Eliminating the Effects of Footrot on Sheep Flocks in the Northeastern United States

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Rationale for Study

Farming sheep in the Northeast

Small, diverse farms; wet conditions

Pasture rotation

Footbaths +/- trimming

Local reactions, efficacy

Vaccination: Foot Wax

Extra-label use, resistance

Antibiotics: Ivermectin, pen/strep, gamithromycin

Available methods for control

Classification of lesions based on keratinase activity

Bacterial etiologies: D. nodosus (virulent strains)

Predispensing factors

Footrot in sheep

Footbaths +/- trimming

Sheep flocks in the Northeastern United States

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*D. nodosus* invades deeply

**Chronic Carriers: Cull**
- Even after trimming, hooves will be deformed
Design

- Preliminary survey identified foot problems as a major concern
- Primarily a proof of concept
  - Extension: outreach and education
  - Sustainable Agriculture Research and Education
- Goals:
  - Educate farmers regarding foot care techniques
  - Guide development of biosecurity plans
    - Pathogen introduction and re-introduction
    - Comingling species elevates risk
  - Explore genetic differences related to susceptibility
  - 150 farmers will reduce footrot losses by 70% and will have farm biosecurity plans

Methods

- Farmer survey
- Farm visits
  - Biosecurity discussions/feedback
  - Demonstration of trimming and scoring feet
  - Assistance for farms with limited facilities/staff
- Blood collection at first or second visit: LTT, RTT
  - Serum banked
  - DNA extracted from a subset of plasma samples to establish correlation with susceptibility to footrot (WSU)
Sheep treatment

- Trim feet and score: 0-5; 0-3
- Foot dip in 10% zinc sulfate: >10 minutes
- Sort into “clean” and “dirty” groups
- Mark chronic cases and cull
- Dry clean area: >1 hour
- Move clean or dirty flocks into separate, clean pastures (rested for >2 wks)
- Repeat weekly for 1 month
Foot Bath

10% Zinc sulfate solution:
• 8.5 pounds zinc sulfate
• 10 gallons of water
• 1 cup of laundry detergent
• Mix well; add waste wool to footbath to improve footing and reduce splashing
• Winter: dry foot bath
  • Most farm visits during warm weather in this study

Results

• 22 farms participated
  • Approximately 1300 sheep
• 60-70% of farms footrot-free by end-of-study survey
  • Failures: why?
    • Not willing to cull
    • “Not enough proactive attention to animals’ feet on an ongoing basis…”
    • Got footrot after the end of the project
    • “I don’t know.”
• 1 of 22 farms did not benefit
• 1 of 22 farms repeated the program; persistent footrot
Of approximately 1300 samples sent to WSU, genomic DNA evaluated in 85 (56 Katahdin, 21 Merino, 1 Tuni, and 7 “unknown breed”) were classified into one of three groups:

- Footrot-free (n=28)
- Mild footrot (n=31)
- Severe footrot (n=26)

Genotyped using the Illumina Ovine 50K BeadChip. Case-control matching accounted for farm, breed, sex, and age. Linear regression analysis (PLINK) with a genome-wide significance threshold of $5 \times 10^{-8}$ was performed. Reanalysis with a higher density chip suggests more markers: data is still being analyzed.
Results

• Typical responses:
  • Benefitted from learning techniques (trimming, footbathing, record keeping, other)
  • Financial benefit: modest ($0 to $5000/yr)
  • “We learned precisely what had to be done. What we didn't learn was how to make the farm manager keep his team doing it!”
  • “The sheep foot health project has made the difference between us getting out of the sheep business and continuing and now growing the flock.”

• Biggest barriers:
  • Culling
  • Separating sheep and keeping fencing intact
  • “Footrot is eradicated by culling, not curing, affected sheep.” (Joe Snyder DVM, AASRP)

Conclusions

• OAR18 region under investigation for gene content and potential functional variants
  • Possible genetic screening test for footrot resistance

• Producers are interested in this project
  • Webinars: >1000 views
  • Foot-trimming videos: >70,000 views
  • Webpage for project: >17,000 views

• Outcomes and projects
  • [http://umaine.edu/sheep/](http://umaine.edu/sheep/)
    • >18,000 visits; >70,000 views of video
  • Foot scoring card
  • Expansion of genetic results
Conclusions

- Reasons for failures:
  - Resistance to culling
  - Inability to reliably separate sheep
  - Limited pasture space or fencing configurations
  - Re-contamination via common pathways

- This method does not work for everyone.
  - Organic growers may adopt
  - Modified method with antibiotic use

- This method requires:
  - Good organization
  - Good fencing
  - Hard work
  - Culling some animals

- This method avoids:
  - Antibiotic costs and development of resistance
  - Vaccination costs and reactions
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Other UMaine SR Projects

- CL surveillance study
- Ovine *H. contortus* study
- EWE Maine Club

Scoring Footrot Lesions

All photos by
Anne Lichtenwalner DVM PhD
University of Maine Cooperative Extension
Evaluate the Whole Foot

- Clean by brushing or spraying
- Look at interdigital skin
- Look at sole (bottom of foot)
- Look at “white line”
  - May need to trim excess (folded) wall first
  - Differentiate between “pockets” and active lesions

Scoring system: original

- 1= no sign of infection
- 2= inflammation of interdigital skin, possible odor
- 3= odor, undermining/separation, lameness
- 4= excessive undermining; two or more feet affected, odor
- 5= chronic carrier (deformed feet)
Scoring system: evolved

- 1 = no sign of infection
- 2 = inflammation of interdigital skin, odor, undermining/separation, lameness
- 3 = Score 2 with two or more feet affected
- Chronic carrier = deformed feet; no active infection
- Pockets: no odor, some defect in wall/sole, no evidence of active infection

Scoring system: evolved

- 1 = no sign of infection
- 2 = inflammation of interdigital skin, odor, undermining/separation, lameness
- 3 = Score 2 with two or more feet affected
- Chronic carrier = deformed feet; no active infection
- Pockets: no odor, some defect in wall/sole, no evidence of active infection
Proper Tools

- Hoof knife and trimmers:
  - Sharpen with file/stone
  - Disinfect between sheep
  - Oil between uses

Sheep Restraint

- “Tip” the sheep
- Restrain in a “cradle”
  - Proper positioning in a metal and mesh cradle
  - Feet are easily and quickly trimmed
  - Most sheep become passive when “tipped”
Tip Tables

Score 1=Clean
Score 1 with Pocket

Pocket along sole and medial wall: no odor, no abnormal discharge

Score 2: Active Lesions

Trimming the toes reveals underrunning of the sole

Pockets: if no infection (odor, fluid), may be healing
Score 2: Active Lesions

• Deep defect in white line
• Foul smell

• Deep defect in sole
• Foul smell
Score 2 Trimmed

- Complete removal of infected material is possible

Score 3:
2 or more feet with footrot

Note severe underrunning of medial wall
Chronic Carriers: Cull

- Even after trimming, hooves will be deformed

Chronic Footrot

- Deep, long-standing infection
  - Deformed foot
- Thick walls
- Non-uniform
- Defects may extend to coronary band
- **Culling is necessary**