A STUDY ON ALTERATION IN HAEMATOLOGICAL PARAMETERS IN HEAT STROKE AFFECTED CATTLE

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ABSTRACT

A study was carried out to estimate the changes in haematological parameters in heat stroke affected cattle. Blood samples were collected from sixteen heat stroke affected cattle and estimation of haemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), total leucocyte count (TLC), total platelet count (TPC), differential leucocyte count (DLC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were carried out. A group of ten healthy cattle was taken as control and same parameters were estimated for comparison. The results indicated that PCV, Hb, MCH, MCHC and neutrophils were significantly higher whereas lymphocyte and total platelet count were significantly lower in heat stroke suffered cattle as compared with the healthy control group. The haematological alterations observed in this study can be helpful in diagnosis and therapeutic management of heat stroke.

Key words: Haematological, heat stroke, cattle

Introduction

Heat stroke is a life-threatening condition characterized by hyperthermia (core body temperature above 104^0F), central nervous system abnormalities and varying degrees of organ dysfunction and occurs when the normal thermoregulatory system fails (Bouchama and Knochal, 2002; Grogan and Hopkins, 2002).Heat stroke is a chief problem of high producing exotic and cross bred dairy cattle especially when the environmental temperature and relative humidity are high and with prolonged exposure to direct sunlight (Grogan and Hopkins, 2002). High humidity makes the sweating mechanism relatively ineffective, thereby making cattle unable to maintain their core body temperature. Heat stroke affects almost all systems of the body including the CNS, gastrointestinal, cardiovascular, hepatobiliary, renal, haematological and muscular (Walters, 2002). It has been estimated that heat stroke causes severe economic loss in approximately 60% of the dairy farms around the world (Wolfenson *et al*., 2000). Therefore the present study was designed to evaluate haematological alterations in heat stroke affected cattle.

Materials and Methods

A total of sixteen cattle (adult exotic and cross bred dairy cattle) presented at Medicine Clinic of Teaching Veterinary Clinical Complex, College of Veterinary and Animal Science, Bikaner and local dairy farms in and around Bikaner city during August and September months of the year 2015 were included in the present study. Blood samples were collected from jugular vein of all sixteen heat stroke affected and ten healthy control group cattle in EDTA containing sterilized test tubes with all aseptic precautions.The blood samples were subjected to estimation of haemoglobin, packed cell volume, total erythrocyte count, total leucocyte count, total platelet count, differential leucocyte count, mean corpuscular volume, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration as per the methods described by (Jain, 1986).

Statistical analysis

The data were analyzed by unpaired 't' test. Mean of all the parameters of heat stroke affected cattle were compared with the mean of all parameters of healthy control group.

Results and Discussion

The mean ± SE values of haematological parameters of sixteen heat stroke affected and ten healthy control cattle are presented in Table 1. In present study, the values of packed cell volume, haemoglobin, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration ($p<0.05$) and neutrophil ($p<0.01$) were significantly increased, whereas lymphocyte and total platelet count ($p<0.01$) were significantly decreased in heat stroke suffered cattle as compared to healthy control group.

Heat stroke is a medical emergency requiring rapid diagnosis and treatment. This potentially life-threatening condition occurs mostly when environmental temperatures and relative humidity are high and is characterized by hyperthermia, panting, tachycardia and changes in mental status following heat exposure (Barrow and Clark, 1998; Flournoy *et al*., 2003).

The results of present study showed that the values of packed cell volume percentage, haemoglobin concentration, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration were significantly higher in heat stroke affected cattle while total erythrocyte count and mean corpuscular volume had non-significant changes as compared to the healthy control cattle which support the observations of similar studies carried out by several earlier workers (Haque *et al.*, 2013; Rana *et al.,* 2014; Abd-Alkareem*et al.,* 2015 and Chaudhary *et al.,* 2015). The increase in haemoglobin, PCV, MCH, and MCHC values observed in present study may be attributed to moderate to severe dehydration (Dematte *et al.*,

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Table 1: Mean±SE values of haematological parameters in apparently healthy and heat stroke suffered cattle.

S. No.	Parameters	Healthy Cattle (n=10)	Heatstroke suffered cattle (n=16)
1	Hb (g/dl)*	10.68±0.4168[a]	11.94±0.1466[b]
2	PCV*	33.62±1.2323[a]	36.81±0.4899[b]
3	TEC (10^{12}/lt)	6.94±0.2420	7.07 ±0.1962
4	TLC (10^{9}/lt)	7.66±0.2544	7.87 ±0.2930
5	TPC (10^{9}/lt)**	467.40 ± 28.6909[c]	315.62±12.3424[a]
5	MCH (pg)*	15.38±0.3725[a]	16.50±0.4615[b]
6	MCV (fl)	48.51±1.338	50.52±1.5295
7	MCHC (per cent)*	31.74±0.2171[a]	32.72±0.3469[b]
8.	Lymphocyte (%) **	64.60±0.9092[b]	50.31±1.2491[a]
9.	Monocyte (%)	2.60±0.3711	2.75 ± 0.2997
10.	Neutrophils (%) **	29.70±1.0651[a]	44.56±1.1318[b]
11.	Eosinophils (%)	3.10±0.4582	2.37±0.2633
12.	Basophils (%)	0	0

* (P<0.05) ** (P<0.01)
Means with different superscripted letters in the same row differ significantly.

1998). The higher PCV values could be attributed to an adapted mechanism to provide water necessary for evaporative cooling process (Al-Haidary, 2004).

In present study total leucocyte counts were non-significantly changed in heat stroke suffered cattle as compared with healthy control cattle, similar findings were reported previously by (Abdalla *et al.*, 2009; Haque *et al.,* 2013 and Rana *et al.*, 2014) which may be due to seasonal changes in thermal environment was not affect the total leucocyte counts (Abdalla *et al.,* 2009). In the present study decrease in total platelets count (thrombocytopoenia) was observed. The activation of the coagulation cascade is exaggerated and platelets are consumed in large quantities, leading to thrombocytopenia (Knochel and Reed, 1994; Bouchama and Knochel, 2002). In the present study significant increase in the number of neutrophil was observed which is in agreement with finding of similar study by (McFarlane and Curtis, 1989 and Alam *et al.,* 2011) and it could be explained by inflammation associated with heat stroke. Moderate heat stroke results in mild to moderate inflammatory responses which are self-limiting and subside after 36 hours with recovery of the animals (Bouchama and Knochel, 2002 and Bouchama *et al.,* 2004). A significant decrease in the number of lymphocyte was observed, similar findings were recorded by McFarlane and Curtis (1989) which may be due to stress associated with high ambient temperature and high humidity.

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