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RAD conceptualized idea of the research, participated in the laboratory work and drafting the initial manuscript. Authors ML, RSUW and AY have all supervised collection of the raw milk samples of camels and impacted on the decision to publish. AY immensely assisted with literature search and presentation of the manuscript. All authors have proofread and approved the final manuscript.

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Toxicity Studies cum Evaluation of Some Renal Parameters of Hypertensive Rats Administered Raw Urine of Some Camels (*Camelus dromedarius*) in Sokoto, Nigeria

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Abstract:

Some key parameters of kidney integrity; the EUC (Electrolytes, Urea and Creatinine) were evaluated for both controls; viz normal (NC), hypertensive positive (PC) and diseased-state; hypertensive negative (HNC) controls and their tests peers in a 4 weeks research conducted with raw camel urine (CU) treatment groups in a bid to assess toxicity status of raw camel urine. An exposure with known Nitric Oxide Synthase; NOS inhibitor -Nitro-L-Arginine Methyl Ester [L-NAME (50mg/kg/day)] made some albino rats hypertensive. 5 rats per each experimental group were randomly chosen and assigned to a respective study set. Only distilled water was given to NC and HNC rats during treatment but HNC in addition get L-NAME fraction tantamount to treatment menu based on their determined body weight; while PC received amlodipine (10mg/kg/day) additional to their [L-NAME] hypertension exposure (50mg/kg/day)]. CU treatments received CU graded doses at (100, 300 and 500mg/kg/day) concurrently with L-NAME which corresponds to CU1, CU3 and CU5. Results showed in HNC; creatinine and duo of K^+ and Cl^- ions increased with significance ($p<0.05$) higher than NC. For CU3 and CU5 treatments, their urea values reassuringly almost align with NC, while CU1 and PC their urea results are analogous too. Na^+, Cl^- and HCO_3^- remain substantially similar for controls and treatments. In conclusion, lower CU treatment dose used resembles NC for creatinine while its higher dose compares with PC in the obtained results; CU can be said to be safe and non-toxic.

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INTRODUCTION

In some occasions of ancient tradition of Arabs, camels' urine got collected and dried on some types of herbs and kept for later use; but it also entails boiling of camels' urine at high temperatures and later drinking it; with sole aim of providing remedy to some liver ailments and some other associated diseases (Khalifa *et al.*, 2005).

Al-Abdalall reported the many documented beneficial health effects of drinking combination of milk and urine of camels narrated by folk life medical practitioners with some of it being upheld by latter scientific studies (Al-Abdalall, 2010). In fact, contemporary science viewed camel urine from different angles and perspective, though it was metabolic waste product; it was still found to be possessive of many medical uses outside the body and also within. Raw camel urine was reported having effective antibacterial and antifungal activities in some designed studies (Abdelzaher *et al.*, 2020; Humaid, 2016; Kabbashi and Al Fadhil, 2016).

Also in alternative medical practice, camel urine was used against various infections of respiratory tract and cancer (Kabarity *et al.*, 1988). In Asian countries camel urine was used for treatment of diabetic neuropathy (Agrawal *et al.*, 2009).

Latter studies have revealed using of milk and or urine of camel have some accompanying relative partial safety status with it; at least where it affirmed absence of pathological lesion on both kidney and liver of the studied animals (Khalifa *et al.*, 2005; Tharwat *et al.*, 2023).

Arabic peninsula famously known for their utilization of natural products has used camel urine as cure for various diseases (Al-Yousef *et al.*, 2012). Usual prescription of camel urine was for its consumers (patients) to drink mixed urine and milk of camel or drink it (camel urine) alone [~100 mL/day] (Al-Yousef *et al.*, 2012; Elhag *et al.*, 2017).

This study was conducted to assess and evaluate toxicity status of raw camel urine at the same time comparing values of some important biomarkers of kidney integrity suspected to have become compromised consequent from being in prolong diseased-state condition of hypertension; which were examined against same peer in other control sets versus those given camel urine treatment in graded doses with a view to gaining more insight about such important parameters.

MATERIALS AND METHODS

Ethics statement

All animal experiments were in accordance with guidelines and recommendations of universal procedures issued by National Institutes of Health (NIH) (NIH publication 85- 23, revised 1985) for the care and use of laboratory animal (Health, 1985).

Permission was granted by Research Ethics Committee of Usmanu Danfodiyo University Centre for Advance Medical Research and Training; (CAMRET) via UDUS/UREC/2019/020.

Collection of raw camel urine (CU) sample and preservation

Raw camel urine was collected during night time using aseptic means by skilled and experienced camel attendants from herds of domesticated camels (aged 6-10 years old); located at a farm. The collected urine samples were properly labelled on plastic containers, sealed and transported immediately via frozen condition to University Laboratory and refrigerated at -30°C until required for subsequent use.

Other reagents/materials used

Chemicals and other reagents as well as distilled water used during this study were all of analytical standard. In addition, N^{w}-nitro-L-arginine methyl ester (L-NAME) was used for induction of hypertension and it was procured from BDH Chemicals Company.

Rat recruitment and treatment

Rats of box sexes (35 in number) were used in this study. Their weights were between 200-250g and they were procured from Animal House of Department of Pharmacology, Faculty of Pharmaceutical Sciences, College of Health Sciences, Usmanu Danfodiyo University, Sokoto. They were chosen at random and have their tails marked with a number for easier identification in their respective cage groups and then further assigned into 6 properly labelled cages with each cage assigned 5 rats. The rats move freely for 7 days in their various cages to acclimatize with their new environment before commencement of the study. Tap water and animal feed (Vita cereals) were provided for rats' consumption *ad libitum* to all the cages and when it gets emptied it is replenished every day. Room temperature of 35°C and relative humidity of 65% within 12 hour light and dark cycle of a single day were the ambient optimal laboratory condition (Dogondaji *et al.*, 2024).

Various treatment regimens

Every day in the morning at time of treatment immediately after hypertension induction by L-NAME gavage exposure depending on assigned group, each rat get its appropriate treatment dose. Negative control (HNC) rats without intervention, received only distilled water but were also administered L-NAME solution tantamount to their weight during treatment time, as positive control (PC) got amlodipine (10 mg/kg, p.o.,) as its menu simultaneously with hypertension induction; L-NAME (50mg/kg/day). Normotensive group (NC) rats that were treatment-free; all-through have received only distilled water each time treatment is being done.

Each rat in CU1, CU3 and CU5 treatment groups also got appropriate CU doses commensurate to its own body weight at the time of treatment simultaneously with hypertension induction. Thus, CU1 received 100mg/kg, CU3 got 300mg/kg and CU5 was 500mg/kg of raw CU up to 28 days and it terminated on 29th day with slaughtering of rats to obtain their blood sera for further subsequent analysis.

Serum preparation

Killing of rats on the 29th day after having fasted for almost half day post their last treatment was done by humane approach through administration of anaesthetic ether (anesthesia) to elicit rapid unconsciousness and death with minimal or no pain at all. Sharp knife blade was later used for the slaughtering and immediately the blood oozing out from the inferior vena cava was collected in labelled EDTA bottles for each category of control and treatment groups. It was centrifuged for 10 minutes separating required plasma needed for further analyses; which was kept at -30°C until needed (Dogondaji *et al.*, 2024).

Renal function analyses

Urea was assayed by combined methods described previously (Wills and Savory, 1981) and creatinine was determined by Jaffe's reaction (Kroll *et al.*, 1987). Electrolytes (sodium, potassium, chloride and bicarbonate) were assayed by the method reported previously (Uriyo and Singh, 1974).

Statistical analysis

Data generated was expressed as mean ± SEM, (n = 5). Multiple group comparisons were performed using Bonferroni's multiple comparison procedure, between groups (n=6). Data were analyzed using one-way analysis of variance (ANOVA), repeated measures, between factors followed by post-hoc Duncan multiple range tests.

RESULTS

Results obtained for the conducted study is summarized in Tables 1 and 2 below. Results showed in HNC; creatinine and duo of K^+ and Cl^- ions increased with significance ($p<0.05$) higher than NC. For CU3 and CU5 treatments, their urea values reassuringly almost align with NC,

while CU1 and PC their urea results are analogous too. Na^+, Cl^- and HCO_3^- remain substantially similar for controls and treatments.

Table 1. Renal integrity indices of urea and creatinine for hypertensive rats.

Group	NC	HNC	PC	CU1	CU3	CU5
Urea (mg/dl)	34.5±0.9	53.9±0.7	38.4±0.8	37.8±1.1	34.7±1.1	34.3±0.8
Creatinine (g/dl)	0.2±0.01	1.0*±0.04	0.4±0.01	0.3#±0.02	0.4#±0.02	0.4#±0.1

Values are expressed as mean ± SEM, (n=5). One-way ANOVA followed post hoc Bonferroni tests. NC:-normal control rats given only distilled water; HNC:-hypertensive negative control rats, administered L-NAME only (50mg/kg/day); L-NAME:-Nitro-L-Arginine Methyl Ester; PC:-positive control rats, administered by gavage both L-NAME+amlodipine 10mg/kg/day; CU1:-rats that received raw camel urine treatment at 100mg/kg/day; CU3:-rats that received raw camel urine treatment at 300mg/kg/day; CU5:-raw camel urine treatment rats receiving 500mg/kg/day.

*Significantly ($P<0.05$) different from Normotensive control rats by using analysis of variance (ANOVA), (n=5), # ($p < 0.05$), significantly different from L-NAME (50 mg/kg body weight/day).

Table 2. Electrolyte values of hypertensive rats given raw camel urine.

Group	Na^+ (mmol/l)	K^+ (mmol/l)	Cl^- (mg/dl)	HCO_3^- (mg/dl)
NC	153.8±7.9	5.6±0.4	110.0±0.7	88.0±1.0
HNC	171.0±1.1	8.4*±0.5	133.4*±0.7	98.8±1.4
PC	153.6±6.1	5.5±0.3	108.4±1.3	86.8±0.9
CU1	154.0±1.3	5.4#±0.3	107.0#±1.2	80.6±0.9
CU3	155.5±1.1	6.0#±0.1	108.4#±1.0	81.4±2.0
CU5	156.5±1.3	5.0#±0.3	110.0#±1.7	82.4±4.6

Values are mean ± SEM, (n=5). One-way ANOVA followed post hoc Bonferroni tests. NC:-normal control rats only distilled water; HNC:-hypertensive negative control rats, L-NAME only (50mg/kg/day); L-NAME:-Nitro-L-Arginine Methyl Ester; PC:-positive control rats, L-NAME+amlodipine 10mg/kg/day; CU1:-raw camel urine treatment at 100mg/kg/day; CU3:-raw camel urine treatment at 300mg/kg/day; CU5:-raw camel urine treatment at 500mg/kg/day.

Na^+:-serum sodium ion concentration; K^+:-serum potassium ion concentration; Cl^-:-serum chloride ion concentration and (HCO_3^-):-serum bicarbonate ion concentration.

* Significantly ($P<0.05$) different from Normotensive control rats by using analysis of variance (ANOVA), (n=5), # ($p < 0.05$), significantly different from L-NAME (50 mg/kg body weight/day).

DISCUSSION

Important serum markers known to depict renal dysfunction are blood urea nitrogen (BUN) and creatinine (Mukinda and Eagles, 2010). The BUN also simply termed and regarded as urea is normally formed as a result of various metabolic reactions of protein and nucleic acids degradation; with urea as a terminal product of all nitrogen from the said metabolic processes and biotransformation. Whenever its level is found above and higher than the assigned normal reference range it signals a possible renal damage and likewise the creatinine. In the present study, as evident from Table 1 creatinine have become elevated in negative control with significant difference; which possibly could be as a result of L-NAME prolong use that have induced whole organism becoming in hypertensive state. The obtained values for CU treatment rats in Table 1 were either almost aligning to positive control for urea as in CU1 or a contiguous results with NC classically both CU3 and CU5 values easily aligns with NC values in most if not all the renal parameters studied here when compared with other controls (normal and positive control groups). The obtained results suggest that raw CU does not have a toxic effect on kidneys because of absence of abnormal result value due to its use.

Thus, this have partially agreed with previous reports (El-Elyani and Khalifa, 2006; Khalifa *et al.*, 2005) that documented absence of organ lesions on liver and kidneys due to use of camel milk or urine. Results shown in Table 2 also for the electrolytes; values obtained for Na^+ in PC and NC were almost similar and slightly different from CU treatment values. Same thing for K^+, Cl^- and HCO_3^-; which could therefore affirmed to CU innocence and non-toxic nature, because if it is toxic, poisonous or unsafe its use could have lead to obtaining very abnormal values. And since no signs of toxicity were observed in all the tested groups with respect to blood biochemical parameters; though without accompanying histopathological examination, it may be concluded that raw CU is non-toxic (Ajiboye *et al.*, 2022; Amina *et al.*, 2024).

CONCLUSION

Albino rats made hypertensive by chemical induction of NOS inhibitor; L-NAME have had some of their kidney integrity biomarkers (creatine, K^+ and Cl^-) became elevated in hypertensive negative control, that was devoid of any intervention but in the raw camel urine treated groups the renal function biomarker values were almost contiguous and analogous with each other or at least at par with normal and or positive controls. It can be safely concluded that raw camel urine treatment has not any untoward health effect with its use. Further research can be performed to outline the root cause of such its action considering its widespread use against many purported beneficial effect.

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CONFLICT OF INTEREST

Authors of this article wish to declare that the report of this study was conducted without any commercial or financial relationships that could be misconstrued a potential conflict of interest.

REFERENCES

Abdelzaher, H., Alsuhaymi, M., Alshammari, F., Alshammari, S., Alshammari, Z., 2020. Evaluation of the effectiveness of virgin camel'surfline as antifungal agents. J. Bacteriol. Mycol., 8: 124-128.

Agrawal, R.P., Dogra, R., Mohta, N., Tiwari, R., Singhal, S., Sultania, S., 2009. Beneficial effect of camel milk in diabetic nephropathy. Acta Biomed., 80(2): 131-4.

Ajiboye, T.O., Ogunbiyi, O.D., Omotola, E.O., Adeyemi, W.J., Agboola, O.O., Onwudiwe, D.C., 2022. Urine: Useless or useful "waste"? Results in Engin., 16: 100522.

Al-Abdalall, A.H.A., 2010. The inhibitory effect of camels urine on mycotoxins and fungal growth. Afr. J. Agric. Res., 5(11): 1331-1337.

Al-Yousef, N., Gaafar, A., Al-Otaibi, B., Al-Jammaz, I., Al-Hussein, K., Aboussekhra, A., 2012. Camel urine components display anti-cancer properties in vitro. J. Ethnopharmacol., 143(3): 819-825.

Amina, R., Habiba, R., Abouddihaj, B., 2024. Camel urine as a potential source of

bioactive molecules showing their efficacy against pathogens: A systematic review. Saudi J. Biol. Sci., 31(5): 103966.

Dogondaji, R., Lawal, M., Wasagu, R., Abubakar, I., Umar, S., 2024. Hepatoprotective effect of camel (*Camelus dromedarius*) raw milk on some increased liver biomarkers in hypertensive rats. J. Innov. Res. Life Sci., 6(2): 24-24.

El-Elyani, R., Khalifa, S., 2006. Histological Studies on the Effect of Camels Urine and Milk on Stomach of Albino Mice.

Elhag, A.E., Bernard, F., El Badwi, S., 2017. Protective activity of camel's milk and urine mixture (Camelus dromedarius) against ethanol-induced hepatotoxicity in rats. Adv. Biosci. Biotechnol., 8(10): 378-387.

Health, N.I.o., 1985. Guide for the care and use of laboratory animals. National Academies.

Humaid, A.A., 2016. Antagonistic effect of camel's urine on some pathogenic bacterial species. PSM Vet. Res., 1(1): 8-12.

Kabarity, A., Mazrooei, S., Elgindi, A., 1988. Camel urine as a possible anticarcinogenic agent. Arab Gulf J. Sci. Res., 6: 55.

Kabbashi, M.A., Al Fadhil, A.O., 2016. In vitro Antifungal Activity of Camel's Urine against Dermatophytes. Am. J. Res. Comm., 4(4): 183-191.

Khalifa, S., AL-Elyani, R., AL-Alwani, A., 2005. Histological, Cytological and Histochemical Studies on the Effect of Camel's Urine on Liver of Rabbi.

Kroll, M., Roach, N., Poe, B., Elin, R., 1987. Mechanism of interference with the Jaffé reaction for creatinine. Clinic. Chem., 33(7): 1129-1132.

Mukinda, J.T., Eagles, P.F., 2010. Acute and sub-chronic oral toxicity profiles of the aqueous extract of Polygala fruticosa in female mice and rats. J. Ethnopharmacol., 128(1): 236-240.

Tharwat, M., Almundarij, T.I., Sadan, M., Khorshid, F., Swelum, A., 2023. Is camel's urine friend or enemy? Review of its role in human health or diseases. Open Vet. J., 13(10): 1228-1238.

Uriyo, A., Singh, B., 1974. Practical soil chemistry manual. Department of Soil Science, University of Dares Salaam, Dares Salaam, Tanzania.

Wills, M.R., Savory, J., 1981. Biochemistry of renal failure. Ann. Clinic. Labor. Sci., 11(4): 292-299.