

## High Prevalence of Ulcerative Posthitis in Rasa Aragonesa Rams Associated with a Legume-rich Diet

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### Summary

This study describes an outbreak of ulcerative posthitis that eventually affected 76 of 80 of rams in a flock of Rasa Aragonesa sheep on a legume-rich diet. Lesions were confined to the prepuce and varied from mild hyperaemia to ulcerations. *Corynebacterium renale* was isolated from the lesions. Treatment of an initial group of 17 was based on a change of diet and topical treatment with Veterin Banedif<sup>®</sup> with prednisolone once a day for 15 days and was successful. Lesions in this group were completely resolved after 15 days. The relationship between a legume-rich diet, ruminal alkalosis, elevated urine pH and posthitis is discussed.

### Introduction

Ulceration of the prepuce is also known as posthitis or pizzle rot (Radostitis et al., 2002). The aetiology of the disease is multifactorial and involves the bacteria, *Corynebacterium renale*, *C. pilosum* or *C. cystitidis*, that usually inhabit the prepuce of rams, as well as diets high in protein that favour the production of abnormally high levels of urea in the urine (alkaline urine) (Smith, 1990; Jubb et al., 1993). Once the protein in the diet rises above 16%, urine can contain more than 4% urea. *Corynebacterium renale* has the ability to break down urea using an enzyme (urease) to form ammonia. Ammonia accumulates in the hair or wool causing a severe irritation and that may lead to ulceration of the skin of the prepuce. The debris from the ulcer forms a crust that may block the opening to the prepuce. The infected ulcers can spread through the opening to the mucosa of the preputial cavity (Blood et al., 1983; Radostitis et al., 2002).

Infectious posthitis is widely recognized among wethers and rams in Australia (Southcott, 1965) and the UK (Doherty, 1985). *Corynebacterium renale* is the most prevalent organism implicated in the disease in Australia (Southcott, 1965; Barajas Rojas and Biberstein, 1974). Other causes of vulvitis and posthitis include *Mycoplasma mycoides mycoides* LC in sheep (Trichard et al., 1993), *Halicephalobus* sp. in horses (Dunn et al., 1993) and *Ureaplasma* sp. in bulls (Gummow et al., 1992).

Rasa Aragonesa is the second most numerous sheep breed in Spain. The sheep are characterized by white medium–short wool, have a body weight of 40–50 kg and are adapted to the continental semi-arid Mediterranean climate (Sierra, 1987). Infectious posthitis has not previously been diagnosed in Rasa Aragonesa rams.

### Materials and Methods

An outbreak of posthitis in a flock of Rasa Aragonesa sheep was seen in the winter of 2003 in Zaragoza in Spain. The flock comprised of 2200 ewes and 80 rams. As is the management practice, rams were housed before breeding. Then, rams were allowed to run for 2 months with the ewes (grazing stubble fields together), after which they were housed for a further 2 months. Mating was controlled in order to regulate the date of lambing. In contrast to previous years where housed rams were fed barley, straw and granulated alfalfa and mineral blocks *ad libitum*, last year's rams were fed alfalfa hay and ryegrass and mineral blocks *ad libitum*.

Ulcerative posthitis developed in 17 rams aged between 1 and 4 years. Animals were subjected to a thorough clinical examination. Each of the rams was in good body condition (score 2.5; range 1–5). The body temperature of the rams was not elevated and rumen contractions were normal.

The lesions were confined to the prepuce and varied from mild hyperaemia to ulcerations. The primary lesion started as a pustule which ruptured to form a soft scab on the skin dorsal to the preputial orifice and around the external orifice on the non-haired part of the prepuce (Figs 1 and 2). In some animals, these lesions persisted for some time without the presence of any clinical signs. However, in others, if untreated, the ulcers at the preputial orifice tended to spread into the preputial mucosa with subsequent crusting, swelling and pain. There was a clear oedema of the prepuce. All affected animals were very sensitive to palpation of the prepuce. Thorough examination of the penis showed no evidence of any balanitis. In general, lesions were less severe in younger than in older animals. No lesions were noted in the ewes.

Samples of rumen liquor, jugular blood and urine from 10 rams (with the most severe lesions) were collected and analysed immediately. Rumen liquor was collected by percutaneous paracentesis. A 16-gauge, 7.5 stainless steel needle, positioned 10–12 cm caudal to the costochondral junction of the last ribs on the left side, was pushed through the abdominal wall into the lumen of the rumenoreticulum (Navarre et al., 1999). Fluid was aspirated with a 20-ml syringe and immediately analysed under field conditions.

The haematological analysis was performed using a Counter Sysmex F-800 (Roche, Barcelona, Spain). Serum biochemical parameters, including total protein, albumin, calcium, phosphorus, blood urea nitrogen (BUN), creatinine and aspartate aminotransferase (AST), alanine aminotransferase (ALT),

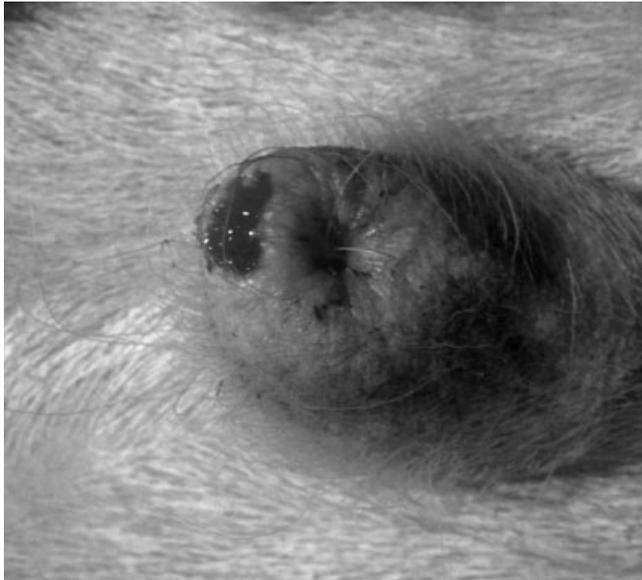


Fig. 1. Small ulcer dorsal to the preputial orifice.

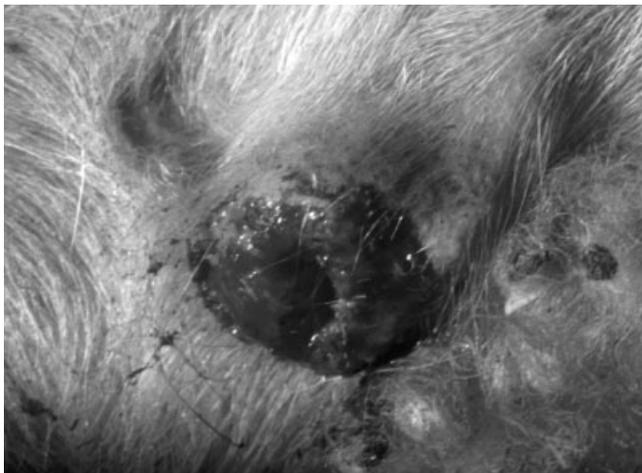


Fig. 2. Extensive ulceration surrounding the preputial orifice.

alkaline phosphatase (AP) and  $\gamma$ -glutamyl transferase (GGT) activities, were measured using a multianalyser Technicom RA-500 (Bayer, Barcelona, Spain). Blood ammonia concentrations were analysed in a VetTest 8008. Blood pH was measured using an ABL<sup>TM</sup> 5 Blood Gas (Radiometer, Copenhagen) and the pH of ruminal liquor was measured using pH indicator strips (EM-Reagents). Immediately after collection, the urine was analysed for proteins, blood, leucocytes, nitrites, glucose, ketones, pH, density, bilirubin, urobilinogen using strips (ComburTest).

Sterile cotton-wool-tipped swabs were taken from the prepuce of six animals and sent to the laboratory for bacterial isolation. The swabs were plated on Columbia ANC (Bio-Merieux) agar and representative colonies taken after 24–48 h of growth. Biopsies from skin of the prepuce were taken for the histopathological study.

## Results

Rumen fluid was brownish-green, slightly viscous with a sedimentation/flotation rate of more than 10 min, and a mean pH of 7.7 (rumen alkalosis). Haematological and serum biochemical parameters apart from BUN, were within normal reference intervals for this breed (Kaneko, 1989; Ramos et al., 1992, 1994). Blood ammonia concentrations ( $215.7 \pm 84.62 \mu\text{mol/l}$ ) (normal range in our laboratory  $54\text{--}110 \mu\text{mol/l}$ ) were elevated. The BUN concentration was  $21.8 \pm 2.39 \text{ mg/dl}$  (normal range  $8\text{--}20 \text{ mg/dl}$ ) was slightly elevated.

In these rams, values of blood pH, 7.39–7.45 were within the normal reference range (7.32–7.54 in venous blood; Radostitis et al., 2002). The mean urine pH of 8.6 was alkaline (range 8.0–9.0). *Corynebacterium renale* was isolated from the preputial swabs of all six animals. The histopathological study of three biopsies from the preputial skin showed epithelial necrosis with neutrophil accumulation and lymphocyte and plasma cell infiltration of the surrounding stroma.

The 17 animals with preputial ulcers were treated topically with Veterin Bandedif<sup>®</sup> with prednisolone (composition per gram: bacitracin 600 IU, neomicin sulphate 5 mg, prednisolone 6 mg; Laboratorios Intervet) once a day for 15 days. Lesions were completely resolved after 9 days of treatment in eight of the affected animals and after 15 days in the remaining nine sheep.

Analysis of a sample of the ration (alfalfa hay and ryegrass) showed the following: moisture 7.60%, gross fibre 19.80%, total protein 16.80%, calcium 2.15%, phosphorus 0.26%, ash 11.60%. Once the disease was diagnosed and the micro-organism identified, the diet was changed. Rams were fed maize grain and alfalfa green hay *ad libitum* (moisture 8.70%, gross fibre 16.58%, total protein 15.21%, calcium 1.83%, phosphorus 0.69%).

During the diagnosis and treatment of the affected rams, new cases of posthitis appeared in the same flock. Eventually, posthitis affected a total of 76 of the 80 rams (95%). Myiasis with maggots of *Wohlfahrtia magnifica*, was a complication in 20, mainly older rams (Fig. 3). At the time, rams were in full fleece, but this breed has no wool around the prepuce or on the belly.

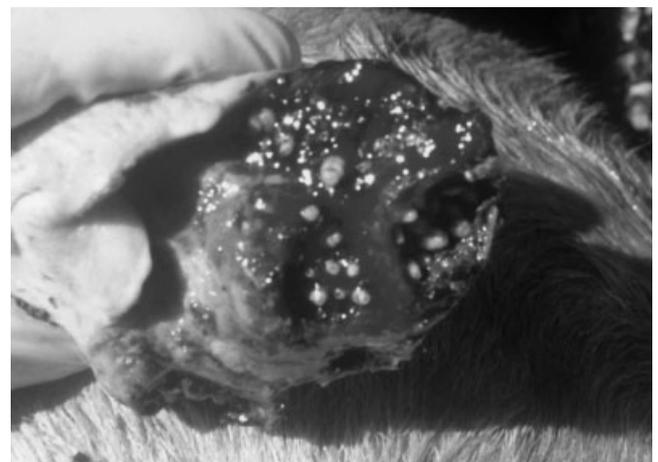


Fig. 3. Numerous maggots (larve of *Wohlfahrtia magnifica*) in preputial ulcers.

In spite of the successful treatment of the initial group, the high number of rams affected by ulcerative posthitis and the management of the animals (rams grazing in stubble fields with ewes) made it impractical to treat all of them. For this reason, animals selected for breeding were put onto natural pasture that comprised thyme (*Thymus vulgaris*) and rosemary (*Rosmarinus officinalis*).

Three months after posthitis first appeared, rams were examined again. Posthitis, although less severe, was still present in 33% of animals. Mild lesions tended to recover spontaneously within a few weeks. In some cases, after the posthitis was resolved, scars developed.

## Discussion

The aim of this study was to describe an outbreak of posthitis affecting about 95% of rams of the flock and to demonstrate the relationship between diet (high level of protein), ruminal alkalosis, elevated urine pH and posthitis. In the normal management of Rasa Aragonesa rams in Zaragoza, it is quite common to increase the protein level of the diet during the months before breeding, to improve their condition. High-protein diets favour a proliferation of proteolytic organisms and the generation of increased amounts of ammonia resulting in an alkaline rumen fluid (Garry, 1999). The rams' diet in our study consisted of alfalfa and ryegrass, a diet rich in protein (16.8%) and poor in energy. A big proportion of the ammonia generated in the rumen cannot be utilized by ruminal flora and as a consequence alkalosis becomes more pronounced. Conceivably, lesions were less severe in young rams because of the need for protein for growth. Moreover, the adult rams have a larger prepuce than young animals possibly making them more prone to the disease.

In normal conditions, ammonia is absorbed from the ruminoreticulum and detoxified by conversion to urea in the liver. However, large amounts of ammonia exceed the detoxifying mechanism of the liver resulting in hyperammonaemia.

Urine is the main route for the excretion of degradation products of dietary protein. The amount of urea in the rams' urine is related to protein level in the diet (Kaneko, 1989). An increase in the protein level in the diet from 4 to 10% causes an increase in the urea concentration in urine from 27 to 68% of the total urine nitrogen (Church, 1993). Excessive urea in the presence of urease from *C. renale*, results in the production of ammonia and therefore, an alkaline urine. The prepuce becomes swollen, ulcerated and very painful.

The pH of ruminant urine varies widely with the type and frequency of feeding. Animals on *ad libitum* roughage diets frequently produce alkaline urine (pH 7.8–8.5) while cereal-based diets produce more acidic urine (pH 5.2–7.0) (Hay, 1990).

The histopathological study of the biopsies from the skin of the prepuce showed congested superficial capillaries. Lymphoplasmacytic infiltration of the preputial mucosa probably is a consequence of the presence of *C. renale*, but this histologic lesion is sufficiently frequent to be considered normal. These microscopic lesions were not specific and thus the diagnosis of posthitis was made on the macroscopic appearance of the lesions (Jubb et al., 1993).

To our knowledge, large outbreaks of posthitis in rams affecting up to 95% of the animals have not been previously reported. A prevalence of posthitis of 40% was described in

Australian wethers (Dent, 1971). However, in most cases, the morbidity rate is seldom >20% and the disease is often sporadic (Songer, 1999). It is important to emphasize the rapid and successful response to treatment based on a reduction of total protein in the ration and the topical application of Veterin Bandedif with prednisolone to the prepuce.

The overall health of rams is a very important for sheep production and special attention has to be given to this in the breeding season and when they are housed. If rams have posthitis, tupping will be uncomfortable or painful and the predisposition to myiasis is greater. Routine clinical examination and a well-formulated ration (avoiding long-term high-protein diets) should be part of flock management.

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