University of Mosul
Lecture No.: 10
College of Veterinary Medicine
Date: 2024-2025
Unit of Scientific Affairs
Website:

Lecture title: **Foot rot**

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Summary:

Bovine Foot rot

Footrot is a contagious disease as a result of localized infection by *Fusobacterium necrophorum*, clinically characterized by sudden onset of lameness and fever, drop in milk production with typical fissuring, necrotic lesion in the skin at the top of the interdigital cleft.

Synonyms:

- Infectious bovine pododermatitis.
- Interdigital phlegmon.
- Interdigital necrobacillosis.
- Foul in the foot.

ETIOLOGY

- *Fusobacterium necrophorum* Biotypes A and AB.
  - o A gram-negative non–spore forming anaerobe.
  - o Produce a soluble exotoxin, a leukotoxin, that play an important role in the pathogenesis.
- Other organisms can facilitate infection..

Epidemiology

- **Occurrence**
  - o Common in most countries and accounts for 5% to 15% of cases of lameness in dairy cattle.
  - o All ages are susceptible (The highest occurs in cows in the first month of lactation).
  - o Usually the disease is sporadic, but 25% of a group may be affected at one time under favorable conditions.
- **Source of infection and transmission**
  - o Discharges from the feet of infected animals are source of infection.
  - o Infection gains entrance through abrasions or damage to the skin in the interdigital cleft.
- **Environmental Risk Factors**
  - o Wet and humid weather.
  - o Wet underfoot conditions (e.g., irrigated pastures).
  - o Stony ground, lanes filled with sharp gravel.

- Unhygienic cubicle passageways and poorly maintained straw beds.

Economic Importance

- Great economic importance in dairy cattle.
- Lame cows will:
  - Lie down for longer time and have difficulty rising.
  - Eat less.
  - At great risk for teat trampling and mastitis.
  - Loss of production occurs.
  - May suffer a serious involvement of the joint and other deep structures of the foot.
  - The disease is not fatal, but some cases may have to be slaughtered because of joint involvement.

Clinical findings

Severe foot lameness appears suddenly, usually in one limb only.
May be accompanied by a moderate systemic reaction with a fever of 39 to 40° C.
Drop in milk production.
The typical lesion occurs in the skin at the top of the interdigital cleft and takes the form of a fissure with swollen, protruding edges:

- may extend along the length of the cleft, or
- confined to the anterior part or that part between the heel bulbs.

Pus is never present in large amounts, but the edges of the fissure are covered with necrotic material, and the lesion has a characteristic odor.
Spontaneous recovery is not uncommon, but if the disease is left untreated, the complications may include:

- the lameness persists for several weeks.
- adverse effects on milk production and condition.
- involvement of joints and tendon sheaths.
- poor response to medical treatment. (surgical measures are necessary to permit drainage).

Long continued irritation may result in the development of a wart-like mass of fibrous tissue, the interdigital fibroma, in the anterior part of the cleft and chronic mild lameness.

Clinical pathology

Not routinely done.
Direct smears of the lesion will usually reveal large numbers of a mixture of Fusobacterium and Bacteroides spp.

Treatment

Parenteral administration of antibiotics or sulfonamides.
Long-acting antimicrobial formulations are preferred to decrease labor associated with daily treatment.
Local treatment of the foot lesion are necessary for best results.
Any antibacterial, and preferably astringent.

 Note:
Immediate treatment as soon as possible after the onset of swelling and lameness will give excellent recovery in 2 to 4 days.

Control

 Avoidance of abrasive underfoot conditions.

 Footbaths (e.g., 5% to 10% solution of formaldehyde or copper sulfate in the doorway
Prophylactic antimicrobials and vaccination may be used.

Bovine Digital Dermatitis

Digital dermatitis (DD) is a painful, erosive, papillomatous-like lesion of the skin of the feet of cattle, clinically most Lesions located on caudal aspect of hindfeet, appears as very painful ,red, granular (strawberry-like) appearance .

Synonyms

 Papillomatous digital dermatitis of cattle

 Foot warts.

 Hairy foot warts.

 Heel warts.

Etiology

 Primary causative agents are thought to be anaerobic ***spirochetes*** *Treponema medium/ Treponema vincentii*–like, *Treponema phagdenis*–like, and *Treponema denticola* /*Treponema putidum*–like, and other foot-adapted Treponema strains.

 Other bacterial may play a role in establishing clinical disease.

Epidemiology

 Worldwide disease.

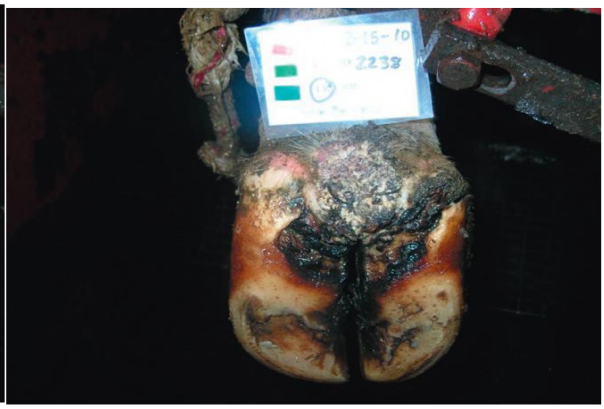
 More common in dairy cattle housed in wet and unhygienic conditions.

Clinical findings

 Lameness episodes of variable severity.
 Affected cattle can be lame and reluctant to move
 Lesions located most commonly on caudal aspect of hindfeet.

 Early lesions have a red, granular (strawberry-like) appearance and are very painful.

 Mature lesions are less painful and more proliferative and may have long wart-like projections.



Control

 Footbaths—5% copper sulfate (not in European Union), 5% formaldehyde.

 Prophylactic antimicrobials and vaccination may be used.

Infectious Footrot in Sheep

An Infectious disease of sheep and goats caused by *Dichelobacter nodosus* formally (*Bacteroides nodosus*) and characterized by severe lameness and bidigital separation of the hoof corneum.

Etiology

 Dichelobacter nodosus.

 Strains vary in virulence to produce benign and virulent footrot.

 Two other bacteria: *Spirochaeta* (*Treponema*) *penortha* and a motile fusiform bacillus, are commonly present in affected feet but are thought to have no primary etiologic importance.

Epidemiology

 Footrot of sheep is common in all countries where there are large numbers of sheep.

 Sheep are the species principally affected, but goats are also susceptible.

 Infection has been identified in farmed red deer and in cattle.

 with environmental conditions of moisture and warmth, the disease in sheep has a high attack rate, and a large proportion of a group of sheep can be affected within 1 to 2 weeks. Both claws of a foot and more than one foot (usually all) on the sheep will be affected.

 Source of Infection:

- The source of infection of *D. nodosus* is discharge from the active or chronic infection in the feet of affected animals.

 Two classifications of footrot:

1. **Benign footrot** (nonprogressive footrot)**:**

- Caused by benign strains of *D. nodosus*.
- Seen in sheep grazing wet pastures.
- Can affect all age groups.
- Can cause marked lameness, particularly in rams and heavy sheep.
- Affected sheep show necrosis and inflammation of the interdigital skin. (The lesions resolve quickly if sheep are moved to dry pasture or if treated with foot-baths.)

2. **Virulent footrot** (progressive footrot):

- Caused by virulent strains of *D. nodosus*.
- survive between footrot transmission periods in pockets of infection in previously underrun ovine hoof
- Outbreaks of severe lameness can occur under favourable environmental conditions.
- Carrier sheep may remain a long term source of infection for the flock, even after dry periods, and spread may occur when moist conditions return.
- Early lesions resemble benign footrot, but can rapidly progress to severe interdigital dermatitis and underrunning of the sole and hoof wall.
- There is little or no purulent discharge with a characteristic odour may be present.
- Many sheep may be affected within the flock, showing lesions of varying severity, with more than one foot.
- Chronically-infected sheep may not appear lame, but often have obvious deformities of the affected hoof.

 Benign footrot cannot be differentiated from early virulent footrot, but does not progress to extensive underrunning of the hard horn of the hoof.

Ovine Interdigital Dermatitis, Foot Scald

This disease is seasonal and occurs when moist conditions underfoot, or trauma from pastures or frost, produce maceration of the interdigital skin, allowing invasion by *Fusobacterium necrophorum*, .

 Methods of Transmission

- Introduction of carrier sheep to the flock.
- Infection can came from the environment when footrot-free sheep use yards, roads, or trucks that have been used by footrot-infected sheep in the immediate past.

 Environmental Risk Factors:

- Wetness and warmth favors persistence of the bacteria in pasture and increases the susceptibility of feet to injury and dermatitis.
- There must be continued moisture on the ground for transmission to occur.
- In cold climate (winter), transmission is reduced or does not occur.
- Concentrates sheep in small areas will favor spread of the disease when environmental conditions favor transmission.
- Failure to isolate introduced sheep until their footrot status has been determined.
- Long mature grass may result in interdigital abrasions as it is dragged through the interdigital space and facilitates infection.

Economic Importance

- Benign footrot infections can depress body weight, wool growth, and wool quality.
- Virulent footrot causes a severe loss of body condition, moderate mortality rate, reduction in wool production.

Pathogenesis

Prolonged wet conditions underfoot
↓
Maceration of the interdigital skin
↓
Infection with F. necrophorum
(hyperkeratosis induced by this infection facilitates infection by *D. nodosus* if it is present).

Clinical findings

Inflammation of the skin at the skin–horn junction in the interdigital area with underrunning of the soft horn in benign (nonprogressive) footrot.

Progresses to underrunning of the hard horn and inflammation of the sensitive laminae in virulent (progressive) footrot and severe lameness.

Clinical pathology

Gram-stained smears and culture to confirm the presence of the organism.

Polymerase chain reaction (PCR) tests for strain virulence.

Treatment and control

Topical treatment with bactericides in footbaths.

Parenteral antibiotics for treating virulent footrot.

Vaccination.

Culling.