

# Lameness Wetlab: Hoof Anatomy and Basic Hoof Trimming

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## Abstract

Lameness is one of the most common causes of morbidity in beef and dairy cattle operations and represents an important threat to the well-being of cattle in all types of operations. Critical to the success of lameness management is preventive and therapeutic trimming of the bovine hoof. The purpose of this document is to supplement a lameness and hoof trimming wetlab presented at the 2010 American Association of Bovine Practitioners (AABP) Annual Conference. This wetlab is presented by the AABP Lameness Committee, and taught by the subject-matter experts represented within this group. This laboratory will focus on review of anatomy of the bovine hoof and approaches to routine hoof trimming.

## Résumé

La boiterie est l'une des causes les plus communes de morbidité dans les fermes de bovins laitiers et de boucherie et représente une menace importante au bien-être des bovins dans tous les types d'opération. Le parage préventif et thérapeutique des onglons est un élément clé afin d'assurer le succès de la régie de la boiterie. Cet article se veut un supplément pour la séance de travaux pratiques portant sur la boiterie et le parage des onglons présentée à la conférence annuelle de 2010 de l'*American Association of Bovine Practitioners* (AABP). Cet atelier est présentée par le comité sur la boiterie de l'AABP et est donnée par des experts en la matière représentés dans ce groupe. Cette séance comportera un survol de l'anatomie de l'onglon bovin et des approches de routine pour le parage des onglons.

## Hoof Anatomy

The majority of bovine lameness occurs in the foot; therefore, a thorough understanding of the normal anatomy is prerequisite for effective trimming and identification of lesions. The bovine hoof has two claws. Anatomically, we refer to the inside claw as the medial claw and the outside claw as the lateral claw. On each claw, we refer to those structures closest to the interdigital space between the claws as axial and those farther from the interdigital space as abaxial. The medial claw is the weight-bearing claw in the forelimbs and the lateral claw is the weight-bearing claw in the hind limbs. The

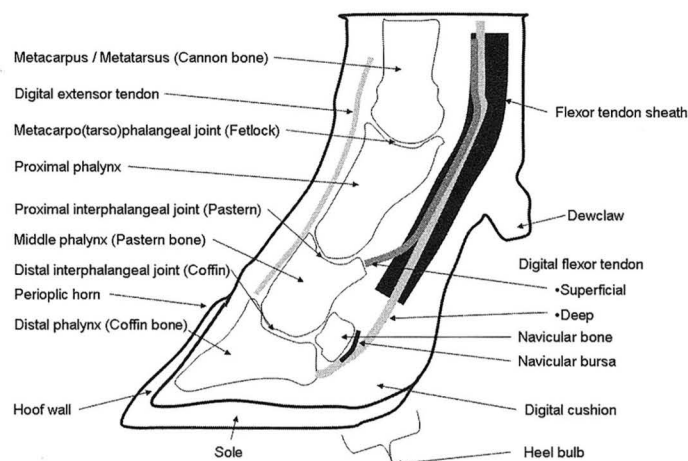


Figure 1. Anatomy of the bovine distal limb.

claw is comprised of a variety of types of horn including the hoof wall, which is the hardest horn in the foot, the sole, and the white line. The white line is a structure that basically represents the junction between the hoof wall and sole. The horn of the white line is structurally distinct from the other horn in the foot, and is both softer and more flexible.

The horn protects deeper structures of the foot, including the third phalanx, navicular bone, distal interphalangeal joint, and the insertion of the deep digital flexor tendon. The claws bear weight over the entirety of the abaxial hoof wall, the foremost one-third of the axial wall, the white line adjacent to weight-bearing aspects of the wall, and the majority of the sole. The heel and associated caudal wall and sole, and the sole directly adjacent to the interdigital space, do not routinely bear substantial weight.

Growth of the bovine hoof varies between the types of horn. On average, the wall horn will grow approximately 0.25 inches (0.64 cm) per month. However, the rate of growth can vary substantially with changes in weather, housing conditions, genetics, and nutrition. Horn growth, combined with the extent of horn wear, determines the frequency of trimming required to maintain a functional hoof.

## Hoof Trimming

A common practice in dairy cattle is for cows to receive two preventive trimmings per year. Routine trim-

ming in beef cattle operations is much less frequent and dependent upon environmental and nutritional conditions. The vast majority of beef cows will not require a preventive trim during their productive lifetime. Routine trimming may be required in beef bulls, although many beef cattle producers will select against cattle that require frequent trimming.

The functional approach to hoof trimming should have a primary purpose of restoring normal hoof balance and weight bearing. Clearly, some animals will need therapeutic interventions to address visible lesions or investigate potential causes of lameness, but our focus here will be on preventive trimming. With this goal in mind, it should be clear that the hoof trimmer must be able to examine a foot or claw and visualize what the “normal” claw for that animal should look like. The pathway and physical actions taken may vary between trimmers, but the end should be similar among the various methods.

A variety of tools are available for use in trimming of the bovine hoof. Hoof nippers are a common tool that can be used to reduce toe length or trim the hoof wall. Care should be taken not to remove too much horn with any single “nip”, as some models may actually cut deeper as the jaws are closed. Hoof knives are also a staple of the hoof trimmer. Swiss knives have a “U”-shaped cutting surface and are used to trim the sole. Depth of hoof removed can be controlled by adjusting the angle and pressure applied. Hoof knives come in right- and left-handed configurations. They typically have a gently curved cutting surface with a tight corner at the end that can be useful in paring lesions in the sole and white line.

Electric grinders are also frequently used to trim feet. They generally have abrasive pads that rotate at high speed and remove hoof horn by grinding or sanding it away. Care must be taken with grinders, because it can be easy to remove too much horn too quickly. In addition, considerable heat can be produced when using a grinder that may cause thermal damage to the sole or underlying corium. This can be avoided by not applying the grinder to the same part of the hoof continuously for more than a few seconds. Grinders may make it easier to remove too much sole. The operator should regularly check pliability of the sole to assess sole thickness during trimming.

Approaches to trimming beef cattle may vary considerably, particularly if one considers specialty trims that may be sought for show animals where “normal” weight bearing may differ from what might be considered appropriate for production animals. Some may choose to start trimming beef cattle by removing sole until it reaches a desired thickness, often established based on pliability of the sole. The adjacent wall is then balanced to meet the established sole thickness. Alternatively, and more commonly employed in trimming dairy animals, one may choose to first establish toe length and trim sole

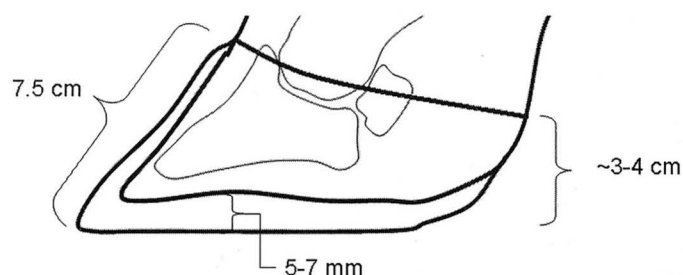
to provide balanced weight bearing. The latter approach will be discussed in more detail here and will be emphasized in the laboratory session.

For an average dairy cow and many beef females, the length of the dorsal wall of the hoof should be approximately three inches (7.5 cm). A common approach is to begin trimming the foot by establishing this toe length in the non-weight-bearing claw. Hoof nippers are commonly used to trim the toe to establish this length. This trim should be made by cutting off the toe such that the exposed surface is perpendicular to the sole. Hand-held tools are available to assist in measuring toe length. Alternatively, this length can be approximated by the width of four fingers for a size 7.5 or 8 gloved hand.

Once toe length is established, the sole and adjacent hoof wall is trimmed to create the weight-bearing surface appropriate for the new toe length. There are several important issues to discuss in trimming of the sole and abaxial wall. First, the heel should not be trimmed unless there is clear evidence of overgrowth. In the majority of cattle, the heel does not need to be lowered to establish a balanced weight-bearing surface. Second, there is some debate regarding the introduction of slope to the sole. It is not uncommon for hoof trimmers to introduce a gradual slope such that the sole directly adjacent to the interdigital space is trimmed in excess of the abaxial sole. Some prefer not to introduce slope. This debate is beyond the scope of this discussion. However, regardless of the choice, the slope should not extend into the weight-bearing region of the sole.

The weight-bearing claw is gradually trimmed to match during this process. This is often done incrementally as the trimmer reduces toe length, trims the sole and abaxial wall, and balances the heels. In some instances, the presence of abnormal claw growth or lesions may preclude complete trimming of a claw or “perfect” matching of dimensions between claws. When these impediments are encountered, preference should be given to addressing lesions contributing to pain or discomfort in the animal and providing a reasonable weight-bearing surface for the animal.

There are several common mistakes in hoof trimming that can be observed and are indicative of poor



**Figure 2.** Typical dimensions of the bovine hoof in an average-sized Holstein cow.

trimming technique. A common error, particularly when using grinders, is to roll the abaxial wall or toe, exposing the white line. As mentioned previously, the white line represents one of the weakest parts of the hoof horn and excessive exposure may predispose the animal to subsequent injury and lameness. Another common mistake is excessive reduction of toe length. The risk here includes exposure of the underlying corium and removal of too much sole when attempting to balance to the established toe length.

As mentioned previously, the heels generally do not require substantial trimming in cattle. Aggressive reduction of heel height alters weight bearing and can predispose the animal to injury or lameness associated with the heel. Finally, excessive modeling of the foot, again commonly encountered when using grinders, can sometimes be observed. This often occurs in conjunction with introducing slope into the axial sole, and is perhaps one of the arguments against attempting to slope the sole. The key here is to restrict the slope to the caudal aspect of the sole and not infringe on the weight-bearing portion of the cranial one-third of the sole.

There are additional nuances to hoof trimming that are learned with practice and cannot be covered adequately in a brief description. Further, often hoof trimmers must also address lesions, anatomical abnormalities, or lameness which complicate the trimming process. The intent of this laboratory is to provide a basic introduction to hoof anatomy and trimming of the bovine hoof. The participant is encouraged to seek additional opportunities to gain experience in hoof trimming and review a number of documents that cover the material presented herein in additional detail.

### References and Recommended Reading List

1. AABP Lameness Committee, Assessing a herd hoof trimming program, accessed 6/15/10 at <http://www.aabp.org/members/Resources/AABPHoofTrimmingB.pdf>
2. Greenough PR: *Lameness in Cattle*, ed 3. Philadelphia, WB Saunders Company, 1997.
3. van Amstel SR, Shearer JK, Haines DK: Maintenance claw trimming in cattle with special emphasis on the Dutch method. *Proc Am Assoc Bov Pract Annu Conf*, 2000.