears.
  - Intestine is susceptible only first few days.
  - *Calf septicemia, E. coli* mastitis,
- Bacteria adhere by hairy fimbria (K99)
  - Toxins cause severe secretory diarrhea, dehydration and death.
  - Many *E. coli* strains - vaccines against a major strain, K99, are effective.
  - Source: cow, environment, infected calf
3. Salmonella

**Cousin to E. coli**
- Affects calves later - 6 days to 2 weeks
- Severe diarrhea; \textit{S. dublin} - respiratory disease
- Some species multi-drug resistant
- High morbidity or mortality

**Highly contagious**
- Different strains, different signs
- Inflammation and necrosis of intestinal tract
- Septicemia with
- Strict animal, pest and worker biosecurity necessary to break cycle of spread
4. *Clostridium perfringens*  
Types C, A & Sarcina

- Usually 7 days - 4 weeks; typically acute weakness, bloat and death in healthy calves; hemorrhagic enteritis.
- Overgrowth of normal inhabitant of environment and gut
  - Anaerobic spore forming, gas producing bacteria
  - Overgrows in favorable conditions – carbohydrate, high pH
  - Produces multiple toxins
- Associated with ‘large volume’ meals (2x), early starter intake, hard water, milk replacer vs. whole milk
- Perforating abomasal ulcers, abomasal crepitus (like bubble wrap) may indicate Sarcina
- Need feeding management and vaccination strategy
5. Rota and Corona Viruses

- **Ubiquitous** - probably the most common causes of scours.
  - Almost always mixed with other infections
  - Calves appear bright until dehydration; wt. loss, acidosis

- **Rota** - 5 to 21 days of age is common.
  - Damage heals with support in 5 days
  - Colostral antibody in blood and gut lumen protective for 4-5 days
  - Many strains of Rota that easily change

- **Corona** - 5 to 30 days - more severe gut villi damage.
  - Depression, protracted scours, often mild respiratory bout
  - Damage from corona infection takes weeks to recover
  - More common in colder climates
6. Cryptosporidium parvum

- 1-4 weeks of age; peak shedding at 12-14 days
- Mild scours to severe cases requiring aggressive fluid support.
  - Often mixed infection; 6-10 day duration. Calves lose wt.
  - Multiples in gut (auto-infective) and re-infests intestinal cells
  - **VERY CONTAGIOUS** - Shed in extremely high numbers
- Most farms infected
- Mortality low, frustration high
- No effective treatment ***
- Survives in environment, hard to destroy.
7. *Eimeria* spp. - *Coccidia*

- **Clinical disease after 17 days (21 day life cycle)**
  - often post-weaning, stress related disease
  - 2 common species; several minor ones

- **95% of infections are subclinical**
  - Unthrifty, poor gains
  - Manure rings on tail
  - Immunosuppression leads to respiratory problems

- **5% are clinical**
  - Blood in manure
  - Risk of death
  - Stunted by intestinal damage
Prevention trumps treatment!
- Must not rely on starter medication to prevent infection
- Normal starter and milk replacer doses will not rid a clinical infection
- Medicate milk or milk replacer from day one!
- Medication through weaning must be seamless

Not all products are the same
- Rumensin®, Bovatec®, amprolium kill
- Deccox® inhibits
8. Giardia (water borne)

- 2 weeks to 6 months.
  - Very contagious; on most farms.
- Giardia-associated scours - likely seen with mixed infection with cryptosporidia, coccidia, coronavirus
  - Trials did not show significant affect on growth
  - May “tip” the balance with mixed infections causing persistent scours
- **Fenbendazole strategy reduces scours and shedding if significant.**
9. “Nutritional” Scours

مصادر غذائية

لا هو "مرض"

-它可以发生在任何年龄段
-没有，轻微或暂时的食欲减退，粪便的质地，颜色或量的变化

-适应于“变化”在饮食中？:

-密度，体积，时机，牛奶温度，环境温度，喂食器
-脂肪，蛋白质，碳水化合物等。

-可能是你需要减少喂食水平或数量，评估常规-一致性，时机，频率，或者评估产品质量的指示。

康奈尔大学 促进
威斯康星大学 联合国

The UNIVERSITY of VERMONT

EXTENSION
Signs and severity of dehydration

If scours have started, you are late to the party

Focus on detecting these!

<table>
<thead>
<tr>
<th>Clinical signs</th>
<th>Loss of body water (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mildly depressed, increased urine output</td>
<td></td>
</tr>
<tr>
<td>Sunken eyes, tight skin, dry mouth and nose, but still standing</td>
<td></td>
</tr>
<tr>
<td>Previous signs worsen, cold ears and legs, unable to stand</td>
<td></td>
</tr>
<tr>
<td>Shock and death</td>
<td></td>
</tr>
</tbody>
</table>

ORS = Oral replacement solution; works best 2-6% dehydration

Acidosis

ORS* = Oral replacement solution; works best 2-6% dehydration
Oral Replacement Fluids - Basics

**BASICS (water!)**
- Any commercial electrolyte, before she scours, calf temperature (102°F)
- Get comfortable using the tube feeder

**Finer tuning**
- High glucose, bicarbonate or acetate, glycine, especially if depressed
- Switch to simple electrolyte after 1-2 days
- Part as subcutaneous fluids (warm)
Approx. fluid replacement for scouring calf (100 lbs)

<table>
<thead>
<tr>
<th>% Dehydration</th>
<th>Amt fluid to replace body water Qts/d</th>
<th>Amt. for maintenance water requirement Qts/d</th>
<th>New daily diarrhea loss Qts/d</th>
<th>Total fluid required per day Qts/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>2.5</td>
<td>2-4</td>
<td>5.5-7.5</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2.5</td>
<td>2-4</td>
<td>7.5-9.5</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>2.5</td>
<td>2-4</td>
<td>9.5-11.5</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>2.5</td>
<td>2-4</td>
<td>11.5-13.5</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>2.5</td>
<td>2-4</td>
<td>13.5-15.5</td>
</tr>
</tbody>
</table>

Maintenance water requirement estimated by McGuirk, 1992 ~ 25 ml/ lb /d
Oral replacement fluids most effective @ 2-6% dehydrated
Antibiotics?

- Depends on severity and if infection is systemic
- Most of scour agents are not susceptible
- Effective antibiotics are usually extra label or the dosage needed is
- Little attention to normal gut flora restoration
Respiratory Disease

- Usually a post-weaning problem unless poor colostral immunity; 1/4 of preweaned deaths nationwide
- Better, longer IgG protection than for scours
- Pneumonia less than 3 weeks of age is indicative of low blood selenium, poor ventilation, airborne allergens, improper tube feeding, large nipple holes or hot BRSV infections in freshening heifers
Respiratory Disease

- Pre-weaning usually viral
- Post-weaning heavily bacterial with mixed infections common
- Coccidiosis can be a potent predisposing factor to disease after weaning
- Cold air increases the penetration of microbes into the lung (Grandma was right about those drafts!)
Respiratory Disease Impact

- Much greater impact on height and weight gains than scours
- Calves with pneumonia <90 days of age are 2.5 X more likely to die before calving
- Fresh heifers having pneumonia histories show higher rates of acute pneumonia and sudden death
Preventative use of Terramycin™, Aureos®, and Aureomycin™ feed additives often effective “band-aid”

Antibiotics are more effective for lung disease than for scours, BUT select based on farm experience and diagnostics AND go high on doses and long on treatment days!!

Early identification and prolonged therapy is rewarding especially for mycoplasma
Addressing Respiratory Disease

- Isolating sick animals for treatment and biosecurity
- Give easy access to feed and water
- Provide supportive therapy i.e. fluids, drenches, anti-inflammatory drugs, vitamin/min supplements
Respiratory Pathogens

**Viral**
- IBR (uncommon w/ vaccination programs)
- BVD (usually a stressor)
- BRSV (primary)

**Bacterial**
- *Pasteurella multocida/ Mannheimia hemolytica* - primary
- *Mycoplasma* – secondary?
- *Salmonella dublin* - new, primary, weaned +
- *Hemophilus (Histophilus)* - secondary, chronic
- *Arcanobacter (Actinomyces)* – secondary, chronic
Vaccination Strategies

- Do no harm!
- No earlier than 3 months if closed herd OR poor colostrum management OR no serious problems
- Avoid combination vaccines early with unnecessary components - e.g. 4/5-way w/Lepto
- Vaccines given before 3 months of age provide dubious “primary” protection
Vaccination Strategies

- Use modified live virals at least by breeding age
- Include type 2 BVD always
- Add *Lepto hardjo* before/at move to group pens with or without tetracycline “firewall”
- Avoid more than two gram-negative vaccines at a time regardless of age
## Example Calf & Heifer Vaccination Schedule

<table>
<thead>
<tr>
<th>VACCINATION</th>
<th>CORE YES/NO</th>
<th>TIME/AGE</th>
<th>BRAND EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clostridium C&amp;D</td>
<td>NO</td>
<td>1-5 days of age</td>
<td>UltraChoice C&amp;D</td>
</tr>
<tr>
<td>Intranasal IBR-PI3</td>
<td>NO</td>
<td>Newborn, pen moves; as needed</td>
<td>TSV-2</td>
</tr>
<tr>
<td>MLV –IBR, PI, BRSV, BVD killed?</td>
<td>NO</td>
<td>7-14 days if early respiratory infections; repeat at 5-6 weeks</td>
<td>Bovi-Shield 4 Prism 4</td>
</tr>
<tr>
<td>Pasteurella Mannheimia</td>
<td>NO</td>
<td>5-8 weeks (and older) if weaning age pneumonia</td>
<td>One-Shot Once PMH</td>
</tr>
<tr>
<td>Lepto hardjo bovis</td>
<td>NO</td>
<td>At or just prior to weaning; repeat in 4 weeks</td>
<td>Spirovac Vista line</td>
</tr>
<tr>
<td>Haemophilus</td>
<td>NO</td>
<td>5 weeks and older if other vaccines not controlling pneumonias</td>
<td>Somubac</td>
</tr>
<tr>
<td>MLV – IBR, PI3, BRSV, BVD killed?</td>
<td>YES</td>
<td>1st dose 12-16 weeks old Repeat in 4-8 weeks</td>
<td>Bovi-Shield 4 Prism 4</td>
</tr>
</tbody>
</table>
# Example Calf & Heifer Vaccination Schedule

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<th>Brand Example</th>
</tr>
</thead>
</table>
| MLV – IBR, PI3, BVD, BRSV + 5 way Lepto | YES  | 1 month prebreeding       | Bovi-Shield 4 + L5  
|                                      |      |                           | Prism 9             
|                                      |      |                           | Titanium 9          |
| Lepto booster                        | YES  | At pregnancy check        | Lepto-Ferm-5        |
| Neospora                             | NO   | At pregnancy check        | Neoguard            |
| E. coli, Rotavirus, Coronavirus      | NO   | 4 and 8 weeks precalving  | ScourGuard 4KC      |
| Live or killed 9 way                 | YES  | 4-8 weeks precalving      | CattleMaster 4 + L5 |
| J-5                                  | NO   | 4 and 8 weeks precalving  | J-Vac               |
| Clostridium 7 way                    | YES  | 4-8 weeks precalving      | Vision 7            |
Consider....

- Antiserums, immune modulators (vit C Immunoboost), intranasal vaccines, oral vaccines and antibodies, endotoxin vaccines instead of conventional vaccines on newborns

- Injectable iron dextran, selenium, vitamin E, multi B-vitamins
Internal Parasites

Nematodes

- Not a problem in total confinement except for bedded packs with larval contaminated manure
- Larvae need 2-3 days to be infective
- Any lot with grass to eat can be a problem
Economic Loss

Â– Depressed growth
Â– Weakened resistance
Â– Possible 500-1000# first lactation milk loss
Strategic Deworming for Heifers (no previous Rx)

Don’t overlook wormers like fenbendazole (Safeguard/Panacur) for safety, economy and ease of use

Larvae From previous year

Deworm replacements
The forgotten parasite - lice!

- Less of a problem where calves are remote from older animals
- Difficult to eliminate
- Cold weather surge
- Sucking lice can cause anemia
- Older alcohol based pour-ons at lower dose offer good, cheap control
Investigating Problems

- Records of who, what, when and how are invaluable; memory only goes so far!
- Work with your veterinarian; push if necessary!
- Don’t make excuses for what went wrong
Diagnostics

Why? Valuable information *if* used to make more appropriate management and treatment decisions.

- More likely to be effective at reducing disease. Reduce frustration.
- Justification for treatment choice
- Reduces indiscriminate and unwarranted treatments, time, cost and frustration
Take ‘selected’ diagnostic samples

- **Representative** animals - early in process - preferably not treated.

1. Total serum proteins on 12 calves!!
2. Fecal samples on live calves – parasitology, culture, gram stain
3. **Post-mortem** representative calves!
   - Euthanize calf for best samples
   - Submit fresh, frozen & fixed tissue samples
4. Tracheal washes
Calf Resources on the Web

www.atticacows.com - Sam Leadley - Calving Ease
www.calfnotes.com - Jim Quigley’s Calf Notes
www.das.psu.edu/dcn/CALFMGT/ - PSU
www.ansc.purdue.edu/dairy/calves/calfpub.htm - Purdue University
www.babcock.cals.wisc.edu/- Babcock Institute
They’re counting on you!

Thank you
Nail Biological Growth Targets

- 55% mature weight @ breeding
- 82 - 85% mature weight
  @ 1st calving
- ≥90% achieving

*Breeding: Avg. 56% MW
(67% Achieving)

*Calving: Avg. 79% MW
(67% Achieving)

(Koval)

What Makes a “Quality Heifer” — (Koval) Maintaining Management Momentum

- 1st Calf “Treated” as Calf/Heifer* ≤ 30% ?
  24 hrs. → 3 mos. ___ 4 mos. → fresh ___
- DOAs in first calf heifers ≤ 9% 7.5%
  Male DOAs 7% Female DOAs 8%
- 1st Calf avg. peak ≥ 80% of Mature 77%
  or total lactation ≥ 80% of Mature 85%
- 1st Calf Culls ≤ 60 Days in Milk ≤ 5% 3%
- 1st Calf ME’s ≥ Mature > (+601)
- 1st Calf “Treated” in Lactation* ≤ 15% ?
- ≥ 85% retention (any herd) to 2nd lactation 88%
- Reduce #1 reason for 1st lactation culls
  (continuous improvement) Mastitis
Questions