

ANALYSIS OF THE STRESS AND HAEMATOLOGICAL CHANGES AFTER FOOT-AND-MOUTH DISEASE VACCINATION IN BUFFALOES

Bhavanam Sudhakara Reddy¹ and Sirigireddy Sivajothi^{2,*}

ABSTRACT

Vaccination is one of the best methods of disease controlling in livestock. The present study was conducted to evaluate the stress and haematological changes in buffaloes after the Foot-and-mouth disease vaccination. Ten apparently healthy buffaloes were selected for study and vaccinated with inactivated trivalent (virus types O, A, Asia 1) oil adjuvant Foot-and-Mouth disease vaccine. Whole blood and serum were collected on the day of vaccination, 15th day and 30th day of post-vaccination for the study. Post-vaccination analysis of the haematology revealed the elevated levels of total leukocyte count, neutrophil, lymphocyte and eosinophil count. Elevated levels of serum cortisol levels were noticed immediately by the 15th day of post-vaccination and elevated levels of total protein, serum albumin, aspartate aminotransferase, blood urea nitrogen levels were noticed by the 30 days of post vaccination. Study findings support the development of the immunity against the vaccination and stress immediately after the vaccination in buffaloes.

Keywords: *Bubalus bubalis*, buffaloes, stress,

foot-and-mouth disease, vaccination, immunity

INTRODUCTION

Foot-and-mouth disease is an acute, highly contagious and economically important viral disease in India. It is reported in cattle, buffalo, pigs and other cloven-hoofed domestic as well as wild animals. It is characterized by fever, anorexia and stingy salivation with formation of the blisters over the tongue and lameness (Saiza *et al.*, 2002). FMD is caused by virus is a member of the family *Picornaviridae*. There are 7 serotypes of FMD virus; namely, O, A, C, SAT1, SAT2, SAT3, and Asia-1, which are immunologically distinct (Knight-Jones *et al.*, 2013). Vaccination is of great importance in the protection of livestock from FMD. Routinely, vaccination causes the stress immediately after vaccination in animals and reports are rare. Literature is very limited on assessment of the hemato-biochemical changes in bovines after FMD vaccination (Sivajothi *et al.*, 2018). Therefore, the present study was conducted to elucidate the haematological changes and assessment of stress parameters in buffaloes after

¹Department of Veterinary Clinical Complex, Faculty of Veterinary Medicine, College of Veterinary Science, Proddatur, Sri Venkateswara Veterinary University, Andhra Pradesh, India

²Department of Veterinary Parasitology, College of Veterinary Science, Proddatur, Sri Venkateswara Veterinary University, Andhra Pradesh, India, *E-mail: sivajothi579@gmail.com

FMD vaccination.

MATERIALS AND METHODS

The present study was carried out in Proddatur, YSR Kadapa District of Andhra Pradesh. Ten apparently healthy buffaloes were selected for the study and vaccinated with inactivated trivalent (virus types O, A, Asia 1) oil adjuvant Foot-and-Mouth disease vaccine. At the time of vaccination, 15th day and 30th day of post-vaccination whole blood and serum were collected for laboratory analysis. Whole blood was collected in vacutainer tubes with ethylene diamine tetra acetate for analysis of packed cell volume (PCV), haemoglobin (Hb), red blood cell count (RBC), white blood cell count (WBC) and differential counts (DC). Absolute neutrophil, lymphocyte, eosinophil, basophile and monocyte count was recorded and compared with the values of before vaccination (Sivajothi and Reddy, 2017). Serum was collected for the estimation of serum total protein, albumin, aspartate aminotransferase (AST), blood urea nitrogen (BUN) and serum cortisol levels estimated according to the standard procedures as per the commercially available kits. Data were presented as the mean $\pm$ standard error (SE) and were subjected to statistical analysis using one-way analysis of variance by using SPSS version 20.0. Differences at $P > 0.05$ were considered as non-significant, $P < 0.05$ is considered as significant and $P \leq 0.01$ were considered as highly significant at 95% confidence level.

RESULTS AND DISCUSSION

Recorded haematological and biochemical parameters were on the 0th day, 15th day, 30th day of vaccination were mentioned in the Table 1. In the present study, buffaloes showed the reduction in feed intake and milk yield upon vaccination. Increased levels of haemoglobin, packed cell volume and total erythrocyte count gradually after vaccination was noticed but there is no statistical significance between before and the after vaccination. Elevated levels of total leukocyte count were noticed by the 15th day of post vaccination and it was higher by the 30 days of post-vaccination. Higher levels of total leukocyte count were due to neutrophilia and lymphocytosis. A neutrophil is the most important phagocytic cell which participates in the innate immune response, also known as the nonspecific immune response. Lymphocytosis is the result of the enhancement of the B cell function for antibody formation as indicated in the present study by increased gamma globulins (Doel, 2003). Observed neutrophilia attributed to the stress response as a result of an endogenous release of cortisol which has the major role in regulating circulating concentration of leukocytes. Recorded haematological changes were in association with the previous literature (Shawky *et al.*, 2016, Barkakati *et al.*, 2015).

Serum total protein levels were increased gradually by the 30 days of post-vaccination and reduced levels of serum albumin levels than compare to the before vaccination. Globulin levels were increased gradually and reduction in albumin levels noticed. In the present study, FMD vaccine stimulates the humoral immune response gradually and it leads to maintenance of higher concentration of serum immunoglobulins which provide more protection against the diseases which was indicated by the changes in globulin levels

Table 1. Haematological changes and stress parameters in buffaloes before and after vaccination (Mean±S.E.).

S.No.	Parameters	Before vaccination	After 15 days of vaccination	After 30 days of vaccination	P -Value
1	Haemoglobin (g/dl)	11.27±0.17	11.50±0.224	11.67±0.52	0.83 ^{NS}
2	PCV (%)	34.12±0.94	35.11±1.02	35.83±2.25	0.88 ^{NS}
3	TEC x10 ⁶ /cumm	7.45±0.13	7.38±0.95	7.61±0.25	0.25 ^{NS}
4	TLC /cumm	8166.8±263.3	11339.61±188.4	14421.67±166.83	0.001**
5	Neutrophils /cumm	2476.6±69.92	2874.65±101.22.4	3618.33±100.82	0.001**
6	Lymphocytes /cumm	5005.6±131.2	5972.5±141.60	7166.67±79.32	0.001**
7	Monocytes /cumm	424.6±44.15	434.34±37.72	505.83±13.56	0.001**
8	Eosinophils /cumm	220.5±31.24	272.6±19.9	413.0±16.67	0.001**
9	Basophil /cumm	48.99±6.1	60.86±2.91	71.50±1.28	0.001**
10	Total protein (g/dL)	6.38±1.16	6.42±0.62	6.54±1.12	0.12 ^{NS}
11	Serum albumin (g/dL)	3.02±0.89	2.98±0.82	2.89±1.19	0.18 ^{NS}
12	AST (IU/L)	52.27±6.44	57.27±5.92	63.99±8.12	0.04*
13	Blood urea nitrogen (mg/dL)	38.66±3.81	42.16±2.98	43.89±2.16	0.04*
14	Cortisol (nmol/L)	23.01±1.1	43.66±7.12	36.11±5.16	0.001**

(Park, 2013). Buffaloes after vaccination showed the elevated levels of AST which indicative of some degree of hepatic dysfunction. But in the present study, elevation levels of serum AST due to glucocorticoid release during the stress and it might be due to vaccination stress which further confirmed by the increased levels of cortisol (Kaneko *et al.*, 1997). Blood urea nitrogen levels were increased gradually after vaccination, it is due to other than primary renal disease and caused by the availability of more protein levels for the metabolism. It is proposed that during the stress period, increased protein catabolism and elevated levels of glucocorticoids causes increased hepatic synthesis of urea (Kohn *et al.*, 2005). Cortisol levels were increased after 15 days of vaccination and which was highly significant than before the vaccination and it was reduced by the 30 days of post vaccination. But after 30 days of post-vaccination, the levels were higher than before the vaccination which indicative of vaccination stress.

It was reported that cattle vaccinated with hexavalent FMD vaccine showed the elevated levels of neutrophil and lymphocyte counts than compared with non-vaccinated group. They also reported that there are no significant differences in RBC counts, hemoglobin concentrations and packed cell volume levels in between the vaccinated and unvaccinated groups (Shawky *et al.*, 2016). It was reported that goats vaccinated with FMD vaccine showed the elevated levels of total leukocyte count and reduced levels of haemoglobin levels (Jo *et al.*, 2014).

CONCLUSION

In conclusion, the present data suggested development of immunity and vaccination stress in

buffaloes after FMD vaccination.

ACKNOWLEDGEMENT

The authors are thankful to the authorities of Sri Venkateswara Veterinary University, Tirupati for providing the facilities to carry out the research.

REFERENCES

- Barkakati, J., S. Sarma and D.J. Kalita. 2015. Effect of foot and mouth disease on haematological and biochemical profile of cattle. *Indian J. Anim. Res.*, **49**: 713-716.
- Doel, T.R. 2003. FMD Vaccines. *Virus Research*, **91**: 81-99. DOI: 10.1016/s0168-1702(02)00261-7
- Jo, N.C., J. Jung, J.N. Kim, J. Lee, S.Y. Jeong, W. Kim, H.G. Sung and S. Seo. 2014. Effect of vaccination against foot-and-mouth disease on growth performance of Korean native goat (*Capra hircus coreanae*). *J Anim. Sci.*, **92**: 2578-2586. DOI: 10.2527/jas.2014-7190
- Kaneko, J.J., J.W. Harvey and M.L. Bruss. 1997. *Clinical Biochemistry of Domestic Animals*. 5th ed., Academic Press, San Diego, USA.
- Knight-Jones, T.J.D. and J. Rushton. 2013. The economic impacts of foot and mouth disease - What are they, how big are they and where do they occur? *Preventive Veterinary Medicine*, **112**(3-4): 161-173. DOI: 10.1016/j.prevetmed.2013.07.013
- Kohn, R.A., M.M. Dinneen and E. Russek-Cohen. 2005. Using blood urea nitrogen to predict nitrogen excretion and efficiency of nitrogen utilization in cattle, sheep, goats, horses, pigs, and rats. *J. Anim. Sci.*, **83**(4): 879-889.

DOI: 10.2527/2005.834879x

- Park, J. 2013. Requirements for improved vaccines against foot-and-mouth disease epidemics. *Clinical and Experimental Vaccine Research*, **2**: 8-18. DOI: 10.7774/cevr.2013.2.1.8
- Saiza, M., J.I. Nunez, M.A. Jimenez-Clavero, E. Baranowski and F. Sobrino. 2002. Foot-and-Mouth disease virus: Biology and prospects for disease control. *Microbes and Infection*, **4**(11): 1183-1192. DOI: 10.1016/s1286-4579(02)01644-1
- Shawky, S.M., N.S. Thabet, S.H. Orabi and M.A. Nayel. 2016. A comparative study on the hemato-biochemical and immunological effects of the hexavalent FMD vaccine alone or in combination with trivalent FMD vaccine in cattle, *Journal of Biosciences and Medicines*, **4**: 16-26. DOI: 10.4236/jbm.2016.41003
- Sivajothi, S. and B.S. Reddy. 2017. Antioxidant status and electrocardiographic changes in buffaloes with *Trypanosoma evansi* infection. *Chemical Science Review and Letters*, **6**(24): 2573-2576.
- Sivajothi, S., Y.V.P. Reddy, B.S. Reddy, S. Vani, S. Chandel, K. Ravikanth and B. Ganguly. 2018. Evaluation of herbal anti-stressor product (Restobal) during the vaccination stress in buffaloes. *International Journal of Current Microbiology and Applied Sciences*, **7**(7): 723-727.