

## Effect of Camel Milk on Blood Glucose, Cholesterol, Triglyceride and Liver Enzymes Activities in Female Albino Rats

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**Abstract:** This study was conducted to evaluate the effect of camel milk in healthy female albino rats. Thirty albino female rats aged 128 days were divided randomly into 5 groups of 6 rats in each. They were fed experimental diets for six weeks. First group was treated as controlled group, to which no milk was given. 2<sup>nd</sup> and 3<sup>rd</sup>, groups were fed with 50 and 100% camel's milk respectively and 4<sup>th</sup> and 5<sup>th</sup> groups were given 50 and 100% cow's milk respectively. At the end of 6-week treatment, the rats were anesthetized and blood samples were taken. No significant difference ( $p \geq 0.05$ ) in glucose, triglyceride, AST and ALT activity was found between the control and treated groups. But cholesterol levels of both 100% cows and 100% camel's milk treated rats were found to be significantly lesser than control group. It can be concluded from the study that camel milk can be safely consumed by non-diabetics or healthy. However, more research is necessary and further studies are warranted before a final conclusion can be made.

**Key words:** Glucose • Lipid profile • Liver enzymes • Camel milk • Alanine aminotransferase • Aspartate aminotransferase

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### INTRODUCTION

Milk plays a significant role in human's nutrition for the wonderful reason that they are excellent source of various nutrients. Milk diet has been suggested in the management of various diseases [1]. Camel's milk in particular is a good source of various vitamins and minerals and is characterized for its low cholesterol and high concentration of insulin [2, 3]. Camel, which is also known as ship of desert, is used for transportation and is a source of milk, meat and wool [4]. It has medicinal properties and antibacterial and antiviral activity [5, 6] which may be due to higher concentration of lactoferrin in camel's milk [7]. Camel milk is used therapeutically against hepatitis [8], dropsy, problems of spleen, asthma, [2, 9, 10]. An Indian study reported hypoglycemic effect of camel milk on diabetic rats [11]. Also, some studies suggested that camel milk, besides being a good nutrient source; it is also an excellent source of components that are involved in some biological activities, one of which is defense against free radicals and reactive oxygen species. Camel's milk has an anti-diabetic activity, which may be because of

insulin like activity, regulatory and immuno modulators effect on beta cells [12]. In this context, this study was conducted to test the effect of camel's milk in comparison to cow's milk on blood glucose level, triglycerides, cholesterol and ALT and AST levels in healthy albino female rats.

### MATERIALS AND METHODS

**Experimental Animals:** Thirty albino female rats aged 128 days with an average weight of 160-180 grams were obtained from the college of pharmacy and were housed in metabolic cages in the house of experimental animals in Community Health department at College of Applied Medical Sciences at 22°C, relative humidity 55% and light/dark cycle of 12 hours. The rats were fed chow diet for 3 days as an adaptation period.

**Experimental Diet:** Experimental diet was prepared according to the recommendations of American Institute of Nutrition (AIN) [13]. Experimental diets were equal in their ingredients (Nitrogen, Fat and Fibre) in addition to mixture of minerals and vitamins (Table 1).

Table 1: Composition of experimental diet

Components	Group				
	Control	Camel's milk 50%	Camel's milk 100%	Cow's milk 50%	Cow's milk 100%
Casein	23	11.5	-	11.5	-
Casein in milk	-	11.5	23	11.5	23
Cellulose	20	20	20	20	20
Starch	50	50	50	50	50
Corn oil	1	1	1	1	1
Mineral mixture	4	4	4	4	4
Vitamin mixture	2	2	2	2	2
Vitamin D	10 micro	10 micro	10 micro	Additive to milk from dairy factory	Additive to milk from dairy factory

**Experimental Design:** Rats were divided randomly into 5 groups of 6 rats in each and every 2 rats were housed in one cage. First group was treated as controlled group, to which no milk was given. 2<sup>nd</sup> and 3<sup>rd</sup>, groups were fed with 50 and 100% camel's milk respectively and 4<sup>th</sup> and 5<sup>th</sup> groups were given 50 and 100% cow's milk, respectively. They were fed experimental diets for six weeks. Deionised water was available for rats all the time which was changed daily. Weight of food was recorded daily while weight of rats was recorded after every 3 days during the period of experiment.

**Biochemical Analysis:** At the end of 6- week treatment, the rats were anesthetized by diethyl ether. Blood was drawn via heart puncture into tubes containing heparin as anti coagulant. Necessary precautions were taken into consideration to prevent hemolysis. Serum was obtained through centrifugation (6000 rotations/ minute for 20 minutes at room temperature) and was kept in deep freezer at -20°C for analysis. Double beam UV-Visible spectrophotometer (Shimadzu UV-UV-Visible spectrophotometer, model 1601) was used for various analyses. The blood glucose was determined immediately by the glucose oxidase method (kits supplied by Randox) using spectrophotometer at 505 nm. Estimation of cholesterol (enzymatic method), triglyceride (enzymatic method) were carried out using respective diagnostic kits (United Diagnostic Industry, Saudi Arabia). Assays for alanine aminotransferase (ALT), aspartate aminotransferase (AST), (Sigma Chemical, St. Louis, MO) were determined according to the method of Reitman and Frankel [14].

**Statistical Analysis:** The data obtained was subjected to statistical analysis by conducting analysis of variance (ANOVA) using SPSS. The significant difference of means were compared using Duncan's multiple range test and each data in table was presented as average of six replicates ± SD and p value was considered significant at 95%.

## RESULTS AND DISCUSSION

Table 2 shows the concentration of glucose, cholesterol, triglycerides in the control and the four experimental groups at the end of 6 week study period. The level of glucose in experimental groups was higher than the controlled group, but no significant ( $p \geq 0.05$ ) difference was found between control and experimental groups. In a previous study, insignificant ( $p \geq 0.05$ ) difference was found during 7 week study period in the blood glucose level of healthy dogs consuming 500 ml of camel milk daily [15]. Agrawal *et al.* [3] in one year randomized study reported the hypoglycemic effect of camel milk in type 1 diabetic patients. In another study it has been noticed that camel milk fed group (CMG) has shown significant difference ( $p \leq 0.05$ ) from diabetic control group (DCG) with an obvious reduction in blood glucose levels of about 19.4% in the first week of experiment. While, both cow and buffalo milks treated groups (COG and BFG) had shown significant reduction ( $p \leq 0.05$ ) in blood glucose levels after four weeks, compared to the diabetic control group (DCG) [16].

A significant ( $p \leq 0.05$ ) difference was found in total cholesterol level between control and experimental group after 6 weeks. Only in camels milk (50%), the level of total cholesterol was higher than control, otherwise all treatments showed lesser value as compared to control. Rats fed on 100% cow's milk showed the least value of cholesterol. Soubi *et al.* [15] in his study found insignificant difference in cholesterol level during 7 week study period in healthy dogs consuming 500 ml of camel milk daily. The level of triglycerides of experimental group was lower than the control group, but like glucose, no significant ( $p \geq 0.05$ ) difference was found between control and experimental groups. Soubi *et al.* [15] found insignificant difference ( $p \geq 0.05$ ) in triglyceride level during 7 week study period in healthy dogs consuming 500 ml of camel milk daily. Arkkila *et al.* [17] in their study in the year 2001 in people with type 1 diabetes mellitus showed that abnormalities in lipid metabolism may be due

Table 2: Effect of camel's and cow's milk on glucose, cholesterol and triglyceride levels in albino female rats

Groups	Glucose (mmol/l)	Cholesterol (mmol/l)	Triglycerides (mmol/l)
Control	5.138 <sup>a</sup> ±0.8427	1.653 <sup>b</sup> ±0.4268	0.983 <sup>a</sup> ±0.3545
Camel's milk 50%	7.025 <sup>a</sup> ±2.6901	1.792 <sup>b</sup> ±0.3388	0.633 <sup>a</sup> ±0.2066
Camel's milk 100%	6.238 <sup>a</sup> ±0.9367	1.543 <sup>ab</sup> ±0.3477	0.967 <sup>a</sup> ±0.1862
Cow's milk 50%	6.857 <sup>a</sup> ±1.5296	1.513 <sup>b</sup> ±0.1921	0.750 <sup>a</sup> ±0.3449
Cow's milk 100%	6.663 <sup>a</sup> ±0.4038	1.202 <sup>a</sup> ±0.2306	0.833 <sup>a</sup> ±0.2733

Data are mean ± S.D of six replicates. Mean value having different superscripts letters in columns are significantly different (p>0.05)

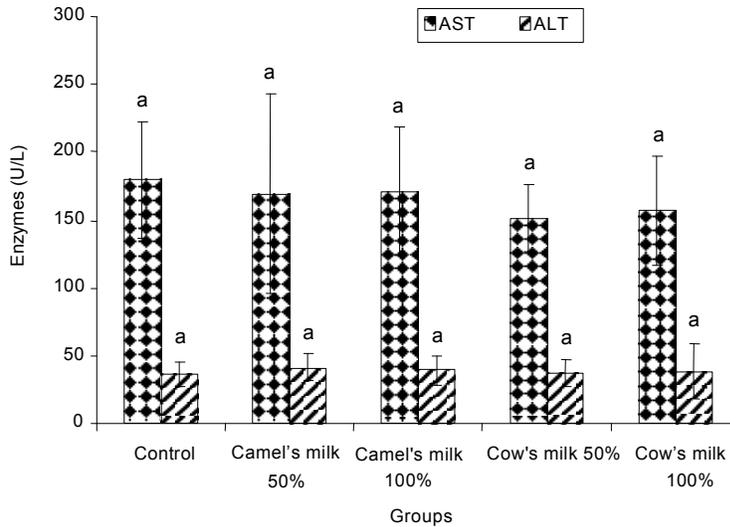


Fig. 1: Effect of camel's and cow's milk on AST and ALT activity in albino female rats

Data are mean ± S.D of six replicates. Mean value having different superscripts letters are significantly different (p>0.05)

to insulin deficiency. Sufficient production of insulin may be responsible for good lipid profile. In this study, it has been mentioned that insulin activates the lipoprotein lipase which in turn hydrolyzes TG under normal condition [17].

The AST and ALT are the two enzymes that are found in liver. Activity of AST increases in serum following tissue damage [18]. AST is present in both mitochondria and cytosol of liver cells, while ALT is found in cytosol only. However, it is worthwhile to note that ALT is more commonly used for screening of liver problems, as the AST level may also be increased as a result of deficiencies or diseases in other body organs [19]. From Graph 1 it has been depicted that AST activity of treatment groups was lower than the controlled group but the difference between these groups were found to be insignificant (p≥0.05). Similarly, insignificant (p≥0.05) difference was found between the controlled and treatment group for ALT activity, although the concentration of ALT was higher in treatment group than controlled group. Ingestion of cow's and camel's milk had no significant effect on the activity of these enzymes in normal healthy rats.

Hamad *et al.* [16] found that camel milk led to an improvement in activities of alanine amino-transferase and aspartate amino-transferase by 41 and 38%, respectively in camel milk fed diabetic rats as compared to the diabetic control group's rats. In this study they also found better activities of ALT and AST in camel milk fed diabetic group as compared to cow and buffalo milk fed diabetic group.

### CONCLUSION

It can be concluded that camel milk can be safely consumed by non- diabetics or healthy. However, more research is necessary and further studies are warranted before a final conclusion can be made.

### ACKNOWLEDGEMENT

This research project was supported by a grant from the research centre of the Centre for Female Scientific and Medical College in King Saud University. I am thankful to Miss Shaista Arzoo and Dr. Zubaida Abdel Nabi Bakeet for their assistance.

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