

COMPARATIVE STUDY ON SOME BIOCHEMICAL CONSTITUENTS OF PLASMA IN BOTH MALE CAMELS AND GOATS

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SUMMARY

The present study was performed to compare plasma levels of biochemical constituents of two different ruminant animals, (camel and goat).

significantly lower than those in goats at ($p < 0.001$). We concluded a significant positive correlation between glucose and cholesterol and also significant negative correlation between both of glucose and cholesterol and that enzymes.

Blood samples were collected from 36 and 14 male camels and goats, respectively, aged ≤ 2 years. The concentration of glucose, total cholesterol (CH), Triglycerides (TG) high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL). Total protein, Aspartate transaminase (AST) and Alanine transaminase (ALT) were measured. The results revealed that plasma glucose level in camels was significantly higher than that of goats ($P < 0.001$), no significant difference was obtained in lipoprotein concentrations of the two animals.

INTRODUCTION

The Arabian Camel or dromedary is considered to be a vital live stock species for poor community in hot arid regions. Camel meat is regarded as a high-quality food with medicinal value and as a least cost source of meat. (Kurtu, 2004).

It is an important sporting animal in many countries. However, the camel has been relatively poorly studied from physiochemical point of view compared with other major domesticated species, the determination of the concentration of various blood constituents may be of great help in diagnosis of many diseases (Haroun, 1994).

The normal values of blood constituents in camels are affected by age, sex, breed, season, nutritional status and other factors El Dirdiri et al. (1987) and Abdalla et al., (1988).

Studies on cholesterol, triglycerides, and lipoproteins in domestic animals showed that species variations exist, and that significant differences occur. The normal concentrations of serum lipids and Lipoproteins of the cat, dog, cow, horse, goats, reindeer calf have been reported (Barrie et al., 1993; Duncan et al, 1994; Hugi (Blum, 1997 and Gueorguieva (Gueorguiev, 1997). However, there is a little information about the serum lipids in dromedary camels, apart from reports on serum concentrations of cholesterol and triglyceride in normal camels by (Al Ani, et al., 1992).

Values for Total proteins, and the activities of AST and ALT were reported by Haroun (1994), Nazifi et al, (1998) Mohammed (Hussein (1999).

Camels are not classified as ruminant although, we consider it as ruminating animals (Schwartz, 1992). Therefore, a comparison of blood values of camels with those of true ruminants (goats) seems to be important. The present study was therefore, conducted to measure the concentrations of plasma glucose, cholesterol, triglycerides (TG), high density lipoproteins (HDL), low density lipoproteins (LDL) and very low density lipoproteins (VLDL), total proteins, and the activities of AST and ALT in normal healthy male camels

and goats.

MATERIAL AND METHODS

In, this experiment 36 healthy male camels (Damam slaughter house) and 14 male goats (Agriculture and Veterinary station for training and research, Al Ahsa) aged ≤ 2 years were used. Blood samples were taken from jugular vein on heparinised tubes and plasma was separated by centrifugation at 3000 rpm for 15 min., and stored at -18°C till analysed. Glucose and total proteins were determined enzymatically according to method of (Siest et al., 1981) using Behcman Du. 65 spectrophotometer a wave length at 505 nm. Cholesterol, HDL, triglycerides were analyzed using both Reflotron ® manual system (Thomas, 2000). LDL was calculated as the differences between the cholesterol concentration and HDL, while VLDL was calculated as one fifth of the triglycerides concentration (Friedewald et al., 1972).

Data were analyzed by student, "t" test (Snedecor and Cochran, 1980). All values were expressed as mean \pm standard error.

RESULTS

The concentration of plasma glucose was significantly higher in camel (132.20 ± 4.45) mg/dL than in goats (36.74 ± 4.48) mg/dL ($p < 0.001$) as showed in (Table 1), which also showed that plasma level of cholesterol in camels was ($<100 \pm$

0.00 mg/dl) while in goats was 30.76 ± 3.67 mg/dl. No significant differences were found in HDL, LDL, TG and VLDL between camel and goat.

Their values were $[(18.96 \pm 1.80), (< 30 \pm 0.0), (< 70.0 \pm 0.0) \& (< 14.0 \pm 0.0)]$ mg/dL $[17.12 \pm 1.11], (19.00 \pm 3.60), (< 70 \pm 0.0) \& (< 14 \pm 0.0)$ mg/dL respectively as shown in table (1).

Camels showed insignificant low concentration of total protein in comparison with goats (6.92 ± 0.12), (8.29 ± 0.70) gm/dL, respectively.

Table (1) which were showed that the activities of both AST and ALT exhibited highly significant differences at ($p < 0.001$) between camels and goats (20.96 ± 2.31) (4.03 ± 0.30) Iu/L (53.00 ± 3.96) (52.0 ± 2.24) Iu/L.

Table (1) Plasma Biochemical Constituents in Male Goat and Camel

Parameters	Species	N	Mean ± SE	"t"	Significant
Glucose (mg/dL)	Goat	14	36.74 ± 4.48	*** 13.06	0.001
	Camel	31	132.20 ± 4.45		
Total Protein g/dL	Goat	14	8.29 ± 0.70		
	Camel	20	6.92 ± 0.12		
AST Iu/L	Goat	14	53.00 ± 3.96	*** 7.47	0.001
	Camel	22	20.96 ± 2.31		
ALT Iu/L	Goat	14	52.00 ± 2.24	*** 21.13	0.001
	Camel	14	4.03 ± 0.30		
Cholesterol mg/dL	Goat	13	30.76 ± 3.67		
	Camel	17	<100.0 ± 0.00		
HDL mg/dL	Goat	14	17.12 ± 1.11		
	Camel	20	18.96 ± 1.80		
LDL mg/dL	Goat	14	19.00 ± 3.60		
	Camel	20	<30.0 ± 0.00*		
(TG mg/dL	Goat	14	<70.00 ± 0.00*		
	Camel	20	<70.00 ± 0.00*		
(VLDL mg/dL	Goat	14	<14.00 ± 0.00*		
	Camel	20	<14.00 ± 0.00*		

N: animals' numbers

***: highly significant different between the values of the two species in the same row

* all samples measurement revealed same value so that their SE was zero.

Table (2): Correlation Coefficient between Studied Parameters

		GL	CH	HDL	AST	ALT
GI	Correlation coefficient significant (2 tailed) N	1.000 45	-.825** 0.00 30	-.177 -.316 34-	-.717** -.000 36	-.732** -.000 28
CH	Correlation coefficient significant (2 tailed) N	.825** 0.000 30	1.000 3	-.111 .567 29	-.738** .000 28	-.761** .000 26
HDL	Correlation coefficient significant (2 tailed) N	.177 34	-.111 29	1.000 34	.015 32	-.050 27
AST	Correlation coefficient significant (2 tailed) N	-.717** 0.000 36	-.738** .000 28	.015 .936 32	1.000 3	6.785** .000 27
ALT	Correlation coefficient significant (2 tailed) N	-.732** .000 28	-.761** .000 26	-.050 .804 27	.785** .000 27	1.000 28

N= Numbers of animals

** correlation is significant at the 0.01 level (2-tailed).

Table (2) explain the correlation coefficient between the parameters in this study, it is clearly appear that there is a positive significant correlation at the 0.01 level between cholesterol(CH) and glucose(GL) and at the same time there is a negative significant correlation between glucose , cholesterol and AST, ALT where there is a negative but non significant correlation between HDL and both cholesterol and ALT.

DISCUSSION

The present study revealed that plasma glucose

concentration of goats was very low (36.74 ± 4.48 mg/dL), because it is absorbed in small amount by the intestine (Scharrer, 1975).

These results are in agreement with those of (Ashmawy, 2000). The present data also indicated that plasma glucose in camels was (132.20 ± 4.45 mg/dL) which is highly significant than that of goats. The obtained glucose level in camel was in agreement with findings of (Zaid and Mu-bark, 1996) and (Nazifi et al., 1998) who reported that glucose level ranged from 47-140 mg/dl blood in adult camels.

The increase in plasma glucose level could be attributed, to elevated glucagon concentration. As proved by the results of (Abdel-Fattah et al., 1999) who found that glucagon level in one humped adult male camels was higher in comparison with other ruminant and in man, and this difference could be attributed to species specificity. Moreover some researchers concluded that the increased plasma concentration of glucose in camel compared to sheep and ponies may be due to poor insulin response and / or reduced tissue sensitivity to insulin (El Mahdi et al., 1997). Following dehydration, the blood glucose levels increased greatly causing water reabsorption, while the urinary excretion was limited. Dehydration led to decreased blood insulin levels, while glucose infusion led to increase levels (Yagil and Berlyne, 1977).

Dahlborn et al., (1992) suggest that strategies for the camel to endure food deprivation include maintenance of plasma volume and glucose concentration and a lowering of the body temperature.

The results of present experiment also indicate that the concentration of cholesterol, in both goats and camels were less than (100 ± 0.00 mg/dL). Also, HDL and LDL were very low and relatively close to each and come in agreement with (Nazifi et al., 2000) who showed that the lipoproteins values were lower at 3 years old

camels or younger than other ages.

In general Lipid metabolites such as triglycerides, cholesterol and phospholipids, may alter according to thyroid status as recorded by (Ibrahim et al., 1984). In camel and goats TG and VLDL were lesser than other animal species, this could be explained by the finding of (Kleepe et al, 1988) who were found that rat hepatocytes secreted approximately 25 times more [$^{14}C^*$] triglycerides than goats, as rats hepatocytes convert three to four times more [^{1-14}C] oleat to $14 CO_2$ and acid soluble products than goat hepatocytes.

However, unlike man and rats, camel's plasma lipid levels are very low, but nevertheless the dromedary has been reported to suffer from spontaneous atherosclerosis, a rare event in species other than man. Camel can also suffer from spontaneous hyperlipoproteinaemia, a factor which might underline atherosclerosis (Michael et al., 1995)

In this study plasma values of VLDL changed in parallel with TG, although there are no more previous information about VLDL in camels, and this is in agreement with the parallel changes in rats (Smith and Welch, 1976), who found that VLDL was chiefly responsible for the transport of triglycerides in the blood. Ovine and caprine serum did not show such changes.

* [^{14}C] oleat : it utilized to fat production by rat hepatocytes

Also the study showed insignificant lower total protein levels in camels as compared with goats. Similar results were reported by (Clarech, 1986) who found that total protein in ruminants is about nearly (7.27 gm/dL).

Moreover, (Damanhoury & Tayeh, 1994, Haroun, 1994 and Nazifi et al., 1998) found that protein concentration in camels is lower when compared to sheep, goats, rats and guinea pigs which can explain the ability of camels to restore plasma volume especially in the excessive thirsty where plasma decrease about 5%. Total protein in camels found to be more particularly, albumin percentage which increase colloid osmotic pressure which play an important role in saving water. we used in this study < 2 years aged camels which are characterized by lower total protein levels than adults as found (Chaudhary et al, 2003).

The mean value of ALT activity in young male camels as shown in (Table 1) was (4.03 ± 0.30) lu/L where it was very low when compared with the values reported by (Nazifi et al., 1998 and EL Dirdiri et al., 1987) (33.65 -16.11, 20 - 7 lu/L) for adult camels, and it was lower than the mean value (9-4 lu/L) reported by (Haroun, 1994) for young male Najdi camels.

Our results as shown in (Table 1) reflected sig-

nificant lower activities for both plasma ALT and AST in camel when compared with those in goats.

The lower levels of enzymes in plasma of any animal reflects to healthy status of the organ that secretes these enzymes, while elevation of their levels points to tissues damage (Murray, et al, 1999).

The results were in agreement with (Ali and El Sheikh, 1992) who reported that camels had significantly lower enzyme activities when compared with sheep and goats born and reared in the same tropical area.

The low levels of AST, ALT could be explained by (Abdullah et al., 1988) who reported that in vitro studies low activity of hepatic mixed function oxidases in camels, may be due to the large liver of camels.

There were high and significant correlations between glucose, cholesterol and AST, ALT which reflect some of liver functions. Although (Kerr, 1989) reported that AST and ALT are not particularly specific for liver disease especially in large animals and the specific large animals liver enzymes are (SDH, GLDH)*, but many of previous reports used AST and ALT in camels for this purpose.

The results of this study revealed that glucose level in camels are highly significant than goats

*SDH : Sorbitol dehydrogenase

GLDH :Glycerol -3-phosphate dehydrogenase

and the plasma lipoprotein of camels and goats were low and did not show any significant differences but there was a highly significant difference between the tested enzymes of the two species .⁵ Positive correlation between glucose and cholesterol and negative one between both of glucose, cholesterol and the two (AST&ALT) enzymes in camels and goats respectively

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REFERENCES

- Abdallah O.M., Wasfi I.A. Gadir F.A. (1988): the Arabian race camel normal parameters - Haemogram, enzymes and minerals. Comp. Biochem. Physiol. 90 A : 237-239.
- Abdel-Fattah, M.; Amer, H.; Ghoneim, M.A.; Warda, M. and Megahed, Y. (1999) : Response of one-humped camel (*Camelus dromedarius*) to intravenous glucagon injection and to infusion of glucose and volatile fatty acids, and the kinetics of glucagon disappearance from the blood. *Zbl f Vet. Med.* 46 (8) : 473-81.
- Al-Ani, F.K., Al-Azzawi, W.A. R.A., Jenmukly, M.S. and Razzaq, K.K., (1992): Studies on some hematological parameters of camel and Llama in Iraq, Bulletin of Animal Health and Production in Africa, 40 : 103-106.
- Ali, B.H. and Eishleikh, H. H. (1992): Drug Metabolism in Camels, Proc. 1st International Camel Symposium (Dubai) p. 110.
- Ashmawy, N.A., (2000) : Effect of exposure to environmental heat stress on physiological response and some blood constituents of ossimi ewes and Egyptian buffalo heifers. *Annals of Agric. Sc. Moshohor*, 38 (2) : 727-736.
- Barrie, J., Watson, T.D.G., Stear, M.J. and Nash, A.S., (1993): Plasma Cholesterol and Lipoprotein Concentration in the dog : The effects of age, breed, gender and endocrine disease. *Journal of Small Animal Practice*, 34: 507-512.
- Chaudhary, Z.I., Iqbal, J. Rashi, J. (2003):Serm protein electrophoretic pattern in young and adult camels. *Aust Vet J*, Oct, 81(10) 625-6.
- Dahlborn, K.; Benlamlih, S.; Zinc-Filali, R.; Gueroulali, Hossaini - Hilali, J. and Oukessou, M. (1992): Food deprivation and refeeding in the camel (*Camelus dromedarius*) *Am J. Physiol.* ,262 (6P12): R1000-5
- Damanhour, Z.A., Tayeb, O.S. (1994): Comparison of cytochrome p-450 content and conjugative enzymes in livers of camels dromedaries, guinea-pigs (*cavia porcellus*) and rats (*Rattus norvegicus*) *Comp. Biochem. Physiol. Biochem. Mol Biol.* Jul; 108(3) : 349-55.
- Duncan, J.R. Prasse, K.W. and Mahaffey, E.A. (1994): *Veterinary Laboratory Medicine Clinical Pathology*, 3rd edn. (Iowa State University Press, Ames, IA), 118-122.
- El Dirdiri N.I., Suliman H.B. and shommein A.M. (1987): Normal serum activities of some diagnostic enzymes in dromedary camel in Sudan. *Ruminant, The Univ. of New England Pub. Unit, Armidale*
- El Mahdi, B.; Sallmann, H.P.; Fuhrmann, H.; Von Engelhardt, W. and Kasko, M. (1997) : Comparative aspects of glucose tolerance in camels, sheep and ponies. *Comp Biochem Physiol A*, 118 (1) : 147-51.

- Friedewald, W.T., Levy, R.J. and Fredrickson, D.S., (1972): Estimation of the Concentration of low density lipoprotein cholesterol without the use of the preparative ultracentrifuge. *Clinical Chemistry*, 18, 499.
- Gareeb H. F. (1986): Digestion physiology and Nutrition. Ruminants (2 nd ed), volume 2. Basara Univ. Press
- Gueorguieva, T.M. and Gueorguiev, I.P., (1997): Serum cholesterol concentration around parturition and in early lactation in dairy cows. *Revue de Médecine Vétérinaire*, 148 : 241-244.
- Haroun, E.M., (1994): Normal Concentrations of some blood constituents in young Najdi camels (Camelus dromedaries) *Comp. Biochem. Physiol.* 108 A (4) : 619-622.
- Hugi, D. and Blum, J.W., (1997): Change of blood metabolites and hormones in breeding calves associated with weaning, *Journal of veterinary Medicine series A*, 44 : 99-108.
- Ibrahim, R.E.; Maglad, M.A.; Adam, S.E.; Mirghani, T.E. and Wasfi, I.A. (1984) : The effect of altered thyroid status on lipid metabolism in Nubian goats. *Comp Biochem Physiol B*, 77 (3) 507-12.
- Kerr, M.G. (1989): *Veterinary Laboratory Medicine clinical Biochemistry and Haematology* Oxford, Black well Scientific Publications.
- Kleppe, B.B; Aiello, R.J.; Grummer, R.R. and Armentano, L.I. (1988): Triglyceride accumulation and very low density lipoprotein secretion by rat and goat hepatocytes in vitro. *J. Dairy Sci* : 71 (7) : 1813-22.
- Kurtu, M.Y. (2004): An assessment of the productivity for meat and the carcass yield of camels (camelus dromedarius) and of the consumption of camel meat in the eastern region of Ethiopia. *Trop Amin Health Prod* 36 (1) : 65-76.
- Mohammed, H.A. and Hussein A.N. (1999): Studies on normal haematological and serum biochemical values of the Hijin racing camels (camelus dromedaries) in Kuwait. *Vet. Res Commun*, 23 (4) 241-8.
- Michael, P.T.; Gillette, Mohammed, S.; Lakhani and Guy-nation. (1995) : Spontaneous hyperlipoproteinaemia in the Arabian dromedary. *Biochemical Society Transactions*. 23- 2815.
- Murry, R.R., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (1999): *Harpers Biochemistry* (22 ed) Appleton and Lang.
- Nazifi, S.; Rezakhani, A. and Gheisari, R. (1998): Physiological, Biochemical and cytologic properties of blood and synovial fluid in clinically normal adult camel (Camelus dromedarius) *J. Vet. Med. A* 45, 155-160.
- Nazifi, S.; Gheisari, H.R.; Abbasali Poorkabir and Saadatifar, S. (2000): Serum Lipids and Lipoproteins in clinically Healthy male camels (camelus dromedaries). *Vet. Res. Commun*, 24 : 527-531.
- Scharrer, E., (1975): In : *Digestion and Metabolism in the ruminant*. The Univ. of New England Pub. Unit, Armidale.
- Schwartz, H.J. (1992): The biology of the camel. In the one-Humped camel in Eastern Africa (Edited by Schwartz H.J. and Dioli M.), pp. 10-29.
- Siest, G.; Hennry, J. and Schiele, F., (1981) : *Inter Pre-dation des examens de laboratoire*. Karger ed. 206-223.
- Snedecor, G.M. and Cochran, W.G., (1980) : *Statistical methods* (7th edition). J.B.H. Publishing Com., Oxford
- Smith, R.W. and Welch, V.A. (1976) : Effect of pregnancy and lactation on triglycerides of very-low-density lipoproteins of rat plasma. *J. Dairy Sci* : 59 (5) : 876-9.