Practical Strategies to Improve Hoof Health

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Take Home Messages

In general, to address lameness properly in a herd it is necessary to create a foot health program that is structured similarly to an udder health program.

Foot Health Program Components:

- Know what is making your cows lame. The ideal source of this data is from hoof trimming records on lame cows.
- Find lame cows early and treat them quickly and appropriately.
- Provide a housing environment that ensures cows' feet are comfortable, clean and dry.
- Disinfect and clean cows' feet regularly.
- Ensure cows' feet have a proper weight bearing surface through proper hoof trimming by a trained individual.
- Minimize metabolic stresses especially nutritional and transition problems.

Introduction

Lameness is a painful, costly disease that affects productivity of cows through its effect on milk production, culling and reproductive performance. In addition, lameness is also a major animal welfare concern as it is highly prevalent and more importantly recognizable by consumers.

Worldwide, estimates of clinical lameness prevalence range from 20 to 30%. Estimates of the prevalence of foot lesions found at hoof trimming are much higher, ranging from 40 to 70% of cows (Cramer et al., 2008). Types of lameness due to foot lesions can be broadly categorized into infectious (digital dermatitis heel horn erosion, foot rot) and hoof horn (ulcers, white line

disease, hemorrhage). Although infectious lesions are the most common type of lesions in most herds, hoof horn lesions are far more costly due to their effects on milk production and culling.

Economic losses due to hoof horn lesions are difficult to quantify yet it is becoming apparent that cows affected with hoof horn lesions are usually cows with higher production potential and production losses start prior to a lameness diagnosis. Typical production losses for cows with hoof horn lesions range from 200-500 kg. These cows are also at increased risk of culling. Infectious lesions, on the other hand, do not appear to have an association with long term productivity and are a source of short term inconvenience.

Fortunately for the dairy industry the knowledge exists to prevent and reduce the impact of lameness. However, the implementation of this knowledge requires a management approach that is similar to the dedication and approach most producers have to improving udder health.

The focus of this paper is on the process of developing a foot health program. It will outline a foot health program that can be used to reduce the level and impact of lameness. This rogram has 6 components and focuses on controlling the major risk factors for both infectious and hoof horn lesions. The reader will find specific recommendations absent. This is due to the fact that recommendations are farm specific and on-farm particulars need to be considered.

Foot Health Programs Components

- Record and use lesion data from lame cow trimmings.
- Find lame cows early and treat them quickly and appropriately.
- Provide a housing environment that ensures cows’ feet are comfortable, clean and dry.
- Disinfect and clean cows' feet regularly.
- Ensure cows' feet have a proper weight bearing surface through proper hoof trimming by a trained individual.
- Minimize metabolic stresses especially nutritional and transition problems.

Record and Use Lesion Data

The recording and use of foot lesion data from clinically lame cows is necessary to the development of a foot health program and for its continuation. This data is necessary because knowledge of the type and

stage of lactation of the lameness event allows the prevention program to be tailored to the specific farm instead of being created for the average dairy farm. Continued recording of foot lesion data allows for the monitoring and adjusting of the foot heath program as farm dynamics evolve.

Recording of foot lesion data starts with the person doing the hoof trimming. Ideally this person records lesions in a standardized manner to allow proper communication between the hoof trimmer and the farm's advisory team. It is equally important that the person who identifies and treats the lame cows uses the same terms as the person doing the routine preventative hoof trimming so there is continuity in the data collected.

The recording of foot lesion data does not have to be complicated. At minimum what is recorded is the cow's ID, the date, the lesion and the treatment. Additional data on location and size of the lesion is of lesser value from a monitoring perspective and should not become an impediment to the recording of the necessary basic information. Regardless of recording method it is necessary that this data gets entered into the on-farm software to allow both cow and herd level interpretations to be made.

Find and Treat Lame Cows Early

The second and probably the most important part of the foot health program is to create a protocol for early detection and treatment of lame cows. It is quite likely that the dairy industry can make the biggest change in lameness prevalence by addressing the lack of detection and treatment of lameness.

The primary reason to focus on the detection and treatment of lameness is to improve the wellbeing of the cow. Compared to a cow with either metritis, mastitis or a displaced abomasum, the time between noticing her as diseased and implementing a treatment is usually delayed considerably for the lame cow. Typical comments are: “Oh we’ll see how she does in a couple of days”, or “The hoof trimmer is coming in a month”, or “Maybe a shot of antibiotics will fix that swollen claw”. Since lameness can quickly develop into a chronic disease, early intervention will result in reduced duration of pain, quicker return to productivity and reduced chance of chronicity.

Clean, Dry and Comfortable

This part of the foot health program focuses on the key risk factors for both infectious and hoof horn lesions.

Clean and Dry

The organisms responsible for digital dermatitis, foot rot and heel horn

erosion are anaerobic bacteria that thrive in wet and moist conditions. For this reason the major focus to control infectious foot lesions should be to ensure that the cow's feet are clean and dry. No amount of foot bathing will overcome an environment where the cow's feet are constantly coated with manure. In free stalls manure and wetness are a fact of life, but measures can still be taken to reduce exposure to wetness by ensuring proper drainage and avoiding pools of water in cow traffic areas.

Although alley scrapers are used a as labour saving device, several research studies have shown an association with increased scraping frequency and higher prevalence of digital dermatitis (Cramer et al., 2009). Therefore scraping of alleys should occur at times when cows feet do not get coated by a "tsunami" of manure several times a day and timing of the scraper should be such that the majority of cows are not standing in the alleys when it is running. For barns with slats, alleys should also be scraped and robotic alley scrapers are an effective way to accomplish this.

Currently, no clinical trial has been done with alley scrapers to prove the association with digital dermatitis prevalence. However, observations of feet in alley scraper barns reveal a thicker coat of manure on the front wall of the claw as opposed to manually scraped barns. This thicker coat would create a more anaerobic environment.

One of the best ways to reduce exposure to manure is to increase the amount of time cows spend lying down in a well bedded stall. A well bedded stall will serve 2 functions: entice the cow to lie in it thereby reducing manure exposure and secondly, the deep bedding will have a cleansing action on the feet.

Comfortable

Hoof horn lesions such as sole ulcers, white line lesions and haemorrhage are caused in a large part by movement of the 3rd phalynx (P3) in the claw capsule. The downward movement of P3 causes compression of the corium resulting in the production of inferior horn. Depending on several factors including the duration and extent of movement by P3, different lesions can develop. The exact cause of the movement of P3 is still open for debate, but enzymes and mediators that act on ligaments and the thickness of the digital cushion are all thought to play a role.

For hoof horn lesions to develop there needs to be forces acting on the corium both from the exterior and interior of the claw. This occurs when a cow is standing as there is pressure exerted on the corium by P3 and a counter pressure by the surface she is standing on.

The major risk factor that should be controlled to prevent hoof horn lesions is

standing time. Any change to a cows' environment that can be made to reduce standing time is going to result in less lameness because it removes weight bearing from the corium. This focus on cow comfort needs to go beyond the stall and needs to consider the cow's time budget to discover areas of “avoidable” standing time. A typical cow stands approximately 12 hours/day split up in 2.7 hrs for milking, 4.3 hrs for feeding, 2.5 hrs for time in the alley and 2.7 hrs in the stall (Gomez and Cook, 2010). Herd level factors that influence standing time on individual farms include parlour and holding pen size, stocking density, social make up of groups, heat abatement strategies and management procedures like fresh checks and synchronizing programs.

The above factors all affect standing time and are in addition to the effects that stall design and management have on standing time. There is not enough space to address each of these factors individually in this paper. To design a foot health program the impact of each of these factors needs to considered and if short comings are identified, additional management efforts will need to be devoted to other areas to compensate for these deficiencies.

Disinfect and Clean Regularly

Once we have addressed the cleanliness of the cow's feet, the reality is that most herds still require the regular use of a proper footbath to clean and disinfect feet. For most herds it is likely not the type of product used that is responsible for the lack of apparent control of infectious lesions. Even though there are few clinical studies to prove the efficacy and economics of most current foot bath products, no product will be effective if it is not used regularly and effectively. What defines regular is likely herd dependent but just like teat dipping is a standard practice twice daily, foot bathing should be standard practice daily on all free stall herds.

A good footbath protocol starts with thinking of a footbath as a preventative tool, similar to teat dipping, and not as a treatment tool. There is a role for antibiotics in footbaths as a treatment solution, however in most cases these should be short term in nature and not used on an ongoing basis.

On most farms digital dermatitis control would improve if footbaths were run more frequently. Does this mean that there needs to be disinfectant in the bath every time? Potentially, but even having a cow walk through a footbath with water alone or with a small amount of soap will have a cleansing action and over time remove the caked manure on the foot. This cleansing will result in a cleaner foot so when a disinfectant is used 3-5x/week, it will be more effective. An additional benefit to running cows through a footbath more frequently is that the footbath becomes part of the cow’s routine and running a footbath does not automatically mean a longer milking time.

For a footbath to be effective we need contact time with the disinfectant and in this case more is better. One way to do this is to increase frequency of use, but the other way is to increase the number of “dips”. If we consider the length of a cow and how far apart her feet are and then watch cows walk through a six foot footbath, it becomes obvious that 6 foot footbaths were meant for the cow to stand in and not to walk through. Recent work out of Wisconsin has shown that over 60% of cows get less than 2 “dips” in a 6 foot footbath (Cook, 2010 pers. comm.). Unfortunately, 6 foot long footbaths are common both in the portable and permanent concrete form. The ideal footbath is at least 8-10 feet long, narrow (20 inches), and has a minimum of 2 feet high side walls to avoid cows stepping on the side and to keep solution in the bath. Minimum water depth should be at 4-6 inches. Higher curbs at the entrance and exit of the footbath will force cows to take more steps again increasing the number of “dips”. To create good cow flow through the footbath the ideal location for a footbath is not in the return lane but in the area that links the parlour to the barn. If this is not possible, then having the footbath at the very end of the return alley will allow for better cow flow out of the parlour.

Spraying the cows feet either in head locks or in the parlour is an alternative to a regular foot bath program but can quickly become a labour issue. Whether spraying or foot bathing, it is important to remember to include dry cows and heifers in the control program.

Proper Balanced Weight Bearing

Hoof trimming plays an important preventative role in a foot health program. In most of our current housing environments an imbalance is created between horn growth and wear. Preventative hoof trimming attempts to remove the excessive growth and redistribute the forces that occur within a cow’s foot to avoid excessive pressure on the sole ulcer location. Several excellent texts exist that describe a functional trimming technique based on the method developed by Dr. Toussaint Raven. The basis of this method is to transfer weight bearing from the overgrown outside claw to the inside claw and to create a flat weight bearing surface to walk on. Unfortunately, no research exists that evaluates different trimming techniques. However, for any trimming method the goal of trimming is to prevent or treat lameness and any horn that is removed from cows' foot should meet these criteria.

Hoof trimming should only be done by trained personnel who have knowledge of the anatomy of the foot as it is possible to do a lot of damage with improper hoof trimming. The required frequency of hoof trimming is cow dependent but in most cases cows should be examined at least twice a year. An examination does not necessarily mean that the foot is trimmed, but twice a year a judgment is made about the length and shape of her feet. Some chronically lame cows will benefit from more frequent trimmings and if a hoof trimmer makes regular visits to a herd this becomes much easier to implement.

Minimize Metabolic Stress

Traditionally nutritional factors and nutritionists have received a lot of the blame for lameness problems in herds. With our current understanding of the effect that the release of mediators and enzymes have on the tissues and structures surrounding the P3, it is clear that nutrition might play a part and is not the sole cause. Furthermore, research is mounting to show that excessive weight bearing due to increased standing time plays a larger role. This does not mean that we should discount metabolic stress from events such as sub acute ruminal acidosis or endotoxin release and a foot health program needs to address their role.

It is likely that today's high producing cow will spend some time with her rumen experiencing a period of acidosis during her lactation. The goal of the foot health program is to reduce the frequency and impact of these events. This can be accomplished by providing adequate physical effective fibre levels, avoiding sorting and slug feeding, and by providing a boringly consistent ration. In most cases it is not likely the nutritionist who is at fault when cows have an acidosis event. Factors such as available bunk space, consistency of the actual feeds and ration delivery, and behavioural factors play a bigger role than the "paper" ration.

The transition period is also a time of great metabolic stress, thus in a foot health program this time period cannot be ignored. Recent work has shown that increased standing behaviour in transition cows not only leads to traditional transition cow problems, but also foot lesions (Proudfoot et al., 2010) This finding provides another reason to treat transition cows properly and ensure they go through a stress free calving.

■ Conclusion

Currently, the knowledge exists to prevent lameness from becoming a major issue. However, the implementation of this knowledge requires a dedicated management approach to foot health similar to the one that exists for udder health. The keys of this program are to detect and treat lame cows early, focus on clean, dry and comfortable feet that are regularly disinfected and evaluated, and ensure cows do not experience metabolic stresses at key periods in their lactation. Following these principles will reduce lameness levels in the dairy industry but will require a concerted effort by all sectors of the industry including producers, hoof trimmers, veterinarians, nutritionists, researchers, dairy supply companies, and contractors.

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