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Trueperella pyogenes; a Cause of Spleen Multi Abscesses in Cattle

Mona Hamedei ^{1*}, Hossein Esmaeili ², Iradj Ashrafi Tamai ², Mohammad Reza Moradbakhsh ³, Mohammad Davoudi ³

¹ Department of Immunopathology, Faculty of Veterinary Medicine, Islamic Azad University, Science and Research Branch, Tehran, Iran.

² Department of Microbiology and Immunology, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran.

³ Faculty of Veterinary Medicine, Islamic Azad University, Science and Research Branch, Tehran, Iran.

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*Corresponding Authors: Mona Hamedei: Department of Immunopathology, Faculty of Veterinary Medicine, Islamic Azad University, Science and Research Branch, Tehran, Iran.
Tel: +98-21-44868613, E-mail: mhamedei42@ut.ac.ir

ABSTRACT

Background: *Truperella pyogenes* (*T. pyogenes*) is a gram-positive bacterium which can lead to visceral abscesses in cattle. The abscesses may be found in internal organs such as spleen, kidney, liver, lungs and skin. The aim of this study is to focus on spleen abscesses due to *T. pyogenes*.

Methods: The whole spleen was sent to the laboratory and the causative agent was evaluated using isolation methods and biochemical tests based on the colonies.

Results: The appearance of isolated colonies and the results of biochemical tests confirmed the presence of *T. pyogenes* in the spleen lesions.

Conclusion: The current results identified *T. pyogenes* as the only isolated bacterium in a case of visceral abscess. This study emphasizes the necessity of implementing effective planes such as improving sanitation, reducing stressful conditions, feeding cattle by balanced diet, avoiding sudden changes in grain intake, and controlling other diseases to prevent the chronic economical losses of visceral infection with *T. pyogenes*.

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Introduction

Trueperella pyogenes belongs to the family Actinomycetaceae is a gram-positive and short, rod-shaped bacterium that colonizes in the skin, mucous membrane of upper respiratory and urogenital tract, bovine rumen and udders of clinically healthy cattle. Infection with the pathogen may cause cutaneous and visceral abscesses, mastitis, metritis and pneumonia (1, 2). In addition, the presence of *T. pyogenes* is usually described as pyogenic infections in livestock and purulent or necrotic lesions of the bacterium may occur in different host tissues. Since the bacterium is an opportunistic pathogen, it usually infects immunosuppressed animals (3).

The isolation of *T. pyogenes* has been reported in cattle with different clinical signs (1, 4, 5), though limited studies have evaluated the role of the pathogen in the formation of visceral abscesses. Ashrafi Tamai et al. in 2017 evaluated the causative agents of cutaneous abscesses in 134 cattle from 15 herds. The researchers demonstrated *T. pyogenes* as the main isolated bacterium (17.6%) (4). Cutaneous abscesses may represent infection of visceral organs with the same bacterium as it is evident for *Corynebacterium pseudotuberculosis* (5). In livestock, *Trueperella* visceral abscesses may lead to significant economic losses including decrease in productivity, mastitis and the need for veterinary intervention (6).

Internal organs such as liver, lungs, spleen and kidneys are susceptible for the infection with *T. pyogene* (1). Animals with visceral abscesses may show general clinical symptoms such as fever, weight loss, and anorexia, along with organ specific clinical manifestations (7). Visceral abscesses are usually visible in slaughtered cattle and are accidental findings during necropsy procedures. An investigation conducted during 12 years at the slaughterhouse of Montreal showed the prevalence of liver abscess 13.2% in heifers, 13.5% in steers, and 23.4% in Holstein cattle. The

researchers detected *T. pyogenes* and *Fusobacterium necrophorum* as the most prevalent bacteria isolated from aerobic and anaerobic cultures respectively (8).

A variety of bacteria including *Streptococcus*, *Staphylococcus*, *Escherichia coli* and *T. pyogenes* have been isolated from abscesses in different studies (7, 9, 10). However, the role of *T. pyogenes* is neglected and remained poorly understood in the formation of visceral abscesses. The present study aimed to report *T. pyogenes* as the cause of spleen multiple abscesses in a cattle and it emphasized the importance of the agent in the formation of visceral abscesses.

Materials and Methods

The whole spleen organ belongs to a necropsied cattle was sent to the laboratory for the presence of multiple abscesses. A direct smear was prepared from the middle of multiple abscesses and stained with gram staining method. Then the samples were cultured on blood agar and MacConkey agar. The cultures were incubated aerobically at 37 °C for 48 hour. Other confirmatory biochemical tests were conducted according to the colonies grown on the cultured plates.

Results

The submitted spleen consisted of multiple abscesses (Figure 1, 2) and in the direct smear, gram positive coccobacilli were observed using light microscope. After 48 hour of incubation no colonies were observed on MacConkey agar, but pure white pinpoint colonies with complete hemolytic zone were visible on blood agar. As the infection of the spleen with *T. pyogenes* was suspected, biochemical tests including CAMP test with *Staphylococcus aureus*, lactose fermentation, gelatinase, and urease were performed and the colonies were also inoculated into loeffler's serum and litmus milk media.



Fig 1. Multiple abscesses in the spleen of cattle infected with *T. pyogenes*.



Fig 2. Transverse section of multiple abscesses of the spleen consists of *T. pyogenes*.

Table 1. Biochemical results of the pure cultures on blood agar which confirmed the isolation of *T. pyogenes* from the multiple abscesses of spleen.

CAMP test with <i>S. aureus</i>	Lactose	Litmus milk	Indole	Urease	gelatinase	loeffler's serum
+	+	Clot,Digestion	-	-	+	+

The results of the biochemical tests which confirmed the isolation of *T. pyogenes* is given in table1.

Discussion

The current result identified *T. pyogenes* as the only isolated bacterium in a case of visceral abscess. However, most of the studies usually reported the bacterium isolation from skin, mucus layer of respiratory tract and urogenital system of cattle (2). To our best knowledge, we isolated the bacterium from spleen (Figure 1, 2) for the first time in Iran and most of the available studies, have reported the presence of *T. pyogenes* in cutaneous abscesses.

T. pyogenes frequently involves in pyogenic diseases and liver is usually known as a visceral target organ for the agent (11). Lazaro et al. in 2023 reported a rare case of isolation of *T. pyogenes* from multiple abscesses in pelvic and abdominal cavity of four heifers and uterus, peritoneum, pre-stomach and liver were infected with the bacterium (12). The presence of *T. pyogenes* in other organs such as lymph nodes and kidney is also recognized and in a study conducted in Turkey in 2019, the bacterium was introduced as the prominent cause of kidney abscesses in cattle (1).

Internal organ involvement with pus-forming bacteria, including *Trueperella*, *E. coli*, *Staphylococcus*, and *Streptococcus*, can lead to progressive weight loss and reduced productivity in domestic animals (1, 10). Additionally, the presence of an infected animal in a herd increases the likelihood of skin abscesses and the risk of bacterial spread (13). *T. pyogenes* which can also cause mastitis and pneumonia has the potential to cause greater economic losses to livestock (1). In animals with immunosuppression or following grain consumption, the bacterium can disseminate via the bloodstream to internal organs. Furthermore, *T. pyogenes* can synergistically contribute to the formation of internal abscesses with other pyogenic bacteria (14). In the current study, we isolated *Trueperella* in the pure culture,

demonstrating the importance of the agent as the main etiology of a purulent infection.

The ability of the bacterium in the formation of a fibrous capsule, limits antibiotic access and reduces the treatment effects in infected animals (4). Visceral abscesses infected with *T. pyogenes* may not be diagnosed until the death or slaughter of animals, which increases the risk of exposure and the disease spread in a herd. In our study, the presence of multiple abscesses in the spleen (Figure 1 and 2) was an incidental finding after necropsy of a dead animal that was sent to the laboratory. As a result, an accurate history of the infected animal, along with the monitoring of the causes of both cutaneous and visceral abscesses using appropriate tests, determine the rate of purulent infections related to *T. pyogenes* and help to implement preventive strategies.

Controlling measures such as improving sanitation, reducing stressful conditions, feeding cattle by balanced diet, avoiding sudden changes in grain intake, and preventing other diseases decreases infection with *T. pyogenes* in cattle (3, 15).

Conclusion

The results of the present study highlight the need to consider *T. pyogenes* as an etiology of visceral abscesses and emphasize the necessity of implementing an effective plane to prevent its chronic economical losses.

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Ethics approval and consent to participate

This article does not contain any studies with human or animal subjects performed by the any of the authors.

Conflict of interest

The authors confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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