BIOCHEMICAL ANALYSIS ON CATTLE NATURALLY INFECTED WITH MYCOBACTERIUM AVIUM SUBSPECIES PARATUBERCULOSIS

Mohammed KB¹, Ibrahim IG², Mohamed ZA¹

¹Department of Pathology and Diagnosis; Central veterinary research laboratories centre, Khartoum, Sudan.
²Department of Biochemistry, Nutrition, Toxicology, Central veterinary research laboratories centre, Khartoum, Sudan.

Summary
The purpose of this study was to measure biochemical parameters (total protein, albumin, calcium, phosphorous, magnesium, total Bilirubin, creatinine) on clinical and subclinical paratuberculosis crossbred cows (Friesian x local Butana eco-type) confirmed by faecal culture. 21 sera were collected (7, 11, 3 from clinical, subclinical and non-infected animals respectively). Total protein, calcium and magnesium decreased significantly with the progress of the disease. Albumin decreased significantly in subclinical and clinical cases. Total Bilirubin increased significantly with progress of the disease. No significant difference was observed in Phosphorous and creatinine in both subclinical and clinical cases compared to control crossbred cows. All above differences were significant at (p≤0.05) as compared with control (non-infected) crossbred cows.

Introduction
Paratuberculosis (Johne’s disease) is a chronic granulomatous enteritis due to Mycobacterium avium subspecies paratuberculosis (MAP) (Motiwala et al., 2005). Cattle are most likely to be infected before 6 months of age, but clinical manifestation seldom occurs before the age of 2 years (Chiodini et al., 1984). Clinical signs of the disease in cattle include diarrhoea, emaciation, lethargy, decreased milk yield and Death. Paratuberculosis is now recognised to be of serious economic impact and animal health consequences in domesticated ruminant species (primarily dairy and beef cattle, sheep and goats) throughout the world. Paratuberculosis has the greatest economic impact in dairy cattle, where premature culling, reduced carcass value, decreased weight gain and milk production; estimated to exceed 1.5 billion dollars annually in USA (Stable, 1998; Motiwala et al., 2005). The aim of this study was to measure biochemical parameters (total protein, albumin, calcium (Ca), phosphorous (P), magnesium (Mg), total Bilirubin, creatinine) on clinical and subclinical paratuberculosis crossbred cows (Friesian x local Butana eco-type) confirmed by faecal culture.

Materials and Methods
This study was established in Khartoum State, Sudan. Twenty one blood samples were taken into plain vacutainer tubes from clinical, subclinical paratuberculosis (confirmed by faecal culture) and non-infected crossbred cows (Friesian x local Butana eco-type) and sera were separated and stored at -20 °C prior to examination. Sera were collected (7, 11, 3 from clinical, subclinical and non-infected animals respectively). Sera were analysed for the concentration of total protein and albumin according to the method of Friedman and Young (1997). Calcium was determined by Arsenazo III method described by Smith and Bauer (1979) and phosphorus was measured according to manufacturer's instructions (Randox laboratories, UK). Magnesium was determined according to tietz (1995) and total bilirubin was measured according to Friedman and Young (1997). Creatinine was conducted according to Bowers and Wong (1980).

Statistical analysis
Data were analysed for significance by ANOVA at P ≤0.05 using SPSS computer Software.
Results
Total protein, albumin, Ca, Mg significantly (P ≤0.05) decreased in clinical and subclinical paratuberculosis crossbred cows compared to control crossbred cows. In clinical and subclinical paratuberculosis crossbred cows total bilirubin increase significantly (P ≤0.05) as compared to control crossbred cows. No significant difference was observed in Phosphorous and creatinine in both subclinical and clinical cases compared to control crossbred cows. (Table 1).

Table 1: Parameters of biochemical changes (Mean±SD) in control, subclinical and clinical paratuberculosis Crossbred cows in Khartoum State, Sudan

<table>
<thead>
<tr>
<th>Group</th>
<th>Total protein</th>
<th>Albumin</th>
<th>Ca</th>
<th>P</th>
<th>Mg</th>
<th>Bilirubin</th>
<th>Creatinine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>6.88±0.24</td>
<td>5.03±0.1</td>
<td>8.26±0.46</td>
<td>3.20±0.1</td>
<td>1.30±0.1</td>
<td>0.133±0.05</td>
<td>1.16±0.05</td>
</tr>
<tr>
<td>Subclinical</td>
<td>5.74±0.8*</td>
<td>4.26±0.88*</td>
<td>5.40±1.90*</td>
<td>3.26±0.52</td>
<td>0.88±0.13*</td>
<td>0.41±0.13*</td>
<td>1.50±0.25</td>
</tr>
<tr>
<td>Clinical</td>
<td>4.49±0.47*</td>
<td>2.97±0.8*</td>
<td>4.14±2.01*</td>
<td>3.30±0.25</td>
<td>0.80±0.12*</td>
<td>0.66±0.15*</td>
<td>1.37±0.26</td>
</tr>
</tbody>
</table>

Values with asterisk in a row differ significantly (P≤0.05) from that on control (non-infected) cross-bred cows.

Discussion
A simple serum biochemistry profile of serum proteins and mineral status may provide a useful preliminary diagnosis of Johne’s disease in emaciated and unthrifty sheep. Sheep with clinical Johne’s disease have decreased serum concentrations of calcium, total serum proteins, and serum albumin compared with controls (Jones and Kay, 1996). In this study, total protein, albumin, Ca, Mg significantly decreased in clinical and subclinical crossbred cows compared to control crossbred cows. This is similar to those described by other investigators (Jones and Kay, 1996; Kopecky, 1972; Patterson et al., 1968; Stewart et al., 1945) but in study of Jones and Kay, 1996 there is no significant change in Mg. The low blood calcium and magnesium concentrations may be due to interference with absorption from the intestine, the loss of cations bound to albumin through a damaged gut or possibly through changes to calcium homeostatic mechanisms induced by the disease. Given that healthy control animals in the same environment possessed normal blood concentrations of calcium, magnesium and phosphorous, and because the severity of disease was positively correlated with the degree of hypocalcaemia, these observations provide no support for the idea that pre-existing nutritional deficiencies of calcium, magnesium or phosphorous could induce disease progression (Lugton, 2004). In the present study total protein and albumin significantly decreased in clinical and subclinical crossbred cows compared to control crossbred cows and this is due to a destructive granulomatous inflammatory response develops that eventually leads to intestinal malabsorption and protein losing enteropathy (Sweeney, 211). Although, the previous studies did not determine significant increase in total bilirubin, in our study total Bilirubin increased significantly with progress of the disease and this may attributed to hepatic dysfunction.

References