

## Lameness in Dairy Cattle Its Prevalence and Etiological Factors

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### **Introduction:**

Lameness is a painful and costly disease that affects the productivity of cows through its effects on milk production, culling and reproductive performance (Booth *et al.*, 2004). Lameness can be defined as the clinical manifestation of painful disorders, mainly related to the locomotors system, resulting in impaired movement or deviation from normal gait or posture. The severity of lameness can vary from stiffness or decreased symmetry of limb movement to an inability to bear weight on a limb, or even total recumbence. After udder health and fertility, hoof diseases were the third most important reason for culling (Landeskuratorium, 2015).

### **Types of hoof disorders**

Lameness has been reported in many species, but it is most common in equine and bovine. Bovine lameness is most common in dairy cows; it has been reported in all ages and sexes (Moreira *et al.*, 2018).

Looking into the functional foot anatomy, the hoof capsule consists of four distinct types of horn, all produced from different regions of germinal epithelial cells. The junction between the different horn types can be natural weak points leading to white line disease. The junction between the horn and underlying corium (soft tissue) can also be a weakness and fluid accumulation (e.g. pus in a white line abscess) can lead to separation of the horn from the corium. The three major digital lameness problems with rather similar incidence rates are digital dermatitis, sole ulcer and white line disease. Lesions are classified into two broad categories: I. Infectious diseases, or lesions of the skin II. Non-infectious diseases or claw horn lesions (David *et al.*, 2018).

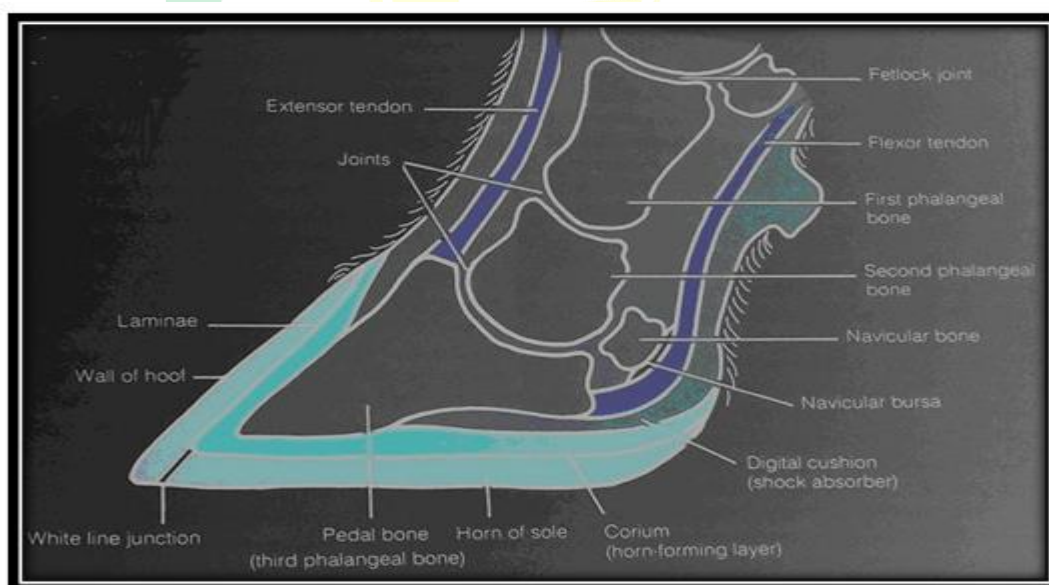
Infectious diseases are usually exacerbated by bacterial invasions. They are put into 3 types viz.

1. Digital dermatitis (also called Mortellaro disease, Hairy warts or Strawberry disease) caused by *Treponemes*
2. Heel horn erosion (also called Slurry heel Interdigital dermatitis, Scald) caused by *Dichelobacter nodosus*.
3. Foul of the foot (also called Foot rot, Interdigital necrobacillosis, Interdigital phlegmon) caused by *Fusiformis necrophorus*

The non-infectious causes of claw horn lesions can be classified as 3 types. viz,

- Sole hemorrhage (also called sole bruising laminitis)
- White line disease (also called white line separations)
- Ulcer or sole ulcer

Laminitis is an inflammation of the laminar corium of the hoof wall. Laminitis is dysfunction of the digital vasculatory system that results in hypoxia and malnutrition of the sensitive laminar structure in the hoof wall (Bergsten, 2003). Other types of lameness include Sand crack, heel erosion, foreign body penetration, Joint infections etc.



**Fig 1 Anatomy of Bovine Hoof**

### Etiology and Risk Factors

Lameness is a multifactorial disorder, some of them are well recognized which occurs due to multiple complexes of factors. However, five groups of factors have been recognized which may act on each other and thereby intensifying the stimulus, sufficient to produce a pathological lesion. These factors are as follows:

1. Inherited factors such as stance, weight, constitution, hoof characteristics.  
(Greenough *et al.*, 1972, Peterse and Antonisse (1981), Whitaker *et al.*, 2000)
2. Nutritional such as proteins, minerals, vitamins, toxins (Manson and Leaver (1988), Livesey and Fleming (1984), Greenough, (1991)
3. Infectious causes (bacteria, virus, rickettsia)
4. Environmental factors such as climate, housing, road wear and tear (Leonard *et al.*, 1994, Webstar, (2002).
5. Managemental practices play a major role in its incidence. (Norlund *et al.*, 2004).

With advancement in age the incidence of lameness increases and follows an inverted 'U' shaped relationship with age. Higher risk of lameness was observed during 7-8 years (Dembele *et al.*, 2006).



**Plate 1** Animals showing different hoof lesions, White line disease (a), Overgrown hoof (b), Sole ulcer (c), digital dermatitis (d), Double hoof (e), Sole hemorrhage (f).

Bicalho *et al.* (2009) have reported that the prevalence of sole ulcers 4.2 and 27.8% for parity 1 and parity >1, respectively and for white line disease was 1.0 and 6.5% for parity 1 and >1, respectively. Incidence of hoof lesions were more in cows and buffalo above 2<sup>nd</sup> and 3<sup>rd</sup> lactation respectively (Bagate *et al.*, 2012). Animals having parity 3 and above had significantly ( $p<0.01$ ) higher incidence of hoof disorders than those who had parity  $\leq 3$ . They also revealed that there was a significant effect of age on the incidence of hoof disorders ( $p<0.01$ ) in their study. The animal having age >6 years found to have a higher incidence of hoof disorders than those who had an age in between 4- 6 years and <4 years (Rohit kumar *et al.*, 2019).

