

A Review of the Main Infectious Diseases of the Feet in Dairy Cows

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Home Messages:

- Lameness is one of the most important economic and welfare challenges for dairy cows.
- The main infectious diseases of the cow's foot are digital dermatitis, interdigital necrobacillosis (foot rot) and heel horn erosion.
- Low hygiene, high humidity and systemic and local immune disturbances can predispose the cows to these infectious diseases.
- Prevention and control of the infectious diseases of the feet in cows is based on welfare, hygienic, nutritional and other management measures such as foot baths.

Keywords: Cow, lameness, foot infectious disease

Introduction:

Lameness in dairy cows is considered one of the most important causes of economic losses that has significantly affected this industry all over the world, so that after mastitis and reproductive problems, is the third cause of economic losses in the dairy cattle industry. Even in some situations, the direct and indirect losses caused by it are at the top of the list of economic impacts. The most important economic losses caused by lameness

are reduced milk production, weight loss, premature culling, reproductive disorders, increased risk of other diseases such as mastitis and abomasal displacement and treatment costs.

The important factors causing lameness in cattle can be divided into three important categories including infectious, metabolic and traumatic causes, among which infectious diseases of the feet can cause significant economic losses in herds. Based on the importance, the main

infectious diseases of the feet that will be discussed in this article are:

1. Digital Dermatitis (DD)
2. Interdigital Necrobacillosis (Interdigital phlegmon)
3. Heel Horn Erosion (HHE)
4. Interdigital Dermatitis (IDD)
5. Mud Fever

1- Digital Dermatitis (DD):

Digital Dermatitis is a bacterial infection of the skin that mainly affects the epidermis. The disease was reported for the first time in the world by Chelli and Mortellaro in 1974 from Italy, and now it is spreading worldwide. The disease in Iran was reported for the first time in 1981 in a small dairy around Tehran under the name of an unknown epidemic in Iranian dairy cows by Nowruzian.

The occurrence of DD varies greatly depending on the cause of the lameness and lesions. Most cows show mild degrees of lesions. For example, Laven in 1999 reported a 41% prevalence of lesions in 1,810 hind limbs examined, while few of these cows had lameness.

For the first time, histological studies identified spirochetes as the cause of the disease. These bacteria have a special preference for keratinized tissues and the toxin they produce is keratolytic.

Usually, the first lesions of digital dermatitis are in the form of dry, painless, gray hyperkeratinized crusts, which often cover the posterior edge of the interdigital cleft. This pouch is the main reservoir of infection in carrier animals. Advanced and painful injuries are seen in the form of wet and light gray-brown exudate with a diameter of 10-20 mm along with rough and pale hairs on both sides of the interdigital cleft and above the heel. If the lesions are cleaned, the swelling of the epidermal tissue is observed as a red area, which is very painful when touched and also has a granular appearance similar to "strawberry".

Various methods have been introduced and used to treat the disease, including individual treatments and herd treatment using spray or foot baths with antibiotic and non-antibiotic materials. The experiences of researchers, especially in recent years, have shown that the simultaneous use of individual treatment (to treat clinical cases) and herd treatment (for other forms of disease and to prevent the spread of infection among animals) has higher efficiency.

2 -Interdigital Necrobacillosis:

This disease is a bacterial infection of the interdigital space. There are different names for this disease, such

as Foot Rot, Interdigital Phlegmon, Foul in the Foot and Lure.

The disease has a worldwide distribution in dairy cows and beef cattle. Usually, only one or a few animals are involved at the same time, but it seems that the disease is contagious and in humid conditions and when the interdigital skin is damaged, its incidence increases and up to 25% of animals may be affected. Two microorganisms are the main cause of this disease, which are *Fusobacterium necrophorum* and *Prevotella* (Bacterioides) *melaninogenicus*. *Fusobacterium necrophorum* is a gram-negative and obligate anaerobe bacterium that is found in the digestive system of cattle and sheep and is distributed in the environment and it can survive even up to ten months. The two biotypes A and AB of this bacterium produce a strong exotoxin (leukocidin) which, with hemolytic and leukocidal properties, contributes to necrotic cellulitis and also causes purulent necrosis and suppression of phagocytosis. Biotype B of this bacterium is not included in the category of disease-causing agents and has been found in healthy feet.

Damage to the interdigital skin is necessary for bacteria to enter and the disease to begin. As a result of the moist environment, the skin of this

area becomes soft and it is more easily damaged. There are reservoirs of infection in contaminated and humid environments, such as the passage of animals in the milking room, and even inside the barns, next to drinking troughs and eating places. In addition, mild DD or IDD can be mentioned among other causes of primary damage to the skin of the interdigital space. Deficiency of micronutrients such as zinc is considered as an underlying predisposing factor of the disease.

Usually, the disease starts with a sudden lameness and it is more present in the hind limbs. The initial erythema and redness of the interdigital followed by the shedding of the skin's epidermis, revealing the necrotic dermis underneath. The infection is characterized by bilateral swelling of two feet, above the coronary band and towards the fetlock area, as well as by the distance between the two digits, due to the inflammation and swelling of the deep soft tissue of the interdigital space.

This disease should be differentiated from retroarticular abscesses (as one of the complications of white line disease), septic arthritis of the distal interdigital joint, and foot and mouth disease, especially when the lesions are limited to the digits.

A wide range of general injectable antibiotics such as penicillin, oxytetracycline, sulfonamides, tylosin, tilmicosin, ceftiofor and cefquinome are effective in treating the disease. The treatment period varies according to the severity of the initial lesion. The affected foot should be examined and the necrotic tissues and any foreign bodies should be removed and a local antibiotic must be used. Local treatment increases the healing rate and prevents the spreading of infection to the environment.

prevention and control can be achieved by regular use of foot baths using disinfectants such as 2-4% formalin. Also, by regularly emptying manure and properly cleaning the barns and alleys. Identifying, isolating and treating infected animals as soon as possible is essential to prevent the spread of infection. Research has shown the usefulness of using food supplements such as zinc methionine. In some countries, vaccines are also used to prevent the disease, but due to their low efficiency, the economic value of this work is questionable.

3- Heel Horn Erosion (HHE):

Heel Horn Erosion is a progressive destruction of the horny tissue of the heel, which starts from the axial surfaces of the heel bulb. With increasing age, this lesion becomes

wider. In cows whose feet are in humid environments for a long time, the heel is usually black, pitted and worn. The lesions quickly become darker in color and form ridges and parallel grooves, leading to V-shaped wear and darkening. This discolored horny tissue is much softer than normal horny tissue. In this case, it does not cause much problem for the animal, but over time and with the destruction of a larger part of the horny tissue of the heel, the longitudinal balance of the toes is disturbed, by translating the weight to the front parts of the sole of the hoof. It can lead to sole ulcer and as a result severe lameness. HHE also predispose the hoof to white-line disease.

Bacteria such as *Dichelobacter nodosus* or *Prevotella melaninogenicus* have been isolated from HHE lesions. Laminitis may also reduce the quality of the horny tissue of the heel, making it prone to HHE.

The most important control measures include hygiene keeping animals in a clean and dry environment, and regular foot baths, especially in the winter months to reduce the severity of the disease. Regular hoof trimming is also effective in preventing the formation of advanced lesions.

4- Interdigital Dermatitis (IDD):

This disease is a superficial inflammation of the skin between the digits, which rarely causes lameness. There is still doubt among researchers whether interdigital dermatitis is an independent disease or a combination of chronic DD with stages of heel erosion. Although this disease usually does not lead to lameness, but it may make the animal prone to other diseases, such as DD, interdigital necrobacillosis, HHE, and interdigital hyperplasia. *Dichelobacter nodosus* is considered to be the cause of the disease, but it is controversial whether this organism causes IDD.

In this disease, the lesions are usually local and do not cause a general reaction. In most cases, they have mild lesions that cause irritation and hyperemia of the skin of the interdigital area, and the lesions continue up to the heel bulb. Cracks and necrosis of the horny tissue of the heel may occur, and along with it, lesions of the coronary band may occur, which disrupt the production of the horny tissue of the wall and subsequent vertical cracks.

To treat the disease, washing, drying and using medications such as oxytetracycline spray, is recommended. It is possible to prevent the disease by maintaining the housing

dry and using a foot bath (3% formalin or 5% copper sulfate).

5- Mud Fever:

This disease occurs when the animals move in cold, humid and muddy environments. The lower part of the limbs gradually swells and the skin becomes dry, hard and scaly. Hair may fall out and bleeding from skin cracks may occur.

For treatment, the feet should be completely washed and dried, and then an oily antiseptic ointment or a spray for teats, which has a lot of softening, should be used. Since *Dermatophilus* microorganism may be the cause of the disease, therefore, the use of an injectable antibiotic such as penicillin can be useful. Hygienic management of the barn and preventing the accumulation of manure with proper drainage and keeping the floor of the barn and alleys dry is the best way to prevent disease.

Conclusion:

In dairy herds, infectious diseases make up a high percentage of factors that cause lameness. Fast and timely treatment and application of the basic standards of prevention and control can greatly reduce the economic losses caused by this category of diseases.

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