Pituitary abscess occurs sporadically in ruminants [3, 4, 7, 9, 10, 13]. It occurs as a single entity or in combination with other lesions [13]. *Arcanobacterium pyogenes* has been reported to be the bacterium most commonly isolated from brain abscesses in cattle [4, 7, 9, 13].

It is postulated that pituitary abscess usually arises from embolic spread of bacteria from a primary process of infection or during septicaemic episodes, which gain entry to sella turcica hematogenously or lymphatically. The abscess is usually terminated with an acute and fatal course of the disease [4, 9].

**Case report**

A 5-year-old Holstein-Israeli cow, 3 months pregnant and with no history of previous illness exhibited signs of dullness, weakness, and reduced milk production. Ataxia and circling movement, and unilateral exophthalmos were also observed. Pupillary light reflexes were absent and at an advanced stage blindness occurred.

The pulse rate was 76 beats/min and the rectal temperature was in the normal range. On the sixth day she was found lying in a state of right lateral recumbency and comatose. All four legs were held in rigid extension while continuous paddling movements were made with the left hind leg.

Blood samples were collected by jugular vein puncture in plain evacuated tubes for recovery of serum and into EDTA-containing tubes for CBC. Following blood clot formation, the serum was separated and analysed biochemically within 24 h of bleeding.

Enzymes, metabolites and minerals were analysed spectrophotometrically in a selective chemistry analyser (Kone: Kone Corporation, Finland) at 30°C, according to standard methods. The activities of the following enzymes were determined: alkaline phosphatase (ALP), amylase, GGT, creatine kinase (CK), L-aspartate aminotransferase (AST). Concentrations are expressed in international units per liter (IU/L).
trations of the following metabolites and minerals were measured: urea, creatinine, total bilirubin, protein, albumin, cholesterol, calcium (Ca) and inorganic phosphorus (Pi). The levels of the electrolytes, sodium, chloride and potassium, were determined with specific electrodes (Kone, Microlyte Ion Selective Analyzer, Kone Corporation). CBC and differential counts were performed by standard procedures with the Technicon H1 System (Miles Inc., Diagnostic Division, Tarrytown, NY).

A haemogram showed a total white cell count of 9.08 x 10^3 µl and neutrophilia - 5.75 x 10^3 µl; other parameters were in the normal range. The following abnormal biochemical findings were found: ALP 175 U/l; AST 364 U/l; CPK 2997 U/l; GGT 29.5 U/l; Total protein 9.5 g/dl; cholesterol 245 mg/dl; creatinine 3.58 mg/dl; urea 136.8 mg/dl; Potassium 8.5 mmol/l; phosphorus 22.15 mg/dl. Other examined parameters, found to be in the normal range, were: albumin, chloride, calcium, sodium and total bilirubin.

A tentative diagnosis of bacterial encephalitis was made. There was no response to parenteral treatment with antibiotics - Oxytetracycline (Vetinex, Bladel, Holland) 10 mg/kg body weight daily, and anti-inflammatory - flunixine (Schering-Plough, France) and, as the animal was rapidly becoming moribund, euthanasia was carried out.

At necropsy (only the skull was examined), as the brain was removed from the skull, the pituitary appeared as a necrotic mass embedded in a thick yellow-grey fluid. The brain did not seem to be involved in that process. Specimens of the pituitary were collected in 10 % neutral buffered formalin. After dehydration and embedding of the tissue in paraffin wax, histological sections were cut at 4 µm, and stained with haematoxylin and eosin (H&E). Histopathological evaluation of the material extracted from the sella turcica revealed a necrotic tissue which did not contain any recognizable normal pituitary elements. This tissue contained very numerous neutrophils and cocciode bacterial colonies.

Swabs were taken from the abscessed pituitary area and dipped in a nutrient broth. They were also applied directly onto 5 % washed sheep red blood cells agar plates (Bacto-Agar, Difco laboratory) and onto MacConkey agar (Difco Laboratories, Detroit, MI 48232, USA). The plates were incubated aerobically at 37°C for 3 days. Bacterial isolates were Gram stained and identified with the API staph (bioMerieux, France). Coagulate activity and presence of a clumping factor were assessed in rabbit plasma (Anilab, Israel). The organism was identified by using the standard laboratory methods, as described by COWAN [1] and a bacteriological examination yielded A. pyogenes in pure culture. Primary identification of the isolates was made by standard laboratory methods [1]. Final identification of Arcanobacterium pyogenes was made with the API Coryne system (bioMerieux, France).

Discussion

Arcanobacterium pyogenes is a commensal on mucosal surfaces of cattle, sheep, swine and, occasionally, other domestic animals. It can disseminate from its normal habitat to cause a wide variety of nonspecific purulent infections [11]. This further supports the concept of circulatory spread of a pyogenic organism [9].

The pituitary gland in ruminants is surrounded by a complex mesh of intertwined arteries and capillary beds known as the rete mirabile [2]. The extensive capillary network and the close association of the rete with the pituitary gland makes the latter susceptible to localization of bacteria that originate from other sources of infection [7].

Arcanobacterium pyogenes was isolated in pure culture from the pituitary abscess as has been reported by others [7, 9, 13]. It is also one of the most common isolates from chronic infections in ruminants. The abnormal neurological findings have been associated with either visual disturbances or pituitary abscesses, and it appears that the high blood urea level could also account for it. It is believed that the pressure caused by the enlarging abscess and its lateral or dorsal extension results in damage to adjacent cranial nerves and their nuclei [9].

Unilateral or bilateral exophthalmos has been reported in the pituitary abscess syndrome in bovines [3, 7]. This important clinical sign seems to be caused by an extension of the inflammatory process through the foramen orbito-rotundum into the retrobulbar area [9]. MORIWAKI et al. [7], postulated that this condition is caused by an increase in the volume of the eyeball caused, in turn, by inflammation and circulatory disturbance of the orbital tissue. Unilateral exophthalmos was observed in the reported case.

In the present study, evidence of apparently chronic infection of the kidney was revealed by clinical-pathological examination. It has been stated that serum urea and creatinine concentrations will increase only after extensive loss of 50-60 % of glomerular function [12]. Serum creatinine levels are usually considered a more accurate indicator of renal function in ruminants than is serum urea, because the normal rumen recycles urea as a nitrogen source for bacterial protein synthesis [8]. This microbial activity decreases or disappears during renal disease and prolonged anorexia [8]. The marked increase in urea concentration in the present case is an important finding, implying decreased urea clearance by the rumen and kidney, and it obviously contributed to the severe neurological signs exhibited by the cow.

Hyperkalaemia and hyperphosphataemia are also the results of kidney failure, especially in the advanced stage of the disease [5]. The increase in GGT activity was also caused by renal failure; the bovine kidney contains the highest GGT concentration (Laboratory Testing in Veterinary Medicine, Boehringer Mannheim, 1985). In field investigations in cattle with pyelonephritis we also found high serum levels of GGT. The increases in urea, creatinine, phosphorus and potassium concentrations reflected the degree and severity of renal failure that occurred in this cow.

Increased AST and CK activities were apparently due to muscle dystrophy and recumbency of the affected cow [5]. The clinico-pathological tests also had a prognostic value.

The short course of the disease was consistent with a previous report [9]. Although all ages can be affected, two to
five years seems to be the most common age range [9], and the age of the present cow was this range.

Except for the neutrophilic leucocytosis the haemogram was normal and was of no diagnostic value. Elevated total protein, caused by high globulin concentration, was evident; this indicates an active inflammatory condition, but it was not useful in differentiating pituitary abscess from other bacterial diseases of the central nervous system.

It would appear to be nearly impossible to confirm a diagnosis of pituitary abscession clinically, because of the variety of clinical signs, and this condition could only be ascertained on necropsy by a careful examination of the skull.

Pituitary abscess in bovine should be included in the differential diagnosis for other nervous system diseases: neoplastic, degenerative (polioencephalomalacia), infectious (rabies, malignant catarrhal fever, listeriosis and other brain abscesses), poisonous (lead poisoning) and trauma. Further differentiation of these diseases can be made by cerebrospinal fluid evaluation.

References