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Haemato-biochemical study of captive leopards

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Assessment of physiological status, diagnosis of diseases and ability of the animal to fight against the infections could be assessed by analysis of blood and their biochemical constituents (Jain 1986). Leopards (*Panthera pardus*) habitat with close vicinity to the rural area of transaction zone particularly outside the forest areas and they prey mainly on domestic animals like calves, sheep and goats with chances of communicable disease occurrence in wild animals through domestic to sylvatic cycle or vice versa (Shrivastav and Singh 2012). In recent years, the population of leopards has been decreasing owing to the indiscriminate poaching, expansion of human rehabilitation and reducing habitat on the borders of protected and non-protected forests. Therefore, blood profiles of flagship species like tiger, lion and leopards could be ascertained the level of communicable diseases migration and health status as they are enlisted under critically endangered species under wildlife Protection Act 1972 and could not be handled without tranquilization or immobilization (Shrivastav *et al.* 2011). Thus, little information on haematology and biochemistry of leopards is available either in captivity or free ranging animals as Fowler (1986), Dunbar *et al*.(1997), More *et al.* (2006), Singh *et al.* (2007) and Sabapara *et al.* (2008) that represents insufficient parameters for health monitoring and disease diagnostic status.

Therefore, the present investigation envisaged in captive leopards of central India with complete blood count and blood biochemicals related to the liver, heart, kidney function parameters that may be useful for evaluation of health status as well as monitoring of ailing leopards.

In the present study, 14 apparently healthy leopards, aged between 4–8 years of either sex (8 female and 6 male) of different rescue centres and zoos of Central India were immobilized for health monitoring and diseases diagnosis during 2003–2013. General body conditions like body coat, attentiveness, physical status as well as rectal temperature, pulse rate and respiration rate were taken and recorded for individual animal subjected to declaring apparently healthy status prior to collection of blood. From each immobilized leopard, 4–5 ml blood was collected by puncture of coccygeal vein using vacautainer with EDTA for serum collection. The complete blood profile including haematology and serum biochemistry was analysed using standard techniques (Jain 1986).

Blood smears of leopards were stained with romanowsky stain of Giemsa and 200 white blood cells from each blood smear were examined for differential leukocytes count. For biochemical analysis, the serum was utilized within 24 h of extraction by using semi auto-biochemical analyser with standard kits for respective serum constituents.

Prominent features in the normal haemogram included average size, appearance and shape of the erythrocytes, high haematocrit values, conspicuous sedimentation rate, variable schilling index, large granular eosinophils and predominance of neutrophils over lymphocytes with considerable platelets count in the individual animals. Erythrocytes reveal slight rouleaux formation, biconcave disk shape and uniform staining. Platelets were uniformly distributed in small to large clumps. Individual platelets were assessed pleomorphic with rounded to elongated shape. Small and large lymphocytes were encountered in varying number with little cytoplasm as nucleus occupied the entire space. Some lymphocytes contained a few azurophilic granules in their cytoplasm. Monocytes were usually larger than lymphocytes with foamy to vacuolated cytoplasm stained moderately blue. The nuclei were amoeboid or horse shoe in shape. Neutrophils showed coiled and 2–5 multilobed nuclei with pale to slightly pink foam and distinct cytoplasm. Eosinophils contained large uniformly hexagonal eosinophilic granules with bilobed nucleus stained with dark blue colour. Serum biochemistry revealed higher range of blood urea nitrogen, alanine amino transferase, aspartate amino transferase and alkaline phosphatase (Table 1).

Outrageous expansion of human population and habitat fragmentation causing detrimental effect on the forest ecology resulting onto communicable disease manifestations as an alarm to the endangered species of wild animals (Shrivastav and Singh 2012). Physiological

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Table 1. Haematological and biochemical values of Leopard (*Panthera pardus*)

Haematology	Unit	Range	Mean	SD (±)
Total erythrocytes count	$\times 10^6/\mu l$	6.5–15.5	8.9	2.2
Haemaglobin	g/dl	8.4–14	12.3	2.0
Pack cell volume	%	32–42	38.0	3.2
Erythrocyte sedimentation rate	Hours	29–38	33.5	3.5
Mean corpuscular volume	*fl*	29.2–54.1	42.7	9.2
Mean corpuscular haemoglobin	*pg*	9.8–19.1	14.2	3.2
Mean corpuscular haemoglobin concentration	%	21.5–98.4	43.5	27.7
Platelets	$\times 10^3/\mu l$	140–250	177.3	37.6
Icterus Index unit	µ/l	2.0–4.0	2.5	0.8
Total leukocyte count	$\times 10^3/\mu l$	1.6–13.7	7.8	5.4
Differential leukocyte count				
Neutrophils	%	64–70	66.1	2.4
Lymphocytes	%	19–28	23.6	3.5
Monocytes	%	3–6	5.1	1.3
Eosinophils	%	2–7	4.6	1.8
Basophils	%	0–1	0.1	0.4
Albumin	g/dl	2.8–6.4	4.2	1.6
Glucose	g/dl	80–135	95.8	20.4
Total protein	g/dl	2.5–8.5	6.0	2.0
Total bilirubin	mg/dl	0.4–1.6	0.8	0.4
Creatinine	mg/dl	0.24–2.35	1.1	0.7
Blood urea nitrogen	mg/dl	19–60	30.5	15.0
Alanine amino transferase	IU/L	18–92	53.8	23.9
Aspartate amino transferase	IU/L	6.7–92	32.8	31.4
Alkaline phosphatase	IU/L	12.7–88.5	50.9	29.0

disorders and diseases diagnosis on the basis of haematological and biochemical data base are essential to ascertain the control measures for possible disease manifestations.

In the present study, the complete blood count and serum biochemistry of 14 apparently healthy leopards (8 female and 6 male) were envisaged with their reference value for evaluation of physiological status to generate the long term base line data on leopards (*Panthera pardus)*. The haematological values obtained by More *et al.* (2006), Singh *et al.* (2007) and Sabapara *et al.* (2008) were compared with the present findings as no remarkable differences were encountered in the haemogram of male and female leopards. The obtained biochemical constituents of the present study (Table 1) showed similar trend with more or less differences as reported by Dunbar *et al.* (1997) in free ranging Florida panthers. However, they obtained high range of alanine amino transferase (33–92, 60.2±35.0 IU/L) and aspartate amino transferase (37–105, 73.4±77.8 IU/L) in comparison to the present study (Table 1) might be associated with the habitat factors and nutritional intake as Shrivastav *et al.* (2011) also reported the high range of blood biochemical's related to liver function tests in free ranging tigers.

SUMMARY

The analysis of blood constituents and their biochemicals are one of the important tools for screening of health status. The study to obtain the normal blood profile of captive leopards was planned. The haemato-biochemicals of 14 apparently healthy leopards were studied of different zoos and captivity in Madhya Pradesh. The range and means (with one standard deviation) for the haematological values viz. total erythrocyte count, haemoglobin, pack cell volume with noticeable erythrocyte sedimentation rate with absence of reticulocytes whereas, total leukocyte count and differential leukocyte counts revealed large granulated eosinophils and predominance of neutrophils over lymphocytes were recorded. The blood biochemical constituents showed the wide range of liver and kidney function enzymes indicates the high tolerance power and adaptability of leopards to sustenance even in adverse conditions.

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