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SHORT COMMUNICATION

Serum Chemistry Variables of Bengal Tigers *(Panthera tigris tigris)* Kept in Various Forms of Captivity

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ABSTRACT

There is a dearth of published literature regarding the effect of captivity on serum chemistry variables of tigers kept in the zoos and wildlife sanctuaries. The present study was hence conducted to determine and compare serum chemistry values in tigers of Bengal origin (*Panthera tigris tigris)* kept in captivity at Lahore zoo (LZ) (n=4) and in semi natural environment of Lahore Wildlife Park (LWP) (n=6), Pakistan. The tigers kept at LZ had significantly ($P<0.05$) higher mean concentrations of Cl^- (108.6±0.57 versus 105.6±0.49 mmol/l) and a significantly lower creatinine (1.78±0.06 versus 3.04±0.35mg/dl) and AST values (41.66±0.77 versus 54.88±4.22 U/l) than tigers kept at LWP. No other significant differences in serum chemistry were observed for both forms of captivity. Results would be useful for the evaluation of physiological and pathological alterations in wild and captive tiger individuals and populations not only in Pakistan but also for other countries harboring the Bengal tigers.

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INTRODUCTION

The serum chemistry profile is one of the most vital initial tests being commonly performed by the practitioners for diagnostic and therapeutic purposes. It provides an opportunity to clinically investigate the presence of different metabolites and other constituents in the body of the animal hence aiding in the assessment of physiological, nutritional and pathological status (Farooq *et al.,* 2011). The blood chemistry of captive individual/animal is usually similar to blood chemistry of free-ranging individuals/populations (Sajjad *et al.,* 2011). Hence the values obtained from captive individuals are compared to the values from domestic or captive individuals of same species (Moen *et al.,* 2010). Many factors such as type of anesthesia capture method, time of blood collection or ecologic reasons associated with survival under natural conditions, however, may alter the physiologic status of wild-caught animals from that of captive animals (McPhee, 2003). The lack of literature regarding variations in blood picture of free-ranging felids kept in different modules of captivity inclines the practitioners to make the comparisons with domestic cats or captive animals for the purpose of physical and therapeutic evaluation.

Tiger being the largest of the cats (Anonymous, 2001) is one of the most magnificent animals. The Bengal tiger (*Panthera tigris tigris)* has recently been categorized as globally endangered one (Anonymous, 2010). A scanty number of Bengal tigers are being kept at various zoos and in certain wildlife sanctuaries in Pakistan and the effect of captivity on serum chemistry profiles has not been published so far. The objectives, hence of this study were to determine and compare certain serum chemistry variables for this species in two forms of captivity i.e., Lahore zoo (LZ) and Lahore Wildlife Park (LWP), Lahore, Pakistan. Results would be useful for the evaluation of physiological and pathological alterations in wild and captive tiger individuals and populations not only in Pakistan but for other countries such as India, Nepal, Bhutan and Bangladesh as well.

MATERIALS AND METHODS

Study area and experimental animals: The present study was conducted on the tigers of Bengal origin *(Panthera tigris tigris)* kept at LZ, Mall Road, Lahore and LWP located on the Raiwind Road, 32 km from the main city of Lahore, in the year 2007-08. The tigers of LZ (n=4) lived solitary consisting of two males and two

females; whereas, the tigers of LWP (n=6) lived in social groups consisting of five males and one female. All the animals ranged from 1 to 4 years in age and from 140 to 170kg in weight.

Standard capture and sampling protocol: Standard capture protocol was used and observed at both sites of study i.e., LZ and LWP (Sajjad *et al.*, 2011). After capture, 5ml blood was collected aseptically from the common tail vein (dorsal coccygeal vein) using disposable syringes and 23 gauge needles and transferred into vaccu-tainers containing thixotropic gel separator for serum separation. The collection procedure was standardized by using the same personnel, same technique of restraint and same time of the day. Blood samples were transported in an ice box to the department of Zoology, Lahore College for Women University, Lahore for analysis.

Serum chemistry analyses: Various serum chemistry values were analyzed using commercial kits as given below:
Chloride (Cl^-), Sodium (Na^+), Potassium (K^+) and urea: Bioassay Systems QuantiChrom™ Assay Kit (DICL-250), Bioassay Systems, Hayward CA, USA.
Creatinine, Bilirubin and Aspartate Transaminase (AST): RANDOX Kits (CR 510, BE 454 and AS 101), RANDOX Laboratories Ltd. Antrim, UK.
Alanine Transaminase (ALT) and Alkaline Phosphotase (APT): Ecoline ® 125, Diagnostica Merck Kit (KGaA 64271), Dramstadt, Germany.

Statistical analysis: Data were expressed as mean±SD. Following homogeneity of variance, comparisons among and between animals kept in captivity at LZ and LWP was made using ANOVA and t-test through Microsoft Office Excel 2000.

RESULTS AND DISCUSSION

Comparative mean serum chemistry variables for tigers confined in captivity at LZ and LWP are given in Table 1. The results revealed that the tigers kept at LZ had significantly ($P<0.05$) higher mean concentrations of Cl^- (108.6±0.57 versus 105.6±0.49 mmol/l) and a significantly lower creatinine (1.78±0.06 versus 3.04±0.35 mg/dl) and AST values (41.66±0.77 versus 54.88±4.22 U/l) than tigers kept at LWP. No other significant differences were observed in the rest of serum chemistry variables between and within the tigers in both forms of captivity.

The serum chemistry variables of the present study include most of the tests of interest in a routine clinical pathology laboratory. The population sample under study is though small but for wildlife species it chalks out a baseline data for further extensive studies. Most of the values reported here were similar to earlier work done (Dunbar *et al.*, 1997; Foster and Cunningham, 2009) however, certain differences were also observed.

The mean values of Cl^- for tigers kept at LZ in this study (108.6±0.57 mmol/l) were significantly higher than those kept at LWP (105.6±0.49 mmol/l). These values are not in line with the findings of previous workers as they have reported either higher or lower mean Cl^- levels for various felids. A lower mean value of 103.9±11.0 mmol/l has been reported by Foster and Cunningham (2009) while working on Florida panthers (*Puma concolor cougar*). Significantly higher values (123.6±4.01 mmol/l) have been reported by Marco *et al.* (2000) for captive European wildcats. Similarly, a higher mean value of 122.0±0.50 mmol/l has been reported by Ulysses *et al.* (1985) for Bengal tigers. The variation in our results is difficult to explain on any biological or physiological basis and could be related to individual variation (Dunbar *et al.*, 1997).

Table 1: Comparative mean (± SD) serum chemistry variables in tigers confined to captivity at Lahore zoo (LZ) and Lahore Wildlife Park (LWP), Pakistan

Parameters	Tigers at LZ (n=04)	Tigers at LWP (n=06)
Chloride (mmol/l)	108.6±0.57*	105.6±0.49
Sodium (mmol/l)	145.8±1.38	146.4±0.9
Potassium (mmol/l)	4.42±0.15	4.70±0.02
Urea (mg/dl)	107.3±4.99	91.7±22.4
Creatinine (mg/dl)	1.78±0.06*	3.04±0.35
Bilirubin (mg/dl)	0.34±0.01	0.34±0.01
AST (U/l)	41.66±4.89*	54.88±4.22
ALT (U/l)	50.10±10.14	31.88±4.57
APT (U/l)	48.10±4.89	43.10±3.0

Values with asterisk in a row differ significant at P≤0.05 from that in LWP group animals.

Mean creatinine levels recorded for LZ and LWP captive tigers in this study (1.78±0.06 versus 3.04±0.35 mg/dl) were significantly lower for LZ captive tigers than their counterparts. However, the values are in range with those of Marco *et al.* (2000) who reported mean creatinine level of 1.30±0.29 mg/dl in captive European wildcats. Serum creatinine levels are related to the muscular mass of the animal, physical activity and dietary factor (García *et al.*, 2010). Increased creatinine values in LWP harbored tigers may hence be attributed to increased physical activity.

The mean values of AST in this study for tigers kept at LZ and LWP (41.66±0.77 and 54.88±4.22 U/l) were significantly lower for LZ captive tigers than their counterparts. The values for both forms of captivity are in accordance with those of Marco *et al.* (2000) who reported a mean AST level of 46.2±14.0 U/l with a range of 23-74 U/l in European wildcats. Similarly, mean AST levels of 40.9±15.7 U/l for adult panthers have been reported by Foster and Cunningham (2009). Moen *et al.* (2010) while working on comparable serum chemistry of free-ranging and captive Canada lynx reported mean AST level of 105±6.00 and 35.00±2.00 U/l, respectively. High activities of muscle enzymes have been described in other species of wild felids due to strenuous exercise, struggling before handling and muscle damage from trapping, darting and anesthetic injection. Values for AST and ALT from wild caught Iberian lynx (Beltran *et al.*, 1991) have shown similar patterns of variability in wild caught and captive individuals. Hence, the increase in AST levels in LWP captive tigers as compared to their counterparts of LZ is attributed to the stress of physical capture in a restraint cage.

Conclusions: The present study clearly indicates that environment, whether captive or semi-natural has significant effect on many of the serum chemistry variables. Lack of published literature regarding the effect of captivity on physiological variables for tigers in

Pakistan makes this preliminary data as one of its kind; and envisages for further studies with a larger sample and added hematological variables. Evaluation of physiological and pathological alterations in wild and captive tiger individuals and populations can be made through these results. Furthermore, the results of the study can also be used as base line reference blood chemistry variables for the specie under study.

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REFERENCES

Anonymous, 2001. Tiger. http://wwf.panda.org/whatwedo/endangered species/tigers. Accessed on December 20, 2010.

Anonymous, 2010. *Panthera tigris*. http://www.iucnredlist.org/apps/ redlist/details. Accessed on December 15, 2010.

Beltran JF, M Delibes, F Recio and C Aza, 1991. Hematologic and serum chemical characteristics of the Iberian lynx *(Lynx pardina)* in southwestern Spain. Can J Zool, 69: 840-846.

Dunbar MR, N Pauline and SB Linda, 1997. Hematologic and serum biochemical reference intervals for Florida panthers. J Wildlife Dis, 33: 783-789.

Farooq U, HA Samad, A Khurshid and S Sajjad, 2011. Normal reference hematological values of one humped camels *(Camelus dromedarius)* kept in Cholistan desert. J Anim Plant Sci, 21: 157-160.

Foster GW and MW Cunningham, 2009. Hematology and serum chemistry values for free-ranging Florida panther neonates with a comparison to adult panther values. J Wildlife Dis, 45: 857-862.

García I, S Napp, I Zorrilla, A Vargas, J Pastor, A Muñoz and F Martínez, 2010. Determination of serum biochemical reference intervals for the Iberian lynx *(Lynx Pardinus)*. Vet J, 183: 201-204.

Marco I, F Martinez, J Pastor and S Lavin, 2000. Hematologic and serum chemistry values of the captive European wildcat. J Wildlife Dis, 36: 445-449.

McPhee ME, 2003. Generations in captivity increases behavioral variance: Considerations for captive breeding and reintroduction programs. Biol Conserv, 115: 71-77.

Moen R, JM Rasmussen, CL Burdett and KM Pelican, 2010. Hematology, serum chemistry, and body mass of free-ranging and captive Canada lynx in Minnesota. J Wildlife Dis, 46: 13-22.

Sajjad S, U Farooq, M Anwar, A Khurshid and SAM Bukhari, 2011. Effect of captive environment on plasma cortisol level and behavioral pattern of Bengal tigers *(panthera tigris tigris)*. Pak Vet J, 31: 195-198.

Ulysses SS, DL Armstrong and LG Simmons, 1985. Yohimbine hydrochoride reversal of ketamine hydrochloride and xylazine hydrochloride immobilization of Bengal tigers and effect on hematology and serum chemistry. J Wildlife Dis, 23: 296-300.