

Managing and Controlling Digital Dermatitis

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Digital dermatitis, commonly known as hairy heel warts, is controllable by either treating cows with warts or preventing cows from developing warts. It is easier and cheaper to prevent digital dermatitis than to treat it.

Some key items to remember when preventing digital dermatitis are to keep the cows in a clean and dry environment, increase cow comfort, and use footbaths (Cook, 2003).

Environment

Environment plays a pivotal role in the spread of digital dermatitis as the causative bacteria can live for up to a year without a host. Cows housed in manure-ridden environments are exposed to more bacteria. Characteristically, these environments are wet, which creates circumstances that lack oxygen, allowing for certain bacteria to develop prolifically. The lower portions of the cow's legs become caked in manure, allowing the bacteria time to integrate and infect the feet. Cows with access to stalls provide the hooves time to dry and reduce exposure (Hoffman et al. 2012). The cleaner and drier the foot is maintained, the lower the prevalence of digital dermatitis (Cook, 2003). A Wisconsin study showed that scraping three times a day was the minimum frequency needed to control infectious foot diseases, like digital dermatitis. Potentially, automatic scrapers maintain a cleaner lower limb cow than conventional scraping, but only if "operated continuously and over short distances" (Cook, 2003). If automatic scrapers are used across long distances, the cow is exposed to compounding waves of manure.

The incidence of digital dermatitis tends to increase during the winter months as cows are confined to concrete, which enhances the stress on their feet (Cook, 2003). With less time generally spent off the concrete lots, the amount of manure deposited in the concrete area increases. If scraping frequencies are not adjusted, the cows stand in more manure than during the summer months.

Overcrowding should be avoided as it increases the amount of manure in the freestall area while reducing the number of available freestalls (Cook, 2003). This circumstance creates competition for a freestall. Timid cows lose access to the stalls and increases the amount of foot problems they experience. Timid cows exacerbate the severity of foot problems as the causative bacteria is spread through the increased presence of manure. Overcrowding should be avoided in freestalls (Cook et al., 2004).

Cow Comfort

In addition to a clean and dry environment, cow comfort should be prioritized. Cows should be encouraged to lie down, thereby taking pressure off their feet. Ideally, cows should lie down for 12 hours per day. Improper stall dimensions deter a cow from using the freestall, which increases the amount of perching (standing with front feet in stalls and rear feet in alleys) and standing on concrete. Concrete enhances the deleterious effect of standing because of its rigidity and lack of cushioning for the soles (Cook, 2003). Concrete tends to result in excessive wear on the foot, which leads to increased exposure of the heel to bacteria.

Heat stress creates foot problems. Cows under heat stress conditions tend to stand more. This might be in an effort to increase their surface area to dissipate heat (Cook et al., 2004). To increase the use of freestalls, fans should be mounted to move air over the resting cows and allow for convection cooling. Sprinklers along the feed bunk that work on a low pressure system in addition to the fans allow for convection and evaporative cooling. Comfortable cows spend more time lying down and chewing their cud. This reduces foot disorders and increases milk production.

Additionally, cows should not spend excess time standing in the holding pen waiting to be milked as it forces them to stand on concrete in crowded and stressful conditions (Cook et al., 2004). If the parlor

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is not large enough to move the entire herd through in an hour window, then groups should be formed so that the amount of time a cow has to wait in the holding pen is reduced. If possible, alternative flooring, such as rubber matting, should be used in the holding pen to reduce the pressure caused by standing directly on concrete.

Footbaths

An important part of digital dermatitis prevention is footbaths. A footbath should be used as a preventative measure and not a treatment. Dairy producers should think about using footbaths like using teat dips. Teat dips are used to prevent mastitis, not treat mastitis. Likewise, footbaths should also be used with a focus on prevention. Common solutions used in footbaths, such as copper sulfate and formalin, do not treat digital dermatitis. Instead, these solutions prevent additional bacteria on the leg from gaining access to the wound. These solutions bind to proteins on the surface of the bacteria causing the deterioration of the outer bacterial cell membrane, which causes the cell to leak and die. Dead bacteria cannot proliferate in the wound.

Footbaths should be located two thirds of the way down the exit alley. This prevents the cows from bottleneaking as they leave the parlor. The footbath should be at least 8 ft long with preference to 10 ft. This length allows the cow to place each foot in the bath at least once. Preference should be given to longer baths that increase the amount of immersions the rear feet will have. Footbaths that are longer than 12 ft dilute with waste as the cows pass through it. There should be at least 5 inches of solution in the bath to allow the hoof up to the dewclaws to be submerged (Cook et al., 2012).

A water bath prior to the footbath with footbath solution may be used, but placement is pertinent. If the baths are adjacent to one another, any gain from the water bath in washing the feet becomes void with the high organic matter circulating in the footbath, which neutralizes the solution. Placing the water bath 4 to 6 ft before the footbath allows the hooves to be rinsed while giving the cow time to defecate and urinate before entering the final bath (Cook et al., 2012).

Footbathing frequency should be determined by limb hygiene (Cook et al., 2004). The dirtier the limb, the higher the frequency baths should be used. If a large portion of the herd possess warts, the frequency at which the footbath is used should increase. As the amount of warts decrease, the length of time between the footbaths, or the concentration of the solution, may be adjusted.

There has been interest in alternatives to formalin and copper sulfate. Many new products contain iodine, zinc, rock salt, lime, peroxides, and mild soaps.

Formalin is formaldehyde in water. This is appealing because of its cheap cost, high effectiveness, and because it possesses a hoof hardening effect (Cook et al., 2004). Formalin kills most bacteria and fungi. This makes it ideal for a footbath. The solution in the footbath should be changed after 300 cow passes. Formalin is experiencing a regression in use as it is carcinogenic (causes cancer), irritates the skin of the workers and cows, is difficult to dispose of, and becomes ineffective as temperatures drop below 45 degrees Fahrenheit. If formalin is used, proper safety measures should be in place. Workers should wear eye, respiration, and skin protection to reduce chances of contact with the solution. It is a skin irritant and should not be used in concentrations greater than 5% as it will cause chemical burns on the lower limbs of the cows. It should also not be used for longer than 3 consecutive days as this will also cause chemical burns (Shearer, 2000). If formalin is used, a step up program should be used to help the cows adjust to the solution. Use a 2% concentration for one week, increase to 3 to 4% for another week, and then increase the solution to 5%. To prevent warts, the solution should be held at 2% unless the frequency increases (Cook, 2006).

Copper sulfate works well in most conditions and is relatively cheap. Copper sulfate is easier to use and possesses fewer human health concerns than formalin. Copper is bacteriostatic which prevents bacteria from multiplying by causing the cells to leak. The potency of copper sulfate increases with the amount of copper in the mixture. Usually, copper sulfate is 25% copper. Copper readily binds to organic matter and because of this, it is more affected by manure and must be changed after 150 to 300 cow passes. Disposal of copper in the bath becomes a problem when it is spread into the field. Disposing of copper sulfate in cropland eventually leads to decreased yields as soils too high in copper inhibit photosynthesis in crops and plants (Epperson and Midla, 2007).

Iodine seems like a logical solution in a footbath. It is readily available and is a common ingredient in most teat dips. Iodine requires a long contact time, which makes it effective as a teat dip but not as a footbath solution. It becomes inactive when exposed to organic matter, including manure. Iodine is more effective for spot treatments of the hoof than a footbath (Sullivan, 2005).

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Zinc is an alternative to copper. It is less environmentally toxic and can be utilized by plants and soils. Zinc is difficult to dissolve in footbaths at its recommended concentration of 10% (Sullivan, 2005).

Rock salt and mild soaps are effective at cleaning the hoof and lower limb. They do not have any disinfectant properties. Their purpose is to clean the limb and increase the amount of oxygen that is able to have contact with the skin and dry it which inhibits bacterial growth.

Lime increases hardness of the hoof. There are some reports of it being used in dry baths but little research has been conducted. A dairy located in a cold climate might use this during the winter when the prevalence of digital dermatitis increases. Lime works by drying out the skin. Caution should be used as to not dry the skin to the point of cracking and bleeding as this exacerbates the problem.

There is growing interest in peroxides. It disturbs the cellular mechanisms of anaerobic bacteria. At high concentrations, it is damaging to all cells. Peroxides are also volatile and lose their potency quickly when exposed to air and organic matter. Stabilized peroxides show promise because air and manure have less effect on them (Sullivan, 2005).

Not every farm is the same; therefore, not every product will work uniformly across all dairies. Before using any footbath products, producers should ask for data displaying the effectiveness of the product specifically towards the prevention of digital dermatitis, contact time, effective product concentration, and the amount of time it is active before a change is needed (Sullivan, 2005).

Though footbaths should be used as a preventative measure, high incidence of digital dermatitis may require a product that has a cure rate and a prevention rate. If digital dermatitis is a major problem, utilizing an aggressive solution would be beneficial. This solution would have a high "cure rate." Cure rate pertains to animals that have a wart and are treated with a solution, which causes the wart's regression. After a few weeks, switching to a product with a high "prevention rate" would be more beneficial. The prevention rate demonstrates animals that have the opportunity to contract a wart but do not. For most products, the company must be contacted for this information.

Treatment

Inevitably, a herd will encounter some cows that develop digital dermatitis. Prescribed antibiotics from a veterinarian can be placed into the footbath as directed but strict adherence to the concentration and length of time must be followed. Antibiotics should not be used for prolonged periods of time as bacteria can develop a resistance. Wraps or bandages that contain an aggressive solution, such as tetracycline or salicylic acid that is placed on the wart are one way to spot treat problematic cows in the herd. It is less expensive than a footbath as higher concentrations of the drug can be applied directly to the site of infection. The product is less likely to become neutralized by manure and urine than in a footbath. There is also less potential for antibiotic residue from ingestion by the cow (Shearer, 2000). In housing where digital dermatitis is present, spontaneous regression does occur. Spontaneous regressions can be increased with proper manure management, slurry removal, and housing facilities (Shearer, 2000).

Conclusion

Lameness is a concern for the cow, the dairy producer, and the consumer. A major cause of lameness is digital dermatitis. Measures should be taken to reduce its prevalence in a herd. Eradication of digital dermatitis is difficult but prevention and control are possible. Prevention of digital dermatitis should take precedence to treatment. Digital dermatitis can be prevented through a clean environment, increased cow comfort, and footbaths.