

# LAMENESS IN CATTLE



## *Introduction*

*Lameness only describes a clinical symptom. It may be caused by a wide variety of foot and leg conditions. Environmental, infectious, nutritional and genetic factors are all significant in the production of specific lesions.*

*Lameness due to pain is a major cause of discomfort to the animals and a financial loss to farmers.*

*Financial loss takes into account treatment and veterinary charges, reduction in milk yield, withdrawal of milk because of antibiotic residues and herdsman's costs. The variation in the cost to the industry is related to the differences in lameness rates recorded. When associated costs are taken into account, such as the adverse effects on fertility, increased replacement costs.*

*A study in UK has estimated that about **half** of the cows exhibiting lameness were slightly lame, over **42%** were moderately lame, with the remaining **8%** severely lame.*

*The incidence of lameness as a major problem in dairy cattle has increased in recent years and has been shown to be more common in large herds and a particular problem during the **winter housing** period. The problem was worsened over the years due to the **inadequate size of cubicles** and deficiencies in their design and construction. Cows and heifers suddenly introduced to concrete surfaces after calving appear to be more susceptible to lameness.*

*Around **80%** of cases of lameness are due to **foot** problems and the remainder to leg damage. Foot lameness is seen **most commonly** in the **hind** feet, particularly in the **outer claws**. The majority of leg lameness is due to **physical damage from badly designed cubicles and to injury at calving**.*

*Early diagnosis is important so that the probable causes of the problem can be identified and a control strategy put into action.*

***The reasons for dairy cows leaving the herd (being culled) are:***

- 1. Low Production*
- 2. Reproductive Failure*
- 3. Lameness*
- 4. Mastitis*

*Lameness leads to both low production and reproductive failure.*

*Low production results because a lame cow will spend more of her time lying down at the expense of time spent eating.*

*Reproduction may be affected because a lame cow will not readily exhibit signs of estrus or maintain the proper body condition to cycle and become pregnant.*

*10 - 20% of lame cows are culled from herd.*

*80% of lameness occurs in the 1st 3 or 4 months after calving*

*The lesions that cause lameness in dairy cows result in intense pain also causes stress, which debilitate and reduces productivity.*

## ***Causes of Lameness***

*Lameness only describes a clinical symptom. It may be caused by a wide variety of foot and leg conditions. Environmental, nutritional, genetic factors and infectious are all significant in the production of specific lesions. The most common Cause or predisposing factors of lameness are:*

- 1. Bad management*
- 2. Diet changes*
- 3. Genetics factors*
- 4. Diseases*

### ***1. Bad management:***

*Dairy cows spend more time on concrete.*

*Dairy cows may spend many hours daily waiting to be milked on muddy and wet ground.*

*Life on "mud" covered concrete, typical of many dairy cattle management systems, predisposes their feet to both infectious and non-infectious hoof disease.*





**2. Diet:**

*Subclinical laminitis*

*Due to not enough high quality fiber/roughage or too much grain*

**3. Genetics:**

*The size of cattle feet*

*Cattle selection for milk production, cattle tends to have fewer foot and leg problems.*

*Abnormal conformation can cause musculoskeletal problems of the limbs, especially the feet.*

**4. Bovine foot disease:**

*1. Infectious Foot Disease*

*2. Non- infectious Foot Disease*



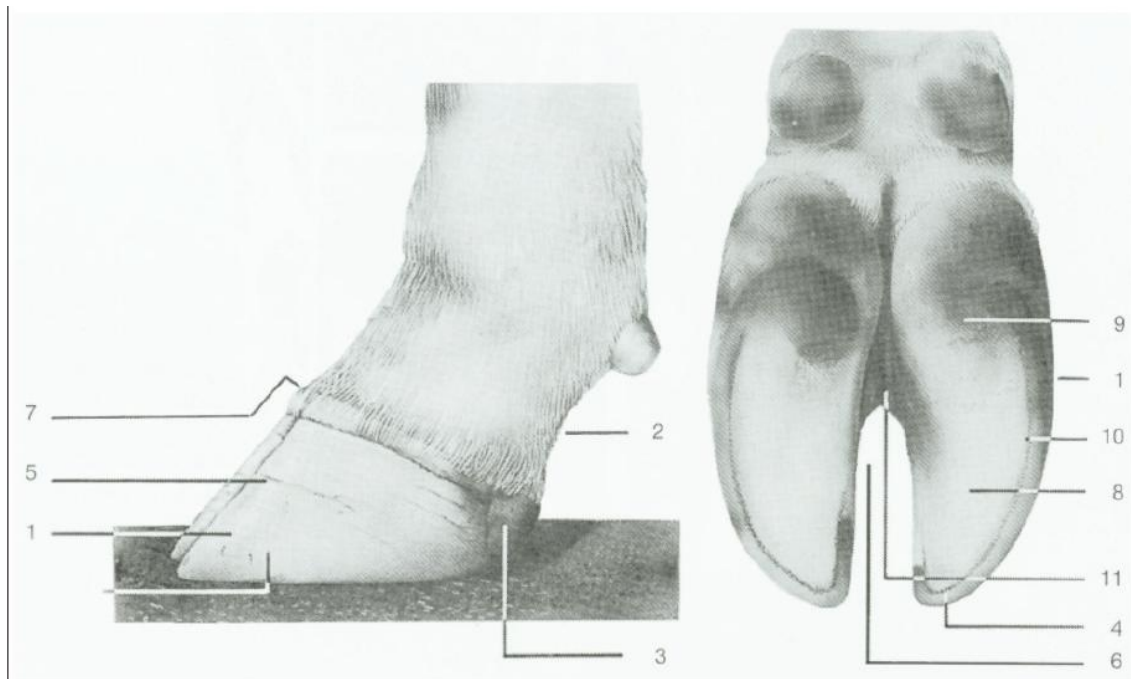
## ***The economic value of lameness in cattle (livestock station) includes:***

- 1. losses from decreased production,*
- 2. cost of treatment,*
- 3. Prolonged calving interval, and possibly nursing labor.*
- 4. Loss of milk of 1.7–3 L/day for up to 1 mo before and 1 mo after treatment (because of pain) plus milk discarded because of antibiotic therapy must also be considered.*
- 5. Lamé cows are more reluctant to use automatic milking systems and show visible signs of stress when forced to do so.*
- 6. At least 10% - 20% of cows in a herd are culled for reasons related to lameness.*
- 7. Rearing replacement heifers is expensive,*
- 8. Lamé cows are less aggressive in their struggle for feed and are more likely to die early or be culled.*
- 9. Replacement animals are not initially as productive as mature cows.*
- 10. Cows in poor condition have a greater predisposition to lameness.*
- 11. Cows that are lame before breeding have a reduced ability to conceive, and cystic ovaries are much more common in lame cows.*

## **CONFORMATION OF THE FOOT**

*For a clear understanding of the causes and the prevention of lameness, it is essential to understand the structure of the foot and the horn-forming process. Figure below shows the conformation of the foot:*

- 1. The horny wall of the claw.*
- 2. The pastern.*
- 3. The heel or bulb.*
- 4. The weight-bearing border of the wall.*
- 5. Growth rings.*
- 6. The interdigital space.*
- 7. The coronet.*
- 8. The sole; if the claw is healthy, the thickness is 5 to 7 mm.*
- 9. The solar part of the heel; the weight bearing part of the heel.*
- 10. The white line; the horny connection between the weight-bearing border and the sole.*
- 11. The interdigital skin.*



**Figure 1** Conformation of the foot

***The forming of horn***

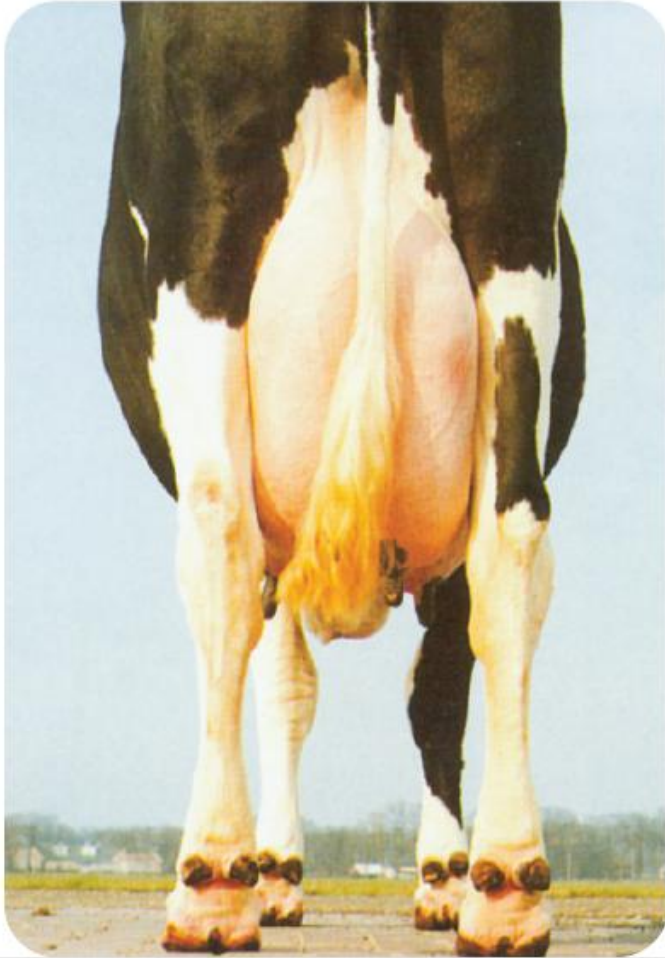
*The hoof is a casing around the foot. Between the hoof and the pedal bone lies a sensitive tissue known as the quick or the corium, the horn-forming tissue. The horn of the wall is formed at the coronet. From here it grows very slowly at a rate of about 5 millimeters per month. The optimal distance from the coronet to the tip of the toe should be about 7½ centimeters. It means that it will take about 15 months before the newly formed horn tissue reaches the toe.*

*The horny layer covering the sole of the foot is produced quickly from the bottom of the foot. This horny layer is softer than the horn of the wall. The junction between the horn of the wall and the horny layer of the sole is known as the white line, which runs around the toes and back along the inside of the claw.*

***Weight bearing***

*The overall weight of the cow should be taken on the solid horny wall of the claw and on the solar part of the heel. The weight should be equally distributed over the inner and the outer claw. Certain foot diseases will cause overloading of one of the claws. A diseased hind foot will lead to abnormal horn formation of the outer claw, whereas at the fore feet the inner claw will be overloaded if a foot is diseased. Usually in case of a diseased hind foot, the outer claw will become higher than the inner claw, resulting in more pressure on the outer claw and consequently ulceration of the sole, which causes lameness. The optimal angle of the claw in relation to the floor level is about 45°. If the angle is over 45°, then there will be probably over growth of the heel or an angle less than 45° indicates overgrowth of the toe.*

Correct weight bearing



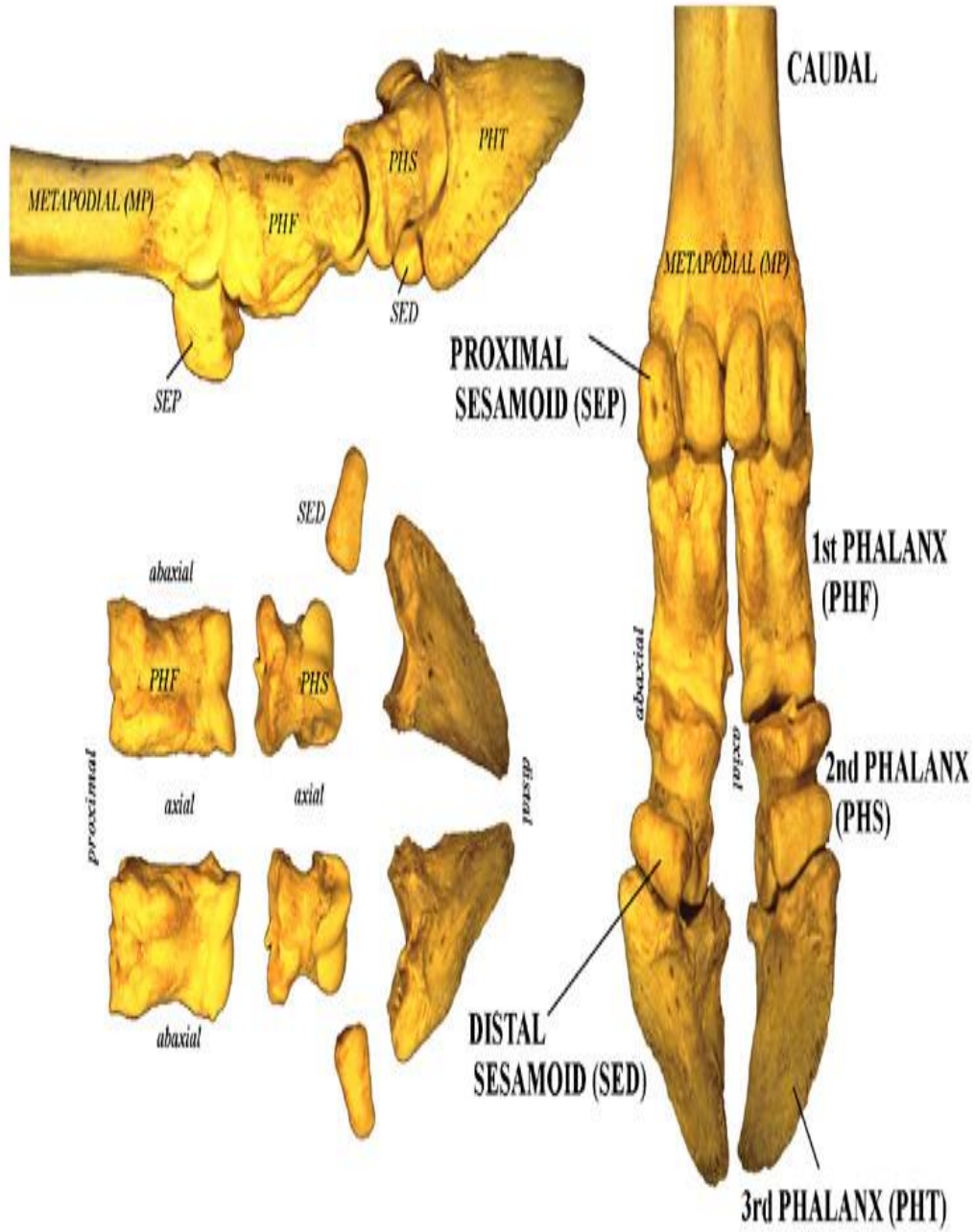
Incorrect weight bearing due to overgrowth of the outer claw

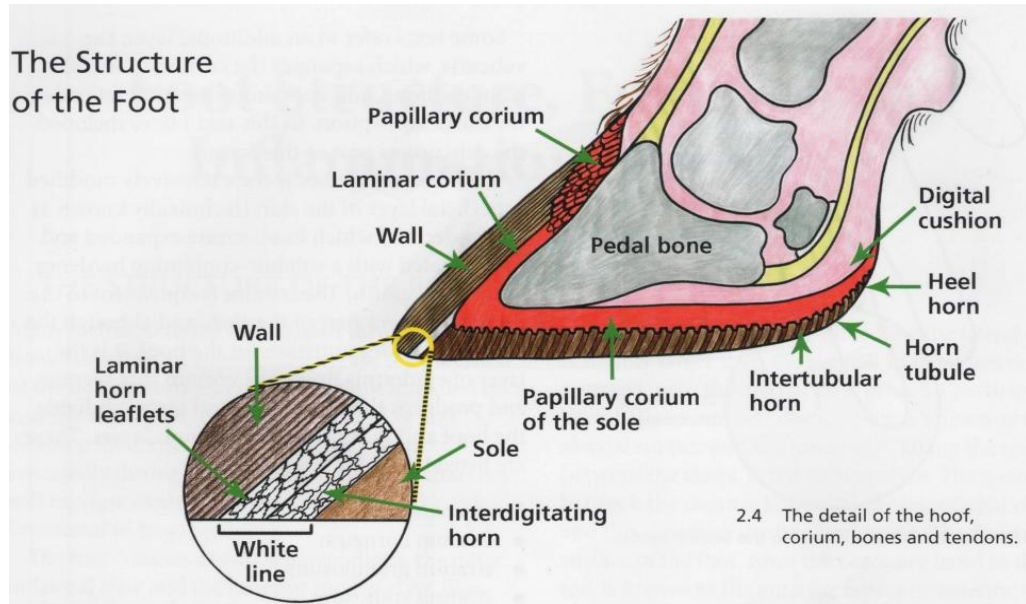
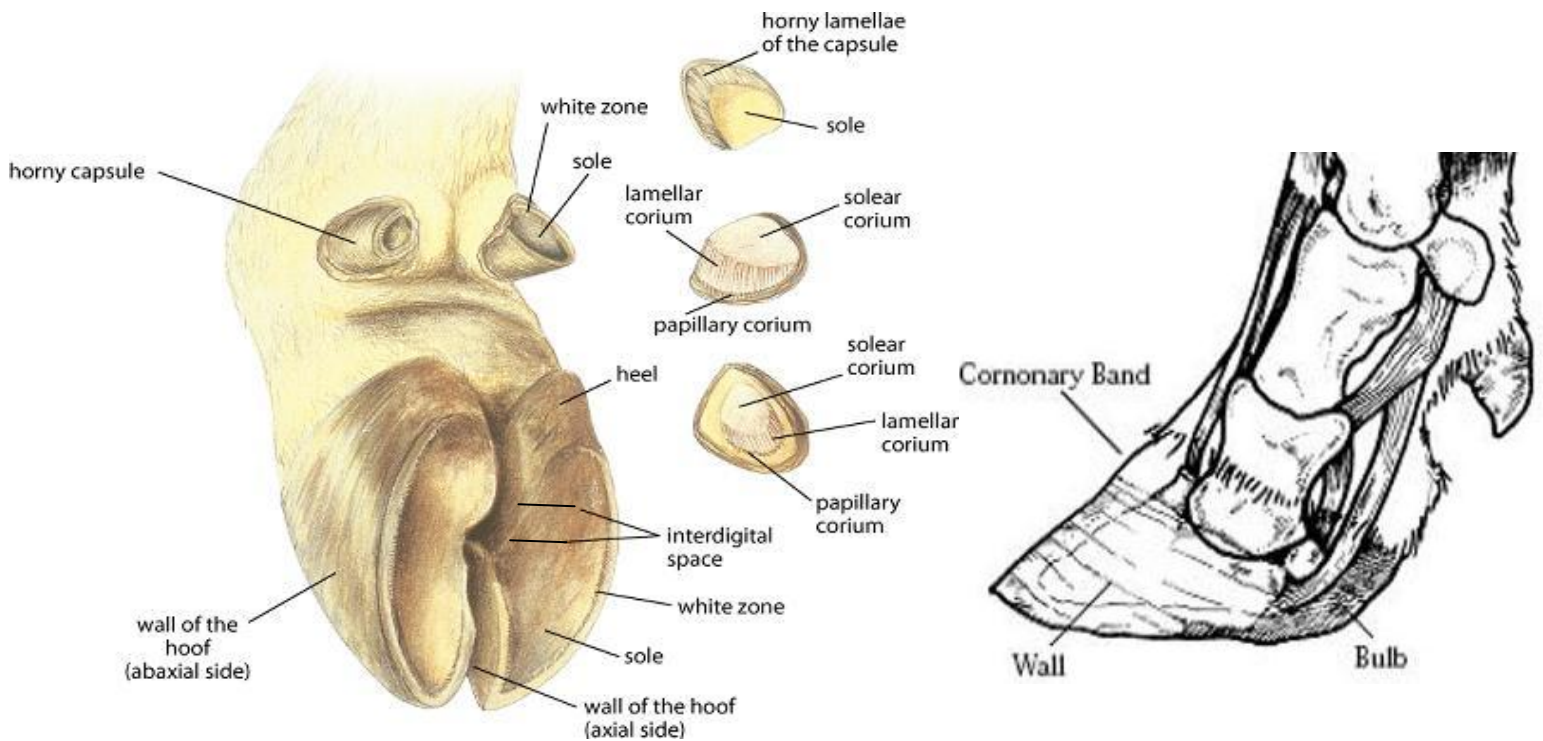




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### PHALANGES (PH) AND SESAMOIDS (SE)





- *The angle of the cranial wall of the hoof to the ground should be 50-55 degrees in the front feet and 45-50 degrees in the rear feet.*
- *The heels should be high enough to keep the softer heel bulbs from touching the ground.*
- *Hoof growth rate: 5 mm/month generally (range of 2 to 6 mm month).*

## ***Hoof affection in cattle***

*The hoof affection in the cattle may be in one of the following area:*

***A. Interdigital space.***

***B. Claw affection.***

***A. Interdigital space affection:***

- 1. Foot Rot.*
- 2. Interdigital fibroma.*
- 3. Interdigital granuloma.*
- 4. Traumatic injuries of interdigital space*

***B. Claw affection:***

- 1. Overgrowth of the hoof.*
- 2. Sepsis of the hoof.*
- 3. Ulceration of the sole.*
- 4. Double sole.*
- 5. Chronic necrosis.*
- 6. Pododermatitis.*
- 7. Penetration of the sole.*
- 8. Bruising of the sole.*
- 9. Cork screw.*
- 10. Laminitis.*
- 11. Separation of the sole.*
- 12. Fracture of the hoof wall.*
- 13. Fractures of the third phalanx.*

## A. Interdigital space affection:

### 1. Foot Rot

- *Foot rot is a contagious, infective caused by (Fusobacterium necrophorum) originates in the gastrointestinal tract and is shed into the environment by feces.*
- *It is characterized by a necrotic lesion in the interdigital skin and soft tissues of the foot causing swelling and lameness.*
- *The bacteria can live freely in the soil or in the internal environment of the animal.*
- *The disease recently reaches the upper leg, if not treated immediate with bad prognosis lead to **deep infection** of the foot.*
- *Reducing foot rot can be accomplished by:*
  1. *Housing cattle in dry, manure-free that have no debris.*
  2. *Footbaths.*
  3. *Feed additives.*
  4. *Vaccines.*
  5. *Isolating infected cattle may reduce the spread of the bacteria to the environment.*





- *Damaging factors which can lead to foot rot include:*
  1. *Stubble fields. (حقول القصب)*
  2. *Small rocks.*
  3. *Abrasive surfaces.*
  4. *High temperatures with high humidity.*
  5. *Infectious diseases, infection of the coffin joint and interdigital dermatitis.*

***Treatment:***

1. *Systemic antibiotics.*
2. *Topical treatment of the wound.*
3. *The lesion should not be covered or bandaged and the animal should be housed in a dry, clean environment to promote healing.*
4. *Dipping path with antiseptic agents reduce the case incidences.*

***Note:***

*Other causes are likely present if three days of treatment have been administered and the animal has not responded.*

*In foot rot the swelling is usually symmetrical a long midline axis of the foot shown by the dotted line.*



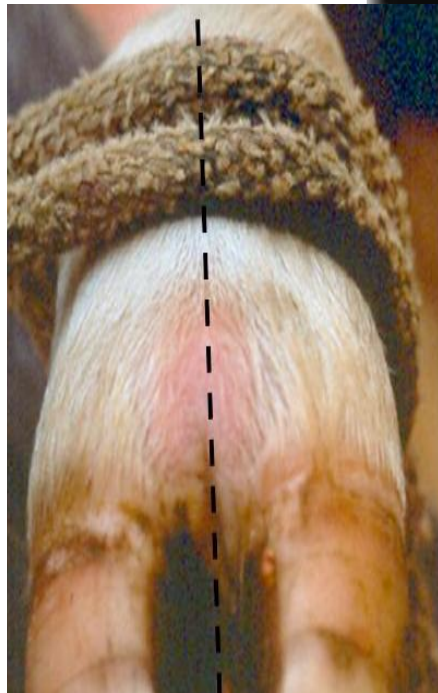
*Deep infection of the foot usually results in asymmetrical swelling of the distal limb and foot.*

**Figure 9. X-ray of an infection of the coffin joint.**

**Note the assymetric swelling of the surrounding tissues (yellow arrows) relative to the long axis of the midline (dotted line).**

**Also note the destruction of bone around the joint (white arrow).**

**The coffin joint of the unaffected digit is shown with the green arrow.**



**2. Interdigital Fibroma:**

- *hyper keratosis or true paploma*
- *Corn flower appearance*
- *Mostly in the hind limbs*
- *Not lead to lameness unless in advanced stages of affection when touch the ground or in case infection and necrosis or ulcer.*

**Caused by:**

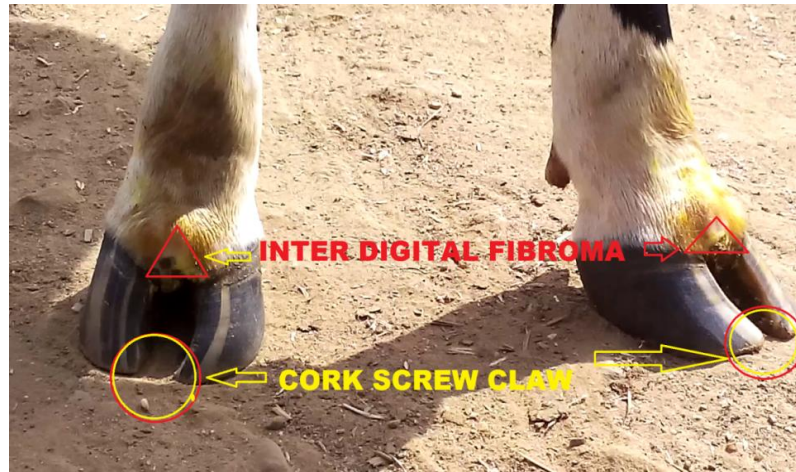
- *May be due to genetic factors*
- *Persistant irritation to the interdigital space by foreign bodies or severe tension on the interdigital ligaments.*
- *Chemical irritation leads to over growth of the epidermis and papilla formation then change to fibrosis.*

**Treatment**

- *The treatment by surgical removal and medical application locally.*



*Inter digital hyperplasia*



### **3. Interdigital granuloma**

#### **Caused by:**

1. *Persistent irritation to the inter digital space ,in heavy weight cow and bulls*
2. *Disease like foot rot or foot and mouth disease*

#### **Clinical signs**

1. *Lameness due to the walk and irritation to the lesion.*
2. *Lead to necrosis and ulceration*
3. *Secondary bacterial infection lead to more severity case*

#### **Treatment**

1. *Surgical removal*
2. *Fixed the hoof of the animal during walking by ligation or fixed by suturing the digit with stainless steel wire.*





**4. Traumatic injuries of interdigital space:**

- *Mild or sever trauma to the interdigital space by foreign bodies lead to trauma or injuries with different level of severity*
- *The severity is related to the damage to the inner tissues and structures.*
- *The mild case treated with good prognosis*
- *The severe case with bad prognosis may needs amputation of the digit.*

**B. Claw affection:****1. Over growth of the hoof****Causes:**

- *The imbalance between growth and wear.*
- *Genetic factors*
- *Diseases like hyperkeratosis*
- *The floor is always wet results in hoof overgrowth.*
- *Dairy cows do not walk as much as cows on pasture. This reduces frictional wear*
- *The exercise increase in the wear requirement.*
- *Wet concrete is more abrasive than dry concrete.*
- *A dairy ration is higher in energy and protein than grass this increases the growth rate of the hoof.*



***Treatment:***

*By hoof trimming*

- *Restoring normal structure, by correct hoof trimming.*
- *Normal sole thickness is the most important aspect of correct hoof trimming.*
- *Hooves should be trimmed or evaluated once or twice a year to improve comfort and performance.*
- *The trimmings should be early in the dry period.*
- *Proper weight bearing on the hoof wall of the inside claw of the front feet and the outside claw of the back feet is especially important.*
  - *Hoof trimming is stressful to cows. A 10 percent reduction in milk yield may be seen directly after trimming.*





## ***2. Sepsis in the hoof:***

### ***Causes:***

- 1. Infection to the inner structure lead to suppurative infection (septic corneo pedal arthritis/septic sesamoideal bursitis/necrosis and tearing of the deep digital flexor tendon)*
- 2. Occurs due to penetration of the foreign bodies*
- 3. infection from others part of the body to the hoof*

### ***Clinical signs***

- 1. Acute lameness*
- 2. Swelling in the area the swelling may reach the upper part of the foot*

### ***Treatment***

- 1. Treatment by **amputation of the digit***
- 2. Drainage of the exudates*
- 3. Use special shoes to elevate the foot to reduce the tension*

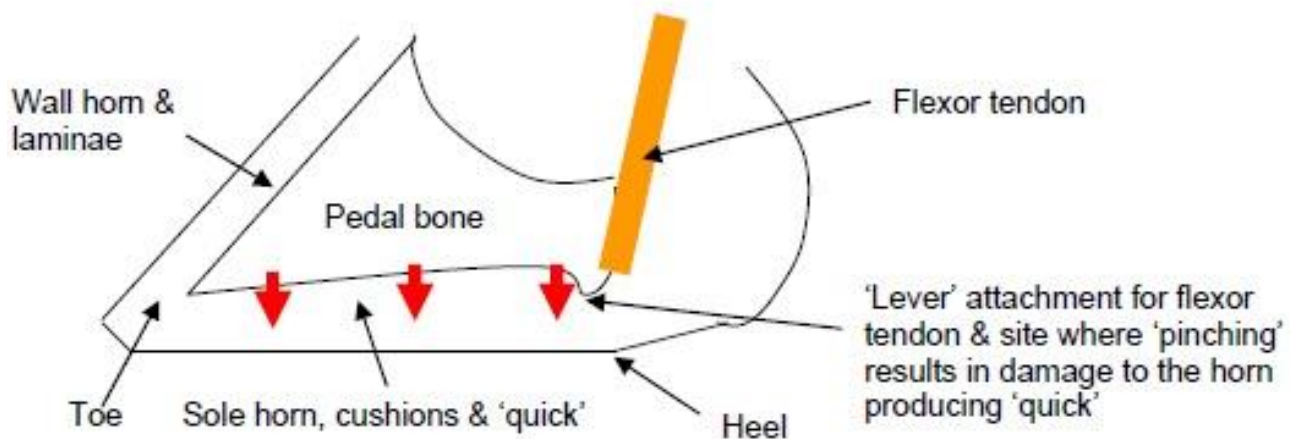


### **3. Ulceration of the sole**

*Sole ulcers affect approximately 6 dairy cows per 100 annually in the UK, but the range on UK farms is wide (0-54.8 cases per 100 cows per year). Sole ulcers tend to first develop following calving, appearing 4-5 months into lactation when cows are under the greatest production strain. Initial damage is often started in the first few weeks of the first calving, going on to cause repeat and persistent problems in subsequent lactations.*

#### **Causes of sole ulcer**

*Sole ulcers are thought to be caused by pinching and concussive trauma and pinching around a hooked process on the pedal bone where the flexor tendon attaches, producing inflammation, triggered by sinking of the pedal bone and other factors that occur around calving. This most commonly occurs in the outer claw of the hind feet. In the front feet, the inner claws are most commonly affected.*



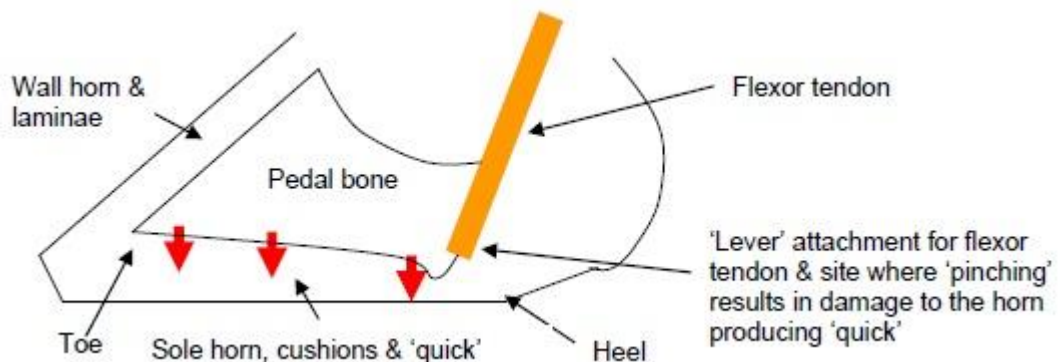
*There appears to be no single factor contributing to this process. Factors can include:*

**Calving** - weakening of laminae in the claw allows pedal bone sinking. Once sunk the pedal bone can never return to the position found prior to first calving.

**Shallow foot angle and claw overgrowth** - increasing overloading and pinching in the heel and typical site for sole ulcers.

**Standing on concrete** - long standing times on concrete in freshly calved cows produces sole ulcers.

**Mud contaminated conditions** -unclear mechanism; either softening and eroding the horn, or reducing the claw horn wear, leading to poor foot angles.



*Shallow or acute foot angle or claw horn overgrowth further increases the overloading and pinching.*

### **Treatment**

*Successful treatment of sole ulcers involves steps to relieve the pinching and inflammation, which is most effectively achieved by:*



1. *Corrective trimming correct claw shape and confirm the sole ulcer. Often the lesion will be covered by overgrown and diseased horn, the lesion becoming visible after correction.*
2. *Relieves weight off the ulcerated claw. This is most effectively done using a block with trimming down back 2/3 of heel on the affected claw will add a height difference.*
3. *Providing soft surfaces under-foot (pasture, straw bedded yard)*
4. *Encouraging cows to rest (free access to comfortable lying area and plenty of feed space).*
5. *Anti-inflammatory drugs.*



#### **4. Double sole**

*A new sole grows beneath an existing one when fluid forms between the dermis and epidermis. This fluid can result from bruising of the sole under conditions such as prolonged walking on rough roads.*

*Seen almost in the over growth of the hoof Not dangerous and not lead to lameness unless the complication occurs, due to accumulation of contamination. It May lead to bruising or trauma to the sole and necrosis and infection.*

*Treatment by hoof trimming*

### “Double sole”





### ***5. Chronic necrotic pododermatitis***

*Occur due to persistent irritation to the sole, Infection with fusiforms nodosus. Mostly occur in the winter season.*

#### ***Clinical signs***

- 1. No lameness unless change to sever case.*
- 2. Many necrotic area and lines can be seen.*
- 3. May be green necrotic spots in the center surrounded with black area from the hoof horn*
- 4. Mostly occurs in the heels and the caudal aspect of the sole*

#### ***Treatment***

*by hoof trimming to remove necrotic debris , antiseptic path solution ( whole the herd going throw the path filled with formalin or cupper sulphate to reduce the incidence of the case and lead to hardening and strength the hoof).*



### ***6. Penetration of the sole by foreign body***

*A stone or fragment of glass or metal penetrating almost through the sole will cause pain due to pressure on the corium and, if not removed, will lead to infection.*

*If the foreign body penetrates through to the corium, infection is introduced to the dermal level, and an abscess develops. The rapidity of onset and severity of the lameness depends on the location of the sole penetration.*

### ***Treatment***

*The foreign body should be removed and the track cored out to the corium with a fine-pointed hoof knife. Creating a large hole is inappropriate. Pus is often released under considerable pressure. Antibiotic should be squeezed into the cavity, which closes rapidly. The opening should not be plugged but covered with elastic waterproof material to prevent blockage with mud or manure. Bandaging may not be required, but the animal should be housed in a well-strawed area for a few days.*



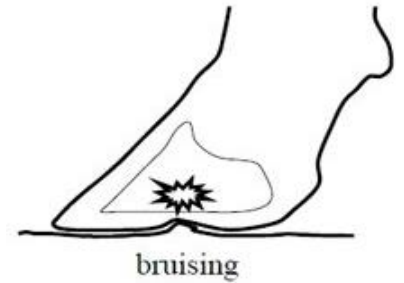


### **7. Bruising of the sole**

*Occur due to foreign bodies and stone or concert stable with out of infection and sepsis.*

*It occurs in heavy breed cow, and light hoof.*

*Increase the tension on the deep digital flexor tendon, or over growth of the hoof, chronic laminitis, or due to anatomical anomalies.*



*It occurs in the lateral hoof of the rear limb and the medial hoof of the fore limb.*

*Mostly occurs at the middle and distal third of the sole*

*The signs are bloody area ,soft sole ,bleeding from the inner area*

*In sever case lead to separation of the sole the **changed** to ulcer in the sole*

### **Treatment**

*Looking for the cause and try to remove it then trimming to remove the necrotic parts, put the animal in the soft dry ground.*



## **8. Cork screw**

*Abnormal conformation due to hyper stimulation to the coronary band.*

*The lateral wall of the hoof grows abnormally down to cover the sole and the animal forced to walk on it.*

*Mostly occur in the lateral aspect of the rare foot.*

*Not seen less than one year old mostly occur after 3-4 years old cow.*

### **Causes**

*Genetic factors may lead to this case.*

*It may occur due to the affection of the deep digital flexor tendon.*

### **Clinical signs**

*Lameness only in sever case and in the hoof anomalies due to the trauma and necrosis to the hoof wall and the sole.*

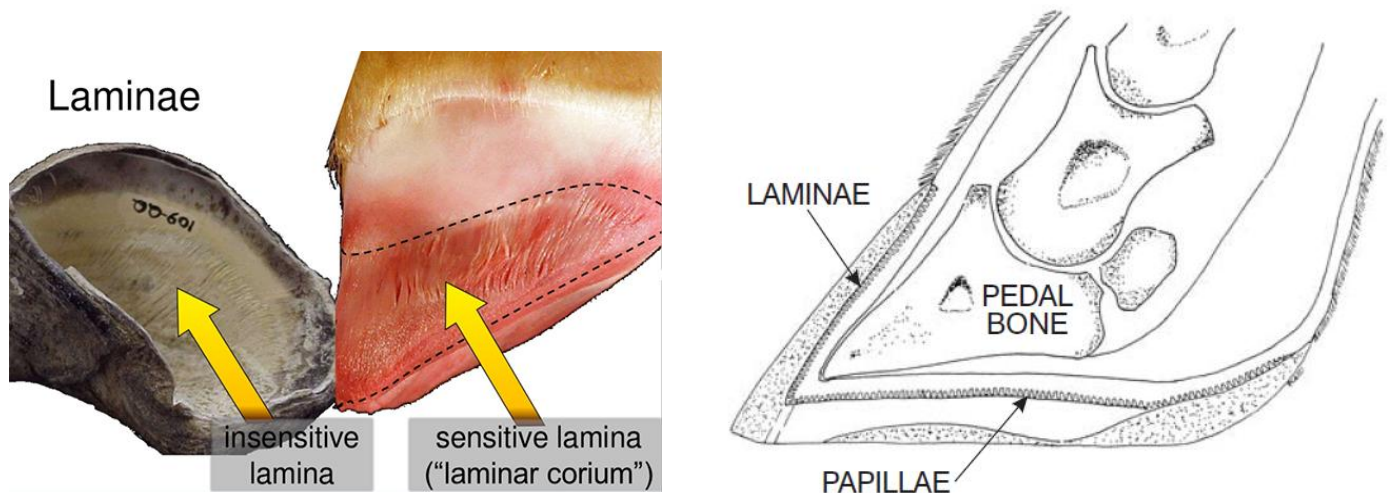
*Infection occurs due to contamination.*

***These cows should be culled from the herd.***



## 9. Laminitis

It's an inflammation of the laminae and papillae in the hoof. The layer of tissue inside the hoof, closest to the hoof wall is arranged in regular folds. This folded tissue that we are referring to when we talk about laminae. The layer of tissue in the sole of the hoof is arranged in irregular folds called papillae. Both laminae and papillae act to absorb the shock created by the hoofs impact with the ground. They also produce the horny tissue of the wall and sole. Any time the blood supply to these tissues is disrupted – through damage to the vessels from internal or external elements – laminitis can result.



There are three phases of laminitis: acute, subclinical, and chronic. **Acute laminitis** is commonly associated with feeding diets too high in concentrates this lead to rumen acidosis. Acidosis causes the release of chemicals into the blood stream; these chemicals can gradually destroy the vessels supplying the hoof tissues with blood. With restricted blood supply, the laminae and papillae begin to die. The dead tissues swell, increasing the pressure also compresses the living blood vessels – further reducing blood flow – and causing intense pen.

**Subclinical laminitis** is the most common form of laminitis. This phase of disease can result from physical injury to the hoof or from

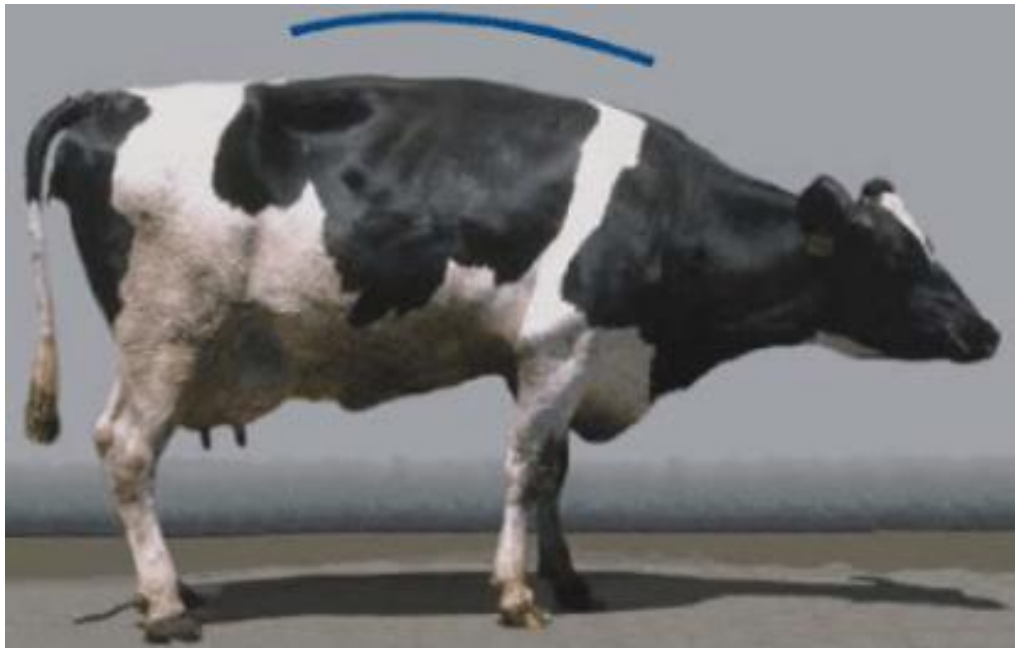


*damage during acute laminitis; so the layers of tissue between the pedal bone and the hoof wall begin to degenerate, meaning that the pedal bone begins to separate from the hoof wall and sole. Untreated the disease will progress to chronic laminitis.*

*During the chronic phase of laminitis the damage within the hoof become permanent and the pedal bone becomes completely separated from the hoof wall and possibly the sole so the pedal bone rotates makes the front tip points downward towards the sole.*

### **Clinical signs**

- 1. Typically, in the most acute cases, there may be fever and an increased respiratory rate.*
- 2. The animal will be unable to walk and will stand abnormally with the feet drawn under the body.*
- 3. The claws may be warm to the touch, and a pronounced digital pulse.*
- 4. Pain may be detected in the claws with the use of hoof testers.*



## ***Treatment***

- 1. Acute laminitis should be treated as an emergency using anti-inflammatory agents to reduce pain, re-establish normal circulation in the hoof.*
- 2. Removal or correcting the cause.*
- 3. Claws cool are reported to be helpful.*
- 4. Other treatments may include antihistamines may be useful if given within the first 48 hr.*
- 5. The recovery rate is limited and severe cases require culling for humane reasons.*

## ***10. Separation of the sole***

- Due to infection or necrosis*
- The separation due to inflammation and accumulation of transudation and exudates between the sole and the under layer area.*
- Because of bad prognosis these cows should be culled from the herd.*

**11. Fractures of the hoof wall (sand crack)**

- Crack in the hoof from the coronary band down ward or transverse crack.
- May be vertical or transverse



- The predisposing factors are hot weather, trauma, genetic factors, fatigue, and old age.
- If the crack reach the sensitive area it may be with bad prognosis

**Clinical signs**

- Pain during walking.
- Infection may occur.

**Treatment**

- Clean the crack, debridement from outside.
- Remove circular part of the hoof and sole.
- Special shoes to the sole to hold the hoof from the ground.
- Remove the separated part of hoof, with caution not damage the sensitive area.

## ***12. Fractures of the third phalanx***

- Rarely and mostly in the front foot.
- Occurs almost in dry season.

### ***Causes***

- Trauma; stress and the concert ground are predisposing factors.
- Weak hoof with anomalies leading to fracture of the third phalanx.
- Bone disease like osteomyelitis lead to pathological fracture.

### ***Clinical signs***

- Sudden lameness in one or more limb with unable to bear the weight.
- Swelling and may be not, with increase in the local temperature.
- Hoof tester and palpation can use in diagnosis
- **X-ray for definite diagnosis.**
- **Treatment by using special shoes to elevate the hoof from the ground (in the sole) for 7weeks, and fixed both foot to limitation the movement.**

## ***Prevention of lameness***

- 1. Treatment of Foot problems.*
- 2. Feet should be trimmed or examined one to two times per year.*
- 3. High concentrate diets should be fed carefully to avoid acidosis.*
- 4. Cows should have limited time standing on concrete and should not be rushed when walking on any abrasive surfaces.*
- 5. Cows need a clean, comfortable environment to lie down in.*
- 6. Early treated Lamé cows and records should be kept on all cases.*



## *Diagnosis of lameness case in cattle*

1. *Case history.*
2. *Clinical signs.*
3. *Physical examination.*
4. *Local nerve block.*
5. *X-ray.*



*Early lameness detection in dairy cattle*

