

## CLINICO-PATHOLOGICAL OBSERVATIONS ON BOVINE RENAL AMYLOIDOSIS

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### SUMMARY

Observations made on clinical and pathological features of nine cases of bovine renal amyloidosis have been presented. The cases presented with a nephrotic syndrome characterised by severe proteinuria, hypoalbuminaemia, subcutaneous oedema and diarrhoea. There was a renal enlargement detectable per rectum in all cases. All animals were mature, 89% were six years and above. At necropsy, the kidneys were found to be enlarged and had a pale waxy appearance. There was massive amyloid deposits within the glomeruli, interstitium and medullary region. Amyloid was also deposited in the liver and spleen. Six of the animals were also found to be suffering from other conditions.

### INTRODUCTION

Renal amyloidosis produces a distinctive clinical syndrome in a variety of domestic animals (Jubb *et al.*, 1985). Reports of the condition in cattle have been sporadic and based mainly on single case reports (Rooney, 1956; Radostitis and Palmer, 1965; Gruys, 1974; Taylor *et al.*, 1975). It was only in the study by Murray *et al.* (1972) eight cases were involved that permitted the interpretation of various observations be made with relatively high degree of certainty.

The objective of the present study was to present clinico-pathological observations made on many cases of bovine renal amyloidosis.

### MATERIALS AND METHODS

#### Animals

Nine cases of bovine renal amyloidosis are reported. These animals were among 304 adult cattle presenting clinically with diarrhoea and which were used in another special study (Shoo, 1984).

#### Clinical and pathological examinations

In addition to thorough clinical examinations,

collection of blood and urine samples for laboratory investigations, post-mortem examinations and other procedures used in the different tests as described by Shoo, (1984) were carried out

Blood samples were examined for packed cell volume (PCV), haemoglobin concentration, total numbers of red and white cells and differential white cell counts. Concentrations of blood urea, bilirubin, inorganic phosphate, alkaline phosphatase, aspartate transaminase (AST) alanine transaminase (ALT), total protein, albumin, globulin, potassium, sodium, chloride, calcium and magnesium were also examined. Urine samples were examined for protein concentrations.

### RESULTS

#### Clinical observations

Every case was admitted with a history of profuse diarrhoea and usually with subcutaneous oedema. These cases invariably presented as single animal incidences. Their mean age was  $7.3 \pm 2.4$  years (range 4 - 12 years). All but one case were in the age range of 6 - 12 years. Eight of the nine cases were dairy cows.

Every animal had profuse homogenous diarrhoea with a normal temperature and emaciated. Six cases (67%) had severe subcutaneous oedema, two were dull with a reduced appetite and two had pale mucous membranes. On rectal examination, an

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enlarged left kidney was detected in every animal.

Of the many routine ante-mortem laboratory tests carried out, only a few were found to be meaningful. Blood biochemistry was carried out in eight cases and the most prominent feature was a marked lowering of blood albumin in all the eight cases, with a mean value of 11.3 g/l (range 4-22 g/l). Haemoglobin was lowered in five of the six cases in which it had been determined. There was a negative correlation between total protein and urine protein concentrations ( $r = -0.77$ ) and between globulin and urine protein ( $r = -0.76$ ). There was however, a negligible correlation between blood albumin and urine protein ( $r = 0.19$ ). There was also elevation of blood urea and AST in each six cases (75%) and hyponatraemia and hypochlorinaemia in four (50%) and five (63%) cases, respectively.

### Pathology

At necropsy, oedema was observed in the subcutaneous tissues and gastrointestinal tract to varying degrees of severity. The kidneys were found to be much bigger with a pale waxy appearance. On microscopic examination, massive amyloid deposits were found in the kidneys within the glomeruli interstitium and the medullary region whilst in the liver, amyloid was deposited in the hepatic sinusoids and around the endothelium of the blood vessels as well as in the red pulp in the spleen.

In six animals, other conditions were found at necropsy. These were traumatic reticulitis (2 cases), suppurative pneumonia (1 case), pyelonephritis (1 case), pulmonary thrombosis (1 case), pulmonary thrombosis and metritis (1 case).

### DISCUSSION

The nine cases presented with a nephrotic syndrome were characterised by severe proteinuria, subcutaneous oedema and diarrhoea.

In the present study, the age of the affected cattle were of six years of age which agrees with other workers who have found that amyloidosis is a disease of mature cattle (Murray et

al., 1972; Murray, 1956). The same is also true in other species, e.g. in dogs, Sloman et al. (1970) found that 91 per cent of their 44 cases were more than four years old whilst Hallow and Jellison (1962) reported amyloidosis in three sheep which were four, five and 12 years of age, respectively.

Subcutaneous oedema was a constant clinical feature in the series reported by Murray et al. (1972), although in three of the nine cases in this study subcutaneous oedema was only detected at necropsy. Massive proteinuria and marked hypoalbuminaemia were consistent findings. Negative correlations were demonstrated between both total protein and globulin in the blood and urine protein. The obvious explanation for these correlations is that the greater the urine protein loss the lower must be the protein concentrations in the blood. The fact that there was a negligible correlation between blood albumin and urine protein was probably due to the low albumin concentrations by the time the patient was examined as a result of the gradual loss through the damaged glomeruli during the preceding weeks or months. Other biochemical changes noted are probably the result of the profuse diarrhoea with, terminally, an elevation in the blood urea as the animal went into renal failure.

Amyloid had been deposited in organs other than the kidney and the extent to which this had occurred was probably related to the severity of the condition. In three cases no other disease was found at necropsy and, therefore, they could be considered to be primary amyloid cases. On the other hand, the remaining six animals were all suffering from other diseases, e.g. suppurative pneumonia, and could be considered to be secondary cases of amyloidosis.

This condition predominantly affects dairy cattle with no apparent explanation. As pointed out by Murray et al. (1972), the increased use of corticosteroids in general practice might be involved in the apparent increased incidence of the disease, particularly those considered to be suffering from primary renal amyloidosis.

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