

Hoof trimming: The steps to success

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Abstract

Hoof trimming plays a pivotal role in both the treatment and prevention of lameness. The role of veterinarians in hoof trimming can vary, from treating lame animals to actively participating in the delivery and assessment of hoof trimming practices. Consequently, it is important for veterinarians to understand the prerequisites for proper hoof trimming. Successful hoof trimming entails selecting the right animal, and using the correct equipment and method. When these things are in place, hoof trimming becomes an intervention that safeguards both the animal and the person conducting the hoof trimming.

Key words: cattle, lameness

Introduction

For bovine veterinarians, knowing how to properly trim a hoof is paramount in effectively treating most hoof horn lesions. Additionally, as routine hoof trimming is a common practice in the dairy industry for preventing lameness, understanding what constitutes a proper hoof trim creates opportunities for veterinarians to oversee a farm's hoof trimming program. The primary goal of hoof trimming is to prevent the development of new hoof horn lesions or to treat existing ones.¹ Lesion prevention is mainly achieved by restoring a more upright foot angle and evenly distributing weight bearing between the medial (inner) and lateral (outer) hooves.¹ Achieving proper hoof trimming that enhances the welfare of the cow involves ensuring the following: 1) trimming the right animal, 2) having the appropriate equipment, and 3) using the right hoof trimming method. A comprehensive grasp of these factors enables the veterinarian to play a role in both treating hoof horn lesions and evaluating hoof trimming programs.

Right animal

There are 2 types of cattle that benefit from hoof trimming: 1) a lame animal, and 2) an animal that will not become lame because they have been hoof-trimmed. Clearly, any lame animal is an appropriate candidate for hoof trimming. However, surprisingly, selecting the right animal for preventive hoof trimming is more challenging due to the limited evidence regarding the impact of hoof trimming in current North American housing systems.² Additionally, questions about when and how frequently to perform hoof trimming are common among farmers.³ The hoof wall grows at a rate of approximately 7 mm per month, while the normal growth rate of the sole's horn is about 3 mm per month.⁴ The rate of hoof wear depends on the animal's environment and daily walking distance. Consequently, the shape and size of the hoof when presented for trimming result from the balance between horn growth and wear rates.

Therefore, when the animal is not lame, choosing the right candidate for hoof trimming becomes a decision that requires weighing the benefits and costs of the procedure. Since hoof trimming involves removing the animal from its usual environment, it leads to corresponding changes in behavior, such as

alterations in lying time and activity levels.^{5,6} Notably, there are also changes in cortisol levels and milk production likely attributable to disruptions in a cow's daily routine.⁵ These costs add to the labor and equipment expenses associated with the procedure. Given these considerations and the fact that the preventive benefits of hoof trimming are not universally applicable, selecting the right candidate becomes a strategic decision that may vary for each operation.

Strategic hoof trimming involves recognizing that there are 4 populations of animals on most farms that require hoof trimming: 1) never lame, 2) currently lame, 3) recently lame, and 4) historically lame. These groups are dynamic, with animals moving between them almost daily. The trimming program for these groups is likely to differ. For example, within the same herd, the group of never lame cows might only be trimmed prior to dry-off, while cows with a history of lameness might be trimmed every 3-4 months. Lame cows should be promptly trimmed in all herds, and recently lame cows with hoof horn lesions require a recheck at least a month after hoof trimming. A strategic approach differs from the commonly recommended approach of trimming every cow twice a year and demands a strong focus on detecting lame cows and utilizing appropriate management software to track them.

Appropriate equipment

Having and using the appropriate equipment for hoof trimming is paramount for the safety of both humans and cattle. Historically, veterinarians have conducted hoof trimmings under less than ideal conditions. To ensure no harm occurs to either the animal or the veterinarian, the animal's foot needs to be immobilized. This cannot be achieved by simply haltering the animal and using a rope. Veterinarians should avoid putting their future health at risk by using these type of methods. If this is the only option available, the animal should be referred to either a hoof trimmer or a clinic equipped with the appropriate equipment. There are various options available to restrain the cow and immobilize the animal's leg, including dedicated hoof trimming chutes. Alternatively, while not ideal, an option would be to use a squeeze chute to restrain the animal and a rope to immobilize the leg.

The second most important aspect of hoof trimming is having the appropriate hand and power tools. Without a sharp hoof knife, it is impossible to perform a proper hoof trim. This means that hoof knives need to be routinely sharpened. Similarly, veterinarians should be proficient in the use of grinders and hoof trimming disks to reduce the duration of restraint and improve the quality of their work. Care should be taken with power tools, as they can lead to faster mistakes. Hoof trimming disks should be cutting disks, not just abrasive disks, to reduce the heating of the hoof and allow for a better view of the sole. Finally, a commonly overlooked tool needed for hoof trimming is a hoof tester. Every hoof trimming kit should include at least one hoof tester, and it should be used liberally to determine if horn should be removed.

Right method

Worldwide, there are several different hoof trimming methods and adaptations of these methods in use.^{2,7,8} These methods can be categorized in one of two ways (“flat” and “sloped”) according to the angle of the sole relative to the metatarsals after trimming is complete. In the first method, the sole is trimmed “flat,” creating a perpendicular angle with the metatarsals, while the “sloped” method involves trimming the sole to create a slope with the whole axial sole being lower than the abaxial side.^{1,9} The most common methods are the functional¹ and white line methods⁹ (both flat methods), and the Kansas¹⁰ or balance method (both sloped methods). There are also variations of the functional method that differ in the extent of horn removed underneath the flexor tuberosity to reduce pressure on the sole ulcer location (known as “modeling”).^{5,11} The most common hoof trimming method worldwide is based on the functional method developed by Dr. Touissant Raven. This consists of a 3-step procedure of functional (preventive) trimming, followed by a 2-step procedure of corrective (therapeutic) trimming to address the treatment of horn lesions.¹ There is little scientific evidence supporting one hoof trimming method as more effective than another in preventing hoof lesions. Due to the lack of scientific evidence for hoof trimming methods, wide variations in methods exist, leading to potentially harmful errors. A good guideline when evaluating methods is that hoof trimming should not harm the animal if they are not lame and should improve lameness if the animal was lame prior to hoof trimming.

To prevent harm, it is essential to ensure that hooves are trimmed to the correct length and thickness, and that weight is transferred properly. If these 3 criteria are followed, it increases the likelihood that hoof trimming will have a preventive effect and that the application of hoof blocks will decrease healing time.

Correct length

The most crucial step in the hoof trimming process is ensuring that the dorsal hoof wall is trimmed to the correct length. There are disagreements about what the correct length should be and where the measurement should be taken from.^{12,13} The easiest way to measure the correct length is to measure the medial hoof on rear legs and the lateral hoof on front legs. These are commonly referred to as the non-weight-bearing hooves. Measurements should be taken as close to the midline of the leg as possible and follow a straight line parallel to the metatarsals. The measurement should be taken from where the dorsal wall horn becomes hard. Sometimes, this is referred to as the coronary band or the hairline, but there are variations in how people interpret these terms. For animals weighing less than 650-700 kg, using 7.5 cm is an appropriate dorsal wall length. For larger animals, including bulls and Brown Swiss animals, a length of 8.2 cm is more appropriate. When cutting the tip of the toe, it is important to angle the cut correctly to make measuring thickness easier. The appropriate angle is parallel to the expected level of the sole. Once the non-weight-bearing hooves have been cut to the correct length, the weight-bearing hooves can be cut to the same length.

Correct thickness

If the length has been measured and cut correctly, the proper thickness is 6 mm. However, if the dorsal wall has been cut too short or at an incorrect angle, it becomes necessary to increase this thickness. This 6 mm thickness ensures that the corium is

protected by about 6 mm of horn, and the foot will have an appropriate angle at the conclusion of hoof trimming. To properly trim the hoof to the correct thickness and maintain a flat sole, it is necessary to trim the sole from the abaxial to the axial wall. In very dry feet, you can gauge the correct thickness by stopping the trimming when the white powdery horn (“pith”) is no longer visible at the tip of the toe region. If this powdery horn has already flaked away due to regular wear and only the abaxial wall remains, it should be lowered to the level of the remaining sole. The sole horn should never yield to digital pressure in the toe region. If this accidentally occurs, the application of a thin protective sole block is recommended.

Proper weight transfer

The final criterion for ensuring proper weight transfer is the most controversial among the hoof trimming community, and this is what creates differences between flat and sloped trimming methods. For animals housed on concrete, the flat method makes the most biological sense, while for animals not housed on concrete, the angle of the sole is likely less critical.¹ The reason for this is that with the sloped method, concrete does not allow higher areas (abaxial wall) of the hoof to sink, and the only way an animal can bear weight on its entire hoof (wall and sole) is by changing the angle of foot placement when it contacts the floor. This change in the angle of foot placement increases the force on the axial part of the foot and underneath the flexor tuberosity resulting in a higher risk of sole ulcers. It is important for the application of blocks that soles are trimmed flat. This allows blocks to be placed in a manner that removes as much weight as possible from the opposite hoof.

In most cases, the lateral hoof and medial hoof carry the most weight in rear and front legs, respectively. The goal of hoof trimming is to correct this imbalance and equalize weight bearing. Additionally, the goal of hoof trimming is to reduce pressure on areas of the foot that commonly develop lesions. To achieve this, the sole of the medial hoof in the back and lateral hoof in the front should only be trimmed in the toe region, and the heel of that hoof should not be trimmed. Similarly, the rear lateral hoof and front medial hoof typically need to have horn removed from toe to heel. The goal when trimming these weight-bearing hooves is to reduce the height of the sole on weight-bearing surfaces to be at least equal to the opposite non-weight-bearing hoof. The final step in ensuring proper weight-bearing is to remove the horn underneath the flexor tuberosity.^{5,11} This process is called modeling and can be done quite extensively, and this is one area where if the sole yields to digital pressure, it is not problematic. While it is not widely accepted by hoof trimmers, there is some evidence that modeling is beneficial and reduces lameness in younger animals.^{5,11}

Assessing

Simplistically, hoof trimming errors can be categorized as over-trimming and under-trimming. Some common examples of hoof trimming errors include trimming the toes too short or the sole too thin, excessive trimming of the non-weight-bearing heel, over-trimming of the abaxial wall, and removing the axial wall of the toe area. Under-trimming is less common but problematic, as it does not correct the imbalance in weight-bearing between the hooves, thereby increasing the risk of sole ulcers. Over-trimming is a more common error, often due to the pressure veterinarians and hoof trimmers feel to remove all loose horn and address black/dirty spots. To avoid this, the liberal

use of a hoof tester is recommended. Over-trimming errors can lead to a wide range of lesions. Trimming of the walls can result in more white line lesions. When the axial wall is excessively trimmed, toe ulcers can become more frequent, and over-trimming can cause excessive horn growth that increases the curvature of the toe. Over-trimming of the sole at the toe can result in thin soles and toe ulcers. Finally, over-trimming of the non-weight-bearing heel (rear medial/front lateral) decreases foot angle and increases the risk of sole ulcers.

For veterinarians to become involved in assessing hoof trimming methods, it requires a working relationship with the farm's hoof trimmers, which can sometimes lead to conflicts.^{14,15} The easiest approach to assessing hoof trimming is typically by addressing the following 2 questions: 1) do non-lame cows remain non-lame after hoof trimming, and 2) do lame cows show improvement within a reasonable time frame after trimming? Most lameness cases should improve immediately following hoof trimming, and most cases should have healed within 4-6 weeks. This does not necessarily mean that locomotion has completely returned to normal, but the original lesion should no longer be painful at this point.

Summary

Hoof trimming is an important aspect of both treating and preventing lameness. To trim a hoof properly, it is crucial to ensure that the correct animal is being trimmed and that the appropriate equipment and method are being used. Only when these conditions are met can hoof trimming be performed in a manner that does not harm the animal or the person conducting the trimming.

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