

# The Ontario Dairy Hoof Health Project



**Digital Dermatitis and Biosecurity Measures in  
Ontario Dairy Herds**  
An Observational Study

October 2012

This project is a result of the cooperation of the following funding partners:



PARTICIPATING MEMBERS



DAIRY FARMERS OF ONTARIO



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## **Forward**

As the Project Coordinator for the Ontario Dairy Hoof Health Project, it has been a privilege to aid in the first steps of a possible strategy to reduce lameness in the province's dairy cattle herds.

The concept of recording hoof lesions at the hoof trimmer level began many years ago with a paper form called the ABC Hoof Lesion Record promoted by the Hoof Trimmers Association. It is still in use today. From that beginning, three factors have evolved to allow this project to occur:

1. New computer systems that are capable of withstanding barn environments, moisture, dust, etc.;
2. In 2008, the Foot Atlas created by the International Lameness Committee and the Zinpro Corporation, that allows pinpoint accuracy was released and;
3. Hoof trimmers who are willing to be trained to record lesions and create hoof health records to benefit their dairy farm clients and those industry partners and researchers willing to help.

This project is a vision towards a system of unifying singular efforts by animal service providers and caretakers to deal with one of the most damaging animal welfare problems confronted by dairy farmers across the world. This can only be accomplished through standardized evaluations by hoof trimmers.

As an example, Denmark, with 110 full-time hoof trimmers, (55 of which do record) has allowed the Knowledge Centre for Agriculture (owned by farmers) to create the Danish Claw Recording system. Their coordinated efforts have produced a data base including 770,000 trim events on their cattle (April 2010 – May 2012). This system is now co-owned by the Nordic countries of Finland, Sweden, Norway and Denmark. Other countries, such as Holland, are also involved in claw health information.

These countries are also progressive because they examining animal welfare and are exploring strategies to address lameness through cooperation of their respective dairy industry partners.

This project has allowed hoof trimmers to prove they can be trained to evaluate hoof health in a standardized format, which allows a better understanding of the herds they deal with. This has created a good deal of fellowship and collegiality amongst the hoof trimmers. This in turn allows more effective communication with milk producers. Our hope this will inspire more to be a part of this emerging knowledge industry.

Lameness did not occur because we didn't care, it occurred because we didn't measure.

Vic Daniel

Project Coordinator - Ontario Dairy Hoof Health Project

October 1<sup>st</sup>, 2012

## **Executive Summary**

The Ontario Dairy Hoof Health Project is one of several projects mandated by the Agricultural Biosecurity Program (ABP) to ensure the following:

- Build awareness of biosecurity risks, and build capacity in the sector to adopt preventive measures and management practices;
- Improve the preparedness of the agri-food sector to deal with risks;
- Increase the level of understanding and awareness of biosecurity risks/issues/measures/importance across the sector;
- Encourage key players in the sector to promote and incorporate biosecurity measures into their operations and activities;
- Foster information-sharing across and between sectors to improve biosecurity along the supply chain;
- Improve biosecurity information available to the sector; and
- Assist sectors in preparing for implementation of national standards as they become available.

The Ontario Dairy Hoof Health Project was created to investigate cases of dairy cattle lameness due to claw lesions from structural damage to and/or infections of hoof (claw) tissues. Hoof lesion data currently being collected by hoof trimmers in Alberta and completed data by British Columbia indicates that bovine digital dermatitis (BDD) is by far the most common lesion among the cows examined. Next in order of prevalence are four lesions related to “claw horn disruption”: sole ulcer, white line lesion, sole hemorrhage and toe ulcer. Many studies in North America and Europe have demonstrated that producers significantly underestimate the incidence of hoof health problems in their herds. Surveys like those being conducted in Western Canada and Ontario will estimate the true scope of hoof lesions in our dairy herds and identify those that need to be immediately addressed. The average cost of digital dermatitis ranges from \$105.00- \$168.00 per cow case (Greenough 2008, Provita 2010). The estimated cost to Ontario producers is three to four million dollars annually (Daniel 2011).

**The Project's Short-Term Goals are to:**

1. Educate hoof trimmers on lesion identification and recording, specifically digital dermatitis, risk analysis and control measures of bovine digital dermatitis;
2. Determine the current level and change in prevalence of bovine digital dermatitis in Ontario based on project herds;
3. Development of biosecurity protocols for controlling bovine digital dermatitis and subsequent lameness in Ontario dairy farms;
4. Develop a plan for the ongoing collection and monitoring of hoof health in Ontario
5. Elevate awareness of bovine digital dermatitis and control strategies among dairy farmers and advisors in Ontario.

**What the Ontario Dairy Hoof Health Project Achieved**

- Twelve Ontario hoof trimmers received three days of training in standardized lesion identification and severity scoring (Foot Atlas –Appendix 4 page 55) with chute side computer recording systems (Hoof Supervisor).
- From August 2011 to July 2012, 335 farms with registered cattle that are milk recorded with CanWest DHI provided 24,045 individual cows identified with over 49,000 health records events.
- 235 general biosecurity surveys were returned for evaluation
- From June 28<sup>th</sup> – July 25<sup>th</sup> 2012, 29 intensive barn surveys including: scoring hygiene of cattle and stalls, measuring ammonia levels, noting barn ventilation type(s), barn temperature, outside temperature and relative humidity on survey day
- Created an up to date database of hoof health in 335 dairy herds that is capable of further evaluations in barn environment, genetics, and a provincial benchmark for inter provincial comparisons that shows;
- The prevalence of bovine digital dermatitis in 24,045 animals was 38% (4,448 cows with a minimum of one digital dermatitis lesion)
- The prevalence of digital dermatitis in 280 herds with over 50% of cows trimmed from Aug 2011 to July 2012 surveyed herds showed an average prevalence of 13.7%.
- Surveyed herds bovine digital dermatitis prevalence ranged from 0% to 62% of cows. The best 25% had 1.9% and lower and the worst 25% of herds were 22% and higher.

Most importantly, the Ontario Dairy Hoof Health Project achieved a communication focus for dairy producers and their hoof trimmers to have their observations be considered. This will help researchers and veterinarians as well as other industry partners in creating lameness reduction strategies in coordination with producers and hoof trimmers.

## Trimmer Training

Photo 1 shows hoof trimmer and trainer Elbert Koster from Alberta. Photos of claws showed the lesion and the Foot Atlas showed the location and severity. The Ontario trimmers had to correctly identify the lesion(s) by entering the zone, lesion and severity in their computers. All trimmers were evaluated at a later date on a project farm by the project coordinator to assess identification accuracy and consistency.

Photo 2 shows computer program training provided by KS Dairy Consulting, Technician Gretchen Demulling (upper right) is showing trimmers program capabilities. By the last training day in June, project trimmers were helping each other increase efficiency in their systems and ideas.

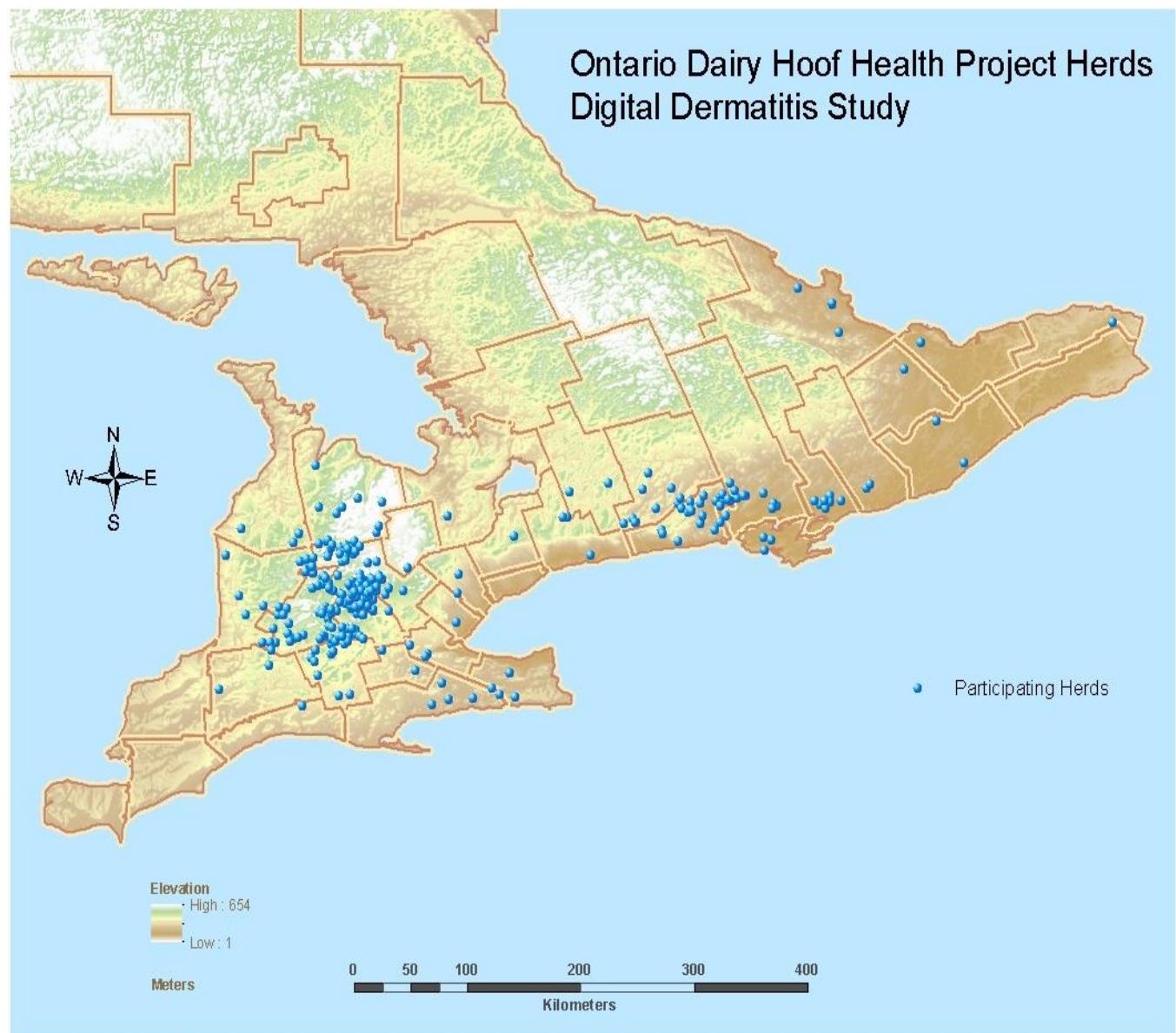


Photo 1 courtesy of B. Murray



Photo 2 courtesy of B. Murray

## Project Herd Locations



## Section 1.0     Overview of Digital Dermatitis

Since the official discovery of digital dermatitis (Mortellaro's Disease) or "Strawberry Foot" by the Italian veterinarian Dr. Mortellaro in the early 1970s, the disease has spread throughout industrialized dairy countries around the world. Many older researchers and farmers recall seeing the disease in the mid-to late-1950's on the occasional cow, but not to the severity we see today.

Photo 3 shows the typical DD lesion we believe to be the disease. This is digital dermatitis in the truest sense, defined as any abnormal skin or skin affliction that corrupts the normal skin tissue.

The actual disease, shown in photo 4, is a spirochete organism from the family of *Treponemas*. It is a very long thin organism with fine hair-like filament along its length making the organism similar in shape and legs of a centipede.



Photo 3 courtesy of V.Daniel



Photo 4 courtesy of N. Capion

Treponemes are capable of entwining around and even piercing through skin cells burrowing deep into the dermis (skin) of the bovine foot. They spread and colonize within the skin cells. This is a large part of what causes the animal to show more pain in the early stages of infection.

#### Quick Facts on Treponemes

- Over 25 different strains are known to exist, and vary from one geographic region to another.
- There are generally three strains per lesion.
- It is the only micro-organism in the deep layers of the skin.
- Vaccines have been produced that can create high level of antibodies but they cannot reach the depth of the treponemes in the skin tissue.
- It is very difficult to transfer the disease in experimental conditions.
- They are easily spread in herd conditions.
- They thrive in an anaerobic environment.

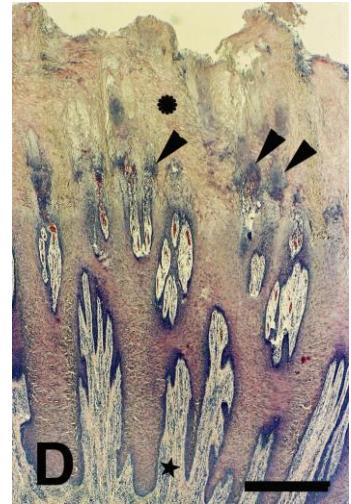


Photo5 courtesy of N. Capion

Though digital dermatitis is considered an infectious disease, its success relies mostly on the opportunities that allow it to infect dairy cattle both young and old. Therefore, reducing the opportunities that foster digital dermatitis is the best way to reduce the disease's impact in a proactive fashion. The following table shows opportunities that allow this disease to be so dynamic within a herd and explain the selectivity of the disease to infect only certain animals. These infections can be a singular event or, in many cases, the infection becomes repetitive or chronic.

Table 1

Animal Risks	Housing Risks	Hygiene Risks	Biosecurity Risks
Breed	Stall dimension/surface	Bedding type + amount	Buying In cattle
Age	Ventilation	Stall cleanliness	Contact between cattle
Calving	Climate	Alley scraper	Visitors, Vet, Trimmer
Milk Yield	Season	Slurry Handling	
Conformation	Grazing or Confinement	Feeding	
Other Hoof Lesions	Floor type	Footbath	
Welfare		Foot care Hoof trimming	
Stocking Density			

Photo 6 shows the posterior view of the bovine foot. This is a healthy foot. The inter-digital cleft space which is above the heel bulbs and between the claws presents no visible signs of bovine digital dermatitis. This is our ideal goal.

Photo 7 shows the beginning stages of bovine digital dermatitis. The upper cleft area shows typical reddening of the skin and skin sloughing exposing the dermis.

As we examine the deeper region of the left side of the inter-digital cleft we see a small digital dermatitis lesion that would escape simple visual inspection. Failure to apply early detection or foot management programs is what allows a minor health problem to become a severe pain causing lesion as seen below in Photo 8



Photo 8 courtesy of V. Daniel

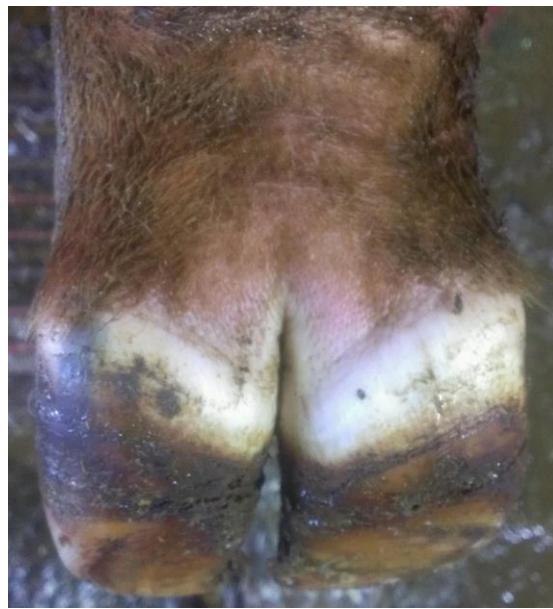


Photo 6 courtesy of V. Daniel



Photo 7 courtesy of V. Daniel

## **Section 2.0**

## **Foot Health Evaluation Past and Present**

In 2005 Dr. Gerard Cramer evaluated the presence of foot lesions in Ontario dairy herds (table 1) and presented the results at what was then called the Large Herd Operators (now Progressive Dairy Operators) Symposium in early 2007. The results showed that the most common lesion found was Bovine Digital Dermatitis, with over 92% of freestall herds and 69% of tie stall herds having at least one cow affected. The average prevalence of cows affected per herd was 22.9 (freestall herds) and 9.3 (tiestall herds). Ulcers and white line lesions were also highly prevalent.

Table 2:

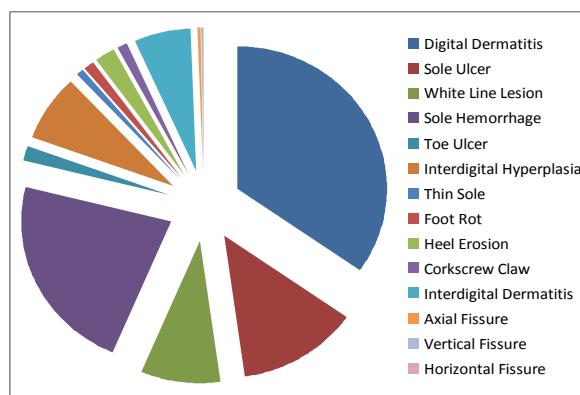
Lameness in Ontario Dairy Herds, G. Cramer, OLHO Ontario Dairy Symposium p 116 (Mar 2007)				
Lesion	Free Stall Herds		Tie Stall Herds	
	Prevalence	% of herds affected	Prevalence	% of herds affected
Infectious lesion	29.3	94.7	15.8	88.0
Heel Horn Erosion	8.4	68.4	8.3	67.6
Digital Dermatitis	22.9	92.1	9.3	69.7
Foot Rot	0.2	2.6	0.2	7.8
Hoof horn lesions	23.3	100.0	12.2	92.3
Hemorrhage	11.1	81.6	7.1	70.4
Ulcers	9.3	89.5	4.7	70.4
White Line Separations	5.2	68.4	1.0	25.3
White Line Abscess	2.0	50.0	0.6	21.1
Other				
Korn	4.3	73.7	1.0	27.5
Vertical Wall Crack	0.2	13.2	0.1	4.3
Thin Soles	0.5	15.8	0.2	5.6
Deep Sepsis	0.2	2.6	0.0	1.4
Non-Foot Lameness	0.6	18.4	0.2	7.0
Blocked	2.2		0.3	
Wrapped	16.2		6.7	
Lesion	46.8	100.0	25.7	99.3
Number of Cows	4252		7668	

Current data from this project's study of Ontario cows, surveyed by hoof trimmers in 2011 and 2012, is shown in Table 3 and Figure 1. Herd level data is shown in Table 4 and Figures 2 to 5.

**Table3:** Prevalence of foot lesions among all cows trimmed by hoof trimmers Aug 2011 to July 2012.

Participating Farms	335	
Total cows trimmed	24,045	
Cows with Lesions	9,156	38.1%
Type of Lesions:		
Digital Dermatitis	4,448	34.8%
Sole Hemorrhage	2,894	22.4%
Sole Ulcer	1,684	13.8%
White Line Lesion	1,106	8.6%
Interdigital Hyperplasia (Korn)	968	7.5%
Interdigital Dermatitis	769	6.0%
Heel Erosion	280	2.2%
Toe Ulcer	213	1.7%
Corkscrew Claw (abnormal claw)	155	1.2%
Phlegmon or Foot Rot	133	1.0%
Thin Sole	128	1.0%
Axial (inner wall) fissure	40	0.3%
Vertical Fissure	30	0.2%
Horizontal Fissure	10	0.1%
Total lesions	12,898	100%

**Figure 1:** Display of prevalence of lesions among cows

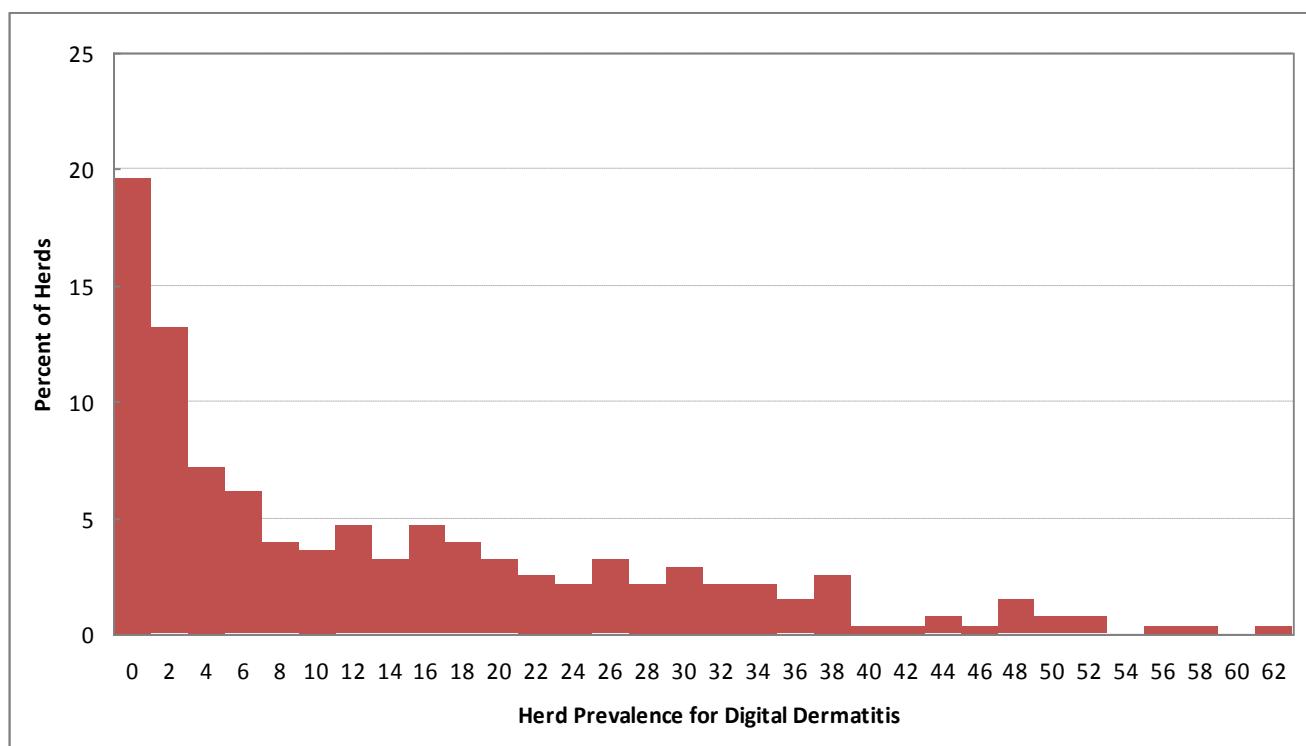


The following tables and figures show the prevalence of the top four lesions in our study.

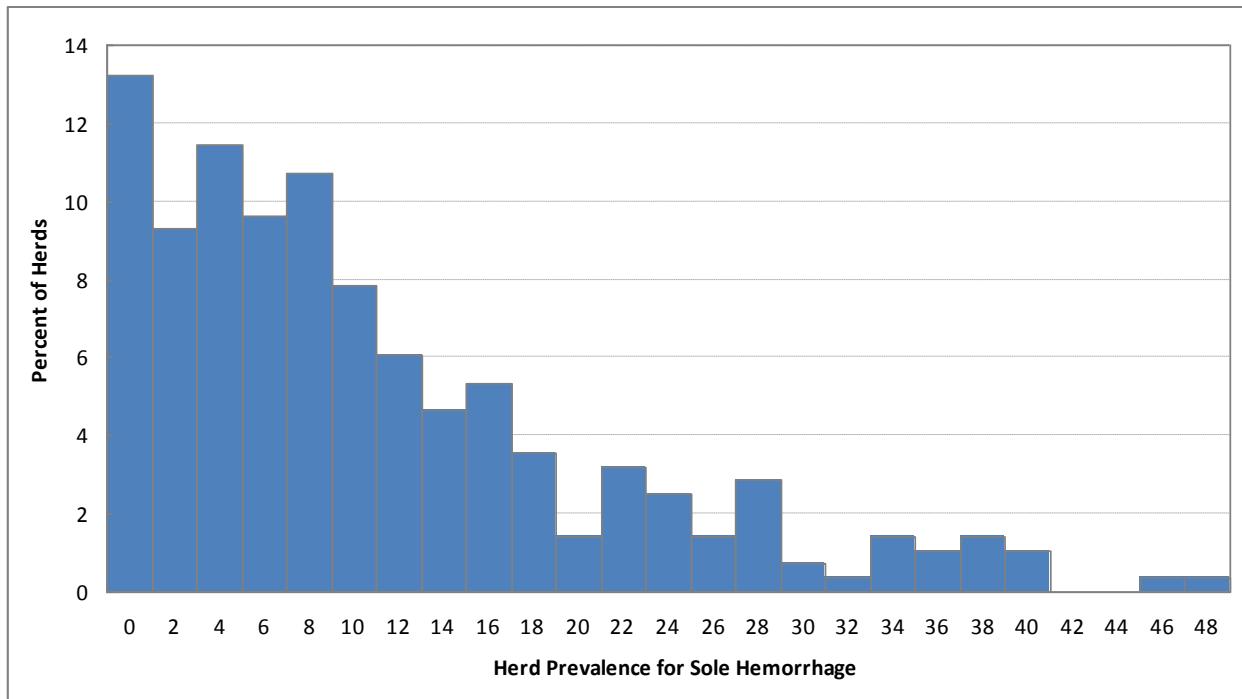
**Table 4:** Herd level estimate of the prevalence of common foot lesions among 280 herds with over 50% of cows trimmed August 2011 to July 2012.

Lesion	Number/(%) of herds with at least one cow affected	Average prevalence	“Best” 25% of herds	“Worst” 25% of herds	Range of averages among 280 herds
Bovine Digital Dermatitis	225 (80.4%)	13.7 %	1.9% or lower	22.0% or higher	0 to 62%
Sole Ulcer	233 (83.2)	4.96%	2.1% or lower	7.15 or higher	0 to 24%
Sole Hemorrhage	243 (87.1%)	10.985	3.5% or lower	15.68% or higher	0 to 48%
White line lesion	157 (56.8%)	2.45%	0%	3.9% or higher	0 to 16.3%

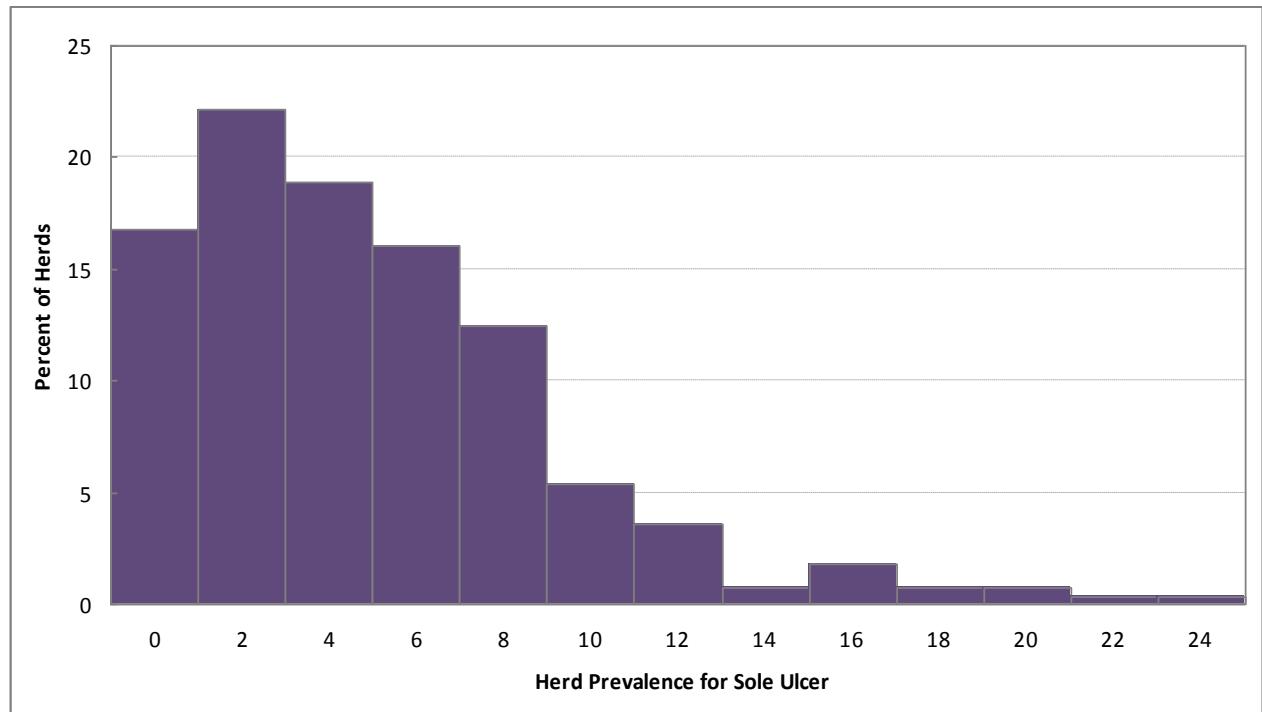
**Figure 2:** Distribution of herd prevalence for Bovine Digital Dermatitis (281 herds)



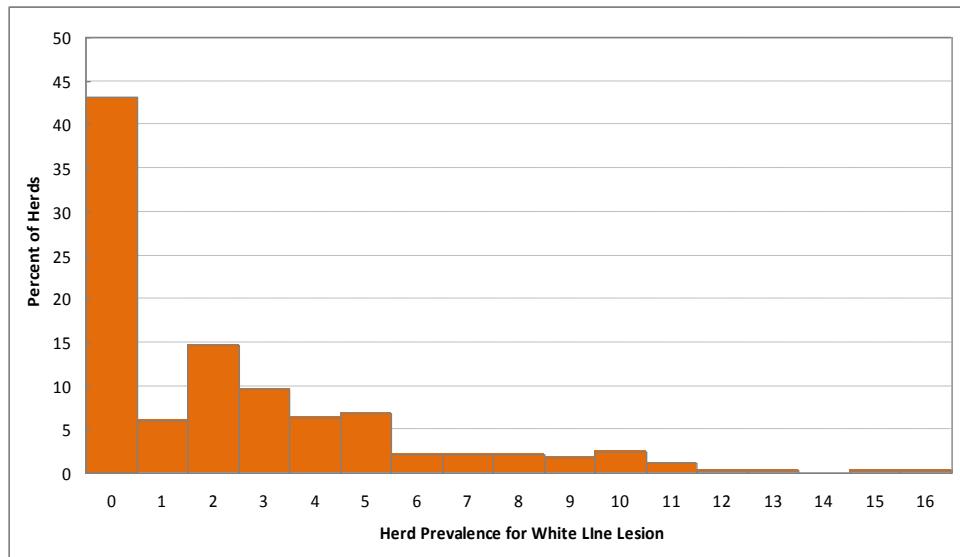
**Figure 3:** Distribution of herd prevalence for Sole Ulcer (281 herds)



**Figure 4:** Distribution of herd prevalence for Sole Hemorrhage (281 herds)



**Figure 5:** Distribution of herd prevalence for White Line lesion (281 herds)



### **Section 3.0**

### **Biosecurity Report**

Bovine digital dermatitis (BDD) is a dynamic and infectious disease in cattle. Efforts are required to keep dairy herds in Ontario free of the disease, or at a low level of infection. BDD has spread widely since the first reports in a few herds in the early to mid-1980s to now over seventy five percent of the herds sampled from the Cramer Study of 2005 and this study in 2012.

In this project 232 of the 335 dairy herds involved were surveyed using a standard form (see appendix 3 pg. 49). While it cannot be quantified, the survey did result in an increase in communication between hoof trimmers and their clients about the others biosecurity measures. The survey questions opened a lot of dialogue and created the realization that perhaps there is room for improvement. The improvements need to be discussed amongst all partners, including all dairy cattle organizations, milk producers, veterinarians, farm suppliers, hoof trimmers and researchers.

**Table 5:** Breakdown of barn types in the survey

Housing	Tie Stalls	Free Stalls	Pack Barn	Other
232 herds	181	47	2	2

Tie stalls constituted 77% of the surveyed herds

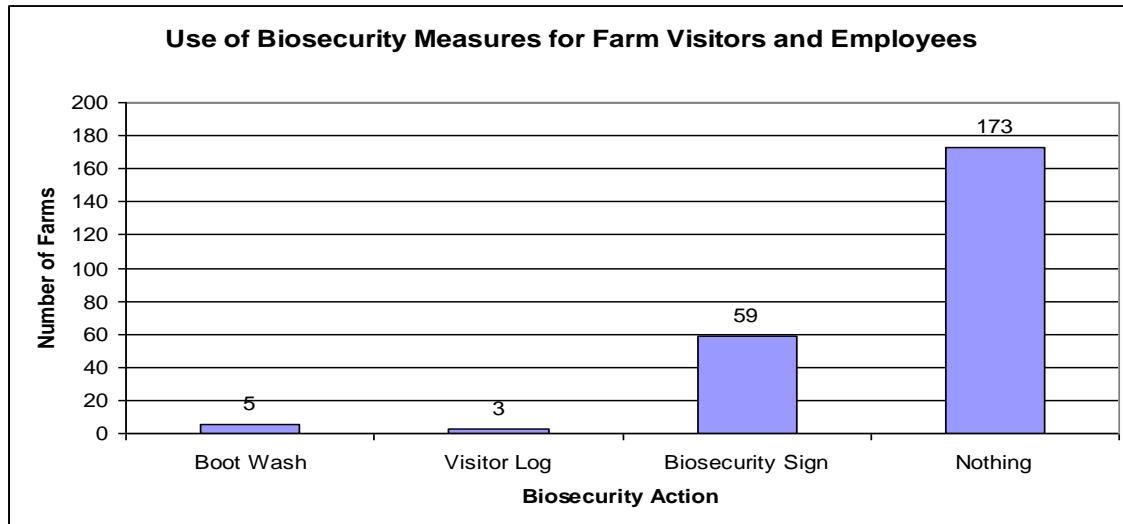
(Tie stall herds constitute 70% of all Ontario dairy barns. –Source: OMAFRA)

Free Stall barns constituted 32.5%

Pack Barns constituted 0.5%

In our general farm survey, section 1 assessed what biosecurity measures are currently in place on Ontario dairy farms. The survey questions show the following results.

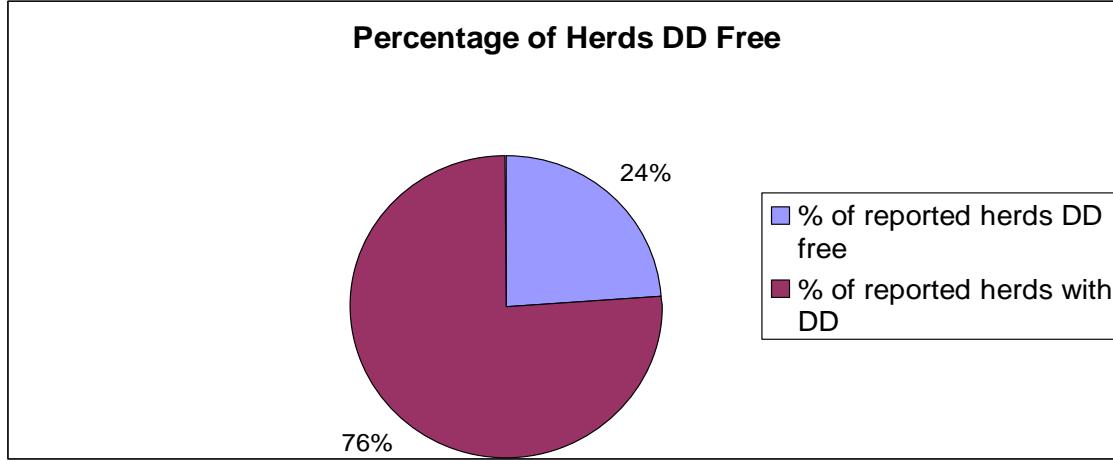
**Figure 6:** Types of barn security measures at entry points (survey responders checked all that applied)



**75% of the project farms surveyed implemented no biosecurity measures at entry.**

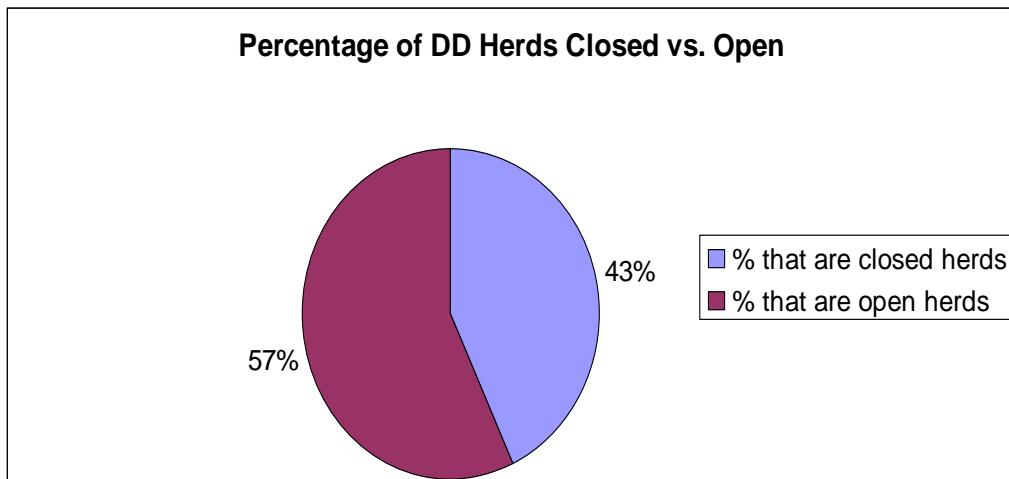
Section 5 of the survey wanted to see how many herds were still free of digital dermatitis

**Figure 7:** Herds reported without bovine digital dermatitis overall



**24% of the surveyed herds did not show visible signs of digital dermatitis.**

**Figure 8:** Infected herd profile, Closed Herds (defined as no cattle entry in the past five years) vs. Open Herds (continual cattle import and export)



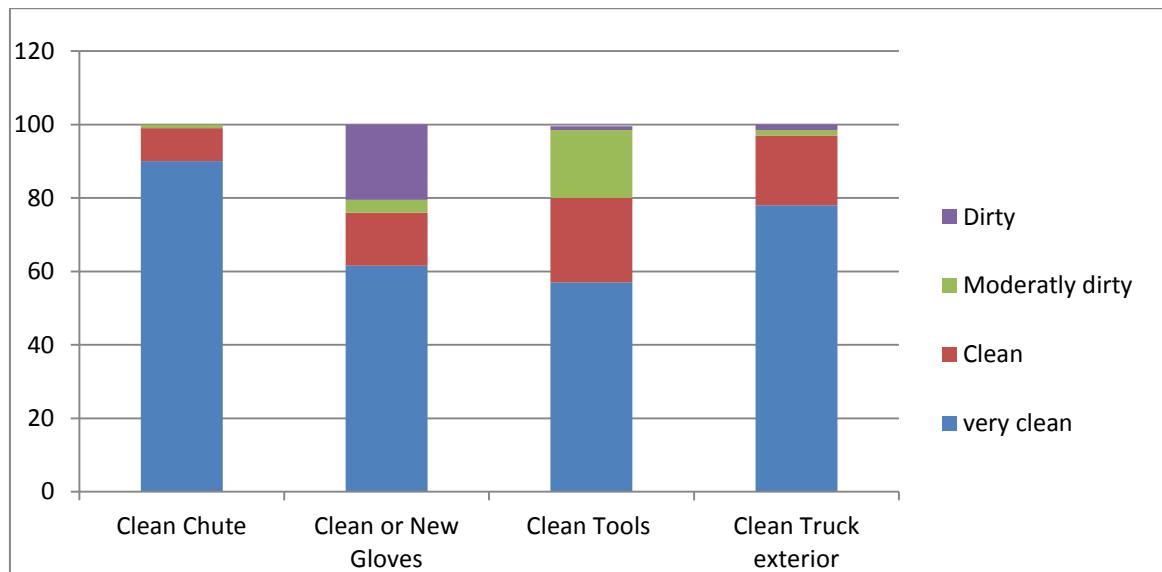
Explanation: the five year timeline creating a definition of a “closed” herd does not preclude the purchasing of animals that may have carried the disease to the farm prior to 2007. This possibility can explain the high percentage in those herds considered closed. It also raises possible disease entry due to personnel or equipment from one farm to the next.

**Figure 9:** Producers awareness of hoof trimmers' hygiene practices on their chutes



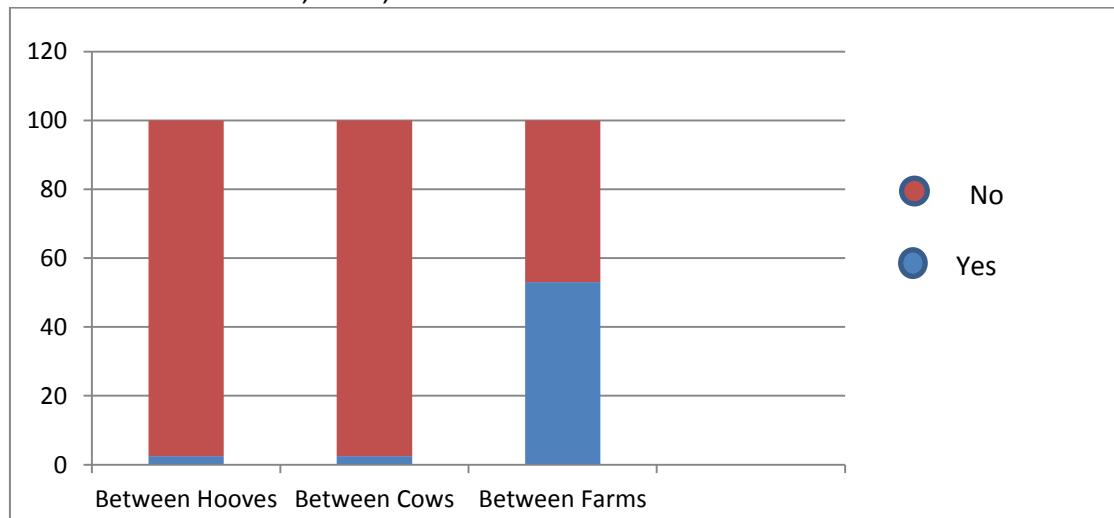
**The majority of producers are aware of trimmer hygiene practices on their chutes.**

**Figure 10:** Producers' evaluation of trimmers' hygiene practices  
 Ratings: 1-very clean, 2- clean, 3 –moderately dirty, 4 – very dirty.  
 The chart combines all the evaluations in percent.



**Improvement could be shown in the gloves and clean tools.**

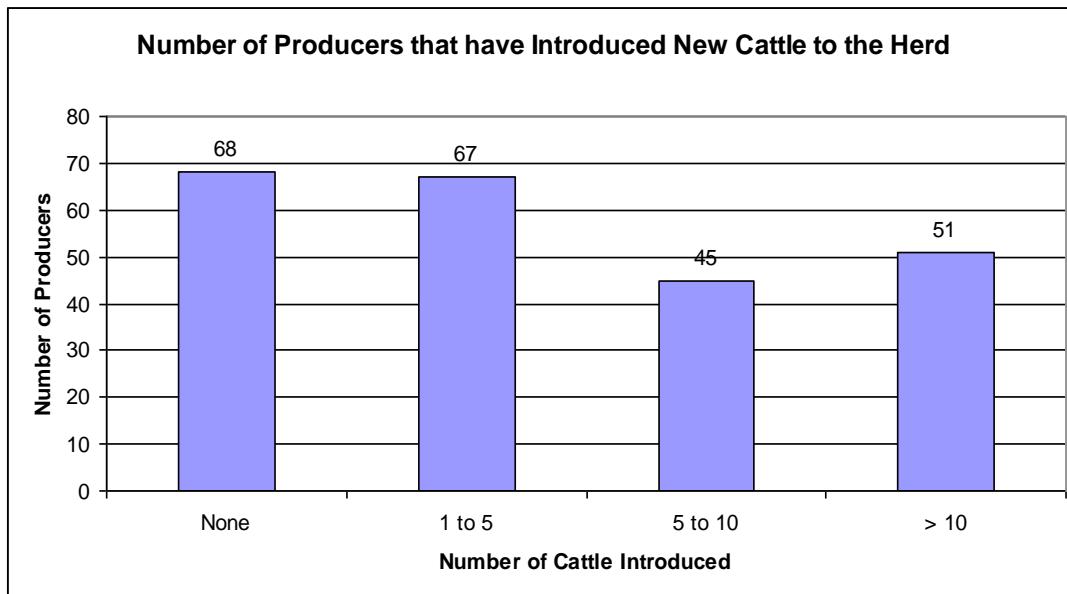
**Figure 11:** Trimmer responses to producers question of when or if their trimmers clean or disinfect Tools between hooves, cows, or farms



**All trimmers had dairy herds with no digital dermatitis. They ranged from 20% to 70% of clients showing no sign of the disease.**

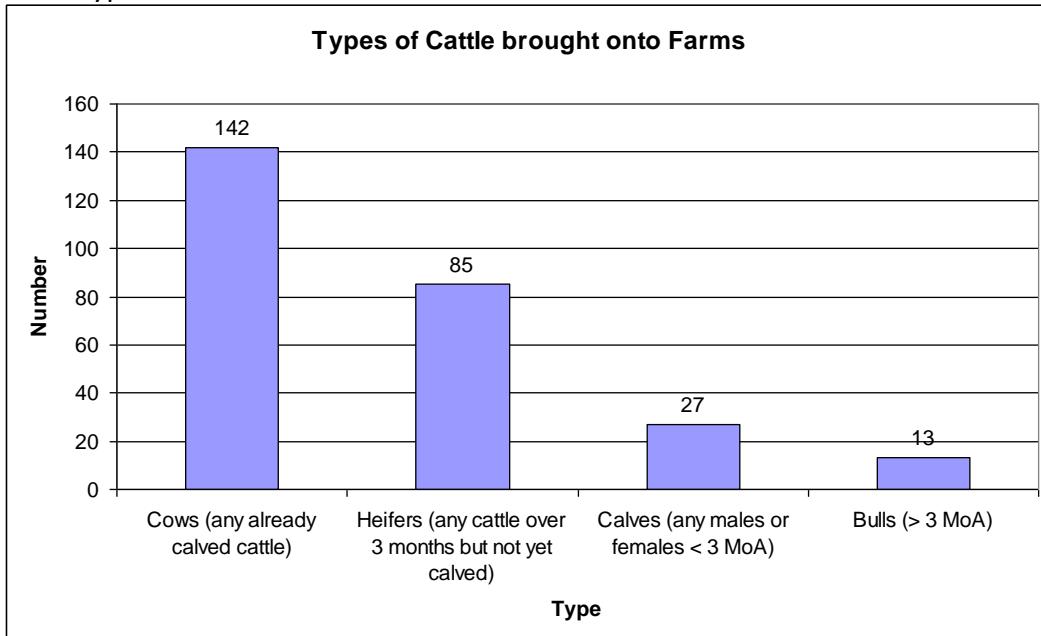
The survey also looked into purchasing patterns of cattle entering farms and the following graph shows the high degree of farms that purchase cattle onto their farms for breeding or replacement purposes.

**Figure 12:** Number of producers (out of 231 responses) who had introduced cattle to their herd in the past five years.



**70.5% of producers introduce new cattle into their herds**

**Figure 13:** Types of new cattle introduced to the herd



**Lactating cattle are what the majority of producers purchase into their barns.**

When producers were asked about implementing disease prevention protocols when introducing cattle to the farms, only 166 farms out of 233 surveyed answered. **Only 33% of responding producers responding practice any disease prevention on cattle prior to entering the herd.**

**Table 6**

Questions	Yes	No
Do you vaccinate cattle on arrival?	38	127
Inspect feet visually for Bovine Digital Dermatitis?	25	141
Inspect foot lesions by picking up feet and trimming?	2	163
Have your vet check new animals over on arrival into your herd?	9	156

**Over two thirds of the producers allow cattle to enter their premises un-inspected for foot diseases such as digital dermatitis.**

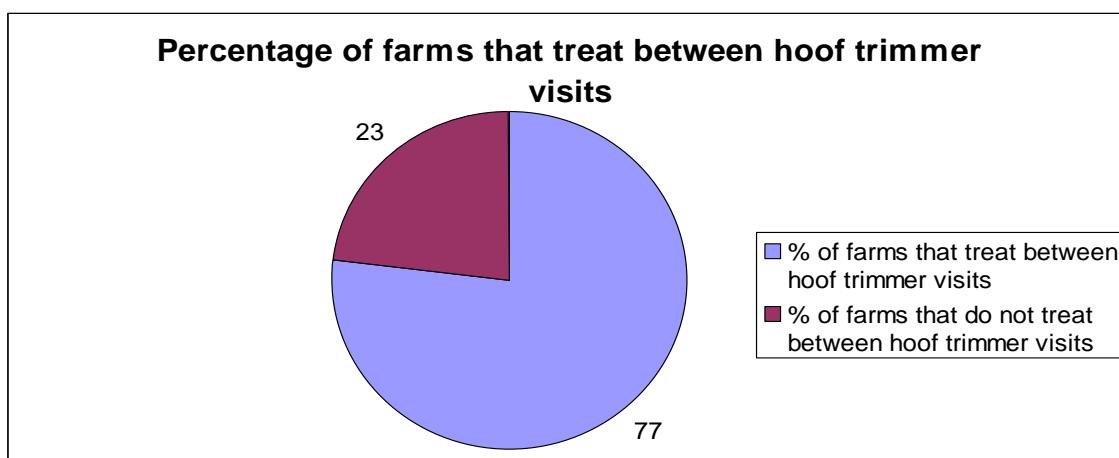
Part of the problem facing producers is how to do foot inspections. Three choices provided in the survey, (section 3.4 of Appendix 3) show the following results from 214 producers.

**Table 7**

On your farm, how do you restrain cows to check for foot lesions or treat lameness?	Yes	No
A chute that restrains cattle	61	153
A chute that tilts cattle	3	211
Rope and a beam or a hook	101	113

**Less than half (47%) of the producers in the project have adequate equipment to properly evaluate hoof lesions, which can protect themselves, employees and their animals.**

**Figure 14:** Percentage of farms that treat BDD infected cattle and provide disease prevention tools between hoof trimmer visits.



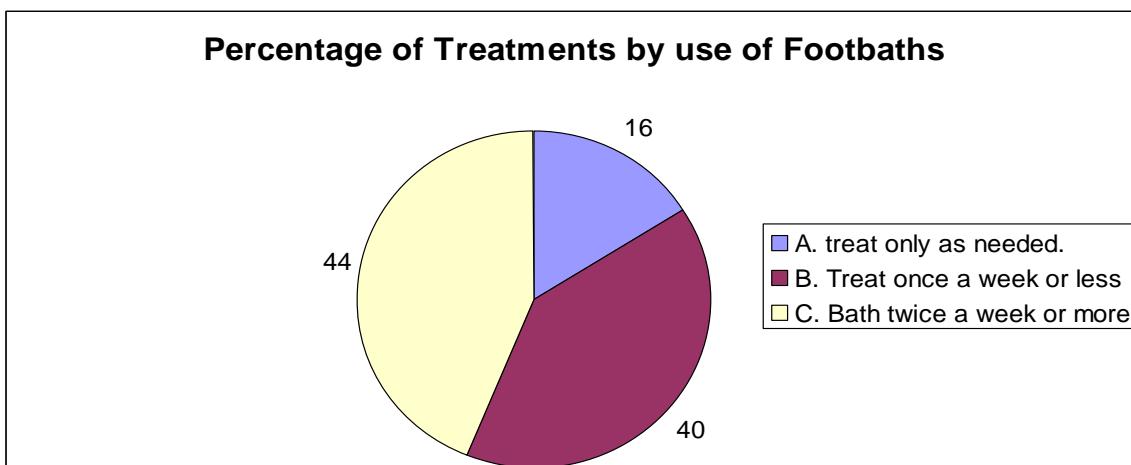
**The majority of producers (77%) are actively engaged in treating digital dermatitis on their farms.**

Three of the top four farm treatment choices were antibiotic-based:

1. Tetracycline spray or wrap
2. Onycin 1000 mixed in solution or wrap
3. Intra Sol Hoof Gel (non-antibiotic)
4. Lincomix powder in spray or wrap

The survey results for producers scheduling of footbath use in 43 herds are shown in the following figure.

**Figure 15: Footbath Scheduling**



**Percent of Farms using the following products used in foot baths:**

1. Formaldehyde (Formalin) constituted 50%
2. Copper Sulphate constituted 21%,
3. "Other" constituted 18%
4. Antibiotics constituted 08%

Most farms are underutilizing their footbaths. In our intensive studies many producers are not accurate in assessing the correct percentage of treatment in their baths. The main problem is a lack of understanding how much water is present in their foot bath.

As an example, a producer thinking he had a 3% Formalin (formaldehyde) concentration in his foot bath in fact, had less than only a one percent Formalin foot bath solution being applied to the lactating cows feet. This allowed a 20% prevalence rate in the milk cow group, which, had the recommended solution been used could have reduced the current infection rate

Producers need help in understanding foot bath use, especially with foot bath calculations.

The following formulas can be used to help establish an objective solution base for controlling BDD by calculating the footbath water amount:

**Table 8:** Footbath Formulas

Metric	
To determine capacity of a footbath	Length (m.) x width (m.) x depth (m.) x1000 = number of liters
Conversion of Litres to Kilograms	Number of Litres = kilograms of water
Determine kg of dry product needed to achieve desired solution	Multiply kg of water x percent solution desired = kg of dry product required

Calculating Appropriate Quantity of Foot Bath Chemical/Product to use				
Footbath volume in litres	Litres or Kg per footbath			
	2%	3%	4%	5%
200	4	6	8	10
300	6	9	12	15
400	8	12	16	20

Formulation source: Creating and managing an Effective Footbath (First Step) Zinpro Performance Minerals

## **Section 4.0**

### **Intensive Survey Protocols**

Project trimmers submitted 29 intensive surveys that required:

- A basic mapping of the barn (rows of stalls, pens, and ventilation style(s) and location in barn)
- Recording barn temperature - outside temperature and relative humidity.
- Record three ammonia levels in the barn at the cows' foot area (approx. 3 inches or 7.6 cm. from the stall or floor surface) using IG3D GasTec Ammonia Dosi tubes 5.3-2100 ppm. Tubes were placed in protective double open ended PVC tubes with secured screens to allow any gas to pass through. Tubes were placed in a cross section pattern in the barn and were then removed and recorded after five hours of exposure time.

The purpose is to assess if ammonia levels vary within barns and if so, do higher ammonia levels reflect a higher proportion of digital dermatitis infections. This theory is based on the question, "Does continual exposure to ammonia create skin irritation that leads to a weakening of the skin allowing treponemes to enter and infect the skin?" Cattle and stalls were scored according to a standard observation.

<b>Cattle Hygiene Score</b>	
Clean	Dirty
1	2

<b>Stall Hygiene Score</b>		
Over 50% soiled	About 50% soiled	Less than 10% soiled
0	1	2

<b>Bedding Coverage in Stalls</b>		
Less than 10% covered	About 50% covered	Over 75% covered
0	1	2

All stalls and animals were to be scored prior to trimming.

All Dosi tubes were installed prior to trimming.

All herds were to be at least 50% of animals to be trimmed.

### **Observations**

In the 15 herds that had cattle with digital dermatitis there were 71 head positive for at least one digital dermatitis lesion the following table shows the results

**Table 9:**

<b>15 herds</b>	<b>Cattle Hygiene Scores</b>	<b>Stall Bedding Scores</b>	<b>Stall Hygiene Scores</b>
71 head with DD	Score 1 clean -63 cows Score 2 dirty – 8 cows	0 = < 10% coverage 4 stalls 1 = 10-50% coverage 34 stalls 2 = >50% coverage 23 stalls	0 = >50% dirty 1 stall 1 = 50% dirty 21 stalls 2 = <10% dirty 46 stalls

Only 12.7% of cows infected with digital dermatitis scored dirty.

Stall bedding scores averaged 40% coverage.

Stall hygiene scores show 68% of stalls were less than 10% dirty.

**The data in this section shows hygiene was not a dominant factor in animal infections of digital dermatitis.**

### **Ammonia Readings**

25 herds had ammonia readings taken. The highest level in a location in a barn was 180 ppm and the lowest level was 0 ppm (See Appendix 1 - page 29). Some barns were very consistent while others varied greatly. A side experiment was created to assess ammonia levels on a vertical reading bar from the standard 3 inch level to 40 inches (animal level) to 64 inches (human level).

This was to see if human detection of ammonia was the same as the foot level of an animal

Two barns provided the following readings

**Table 10:**

<b>Barn type</b>	<b>Ventilation</b>	<b>3 inch (7.6 cm) from floor height reading</b>	<b>40 inch (101.6 cm) from floor height reading</b>	<b>64 inch ( 162.6 cm) from floor height reading</b>
Free stall concrete floor	Fans turkey curtains Brisk air movement	25ppm	0	0
Free stall slatted floor	Turkey curtains Low air movement	150ppm	50ppm	25ppm

**Ammonia levels were higher at the hoof level than at a level for human senses of ammonia. As ventilation decreases ammonia levels increase.**

Eighty percent of all tunnel ventilation barns (10) showed a consistent reading in ammonia levels from the air intake area (avg. 22.75 ppm) that increased significantly at the air exhaust by twofold (45.6 ppm).

The chimney and curtain barns were more consistent in their ammonia levels from one end of the barn to the other as shown in Appendix 1 (page 29).

While the data shows ammonia variability it cannot show relativity to digital dermatitis rates due to animal movement. Even when identified in the barn location on the barn map, animals could have just recently moved from a high area to a low area of ammonia already infected with the disease.

## **Section 5.0**

## **RECOMMENDATIONS**

1. As Bovine Digital Dermatitis (BDD) is a 20 year old epidemic, having a high prevalence in Ontario dairy herds, with many dairy cattle exposed to the disease on a day to day basis. The survey assessment shows dairy producers and hoof trimmers with little standardized biosecurity measures being applied. **Therefore we recommend a coordinated effort by governing bodies to investigate creating standard bio-security protocols regarding this disease.**
2. By using the Foot Atlas (see Appendix 4, page55) as a standard for lesion identification and location, the data shows clearly a linear risk factor according to the zone of the foot:

Zone 10 –	between the heel bulbs had a	79.0% infection rate
Zone 0 -	the inter digital space between the toes had a	16.82% infection rate
Zone 11 -	between the toes at the front of the foot had a	3.21% infection rate
Zone 9 -	above the foot and below the dewclaws had a	0.83% infection rate

**We recommend that a four point inspection of the hoof area be part of that standardized bio security protocol**

3. Low prevalence BDD herds had fewer new animals from other sources introduced in the herd. Herds introducing new cattle from many sources showed a very significant statistical indicator for high BDD prevalence. **We recommend a herd policy for managing animal introduction into the herd as part of that standardized bio security protocol.**
4. Herds in the high prevalence group of BDD showed that over 50% of those herds had BDD in their heifer groups. **We recommend that early detection for BDD in young cattle be implemented as part of a standardized bio-security protocol.**
5. In our dataset there is a significant association between footbath use to prevent infectious foot disease and BDD prevalence but we do not know why. **We recommend strongly that further research on the utility and effectiveness of footbaths be examined.**
6. **We recommend the continuation of hoof health data collection.**

The Participating Member Hoof Trimmers who helped make this project possible:

Steve Burns – Havelock  
Jeff Butchers – Stirling  
Vic Daniel – St. Marys  
Scott Den Haan – Markdale  
Jamie Farrell – Mt. Forest  
Peter Kudelka - Mitchell  
Randy Lichti – New Hamburg  
Allan Martin – Bluevale  
Randall Martin – Bluevale  
Jim Ness- Cobden  
Dave Stephenson – Princeton  
Doug Vaughan - Fergus



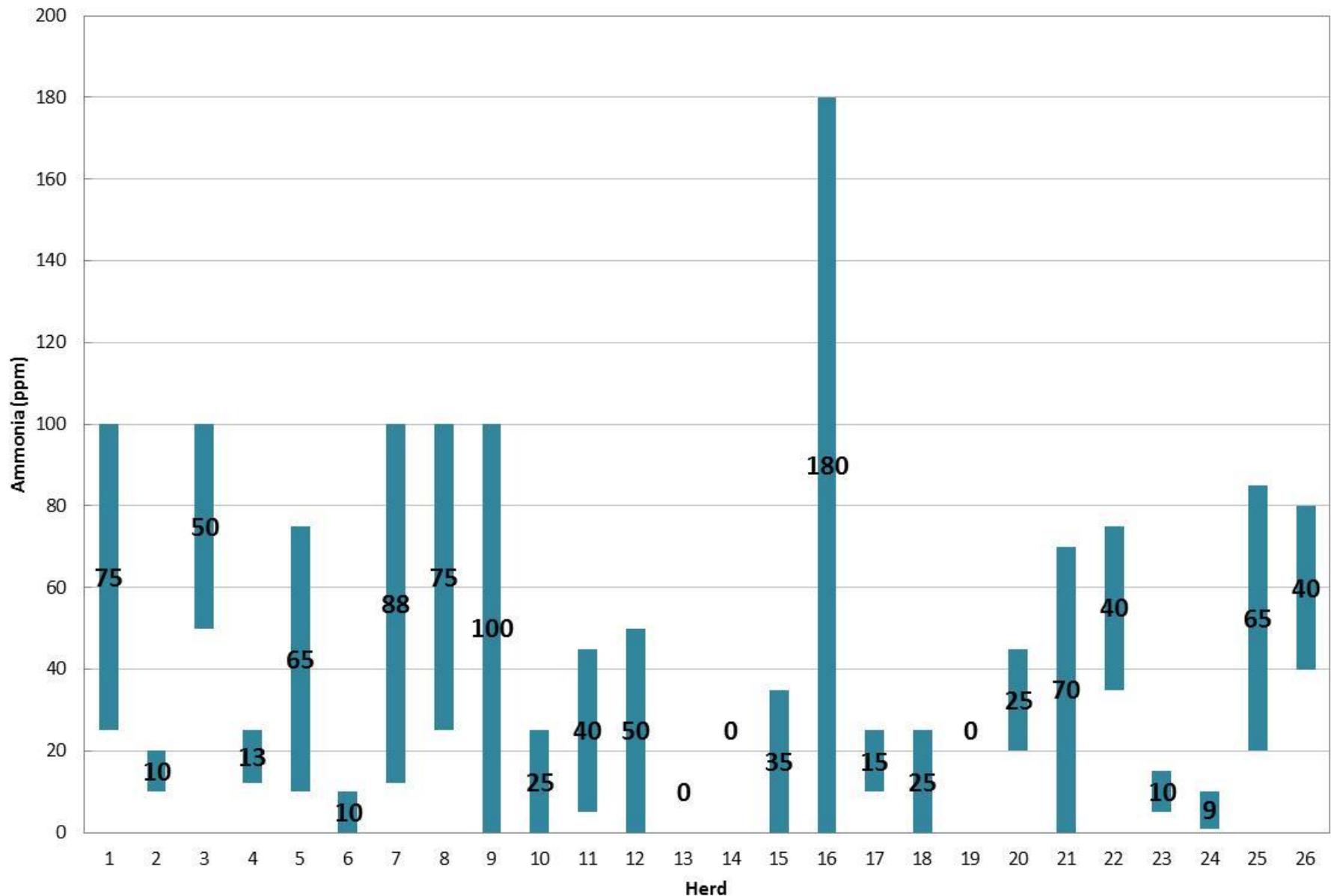
Appendix 1 – Table 11: Ammonia Readings

A INTENSIVE SURVEYS AMMONIA READINGS JUNE 28 2012 TO JULY 25 2012								
DATE	DHI #	AMMONIA READING SITE 1 (5HR)	AMMONIA READING SITE 2(5hr)	AMMONIA READING SITE 3(5hr)	AMMONIAAVG PER HOUR	BARN TEMP IN CELCIUS	OUTSIDETEMP INCelsius	RELATIVE OUTSIDE HUMIDITY
06/28/12	12955	100	25	50	35.0	23.0	21.0	55%
06/29/12	18712	25	0	0	5.0	24	27	10%
02/07/12	21802	25	12	10	11.4	27	32	84%
03/07/12	17371	25	100	50	35.0	29	33	89%
04/07/12	18918	50	25	0	15.0	28	31	89%
05/07/12	30856	45	20	25	18.0	31	35	80%
06/07/12	13102	25	20	12	11.4	26	30	80%
06/07/12	14436	10	25	75	22.0	29	35	80%
09/07/12	20085	20	0	180	40.0	24	29	74%
11/07/12	32134	75	20	85	36.0	24	27	65%
12/07/12	18125	0	20	100	24.0	20	19	88%
12/07/12	31527	35	50	75	32.0	25	27	35%
12/07/12	17090	15	12	100	25.4	28	31	49%
16/07/12	19654	25	25	25	15.0	25	26	90%
17/07/12	245854	40	55	80	35.0	33	33	81%
17/07/12	31964	5	1	10	3.2	29	33	60%
18/07/12	31402	0	70	40	22.0	24	24	70%
18/07/12	30493	25	25	25	15.0	20	22	70%
18/07/12	31924	10	5	15	8.0	22	21	75%
18/07/12	10950	25	50	100	35.0	27	28	45%
19/07/12	22341	0	25	25	10.0	21	22	69%
19/07/12	12762	10	20	0	6.0	20	20	75%
19/07/12	19526	10	10	10	6.0	26	26	?
20/07/12	18916	45	25	5	15.0	24	24	36%
20/07/12	15785	0	0	10	2.0	23	25	34%
25/07/12	20052	0	35	25	12.0	25	27	47%
MEAN AVGS.					19.0	25.5	27.5	64.8%

**Table 12:AMMONIA READINGS IN RELATION TO AIR INTAKE AREA AND FAN EXHAUST AREA**

Herd Identity #	BARN VENTILATION TYPE	INTAKE AREA 5HR. READING (PPM)	MID POINT 5 HR. READING (PPM)	EXHAUST AREA 5 HR. READING (PPM)
950	TUNNEL	25	50	100
052	MOUNTED FANS	0	35	25
134	CURTAIN/CHIMNEY/FANS	20	85	75
964	CURTAIN/CHIMNEY/FANS			
402	CURTAIN/TUNNEL/CHIMNEY	0	20	40
916	CHIMNEY/TUNNEL/WINDOWS	5	25	45
436	CHIMNEY/TUNNEL	25	10	75
526	CHIMNEY/CURTAIN	10	10	10
764	CHIMNEY/CURTAIN/FANS	25	25	25
955	CHIMNEY/CURTAIN/OVERHEAD FANS	100	25	50
102	TUNNEL	12.5	20	25
527	TUNNEL	35	50	75
493	CHIMNEY/CURTAIN	25	25	25
125	TUNNEL	100	20	1
085	TUNNEL/ALLEYFANS	25	0	180 (BOXPENS)
802	WALL FANS	25(BOX PENS)	12	10
712	OVERHEAD FANS	0	0	25
785	TUNNEL/CURTAIN	0	10	0
584	ALLEY AND OVERHEAD FANS	40	55	80
586	TUNNEL/OVERHEAD FANS	25	20	45
371	CHIMNEY/CURTAINS/WALL FANS	25	50	100
341	OVERHEAD FANS/CURTAINS	0	25	25
918	TUNNEL	0	25	50
090	CURTAINS/OVERHEAD FANS	15	100	12
924	CHIMNEY/TUNNEL/CURTAIN	10	5	15

Table 13

**Range of Ammonia (ppm) Readings from 3 Sites within 26 Herds**

## Results of Survey Analysis Ontario Dairy Hoof Health Project 2012

September 19, 2012

Dr. K.J. Hand

Survey questions were analyzed with respect to bovine digital dermatitis (BDD) prevalence categories based on quartiles of BDD prevalence Ontario, see Table 1. All tests of association were performed using exact likelihood ratio tests. Notice, some care needs to be taken when more than one association test is performed on the same data table.

Note:

Table 1: Prevalence categories (PC) for BDD in Ontario dairy herds

Prevalence Category	BDD Herd Prevalence
Low	≤ 1.96 %
Medium	between 1.96 and 22.22
High	>22.22%

### **Survey Question 2.21**

Does you trimmer clean or disinfect his tools between hooves?

Objective: To test if there is an association between disinfecting tools between hooves and PC.

PC	Clean Tools	Frequency	Percent
Low	Yes	1	0.55
	No	40	22.10
Medium	Yes	1	0.55
	No	93	51.38
High	Yes	1	0.55
	No	45	24.86
<b>Total</b>		<b>181</b>	<b>100</b>

Test of association was found to be not significant ( $p = 1.00$ ).

### **Survey Question 2.22**

Does you trimmer clean or disinfect his tools between cows?

Objective: To test if there is an association between disinfecting tools between cows and PC.

PC	Clean Tools	Frequency	Percent
Low	Yes	1	0.56
	No	40	22.22
Medium	Yes	1	0.56
	No	93	51.67
High	Yes	1	0.56
	No	44	24.44
<b>Total</b>		<b>180</b>	<b>100</b>

Test of association was found to be not significant ( $p = 1.00$ ).

### **Survey Question 2.23**

Does you trimmer clean or disinfect his tools between farms?

Objective: To test if there is an association between disinfecting tools between farms and PC.

PC	Clean Tools	Frequency	Percent
Low	Yes	25	13.97
	No	18	10.06
Medium	Yes	44	24.58
	No	49	27.37
High	Yes	18	10.06
	No	25	13.97
<b>Total</b>		<b>179</b>	<b>100</b>

Test of association was found to be not significant ( $p = 0.3006$ ).

### Survey Question 3.1

Have you introduced cattle to this herd?

Objective: To test if there is an association between number of cattle introduced into the herd and PC.

PC	Number of Cattle Introduced to Herd	Frequency	Percent
Low	None	21	11.11
	1 to 5	16	8.47
	5 to 10	2	1.06
	more than 10	6	3.17
Medium	None	26	13.76
	1 to 5	30	15.87
	5 to 10	22	11.64
	more than 10	20	10.58
High	None	7	3.70
	1 to 5	13	6.88
	5 to 10	17	8.99
	more than 10	9	4.76
<b>Total</b>		<b>189</b>	<b>100</b>

A significant association was found, p-value < 0.0012

To further the analysis the association between number of cattle and PC, data were separated into pairwise type comparisons. For example, the association was tested between categories of number of cattle introduced prevalence class in pairs; Low and Medium, Low and High and finally Medium and High. The results were as follows:

PC included in Test of Association Between PC and Number of Cattle Introduced to Herd	p-value
Low and Medium	0.0081
Low and High	< 0.0000
Medium and High	0.2428

In terms of association, there appears to be no difference between prevalence class Medium and High. The significance appears to be resulting from differences in the Low prevalence class and the two higher classes. Therefore, the response of interest is whether a herd is in the Low prevalence group or not, and if the proportion of herds in the Low prevalence group changes with number of cattle introduced into the herd.

The hypothesis of interest now becomes,

**Ho:** There is no linear trend in the proportion of herds in the Low prevalence group across number of cattle introduced into the herd class.

**Ha:** There is a linear trend in the proportion of herds in the Low prevalence group across number of cattle introduced into the herd class.

The test statistic utilized for the above hypotheses is the Cochran-Armitage test for trend. The one tailed test was found to be significant with a p-value of 0.0005.

Number of Cattle Introduced into Herd	Percent of Herds in Low Prevalence Class
None	38.89
1 to 5	27.12
5 to 10	4.88
more than 10	17.14

### Survey Question 3.211

If you have introduced cattle to this herd have you introduced cows?

Objective: To test if there is an association between introducing cows and PC.

PC	Introduced Cows	Frequency	Percent
Low	Yes	19	14.07
	No	5	3.70
Medium	Yes	65	48.15
	No	7	5.19
High	Yes	32	23.70
	No	7	5.19
Total		135	100

Test of association was found to be not significant ( $p = 0.3146$ ).

### **Survey Question 3.212**

If you have introduced cattle to this herd have you introduced heifers?

Objective: To test if there is an association between introducing heifers and PC.

PC	Introduced Heifers	Frequency	Percent
Low	Yes	13	9.63
	No	11	8.15
Medium	Yes	39	28.89
	No	33	24.44
High	Yes	16	11.85
	No	23	17.04
<b>Total</b>		<b>135</b>	<b>100</b>

Test of association was found to be not significant ( $p = 0.4079$ ).

### **Survey Question 3.213**

If you have introduced cattle to this herd have you introduced calves?

Objective: To test if there is an association between introducing calves and PC.

PC	Introduced Calves	Frequency	Percent
Low	Yes	3	2.22
	No	21	15.56
Medium	Yes	9	46.67
	No	63	6.67
High	Yes	5	25.19
	No	34	3.70
<b>Total</b>		<b>135</b>	<b>100</b>

Test of association was found to be not significant ( $p = 1.000$ ).

### **Survey Question 3.214**

If you have introduced cattle to this herd have you introduced bulls?

Objective: To test if there is an association between introducing bulls and PC.

PC	Introduced Bulls	Frequency	Percent
Low	Yes	2	1.48
	No	22	16.30
Medium	Yes	3	2.22
	No	69	51.11
High	Yes	0	0.00
	No	39	28.89
<hr/>		Total	135
			100

Test of association was found to be not significant ( $p = 1.000$ ).

### Survey Question 3.2

If you have brought cattle onto your farm, how many different farms have they come from?

Note: I have included those farms from question 3.1 that did not introduce any cattle as they are considered class 0, or cattle from no farms.

Objective: To test if there is an association between number of source farms for cattle brought onto herd and PC.

PC	Number of Source Farms	Frequency	Percent
Low	None	21	11.11
	1 farm only	6	3.17
	2 to 5	13	6.88
	5 to 10	3	1.59
	more than 10	2	1.06
Medium	None	26	13.76
	1 farm only	10	5.29
	2 to 5	43	22.75
	5 to 10	10	5.29
	more than 10	9	4.76
High	None	7	3.70
	1 farm only	8	4.23
	2 to 5	18	9.52
	5 to 10	9	4.76
	more than 10	4	2.12
Total		189	100

Test of association was found to be significant ( $p = 0.0509$ ).

To further the analysis the association between number of source farms and PC, data were separated into pairwise type comparisons. For example, the association was tested between number of source farms and prevalence class in pairs; Low and Medium, Low and High and finally Medium and High. The results were as follows:

PC included in Test of Association Between PC and Number of Source Farms	p-value
Low and Medium	0.1448
Low and High	0.0225
Medium and High	0.2689

In terms of association, there appears to a significant difference between Low and High prevalence class. Therefore, the response of interest is whether a herd is in the Low prevalence group compared to High, and if the proportion of herds in the Low prevalence group changes with number of source farms.

The hypothesis of interest now becomes,

$H_0$ : There is no linear trend in the proportion of herds in the Low prevalence group compared to High across number of source farms.

$H_a$ : There is a linear trend in the proportion of herds in the Low prevalence group compared to High across number of source farms.

The test statistic utilized for the above hypotheses is the Cochran-Armitage test for trend. The one tailed test was found to be significant with a p-value of 0.0012.

<b>Number of Cattle Introduced into Herd</b>	<b>Percent of Herds in Low Prevalence Class Compared to High within Introduction Class</b>
None	75.00
1 farm only	42.86
2 to 5	41.94
5 to 10	25.00
more than 10	33.33

### **Survey Question 3.31 to 3.34**

If you have brought cattle onto your farm, do you use any disease prevention protocols when introducing cattle to the farm?

Objective: To test if there is an association between use of disease prevention protocols and PC.

PC	Use of Protocols	Frequency	Percent
Low	Yes	10	7.35
	No	15	11.03
Medium	Yes	21	15.44
	No	51	37.50
High	Yes	13	9.56
	No	26	19.12
Total		136	100

Test of association was found to be not significant ( $p = 0.6081$ ).

### **Survey Question 3.31**

If you have brought cattle onto your farm, do you vaccinate cattle on arrival at your farm?

Objective: To test if there is an association between vaccination of introduced cattle and PC.

PC	Vaccinate	Frequency	Percent
Low	Yes	9	6.72
	No	16	11.94
Medium	Yes	18	13.43
	No	54	40.30
High	Yes	6	4.48
	No	31	23.13
Total		134	100

Test of association was found to be not significant ( $p = 0.2108$ ).

### **Survey Question 3.32**

If you have brought cattle onto your farm, do you inspect feet visually for BDD?

Objective: To test if there is an association between inspection for BDD on introduced cattle and PC.

PC	Inspect for BDD	Frequency	Percent
Low	Yes	2	1.47
	No	23	16.91
Medium	Yes	11	8.09
	No	61	44.85
High	Yes	5	3.68
	No	34	25.00
<b>Total</b>		<b>136</b>	<b>100</b>

Test of association was found to be not significant ( $p = 0.6625$ ).

### **Survey Question 3.33**

If you have brought cattle onto your farm, do you inspect feet for foot lesions by picking feet up and trimming?

Objective: To test if there is an association between inspecting feet for foot lesions on introduced cattle and PC.

PC	Inspect for Lesions	Frequency	Percent
Low	Yes	0	0.00
	No	25	18.52
Medium	Yes	1	0.74
	No	70	51.85
High	Yes	1	0.74
	No	38	28.15
<b>Total</b>		<b>135</b>	<b>100</b>

Test of association was found to be not significant ( $p = 1.00$ ).

### **Survey Question 3.34**

If you have brought cattle onto your farm, do you have your vet check them over on arrival in your herd?

Objective: To test if there is an association between having vet checks on introduced cattle and PC.

<b>PC</b>	<b>Vet Check</b>	<b>Frequency</b>	<b>Percent</b>
Low	Yes	2	1.48
	No	23	17.04
Medium	Yes	3	2.22
	No	68	50.37
High	Yes	2	1.48
	No	37	27.41
<b>Total</b>		<b>135</b>	<b>100</b>

Test of association was found to be not significant ( $p = 0.87$ ).

## Survey Question 4.2

What is your housing for lactating cows?

Objective: To test if there is an association between housing for lactating cows and PC.

<b>PC</b>	<b>Housing</b>	<b>Frequency</b>	<b>Percent</b>
Low	Tie	43	23.24
	Free	3	1.62
Medium	Tie	82	44.32
	Free	15	8.11
High	Tie	28	15.14
	Free	14	7.57
		185	100

Test of association was found to be significant ( $p = 0.0048$ ).

A Cochran Armitage test for trend was performed. There was found to be a significant increase in the proportion of free stall housing as prevalence class increased ( $p < 0.0001$ ).

<b>PC</b>	<b>Percent of Herds in PC that are Free Stall</b>
Low	6.52
Medium	15.46
High	37.78

### **Survey Question 4.4**

Do lactating cattle on this farm go outside?

Objective: To test if there is an association between lactating cows that go outside and PC.

PC	Outside	Frequency	Percent
Low	Yes	9	4.79
	No	35	18.62
Medium	Yes	27	14.36
	No	71	37.77
High	Yes	7	3.72
	No	39	20.74
		188	100

Test of association was found to be not significant ( $p = 0.2388$ ).

### **Survey Question 4.9 Freestall**

How often are free stalls “picked” per day?

Objective: To test if there is an association between number of times free stalls are picked and PC.

NOTE: Due to the number of empty cells the data were collapsed into 2 classes if pick frequency, 2 or less and greater than 2.

PC	Pick Frequency	Frequency	Percent
Low	$\leq 2$	2	5.88
	$> 2$	1	2.94
Medium	$\leq 2$	12	35.29
	$> 2$	3	8.82
High	$\leq 2$	6	17.65
	$> 2$	10	29.41
		34	100

Test of association was found to be not significant ( $p = 0.0635$ ).

### Survey Question 4.9 Tiestall

How often are tie stalls “picked” per day?

Objective: To test if there is an association between number of times tiestalls are picked and PC.

NOTE: Data were classified into 1, 2, 3, and  $\geq 4$

PC	Pick Frequency	Frequency	Percent
Low	1	0	0.00
	2	10	6.71
	3	9	6.04
	$\geq 4$	21	14.09
Medium	1	1	0.67
	2	16	10.74
	3	21	14.09
	$\geq 4$	43	28.86
High	1	0	0.00
	2	7	4.70
	3	12	8.05
	$\geq 4$	9	6.04
		149	100

Test of association was found to be not significant ( $p = 0.3854$ ).

## Survey Question 5.2

Have there ever been heifers with BDD?

Objective: To test if there is an association between presence of heifers with BDD and PC.

PC	Heifer with BDD	Frequency	Percent
Low	Yes	2	1.12
	No	40	22.47
Medium	Yes	23	12.92
	No	70	39.33
High	Yes	26	14.61
	No	17	9.55
		178	100

Test of association was found to be significant ( $p < 0.0001$ ).

A Cochran Armitage test for trend was performed. There was found to be a significant increase in the proportion of footbath use as prevalence class increased ( $p < 0.0001$ ).

PC	Percent of Herds in PC that had Heifers with BDD
Low	3.92
Medium	45.10
High	50.98

### Survey Question 5.3

Is there a footbath?

Objective: To test if there is an association between presence of footbath and PC.

PC	Footbath	Frequency	Percent
Low	Yes	3	1.58
	No	43	22.63
Medium	Yes	15	7.89
	No	83	43.68
High	Yes	15	7.89
	No	31	16.32
		190	100

Test of association was found to be significant ( $p = 0.0044$ ).

A Cochran Armitage test for trend was performed. There was found to be a significant increase in the proportion of footbath use as prevalence class increased ( $p < 0.0001$ ).

PC	Percent of Herds in PC that Use a Footbath
Low	6.52
Medium	15.31
High	32.61

Table of Footbath Usage by Housing and PC

	PC	Footbath	Frequency	Percent
Free	Low	Yes	3	1.62
		No	0	0
	Medium	Yes	14	7.57
		No	1	0.54
	High	Yes	11	5.95
		No	3	1.62
Tie	Low	Yes	0	0
		No	43	23.24
	Medium	Yes	1	0.54
		No	81	43.78
	High	Yes	1	0.54
		No	27	14.59
		185	100	

## Lesion Zones

Frequency of BDD Lesions by Zone

Zone	Frequency	Percent
0	404	16.82
1	1	0.04
9	20	0.83
10	1900	79.10
11	77	3.21
<b>Total</b>	<b>2402</b>	<b>100</b>

Note: The count includes all hooves of infected animals from herds where percent of herd trim was  $\geq 50\%$

Date of questionnaire (dd/mm/yyyy) \_\_\_\_\_

Farm Name \_\_\_\_\_ DHI Herd number: \_\_\_\_\_

Name of person from this farm doing survey \_\_\_\_\_

Hoof trimmer completing survey \_\_\_\_\_

**Ontario Dairy Hoof Health Project 2012  
General Farm Survey on Biosecurity around Hoof Health**

**Section 1: Farm visitors (including routine service personnel)**

- 1.1 At your barn entry for people, do you have: (check all that apply)
- Boot wash or foot bath (5 yes, 227 no, 1 blank)
  - Visitor log (3 yes, 229 no, 1 blank)
  - Biosecurity sign (59 yes, 173 no, 1 blank)
  - Nothing (173 yes, 59 no, 1 blank)

**Section 2: Hoof trimmers hygiene**

- 2.1 When your hoof trimmer comes to your farm does he/she have:  
(please circle the number that describes what you see.

Score 1 = very clean to 4 = very dirty)

Clean chute (inside and out)	1(206) 2 (21) 3 (3) 4 (2) and (1 blank)
New or clean gloves for work	1(139) 2 (31) 3 (8) 4 (46) and (9 blanks)
Clean tools (nippers, knives)	1(129) 2 (52) 3 (42) 4 (2) and (8 blanks)
Clean exterior of truck	1(176) 2 (43) 3 (4) 4 (2) and (8 blanks)

- 2.2 Does your hoof trimmer clean or disinfect his tools between:

Hooves?	Y (5) N (207) and (21 blanks)
Cows?	Y (5) N (206) and (22 blanks)
Farms?	Y (109) N (105) and (19 blanks)

- 2.3 Do you know how your hoof trimmer cleans his/her chute? Y (159) N (71) and (3 blanks)

If yes, do they: (check the one that best describes)

- (105) Power wash - water only
- (41) Power wash - water and soap
- (7) Power wash - water and soap then spray or brush on disinfectant
- (0) Removes organic material manually (shovel, sweep) but that's it
- (2) Removes organic material manually (shovel, sweep) then disinfects
- (3) Other: (75 blank)

**Section 3: Cattle movement**

**IN THE LAST 5 YEARS:**

- 3.1 Have you introduced cattle to this herd? Please check the appropriate number.  
(including all or any of calves, bulls (mature or calves), heifers or cows)
- (68) None (if the answer is "none" skip to question 3.4)
  - (67) 1 to 5 head

- (45) 5 to 10 head
- (51) More than 10  
(2 blanks)

3.2 **If you have brought cattle onto your farm**, what kinds of cattle have you introduced? (check all that apply)  
(includes any via purchase, lease, borrow, board etc):

- Cows (any already calved cattle) (142 yes, 21 no, 70 blanks)
- Heifers (any cattle over 3 mos but not yet calved)(85 yes, 78 no, 70 blanks)
- Calves (any males or females less than 3 mos of age)(27Y, 136N, 70 blanks)
- Bulls (over 3 mos of age) (13 yes, 150 no, 70 blanks)

3.2 **If you have brought cattle onto your farm**, how many different farms have they come from?

- (27) one farm only
- (90) 2 to 5 farms
- (26) 5 to 10 farms
- (20) more than 10 farms  
(70 blanks)

3.3 **If you have brought cattle onto your farm**, do you use any disease prevention protocols when introducing cattle to the farm?

Y(55) N (111) and (67 blanks)

**If yes**, do you: (check all that apply)

- Vaccinate cattle on arrival at your farm (38 yes, 127 no, 67 blank)
- Inspect feet visually for Bovine Digital Dermatitis (25 yes, 141 no, 67 blank)
- Inspect feet for foot lesions by picking feet up and trimming (2Y, 163N, 68bl)
- Have your vet check them over on arrival in your herd (9Y, 156N, 68 blank)

3.4 On your farm how do you restrain cows to check foot lesions or treat for lameness? Do you have: (check all that apply)

- Chute that restrains standing cattle (61 yes, 153 no, 19 blank)
- Chute that tilts cattle (3 yes, 211 no, 19 blank)
- Rope and a beam or a hook (101 yes, 113 no, 19 blank)

#### Section 4: Herd Housing and environment management

4.1 Housing for **lactating** cows is:

- (47) Freestalls
- (181) Tiestalls
- (2) Pack
- (2) Other  
(1 blank)

4.2 Housing for **dry** cows is:

- (34) Freestalls
- (16) Tiestalls
- (158) Pack
- (24) Other  
(1 blank)

Are dry cows in the same barn as lactating cows? Yes(47) No(106) and 77 blank

4.3 Housing for **bred** heifers is:

- (32) Freestalls
- (2) Tiestalls
- (181) Pack
- (17) Other  
(1 blank)

Are **bred** heifers in the same barn as lactating cows? Yes(80) No(87) and 65 blanks

### Lactating Cow Housing

4.4 Do lactating cattle on this farm go outside?

- (162) Never
- (39) Summer (May to October) pasture (Pasture >3 acres)
- (8) Summer (May to October) in a yard (yard <3 acres)
- (4) Summer pasture, winter yard, (out daily all year round)
- (16) Summer and winter in a yard (out daily all year round)  
(2 blanks)

For next section, do only the section for lactating cattle housing for this farm.

*If lactating cows are in Freestall housing:*

F 4.5 Alleyways

- |   |  |
|---|--|
| <input type="checkbox"/> (15) Concrete – diamond grooved            | <input type="checkbox"/> (6) Slatted floors – concrete       |
| <input type="checkbox"/> (2) Concrete – straight grooves (parallel) | <input type="checkbox"/> (1) Slatted floors – rubber covered |
| <input type="checkbox"/> (3) Concrete - broom finished              | <input type="checkbox"/> (3) Milled flooring                 |
| <input type="checkbox"/> (18) Other                                 |  |

(185 blanks)

F 4.6 Manure removal is by

- |   |                             |
|---|-----------------------------|
| <input type="checkbox"/> (31) Alley scrapers  | (Run (2-20) times per day)  |
| <input type="checkbox"/> (13) Tractor scraper | (Done (1-10) times per day) |
| <input type="checkbox"/> (1) Flush barn       | (Flush (4) times per day)   |

(188 blanks)

F 4.7 Bedding used in freestalls is: (check all that apply)

- |  |   |
|--|---|
| Shavings (13 yes, 35 no, 185 blank)            | Straw chopped long (4Y, 44 no, 185 blank) |
| Sawdust (11 yes, 37 no, 185 blank)             | Long straw (1 yes, 47 no, 185 blank)      |
| Sand (10 yes, 38 no, 185 blank)                | Manure solids, composted                  |
| Straw chopped short (13 yes, 34 no, 186 blank) | (2 yes, 46 no, 185 blank)                 |
| Other: (1 yes, 47 no, 185 blank)               |   |

F 4.8 Do the freestalls have:

- |                                       |     |                              |
|---------------------------------------|-----|------------------------------|
| (32 yes, 13 no, 188 blank) Stall mats | Y N | Brand Name ? Year Installed? |
| (2 yes, 42 no, 188 blank) Water beds  | Y N | Brand Name ? Year Installed? |

F 4.9 How often are freestalls “picked” (manure removed) per day?

Range of 1-4 times/day, 2 was the most common (with 27 responses), 188 blanks

F 4.10 Freestall measurements (if multiple sized stalls, give multiple answers)

- |   |                               |
|---|-------------------------------|
| Bottom of neckrail to top of stall surface  | range:40-80inches, 188 blanks |
| Stall width on centres                      | 42-60inches, 186 blanks       |
| Back edge stall to brisket board or locator | 55-108inches, 189 blanks      |

47 responses had 1 set of measurements, 7 responses had 2 sets of measurements

***If lactating cows are in Tiestall housing:***

T 4.5 Number of rows of tiestalls (total) range of 1-6 rows, 2 rows was most common (155), 54 blanks

Number of rows head to head \_\_\_\_\_

Number of rows tail to tail \_\_\_\_\_

T 4.6 Manure removal is by:

- Gutter cleaner  
 Other \_\_\_\_\_

T 4.7 Bedding used in tiestalls is: (check all that apply)

- Shavings (9 yes, 172 no, 52 blank)  
 Sawdust (6 yes, 175 no, 52 blank)  
 Sand (0 yes, 181 no, 52 blank)  
 Straw chopped short (98 yes, 82 no, 53 blank)  
 Other: (2 yes, 179 no, 52 blank)
- Straw chopped long (47 yes, 134 no, 52 blank)  
 Long straw (35 yes, 146 no, 52 blank)  
 Manure solids, composted (1 yes, 180 no, 52 blank)

T 4.8 Do the tiestalls have:

(161 yes, 18 no, 54 blank) Stall mats Y N Brand name? Year installed  
(4 yes, 175 no, 54 blank) Water beds Y N Brand name? Year installed

T 4.9 How often are tiestalls “picked” (manure removed) per day? Range of 1-30, 55 blanks

T 4.10 Tie stall measurements (if more than one size, give multiple answers)

- Bottom of tie rail to top of stall surface range: 29-60 inches, 66 blank  
Stall width on centres 24-60 inches, 54 blank  
Back edge stall to front curb 60-79 inches, 56 blank  
Height of front curb (stall surface to top) 3-24 inches, 59 blank

179 responses had 1 set of measurements, 85 had 2 sets, 15 had 3 sets.

***If lactating cows are in Pack housing: Not summarized – too few herds with packs.***

P 4.5 What is the area of the pack for use by cows? (Pack only)

Length \_\_\_\_\_ (ft, meters?) Width \_\_\_\_\_

P 4.6 What is the pack made of?

- Long straw  
 Chopped straw  
 Shavings  
 Sawdust  
 Other (combinations) please describe: \_\_\_\_\_

P 4.7 To maintain the pack it is:

- Tilled daily, \_\_\_\_\_ times per day  
 Not tilled at all

The pack is removed (frequency/year) \_\_\_\_\_

P 4.8 How often is new bedding added? (Check or fill in one option)

- Once every day

Twice every day  
 Times per week

P 4.9 What is the floor of the feed alley where cows stand? (Check and fill in all that apply)

Concrete, scraped \_\_\_\_\_ times daily  
 Slatted floor  
 Rubber covered floor

#### Section 5: Bovine Digital Dermatitis (BDD) (Do for ALL housing types)

5.1 Does this herd have cows with BDD today? (172 yes, 53 no, 8 blanks)

5.2 Have there ever been heifers with BDD? (ie. before first calving) (73 yes, 147 no, 13 blanks)

5.3 How do you treat individual cows for BDD between hoof trimmer visits? (Other than footbathing)

Only treat when HT is here  
 Spray individual feet with \_\_\_\_\_  
Number of times sprayed for treatment \_\_\_\_\_  
 Wrap individual feet with \_\_\_\_\_  
 Apply paste, no wrapping

Other – please describe: \_\_\_\_\_  
(47 only treat when HT is here, 163 treat between visits, 23 blanks)

5.3 Is there a footbath? Y (43) N (187) and (3 blanks)

Type? (ie built in, rubber tray type, other) \_\_\_\_\_

Footbath measurements – pls circle units used

Length                    range: 36-132 inches, 197 blank (ins/cms)  
Width                    10-60 inches, 197 blank  
Height                    3-47 inches, 200 blank

Depth of solution today 0-6 inches, 202 blank (in/cms)

5.4 Product(s) used in footbath is/are, and give concentration used or record as unknown:

- |                     |                         |
|---------------------|-------------------------|
| 1. 8 copper sulfate | concentration = _____ % |
| 2. 20 formaldehyde  | concentration = _____ % |
| 3. 3 antibiotic     | concentration = _____ % |
| 7 other             |                         |
| 195 blank           |                         |

5.5 Who on this farm is responsible for maintaining the foot bath?

- (34) Farm owner  
 (3) Other family member  
 (6) Farm employee  
 (0) Service company  
(190 blank)

5.6 How often is the footbath used?

- \_\_\_\_\_ (32) Routinely. A written schedule or plan is followed.  
The foot bathing program/schedule per week is (pls circle):  
1X      2X      3X      4X      5X      6X      7X  
\_\_\_\_\_ (7) "As needed" (ie when owner thinks there are foot problems)  
\_\_\_\_\_ (4) Rarely (less than once in 6 months)  
\_\_\_\_\_ (190 blank)

5.7 When do cows go through the footbath?

- \_\_\_\_\_ When exiting the milking parlour  
\_\_\_\_\_ When let out to go through the footbath (ie tiestall housing)  
\_\_\_\_\_ Other: please describe \_\_\_\_\_

Mostly exiting the milking parlour

5.8 Do heifers go through a footbath?                  Y                  N

If "Y", how often? \_\_\_\_\_

5.9 Do dry cows go through a footbath?                  Y (9)                  N (218) and (6 blank)

If "Y", how often? \_\_\_\_\_

5.10 **For hoof trimmer to answer:**

Overall, compared to farms you visit, how would you rate the "wetness" of the environment (floors, air etc) for the lactating cows? (circle one)

1 (107) (very dry)                  2 (82)                  3 (20)                  4 (1) (very wet) (23 blanks)

Any other input?

**Producers – is there anything else you do that you think prevents or helps BDD that we have not asked about?**

61 comments, 172 blank

Thank you for your support in helping us to understand actual farm circumstances  
All information collected as part of the Ontario Dairy Hoof Health Project is confidential.

## Appendix 4

### The Foot Atlas

## Claw Zones

