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Early changes in vital signs and leukogram profile of diarrheic Surti buffalo calves

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Abstract

The present study was conducted to study Early changes in vital signs and leukogram profile of diarrheic Surti buffalo calves. Thirty Surti buffalo calves were selected and divided into two groups viz. healthy (n=10) and diarrheic calves (n=20). Recording of rectal temperature, respiration rate and heart rate was done simultaneous to blood collection in all the calves as soon as diarrhea was reported. Blood was analyzed for leukogram profile. Results revealed that diarrheic calves had significantly ($p \leq 0.05$) higher physiological parameters such as rectal temperature, heart rate as well as respiration rate as well as significantly ($p \leq 0.05$) higher leukogram profile parameters such as total leukocyte count. There was no change in differential leukocyte count between health and diarrheic calves. Thus, it was concluded that early changes in diarrheic Surti buffalo calves include rise in parameters of vital signs such as increase in total leukocyte count without any change in differential leukocyte count.

Keywords: Vital signs, leukogram profile, diarrhoea, Surti buffalo calves

1. Introduction

India is an agrarian based economy is dependent on livestock on many fronts. Livestock contributes significantly to GDP of the country. Among many sectors, dairy is key area where milch animals contributes to nutritional as well as financial security for the whole population. Among milch animals, buffaloes (*Bubalus bubalis*) are the mainstay as they have a large population in our country. State of Gujarat especially southern region is populated with Surti breed of buffaloes. As the future performance will be reflection of today's foundation, it is imperative that rearing of calves of buffaloes should be taken good care upon. Diarrhea is particularly prevalent in calves aged under three months (Malik *et al.*, 2013) [1]. The health of buffaloes calves at an early age is jeopardized due to common occurring disease of diarrhea. Diarrhea can be both infectious and non-infectious but ultimately the death occurs due to internal derangement. The intensity and extent of these changes may vary depending on species, age, hygiene, management, feeding, geographical and surrounding environment and climatic factors. It is important to study early changes that may occur during diarrhea in buffalo calves so as to differentiate from other such anomalies and initiate a therapeutic as well as managerial support for faster recovery and minimizing economical losses that may be incurred due to prolonged illness. Early signs may be reflected in changes in physiological parameters such as rectal temperature, respiration rate and heart rate. There are changes that may also involve variations in leukogram profile. Therefore, the present study was conducted with the objective to study early changes in vital signs and leukogram profile of diarrheic Surti buffalo calves.

2. Materials and Methods

The present study was done at Department of Veterinary Physiology and Biochemistry, College of Veterinary Science and Animal Husbandry, Navsari (Kamdhenu University), Gujarat, India. The study was done after it was approved by Institutional Animal Ethics Committee (IAEC). Selection of about thirty buffalo calves of Surti breed (aged about 2 months) was done from organized farm of Navsari district that is located in south Gujarat region. They were divided into groups as healthy calves (n=10) as well as those suffering from diarrhoea i.e., diarrheic calves (n=20). As soon as diarrhoea was reported in calves physiological parameters such as rectal temperature, respiration rate and heart rate was recorded and whole blood samples were collected from all the calves.

Whole blood was collected in vacutainer containing anticoagulant (K₃EDTA) for analyzing leukogram profile such as total leukocyte count and differential leukocyte count viz. lymphocytes, neutrophils, monocytes, basophils and eosinophils. Obtained data was statistically analyzed and Mean±SE, minimum and maximum values for each parameter were mentioned for both the groups. Comparison of means between groups was done using student

t-test for differences at 5% level of significance ($p \leq 0.05$).

3. Results

3.1 Physiological parameters

The results for physiological parameters and leukogram profile of healthy and diarrheic Surti buffalo calves are mentioned in table 1 and 2 respectively.

Table 1: Physiological parameters of healthy and diarrheic Surti buffalo calves

Parameter	Group	Mean±SE	Range
Rectal temperature (°F)	Healthy calves (n=10)	101.09 ^b ±0.28	99.80-102.20
	Diarrheic calves (n=20)	102.49 ^a ±0.17	101.00-103.70
Heart rate (beats/minute)	Healthy calves (n=10)	108.00 ^b ±0.47	106.00-111.00
	Diarrheic calves (n=20)	111.25 ^a ±0.84	106.00-118.00
Respiration rate (breaths/minute)	Healthy calves (n=10)	16.40 ^b ±0.31	15.00-18.00
	Diarrheic calves (n=20)	18.15 ^a ±0.39	16.00-22.00

Means with alphabetical superscripts (a, b) differ significantly ($p \leq 0.05$) between groups

Rectal temperature of healthy calves was 101.09±0.28°F and diarrheic calves was 102.49±0.17°F. Minimum and maximum rectal temperature of healthy calves ranged from 99.80°F to 102.20°F and of diarrheic calves from 101.00°F to 103.70°F. Rectal temperature of diarrheic calves was significantly ($p \leq 0.05$) higher as compared to healthy calves.

Heart rate of healthy calves was 108.00±0.47 beats/minute and diarrheic calves was 111.25±0.84 beats/minute. Minimum and maximum heart rate of healthy calves ranged from 106.00 to 111.00 beats/minute and of diarrheic calves from 106.00 beats/minute to 118.00. Heart rate of diarrheic calves was

significantly ($p \leq 0.05$) higher as compared to healthy calves.

Respiration rate of healthy calves was 16.40±0.31 breaths/minute and diarrheic calves was 18.15±0.39 breaths/minute. Minimum and maximum respiration rate of healthy calves ranged from 15.00 breaths/minute to 18.00 breaths/minute and of diarrheic calves from 16.00 breaths/minute to 22.00 breaths/minute. Respiration rate of diarrheic calves was significantly ($p \leq 0.05$) higher as compared to healthy calves.

3.2 Leukogram profile

Table 2: Leukogram profile of healthy and diarrheic Surti buffalo calves

Parameter	Group	Mean±SE	Range
Total leukocyte count, TLC ($\times 10^3/\mu\text{l}$)	Healthy calves (n=10)	7.84 ^b ±0.11	7.40-8.35
	Diarrheic calves (n=20)	10.41 ^a ±0.26	8.40-12.10
Differential Leukocyte Count			
Lymphocytes (%)	Healthy calves (n=10)	62.60±0.72	59.00-66.00
	Diarrheic calves (n=20)	62.05±0.44	59.00-66.00
Neutrophils (%)	Healthy calves (n=10)	31.60±0.73	27.00-34.00
	Diarrheic calves (n=20)	32.65±0.56	29.00-37.00
Monocytes (%)	Healthy calves (n=10)	2.80±0.29	2.00-4.00
	Diarrheic calves (n=20)	2.50±0.15	2.00-4.00
Basophils (%)	Healthy calves (n=10)	0.20±0.13	0.00-1.00
	Diarrheic calves (n=20)	0.20±0.09	0.00-1.00
Eosinophils (%)	Healthy calves (n=10)	2.80±0.25	2.00-4.00
	Diarrheic calves (n=20)	2.60±0.17	2.00-4.00

Means with alphabetical superscripts (a, b) differ significantly ($p \leq 0.05$) between groups

Total leukocyte count (TLC) in healthy calves 7.84±0.11 $\times 10^3/\mu\text{l}$ and diarrheic calves was 10.41±0.26 $\times 10^3/\mu\text{l}$. Minimum and maximum total leukocyte count (TLC) of healthy calves ranged from 7.40 $\times 10^3/\mu\text{l}$ to 8.35 $\times 10^3/\mu\text{l}$ and of diarrheic calves from 8.40 $\times 10^3/\mu\text{l}$ to 12.10 $\times 10^3/\mu\text{l}$. Total leukocyte count (TLC) was significantly ($p \leq 0.05$) higher in diarrheic calves as compared to healthy calves.

Lymphocytes in healthy calves were 62.60±0.72% and diarrheic calves were 62.05±0.44%. Minimum and maximum

lymphocytes in healthy calves ranged from 59.00% to 66.00% and in diarrheic calves from 59.00% to 66.00%. As compared to healthy calves, lymphocytes were slightly lower in diarrheic calves but the difference was not significant.

Neutrophils in healthy calves were 31.60±0.73% and diarrheic calves were 32.65±0.56%. Minimum and maximum neutrophils in healthy calves ranged from 27.00 to 34.00% and in diarrheic calves from 29.00% to 37.00%. As compared to healthy calves, neutrophils were slightly higher in diarrheic

calves but the difference was not significant.

Monocytes in healthy calves were $2.80 \pm 0.29\%$ and diarrheic calves were $2.50 \pm 0.15\%$. Minimum and maximum monocytes in healthy calves ranged from 2.00% to 4.00% and in diarrheic calves from 2.00% to 4.00%. Monocytes were slightly lower in diarrheic calves but the difference was not significant.

Basophils in healthy calves were $0.20 \pm 0.13\%$ and diarrheic calves were $0.20 \pm 0.09\%$. Minimum and maximum basophils in healthy calves ranged from 0.00% to 1.00% and in diarrheic calves from 0.00% to 1.00%. Basophils were slightly lower in diarrheic calves but the difference was not significant.

Eosinophils in healthy calves were $2.80 \pm 0.25\%$ and diarrheic calves were $2.60 \pm 0.17\%$. Minimum and maximum eosinophils in healthy calves ranged from 2.00% to 4.00% and in diarrheic calves from 2.00% to 4.00%. Eosinophils were slightly lower in diarrheic calves but the difference was not significant.

4. Discussion

4.1 Physiological parameters

Rectal temperature, heart rate as well as respiration rate are vital signs of health. Any significant variation in them indicates an adverse change in internal milieu of the body.

In the present study, it was inferred that due to diarrhoea, loss of fluids and electrolytes caused dehydration, hypovolemia and metabolic acidosis in the affected calves. An increase in rectal temperature in diarrheic calves might have occurred owing to dehydration that may impair thermoregulatory mechanism causing an increase in body temperature. Increased heart rate in diarrheic calves of present study can be attributed to hypovolemia induced cardiovascular adjustment of compensatory tachycardia to maintain normal cardiac output. Hyperventilation may occur to reduce pCO_2 levels in blood as an additional measure to buffer (apart from bicarbonate buffer system of blood) and mitigate the impact of metabolic acidosis.

Like the findings of present study, increased rectal temperature, heart rate as well as respiration rate have been reported in calves during diarrhoea (Kalita *et al.*, 2000; Verma *et al.*, 1995 and Devkate *et al.*, 2010) [2, 3, 4].

In contrast to findings of present study, interestingly some studies have also reported sub-normal body temperatures (Kalita *et al.*, 2000; Fernandes *et al.*, 2009 and Cho *et al.*, 2014) [2, 5, 6]. This could be viewed in the light of another study by El-sheikh *et al.* (2012) [7] which states that after onset of diarrhoea initially body temperature increases but as it progresses to chronic stage of dehydration the temperature may become sub-normal.

In the present study, the recording of parameters was done at the beginning of diarrhoea rather than at later stage when they transform to chronic diarrhoea. Thus, increase in rectal temperature, heart rate and respiration rate may reflect the early changes during diarrhoea in Surti buffalo calves.

4.2 Leukogram profile

Leukogram profile comprises of different types of leucocytes that play role in defence mechanism directly (Shekhar *et al.*, 2017) [8]. However, if the cause is non-infectious their numbers may also fluctuate either due to stress or due to dehydration induced hemoconcentration.

Increase in any particular type of leukocyte may increase total leukocyte count and as well as change the relative proportion

of differential leukocyte count. However, in absence of any infectious cause of diarrhoea, dehydration itself may cause relative increase in leukocytes (due to hemoconcentration) without altering the relative change in differential leukocyte count. This might be the case of diarrheic calves in the present study wherein they showed significant rise in total leukocyte count without any change in relative proportions of differential leukocyte count. In the present study, the total leukocyte increase even though significant was not drastic. Increase in TLC due to infectious causes was much greater (Mir, 2009 and Tikoo *et al.*, 2017) [9, 10] than due to non-infectious causes such as stress Gupta *et al.* (2016) [11] or dehydration.

Similar findings of leukogram profile of present study comprising of increase in TLC without any change in DLC was also reported by Sweetey (2017) [12] in diarrheic calves as compared to healthy ones. Increase in TLC in diarrheic calves have been a consistent observation in several other studies (Asati *et al.*, 2006; Bashir *et al.* 2015. and Amrutha, 2018) [13, 14, 15] that agree to the present study findings.

Therefore, increased TLC without any change in DLC in Surti buffalo calves may serve as indication for early diarrheic changes.

5. Conclusion

It was concluded from the present study that early changes that occur in diarrheic Surti buffalo calves comprise of increase in vital signs of rectal temperature, heart rate and respiration rate and increased leukogram profile parameters such as total leukocyte count without any change in differential leukocyte count. They should be taken into consideration with progression of diarrhea.

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