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The Electrolytic Effect of *Sida Acuta* Leaf Extract on the Kidney Electrolyte of Adult Wistar Rats

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Abstract
This study was carried out to assess the effect of ethanolic leaf extract of Sida acuta on the kidney electrolytes of adult Wistar rats. Forty five rats weighing between 140-180g were assigned to three groups (A, B and C) with fifteen animals each. Group A served as the control while groups B and C served as the experimental groups and received 100mg/kgbw and 200mg/kgbw of the extract respectively for fourteen days. All the animals were sacrificed after fourteen days. Blood was collected by cardiac puncture for biochemical analysis of serum electrolytes. Serum chemistry revealed significantly raised sodium and decreased potassium levels in animals treated with 100mg/kgbw, but chloride, creatinine and potassium not significantly affected ($P>0.05$). Animals treated with 200mg/kgbw of the extract had significantly raised sodium levels, but reduced potassium, chloride and creatinine relative to control ($P<0.05$). From the result of this experiment, it is concluded that the administration of ethanolic extract of Sida acuta leaves could have adverse effects on the kidney electrolytes of Adult Wistar rats at the doses and duration used in the course of this experimentation
Keywords – Biochemical, Electrolyte, Kidney, Serum, Sida acuta

INTRODUCTION

Using plants for medicinal purposes is an important part of culture and the tradition in Africa. Thus, up to 80% of the population depend directly on the traditional medicine for their primary health care (Kirby, 1996). Higher plants as sources of medicinal compounds continue to play a dominant role in the maintenance of human health since antiquities. Over 50% of all modern clinic drugs are of natural plant products origin. Natural plant products play an important role in drug development programme of the pharmaceutical industry (Barker *et al.* 1995; Cordeil 1995). *Sida acuta* (Malvaceae) a shrub indigenous to pantropical areas has wide application in Nigeria folk medicine. Some herbalist have claimed the traditional use of this plant to cure infections such as malaria, ulcer, fever, gonorrhoea, breast cancer, wound infections. (Kayode, 2006; Edeoga *et al,* 2005). The kidneys chief responsibility is urine production. Here , blood is delivered through the renal arteries and is filtered through the kidneys, where harmful waste products are removed, notably solution that is carried to an stored within the bladder prior to excretion (Kriz and Kaissling, 2005). The present review is focused on the adverse effect the leaf under study may have on the kidney electrolytes of Wistar rats and will therefore provide background information with regards to the toxic effect associated with consumption of *Sida acuta* plant. Kebe *et al* (2013) recently documented results on the possible effect of *Sida acuta* on the histochemistry of the adult Wistar rats at a given dose. Furtherance to the above, this study investigates the possible effect of *Sida acuta* leaf on the kidney electrolytes of adult wistar rats.

MATERIALS AND METHODS

Forty five healthy Wistar rats with an average weight of 140g were procured from the animal house of the Department of Pharmacology, University of Calabar, Calabar, Nigeria. The rats were kept and maintained under standard laboratory conditions of temperature, humidity and light for a period of two weeks in the animal holdings of the Department of Human Anatomy, University of Calabar, Calabar, before the commencement of the experiments. During this course, the rats freely fed on pellets from Ettems' feed holdings, Calabar and were given distilled water ad libitum.

2.1. Experimental design and groupings

In this study, a total of 45 adult Wistar rats were used. They were randomly separated into 3 groups of 15 rats each. Group B and C served as the experimental groups and received ethanolic extract of *Sida acuta* at varying doses. Group A served as the control group and received the same quantity of distilled water as contained in the experimental doses.

Administration of the ethanolic extract of *Sida acuta* was done orally by means of an oral canula. Group B and C received 100 and 200mg/kg body weight for three weeks. Rats in the control group (Group A) received quantity of distilled water as contained in the experimental doses.

At the end of the study, the rats were sacrificed by cervical dislocation. The blood was collected by cardiac puncture, and the kidney harvested using a pair of scissors and forceps to trim fatty tissue and weighed.

After which it was immersed in glass beakers containing cold sucrose-tris-potassium-magnesium (STKM) buffer. It was then removed and put in a separate clean mortars where they were homogenized using some aliquots of the STKM buffer, forming the whole homogenate (WHL). 10ml of the whole homogenate was taken and sub-fractionated to obtain the post mitochondrial supernatant (PMS).

RESULTS

3.1. Serum electrolytes

3.1.1. Potassium

Animals in the control group A showed normal level of serum potassium ions (4.2±0.25mmol/L)

Group B animals administered with 100mg/kgbw had significantly ($P<0.05$) reduced potassium levels compared to the control group (2.3±0.68mmol/L)

The group C animals administered with 200mg/kgbw showed values that are reduced when compared to the control group (2.6±1.45mmol/L) (Figure 1)

3.1.2. Serum sodium and chloride

Group A (control) animals showed normal level of sodium and chloride ions (139.12±2.71mmol/L) (101.02±1.0 mmol/L)

Group B animals administered with 100mg/kgbw showed increased level of serum sodium and chloride when compared to their respective control (159.78±10.67mmol/L) (103.46±3.34mmol/L)

Group C animals administered with 200mg/kgbw of extract revealed significantly ($P<0.05$) increased level of sodium and significantly ($P<0.05$) reduced mean levels of chloride compared to their respective control (160.15±4.22mmol/L) (85.01±39mmol/L) (figure 2 and 3)

3.1.3. Creatinine

Animals in the control group revealed normal levels of serum creatinine. (1..25±3.34mg/dl)

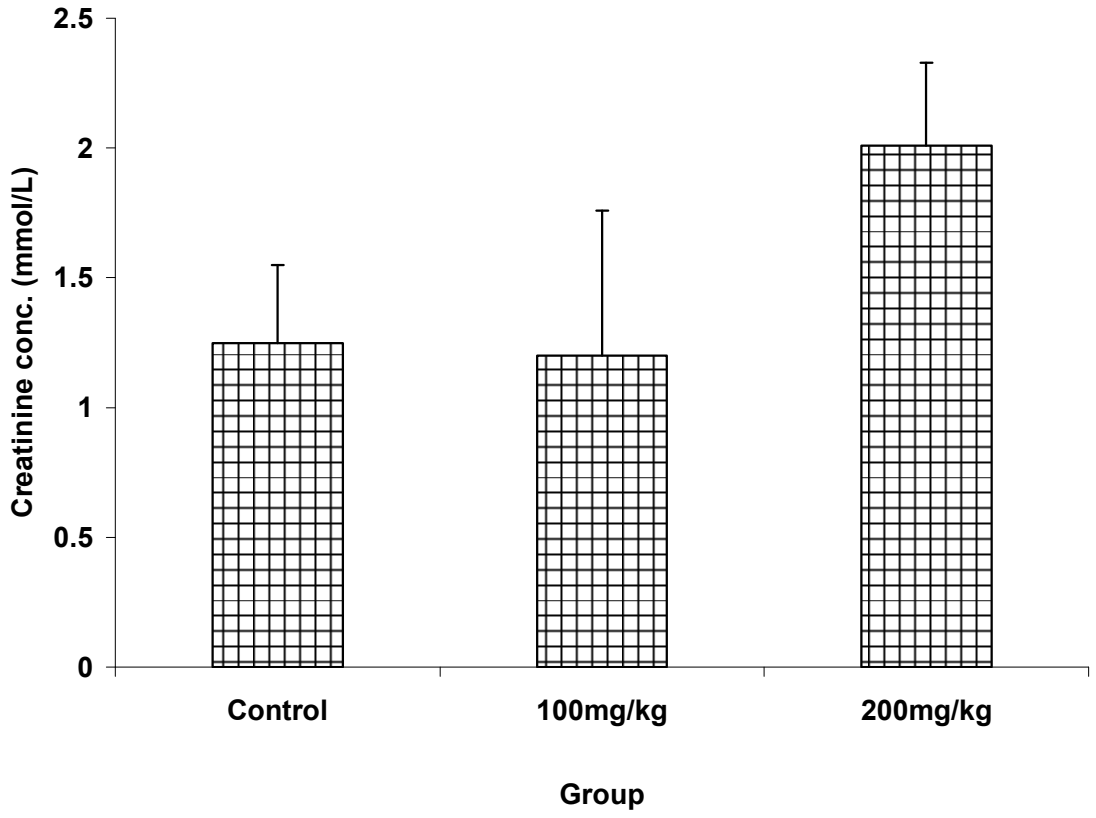

Fig. 4 Comparison of creatinine levels in control and test groups. Values are mean ± SEM.

Animals in group B showed reduced level of serum creatinine compared to the control. (1.20±0.56mg/dl)

Animals in group C revealed increased level of serum creatinine compared to the control group (2.01±0.32mg/dl) (figure 4).

3.2. Discussion

The use of plants as sources of remedies for the treatment of many diseases dates back to pre history and people of all continents have this old tradition. Despite the remarkable progress in synthetic organic chemistry of the twentieth century, over 25% of prescribed medicines in industrialized countries are derived directly or indirectly from plants (Newman *et al*. 2000). In developing countries, notably West Africa new drugs are not often affordable, thus, up to 80% of the population use medicinal plants as remedies (Kirby, 1996; Hostettman and Marston, 2002). Medicinal plants have contributed immensely to health care in Nigeria. This is due in part to the recognition of the value of traditional medical systems and the identification of medical plant from indigenous pharmacopoeias which have significant healing power (Mbata and Saika, 2008). The consumption of a variety of local herbs and vegetables by man is believed to contribute significantly to the improvement of human health; in terms of prevention or cure of diseases because plants have long served as useful and rational sources of therapeutic agents (Roberts and Tyler, 1999).

Sida acuta is a shrub belonging to the malvacea family and has been widely used as traditional medicine for the treatment of various ailments (Coee and Anderson, 1996; Caceres *et al*. 1987; Malairajan, 2006). Studies have demonstrated some biological activities exhibited by this plant (Bonjean *et al*. 2003; Dassonneville *et al*. 2000; Karou *et al*. 2003; Banzouzi *et al*. 2004) and also revealed the presence of active compounds (Dinan *et al*. 2001; Jang *et al*. 2003).

The kidney is a chief regulator of all the body fluid and is primarily responsible for maintaining homeostasis or equilibrium of fluid and electrolytes of the body. Kidney's main function is urine formation, regulation of acid-base balance, excretion of waste products of metabolism and toxic substances, protein conservation, secretary functions and recovery of useful metabolites which filters through them (Williams *et al*. 1998). The ability of the kidney to regulate blood volume and chemical composition in accordance with the body's changing needs requires great complexity of function. Homeostasis is maintained in large part of co-ordination of renal functions with those of the cardiovascular and pulmonary systems. The compromise of kidney functions maybe the result of ischemia caused by reduced blood flow, it may also result from excessive use of certain drugs (Stuart, 2004).

The effect of the extract on the kidney electrolyte after administration revealed no marked differences in the potassium levels while sodium, chloride and creatinine showed higher levels that are significant when compared to their respective control groups.($p<0.05$) From this observation, it can be suggested that the extract has adverse effect on some kidney electrolytes. It is on record that too much or too little sodium can cause cells to malfunction, and extremes in the blood sodium levels can be fatal. High levels of sodium in the blood causes the cells to be dehydrated leading to hypernatrema which can cause coma or death. Chloride balances sodium cations and helps to maintain proper water distribution outside the cell s and a high level of it causes certain kidney disease and over activity of parathyroid glands. Similarly, high levels of serum creatinine is of clinical importance since creatinin is used as a measure of renal functions. The only important pathological condition that causes high levels of serum creatinin is damage to large number of nephrons. (Delanghe *et at.* 1989), Creatinine levels about 2.0mg/dL is suggestive of severe kidney impairment; hence any condition that impairs the function of the kidney is likely to raise the creatinine level in the blood. Therefore, this report is an indication that the ethanolic extract of *Sida acuta* has adverse effect on the kidney electrolytes.

CONCLUSION

The effect of the extract in the kidney electrolytes after the administration revealed that the extract of *Sida acuta* has adverse effect on the electrolytes of the kidney at the dose administered to the rats.

In view of the above reports, it can be concluded that ethanolic extract of *Sida acuta* may be toxic when administered at a dose of 200mg/kgbw to Wistar rats.

REFERENCES

Banzouzi J.T ;R. Prada, H .Menan ,A .Valentin & C . Roumus-Tan (2004).Studies on medicinal plants of Ivory Coast; Investigation of *Sida acuta* for invitro anti- Plasmodial activities & identification of an active constituted *phytomedicine*. 11:338-341

Barker, J. T , Borns , P.R., Carta, B. Cordeil, G.A ,Gupta M.P, Iwu, & tyler; A.V(1995). Natural product. drug discovery & development . New perspective on international collaboration *Journal of natural products* 132s-1357.

Bonjean, K, M. C. De pawn –Guillet, Mop-Defrens,P.Colson & C. Houssier*(*1998). The DNA intercalating Alkaliod cryptolepine interferes with topiosomerase 11 & Inhibits primary DNA synthesis in B16 melanoma cells. *Biochemistry*.37.5136-5146.

Coee FG, Anderson GJ(1996). Ethnobotany in the garifuna of Estern Nicaragua *Economic Botany*.50:71-107.

Dassonneville L , Bonjean K,De pauw-Gillet m-c, Colson P, Houssier C, Quctin –leclerce J I ,Angenot L, Bailly C .(1999).Stimulation of Topoisomerase 11-mediated DNA cleavage by three DNA intercalating plant Alkaliods cryptolepine, metadine & serpentine. *Biochemistry* 38:7719-7726.

Delanghe J; Deslgpere JP, De Buyzere M, Robbrecth J, Wieme R, Vermeulen A (1989). Normal reference values for creatine, creatinine & carnitine are lower in vegetarians. *Clinical chemistry* 35(8) 1802-3.

Dinan L, Bourne p,whitingp(2001). Phytoecdy steriod profiles in seeds of *Sida acuta* spp (melvaceae). *Phytochemical Analysis* 12.110-119.

Edeoga H O, Okwu DE, mbaebia BO (2005). Phytochemical Constituents of some Nigeria medical plant. *African journal of biotechnology*. 4:68-688.

Hostettmann K., Marston A (2002). Twenty years of research into medicinal plants: result & perspectives. *Phytochemistry Research*. 1:275-285.

Jang D S, Park E J, Kang Yh,SU BN, Hawthorne ME,Vigo Craham JG, Cabieses F, Fong HH, Mehta RG, Pezzuto JM. Kingdom AD (2003). Compounds obtained from *Sida acuta* with the potential to induced quinone reductase & to inhibit 7,12- Dimethy [a] anthrace ne-induced preneoplastic lessions in a mouse mammary organ culture model. *Archives of Pharmacal.Research* .26:585-590.

Kayode J, (2006). Conservation of indigenous median botanicals in Ekiti State, Nigeria. *.Zhejiang university science* B7 :713-718.

Kirby, GC (1996). Medicinal plants & the control of parasite. *Transaction Of The Royal Society Of Tropical Medicine & Hygiene* 90:605-609.

Kriz, W & Kaissling, B. (2005). Structural Organization of the Mammalian Kidney. In Seldin DW, Giebisch G (eds). *The kidney-physiology and pathophysiology*, 4th ed. New York: Raven Press, 687-705

Malairajan P., Gopalakrishrian G., Narasimhan S., Venk KYK (2006). Analgesic activity of some Indian medicinal plants. *Journal Of Ethnopharmacology* 106:425-428.

Mbata TI, Saika A (2008). Antibacterial activity & phytochemical screening of crude ethnaolic extract of leaves of *Ocimum gratissimum* L on listeria monocytogenes. *Internet Journal Of Microbial*., 4:2.

Newman DJ, Cragg GM, Snadder KM (2000). The influence of natural products upon drug discovery. *Natural. Product. Report*. 17:175-285.

Obeten, K. E., Uruakpa, K. C., Isaac, V. N. (2013) The evaluation of the effect of *sida acuta* leaf extract on the micro-anatomy and some biochemistry parameters on the liver of Wistar rats. *Journal of applied physics 4*(1) 60-66

Roberts JE. Tyler VE (1999).*Tyler's herbs of choice*. The therapeutic use of phytomedicals. The Haworth Press New York: 11.

Stuart F. I (2004). *Human physiology*. 8th ed. McGraw Hill Inc. New York USA. 66(5), 629-637

Williams PI, Bannister W. Berry MM, Dussex JI (1998). *Gray's Anatomy*, 38th Edi. Churchill Livingstone. Harcourt Publisher, 1895-1826, 1753-1762.

FIGURES

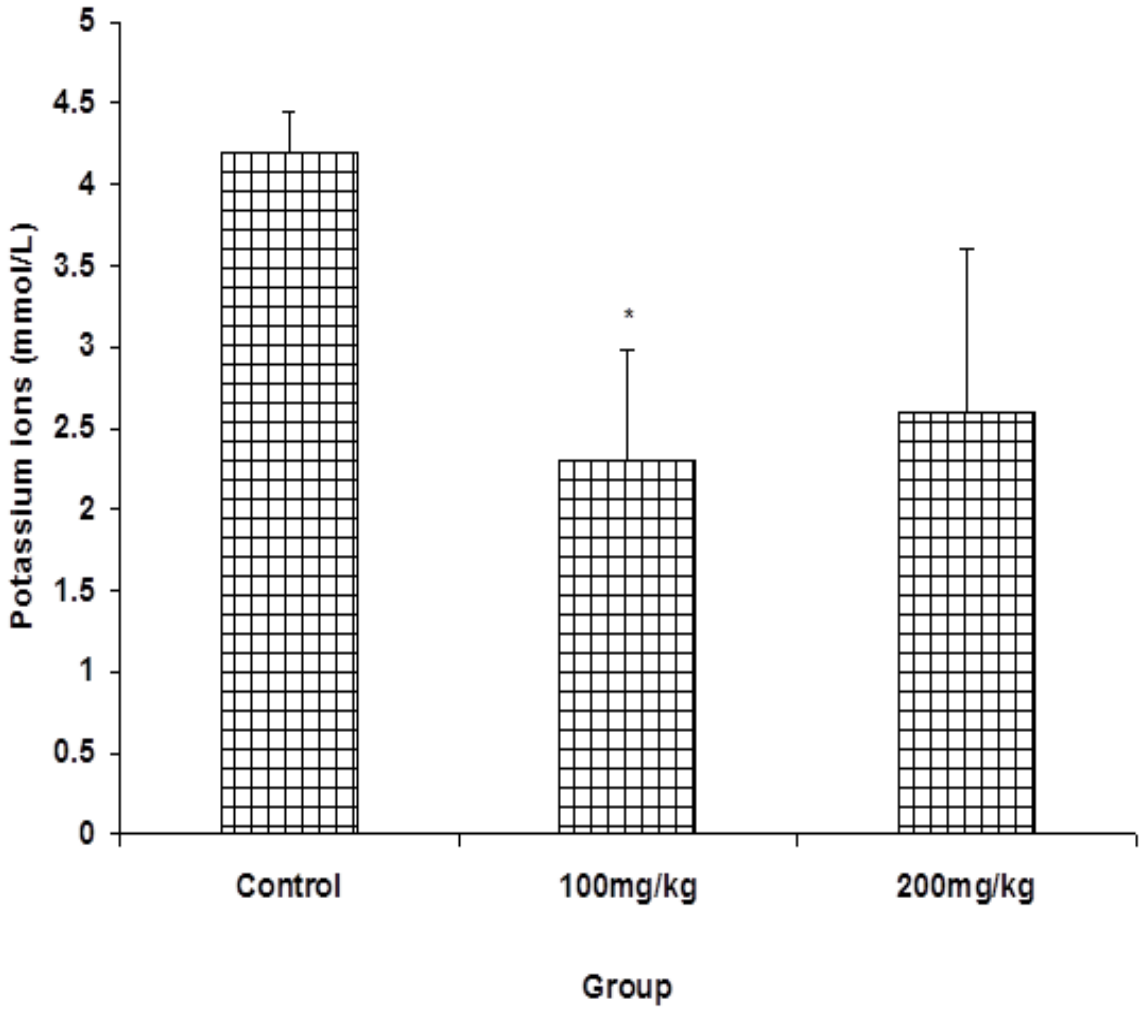

Figure 1: Comparison of potassium ion levels in control and test groups.
Values are mean ± SEM.
***Significantly different from control at P<0.05**

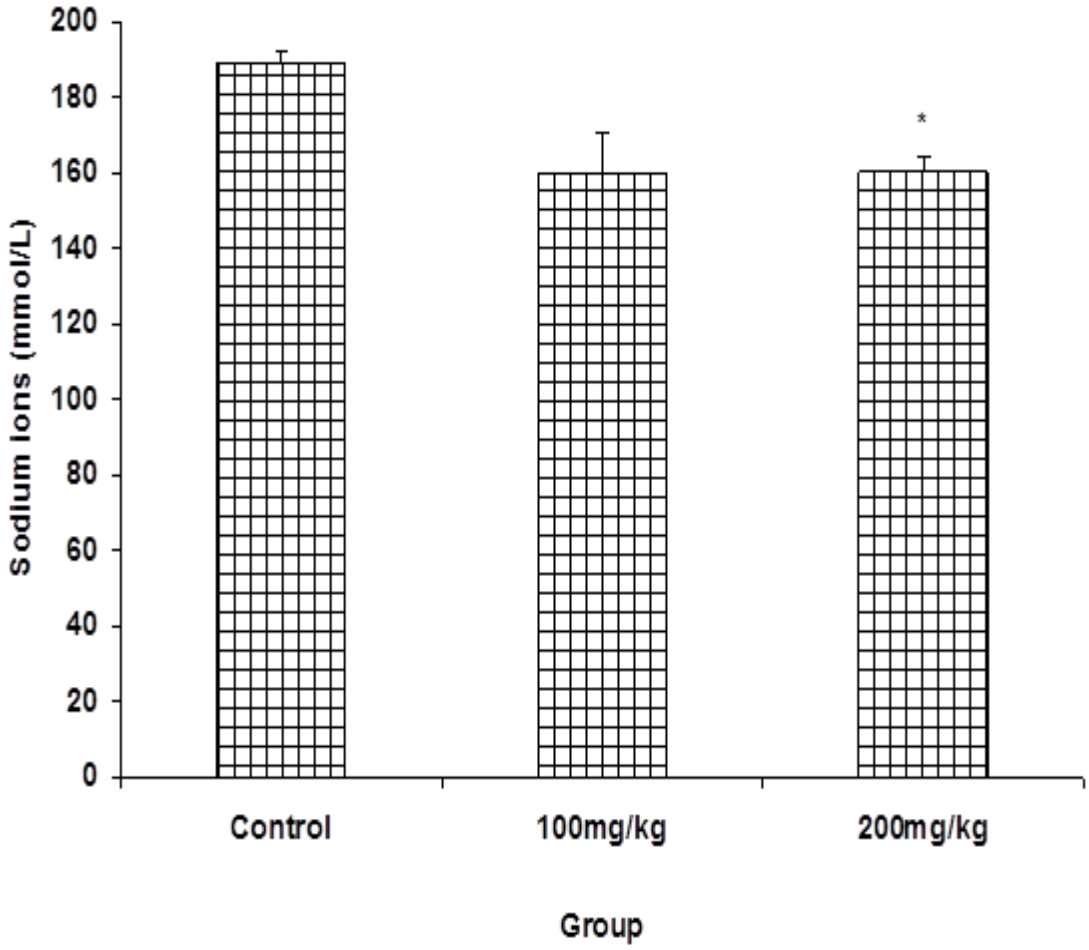

Figure 2: Comparison of sodium ion levels in control and test groups.
Values are mean ± SEM.
***Significantly different from control at P<0.05**

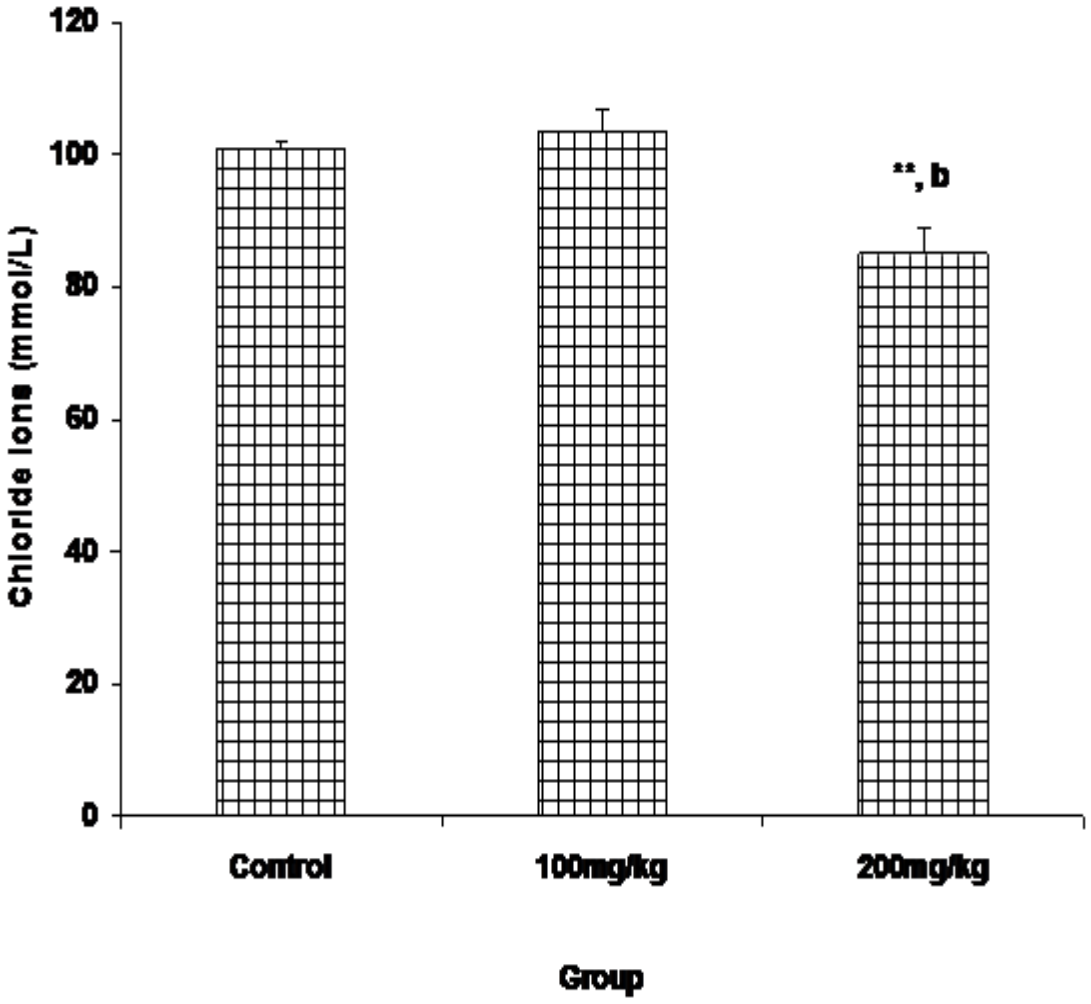

Figure 3: Comparison of Chloride ion levels in control and test groups.
Values are mean ± SEM.
***Significantly different from control at P<0.05**

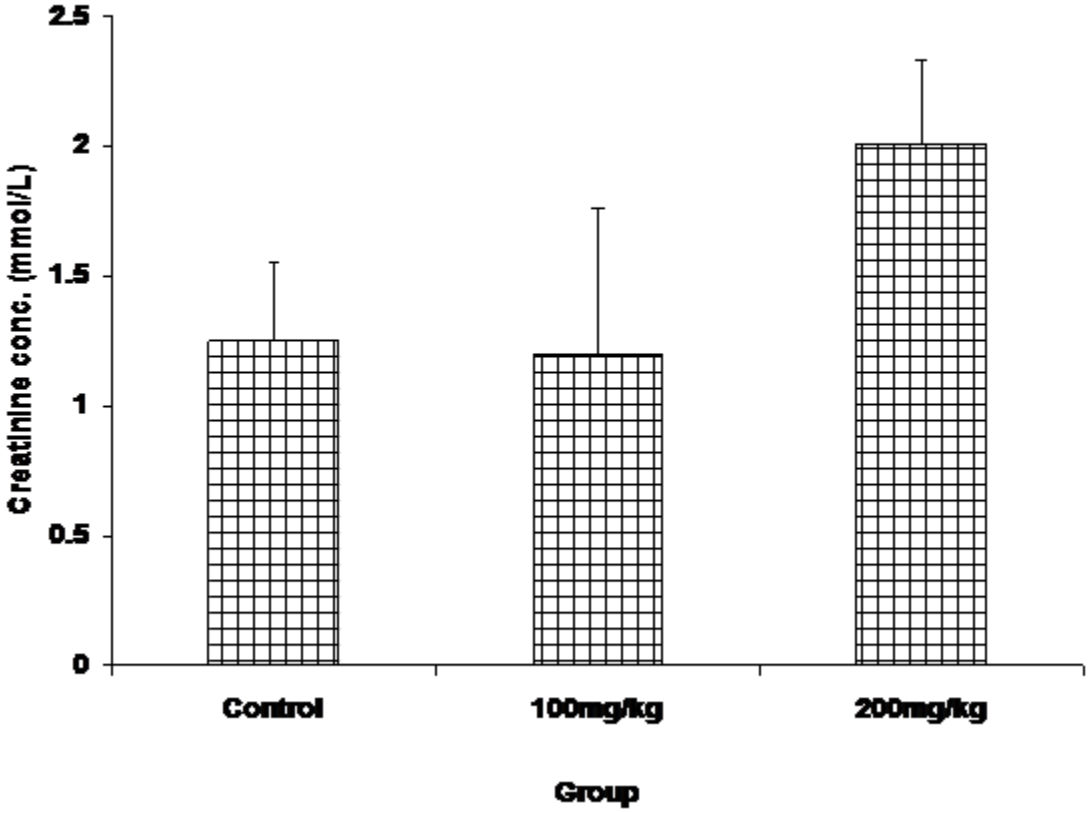

Figure 4: Comparison of creatinine levels in control and test groups.
Values are mean ± SEM.
***Significantly different from control at P<0.05**