Foot Health -
A Foundation of Animal Care

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Overview

• Status of the Industry
• Understanding foot health
• Early fall lameness
• A lesion orientated approach for foot health
• Managing lameness trigger factors
• Action plan for great foot health
A cow has the same anatomy no matter how large the farm

• Hooves and cows have fiscal limitations
• Expectation for cows today are far beyond their capabilities
• Lameness today is the result of man made conditions
Foot health = CURRENCY
Cost of lameness

• 2% of cows die

• 20% prematurely culled

• 28 extra days not in calf

• 340 kg lost milk production
Lameness around the World

Mean = 25%

WI herds averaging >90lb milk/cow/day

Lameness Prevalence %

Location

NZ
USA (WI)
Netherlands
Norway
USA
UK
Romania
USA (WI)
Finland
USA
Italy
CA
USA (CA)
China
Austria
Germany/Austria
UK
UK
USA (NE)

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Dairyland cluster survey
Brotzman MS Thesis, 2014

- AgSource Cooperative Services DHIA served herds, from 3,078 herds in Upper Midwest with complete data, sorted 557 herds >200 cows likely to be freestall housed

- Principal component analysis found 16 DHIA variables that best explained differences between herds and performed cluster analysis

- Herds grouped into one of 6 clusters

- Visited 66 herds in the three highest milk producing clusters, locomotion scored high group cows.
Lame and severely lame (n=66)

Wisconsin is fairing extremely well but is it good enough?
Looking at foot health through science

Hinterhofer, 2009 JDS
A life cycle approach

• No matter what the causation of lameness, once the cow develops a lesion, they are at much greater risk for developing the same lesion again in the next lactation (Oikonomou et al., 2013)
A life cycle approach

• This is due to permanent anatomical changes to the structure and function of the claw – including the fat pad, the suspensory apparatus and the pedal bone itself
Cited lameness risk factors

Less

• Deep bedded stalls
• Solid floors
• Non-slippery floors
• Treat lame cows within 48h
• Access to pasture/outside
• Feed bunks with a barrier/head lock
• Wider stalls

More

• Mats/Mattresses
• Slatted floors
• Slippery floors, damaged concrete
• Poor identification of lame cows
• Confinement 24/7
• Stall design – neck rails and lunge impediments
• Post and rail feeder and narrow feed alleys

Barker et al., 2010; Bell et al., 2009; Chapinal et al., 2013; Dippel et al., 2009; Popescu et al., 2013; Rouha-Mulleder, et al., 2009; Sarjokari et al., 2013; Solano et al., 2015; Westin et al., 2016
Reality of lameness onset

- Transition and calving → lameness triggers
- Heat stress → lameness trigger !!!
- Standing cows → lameness trigger
- Poor hoof trimming
- Lameness occurs 45 to 60 days following trigger period
- Delayed and poor recovery from lameness during a stress period

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90% Lameness = rear outside claws
Lesion distribution by limb

All Lesions for Lactation > 0

Lesion Distribution by Limb

LF | LR | RF | RR
---|----|----|----
0  | 800| 0  | 0  
0  | 0  | 200| 0  
0  | 0  | 0  | 600
Right rear outside claw > lameness

- Cows make more right turns
- Right rear is dominant leg
- Any lameness more exuberated in right rear
- Sharp right turns make things worse
- On sand more wear on right rear

Need more data for better understanding
Why cows get lame?

Three claw horn lesions

• Sole ulcers
• White line lesions
• Toe ulcers

One infectious hoof lesion

• Digital dermatitis (hairy warts)
Distribution of top 5 lesions across DIM Range\textsuperscript{a}: DC305 Lame & Trim events > 40,000 cows in the South West

- Digital Dermatitis
- Foot Rot
- Sole Ulcer
- Toe Ulcer
- None
- White Line Disease

\textsuperscript{a} DC305 Lame & Trim events

Days in milk

% across DIM range

1 - 60
61 - 120
121 - 180
181 - 240
241 - 300
301 - 360
361 - 420
421 - 480
481 - 540
541 - 600
> 601

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3/16 in growth per month = 3 inches in 15 months

- Healthy claws have convex dorsal Walls
- Healthy claws have healthy fat pads (digital cushions)
90% Lameness = rear outside claws
The load on the outside claw is not 90 degrees
Sole ulcer cause

Lateral claw over-growth
Today’s story...

From a BEHAVIOR perspective = INFLAMMATION AND TRAUMA

A. Gomez, 2010
Dairyland cluster survey: average time from gate open to gate close = 90 Min per Milking

- We are not going to improve foot health as long as we force cows to stand for that long
- What about heat stress in holding pens
- Hot cows will not lay down
Time series of temperature humidity index and claw lesion rate

2 month lag time

Data from 450 cow dairy, Unpublished
Too hot to lie down!

39°C cows stand up --- 37.8°C cows lie down

Body temperature increases 0.5°C per hour when heat stressed cows lie down and decreases by 0.26°C per hour when they stand
Cows generate a lot of heat!

- 120lb cow: 6000 BTU per hour
- 40 lb cow: 3000 BTU per hour
- Resting human: 1000 BTU per hour
Hot cows = Standing cows

> Sole ulcers

> White line lesions

> Thin soles

• It is about impaired circulation
• Inflammation
• Depriving the corium of oxygen
• Depriving the corium of nutrients
Why standing cows > Sole ulcers

Healthy corium

Inflamed Corium

This demonstrates the blood flow to the hoof of a standing cow.
Poor floors result in more trauma

Trauma leads to sole and toe overgrowth or wear!

= Sole ulcers
White line lesions
Thin soles and toe ulcers
Typical sole ulcer
Therapeutic trimming = rest
= relieve of trauma = recovery
Horn overgrowth = Abnormal load
Side trauma ➔ White line lesion
Poor foot angle = White line lesions
Poor foot balance = White line lesions + Sole ulcers
Slippery and slatted floors
Slippery, Rough Floors, Slopes
Typical white line damage
Therapeutic trimming = rest
= removing trauma = recovery
Toe ulcer

The only causes!

Over-trimming

Too much wear

Resulting in chronic toes and culling
Horn is produced at 3/16 inch per month

- When wear exceeds growth = problem
- Pen size and walking distances today exceed claws capabilities
- Thin soles are a huge large farm problem with sand bedding
- No trimming only blocking
Short claws and thin soles
Rough concrete and coarse sand
We build Dairies that last 25 to 40 years but we equip them with floors that last 1 to 6 years

Alan LeBlanc Flooring Consultant
As a producer are you paying?

For the hoof chips on the floor?
The five hoof trimming errors
Trimming toes too short & soles too thin

Toe Ulcer

Chronic Toes
Excessive trimming
Heel of the inner claw. White soles means = over-trimming
Removal of the axial or inside wall of the toe

Trimming between the toes with the grinder
Excessive removal of the abaxial or outside wall wall

This is the same as thinning a wall of a building!
Trimming the sole of claws with extreme concavity, rather than flat.

Who would erect barn walls this way?
Fat pad or digital cushion

Poor development of the digital cushion

Poor shock absorption during foot-stride

Inappropriate forces on the corium of the sole

Hemorrhaging under the third phalanx, active claw horn lesions

Healthy Fat Pad

Fat Pad after Lameness
Heifers and fat pads

• Heifers raised on pasture or dry lots have smaller fat pads
• Under-developed in heifers (Raeber 2002)
• Exercise & hard surfaces stimulates development of digital cushion (Muelling 2013)
• Heifers must be introduced to freestall housing 6 to 8 week before calving
Digital dermatitis (hairy warts)

- Primary cause: breakdown in innate immune system
- Compromised skin integrity
- Opportunity for bacteria to enter
- Also need low oxygen environment
- NOTE: Placing bacteria that cause digital dermatitis on healthy skin will not result in digital dermatitis
Early acute stage

Topically treating at this stage provides the best guarantee that DD does not reoccur!
Early identification and prompt treatment can stop this disease!

6cc of Oxytetracyline 100ml Quick-Hit Gel +2 g Tet 324

Less is successful and safe! 2 grams!

Remove wrap after 24 hrs !!!
Progression of disease. Bacteria have begun to migrate deeper into the epidermis and encyst!

M2 with Proliferation
This is a permanent DD lesion

Lesion present for life

- Spirochetes migrated deep into the epidermis = are encysted
- Hyperkeratosis present
- Encysted bacteria have colonized/organized and become more aggressive
- New infections must be prevented with regular footbaths and good hygiene

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New infection = disease shedder

New infection occurring from the inside out!

M2 with Proliferation
The integrated approach in controlling digital dermatitis

- Early observation in heifers starting at 10 month of age
- Excellent hygiene and a stress free environment
- Aggressive early antibiotic treatment of the first lesions
- A well managed regular footbath to control M4 lesions and prevent M1 lesions
The integrated approach in controlling digital dermatitis

- 1\textsuperscript{st} lactation animals without DD produced 770lbs (350kg) more milk compared to animals that had DD twice

(Gomez2014)

There is a huge monetary benefit in preventing DD in growing heifers and at anytime!
The hoof bath is for infectious hoof lesion control and prevention
The Role of the hoof bath

- Using hoof baths for the control of digital dermatitis and foot rot is similar to the use of teat dip for the control of contagious mastitis.
- It does not treat active infections, but it helps control the spread of infection from cow to cow.
Hoof bath mission statement

• Disinfect feet for prevention of infectious claw lesions such as digital dermatitis, foot rot
• Does not compromise skin integrity
• Does not harm cattle and people
• Is reasonably priced and does not harm equipment, structures and environment during storage, use and disposal
Effective hoof bath

- 12 feet (4m) long
- 20 inches (50cm) wide
- 36 inch (75cm) sides
- 6 foot (1.80m) side panels
- 12 inch (25cm) entrance and exit curb
- 3 ½ inch (10cm) solution
Hoof bath with sidewalls
Hoof and leg hygiene

Hoof and Leg Hygiene Scoring Chart

Score at least 20% of the cows in each pen in a free stall herd or all of the cows in a tie stall herd

Score 1
Clean, little or no manure contamination of the lower limb

Score 2
Slightly dirty, where the lower limb is lightly splashed with manure

Score 3
Moderately dirty, where there are distinct plaques of manure on the foot, progressing up the limb

Score 4
Very dirty, where there are confluent plaques of caked on manure on the foot and higher up the lower limb

Interpretation

<table>
<thead>
<tr>
<th>Proportion of cows scoring 3 and 4</th>
<th>Comment</th>
<th>Your Herd</th>
<th>Suggested Foot Bath Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;25</td>
<td>Good</td>
<td></td>
<td>As required</td>
</tr>
<tr>
<td>25-50</td>
<td>Fair</td>
<td></td>
<td>2 days per week</td>
</tr>
<tr>
<td>51-75</td>
<td>Poor</td>
<td></td>
<td>5 days per week</td>
</tr>
<tr>
<td>&gt;75</td>
<td>Very Poor</td>
<td></td>
<td>7 days per week</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Proportion of cows with hygiene scores of 3 and 4</th>
<th>Suggested foot bath frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 25</td>
<td>as required</td>
</tr>
<tr>
<td>25 to 50</td>
<td>2 d/wk</td>
</tr>
<tr>
<td>51 to 75</td>
<td>5 d/wk</td>
</tr>
<tr>
<td>&gt; 75</td>
<td>7 d/wk</td>
</tr>
</tbody>
</table>
Hoof Bath Chemicals

• Leg hygiene score and manure contamination dependent (200 – 300 cow passes?)

• At what point does the chemical cease to kill Treponeme spp?

• How much does the chemical promote skin hyperkeratosis !!!?
Common Hoof Bath Solutions - Disinfecting

- Copper Sulfate 2.5% 12 lbs (5kg) CU +
- Sodium Bisulfate 6oz(100g)/50gal/200l water (NaHSO4) (.0.5g/l)

  (monitor pH regularly, 3.0 - 5.5)

- Use hot water for initial mix of CU
- Formalin 1.5 - 2% 2-3 quarts/50gal water
  1.5 - 2% 2-3 liters/200l water
Hoof bath frequency

• Farm Dependent!

• Adapt the footbath frequency based on DD prevalence (M4) and foot rot prevalence

• Use records to predict changes with DD, stocking density or determine high risk periods

• Careful with environmental accumulation of chemicals and costs
Hoof bath take home...

- Hoof baths are used to keep Chronic or Subclinical DD from going into Active DD

- The hoof bath design matters!

- Hoof bathing protocol is farm dependent
Hoof trimming protocol

• Every dry cow, every springing heifer is assessed and functionally trimmed 8 to 3 weeks prior to calving

• Perform one or two more lactation assessments and trims depending on:
  – Cow housing, environment and management
  – Age of cow
  – High maintenance cows
Action plan for great foot health

• All cows are assessed 2X or more per year and functionally trimmed
• Superb lameness identification
• Lameness treated within 24 hrs
• *No tolerance* for lameness
Action plan for great foot health

• 12 + hours of lying time per cow
• < 2.5 hours form gate open to gate close
• Introduce heifers to concrete 8 weeks before calving
• Build facilities where cows succeed
• Reduce forced standing during hot weather

Animal welfare is everyone’s bottom line
Success in the Details

Thank You!

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