

Hoof Health

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Lameness is one of the most common reasons for dairy cattle to be culled prematurely. In herds with a high incidence of lameness the economic impact is high. The economic impact of lameness is due to decreased milk yield, discarded milk due to treatment, cost of treatment, decreased reproductive performance, increased involuntary culling, and additional management time.^{2,5}

Lameness is a multifactorial problem and prevention will be less costly than treatment; however, prompt treatment should decrease the duration of lameness. Nutrition, freestall management, standing and walking surfaces, manure management (hygiene), and routine hoof trimming will all have an effect on the incidence of lameness. The most common cause of lameness is chronic, subclinical laminitis (coriosis). Maintaining healthy hooves will decrease the incidence of lameness.

Studies in the UK observed a mean incidence of 60 cases of lameness per 100 cows per year on 3 farms over a 3-year period.¹² The vast majority of lesions causing lameness were in the feet. Ninety percent of the foot lesions were in the hind feet with the majority involving the lateral (outside) claws. Risk factors for increased lameness in this study were long toes, high heels, freestalls with high curbs, lack of bedding, and moving cows too fast from the pens to the milking parlor. Other studies have identified nutrition and routine hoof care as risk factors for lameness. Studies in France, Florida, and New York^{3,5,10} found the lameness incidence to be about half that found in the UK and the economic cost of lameness was estimated to be about \$90/cow/year based on an incidence of 30 cases/100 cows/year.⁵

Since the most of the lameness lesions are the result of insult to the corium it would stand to reason that anything we do to protect the corium from unnecessary insult would decrease the incidence of lameness. I will briefly review problems with nutrition and housing but the major emphasis of this paper will be on functional trimming of the claws.

Nutrition

It has been suggested that metabolic problems in early lactation contribute to the occurrence of laminitis although the exact mechanism has not been elucidated. Studies in the UK and Netherlands have shown that increased concentrates in ration in early lactation will lead to increased incidence of sole hemorrhage, sole ulcers, white line hemorrhages, and heel erosions in Holsteins.^{6,8} It has been postulated that rumen acidosis ensuing after high concentrate feeding will lead to the vascular disturbances in the corium that will affect the dermal-epidermal junction and lead to laminitis.⁷

It is incumbent on the producer and nutritionist to make sure that the transition from dry cow to lactating cow rations are made as smoothly as possible, that buffers are used if necessary, and that effective fiber length is sufficient. First lactation cows are especially sensitive to the changes in rations at the beginning of their lactation and will require even closer management than older cows.

Housing & Environment

An increasing number of cows are being kept on cement for most or all of the year. Cement can lead to increased wear on the hooves, which can cause lameness. If the cement is rough then hooves will wear even faster and problems will occur sooner.³ These observations are self-evident, but what many do not realize is that freestall management (read cow comfort) can also help or hinder hoof health. Freestalls that are not bedded properly will not be comfortable to the cows and they will spend more time standing and less time lying down. Time spent standing will exacerbate lameness problems.¹ If the freestall alleys are not kept clean either by scraping or by flushing, cows will have increased lameness problems due to soft hooves wearing faster and constant exposure to manure slurry leading to heel erosion. Also, constant moisture and low oxygen tension from the manure slurry will contribute to increased problems with footwarts.⁹



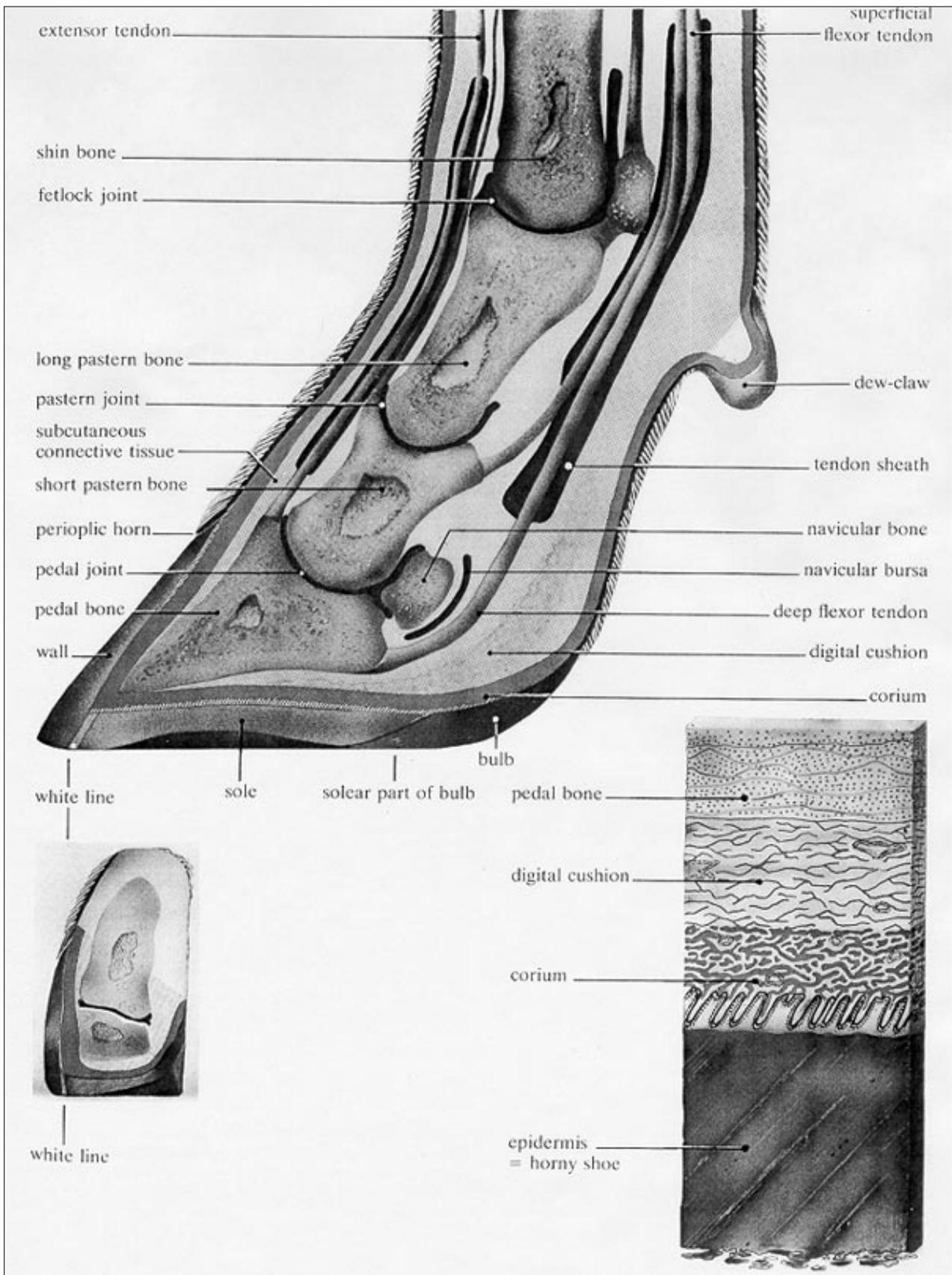


Figure 1: Structure of the normal foot (From "Cattle Footcare and Claw Trimming" by E. Toussaint Raven by permission of the author)

Hoof Trimming

To understand the necessity of hoof (claw) trimming, we should first understand normal anatomy and function of the bovine foot.^{4,11} See Figure 1 for a diagram of the anatomy of a normal foot.

You can see from Figure 1 that the corium (dermis) is the specialized tissue that is immediately beneath the hoof and, in fact, produces the hoof tissue. The corium produces the horny hoof, which is composed of hoof wall, sole horn, heel horn, and the white line (where the wall and sole meet). Healthy corium produces healthy hoof, which in turn, keeps cows sound. Damaged or diseased corium produces damaged or weak hoof, which leads to lameness. Karl Burgi, a hoof trimmer from Baraboo, WI put it succinctly when he said, "Hoof care is an investment in the future, not an expense".

Functional claw trimming is the process of maintaining correct claw conformation so that trauma to the corium is minimized. Functional claw conformation will differ based on the surface that the cow must walk on. Cows that are on pasture (soft, yielding surface) will not need as much trimming as cows that are on cement (hard, unyielding surface).

The late Dutch veterinarian, E. Toussaint Raven, wrote the best reference on this subject and he developed the following method of claw trimming.¹¹ Claw trimming will help balance the wear and growth that occurs as we confine cows on more artificial surfaces. Claw trimming will vary on each dairy dependent on the conditions on that dairy but certain guidelines should be followed. The functional claw will be able to protect the corium while carrying the body weight of the cow.

Cows normally carry about 60% of their weight on the front legs and about 40% on the rear legs. It is curious that most of the lameness occurs in the rear legs. If we look at the anatomy of the cow we can see that when they walk the front feet are placed on the ground more squarely and are more stable. Also, muscles, ligaments, and tendons suspend the front legs while the rear legs terminate in a fixed, bony joint at the hip.

When the cow walks, she places the medial (inside) claw squarely on the ground when weight is transferred to that leg. The lateral (outside) claw hits the ground but then moves to the outside in a

sort of sliding motion. This places more stress on the lateral claw, which also results in more growth compared to the medial claw. This will explain some of the reason for more lameness occurring in the rear, lateral claws.

As the claw grows, the toe wears slower than the heel because of the weight pattern and also the horn is softer at the heel. What this means to the hoof trimmer, is that the toes are trimmed and usually the heels are spared as much as possible during trimming. There will be exceptions to this pattern depending on the growth and pathology of the claws but the general rule is to trim the toe to the proper length and spare the heel when trimming the sole and wall.

Functional trimming will be divided into 6 steps. Steps 5 and 6 are considered therapeutic and will only need to be done when pathology is present.

1. Start with the medial claw of the rear foot and trim the toe to 3 inches (7.5 cm) from the end of the soft periople to the tip of the toe. The medial claw is the most normal shaped of the rear claws. The thickness of the sole should be at least 1/4 inch (5-7 mm). Trim the sole, making a flat weight-bearing surface of the sole and wall. The plane of the flat surface should be 90° to the leg. Spare the heel as much as possible. The heel is trimmed only if it is necessary to stabilize the claw and will not make the heel too thin.
2. Trim the lateral claw to the same length as the medial claw, using the medial claw as a guide (it may be slightly longer than 3"). Pare the sole and wall to match the medial claw. The weight-bearing surfaces should be flat at the toe.
3. Slope the soles slightly on the axial (middle) part of the sole. The shaping should open up the interdigital space slightly but should reduce the weight-bearing surface as little as possible. This will also help to reduce the pressure on the corium on the "typical site" for sole hemorrhage or ulcers.
4. Balance the heels. The weight-bearing surfaces should be flat across the heels, which will facilitate even weight distribution between the claws.
5. If the lateral claw is damaged, then pare down the damaged area (usually near the



heel) so that the sound claw supports more of the cow's weight. Sometimes, it will be necessary to apply an orthopedic block to the sole of the sound claw to rest the damaged claw until it can heal.

6. Remove loose horn and pare away any hard edges to decrease the irritation from foreign material packing in the loose places. Only healthy horn should be remaining but care must be taken to spare the medial claw as

much as possible, especially at the heel.

Front feet will need much less attention and trimming since lesions are found in them far less often. When trimming the front hooves, the same procedure is followed as with the rear claws except that you start with the lateral claw instead of the medial claw.

The end result of correctly done functional claw trimming is a functional corium and functional hoof. A happy corium equals a sound cow.

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Notes