American Journal of Pharmaceutical Sciences

Journal homepage: www.mcmed.us/journal/ajps

ERYTHRON FUNCTIONS VERSUS TEMPERATURE HUMIDITY INDEX VALUES IN LABRADOR DOG

Mamta Saini, B.S.Saini, Ashish Joshi, Sunita Pareek, Nalini Kataria* and A.K.Kataria

Apex Centre for Animal Disease Investigation, Monitoring and Surveillance College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner – 334 001, Rajasthan, India.

Article Info

Received 05/10/2016
Revised 26/10/2016
Accepted 20/11/2016

Key words: Cold, comfortable, environmental temperature, erythron, humid hot, Labrador.

ABSTRACT

An endeavor was conducted to elucidate the influence of large variations in temperature humidity index values on erythron functions in Labradors. To accomplish the mandate of investigation, blood samples were collected from the adult Labrador male dogs of during cold, humid hot and comfortable environmental temperature periods (ETP). Sampling was done from the same pets during January, July and November months, respectively with obtaining of temperature humidity index values. The mean value of each parameter during humid hot and cold ambiences were evaluated against respective mean value obtained during comfortable period. The erythron functions incorporated RBC counts, haemoglobin, packed cell volume, mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration, erythrocyte sedimentation rate, platelet counts and WBC count. A considerable ($p<0.05$) effect of extreme ETP was found on each parameter. The mean values of RBC counts, haemoglobin, packed cell volumes, mean corpuscular haemoglobin concentration, platelet and WBC countswere significantly ($p<0.05$) higher during humid hot and significantly ($p<0.05$) lower during cold when equated to comfortable ETP while the mean values of MCV, MCH and ESR were appreciably ($p<0.05$) lower during humid hot and extensively ($p<0.05$) higher during cold as compared to comfortable ETP. The mean values of RBC counts, haemoglobin, packed cell volumes, mean corpuscular haemoglobin concentration, platelet and WBC counts were significantly ($p<0.05$) lower during cold as compared to humid hot whereas the mean values of MCV, MCH and ESR were significantly ($p<0.05$) higher during cold as compared to humid hot ETP. It was construed that extreme ETP influenced erythron functions. The upshot of the study insinuated that additional care of pets must be taken during the periods of large variations of temperature humidity index values. This may assist in deterrence of loss of water from the blood during humid hot ambience and avert the possibility of dehydration in the animals.

INTRODUCTION

Animals exhibit great variation due environmental variations. Being a loyal family pet, Labrador has become the idyllic preference for large number of people.

Corresponding Author

Nalini Kataria
Email: nalinikataria@rediffmail.com

However, there is dearth of scientific attention to know changes in physiological variations due to environment in Labradors. Hence it becomes compulsory to supervise health issue of Labradors in a logical manner. Now it is a broadly established fact that pet possession and animal support in therapy and education may have massive amount of optimistic consequence on human population. Blood is vital in appraising health status of animals. Erythron function test is an important tool to investigate the health status of pets. Every laboratory should prepare a

series of normal values obtained from different breeds of animals with varying environmental temperatures. This may help in proper interpretation of clinical data. Animal variability can affect upshot of investigation. The determination of normal erythron function values in different animal species are priceless implements in the diagnosis and prognosis of many diseases. Scientists are of the opinion that surrogate tools like haematological parameters can be used effectively in dogs. Increase in parasitic load is found to be followed by intensification of non-regenerative anaemia, neutrophilia, eosinopenia, hepatic injury and oxidative imbalance [1]. Erythron function tests are useful in confirming various types of carcinomas and play an important role in preclinical evaluation of health of animals. Platelet function tests are important in assessing valvular heart problems in canines [2]. Scientists prefer to use haematological parameters along with other tests for screening of infections in the dog [3]. Erythron function tests are important tools for the assessment of anaemia in the dogs. Regular screening of blood samples is mandatory for upholding of health condition of animals. Consideration of breed, sex and age on haematological parameters are important for interpretation. Scientists are concerned about changes in test upshots illustrating growth associated changes in body tissue and metabolism leading to dynamic and marked changes in haematological parameters, which have to be considered for the interpretation of clinical data obtained from dogs [4]. Erythron function tests are gaining importance for critical management of geriatric dogs. Erythron function evaluation can be useful for correlating with the patho-physiological status of the animal. Environment can influence erythron functions, for this reason, the setting up of standard basic data is significant. Extreme changes in environmental temperature may be harmful to dogs. Recurrent variations in environmental conditions and stuffy spaces can be a factor for development of environmental stress in dogs. Heat and humidity can elevate canine body temperature to risky levels. Heat associated troubles are among the most common canine summer sickness. The awareness of these alterations is important to design specific health strategies for an early diagnosis of clinical cases. This can minimize the peril of hot or cold environment related diseases. Looking towards the paucity of research on erythron function tests during different temperature humidity index values, an endeavor was planned to determine values of erythron function parameters to assess the effect of extreme environmental temperatures.

MATERIALS AND METHODS

The present endeavor was planned to screen ten healthy adult (between 3 and 5 years) Labrador male dogs kept by the private owners with almost similar type of management conditions. Blood sample for the determination of various erythron function parameters were collected during comfortable, humid hot and cold environmental temperature periods (ETP). Temperature humidity index values were calculated for each ETP [5]. During all the ambiences same animals were used. Blood was collected through saphenous vein with anticoagulant (EDTA dipotassium) in morning hours and handled on the same day to analyse different parameters. Standard methods were used to determine erythron function parameters viz. RBC counting, haemoglobin (Hb), packed cell volume (PCV), erythrocyte sedimentation rate (ESR), mean corpuscular volume(MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), WBC count and platelet counts (PLT) [6]. The wet and dried blood films were examined in order to screen for microfilaria and protozoan infection. The dried blood smears were stained by Leishman's methods.Statistical significance for individual parameter between comfortable and extreme ambiences was analysed [7]. Mean value during comfortable ETP for each parameter was taken as control.

RESULTS

The mean ±SEM values of erythron function parameters are presented in table 1 and per cent changes during humid hot and cold environmental temperature period are depicted in figure 1 and 2, respectively. The main parameters included RBC counts, haemoglobin, packed cell volume, mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration, erythrocyte sedimentation rate, platelet counts and WBC count. Temperature humidity index values of sample collection period varied as 70-71, 82-84 and lower than 60 during comfortable, humid hot and extreme cold ETPs, respectively. A significant ($p<0.05$) effect of extreme environmental temperature period was observed on each parameter. A significant ($p<0.05$) effect of extreme ETP was found on each erythron function parameter. The mean values of RBC counts, haemoglobin, packed cell volumes, mean corpuscular haemoglobinconcentration, platelet and WBC countswere significantly ($p<0.05$) higher during humid hot and significantly ($p<0.05$) lower during cold when equated to comfortable ETP while the mean values of MCV, MCH and ESR were appreciably ($p<0.05$) lower during humid hot and extensively ($p<0.05$) higher during cold as compared to comfortable ETP. The mean values of RBC counts, haemoglobin, packed cell volumes, mean corpuscular haemoglobin concentration, platelet and WBC counts were significantly ($p<0.05$) lower during cold as compared to humid hot and the mean values of MCV, MCH and ESR were significantly ($p<0.05$) higher during cold as compared to humid hot ETP. Maximum percent change was observed in the values of ESR during humid hot and cold ETPs, respectively. No microfilaria and protozoan infection was found.

Table 1. Mean ±SEM values of erythron function parameters during various environmental temperature periods (ETP) of dog (n=10)

Parameters	Mean ±SEM values		
	ComfortableETP	Humid hotETP	ColdETP
RBC, 10^{12} / L	8.51 ± 0.001	9.41 ±0.002[d]	7.15 ± 0.002[db]
Hb, g/L	138.0 ±0.01	153.00 ±0.02 [d]	122.50 ±0.04[db]
PCV, L/L	0.40 ±0.002	0.45 ±0.002 [d]	0.35±0.003[db]
MCV, fl	48.78 ±0.002	46.28±0.003 [d]	52.24 ±0.001[db]
MCH, pg	17.50 ±0.003	16.40±0.002 [d]	17.55 ±0.001[db]
MCHC, g/L	349.00 ±0.12	355.00±0.10 [d]	330.00 ±0.03[db]
ESR, mm/hour	6.8 ±0.002	5.00 ±0.001 [d]	8.13 ±0.002[db]
Platelets, 10^9 / L	340.00±1.00	385.00±1.60 [d]	318.00±1.30[db]
WBC, 10^9 / L	10.31 ± 0.003	11.50 ±0.004 [d]	9.15 ± 0.002[db]

[d]= Mean differs significantly ($p<0.05$) from respective comfortable mean value
[b]= Mean differs significantly ($p<0.05$) from respective hot mean value
RBC = Red blood cells Hb = Haemoglobin PCV = Packed cell volume
MCV = Mean corpuscular volume MCH = Mean corpuscular haemoglobin
MCHC = Mean corpuscular haemoglobin concentration
ESR = Erythrocyte sedimentation rate
WBC = white blood cells PLT = Platelets.

Fig 1. Per cent change in erythron function test during humid hot environmental temperature period

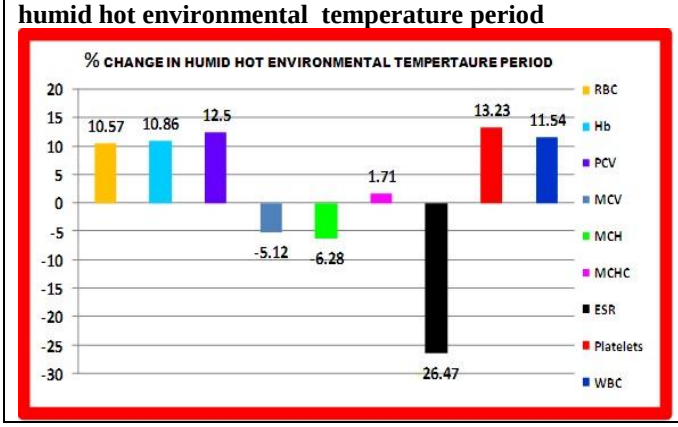
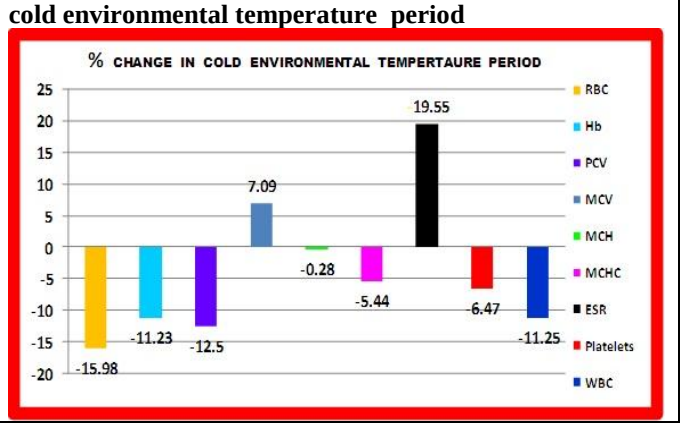


Fig 2. Per cent change in erythron function test during cold environmental temperature period



DISCUSSION

Various causes influence the total number of erythrocyte in the blood out of which environmental temperature is one [8]. In the present endeavor, elevated concentration of cells viz. RBC, WBC and platelets during humid hot ETP in contrast to comfortable ETP showed haemo-concentration. It may occur due to declining in plasma volume owing to heat stress. Concurrently the mean values of the cellular components in the blood were decreased during cold ETP when judged against comfortable ETP exhibiting spreading of plasma volume. Lowering of ESR value during humid hot and its increase during cold ETP as compared to comfortable ETP hold the surmise of development of haemo-concentration. Researchers have stated comparable changes in the ESR value during hot and cold ETPs, respectively [9].

Variation in erythrocytes numbers can affect other blood indices associated with erythrocytes and haemoglobin is one of them. Probably this was the reason that an increase in haemoglobin concentration was observed associated with increased RBC number during hot ETP and decreased haemoglobin concentration associated with decreased RBC number during cold ETP as compared to comfortable ETP. Owing to this, other parameters of erythron functions were also affected. The slight haemo-concentration during extreme hot ETP affected the ESR which was reduced significantly ($p<0.05$) and packed cell volume which was increased significantly ($p<0.05$). In order to dissipate heat water is evaporated by the panting mechanism thereby causing slight haemo-concentration during extreme hot condition. During stress condition a rise in leucocytes number can be observed [10]. Erythron functions serve as one of the screening procedures and their results offer valuable diagnostic information. Erythrocyte sedimentation rate may be performed on canine blood to gain some useful information for clinical evaluation of the patient. Muscular activity, excitement, apprehension, emotional stress and infection have a significant influence on total leucocyte numbers. Packed cell volume is imperative to observe the magnitude

of dehydration due to temperature stress [10]. The result of present investigation revealed that ESR values can be effectively used in the clinical cases to appraise the magnitude of water deficit in the dog. The data of erythron functions showed the association with each other during various ETPs. Packed cell volume and erythrocyte sedimentation rate are two important tests of erythron functions which indirectly help in assessing hydration status of animals. Lower ESR and higher PCV assist in detecting magnitude of plasma loss.

CONCLUSION

Investigation elucidated the variations in erythron function test parameters due to temperature humidity index values. Data produced in the investigation will be valuablein clinical interpretation of erythron functions and for healthier management of Labradors. Enormous magnitude of differences in the values due to large variations in THI values exhibited the influence of extreme environmental tempertaures. The result of the investigation implied that extra care of pets must be taken during the periods of humid hot and cold environments. This may help in avoidance of water deficit from the blood during humid hot and avert the possibility of chronic dehydration in the pets.

ACKNOWLEDGEMENT: None

CONFLICT OF INTEREST:
The authors declare that they have no conflict of interest.

REFERENCES

1. Beetz A, Uvnäs-Moberg K,Julius H, Kotrschal K. (2012). Psychosocial and psycho-physiological effects of human-animal interactions: The possible role of oxytocin. *Frontiers in psychology*, 3, 234.
2. Tong LJ, Hosgood GL, French AT, Irwin PJ, Shiel RE. (2016). Platelet function and activation in Cavalier King Charles Spaniels with subclinical chronic valvular heart disease. *American Journal of veterinary Research*, 77(8), 860-868.
3. Reddy BS, Kumari KN, Sivajothi S, Rayulu VC. (2016). Haemato-biochemical and thyroxin status in Trypanosomaevansi infected dogs. *Journal of Parasitic Diseases*, 40(2), 491-495.
4. Balls M, Amcoff P, Bremer S, Casati S, Coecke S, *et al*. (2006). The principles of weight of evidence validation of test methods and testing strategies. *Alternatives to laboratory animals*, 34, 603–620.
5. Gantner V, Mijic P, Kuterovac K, Solic D, Gantner R. (2011). Temperature-humidity index values and their significance on the daily production of dairy cattle. *Mljekarstvo*, 61(1), 56-63.
6. Jain NC. (1986). Schalm's Veterinary Haematology, 4thedn, Lea&Febiger, Philadelphia, 20-85.
7. Kaps M, Lamberson WR. (2004). Biostatistics for Animal Science. CABI Publishing Oxford shire, 36-270.
8. Ha CS, Son HY, Kang BY, Cha SW, Park JI, Han SS. (1995). A study of hematology and serum chemistry in beagle dogs. *Korean journal of laboratory animal science*, 11, 153–158.
9. Kataria N, Kataria AK Agarwal VK, Garg SL, Sahani MS. (2002). Effect of seasonal water restriction on erythrocytic and leucocytic indices in camel. *Indian journal of animal health*, 41, 24-28.
10. Kataria N and Kataria AK. (2002). Effect of extreme ambience on certain blood indices in dogs. *Journal of canine practice and research*, 2(2), 46-50.