CASEOUS LYMPHADENITIS IN GOATS

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Abstract: Caseous lymphadenitis is a chronic disease of lymph nodes in goats and sheep, sometimes in humans. A cause is Corynebacterium pseudotuberculosis. The disease is manifested with development of abscesses, mostly in superficial lymph nodes. If disease is not generalized, general condition of animal does not need to be changed. This disease can influence big economic losses. Removing of muscle tissue with changed lymph nodes can cause damage of goat leather and its economic value could be quite diminished. If the disease is generalized it can cause death of adult animals and a breakdown of fertility. Changes on lymph nodes are noticed mostly during the slaughter. The aim of an inspection of goat carcasses was to provide hygienic safe meat (healthy) for human consumption. During the inspection of goats before and after slaughter, on the slaughter line we noticed an enlargement of prescapular and sub-mandibular lymph nodes on the right half (middle walnut size). The lymph nodes were forwarded to analysis in the laboratory. During the primary bacteriological treatment of samples it is established that both lymph nodes were hard, covered with connective tissue capsule with caseous content. In direct microscopic preparation colored by Gram, in these samples were found out Gram-positive bacilli. Coloring by Löffler it was found out metachromatic granules. According to microscopic morphology, cultural and physiological properties and testing biochemical activity, this isolated culture was identified as Corynebacterium pseudotuberculosis. Clinical signs, patomorphological and bacteriological finding are in accordance to the literature descriptions.

Key words: goats, lymphadenitis caseosa, Corynebacterium pseudotuberculosis, lymph node, meat, economic loss

Introduction

Pseudotuberculosis (lymphadenitis caseosa – CLA) is chronic bacterial infectious illness of sheep and goats. It appears sporadically, sometimes enzootic. It is manifested by local inflammation on the place when bacteria are being entered. After being entered, bacteria penetrate into lymph nodes developing abscess –
lymphadenitis caseosa (Glen, 2000). It is possible the dissemination of bacteria through blood consequently with abscess development in lung, liver and kidneys. The cause of this disease is *Corynebacterium pseudotuberculosis*. Pseudotuberculosis is contagious illness that spread by cohabitation and by transmission of cause through skin wounds. In goats the wounds are localized mostly on the head, neck and sternum that is characteristic in goats that browse - extensive breeding. The illness is world wide problem. It is proved in Europe, North and South America, South Africa, Middle East and New Zealand. In Australia, there are up to 54 % ill sheep. In North America, average prevalence in goats is 8 % and similar is proved in wild goats in Australia, respectively. The prevalence increases with a growing old and in goats older than 4 years is 22 %. The cause is taken in the flock by latently infected animals (carriers). In the flock without health control, the illness can be widen in majority of animals during several years.

Infection can be widen in two ways. Abscessing of primary lesions the large number of bacteria is released in environment. Bacteria can survive several months in ground, straw or on the surface of various stuffs as are wood troughs etc. Possible way for entry of bacteria in the body is through the injured skin and mucous membrane as well traumatic skin lesions after fight, the ear lesions after marking or tattooing and skin lesions during shearing and browsing; lesions of mouth and gums during the falling out of teeth. Also, cause can entry in the organism *per os* when exist the primary contamination of feeding stuffs, water and troughs (Baird, 2001).

Due to its importance, *Corynebacterium pseudotuberculosis* is the topic of interest of many researchers word wide. In this paper, results of our previous researches relating to the disease whose ethyological agent is the fore mentioned bacteria, are presented.

**Materials and Methods**

As material is used macroscopic changed lymph nodes of goats (submandibularis et praescapularis). Samples were collected at the slaughter line, packed in sterile, signed bags and transported to the lab. Lymph nodes were cut by sterile scissors and than the part of its content with loop were placed on the glass and colored by Gram. Lymph node content is incubated anaerobic for 48 hours, at 37°C, in the medium with 5 % of sheep blood and in MacConkey medium. Grown colonies were examined by microscope. Biochemical activity was evaluated by commercial tests (bioMerieux, HiMedia). Bacteria were identified by BBL Crystal GP ID Kit (*Becton Dickinson*).
Results and Discussion

During the checkup of animals before the slaughter in slaughterhouse depot, in two goats mandibular and prescapular lymph nodes were enlarged and with hard consistence. After the slaughter, they were examined in the laboratories. On the section is noticed that were laminated, encircled with fibrous capsule, filled with caseous, greenish-yellowish purulent contend without odor.

![Figure 1. Appearance of changed sectioned lymph node](image1)

By microscope there were found Gram positive bacilli and coccobacilli. In the preparation by Löffler it is viewed metachromatic granule. On the blood agar in the primary isolation, there were grown small colonies encircled with narrow zone of β hemolysis.

![Figure 2. Appearance of *Corynebacterium pseudotuberculosis* colonies on the blood agar](image2)
After 2 days incubation the colonies was 2 mm in diameter, crumbly and yellowish in colour. It was not appear the growth on MacConkey agar. Culture showed opposite (inhibited) CAMP test with *Staphylococcus aureus* and positive CAMP test with *Rhodococcus equi*. By synergistic influence of *Corynebacterium pseudotuberculosis* and *Rhodococcus equi*, around the colonies of isolated strain, it appeared intensified haemolysis on the limited area of together diffusion its extracelular products. In the microscopic preparations from pure culture, it determined Gram positive cocobacilli with metachromatic granules (Figure 3).

![Figure 3. Corynebacterium pseudotuberculosis in a Gram-stained smear from a colony (x1000)](image)

*Corynebacterium pseudotuberculosis* is Gram positive bacterium and if it coloured by Albert or Neisser, it can be viewed spiral granules. This microorganism is facultative intracellular pathogen, presented in pleomorfic form as coccus or bacill, sized 0.5-0.6 μm to 1.0-3.0 μm (*Buxton et al., 1977, Connor et al., 2000; Selim, 2001*). It does not produce capsula and it is not movable, it has fimbriae. This bacterium is facultative anaerobic and it growths the best at 37°C, ph 7.0-7.2 (*Selim, 2001*). In the beginning, at the agar surface it growths unit colonies and after then they are larger and become chains, cream to orange, dry, non-transparent and round. In the liquid medium it is developed granulated layers with superficial membrane (*Buxton et al., 1977; Merchant et al., 1967; Mucke, 1982*). Colonies on sheep blood agar are rounded with narrow zone of β haemolysis, similar to haemolysis of *Rhodococcus equi* (*Buxton et al., 1977*). Obtained results, presented in Picture 2 and 3 are in accordance with results of mentioned authors.

The results of biochemical activity are presented in Table 1.
Table 1. Biochemical activity of *Corynebacterium pseudotuberculosis*

<table>
<thead>
<tr>
<th>Glucose</th>
<th>Arabinose</th>
<th>Xylose</th>
<th>Rhamnose</th>
<th>Fructose</th>
<th>Mannose</th>
<th>Nitrate reduction</th>
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Following (Table 1)

<table>
<thead>
<tr>
<th>Lactose</th>
<th>Maltose</th>
<th>Sucrose</th>
<th>Trehalose</th>
<th>Raffinose</th>
<th>Salicin</th>
<th>Urease</th>
<th>Esculin</th>
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Table 1 show that *Corynebacterium pseudotuberculosis* give positive reaction on glucose, arabinose, fructose, mannose, maltose, sucrose, urease and MR. Reaction is negative on xylose, rhamnose, lactose, trehalose, raffinose and salicin. Esculin not hydrolyzed. Nitrate not reduced.

According to morphological, physiological and cultural properties and biochemical activity, isolated culture is identified as *Corynebacterium pseudotuberculosis* that is in accordance with cites of Holt (1994) and Quinn (2002). The absence of nitrate reduction confirms in this case biovar adapted on goats and sheep. The presence of metachromatic granules, as elements of energy reserve, it is clear viewed in bacilli form, while they are absent in coccoid form of cells.

Toxin of *Corynebacterium pseudotuberculosis* inhibits the influence of staphylococcal β haemolysin (Jones et al., 1986). Very strong egsoxin (phospholipase D) could be considered as the main factor of virulence (Hodgson et al., 1992). It is penetrating factor and factor of accelerating of ester hydrolysis of sphynomielin in cell membranes in mammals. It particularly contributes to bacteria spreading from primary to secondary location of infection (McNamara et al., 1995; Peel et al., 1997; Tachedjian et al., 1995; Tambourgi et al., 2002). Moreover, it causes dermatonecrotic lesions and high doses are lethal for many various laboratory and domestic animals (Songer, 1997).

In small ruminants CLA is manifested on that way many bacteria produce caseous necroses in lymph nodes. Frequent form of illness is external CLA that is characterized with abscesses in superficial lymph nodes and subcutis. These abscesses can be developed in lung, kidneys, liver and spleen that is characteristic of CLA (Piontkowski et al., 1998). Changed lymph nodes, shown in Picture 1 are in accordance to description cited of mentioned authors. In some cases of infections there are present clear expressive clinical symptoms in animals, while in some cases they are latent and animal is considered as healthy to the slaughter (our
case) or postmortem inspection in the case of death (Arsenault et al., 2003; Paton et al., 1994).

The sensitivity of Corynebacterium pseudotuberculosis on antibiotics examined in vitro, is various in different region (Connor et al., 2000; Foley et al., 2004; Literák et al., 1999). Muckle and Gyles (1982) examined 26 strains isolated from lesions of caseous lymphadenitis in goats. All of isolated strains were sensitive to ampiciline, chloramphenicol, lincomycinic, genthamicine, tetracycline and penicillin G.

Therapy with CLA antibiotics is mostly without success, because bacteria stay alive after application, protected inside the abscess that is rounded with thick capsule (Piontkowski et al., 1998; Stanford et al., 1998; Williamson, 2001). Superficial lipids of cause influence antiphagocytic and on that way is decreased defense of microorganism and enabled facultative persisting intracellular parasitism of cause. The best strategy of illness control could be the vaccination of healthy animals (Menzies et al., 2004; Paton et al., 1995; Williamson, 2001). Of course that is the control of animals during the entering in the flock necessary. But, sometimes is hard early discover and connection the clinical signs with illness that can be hurdle of prevention. The consequences of this illness are great economic damages. They are less because of death of sheep and goats, but greater due to decreased production of wool, meat and milk (Arsenault et al., 2003; Paton et al., 1994).

Human infections caused by Corynebacterium pseudotuberculosis are not often. Mostly they are noticed in farm workers and veterinarians that are in contact with ill animals (Mill et al., 1997). In the literature is noted that this cause could be transmitted to humans by contaminated goat meat and cow milk (Peel et al., 1997). Peel et al. (1997) described 22 cases with people with lymphadenitis, abscesses and general weakness. Liu et al. (2005) described the infection with Corynebacterium pseudotuberculosis as eye infection.

**Conclusion**

Having these cites and taking into consideration relative little number of literature data, we have opinion that infection of goats and sheep with Corynebacterium pseudotuberculosis in Serbian flocks are not so expressed. Due to mentioned, this kind of investigation should be continued widely, because in spite of healthy aspect, this illness has economic aspect of animal husbandry and, disregarding rare appearance, it presents potential risk for human health.
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Rezime


References

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