

Communication

[Comunicação]

**An unusual gangrenous goat mastitis caused by
Staphylococcus aureus, *Clostridium perfringens* and *Escherichia coli* co-infection**

[Mastite gangrenosa caprina atípica causada por co-infecção
por *Staphylococcus aureus*, *Clostridium perfringens* e *Escherichia coli*]

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Mastitis is considered one of the most important diseases of domestic animals, caused by several etiologic agents. Transmission of the microorganisms primarily occurs by ascendant via in canal of teats, usually involving agents from animals and environmental origin and from milking process (Anderson et al., 2005). *Staphylococcus aureus* is recognized as the most common causal agent of goat mastitis, followed by minor occurrence of *Mannheimia (Pasteurella) haemolytica*, *Escherichia coli*, *Clostridium perfringens*, *Streptococcus*, *Pseudomonas* and *Nocardia* genera (Bergonier et al., 2003, Radostits et al., 2007), including in Brazil (Megid et al., 1990, Ribeiro et al., 1998).

Gangrenous mastitis in goats is a severe clinical condition of the inflammatory process in mammary glands. Clinical signs commonly occur in the first weeks of lactation, committing one or two sides of the glands and are characterized by fever, anorexia, dyspnea and systemic signs of toxemia. Initially, the udder is hot, painful and occurs swelling of the affected side, with milk watery, containing flocculent pus and/or blood secretion. Evolution of the process is characterized by udder becoming discolored (blue-blackish or blue-greenish), cold, with demarcation line of the affected tissue, development of abscess and draining pus. Fatal clinical course is characterized by worse of corporal condition, pneumonia, septicemia and/or toxemia. Usually, gangrenous goat

mastitis is associated with *S. aureus* or *M. haemolytica* infections. Treatment involves antimicrobial and anti-inflammatory drugs associated with fluid therapy, surgical drainage, debridation and demotion of necrosis tissue (Cable et al., 2004). The present report describes an unusual case of combined infection by *S. aureus*, *E. coli* and *C. perfringens* isolated from gangrenous mastitis in goat.

A three-year-old goat, Boer breed, was referred to the Veterinary Hospital, presenting peracute clinical signs of mastitis in the right side of mammary gland, two weeks after the parturition. In the clinical exam, fever, anorexia and dyspnea were observed. The mammary gland was blue-greenish, cold, with marked line of the affected tissue and milk containing blood and pus secretion (Figure 1). No evidence of traumatic lesions or foreign body was observed during the clinical exam in mammary gland.

Milk samples were aseptically collected and submitted to microbiological culture on defibrinated sheep blood agar (5%), MacConkey agar and Sabouraud agar, incubated under aerobiosis, at 37°C for 72h. The same material was submitted to sheep blood agar (5%), incubated under anaerobic conditions, at 37°C for 120h. Microorganisms isolated were identified based on macro and microscopical morphology by Gram stain, culture characteristics and biochemical profile (Krieg

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and Holt, 1984; Quinn et al., 1994). Cytological smears of milk stained by Gram and Giemsa revealed combined infection characterized by numerous Gram-positive cocci and rods and Gram-negative rods microorganisms. Golden-yellowish, circular, beta-hemolytic colonies associated to grayish, non-hemolytic colonies were obtained after 24h on sheep blood agar, while on MacConkey agar, pink colonies (lactose-positive) were observed in pure cultures

after 24h. Biochemical tests characterized golden-yellowish colonies on sheep blood agar as *S. aureus*, and pink colonies on MacConkey agar as *E. coli*. After five days of incubation under anaerobic conditions, smooth, round, glistening colonies, surrounded by “target” or double hemolysis were verified on sheep blood agar, and the agent was identified as *C. perfringens*.



Figure 1. A) Severe gangrenous mastitis in goat of Boer breed, caused by *Staphylococcus aureus*, *Escherichia coli* and *Clostridium perfringens* co-infection; B) Detail of mammary lesion, Botucatu, SP, Brazil.

S. aureus and *E. coli* isolates were submitted to *in vitro* drugs susceptibility test using disk diffusion method (Bauer et al., 1966) and showed susceptible to ampicillin (10µg), enrofloxacin (5µg) and gentamicin (10µg).

Treatment was initially attempted using ampicillin (22mg/kg, 8h, SC) and enrofloxacin (10mg/kg, 24h, SC), associated to flunixin meglumin (1.1mg/kg, 24h, SC). In despite of initial therapy, the animal was submitted to unilateral mastectomy (Cable et al., 2004) 24h after the clinical exam, due to worsen of general clinical signs and extension of the mammary lesions (Figure 1). Histopathological evaluation of mammary tissue after mastectomy revealed severe acute inflammatory process, characterized by numerous neutrophils, necrotizing tissue and pus, containing cocci and rods microorganisms. Fragments of mammary gland were submitted to microbiological culture and revealed the same microorganisms isolated from milk. Mastectomy is a choice procedure in gangrenous mastitis in goats (Cable et al, 2004). From a similar way, mastectomy associated to anti-inflammatory and

antimicrobial drugs therapy in the present case also showed to be effective. No evidence of lesion or foreign body was observed during the clinical exam of the goat mammary gland which suggests a traumatic introduction of the agents. Thus, the mammary infection in the present report probably occurred via ascendant by the teat canal, described as principal form of transmission in domestic animals (Radostits et al., 2007).

S. aureus is recognized as the most-common agent of mastitis in domestic animals, including gangrenous presentations in small ruminants (Anderson et al., 2005). *E. coli* and *C. perfringens* are considered as the minor occurrences in mammary infections of small ruminants, although they have been associated to serious mastitis cases. In the present case, severe clinical mastitis with systemic signs produced by *S. aureus*, *C. perfringens* and *E. coli* probably occurred due to the action of different cytotoxins and endotoxins that led to extensive tissue damage and systemic reaction in the animal (Quinn et al., 1994, Radostits et al., 2007).

The identification of different causal agents associated to mammary infections in small ruminants has been reported (Anderson et al, 2005, Radostits et al., 2007). However, combined infection by *S. aureus*, *C. perfringens* and *E. coli* in gangrenous mastitis in goats is

reported by the first time in Brazil and also in the consulted literature.

Keywords: goat, gangrenous mastitis, etiology, co-infection

RESUMO

Relata-se, pela primeira vez no Brasil, a ocorrência de mastite gangrenosa caprina atípica causada pela co-infecção por Staphylococcus aureus, Clostridium perfringens e Escherichia coli em uma cabra da raça Boer, na segunda semana de lactação. Descrevem-se os achados clínicos, os procedimentos de diagnóstico microbiológico e a conduta terapêutica.

Palavras-chave: cabra, mastite gangrenosa, etiologia, co-infecção

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