Short Communication:
Some biochemical aspects of Ivermectin (Ivomec) subcutaneously administered to camels (Camelus dromedarius)

By
Idris O.F. 1, Seri H. I. 2, Elsadig A. A. 1, Hussan T. 3, Baraka O.Z. 4
1-Central Veterinary Research Laboratory.
2-Department of Clinical Studies, Faculty of Veterinary Science, University of Nyala-Sudan. E-mail seri68@yahoo.com.
3-Department of Medicine Pharmacology & Toxicology, Faculty of Veterinary Science, University of Khartoum, Sudan.
4-Department of Medicine, Faculty of Medicine, University of Khartoum, Sudan.

Summary
Results indicated that Ivermectin administered subcutaneously at dose rate of 150μg and 200-μg/kg-body weight to camels caused marked increases in serum total protein, globulins, and alkaline phosphatase. However, serum albumin, urea, urea nitrogen, calcium and inorganic phosphorus were decreased during the time course of the drug.

Introduction
The camel (Camelus dromedarius, one-humped camel, dromedary) is an important livestock species uniquely adapted to tropical and arid environments. It produces meat, milk, wool, hair and hides, serves for riding, as a beast of burden and as a draft animal for agriculture and short and long - distances transport (Schwartz and Dioli, 1992). In few cases drug manufacturers give specific recommendations for the camel. Toxic or even fatal reactions sometimes occur in camels given certain drugs at doses which are apparently harmless to other species (Homeida et al., 1981. Ali and Hassan, 1986). Ivermectin is a macrocyclic lactone with potent antiparasitic activity, widely used in veterinary medicine (Campbell et al., 1983, Campbell. 1985). Ivermectin the 22, 23 - dihydro - derivative of avermectin BI has proved to have a better combination of efficacy and safety than other avermectins (Campbell 1981, Campbell and Benz, 1984). In this study the changes in some serum constituents are determined after the administration of Ivermectin.
Materials and Methods

Experimental animals: Four clinically healthy female Sudanese Arab camels (Camelus dromedarius) were used in this study. These were adult animals, 8-12 years in age and weighing 390-450 kg. The animals were housed in one large pen at the Camel Research Centre, Shambat, U. of K. and received water and sorghum ad libitum.

Drug used: Ivermectin (Ivomec; MSD AG VET) was injected subcutaneously at the neck region at 150μg and 200-μg/kg-body weight.

Collection of blood: Blood was collected from the jugular vein in plain vacutainer tubes and allowed to clot over night at room temperature. Clotted blood was then centrifuged at 3000 r.p.m. for 10 minutes and the separated sera were stored at -20°C for biochemical analysis.

Experimental work: Three experiments were carried using the above mentioned animals. Samples were collected from the animals before injection of the drug as control group. Then the same animals were utilized as treatment 1 each given a single injection of Ivomec (150 μg/kg) subcutaneous in day one of the experiment. Treatment 2 (200 μg/kg) was injected subcutaneous once for each camel in day 35 of the experiment.

Biochemical methods: Total serum protein concentration was measured according to method described by King and Wooton (1956). The serum albumin concentration was determined according to Bartholomew and Delany (1966). The serum globulins were determined by deduction the values of serum albumin from the values of total serum protein. The activity of alkaline phosphatase was measured by an enzymatic calorimetric method using a commercial kit (Plasmatec Laboratory Products Ltd. U. K.). Serum urea concentration was measured by an enzymatic calorimetric method using a commercial kit (Randox Laboratories Ltd., U. K.). Urea nitrogen was calculated in mg/dl as follows: 1 mg of urea corresponds to 0.467 mg of urea nitrogen. The serum creatinine concentration was determined using a commercial kit (Randox Laboratories Ltd., U.K.). The serum calcium concentration was
determined according to method described by Trinder (1960). The serum inorganic phosphorus was determined according to Varley (1967).

**Statistical analysis:** Values reported are mean ± standard error of mean (number of observations) and were tested by the t-test, P values higher than 0.05 have been considered insignificant.

**Results and Discussion**

Table (1) shows significant increase (P<0.05) in serum total protein, which supports the findings of Ibrahim et al. (1981) in infected camels and Shaddad (1997) in ewes after using three times the recommended dose. Shaddad (1997) correlates the increase of the total protein with the pharmacokinetics studies that revealed the persistence of the drug till the last day of the experiment. Results in table (1) reflected significant increase (P<0.05) in globulins but it is within the normal level which agreed with the findings of Ibrahim et al., (1981) who reported slight but non significant increase in globulins. Significant variation in total plasma protein value is most frequently due to decrease in the albumin fraction which will usually produce a relative hypergammaglobulinaemia, but a degree of hypoproteinaemia is often present. On the other hand; in Table (1) also we observed significant decrease (P<0.05) in serum albumin concentration which supports the finding of Shaddad (1997) in pregnant ewes. Hypoalbuminaemia occurs in starved animals and in gastrointestinal diseases causing malabsorption and protein loss (Kelly, 1984). Table (1) also showed significant increase in the activity of enzyme alkaline phosphatase (P<0.05) although it is within the normal level which supports the findings of Ibrahim et al., (1981), while Mohamed and Hussein (1994) reported non significant difference after different doses of Ivermectin in sheep. Kramer (1980), reported that liver alkaline phosphatase activity can increase in serum in association with hepatic lipodiosis, diabetes mellitus, hypothyroidism, hyperadrenocorticism, severe starvation, and late pregnancy. A significant decrease in urea level (P<0.05) was observed after the two different injections which also supports the findings of Shaddad (1997) in the pregnant ewes, but differs
from those of Mohamed and Hussein (1994) in desert sheep and Shaddad (1997) in toxic dose group (three times the recommended dose), it is worth mentioning that at day zero, the control urea level was significantly higher (P<0.05) than that of the treatment group for the same day; a finding which rendered the comparison of the results between them meaningless.

Table 1. Some biochemical changes in camels following subcutaneous injections of Ivomic at 150µg and 200µg/kg.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control group</th>
<th>Treatment 1 150 µg/kg</th>
<th>Treatment2 200 µg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>T. Protein g/dl</td>
<td>6.37±0.37</td>
<td>6.47±0.36Ns</td>
<td>6.95±0.54*</td>
</tr>
<tr>
<td>Albumin g/dl</td>
<td>3.83±0.25</td>
<td>3.16±0.15*</td>
<td>2.79±0.18*</td>
</tr>
<tr>
<td>Glubulin g/dl</td>
<td>2.54±0.39</td>
<td>2.92±0.33*</td>
<td>4.17±0.48*</td>
</tr>
<tr>
<td>Al kaline Phosphatase IU</td>
<td>14.85±2.41</td>
<td>23.08±2.51*</td>
<td>25.56±3.20*</td>
</tr>
<tr>
<td>Urea mmol/l</td>
<td>8.50±0.96</td>
<td>3.86±1.52*</td>
<td>3.22±1.71*</td>
</tr>
<tr>
<td>Urea nitrogen mg/dl</td>
<td>23.95±2.6</td>
<td>10.82±4.29*</td>
<td>9.06±4.79*</td>
</tr>
<tr>
<td>Calcium mg/dl</td>
<td>9.05±0.55</td>
<td>8.43±0.4*</td>
<td>8.04±0.56*</td>
</tr>
<tr>
<td>Phosphorus mg/dl</td>
<td>5.53±1.15</td>
<td>5.05±0.51Ns</td>
<td>4.63±0.52*</td>
</tr>
</tbody>
</table>

Values in the table are mean ± s.e.m. (n=88), * Significant at p<0.05. Ns= non significant change

The present results observe inconsistent increase in urea level in the treatment groups started at day 7 and continued until the end of the experiment. Comparison between the treatment groups and the control showed significant decrease (P<0.05) in urea nitrogen level, similar results were obtained by Ibrahim et al., (1981) in camels. As in case of urea also urea nitrogen was raised terminally. In severe hepatic disease, the blood urea nitrogen level falls and the blood NH₃ level rise (Ganong, 1987). In this study camels injected with Ivermectin at the recommended dose showed significant decrease (P<0.05) in serum calcium level. This result is in agreement with the findings of Shaddad (1997), but differs from that of Ibrahim et al., (1981); putting in consideration that Ibrahim and his colleagues conducted their experiment in camels infested with internal and external parasites. Total serum calcium levels are likely to be depressed by deficient absorption from the intestine, by decrease in the amount of parathyroid hormone. by increased secretion of thyrocalcitonin (Kelly. 1984). Varley (1980) demonstrated that the level of total calcium could be affected by alteration in plasma proteins. Whitby et al., (1989)
reported that changes in plasma albumin caused parallel changes in plasma calcium. A significant decrease (P<0.05) in phosphorus was observed in the treatment groups similar results has been reported by Shaddad (1997) in pregnant ewes, but differs from those of Ibrahim et al., (1981) in infected camels. It is worthy mentioning that Ivermectin at dose rate of 150 μg/kg body weight did not produce any significant change in serum inorganic phosphorus level. Kelly (1984) reported that during periods of high carbohydrate utilization the blood level of inorganic phosphate falls. Deficiency in vitamin D often causes pronounced hypophosphataemia in early stages, followed later by a fall in serum calcium (Simesen, 1980). The present study concluded that Ivomec is safe when given in the therapeutic level to camels.

References

Ali, B. H. and Hassan, I., (1986). Some observations on the toxicosis of isometamidium chloride (Samorin) in camels. Veterinary & Human Toxicology, 28; 424-426


