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Ovine orchitis, with special reference to orchitis associated with *Arcanobacterium pyogenes*☆

P.G. Gouletsou*, G.C. Fthenakis

Veterinary Faculty, University of Thessaly, PO Box 199, GR-43100 Karditsa, Greece

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Abstract

Initially, the literature on ovine orchitis, a disorder with significant reproductive consequences, is briefly reviewed. Subsequently, the results of research work on orchitis associated with *Arcanobacterium pyogenes* are presented. *A. pyogenes* was isolated from the preputial cavity and the scrotal skin of healthy rams, as well as from field cases of ovine orchitis. Intratesticular inoculation of the organism caused orchitis, by means of clinical, cytological, seminological, bacteriological and pathological examinations. Although semen quality was affected and severe histopathological changes were evident, regeneration of testicular elements were evident at the late stages of the disease.

Keywords: Sheep; Orchitis; *Arcanobacterium pyogenes*

1. Introduction

Orchitis is an important reproductive disorder in sheep flocks. Usually, it is of bacterial aetiology, although various factors may predispose animals to the disease.

Infections may be caused either by specific bacterial pathogens with a predilection for the testis and epididymis, as *Brucella ovis*, or by a variety of ubiquitous bacteria able of causing tissue damage in any organ to which they are introduced. According to Bath and de Wet (2000), the most common bacterial causes of ovine orchitis-epididymitis can be classified into one of the following three groups: (i) *Brucella*; (ii) *Haemophilus*, *Pasteurella* and *Actinobacillus*; (iii) *Arcanobacterium* and *Corynebacterium*.

More specifically, the most common causes of the disease are *Brucella* spp. (mainly *B. ovis*, less commonly *B. melitensis* and *B. abortus*), *Actinobacillus seminis* and *Histophilus ovis*. Less common causal agents are *Acinetobacter* spp., *Arcanobacterium pyogenes*, *Bacteroides* spp., *Corynebacterium ovis*, *Corynebacterium pseudotuberculosis*, *Erysipelothrix rhusiopathiae*, *Escherichia coli*, *Flavobacterium* spp., *Haemophilus* spp., *Micrococcus* spp., *Moraxella* spp.,

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* Corresponding author. Tel.: +30 4410 66071; fax: +30 4410 66077.
E-mail address: ngoule@vet.uth.gr (P.G. Gouletsou).

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Pasteurella multocida, *Pseudomonas* spp., *Staphylococcus* spp., *Streptococcus* spp. and the Sheep-pox virus. The causal agents enter the testis by several routes, including penetrating wounds, blood or lymphatic vessels or by means of exudate reflux through the vas deferens from an infection elsewhere in the genito-urinary tract.

The disease occurs usually in association with epididymitis; however, it may also appear as a single entity, although this is sporadic (Greig, 1991, 2000). The incidence of the disorder in Australia has been found to vary from 0.5 to 1.5% (Watt, 1972); in a similar study in Greece (Fthenakis et al., 2001), the incidence was found to be 1.0%.

The incidence of the disease appears to increase with age of the animals (Walker et al., 1986). Furthermore, increased exposure of the genital organs of rams to bacterial agents during the mating period, appears to contribute to development of the disease (Bulgin and Anderson, 1983).

During the acute phase, the affected testis shows signs of acute inflammation. The scrotum contents become grossly enlarged and are very painful. Pyrexia may also occur. In the chronic phase, the testis becomes shrunken, fibroid and adherent to the tunic and scrotum. Abscesses may break through the scrotal skin.

The earliest changes in the affected testis consist of haemorrhages, oedema and varying amounts of degeneration of seminiferous epithelium, coupled with an influx of inflammatory cells. The distribution and nature of the inflammatory cells vary according to the virulence of the causative agent. Neutrophils are usually the first inflammatory cells to appear in the infected organ. These are generally scattered diffusely throughout the oedematous interstitium, but accumulate in great numbers in the lumina of affected seminiferous tubules. Cellular debris from necrotic spermatogenic and Sertoli cells also desquamate into the tubular lamina. If spermatozoa were released into adjacent stroma, intense granulomatous inflammatory reaction would ensue with formation of a spermatic granuloma. Occasionally, the causative agent may penetrate the tunica albuginea of the testis, extending into the scrotal sac. In such cases, the vaginal cavity becomes distended with fibrinopurulent exudates (Acland, 1995; Jansen, 1980; Ladds, 1985).

The healing phase of the inflammatory process in the testis and epididymis is invariably accompanied by varying degree of fibrosis and mononuclear inflammatory cell infiltration. As a consequence, tubules frequently become obliterated or occluded by fibrous connective tissue. Varying degrees of testicular and/or epididymal atrophy result. Depending on the degree of tubular atrophy and occlusion, fertility maybe normal or severely impaired (Acland, 1995; Jansen, 1980; Ladds, 1985).

In this paper, we describe in detail our work on ovine orchitis associated with *A. pyogenes*. Field and experimental results are presented herebelow.

2. Materials and methods

2.1. The bacterial flora of the scrotum and the preputial cavity of rams

In a field study, samples were obtained from the scrotal skin (cranial and caudal side) and the preputial cavity of 48 clinically healthy rams and examined bacteriologically, by culturing them aerobically and anaerobically.

2.2. Clinical cases of orchitis associated with A. pyogenes

We investigated in detail three cases of ovine testicular abnormalities associated with *A. pyogenes*. Their clinical, ultrasonographic and pathological features are presented.

2.3. Experimental findings

The objectives of this study were to describe the features of experimentally induced orchitis associated with *A. pyogenes* and confirm the pathogenicity of the organism for the ovine testis. One testis of each of nine rams was inoculated with 1.3×10^4 colony-forming units of an *A. pyogenes* isolate and regular clinical, ultrasonographic, bacteriological and seminological examinations were carried out up to 204 days after challenge. The rams were sequentially euthanatised 3, 6, 9, 18, 30, 50, 71, 113 and 204 days after challenge and a gross- and histopathological examination of their testes was performed.