

Footrot in Ruminants

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ABSTRACT

The footrot is a disease that only affects ruminants and is highly contagious. *Dichelobacter nodosus*, a Gram-negative anaerobic bacterium, is responsible for the condition. Footrot typically appear within two to three weeks under ideal circumstances. Warm, humid environments are ideal for footrot. Affected animals frequently graze while resting on their Carpi and exhibit varying degrees of lameness. Interdigital swelling (benign foot rot) to complete horn show underrunning in advanced stages of virulent footrot are some of the local clinical signs. The disease results in significant financial losses for the wool, meat, and dairy industries. This review provides a summary and discussion of strategies for treatment and prevention.

Keywords: Footrot, Etiology, Preventive strategies

Introduction

Footrot is a highly contagious disease that mostly affects sheep and goats, but cattle have also reported experiencing symptoms [1]. It infects the skin of the interdigital gap, severely comprising its integrity, before affecting the hoof [2]. Foot rot is caused by two anaerobic Gram negative (-) bacteria, *Fusobacterium (F.) necrophorum* along with *Dichelobacter (D.) nodosus* [3,4] As of them *D. nodosus* is a primary causative agent which is specialist and crucial component, whereas the presence of *F. necrophorum* strain is regarded as a helper component that influences the inclination and the onset of the disease [5].

Footrot is an extremely infectious disease which depends on the virulence of *D. nodosus* strain spp. Its symptoms can be mild (benign foot rot) or more severe (virulent foot rot). *Prevotella*, *D. nodosus*, and *F. necrophorum* play a vital role in the pathogenesis of the disease. Moreover, a type of *Treponema*; the purpose of these organisms is still unidentified, despite the fact that they have been isolated from cases of footrot [6]. The location, extent and progress of the disease determine by the severity of foot rot-induced lameness. In the beginning stage, it is reported by minimal tissue inflammation in the interdigital gap. Even though the lameness is not for all time apparent in these instances, spread of the bacterium that cause the lameness favors the spread of footrot throughout the flock. At more advanced stage of the disease, the under running of the claw horn, which may eventually completely separate from the underlying tissues in characteristic of subsequent stages. It results in rotten, pungent, and decayed interdigital skin as well as the underlying hoof matrix [3]. The microbial factors like strain virulence, environmental factors, dampness, and host genetic factor like susceptibility to *D. nodosus* are all unfair to the footrot's epizootiological characteristics [2,3,7]. This paper describes the knowledge relating to etiology, virulence/bacteriology, clinical signs, and control of footrot.

Etiology and Pathogenesis

Footrot is caused by *F. necrophorum*, *D.* (earlier *Bacteroides nodosus*, which is more common in ruminants, and *Bacteroides melaninogenicus*, is more common in sheep as well as cattle. Ruminant digestion is dominated by *F. necrophorum*. Microscopic organisms that can live for as long as ten months in soil produce a leukocidal exotoxin that causes suppurative putrefaction and decreases the quantity of platelets that eat and safeguard against microorganisms (phagocytosis). Tendon and subcutaneous tissue are damaged by proteases produced by *Bacteroides melaninogenicus*. *D. nodosus* can only survive for two weeks in the environment. Because the animal has a suitable catalyst for processing the connective tissue that binds the horn to the foot tissue, it is able to move into areas below the horn. If not treated, footrot can spread to the deeper structures of the foot, including the joints, and result in septic arthritis. Footrot is a seasonal disease because most cases occur during the wetter seasons. By allowing microorganisms to attack and reproduce within the tissue,

cuts, wounds, stab wounds, or severe scrapes to the foot caused by rocks, frozen mud or ice can damage the skin in the interdigital space and incline a creature toward footrot. The bacteria cannot cause foot rot on their own [8, 9, 10].

Transmission

By contaminating the environment, *F. necrophorum*-contaminated feet spread the disease to other animals. *F. necrophorum* can be found in the rumen and feces of healthy animals as well as on feet of animals that have not been infected. Additionally, these organisms can contaminate the environment because they are easily accessible; they are an expected component of the gut flora. *Porphyromonas levii* (formerly *Bacteroides nodosus*), the bacteria that causes sheep foot rot, may infect cattle's interdigital skin surface, allowing *F. necrophorum* to enter and cause foot rot. Multispecies grazing may increase the incidence of foot rot as a result. When the skin loses its uprightiness, microorganisms enter the subcutaneous tissues and start quickly duplicating and creating poison. This makes it easier for bacteria to multiply and for infections to get into the deeper structures of the foot [11].

Clinical Symptoms

Lameness is the most obvious sign of footrot. The affected foot typically experiences swelling and inflammation, particularly in the interdigital space the space between the toes. A sign of footrot is a distinct foul odor coming from the affected foot. This smell is caused by a bacterial infection and the presence of necrotic tissue. The affected foot may feel warm to the touch as a result of inflammation. As footrot progresses, it may cause the horn to separate from the underlying tissues, leading to erosions or ulcers. These lesions may be accompanied by a discharge that is typically either serous (like clear fluid) or purulent (like pus) [9].

Management and Prevention of Footrot

(a) Good Living Conditions: The farmer and the consultant use evidence to determine the suitability of the below mentioned parameters based solely on the unique characteristics of the farm [12]. The proper exposure to air, stocking density, floor, bedding material, and clean-up, followed by disinfection of the location, all are necessary parameters for controlling footrot. Regardless, the objective is to create sanitary conditions that reduce the amount of dampness and manure that accumulate in the animal's hooves [13].

(b) Footbaths: The standard footbath treatment is utilized during the hot and dry seasons, it comprises of three phase that is useful, sequentially and make helpful restorative impacts. To begin, it must first undergo an excellent water shower to eliminate compost and mud from the hooves. Because of this, the following bath solution will be able to pierce the infection sites and claw horn. Animals go through the disinfectant-filled footbath solution to a depth of 5 to 6 centimeters in the second stage. This stage's duration is determined by the

antiseptic used and the severity of the infection. The post-bath drying process is used in the third stage. Until the hooves are dry, the animal must remain on a firm, dirt-free floor. In footbaths, zinc sulfate (10 to 20%), copper sulfate (5%), and formalin (3% to 5%) are the most frequently used disinfectants. The solution's concentration depends on how bad the infection is at the flock level [7].

(c) Trimming the claws: Claws need to be commonly trimmed once or twice a year to remove trapped foreign bodies and overgrown horn. Additionally, routine foot examination is necessary for the early exposure and treatment of foot rot-related lesion. Avoid excessive trimming of the claws, which can harm the corium lamina and multiply pathogens depending on the presence of overgrown hooves and foot related lameness, claw trimming is only occasionally recommended for meat and wool sheep [3].

(d) Antibiotics: For the treatment and prevention of the transmission of pathogens that cause foot-related lameness, antibiotics can be administered to individuals or the whole flock in accordance with national regulations [15]. Oxytetracycline (CTC) spray applied topically is effective for treating footrot in its early stages [3, 14]. Penicillin and streptomycin, among other antibiotics [3]. Wool and meat sheep frequently receive lincomycin/spectinomycin [15], Erythromycin [17], Tylosin [3], and gamithromycin [18].

Conclusion

Footrot is a typical and exceptionally infectious bacterial illness that influences sheep and other creatures' hooves. Farmers have a lot of concerns about it, and if it is not handled properly, it could cost them a lot of money. To control the disease's spread and minimize its impact on animal health and productivity, it is necessary to apply foot rot management.

In conclusion, a comprehensive strategy that incorporates biosecurity measures, vaccination, regular foot care, pasture management, early detection, and treatment is required for foot rot prevention. Farmers can reduce foot rot incidence and impact while simultaneously protecting livestock health and productivity by implementing these strategies. In order to create a management strategy that is tailored to the particular requirements and conditions of the farm, it is always recommended to work closely with a veterinarian.

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