International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2017; 5(2): 217-220

Received: 08-01-2017
Accepted: 09-02-2017

Mayuri Chetia
Department of Veterinary Biochemistry, College of Veterinary Science Khanapara, Assam Agricultural University, Guwahati-22, Assam, India

Dhruba Jyoti Kalita
Department of Veterinary Biochemistry, College of Veterinary Science Khanapara, Assam Agricultural University, Guwahati-22, Assam, India

Satya Sarma
Department of Veterinary Biochemistry, College of Veterinary Science Khanapara, Assam Agricultural University, Guwahati-22, Assam, India

Correspondence
Mayuri Chetia
Department of Veterinary Biochemistry, College of Veterinary Science Khanapara, Assam Agricultural University, Guwahati-22, Assam, India

Biochemical effect of swine fever vaccine in Hampshire piglets

Mayuri Chetia, Dhruba Jyoti Kalita and Satya Sarma

Abstract
Classical Swine Fever (CSF) is a highly contagious disease of swine. So vaccination against Swine Fever is an utmost necessity. The aim of this study was to see the effect in the serum biochemistry following vaccination against classical swine fever (CSF) with lapinized swine fever vaccine. A group of twelve healthy Hampshire piglets of two months of age were selected and vaccinated against swine fever. The peripheral blood samples were collected before the vaccination i.e. 0 day and at post-vaccination days 30th, 60th and 90th day respectively. The different serum biochemical constituents and enzymes were estimated using standard methods. It has been found that there was a significant increase in the serum biochemicals (total protein, globulin, urea, creatinine, uric acid) along with the activities of serum enzymes (serum glutamate oxaloacetate transaminase, serum glutamate pyruvate transaminase and lactate dehydrogenase) on the successive days of post-vaccination. However, serum glucose, albumin, calcium, phosphorus and serum alkaline phosphatase enzyme were not significant on the different days of post-vaccination.

Keywords: Hampshire piglets, serum biochemicals, swine fever, vaccination

1. Introduction
Pig rearing plays an important role in the different community of North Eastern states of India. In this region, more than 70 % of the populations are non-vegetarian and pork is a popular dietary item particularly among the tribal population. But this unique industry has been threatened very frequently by the Classical Swine Fever (CSF) virus infection. Classical Swine Fever is one of the most important viral disease of pigs and an economically important contagious disease of swine in world-wide [1]. Variations in blood parameters have been reported in animals due to several factors such as altitude, management, feeding level, age, sex, breed, health status, exogenous administration of drugs, diurnal and seasonal variation, ambient temperature, and physiological status of the animal [2]. The hematological and serum biochemical differences may be associated with variations in environment, breed, physiological status, etc. [3]. Serum constituents are normally the secretory or excretory products of the cell or the function of dietary nutrients. These constituents always remain within a normal range at the different physiological status in healthy individuals. Similarly, the level of certain metabolites including enzymes in the blood might indicate various types of stress and health of an individual [4]. The enzymology has been the most rapidly developing field in clinical chemistry and study of the enzymes along with other serum constituents play an important role in the diagnosis and prognosis of animal diseases. In addition, any infection can increase cell membrane permeability resulting in the escape of intracellular enzymes in blood [5]. These enzymes have wide distribution in animal tissues. So, it is possible to diagnose any unhealthy condition by estimating the serum constituents and enzyme level of an animal. Different types of vaccines are available namely live virus, modified live virus (MLV), Subunit 'marker vaccines' etc. There is paucity of systematic study on the effect of such vaccines on serum biochemicals in post-vaccination period in pigs. Therefore, the present study was undertaken to study the effect of lapinized swine fever virus vaccine on different serum biochemistry.

Materials and methods
Experimental animals and sample collection
A total of 12 healthy Hampshire piglets of 2 months age were selected from Base Pig Breeding Farm, Animal Husbandry and Veterinary Department, Government of Assam and were

maintained in standard nutritional and managemental conditions throughout the period of study. The animals were vaccinated against Swine Fever using lapinised swine fever vaccine at the dose rate of 1 ml subcutaneously. Blood samples were collected from ear vein on 0 day (the day before of vaccination) and 30th, 60th and 90th day of post-vaccination for biochemical analysis.

Serum biochemistry

The non anticoagulated blood samples were kept at room temperature for 1 hour to ensure complete clotting. Then, the serum was separated from non-anticoagulated blood samples by centrifugation at 2000g for 10 min. The serum samples were stored at -20 °C until analyzed. In the serum, total protein, albumin, globulin, urea, uric acid, creatinine, calcium (Ca), inorganic phosphorus (P), serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT) alkaline phosphatase (ALP) and lactate dehydrogenase (LDH) concentrations were estimated. Analysis was carried out using commercial test kits (Greiner Diagnostic GmbH, Unter Gereuth 10-D-79353, Bahlingen-Germany) using UV Spectrophotometer.

Statistical analysis: Analysis of variance was performed to determine the presence or absence of significant differences in the analytical variables using GraphPad PRISM version 5.0 statistical software package and the differences between the different post vaccinated days were tested by Tukey's multiple comparison test.

Result and discussions

The concentration of all the estimated serum biochemicals in Hamshire piglets after swine fever vaccination is presented in table 1. The peak mean concentration for serum constituents such as, total serum protein, globumin, albumin, urea, creatinine, uric acid, calcium and phosphorus and the serum enzymes namely, SGOT, SGPT, ALP and LDH activities was recorded on 60th day of post vaccination. The biochemical constituents and the respective serum enzymes showed a significant difference among the different days of post-vaccination except albumin, glucose, phosphorous, calcium and ALP respectively. The significant increase of total serum protein concentration in the present study was corroborated to the previous reports [6-8]. Also, there was a rise in total serum protein level in cross-bred calves after Foot and Mouth disease and Haemorrhagic Septicaemia vaccination [9, 10]. The significant (P<0.01) variation of concentration of total protein in serum during post vaccination period might be due to an increase in the serum antibody titre of the vaccinated pig as well as due to increase over all transaminase activity [11, 12]. The increase in γ- globulin levels after swine fever vaccination was reported [13] which might be attributed to the increase in the total serum protein concentration in the vaccinated piglets. Similarly, the significant increase in serum globulin content observed in the study was correlated with previous reports [8, 14, 15]. The increase might be due to increase production of immunoglobin as result of humoral immune response after vaccination [11]. The increase of albumin is positively correlated with the globulin in post vaccinated animal [16]. However, in the present study, no significant differences on albumin levels between the pre- and post-immunization days was recorded. The blood urea level might rise up to 10 times than normal during increased protein catabolism or turnover [17]. The concentration of urea output is related to the quality and quantity of protein ingested and regarded as a determinant factor on protein utilization [18]. Vaccination causes the stimulation of protein metabolism by different cells of the whole body [19] and it might be the factor of significant (P<0.05) increase of urea concentration on the different days of post vaccination. The increase in creatinine content in the study was in agreement with previous researchers of increase concentration and excretion of creatinine in vaccinated human being [19]. Creatinine is mainly produced by the metabolism of creatine or creatine phosphate in skeletal muscle, but also originates from dietary sources of creatinine [20]. Elevation of the serum creatinine level was an indication of abnormal renal function [21, 22]. However, our estimated values were within the normal range of swines [23]. The present finding of uric acid was within the normal physiological range of in pig [24]. Uric acid, a metabolic product of purines was an antioxidant which scanvenges reactive oxygen radicals in the blood [25, 26]. Hence, vaccination might have caused increase in free radicals and inorder to neutralize them, uric acid might have increased. The serum glucose, calcium and phosphorus concentration was not significantly differed in pre and post immunization period. The finding was closely co-incide with the previous reports observed [27]. However, the concentration of glucose, calcium and phosphorus was within the normal range [28-31].

Our result of SGOT and SGPT activity is corroborated with previous reports [32]. The increase in SGOT and SGPT level among the days of post vaccination was due to the triggering action of vaccine for increase synthesis of total protein and for augmenting protein synthesis, transaminase activity has to be increased [12]. The level of ALP and LDH recorded in our experiment was within the reported range of earlier research [33, 34].

Table1: Mean±SE of the serum biochemicals in the different days of vaccination in Hampshire piglets

Parameters	0 day	30th day	60th day	90th day	Significance
Total Serum Protein (g/dl)	8.26_{A}± 0.07	8.64_{B}± 0.10	8.71_{BC}± 0.09	8.58_{BC}± 0.05	P<0.05
Globulin (g/dl)	2.73_{A}± 0.02	3.08_{B}± 0.03	3.13_{BC}± 0.09	3.06_{BC}± 0.07	P<0.01
Albumin (g/dl)	5.55^{c}± 0.04	5.56^{bc}± 0.07	5.58^{bc}± 0.10	5.51^{ac}± 0.04	NS
Urea (mg/dl)	18.32_{A}± 0.06	18.50_{AB}± 0.07	18.67_{BC}± 0.05	18.44_{AB}± 0.03	P<0.05
Creatinine (mg/dl)	1.11_{A}± 0.07	2.06_{B}± 0.05	2.14_{A}± 0.04	1.93_{B}± 0.02	P<0.01
Uric acid (mg/dl)	0.98_{A}± 0.07	1.80_{B}± 0.17	1.88_{BC}± 0.20	1.40± 0.13	P<0.01
Glucose (mg/dl)	89.55± 1.55	92.75± 1.74	90.56± 1.90	93.99± 1.63	NS
Calcium (mg/dl)	9.19± 0.03	9.35 ± 0.06	9.36± 0.07	9.29± 0.07	NS
Phosphorus (mg/dl)	4.57±0.02	4.74±0.12	4.86±0.13	4.77±0.17	NS
SGOT (U/L)	25.23_{A}±0.18	25.86_{AB}±0.16	26.92_{ABC}±0.27	26.46_{ABC}±0.28	P<0.05
SGPT(U/L)	19.66_{A}± 0.24	20.21_{B}± 0.13	20.51_{BC}± 0.16	20.08_{ABC}± 0.09	P<0.05
ALP (U/L)	158.67±1.08	160.56±1.04	162.65±1.02	159.98±1.61	NS
LDH (U/L)	384.95_{A}± 7.17	386.35_{AB}±9.25	424.18_{C}±9.05	396.49_{AB}±8.10	P<0.05

Note: P<0.05, 0.01; NS- no significance. Means bearing the same subscript within a parameter in a row do not differ significantly.

Conclusions

In our present study, we have observed a significant increase in the serum concentration of total protein, globumin, urea, creatinine, uric acid, SGOT, SGPT and LDH enzymes. Though there was an increasing trend of different serum constituents and serum enzymes, the values were within the normal range as reported by various researchers. Hence, it can be concluded that swine fever vaccination can causes an increase in certain serum biochemicals. Moreover, the increase enzymatic activities were reflected after vaccination in Hamshire piglets might be due to an increase synthesis of protein in immunized animal.

Acknowledgement

The authors are whole-heartedly thankful to the staffs of Base Pig Breeding Farm, Animal Husbandry and Veterinary Department, Government of Assam.

References

1. Edwards S. Survival and Inactivation of Classical Swine Fever Virus. Veterinary Microbiology. 2000; 73:175-181.
2. Wilson G D A, Harvey D G, Snook C R. A review of factors affecting blood biochemistry in the pig. British Veterinary Journal. 1972; 128:596-609.
3. Charles WB, Mahaffey AE, Bush ES, Krupp DW. Hematological and serum biochemical reference intervals for Vietnamese potbellied pigs (*Sus scrofa*). Comparative Clinical Pathology. 2004; 13(4):162-165.
4. Payne JM, Rowlands GJ, Manstan MR, Dew SK, Bryne M. The use of metabolic profiles in dairy herd management and also as an aid in the selection of superior stock. Britain cattle Breeders Club Digest. 1973; 28: 55-59.
5. Coles EH. Clinical Enzymology. In Veterinary Clinical Pathology by Coles, E.H. 4th Edition, W.B. Saunders Co. 1986, 114-127.
6. Nalini Kumari K, Chaudhari P, Krishnaswami T. Effect of levamisole in immune response of calves to Rinderpest vaccine. Indian Veterinary Journal. 1987; 64:984-985.
7. Mukherjee S. Immunomodulatory effects of levamisol on the immune response M.V.Sc. thesis submitted to the Assam Agricultural University, 2001.
8. Choudhury KA, Mondal SK, Rahman MM, Amir MM, Sankar AG. Changes in leukocytes, serum total proteins and immunoglobin levels in chickens immunized against fowl cholera. Bangladesh Veterinary Journal. 1990; 7:27-30.
9. Kumar B, Singh C. Total serum proteins, albumin and globulin in cross-bred female calves. Indian Veterinary Journal. 2004; 81:955-957.
10. Bijwal D, Sadekar RD, Mode SG, Chede SA, Joshi MV, Pund TG. Immuno-modulatory effect of levamisole in haemorrhagic septicaemia vaccinated crossbred calves. Indian Journal of Animal Science. 1999; 69(8):570-571.
11. Awad F, Redo I, Mosussa AA, Daoud A, Hussein K, Marzouk MS. Immune response of susceptible buffaloes to primary vaccination with formalized inactivated aluminium hydroxide Foot and Mouth disease type 'O' vaccine. Journal of Egyptian Veterinary Medicine Association. 1979; 39(2):97-107.
12. Lehninger AL. Principles of Biochemistry, 2nd (ed.) CBS. Publisher and Distributors, New Delhi. 1987.
13. Charlier G, Strobbe R, Leunen J. Inflence of swine fever vaccination on the serum protein fractions of pigs. Vlaams-Diergeneeskundig-Tijdschrift. 1975; 44(2):50-55.
14. Pakhmov GA. Immunological reactivity of calves undergoing treatment with levamisol for acute bronchopneumonia. Veterinaria Moscow. 1982; 8:45-50.
15. Gogoi M. Immunomodulatory effect of levamisole in goats vaccinated with enterotoxaemia and foot and mouth disease vaccine. A M.V.Sc thesis submitted to the Assam Agricultural University, 2001.
16. Aikhuomobhogbe PU, Orhervata AM. Haematological and blood biochemical indices of West African dwarf goats vaccinated against Pestes des Petits ruminants (PPR). African journal of Biotechnology 2006; 5(9):743-748.
17. Guyton AC. Textbook of medical Physiology. 5th ed. W.B. Saunders co., Philadelphia, London, Toronto, Tokyo, 1976.
18. Voit CZ. Protein and amino acids. Newer methods of nutritional biochemistry. Academic Press, London Biology. 1966; 2 (I):307.
19. Garlick PJ, Mc Nurlan MA, Fern EB, Tomkins AM, Waterlow JC. Stimulation of protein synthesis and breakdown by vaccination. British Medicinal Journal. 1980; 281:263-265.
20. Nankivell BJ. Creatinine clearance and the assessment of renal function. Australian Prescription. 2001; 24:15-17.
21. Perrone R, Madias N, Levy A. Serum Creatinine as an index of renal function: New insights into old concepts. Clinical Chemistry. 1992; 38:1933-1953
22. Mouton R, Holder K. Laboratory tests of renal function. Anaesthesia intensive care medicine 2006; 7(7):240-243.
23. Dukes HH. The physiology of domestic Animals (c.f. Melvin J. Swenson and William O. Reece edn.), Comstock Publishing Associates. Ithaca and London. 1996, 42.
24. Yang Joseph J, Krueger Andrew J, Roy Timothy A, Feuston Maureen H. Serum Chemistry Assays in ReproductIon ToxicIty Testing, Mobil Environ. And Health Sci. Lab., P.O. Box 1029, Princeton, NJ 08540, 1998.
25. Hooper DC, Scott GS, Zborek A, Mikheevn T, Kean RB, Koprowski H *et al*. Uric acid, A peroxynitrite changes and tissue damage in a Mouse. Faseb Journal. 2000; 14(5):691-698.
26. Knapp CM, Constantinescu CS, Tan JH, Mc Lean R, Cherryman GR, Gottlob I. Serum uric acid levels in optic neuritis. Multiple Sclerosis. 2004; 10(3):278-280.
27. Banik SC, Podder SC, Samad MA, Islam MT. Sero-surveillance and immunization in sheep and goats against Peste des petits ruminants in Bangladesh. Bangladesh Journal of Veterinary Medicine. 2008; 6(2):185-190.
28. Yakimchuk NV. Biochemical composition of the blood of sows. Veterinariya Moscow. 1978; 8:94-95.
29. Kakoti A, Talukdar SC, Baruah RN, Baruah KK, Baruah A. Studies on certain blood constituents profiles during pregnancy in indigenous pigs of Assam. Indian Journal of Animal Reproduction. 1998; 19:34-36.
30. Swenson Melvin J. Carbohydrate Metabolism. Duke's physiology of domestic animals, 10th ed. Comstock Pub. Associates, 1984, 375-378.
31. Saikia AK. Performance of crossbred (Hampshire x Assam local) pigs fed different dietary energy levels with or without supplemention of enzymes M.V.Sc. Thesis, Assam Agricultural University. Guwahati. Assam, 2000.

32. Sahoo SK. Effect of feeding different levels of de-oiled rice polish based diet with or without enzyme supplementation on the performance of crossbred (H x L) pigs. Ph. D Thesis, Assam Agricultural University, Khanapara, Guwahati-781022, 2001.
33. Friendship RM, Lumsden JH, McMillan I, Wilson MR. Hematology and Biochemistry Reference Values for Ontario Swine. Canadian Journal of Comparative Medicine. 1984; 48:390-393.
34. Dhanotiya RS. Textbook of Veterinary Biochemistry, 2nd edition, Jaypee Brothers, Medical Publishers (P) LTD., New Delhi, 2006.