

Corynebacterium Pseudotuberculosis Associated Skin Disease of Holstein Cattle in the San Joaquin Valley, California

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Introduction

The role of *Corynebacterium pseudotuberculosis* in diseases of sheep and goats, particularly caseous lymphadenitis, is well recognized². However, there are few reports in the North American literature of *Corynebacterium pseudotuberculosis* causing diseases of cattle. There is a case report of *Corynebacterium pseudotuberculosis* associated with otitis media in feedlot cattle³ but there are no reports of its association with skin disease of cattle. By contrast, the Egyptian literature contains many case reports of an "oedematous skin" disease which occurs primarily in buffalo, but which has also been reported in cattle.⁴ Edematous skin disease is associated with *C. pseudotuberculosis*.

In this report the clinical findings are described for a herd that was affected by an outbreak of severe skin disease associated with *Corynebacterium pseudotuberculosis*. Pathology, microbiology and treatment of this condition are discussed. Herd outbreaks of this condition appear to be not uncommon in the San Joaquin Valley based on records of the California Veterinary Diagnostic Laboratory System at Tulare (CVDLS) which record seven additional herd outbreaks since 1987. Herd outbreaks are characterized by the sudden onset of skin lesions in a number of animals. All outbreaks have occurred between October and February. The condition is severe and results in losses due to culling, treatment costs and problems with milking parlor cleanliness and disinfection.

Clinical Findings

The investigated herd was a typical California drylot dairy with a rolling herd average of approximately 9,000 kg milk/head/305 day lactation. The facility was old, but the milking parlor areas showed good attention to herd cleanliness. The dairy had 521 milking cows and 80 dry cows. Cows were milked in a flat barn. Consultation was requested approximately 3-4 weeks after the initial outbreak of the disease. The initial outbreak of disease was explosive as 18 cases occurred in the first 3 days of the outbreak. Figures 1 and 2 show typical lesions. There was a total of

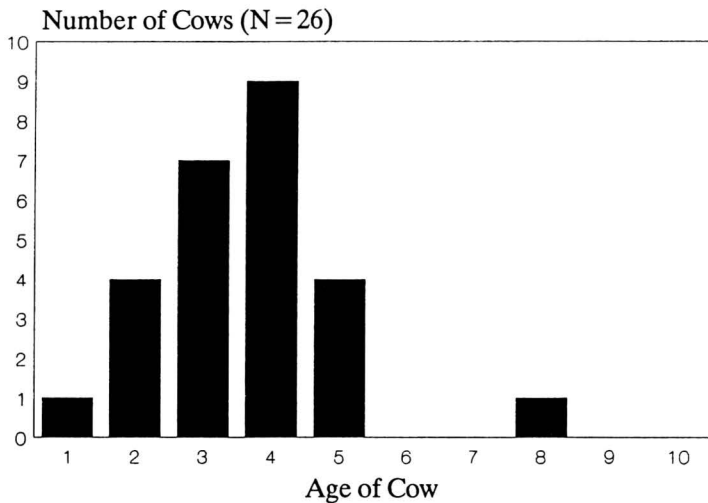
Figure 1. Cow with several ulcerated skin lesions at the point of shoulder and lateral thorax with extensive hemorrhage and purulent exudate.



Figure 2. Closer view of an ulcerated skin lesion on the back. Surface is raised due to deep inflammation, scarring and accumulation of exudate.



26 cases of the condition in the milking herd and 1 case in the dry pen. The incidence in adult cattle was 4.5% and there were no cases reported in heifers that had not commenced milking. The incidence rate in lactating cows was 4.95% and in dry cows 1.25%. Lactating cows were 3.96 times more likely to be affected than dry cows, but this increased risk for lactating cows was not statistically significant. Skin lesions were present in all strings of cows of milking age. Cows in mid lactation appeared to be at greater risk for the condition. Cows born in 1981/82 (ie. 5-7 years old), appeared to be more at risk as 12 of 26 animals were born in these years (Fig 3). However, neither of these risk factors were formally investigated.



Age of Cows with *Corynebacterium pseudotuberculosis* Associated Skin Lesions

The lesions found varied quite markedly between cows. Milder cases had evidence of lymphadenitis (swollen lymph nodes), with small (approximately 1 cm in diameter) pustules while severe cases had extensive areas of epidermal loss (20cm diameter and greater). These extensive lesions oozed serosanguinous to purulent exudate from deep ulcers with exposure of underlying musculature. In some cows the abscesses had not ruptured and appeared as nodular masses. Differential diagnoses for this condition included neoplastic growths, seromas and hematomas, *Actinobacillus*, *Nocardia* and atypical *Mycobacterium*. Lesions were noted on the dorsal and lateral thorax, base of the tail, back, point of the shoulder, flank and paralumbar regions. severely affected cows were inappetent. Temperature elevation $>39.5^{\circ}\text{C}$ (103.5°F) was noted in some cases. Otherwise clinical findings were unremarkable.

The outbreak persisted for a 3-4 week period. The other 7 herds reported similar initially explosive outbreaks that then tapered off. This pattern of outbreak is sugges-

tive of an initial causative factor, i.e. a point epidemic pattern of disease. A thorough examination of the facility was conducted, but no single factor likely to be associated with the disorder was identified.

There was a history of increased fly numbers in the herd environment and there was ample evidence of protruding nails, wood and other sharp objects in the lanes leading to the milking parlor. The distribution of lesions which were predominately on the lateral trunk, bony protuberances and paralumbar fossa may support a hypothesis of injury followed by infection. The corrals had been recently scraped and excess manure and dirt removed. Recent cleaning of corrals had been reported in one other herd outbreak. However the reason for the explosive nature of the herd outbreak was not obvious. Five of the other seven outbreaks involved lactating Holstein cattle from large dairies, >400 milking cows. One herd had 150 milking cows. Explosive outbreaks with a similar distribution of lesions and occurrence in all strings were reported from all six herds. The 7th outbreak occurred in heifers weighing approximately 270 kg on a heifer ranch which housed 3000 animals. Four of the seven outbreaks occurred in October-November 1987, and one each in February and November 1988 and January, 1989.

Histopathology

Two of five animals from the initial herd were biopsied. The epidermis was ulcerated and replaced by a hemorrhagic and purulent exudate. Abscesses extended into the deep dermis, subcutaneous fat and the underlying muscle. Abscessed regions contained gram positive coccobacilli within their center and were surrounded by macrophages, lymphocytes, plasma cells and rarely giant cells within granulation tissue and mature scar tissue. Biopsies from animals in two additional herds had similar pathology.

Microbiology

Three of five cows from the investigated herd had a pure growth of *C. pseudotuberculosis* on aerobic culture. Two cows had mixed growth with small numbers of *Pasteurella* sp. and one of these two also had small numbers of alpha-haemolytic streptococci.

Seventeen swabs or aspirates from intact nodules were submitted for aerobic culture from the additional 7 affected herds. Only two of these samples were cultured anaerobically. Ten of 17 had pure growth of *C. pseudotuberculosis* aerobically. Two specimens had no aerobic growth while four had mixed growth of *C. pseudotuberculosis* and small numbers of other gram negative bacilli. One swab had a pure culture of coagulase negative *Staphylococcus* sp. Of the two anaerobic cultures, one had no growth and the other had mixed anaerobes. Both had pure cultures of *C. pseudotuberculosis*.

All *C. pseudotuberculosis* isolates were slow growing, white, beta-haemolytic colonies on bovine and sheep blood

agar. All isolates were catalase positive, hydrolyzed urea, produced acid from glucose and reduced nitrate.

Treatment

We did not extensively examine treatment of this condition. However, parenteral penicillin (procaine) at doses of 20,000 IU/kg and greater, coupled with topical application of mild iodine preparations have been reported as being successful. Due to the extensive areas of epithelial loss, consideration may be given to topical treatments appropriate for burn injuries, ie. silver sulphathiazine. The condition may spontaneously resolve.

Conclusion

It is not certain that *C. pseudotuberculosis* is the initiating agent in this condition, but it would appear to be associated with the condition based on its presence in pure culture in 68% of the swabs and aspirates tested as well as the presence of gram positive diptheroids within biopsy specimens. In addition, experimental induction of the condition by intradermal and subcutaneous injection of *C. pseudotuberculosis* strongly suggests that the organism is involved in the pathology of the disease.³ The condition is of economic importance for herds experiencing outbreaks and warrants further study. The incidence rate of approximately 5% reported in this report has been recorded in other herds. Epidemiology of the condition is at present poorly understood and efforts should be directed towards

identifying risk factors that facilitate herd outbreaks. The role of biting flies in this skin disease merits particular attention since the disease occurs during the same seasonal period as "pigeon breast" in horses. This seasonal *C. pseudotuberculosis* associated disease in horses is believed to have a fly vector.

Interestingly, *C. pseudotuberculosis* isolates from horses reduce nitrate similar to these cattle isolates while isolates from sheep and goats do not reduce nitrate and rarely cause skin lesions. The nitrate negative *C. pseudotuberculosis* isolates from sheep and cattle have been shown to cause internal lymph node abscesses rather than skin lesions when inoculated intradermal or subcutaneously into sheep and cattle.⁴ Production of dermatolytic toxins has been postulated as the cause of the skin lesions in cattle.¹

References

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