IJABR Vol. 2(2):49 - 54 (2010)

Original Article

# THE EFFECTS OF KANWA (SALTLICK) ON KIDNEY FUNCTION INDICES IN RABBITS

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Submitted: Dec 2, 2010; Accepted: Jan. 03, 2011; Published: Feb. 14, 2011

## ABSTRACT

The kidney function indices were evaluated using thirty two rabbits made up of sixteen male and sixteen females, that were randomly grouped into four (each group consisting of 4 males and 4 females). Treated Groups 1, 2 and 3 rabbits orally received 200mg/kg, 800mg/kg and 3200mg/kg body weight (BW) of kanwa saltlick respectively. The fourth group (control) received normal saline. The serum Na value showed no significant difference ($P<0.05$) between the treated and control animals, with the Control having 138.34± 4.02, Group 1, 140.94± 7.4, Group 2, 133.62± 2.25 and 139.0 ±3.69 (mmol/L) for Group 3 all in mmol/L. The serum K in mmol/L are 3.76 ±2.50 (Control), 3.37 ±0.77 (Group 2), and 3.95± 0.17 and 3.96± 0.3 for Groups 2 and 3 respectively. While serum Chloride level are 103.92± 3.22, 107.0± 4.9, 104.34 ±5.33 and 113.12 ±14.77 in mmol/L for control, Groups 1, 2 and 3 respectively. The serum urea for the control group was higher (9.82 2.12mmol/L), while a fluctuation was observed in the treatment groups over the experimental period, with Group 1 having the lowest level of 7.02 ±1.59mmmol/L, while the values for Groups 2 and 3 are 8.76 ±1.88 and 8.33± 0.56 mmol/L respectively. The serum enzymes activity shows no significant variation between the control and the treated Groups. These results suggest that kanwa may possess some nutrition enhancing activities.

**Key words**: kanwa, electrolyte, serum, kidney, rabbits,
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## INTRODUCTION

Mineral elements are required in the body for many diverse beneficial biological functions including; bone strength, fast growth, high productivity, reproduction, lactation, optimum health etc, (Underwood, 1977). Toxicity manifest in specific clinical signs as wasting diseases, loss of hair pigmentation, skin disorders, abortion, diarrhea, anaemia, loss of appetite, bone abnormalities, tetany, low fertility. Also, pica are some of the clinical signs often suggestive of mineral deficiencies throughout the world, (Mcdowell, 1977). Mineral elements are not synthesizable, when not available in the diet, thus, man and animal rarely obtain adequate mineral nutrient from the diet as a result of the poor soil quality on which the plants grow. In addition the biological effects of a nutrient are heavily dependent on its bioavailability (Huang *et al.*, 2007). The key factors of

dietary bioavailability of micro nutrient are the chemical form in which the nutrient is presented to the intestinal absorptive surface, presence of other competing chemicals (antagonist in the intestinal lumen, the types of food constituents such as phytates and other chelating agents) can reduce the absorption of mineral and vitamin. Thus, there is the constant need for supplementation to enhance balanced nutrition for growth and good health. For disease management purpose many individual use multivitamins/mineral as prophylactics (Huang *et al.*, 2007). In livestock management mineral supplementation is usually by the use of mineral salt dust, rock or tablets often mixed with feed, water or given directly as licks. These are often not readily available commercially, as a result of difficulties involved in its transportation, storage and cost of production. "Kanwa" is the local trade name in northern Nigeria for the lake salt deposit, primarily obtained from geological weathering of igneous rocks; it is predominantly found in the Lake Chad region of West Africa and is commonly used as mineral supplement by the herd's men. Kanwa has been shown to have chemical constituent similar to commercial salt licks. Various workers reported the presence of chlorides, carbonates and bicarbonates of sodium, potassium, sulphates of calcium, magnesium, potassium, zinc, cupper and phosphates (Ikwuegbu and Gbodi, 1982). In addition to its use as a supplement in livestocks, Kanwa is domestically used in homes in culinary, for tenderizing tough and hard meat cuts, as food additive, for preservation, seasoning, flavouring and colouring. Also widely used for cooking vegetables such as okra (*Hibiscus esculentus*) and spinach (*Amaranthus* Spp), ayoyo/ewedu (*Corchorus olitorious*) to retain the green coloration. It is also used as a preservative to hinder growth of microorganisms that cause food spoilage. The Gwaris in Niger state daily make use of kanwa to prepare their cereal and grain porridge meals. Other important and notable uses to which Kanwa is put to in local industries includes, as additives in ink making, soap making (washing soda), baking soda, snuff making, dying of textiles, tanning and curring of hides, Because of the high cost and scarcity of the commercial saltlick, the Fulani have preference for the use of kanwa as mineral supplement for their cattle and they claim that it has wide nutritional and medicinal values on their livestock (Ikwuegbu *et al.*, 1983). The objective of this work is to determine toxicological effects on the kidney that may arise from the usage of kanwa, considering the kanwa salt are usually given in it unrefined form and not free from carbonaceous organic matters, sand and other impurities.

## MATERIALS AND METHODS

### Sample collection

Kanwa salt used for this investigation was obtained from the Minna township market, Niger State Nigeria. The samples were coded, crushed ground into fine powder, sieved and stored in polythene bags from which portions were taken for analysis as required.

### Experimental Animal

Thirty-two rabbits between the ages of 8-12weeks and weighing between 380-779g were purchased from the Agric. Department animal house of the Federal University of Technology, Minna, Niger State, Nigeria. De-worming and control of endo- and ecto- parasite treatment was carried out using Ivomec super. The animals were grouped into four with eight animals in each group (4 males and 4 females). The animals were

conditioned for two weeks. A diet compounded with 7kg ground maize, 2.65kg roasted Soya beans, 0.265kg of bone meal and 0.065kg of salt. Water and feed were provided ad-libitum.

### Experimental Design

Fifty grams of kanwa was dissolved in 100ml (50% w/v) of distilled, de-ionized water. The animals in three of the four groups orally received 200mg/kg (group 1), 800mg/kg (group2) and 3200mg/kg (group3) which are equivalent to 0.4ml/kg BW, 1.6ml/kg BW and 6.4ml/kg BW respectively. The fourth group which served as the control received only water. The dosing was carried out twice weekly as commonly practiced by the local herds' men for a period of 3, 6 and 9 weeks.

### Heamatological Parameter Determinations

The serum electrolytes including that of sodium and potassium ions were determined by flame emission spectrophotometer (Bobboi *et al.*, 2004). Serum chloride was determined by the Schales and Schales titrimetry method (1941). Serum Urea by the diacetyl/monoxime method of Kaplan et al, (1988), using colorimeter (Spectronic 20D+). Serum glutamate oxaloacetate transaminase (GOT), glutamate pyruvate transaminase (GPT) determined using Hospitex diagnostic kits that were based on the principle of amino acid transamination enzymes, (Reitman *et al.*, 1959).

### Statistical Analysis

Results are presented as Means±SD. Statistical significance between groups was analysed using analysis of variance (ANOVA) with values having $P>0.05$ considered significant.

## RESULTS

The Means±SD serum electrolyte value for Na given in Table 1 shows no significant statistical variation between the animals treated and control animals, with the Control having138.34± 4.02, Group 1, 140.94± 7.4, Group 2, 133.62± 2.25 and 139.0 ±3.69 (mmol/L) for Group 3. The serum K Means±SD in mmol/L are 3.76 ±2.50 (Control), 3.37 ±0.77 (Group 2), and 3.95± 0.17 and 3.96± 0.3 for Groups 2 and 3 respectively. Means±SD of Serum Chloride shown in Table 2 are 103.92± 3.22, 107.0± 4.9, 104.34 ±5.33 and 113.12 ±14.77 in mmol/L for control, Groups 1, 2 and 3 respectively. nd fall) pattern over the experimental period but with Means±SD of 6.27±1.35g/100ml for control, while 6.67 ±0.65, 6.15± 0.53 and 6.62 ±1.30 g/100ml were for Groups 1,2 and 3 respectively. The Means±SD serum urea for the control group was higher (9.82 2.12mmol/L0, while a fluctuation was observed in the treatment groups over the experimental period, with Group 1 having the lowest level of 7.02 ±1.59mmmol/L, while the values for Groups 2 and 3 are 8.76 ±1.88 and 8.33± 0.56 mmol/L respectively.

The serum enzymes activity evaluated and presented in Table 1, show no significant variation between the control and the rest treated groups.

Table 1: Serum Electrolyte and Biochemical assay of Kanwa in rabbits.

| Parameter | Control | Group 1 | Group 2 | Group 3 |
|---|---|---|---|---|
| Na (mmol/L) | 138.64±4.02 | 140.94±9.17 | 133.62±2.62 | 139.00±3.69 |
| K (mmol/L) | 3.76±0.50 | 3.73±0.77 | 3.95±0.17 | 3.96±0.30 |
| Cl (mmol/L) | 103.92±6.41 | 107.47±4.9 | 104.34±5.33 | 113.12±14.77 |
| Urea(mmol/L) | 9.82±2.12 | 7.02±1.59 | 8.76±1.88 | 8.33±0.56 |
| SGOT U/L | 19.23±5.19 | 14.38±3.25 | 18.33±3.81 | 16.72±4.15 |
| SGPT U/L | 20.66±4.27 | 19.17±3.54 | 18.29±5.86 | 20.97±2.49 |
| SALP U/L | 25.75±5.22 | 22.90±10.80 | 21.71±8.27 | 26.74±12.55 |

## DISCUSSION

There seems to be no notable adverse effect of Kanwa on the serum electrolyte as essential mineral elements may be toxic at a dose that overwhelms homeostatic control on absorption and excretion (Ammarman *et al.*, 1977, Merill *et al.*, 2001). The mean serum sodium level in this investigation falls within the normal range of 128- 148 mmol/L as reported by Okerman, (1988). It has been established that dietary mineral is non toxic if sufficient water is ingested and the renal function is adequate to maintain homeostasis, (Birch, 1988). Any temporary increase is therefore rapidly excreted by the kidney. An abnormal increase will only arise if there is renal damage or during an incidence of shock (Tiezst, 1973), and disorder of acid-base balance, (Hall, 2001). The serum potassium was equally within the normal range, indicating that Kanwa probably have no toxicological effect on serum potassium level in this investigation. Serum potassium intake and decreased serum concentration are often associated with anorexia. Increase in serum potassium is an uncommon finding and may be observed with a variety of conditions causing acidosis, because extracellular hydrogen ions are exchanged for intracellular potassium ions. Severe tissue necrosis and anuric renal failure are infrequent causes of hyperkalemia, also decreased potassium concentration are sometimes associated with gastro intestinal losses and polyuric renal losses (Hall, 2001).

Lower but insignificant level of serum chloride was observed in the control compared to the treated groups, this was however not dose dependent as there were fluctuations within the treated groups.

The serum urea level were normal in both the control and the treated groups, thus neither kidney nor the metabolic processes appeared to be negatively affected by the feeding of Kanwa to the rabbits.

A non significant fluctuation is seen in the levels of serum enzyme, (SGOT, SGPT and SALP). All the serum enzyme values were within the normal range as reported by Okerman (1988). SGOT and SGPT are maker enzymes of liver and kidney functions (Lawal *et al.*, 2005). This is indicative of a possible lack of negative effect of Kanwa on the kidney function (Kaplan *et al.*, 2005). Although the use of kanwa at high concentration may be toxic particularly as it may contain high levels of lead and cadmium (Makanjupla and Beetlestone, 1975). Kanwa, however, is a salt with varying composition depending on where it is mined (Egwim *et al.*, 2002). This may

likely explain the lack of toxicity effects on the kidney in this study.

## CONCLUSION

The feeding of Kanwa at a level as high as 3200mg/Kg body weight and for the duration of study did not appear to have any remarkable toxicological effects on the animals. The supplementation of feed with Kanwa for nutritional benefits to animals especially in the absence of the commercial salt lick may be encouraged but with improved purification.

## ACKNOWLEGEMENTS

We wish to appreciate the contributions and assistance of the Department of Chemistry, Federal University of Technology minna for permission to use AAS. The department of Biological Sciences for accommodating the rabbits and technical staff of Biochemistry Department, Prof. O. O. A. Fasanya and the Haematological Unit of General Hospital Minna.

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