

## PARATUBERCULOSIS OF GOATS AT QASSIM REGION OF CENTRAL SAUDI ARABIA

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### Summary

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A survey was conducted to determine the incidence of Johne's disease (JD) in goat flocks at Qassim region, central Saudi Arabia. Cases of JD were recorded in eighteen out of 90 goat herds (20%) (n = 2610). All infected goats were adult of more than 3 years of age. Twelve herds had single cases, while the other 6 herds presented more than one affected animal (range 2–5). The total number of confirmed JD cases was 29 which amounted to 1.11% of the total number of goats in the original 90 herds. Nine goats at extremis were humanely killed and autopsied. The lesions of the disease were confined to the intestine and the liver, with one animal showing remote pancreatic involvement. Gross lesions were enlarged mesenteric lymph nodes and thickened corrugated intestinal mucosa. The pancreas was fluffy white. Histopathological examination showed infiltration of the intestinal mucosa and mesenteric lymph nodes with epithelioid cells. The liver had two types of granulomas: a lepromatous type (which was more dominant), and a tuberculoid type that was characterized by presence of Langhans giant cells. There was a massive destruction of the exocrine pancreas in one goat. Clumps of short slender acid-fast bacilli were isolated in pure culture on Herrold's egg yolk agar medium from faeces and various lesions including the liver granuloma. The organism was identified as *Mycobacterium avium* subsp. *paratuberculosis* on the basis of its slow growth and strict mycobactin dependence.

**Key words:** goats, Johne's disease, remote lesion, Saudi Arabia

### INTRODUCTION

Paratuberculosis (Johne's disease, JD), is a slow-developing infectious disease characterized by chronic granulomatous enterocolitis and hepatitis, regional lymphadenitis and possibly other lesions that might lead to a chronic wasting diarrhoea (Clarke, 1997; Jones *et al.*, 1997). The disease is of world-wide distribution, mainly affecting ruminants and there are many reports linking it to human Crohn's disease (Uzoigwe *et al.*, 2007).

The pathology and epidemiology of JD in goats are not very well documented

in the literature, but the disease is known to cause intestinal and hepatic lesions in sheep and cattle (Jones *et al.*, 1997). The macroscopic lesions of the disease in sheep are thickening and corrugation of the intestinal mucosa, enlargement of mesenteric lymph nodes and hepatic granuloma (Mahmoud *et al.*, 2002). Diffuse epithelioid cell infiltration in the intestinal mucosa, mesenteric lymph nodes and liver are the main microscopic lesions of the disease (Clarke, 1997; Mahmoud *et al.*, 2002).

Remote lesions of paratuberculosis were described in cattle and include lymphocyte depletion in the thymus and arteriosclerotic lesions in the heart and aorta (Clarke, 1997). Rarely, widespread granulomatous lesions affecting the kidneys, lungs and systemic lymph nodes were described in advanced clinical cases (Clarke, 1997).

In this paper we report the incidence of JD in goat farms at central Saudi Arabia and the common macroscopic and microscopic lesions caused by the disease in this species. We also describe the pathology of a remote lesion involving the pancreas in one animal.

## MATERIALS AND METHODS

### *Johne's disease register*

A survey was conducted to investigate the incidence of JD in goat farms at Qassim region of central Saudi Arabia. The climate of the area was that of a dry hot desert type. The goats were kept in private farms and were fed on alfalfa and locally made concentrate diet. The animals were allowed to mate freely with the males all the year round.

In order to conduct a basic investigation on the spread of JD diseases in goat herds in the Qassim region, a Johne's disease register was established within the Veterinary Teaching Hospital at the Qassim University. This record identified each herd from which one or more cases of Johne's disease were presented.

Disease cases were confirmed by one or more of the following procedures: faecal culture following positive rectal scrapings, agar gel diffusion test, postmortem examination and identification of pathogenic lesions. All confirmed cases were formulated for postmortem examination immediately or after 15–20 days of hospi-

talization. Owners were counseled about the contagious nature of the disease and the risk it poses for the rest of the herd.

### *Culture*

Samples for bacteriological culture were obtained from rectal scrapings, mesenteric lymph nodes and liver granulomas. Prior to culture, smears were made from the obtained samples and stained with the Ziehl-Neelsen (ZN) procedure to presumptively identify candidate specimens. The protocol described by Anon (1974) was followed for isolation of *Mycobacterium avium* subsp. *paratuberculosis*. Briefly, scrapings and tissue specimens were initially decontaminated by addition of 0.1% benzalkonium chloride (Zephiran), homogenized in a blender jar in presence of Zephiran, and filtered through gauze. The filtrate was centrifuged at 9×g for 10 min and 0.1 mL aliquots of sediment were used to inoculate five slants of Herrold's egg-yolk agar (HEYA) medium. Three slants were supplemented with mycobactin and two were without mycobactin. The slants were incubated at 37 °C and examined weekly for 16 weeks. Positive growth was verified by ZN staining.

### *Pathology*

Nine adult goats severely affected with JD were humanely killed with intravenous barbiturate and autopsied. Organs showing lesions were fixed in 10% formol saline. Fixed tissues were processed in wax, sectioned and stained with haematoxylin/eosin (H&E) for studying morphological changes and with ZN stains for demonstration of acid-fast organisms.

## RESULTS

Cases of JD were recorded in eighteen out of 90 goat herds (20%) (n = 2610) whose

owners brought cases to the University Teaching Hospital for consultation over a 2-year period. All infected goats were adult (more than 3 years of age) of the Najdi breed, indigenous to Saudi Arabia. Twelve herds presented single cases, while the other 6 herds presented more than one affected animals (range 2–5) over the study period. The total number of confirmed JD cases was 29 which amounted to 1.11% of the total number of goats in the original 90 herds (2610).

The results of culture characteristics and ZN staining confirmed the presence of *Mycobacterium avium* subspecies *paratuberculosis* in all infected goats. The bacterium was also confirmed in histopathological sections of the intestine, mesenteric lymph nodes and liver by ZN stain. However, the ZN-stained pancreatic sections showed no acid-fast organisms.

The lesions of the disease were confined to the intestine and the liver of autopsied animals with one animal showing a remote pancreatic lesion. Gross lesions were enlarged mesenteric lymph nodes and thickened corrugated intestinal mu-

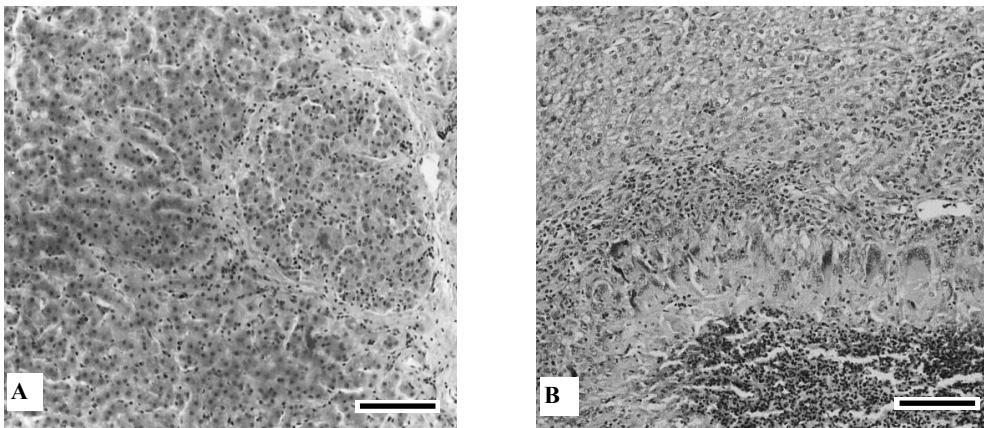
cosa. The microscopic lesions were epithelioid cell infiltration of the intestinal epithelium and the mesenteric lymph nodes. The liver showed two types of granuloma: lepromatous type, characterized by aggregates of epithelioid surrounded by a fibrous capsule and tuberculoid type, characterized by giant cell formation (Fig. 1A, B).

The pancreas was fluffy white in one animal and had selective destruction to the exocrine part with no changes in the endocrine tissue (Fig. 2A, B).

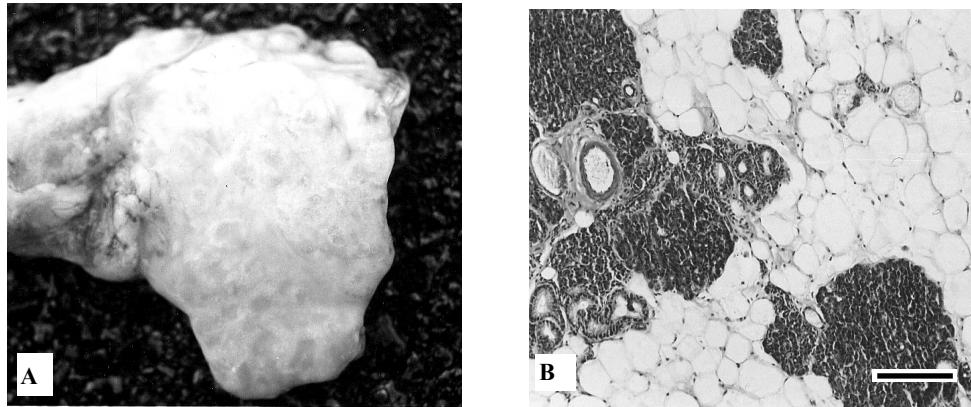
## DISCUSSION

The interest towards JD infection in farm animals is augmenting worldwide as there is increasing evidence that links it to Crohn's disease of humans, both being chronic bowel infections (Uzoigwe *et al.*, 2007).

The authors are not aware of previous cases of Johne's disease among animals in Saudi Arabia. The figures obtained for the incidence of JD in goat farms of Qassim region should be considered as the least



**Fig. 1.** Liver of goat affected by Johne's disease showing: A. lepromatous granuloma; B. tuberculoid granuloma (H & E, bar = 100  $\mu$ m).



**Fig. 2.** A. fluffy white pancreas; B: histopathology of (A) showing destruction of exocrine pancreas; H & E; bar = 100  $\mu$ m.

estimate of the disease since a wide survey was not conducted. The proportion of involved herds was large (20%) and appeared to be increasing. The records of the Veterinary Teaching Hospital showed that the number of JD cases brought for treatment of the disease in goats was increasing annually over the last five years. This prompts action to be taken for the efficient control of JD which might reach an epidemic state in the area if not given the proper attention.

The results for JD pathology in goats reported in this study are similar to those recorded for other animal species (Clarke, 1997; Mahmoud *et al.*, 2002). The authors are not aware of a previous report on the effect of JD on the pancreas in goats or any other animal. The damage seen in the exocrine pancreas of one goat could be attributed to the immunological reaction to infection as longstanding cases might depress immunity and result in a wide range of lesions (Clarke, 1997; Perez *et al.*, 1999; Tanaka *et al.*, 2000). Paratuberculosis has been known to cause remote lesions in many organs such as retropharyngeal lymph nodes (Sigurdardottir *et*

*al.*, 1999), kidneys and lungs (Hines *et al.*, 1987; Clarke, 1997). Severe depletion of lymphocytes was reported in the thymus of infected cattle (Clarke, 1997). Involvement of remote organs is probably due to spread of infection by infected macrophages from the intestine via the blood. The bacterium is known to resist destruction by macrophages (Bendixen *et al.*, 1981).

In conclusion, the prevalence of *Mycobacterium avium* subsp. *paratuberculosis* infection in goats at Qassim region of central Saudi Arabia was found to be 1.11%. Infection produced lesions in the intestine, mesenteric lymph nodes, liver and pancreas. Both tuberculoid and lepromatous granulomas were seen in histopathological sections of infected liver. The exocrine pancreas in one goat was massively destroyed.

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