Prevalence of Digital Dermatitis in Dairy Cattle in Eastern Wisconsin Dairy Herds 2016 Field Survey

UW-Extension Dairy Team

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Special thanks is extended to Dr. Dörte Döpfer, DVM, MSc, PhD for her assistance, education and mentorship regarding this field survey.

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Prevalence of Digital Dermatitis in Dairy Cattle in Eastern Wisconsin Dairy Herds

OBJECTIVES:

- Determine the prevalence of various stages (M0, M2 or M4) of Digital Dermatitis (DD) in selected groups of cows on eastern Wisconsin dairy operations.
- Determine hoof health management practices utilized to manage DD on eastern Wisconsin dairy operations.

HIGHLIGHT OF RESULTS:

- 45 eastern Wisconsin dairy operations.
- 11,817 cows identified, scored, and recorded for stage and chronicity of digital dermatitis (DD).
- Prevalence of DD within the group of 11,817 cows scored and recorded indicated the following:
    - M0 (no lesion) 81.1 percent
    - M2 (acute, active lesion) 1.8 percent
    - M4 (chronic, non-active lesion) 17.1 percent
- Prevalence of DD based on operation type is shown in the table below:

Operation Type	M0 (%)	M2 (%)	M4 (%)
Small (tie-stall)	76.1	5.8	17.4
Medium (less than 700 cows, freestall)	72.0	3.2	24.6
Large (700 cows and more, freestall)	82.9	1.1	16.0

- 17.8 percent of herds had a low (≤5 percent) prevalence of DD.
- Prevalence of DD between tiestall and freestall operations was similar.
- Concentration of footbath solution, trimming frequency, and type of treatment had a significant (*P>0.1*) impact on the types and prevalence of DD lesions.

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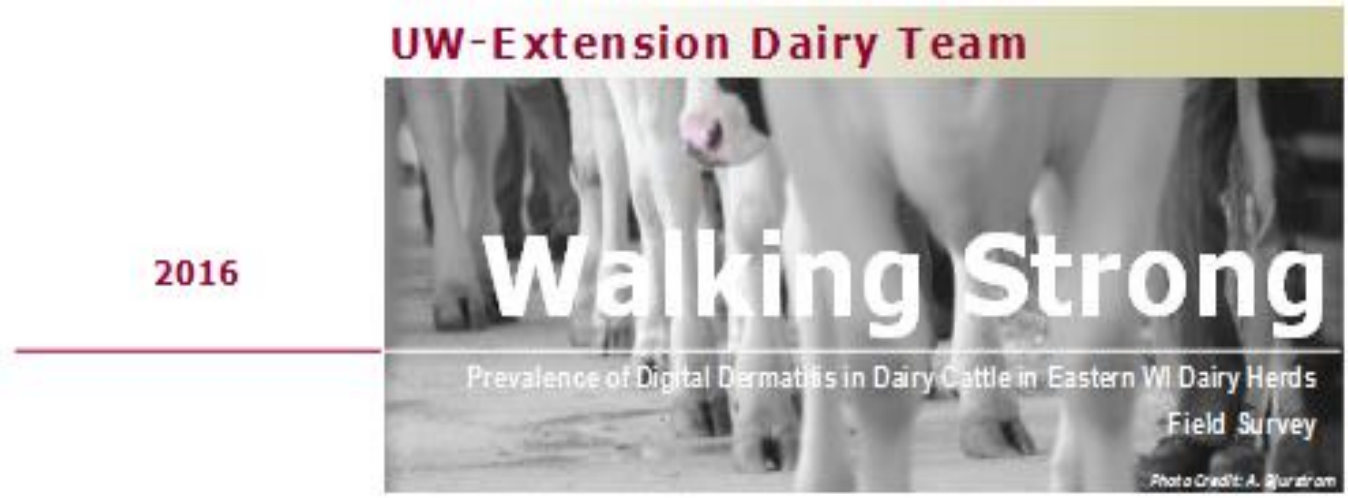

RECOMMENDATIONS FOR MANAGING DIGITAL DERMATITIS

- The UW School of Veterinary Medicine's Dairyland Initiative Footbath Blueprint https://thedairylandinitiative.vetmed.wisc.edu/ recommends footbaths dimensions to be:
  - 10 to 12 feet long
  - 24 inches wide
  - 10-inch step-in or depth height
- Footbaths should be changed after 150 to 300 cows have passed through the footbath.
- Footbath solution should be maintained at 3.5 to 5.5 pH. Maintaining pH at normal skin pH level will help maintain healthy skin condition and improve treatment results.
- The recommended concentration for a copper sulfate ($CuS0_4$) footbath is two to five percent.
- Maintenance footbaths should be offered a minimum of three times per week. In the event of an outbreak, frequency should increase to four to five times per week.
- It is recommended to clean and apply two grams oxytetracycline powder to the affected area when treating an active digital dermatitis (DD) lesion. (*Please note:* the use of oxytetracycline powder for treatment of DD is considered extra-labeled prescription drug-use and must be used in this manner through a valid veterinary-client-patient-relationship (VCPR)).
- The purpose of a foot wrap is to ensure the treated lesion is dry and has contact with the antibiotics powder for a minimum of 30 minutes. Wraps should be removed within 24 hours, if they have not fallen off, to risk of injury and to perpetuate the foot disease.

**Recommendations based from 2017 UW-Extension Hoof Health Training conducted by Dr. Dörte Döpfer, DVM, MSc, PhD, UW-School of Veterinary Medicine*

For UW-Extension factsheets focusing on hoof health, please visit: http://fyi.uwex.edu/dairy/ for the Walking Strong Factsheet series on Dairy Hoof Health

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INTRODUCTION:

Dairy profitability is greatly affected by herd health and animal well-being. Providing proper care and housing throughout the dairy animal's life significantly reduces metabolic and reproductive disorders and increases milk production. Management practices which address "how to", as well as judicious use of antibiotics are becoming increasingly important as producers strive to provide safe and wholesome food products.

When it comes to health issues on dairy operations, lameness is a main concern along with mastitis and reproductive issues. Digital dermatitis (DD), commonly known as hairy heel warts or foot warts, is one of the most common foot diseases of the dairy cow and can be found in even well- managed dairy herds. Digital dermatitis has been reported on 70 percent of all United States (US) dairies and on 95 percent of large (500 plus cows) operations, according to the February 2009 Dairy Cattle Health and Management Practices in the US, United States Department of Agriculture/National Animal Health Monitoring System report.

Digital dermatitis is an infectious disease caused by a family of spiral-like bacteria called *Treponema*. Lesions are most commonly found near the flexor commissure of the interdigital space. One or both hind feet are most commonly infected, although forefeet can be affected. Common signs of DD are raw, bright-red or black circular growth, above the heel bulbs, with edges forming a white opaque ring or hard, thin, hairy, wart-like growths or sores.

Digital dermatitis is a costly disease. Advanced cases of DD are often associated with other hoof issues such as necrotic toe and wall lesions, severe heel erosion, and severe sole ulcers. Udder health issues such as teat necrosis and udder sores have also been attributed to DD. According to the National Animal Disease Information Service, cows who suffer from DD lameness are at higher risk for reduced fertility and milk yield.

Risk factors:

Digital dermatitis is more prevalent when hygiene is poor and feet are often exposed to manure slurry. Special attention must be given to this foot disease in order to treat the animals that serve as a reservoir and to reduce the spread of infection. Risk factors for DD are:

- Wet conditions
- Poor foot hygiene
- Presence of infected animals in the herd
- Poor footbath management
- High milk producing cows
- Early lactation
- Low parity

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Stages of DD:

A five-point system is used to classify the stages of the disease: M0 = normal skin; M1 = early, small circumscribed red to gray epithelial defects of <2 cm in diameter preceding the acute stage, appearing between acute episodes or within the margins of a chronic M4 lesion; M2 = acute, active ulcerative ("strawberry-like") or granulomatous (red-gray) lesions >2 cm in diameter and sometimes surrounded by white halo-like tissues, which may be slightly papillomatous; M3 = the healing stage occurring within 1 to 2 days after topical therapy, with the lesion covered with firm, scab-like material; M4 = the chronic stage in which the epithelium is thickened and/or proliferative (filamentous or scab-like) and several centimeters in diameter. The M4.1 lesion type was added to describe a chronic lesion (M4) with a small, painful area of active M1 lesion within it.

Progression of the disease:

According to Dr. Dörte Döpfer, DVM, MSc, PhD, UW-School of Veterinary Medicine, digital dermatitis is a multifactorial disease with a strong pathological influence of the *Treponema* bacteria. *Treponema* bacteria will infect deep layers of dermis tissue. The bacteria avoid the host's immune system defense by fragmenting their deoxyribonucleic acid (DNA) and encysting in the tissues causing a lifetime infection.

Breaking the cycle of disease through hoof management practices is key. The goal in managing DD is to identify and treat lesions early (M1 stage) and prevent them from turning into M4 lesions. The dynamics of DD is driven by chronic, M4 lesions (see diagram below).

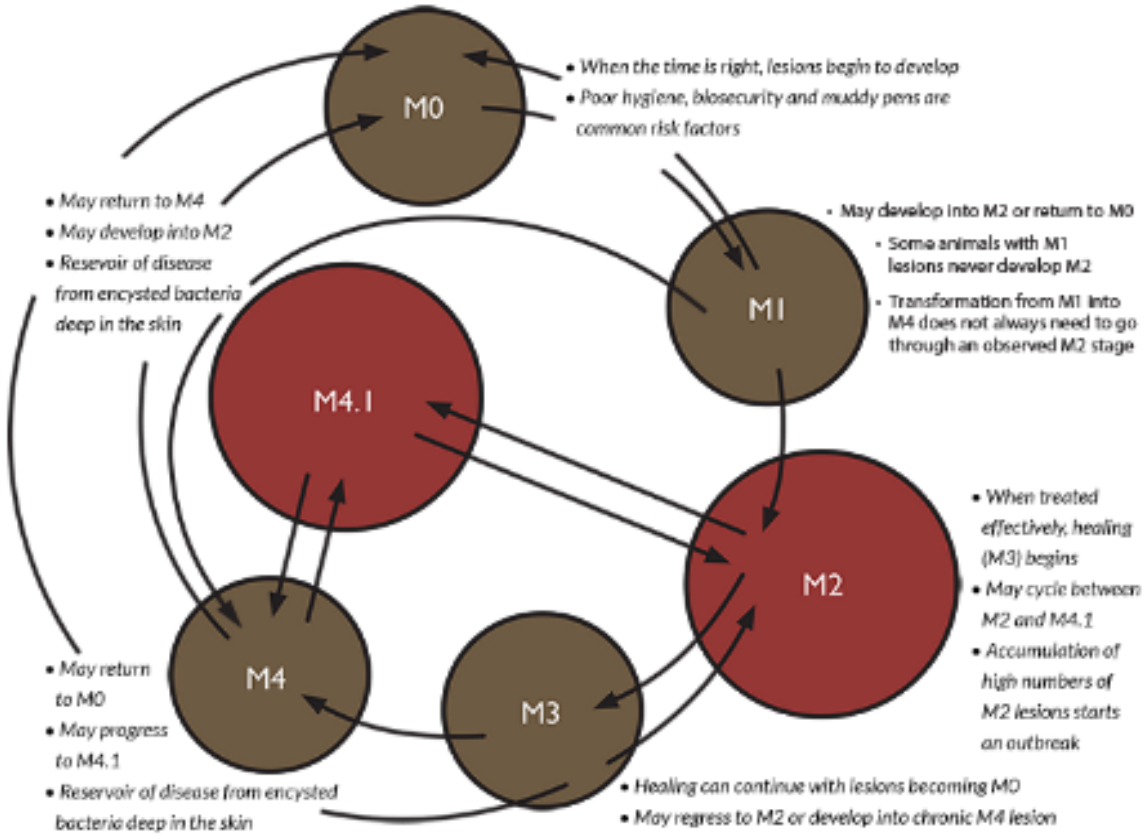

Image source: Zinpro http://www.zinpro.com/lameness/digital-dermatitis#all

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OBJECTIVES OF PREVALENCE OF DIGITAL DERMATITIS IN DAIRY CATTLE IN EASTERN WISCONSIN DAIRY HERDS:

- Determine the prevalence of various stages (M0, M2 or M4) of DD in selected groups of cows on eastern Wisconsin dairy operations.
- Determine hoof health management practices utilized to manage DD on eastern Wisconsin dairy operations.

MATERIALS & METHODS:

Dairy operations were divided into three categories in an attempt to represent a broad spectrum of the eastern Wisconsin dairy industry:

- Small: Tiestall operation (n=15)
- Medium: Freestall operation up to 700 cows (n=19)
- Large: Freestall operation with 700 cows or more (n=11)

The identification and scoring of DD lesions on individual cows and the collection of farm management practices were conducted by county-based University of Wisconsin-Extension agriculture agents and one dairy and livestock extension summer intern in 10 counties. To facilitate consistency in scoring, as well as understand the mechanics of DD, agriculture agents attended a four-hour classroom training session followed by five hours of on-farm training with two different farms. Training was provided by Dr. Dörte Döpfer, DVM, MSc, PhD, Department of Medical Sciences, University of Wisconsin School of Veterinary Medicine.

*Image Source: Kewaunee County Land Information

County agriculture agents visited the farms during milking times, or at a time the hoof trimmer was present, to identify, score, and record three primary stages (M0=no lesion, M2=active lesion, and M4=chronic, non-active lesion) and chronicity (hyperkeratotic (thickening of skin) or proliferative (cauliflower-like protrusion)) of DD on individual milking cows. Lesions were observed only on the hind feet since research has indicated hind feet have 90 to 95 percent of DD lesions.

By identifying the three stages (M0, M2, and M4) agents could determine the prevalence of each scored herd: healthy non-infected feet; contagious, active infections; and chronic infections, which serve as a reservoir of infection for other cows. Determining the prevalence of each of the three stages within a scored herd can help strategically outline a plan to manage and prevent future outbreaks of DD.

Agents utilized Apple iPad mini 2s and the Zinpro “DD Check” iOS-based app developed by UW-School of Veterinary Medicine’s Dr. Dörte Döpfer to record stage and severity of individual cow lesions.

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The following images are examples of the various stages and chronicity of DD identified and scored for this field survey.

Stages:

M0
Normal, healthy skin no signs of DD*

M2
Acute, active ulcerative (bright red) digital skin**

M4
Chronic, non-active lesion**

Chronicity:

Hyperkeratotic*
(thickened, callus skin)

Proliferative**
(cauliflower like protrusion, with filaments)

**Photo credit: A. Bjurstrom*
***Photo credit: T. Kohlman*

One hundred percent of the milking cows were identified, scored, and recorded for DD on operations with 150 cows or less. For operations with 150 cows or more a minimum of 150 milking cows, or 20 percent of the herd whichever was greater, were identified, scored, and recorded for DD. Therefore, data presented from “medium” and “large herds” in the following “Results and Discussion” section reflect groups of cows, and not the whole herd.

Cooperating farms each received a detailed DD report listing the cow number/name with the corresponding lesion stage and chronicity. Farms also received the percent prevalence of M0, M2, and M4 lesions within groups of cows scored.

Agents also utilized a Qualtrics off-line survey data collection program installed on the Apple iPad mini 2s to collect hoof health management practices for each farm.

Summary statistics were developed for the entire data set (45 operations total) and for each operation category. Statistical analysis using two-sample assuming unequal variance t-tests was conducted in Microsoft Excel.

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RESULTS & DISCUSSION:

County agents identified, scored, and recorded the three primary stages (M0=no lesion; M2=active lesion; and M4=chronic, non-active lesion) and chronicity (hyperkeratotic or proliferative) of DD lesions for 11,817 individual milking cows on 45 eastern Wisconsin dairy operations. County agents visited the farms during milking times or at a time the hoof trimmer was present.

Average herd size across all operations was 607 cows, ranging in size from 30 cows up to 6,200 cows.

Eighty-one percent (n=11,817) of all cows identified, scored, and recorded for DD in this field survey had no signs of lesions (M0). Operations ranged from 49 to 100 percent of the cows scored M0, with an average per farm percentage of 76. Over 2,200 of cows (18.9 percent) identified, scored and recorded, had an M2 or M4 lesion. Operations ranged from zero to 27 percent and zero to 50 percent of those cows scored with M2 and M4 lesions, respectively (Table 1).

Table 1: Prevalence of DD within a select group of cows identified and scored on surveyed eastern Wisconsin dairy operations.

					Range		Operation[2]	
Lesion	**Number of Cows**	**% cows scored**	**Avg per farm (%)**	**SD[1]**	**Min (%)**	**Max (%)**	**High (%)**	**Low (%)**
M0	9,591	81.1	76.0	14.9	49	100	49	100
M2	212	1.8	3.5	5.7	0	27	1	0
M4	2,014	17.1	20.1	11.9	0	50	50	0
Total	11,817							

[1]*SD is an abbreviation for standard deviation*

[2]*Two operations, one with the highest prevalence of DD lesions and one with the lowest prevalence of DD lesions.*

Only one operation had no prevalence of DD identified. The operation with the highest prevalence of DD had 51 percent of the cows showing signs of lesions. Even though only one percent of the cows scored on this operation had an active (M2) lesion, 50 percent of the cows scored had a chronic M4 lesion, which serves as a reservoir of infection for future outbreaks. The operation with the highest prevalence of active DD lesions, had 21 percent of the cows scored as having a M2 lesion.

Herd Size and Prevalence of DD

Dairy operations (n=45) were divided into three categories: small (tiestall (n=15); medium (freestall up to 700 cows (n=19)); and large (freestall with 700 cows or more (n=11)) in an attempt to represent a broad spectrum of the eastern Wisconsin dairy industry.

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Average herd size across all operations was 607 cows, ranging in size from 30 cows to 6,200 cows. Small operations averaged 63 cows per herd, ranging in size from 22 to 115 cows. Medium operations averaged 257 cows per operation, ranging in size from 70 to 590 cows. Large operations averaged 1,955 cows, ranging in size from 850 to 6,200 cows.

One hundred percent of the milking cows in tiestall operations were identified, scored, and recorded for DD. For medium size operations, 40 to 100 percent of the total herd (68 to 497 cows) was identified, scored, and recorded for DD, averaging 84 percent of the herd scored across these operations. On large operations, 17 to 87 percent of total milking cows (418 to 1,485 cows) were identified, scored, and recorded for DD, averaging 43 percent of the herd scored.

Based on observations, groups of cows on large operations had the highest prevalence of M0s (82.9 percent) as compared to groups from small and medium operations (76.1 and 72.0 percent, respectively). Large operations had a higher (*P=0.06*) prevalence of M0s than the medium operations within the group of cows scored.

Groups of cows on large operations also had a lower prevalence of M2 as compared to groups of cows on both the small (*P=0.06*) and medium (*P=0.06*) operations. Groups of cows on small (17.4 percent) and large operations (16.0 percent) had a lower (*P=0.07 and P=0.09, respectively*) prevalence of chronic M4 lesions as compared to groups of cows on medium operations (24.6 percent).

Table 2: Prevalence of the various stages of DD within groups of cows by operation type on surveyed eastern Wisconsin dairy operations.

Operation	Operations	Cows observed (#)	M0 (%)	M2 (%)	M4 (%)
Small	15	917	76.1[a,b]	5.8[a]	17.4[a]
Medium	19	3,486	72.0[a]	3.2[a]	24.6[b]
Large	11	7,414	82.9[b]	1.1[b]	16.0[a]

[a,b]*Values within a row with different superscripts differ (P<0.1)*

Prevalence of DD severity on operations can be divided into four categories: low (≤5 percent); moderately low (6 to 10 percent); moderately high (11 to 24 percent); and high (≥25 percent).

The field survey indicated 17.8 percent of the operations (or eight operations) surveyed had a low (≤5 percent) prevalence of DD within the group of cows identified, scored, and recorded (Table 3). Nearly half of the operations (or 22 of the operations) had a high (≥25 percent) prevalence of DD within the group of cows scored.

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Table 3: Prevalence of DD severity within a group of cows based on herd size on surveyed Eastern Wisconsin operations.*

Herd Size	Low (≤5%)	Moderately Low (6-10%)	Moderately High (11-24%)	High (≥25%)
	Percent of Operations			
Small	13.3	13.3	26.7	46.7
Medium	10.5	0.0	26.3	63.2
Large	36.4	9.0	27.3	27.3
Average	17.8	6.7	26.7	48.9

**Categories of Low, Moderately Low, Moderately High, and High derived from the Zinpro Digital Dermatitis Field Guide, developed in conjunction with Dr. Dörte Döpfer, DVM, MSc, PhD, University of Wisconsin School of Veterinary Medicine.*

Of the eight operations which had a low (≤5) prevalence of DD within the groups of cows scored in their operations, four operations were considered large (700 cows or more), one medium (freestall; up to 700 cows), and three small (tiestall). The operations consisted of three tiestall operations (ranging from 34 to 95 cows, with an average of 66 cows per operation) and five freestall operations (ranging from 350 to 6,100 cows, averaging 1,819 cows per operation).

Of the herds with a low (≤5%) prevalence of DD within the groups of cows scored, all of the herds recorded hoof health issues on a regular basis and treated DD with a foot wrap and an antibiotic. All of the operations with a low prevalence of DD utilized a professional trimmer, with one also using an in-house trained trimmer. Eighty-six percent of the operations indicated they trimmed feet on a maintenance schedule, with 71 percent of the operations trimming at least three times per month. Seventy-one percent of the low prevalence operations used a footbath, and of those, all used a footbath at least three times per week. Forty-three percent of the operations conducted systematic lameness scoring.

Barn Type and Prevalence of DD

Fifteen operations used tiestall barns as the housing of choice while 30 operations had freestall barns in this field survey (Table 4). There were no significant differences in prevalence of DD among groups of cows scored with regards to barn type. However, it should be noted groups of cows housed in freestall barns had a higher percentage (79.8 percent) of healthy, non-infected DD feet as compared to those groups of cows housed in tiestall barns (76.2 percent). Also, groups of cows housed in freestall barns had a lower prevalence of active, M2 lesions (1.9 percent) as compared to groups of cows housed in tiestall barns (5.6 percent). Prevalence of M4 was similar between tiestall and freestall barns.

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Table 4: Prevalence of DD within a group of cows by type of housing on surveyed eastern Wisconsin dairy operations.

Barn Type	Operations	Number of cows	M0 (%)	M2 (%)	M4 (%)
Tiestall	15	917	76.2	5.6	18.2
Freestall	30	10,900	79.8	1.9	18.3

Footbaths and Prevalence of DD

According to UW-School of Veterinary Medicine's Dr. Dr. Dörte Döpfer footbaths are an important tool when it comes to managing DD. The goal of a footbath is to help maintain chronic, non-active M4 lesions from becoming acute, active lesions. Footbaths do not treat active infections (M2 lesions), but they help control the spread of DD infection from cow to cow by keeping them in a M4, non-active state.

Effectiveness of footbaths in preventing infectious DD lesions is dependent upon a number of factors including footbath dimensions, footbath solution, frequency of changing solutions, and frequency of use.

Twenty-nine of the 45 operations participating in the field survey utilized a footbath. Five operations did not indicate whether or not they utilized a footbath.

Footbath frequency

Even though there was no significant difference based on the number of times a footbath was used, survey results indicated the higher the frequency, the higher percentage of M0 lesions and the lower the percentage of active (M2) and inactive, chronic (M4) lesions (Table 5). Operations which did not use a footbath had a lower prevalence of M0 (71.5 percent) as compared to operations which utilized a footbath as part of their DD management in those groups of cows scored. Consequently, these operations also had a higher prevalence of active M2 and non-active active M4 lesions as compared to operations which used a footbath in the group of cows surveyed. Operations that used a footbath four to seven times per week had a lower prevalence of M2 lesions (1.7 percent) in groups of cows scored as compared to those operations that did not utilize a footbath (6.9 percent).

Table 5: Prevalence of DD within a group of cows based on footbath frequency on surveyed eastern Wisconsin dairy operations.

Footbath Frequency	Operations	M0 (%)	M2 (%)	M4 (%)
No footbath	11	71.5	6.9	21.5
1 to 3 times per week	16	74.1	3.1	22.8
4 to 7 times per week	13	79.6	1.7	18.4

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Footbath length

An ideal footbath is a minimum of 10 feet in length (source: UW-School of Veterinary Medicine's Dairyland Initiative). In the field survey, footbath length of participating operations averaged six feet, nine inches, ranging from five feet to 10 feet in length.

Footbath length observations in this field survey were grouped into two lengths: less than ten feet and greater than or equal to 10 feet (Table 6). Of those operations that indicated they used a footbath, results showed no significant difference in footbath length and the prevalence of M0, M2, and M4 lesions.

Table 6: Prevalence of DD within a group of cows based on footbath length on surveyed eastern Wisconsin dairy operations.

Footbath Length	Operations	M0 (%)	M2 (%)	M4 (%)
Less than 10'	8	76.2	3.6	20.2
Greater than or equal to 10'	21	75.2	2.4	22.4

Footbath Solution

Copper sulfate ($CuSO_4$) solutions are commonly used in footbaths to disinfect the interdigital space. Research has shown using $CuSO_4$ decreases both incidence and severity of hoof lesions. Copper sulfate's antibacterial properties help keep the hoof clean, and also acts to harden the claw horn. It is relatively low in cost per animal treated, and commonly perceived among farmers as effective in controlling infectious lesions.

Formalin footbaths have been shown to have similar effects on hooves as $CuSO_4$. However, formalin requires additional precautions due to carcinogenic and caustic properties.

Three types of solutions were used in footbaths on the surveyed operations: $CuS0_4$ only, a $CuS0_4$ - with formalin, and a premix solution (Table 7). Of those operations that utilized a footbath as part of their hoof health management program, 20 of the 31 operations utilized $CuS0_4$ solution for footbaths. Even though there was no significant difference found between types of solutions used, those herds that used $CuS0_4$ had a higher percentage of no lesions (M0) in those groups of cows identified and scored for DD. Those operations that incorporated $CuS0_4$ (as a main solution or mixed with formalin) had a lower prevalence of chronic, non-active M4 lesions (18.9 and 23.2 percent, respectively) as compared to operations which used a premix solution (24.5 percent).

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Table 7: Prevalence of DD within a group of cows based on footbath solution on surveyed eastern Wisconsin dairy operations.

Footbath Solution	Operations	M0 (%)	M2 (%)	M4 (%)
$CuS0_4$	20	77.7	3.4	18.9
$CuS0_4$ & Formalin Mixture	5	74.8	2.0	23.2
Premix	6	73.3	2.2	24.5

Concentration of Copper Sulfate Solution

Copper sulfate concentration is recommended at two to five percent of the solution. Eleven operations using $CuSO_4$ in the footbath mixed it between one and six percent concentration, while four operations reported they mixed the solution between 12 and 30 percent concentration (Table 8). Those operations that mixed the $CuSO_4$ at the four to six percent concentration level had a higher (*P=0.09*) prevalence of no lesions of DD within the group of cows scored in their operation as compared to operations that used a concentration of one to three percent. Also those operations that used a four to six percent solution concentration of $CuSO_4$ had a lower prevalence of chronic, non-active (M4) lesions.

Table 8: Prevalence of DD within a group of cows based on footbath solution concentration on surveyed eastern Wisconsin dairy operations.

Concentration	Operations	M0 (%)	M2 (%)	M4 (%)
1 to 3 percent	5	67.0^{a}	7.6	25.2
4 to 6 percent	6	82.3^{b}	1.8	16.0
12 to 30 percent	4	$80.5^{a,b}$	2.2	17.5

^{a,b}*Values within a row with different superscripts differ (P<0.1)*

Trimming Frequency and Prevalence of DD

Regularly scheduled trimming of hooves can help prevent DD infections. Routine trimming allows for close examination of the foot for early identification and treatment of DD.

For trimming frequency, operations which had a weekly or biweekly schedule were grouped together for statistical analysis, as were operations with a monthly and bimonthly, and an annual and biannual hoof trimming schedule. Results indicated weekly or biweekly trimming schedules had a higher prevalence of non-infected feet (82.0 percent) as compared to (bi)monthly (70.1 percent), quarterly (72.9 percent), or (bi)annually (76.1 percent) trimming schedules (Table 9). (Bi)weekly trimming schedules had a lower prevalence of both M2 (*P=0.02)* and M4 (*P=0.09*) lesions as compared to (bi)monthly trimming.

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Table 9: Prevalence of DD within a group of cows based on hoof trimming frequency on surveyed eastern Wisconsin dairy operations.

	Operations	M0 (%)	M2 (%)	M4 (%)
(Bi)Weekly	11	82.9	1.1[a]	16.0[a]
(Bi)Monthly	16	70.1	5.3[b]	24.6[b]
Quarterly	8	72.9	3.0[a,b]	24.0[a,b]
(Bi)Annually	7	76.1	7.0[a,b]	18.4[a,b]

[a,b]*Values within a row with different superscripts differ (P<0.1)*

Treatment and Prevalence of DD

In general, topical antibiotics have been effective in treating DD, but do represent extra label drug use requiring a veterinary prescription through a recognized veterinary-client-patient-relationship with a licensed veterinarian. Treating infectious, active M2 lesions on individual cows reduces the reservoir of infection, which in turn reduces the prevalence of spreading the bacteria to other herd mates.

Regardless of whether the lesion is non-infectious or in the case of DD, infectious, one major contributing factor to lameness reduction success is the prompt and effective treatment of all lesions as early as possible.

Treatment Product

Forty-four surveyed operations indicated they treated DD with one of three types of products: antibiotic, non-antibiotic, or a custom mixture (Table 10). Seventy-seven percent of the operations indicated they treated with an antibiotic. There was no significant difference in lesions based on the type of treatment product used.

Table 10: Prevalence of DD within a group of cows based on treatment product on surveyed eastern Wisconsin dairy operations.

Product	Operations	M0 (%)	M2 (%)	M4 (%)
Antibiotic	34	74.7	3.6	21.3
Non-antibiotic	6	76.7	5.2	18.2
Custom Mixture	4	80.5	1.5	17.8

Treatment Type

Thirty-two operations indicated they used a foot wrap as part of their treatment plan for DD (Table 11). Operations which utilized a treatment with a foot wrap had a higher prevalence of no lesions (78.5 percent) as compared to those operations that did not use a foot wrap. When operations used a foot wrap to treat DD, groups of cows had a significantly higher prevalence

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(*P=0.03*) of no lesions as compared to treatment without a wrap (78.5 percent as compared to 65.0 percent, respectively). Those operations also had lower prevalence of active M2 lesions (3.1 percent) as compared to operations which did not use foot wrap (5.4 and 4.0 percent, respectively). Operations who treated with a foot wrap had a lower (*P=0.07*) prevalence of chronic, M4 lesions. Operations which sprayed antibiotics on lesions had a lower prevalence of M4 lesions as compared to those operations that treated without a wrap.

Table 11: Prevalence of DD within a group of cows based on treatment type on surveyed eastern Wisconsin dairy operations.

Treatment	Operations	M0 (%)	M2 (%)	M4 (%)
Spray	7	74.4[a,b]	5.4	20.1[a]
Treatment with foot wrap	32	78.5[a]	3.1	18.4[b]
Treatment without wrap	6	65.0[b]	4.0	29[a]

[a,b]*Values within a row with different superscripts differ (P<0.1)*

CONCLUSIONS:

Digital dermatitis has been studied and evaluated in the dairy industry for over 40 years. While the industry has a hearty set of recommendations for control of the disease, studies investigating heredity, social status in the herd, immune response, and DD vaccines are already in progress. Studies continue to gain more knowledge on DD and how to reduce or eliminate it.

Controlling DD on operations has proven difficult and remains one of the major foot issues afflicting dairy cattle. Many operations have protocols in place to manage DD, but others may not be aware of the prevalence in their herd. In order to get a baseline of DD prevalence in the herd, operations can utilize the DD Check app to score their cows. Once a baseline has been established, operations can focus on managing DD. Recommended practices such as frequent foot trimming, improving stall and pen manure hygiene, biosecurity, and increasing footbath usage can be utilized to manage the disease.

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