

Efficacy of Camel Urine in the Management of Diabetes Mellitus in Alloxan induced Albino Rats

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Abstract: *There are many anecdotal reports on traditional use of camel urine in the treatment of Diabetes Mellitus (DM). The need therefore arises to validate this claim. The objectives of the study is to; evaluate the effect of camel urine on serum glucose of rats, assess the effect of camel urine on serum lipids of rats and to Compare Different doses of the products on serum glucose and lipids. Thirty-six adult albino rats were used in 4 X 3 factorial experiment involving 4 product treatments and 3 doses. A significant decrease in the blood glucose level in the experimental groups fed camel urine when compared to diabetic untreated (control) group. In treatment group treated with 1.5 ml camel urine there was a significant decrease in glucose compared to control. The result shows that there were significant decrease in TG, TC, LDL-C and VLDL-C compared with the control while the HDL was significantly increased. The results indicate that camel urine possess anti-diabetic effects on alloxan induced rats. This study recommended that awareness should be created on the therapeutic value of camel urine.*

Keywords: *Diabetes mellitus, induced, Camel urine, alloxan, rat*

INTRODUCTION

The camel belongs to the family *camelidae* and divided into two genera: genus *camelus* (the true or old world camels) and genus *lama* (the new world camels). The genus *camelus* includes two species, the Dromedary, (*Camelus dromedarius*) or one-humped camel and the Bactrian camel (*Camelus bactrianus*) the two humped camel. The Dromedary (*C. dromedarius*) is adapted to hot arid environments and contributes significantly to the food security of the nomadic camel pastoral households (Schwartz & Dioli, 1992). Camelids are ruminating animals and are in proximity to ruminants but are not part of the suborder *Ruminantia*. Differences such as foot anatomy, stomach system and the absence of horns confirm this fact. They belong to the suborder *Tylopoda* (Werney, 2003).

DM is the fourth leading cause of death in most developed countries, and its prevalence is rising in Nigeria (IDF, 2013). The conventional medications for DM such as Biguanides, Sulfonylureas and Thiazolidinedione are associated with undesirable side effects such as allergic reactions, nausea and vomiting, diarrhea, sexual dysfunction, haemoglobin disorders and lipodystrophy (Oliver and Tellervo 1993). For this reasons cheaper alternatives such as medicinal plants and animal products are sought.

Among these alternatives to the conventional drugs are camel urine, for which there are many anecdotal reports and few scientific studies. The need therefore arises to validate this claim.

The aim of the study is to investigate the anti-diabetics effects of camel urine in alloxan induced diabetic rats. The objectives of the study are to; evaluate the effect of camel urine on serum glucose of rats, assess the effect of camel urine on serum lipids of rats and to determine different doses of the product on serum glucose and lipid profiles.

MATERIALS AND METHODS

The study was conducted at the Ramat Polytechnic Teaching and Research Farm, Maiduguri, Borno State of Nigeria. Maiduguri is located between latitude 11°N and 12°N longitude 13°E and 14°E and on an altitude of 354 above sea level (Alaku, 20005). It falls within the sub-arid zone of West Africa Characterize by short duration of rain fall (3.4 months), which varies from 580mm to 600mm with long dry season (7-8 months). Ambient temperatures are high during the month of April to June and fall within the range 40°C and above well relative humidity at non-range from 5-45% (Alaku, 2005).

Experimental Animals and their Management

Thirty Six adult albino rats of both sexes weighing between 150 -170 g, were obtained from National Veterinary Research Institute, (NVRI) Vom, and used for the study. The rats were housed in cages in a well-ventilated room with free access to feed (grower mash) and water. The rats were allowed to acclimatize under laboratory condition for a period of two weeks before the commencement of the experiment. Fresh Camel urine was administered to the rats by oral intubation, in doses according to the experimental protocol.

Induction of Diabetes Mellitus

Diabetes mellitus was induced according to Szkudelski (2001), the rats were injected with a single dose of 120mg/kg bw of alloxan monohydrate, in dorsally recumbent position via penial vein. Food and water were given to the animals 30 minutes after the drug administration. A sample of the rat's venous blood was collected 7 days after induction and DM was confirmed by measuring the serum glucose level with the aid of Accu Chek glucometer (mode: AE-350, BY ERMA INC). Rats that had serum glucose level >7.0 mmol/l were considered diabetic.

Experimental layout

The 36 diabetic albino rats were randomly allocated into four treatment groups of nine rats each. In a Complete Randomised Design with 4 treatments and each treatments was replicated 3 time with dose levels (0, 0.5, 1.0 and 1.5 ml) were used

Blood collection

Blood samples for monitoring of blood glucose level were taken from the tail. The tail of each of the rats was pricked with lancet and a drop of the blood was collected on the test strip and inserted into the glucometer to read glucose concentration on the screen in mg/dl. Readings were taken before, after the induction and at 28 days post treatment. The first blood collection (pre-induction) was for screening of the animals, while the second collection (post-induction) was for the confirmation of DM. The third collection was for the determination of the effect of treatments.

The serum lipids were measured 28 days after the commencement of the treatments where the animals were fasted overnight and sacrificed. The blood of the animals was collected in plain bottle, centrifuged and the serum separated and kept in labeled sample bottles at 4°C until required for lipid profile analysis.

Data collection

Serum glucose level was measured using glucometer, Total cholesterol (TC), Triglycerides (TG) and High Density Lipoprotein (HDL) were determined using Randox cholesterol kit (mode: CAT/TYP 05075548002, ROCHE INC). Low Density Lipoprotein (LDL) and Very Low Density Lipoprotein (VLDL) were calculated using Friedewald formula (Friedewald *et al.*, 1972).

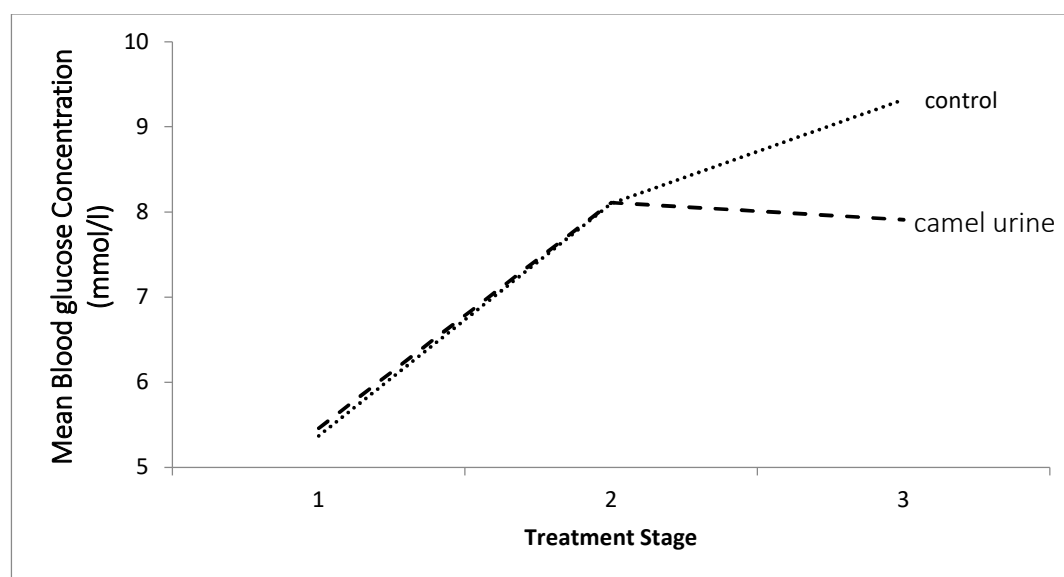
Data analyses

General Linear Model (GLM) univariate procedure was used to determine the effects of the camel urine and dose on serum glucose, TC, TG, HDL, LDL, and VLDL significant means were separated using tukey test.

RESULTS AND DISCUSSIONS

Effect of Camel Urine on Serum Glucose

Before induction all the animals were in non-diabetic state, however, after successful induction there was a sharp increase in blood glucose levels in all the rat groups. With the commencement of treatment there was a steady decline in serum glucose in groups except the control groups. The groups administered camel urine had the lowest concentration of serum glucose, while there was no decline in serum glucose in the control groups (Figure 1).

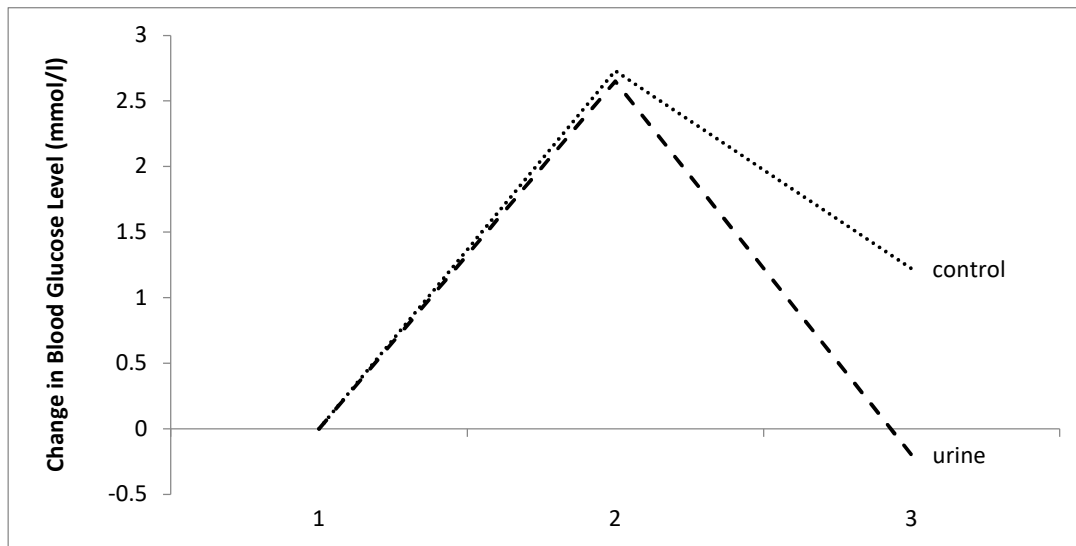


1= Pre- induction, 2= Post- induction before treatment 3= 28 days Post-treatment.

Figure 1 Change in blood glucose level among the various treatments groups

The trend indicated that the camel urine had some hypoglycemic effects that might be due some hypoglycemic factors they contain.

The rate of decline in serum glucose of the control group (Figure 2) was greater in treated groups than in the control group. In all the treated groups, serum glucose fell below pre-induction stage.



1= Pre- induction, 2= Post- induction before treatment 3= 28 days Post-treatment.

Figure 2: Rate of change in serum glucose across the treatment

The trend indicated that the drop in serum glucose in treated group is suggestive of the presence in the products of hypoglycemic factors, which was in fact reported for camel milk by Singh (2001). It is conceivable that this same factor might be present in the urine, in lower concentration.

There was significant difference in serum glucose between control group and groups administered with camel urine. Significant differences also exist among treated groups (Table 1.). Furthermore, the treatments appear to be dose dependent, where significant reduction in serum glucose was recorded with increasing in doses.

Table 1: Blood glucose levels (mmol/l) of albino rats according to treatments and doses

Treatment	Serum glucose
Urine	7.91 ^b
Control	9.32 ^a
SE	0.16
Dose (ml)	
1.5	7.44 ^c
1.0	7.88 ^b
0.5	7.96 ^b
0.00	9.32 ^a
SE	0.16

Interaction

NS

abc, means bearing different superscript along the same column within a subset differ ($P < 0.05$);

NS not significant

The low concentration of serum glucose in rats administered with camel urine, suggest the likely presence of the insulin-like protein, since it has been established to be present in milk (Singh, 2001), its presence in urine is therefore highly probable.

The lower concentration of serum glucose in treated rats may also be related to the report of Yadav *et al.* (2015) that some plants materials consumed by camel have anti-diabetic effects and the active ingredients are present in the body fluids such as urine and milk.

Effect of Camel milk and urine on Serum Lipids

Rats administered camel urine had significantly lower TG, TC, LDL and VLDL than the control groups. HDL was however higher ($P < 0.05$) in the treated groups. Dose had no effect ($P > 0.05$) on all the lipid parameters among the treated groups. Treatment x Dose interaction was also not significant (Table 2).

Table 2: Serum lipids (mg/dl) in alloxan induced diabetic rats according to treatments and doses

Treatment	Serum Lipids (mg/dl)				
	TC	TG	HDL	LDL	VLDL
Control	248.33 ^a	237.11 ^a	15.33 ^d	296.11 ^a	54.44 ^a
Camel urine	168.78 ^b	133.0 ^b	29.36 ^c	168.79 ^{bc}	27.22 ^b
S.E	6.68	10.22	2.04	10.50	2.00
Dose (ml)					
1.5	182.33 ^b	141.22 ^b	177.33 ^b	33.67 ^a	28.22 ^b
1.0	163.89 ^b	132.89 ^b	160.67 ^b	39.78 ^a	27.44 ^b
5.0	172.67 ^b	137.22 ^b	169.00 ^b	36.78 ^a	28.00 ^b
0.0	248.33 ^a	273.11 ^a	296.11 ^a	15.33 ^b	54.44 ^a
S.E	7.45	4.85	9.03	1.90	0.90
Treatment x Dose Interaction	NS	NS	NS	NS	NS

abcd, means bearing different superscripts along the same column within a subset differ ($P < 0.05$)

NS = Not significant

Key: Total cholesterol (TC), Triglycerides (TG), High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL) and Very Low Density Lipoprotein (VLDL)

Hyperlipidemia is a recognized consequence of diabetes mellitus (Sherma *et al.*, 2003). Thus the higher TC, LDL, VLDL and TG in the control group than in treated groups. The higher lipid value of

control group is due to DM, which led to abnormalities in lipid metabolism (Arkkila *et al.*, 2001). The increase in lipids in the control group may be attributed to excess mobilization of fat from the adipose tissue due to the under utilization of the glucose (Krishnakumar *et al.*, 2000). It appears that camel milk and urine have hypolipidaemic effects because the treated groups showed significantly lower levels of these lipids (Table 3).

Since insulin has been reported to activate lipoprotein lipase (Arkkila *et al.*, 2001), an enzyme that hydrolyses triglyceride leading to low serum lipids. The presence of insulin-like protein (Singh, 2001) in camel urine will lower lipid components in camel urine treated rats. This supposition is supported by Hull, 2004 and Agrawal *et al.*, (2007b) showing that a high insulin-like factor concentration of camel urine can cause the activation of lipoprotein lipase enzyme.

The HDL level in the treated groups is higher compared to the lower group. This may probably due the presence of some enzymes in camel urine that enhance the reverse cholesterol transport system Al-Numair (2010). In addition the mechanisms by which HDL decreases in diabetes may be due to the impaired metabolism of triglycerides rich lipoprotein with decreased activity of lipoprotein lipase and impaired transfer of materials to the HDL components, in addition to the high level of hepatic lipase among diabetics (Balkis 2009). Finally, insulin resistance may be a direct cause of decrease of HDL concentration (Van Linthout *et al.*, 2010).

A significant increase in LDL and VLDL levels may lead to a significant decrease in HDL levels. The inverse relationship between VLDL and HDL (Boizel 2000) might also explain lower levels of the HDL in the control groups.

The decrease in TC and TG in the treated groups and the increase in HDL in the present study are in agreement with Hassan and Emam (2012), who reported similar findings.

CONCLUSIONS

The following conclusions were drawn from the study.

1. Camel urine reduced serum glucose in rats
2. The hypoglycemic and hyperlipidemic effects of the product is not dose dependent.

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