

## EFFECT OF INDUCED HYPERTENSION ON PHYSIOLOGICAL AND HAEMODYNAMIC PARAMETERS IN MURRAH BUFFALO

P. K. Choudhary<sup>1</sup>, G. K. Choudhary<sup>2</sup>, P. K. Das, S. Sanyal and P. R. Ghosh

West Bengal University of Animal and Fishery Sciences,  
Kolkata, West Bengal -700037, India

### ABSTRACT

The study was conducted in twelve numbers of female Murrah buffalo dividing in to two groups, each of six numbers. One as control and other group as experimental animals. Physiological and haemodynamic parameters were studied in both groups. In experimental group, 2000 ml of normal saline solution was introduced to each animal through two intravenous routes within 20 minutes. There was non-significant variation of rectal temperature at 15 and 25 minutes after induced hypertension. The mean respiratory rate at 15 minutes of induced hypertension increased non-significantly and at 25 minutes after induced hypertension the mean value of respiration was significantly ( $p < 0.01$ ) increased compared to control group. Post exposure the heart rate was non-significantly increased at 15 minute from control group. At 25 minute of induced hypertension the mean heart rate also increased non-significantly from the mean of 15 minutes. The pulse rate significantly ( $p < 0.05$ ) increased from control at 15 and 25 minutes after induced hypertension respectively. The pulse deficit was non-significantly increased at 15 and 25 minutes after induced hypertension. The mean value of blood volume increased significantly ( $p < 0.05$ ) at 25 minutes of induced hypertension. The present study helps the clinician to diagnose the hypertension in buffalo and it can be elaborated in diagnosis of hypertension in other animal also.

**Key words:** Murrah buffalo, Normal saline solution, Induced hypertension, Haemodynamic parameters, Hypertension

In the world buffalo contribute about 5% of total milk production and in India buffalo contribute about 57% of total milk production (Rabobank, 2005). However some undiagnosed and emerging diseases adversely affect the productivity. Among those diseases, diseases of cardiovascular system are the most important. Systemic hypertension is generally divided into essential (primary) and secondary hypertension. Most of the hypertension in animals is secondary hypertension. The more common causes of secondary hypertension include renal disease, hyperadreno-corticism, hyperthyroidism and diabetes mellitus (Kittleson and Kienle, 1988). Hypertension induced by fluid overload usually been considered as a volume dependent hypertension, which is due to expanded intra vascular volume (Laragh, 1973). The present work was undertaken to know the effect of

hypertension on some physiological and haemodynamic parameters in Murrah buffalo.

The present study was conducted in the Shed no.-9 of cattle resettlement project, Government of West Bengal, Ganganagar, North 24 parganas, West Bengal. The experiment was conducted during the month of April 2005 to July 2005. During the experimental period average temperature was recorded minimum 26.96°C and maximum 34.56°C. The average rainfall was 3.94mm and relative humidity ranges from 60% to 91%. The study was conducted in 12 numbers of clinically healthy female Murrah buffaloes dividing into two groups, each containing six numbers. One as control and other as experimental. The age of buffaloes were between 9 to 11 years and animal weighing between 480 to 560 Kg. Physiological and haemodynamic

<sup>1,2</sup>College of Veterinary Sciences and Animal Husbandry, N.D. University of Agriculture and Technology, Kumarganj, Faizabad, (U.P.)

parameters were studied in both groups. In experimental group, 2000ml of normal saline solution (NSS) was introduced to each animal through two intravenous routes within 20 minutes. Physiological and haemodynamic parameters were recorded at 15 minutes (except blood volume) and 25 minutes intervals, same parameters were recorded in control group.

Blood samples were collected by jugular vein puncture into heparinised test tube for estimation of blood volume. Heparin was used @ 20 IU/ml of blood as anticoagulant. The blood samples were collected directly in the test tube. Soon after collection blood sample were transferred into a sterilized centrifuge tube and centrifuged at 3000 rpm for 30 minutes. Plasma sample were aspirated by using Pasteur pipette for the estimation of blood volume, plasma samples were stored at 4 °C.

The body temperatures were measured by the clinical thermometer. The bulb-end of the thermometer was lubricated with soap then inserted through anal sphincter into the rectum. Thermometer was left in appropriate position for about 2 minutes. Then the temperature in °C was recorded. The respiration rates were measured by applying the palm in front of the nostrils keeping about 4 - 5 inches away from nostrils. The flow of air is felt with palm. Heart rate was estimated from the Electrocardiogram (ECG) tracing and was calculated by the following formula.

$$\text{Heart beats / minute} = \frac{1500}{\text{Number of SS in one RR interval}} \quad \text{as described by Mahapatra (2003)}$$

Where, SS = Small Square, R = R wave of ECG

Pulse rate was recorded by palpating coccygeal artery about 10cm from the base of tail. Pulse deficit can be defined as a deficit in the number of pulses felt in the coccygeal artery in relation to the number heart rate (Guyton and Hall, 1996). The pulse deficit was calculated as per method described by Mahapatra (2003)

In the present studies the blood volume was determined colorimetrically by using T-1824 dye (Evan's blue) as described by Jain (1986) in Erma photoelectric colorimeter. The experimental data for the effect of induced hypertension in buffalo were subjected to statistical analysis by one-way analysis of variance and pair t-test by using SPSS software (SPSS windows, 1999).

The results of physiological and haemodynamic parameters of buffalo in control and induced hypertension were presented in Table1. The rectal temperature non-significantly decreased at 15 minutes and increased at 25 minutes after induced hypertension. Non-significant variation of rectal temperature coincides with the finding of Singh *et al.*, (2002) in buffalo calves. The mean value of respiratory rate was non-significantly increased after 15 minutes of induced hypertension and after 25 minutes the mean value of respiratory rate increased significantly ( $p < 0.01$ ) compared to control group. Though, this value (25 minutes group) was not significantly different to the mean of induced hypertensive buffalo at 15 minutes. The increase in respiratory rate may be attributed

**Table 1:** Physiological and haemodynamic parameters of buffalo in control and induced hypertension group (Mean  $\pm$  SE).

Parameter(Unit)	Mean with standard error		
	Control	Induced Hypertension	
		After 15 minutes	After 25 minutes
Rectal temperature (°F)	101.467 $\pm$ 0.184	101.450 $\pm$ 0.180	101.833 $\pm$ 0.167
Respiratory rate (breaths per minute)	27.833 <sup>a</sup> $\pm$ 2.834	32.667 <sup>ab</sup> $\pm$ 1.542	39.000 <sup>b</sup> $\pm$ 1.265
Heart rate (beats / minute)	59.167 <sup>a</sup> $\pm$ 2.213	65.167 <sup>ab</sup> $\pm$ 1.377	67.167 <sup>b</sup> $\pm$ 1.108
Pulse rate 'coccygeal' (pulse / minute)	57.833 <sup>a</sup> $\pm$ 2.198	64.883 <sup>bc</sup> $\pm$ 2.198	67.000 <sup>c</sup> $\pm$ 2.450
Pulse deficit (per minute)	2.000 $\pm$ 0.856	3.000 $\pm$ 1.155	3.833 $\pm$ 0.749
Blood Volume (ml per kg body weight)	44.130 <sup>a</sup> $\pm$ 2.785	-	49.795 <sup>b</sup> $\pm$ 2.297

Mean with common superscript in the same row does not differ significantly  $p < 0.01$ .

to hyperactive vasomotor center, reflected in increased pulmonary ventilatory rate (Guyton and Hall, 1996).

The mean heart rate after induced hypertension was non-significantly increased at 15 minute from control group. At 25 minute of induced hypertension the mean of heart rate also non significantly increased from the mean of 15 minutes. Though, this value was significantly ( $p < 0.01$ ) differing from the value of control group. Probably this increase in heart rate was caused by the increased atrial volume, which stretches the SA node (Guyton and Hall, 1996).

The pulse rate significantly ( $p < 0.01$ ) increased from control at 15 and 25 minutes after induced hypertension. The non-significant pulse rate was observed at 15 and 25 minute interval. The reason of increased pulse rate might be due to the increased heart rate as induced by rapid infusion of saline solution in buffalo. The pulse deficit was non-

significant after induced hypertension. In present study slight but non significant increase in pulse deficit is probably due to the fact that when the heart contract ahead of schedule, the ventricles are not filled properly and output during that contraction is depressed or some time almost none at all. Therefore, the pulse wave passing to the periphery following a premature beat may be so weak that the pulse cannot be felt at all in peripheral artery. Thus a deficit in the number of pulses felt in the peripheral pulse in relation to number of beats of the heart (Guyton and Hall, 1996). The mean value of blood volume increased significantly ( $p < 0.01$ ) at 25 minutes of induced hypertension. The apparent increase in blood volume is probably due to the change in plasma volume (Schalm *et al.*, 1974). The present study helps the clinician to diagnose the cardiovascular disease in buffalo and it could be elaborated in diagnosis of cardiovascular disease in other animal also.

#### REFERENCES

- Guyton, A. C. and Hall, J. E. (1996). Text Book of Medical Physiology, 9<sup>th</sup> edn., W. B. Saunders Company, Philadelphia.
- Jain, N. C. (1986). Schalm's Veterinary Haematology 4<sup>th</sup> edn., Leg and Febiger. Philadelphia.
- Kittleson, M. D. and Kienle, R. D. (1998). Small Animal Cardiovascular Medicine. Mosby, St. Louis, 499p.
- Laragh, J. H. (1973). *Am. J. Med.*, **55** : 261.
- Mahaptra, A.B.S. (2003). Essential of Medical Physiology, 2<sup>nd</sup> edn., Current Book International, Kolkata.
- Mullick, D. N. (1974). *Indian J. dairy Sci.*, **17** : 45.
- Rabobank (2005). [http://www.Rabobank.com/cotent/Services/corporates/research/foe\\_files/industry notes\\_dairy.Jsp](http://www.Rabobank.com/cotent/Services/corporates/research/foe_files/industry notes_dairy.Jsp).
- Schalm, O. W *et.al.* (1974). Veterinary haematology, 3<sup>rd</sup> edn, Leg and Febiger, Philadelphia.
- Singh, D. V. *et.al.* (2002) *Indian J. Anim. Sci.*, **72** ; 120.
- SPSS for windows (1999): Release 9.0 standard version. Copy right spss inc.