EFFECT OF FMD VACCINATION ON SEMEN CHARACTERISTICS IN HOLSTEIN FRIESIAN BULLS

SUJIT SAHA[1], G.K. MISHRA[2*], R.B. SINGH[3], M.K. SHUKLA[4], RITESH TIWARI[5] AND S.K. SAXENA[6]

Animal Breeding Centre Salon – 229 127, A unit of Animal Breeding Research Organization (India)

Received : 02.09.2011 Accepted : 27.01.2012

ABSTRACT

The present study was designed to investigate the effect of Foot and Mouth disease (FMD) vaccination on semen production performance and quality parameters on the basis of semen collected from 25 Holstein Friesian bulls maintained at Animal Breeding Centre, Salon, Rae Bareli district of Uttar Pradesh during 2008 and 2009. The results indicated that ejaculate volume and initial motility differ significantly between pre and post vaccination period, while no significant difference was evident with respect to concentration and total sperm output. But for all the parameters maximum deterioration was noticed up to first 10 days post vaccination period. There was a significant change ($p<0.05$) in the live sperm percentage following vaccination. The percentage of live sperm reduced from 95.23% to 83.19% (10 days after vaccination) and 84.57% (11-20 days after vaccination), which was significantly improved after 20 days following vaccination (90.18%). Although sperm morphological abnormalities like free normal head, free abnormal head, simple bent tail, mid piece defect etc. were prevalent after vaccination there was no significant difference with respect to percentage of morphologically abnormal sperm between pre and post vaccination period. The study indicates FMD vaccination adversely affects most of the seminal attributes in the initial 10 days but there is no adverse effect on sperm morphology as such.

Keywords: Holstein Friesian, Semen production, Semen quality, FMD vaccination

The breeding bulls reared at different semen station for production of frozen semen doses are vaccinated regularly as a preventive measure against various bacterial and viral diseases. But the available the reports on the effect of vaccination on semen production and quality parameters are very much contradictory. Kammar and Gangadhar (1998), Bhakat *et al.*(2008) reported that vaccination leads to increase in sperm abnormalities in various breeds In contrast, Mangrukar *et al.* (2000), Krishnan *et al.* (2003) did not found adverse effect of vaccination on semen production and quality parameters.

Perusal of literature also indicated that viral vaccine compared to bacterial vaccine produce more deleterious effect. With the administration of viral vaccine both the metabolic activity and cold shock resistance of sperm are reduced to a considerable level (Venkataswami *et al.*,1972) and recommended to suspend semen collection till normal fertility of sperm is restored. The prolonged break in semen collection following vaccination always results into considerable loss in production of frozen semen doses and thus adversely affects the economy of the semen station. Keeping this in mind, present investigation is designed to study the impact of FMD vaccination on semen production performance and quality parameters in Holstein Frisian bulls and its trend over different post vaccination period, so that suitable management strategy may be adopted to minimize the economic losses.

[1]Manager (AB),NDDB Murrah Buffalo PT project, Rohtak Semen Station, Rohtak, Haryana-124001
[2*]Corresponding author, Manager –I (SS), ABC Salon. Email: drkodu@rediffmail.com
[3]Manager – II (SS), ABC Salon
[4]OG-II, ABC Salon
[5]OG-I, ABC Salon
[6]General Manager, ABC Salon

Present study was carried out with 2979 ejaculates obtained from 25 Holstein Frisian bulls (aged between 2 to 7 years) under regular semen collection at Animal Breeding Centre, a Unit of Animal Breeding Research Organization (India), Salon, Raebareli district of Uttar Pradesh in the year 2008 and 2009. The bulls were reared at individual pens under standard management practices. Semen was collected twice a week and two ejaculates per collection in the morning by AV technique. Minimum 30 minutes gap was given between two successive ejaculates.

As a prophylactic measure the bulls were vaccinated with 2 ml deep intramascular of oil adjuvant FMD vaccine (Raksha Ovac Trivalent) manufactured by Indian Immunologicals Limited, Hyderabad at six monthly intervals (in the month of March and September during the study) each year. The data pertaining various semen production performance namely volume, concentration, total sperm output and Initial motility was recorded 30 days prior to the date of vaccination (as control) and 30 days after vaccination. The data post vaccination period based on 1378 ejaculates was further classified into 3 categories i.e. up to 10 days, 11-20 days and 21-30 days.

The recorded data on various semen production parameters was corrected for different non genetic factors (i.e. season, period and age) by Least squares analysis technique (Harvey, 1975). The corrected data was used to study the effect of FMD vaccination on semen production performance by including vaccination as an effect in the model. In addition, some quality parameters of the semen (i.e live sperm %, sperm morphology etc.) was also studied following standard protocol by collecting the semen samples at an interval of 10 days from each bull during pre and post vaccination period.

The average volume of semen found to differ significantly ($p<0.01$) between pre-vaccination and post vaccination period. The maximum volume was observed before vaccination (4.54±0.04 ml), while minimum volume was observed upto 10 days post vaccination (4.28±0.07). However, an increasing trend in volume was observed after 10 days. In contrast, Mangrukar *et al.* (2000) in exotic and crossbred bulls, Bhakat *et al.* (2008) in Sahiwal bulls and Bhakat *et al.* (2010) in Karan Fries bulls did not observe any significant effect of FMD vaccination on volume of semen.

However, concentration and total sperm output between different periods did not differ significantly. Maximum value was observed 11-20 days post vaccination period for both concentration (849.82±16.18 million/ml) and total sperm output (3782.55±99.51 million). However, total sperm output was reduced by 6.5% immediately after vaccination (upto 10 days). Bhakat *et al.* (2008) in Sahiwal bulls although reported reduction in total sperm output following vaccination but it was not statistically significant. While, Venkataswamy and Rao (1970),Venkatareddy *et al.* (1991) also reported significant decrease in sperm concentration following vaccination. The decrease in sperm concentration may be due to the adverse effects of therapeutic agents on germinal epithelial cells, resulting in increase number of dead spermatozoa, which were absorbed by leucocytes through phagocytosis (Mann and Mann, 1981). In contrast, Kammar and Gangadhar (1998) did not find any adverse effect of vaccination on sperm concentration.

Average Initial Motility observed to be reduced from 65.69% to 61.53% immediately after vaccination. However, it was found to improve after 10 days post vaccination period. Average initial motility found to differ significantly ($p<0.01$) between Pre and post vaccination period. The decrease in sperm motility may be due to rise in body and testicular temperature, which resulted in disturbance in epididymal functions (Venkatareddy *et al.*,1991). Rao (1976) reported low sperm motility with high incidence of sperm tail defects as a result of epididymal dysfunction. Bhakat *et al.* (2008) reported negative correlation ($r= -0.64$) between progressive motility and tail abnormalities

There was a significant change ($p<0.05$) in the live sperm percentage following vaccination. The percentage of live sperm reduced from 95.23% to

83.19% (10 days after vaccination) and 84.57% (11-20 days after vaccination). However, significant improvement with respect to % live sperm was observed after 20 days following vaccination (90.18%). Contrary to this study, Krishnan *et al.* (2003) did not found any significant change in live sperm percentage following vaccination in Sunandini cattle. The morphological abnormality of sperm did not differ significantly between pre and post vaccination period. However, among the various sperm morphological abnormalities, free normal head, free abnormal head, simple bent tail, mid piece defect etc. were prevalent after vaccination. The incidence of dead spermatozoa and morphological abnormalities may be due to rise in body and testicular temperature and it could develop secondary abnormalities among the fully formed epididymal spermatozoa (Venkataswami and Rao, 1970). However, the degree of abnormality of sperm also depends on the extent and duration of increased temperature (Waites and Setchell, 1990).

The Trends in initial discard of semen doses during pre-vaccination and post vaccination period was found to be increased from 15.4% (pre vaccination) to maximum 21.5% (till 10 days post vaccination period), which was then reduced to 18% (till 20 days post vaccination period). The major reason for discarding the semen doses after initial evaluation was either due to poor progressive motility or higher incidence of dead sperms.

It can be concluded from the study that application of FMD vaccine has an adverse effect on semen production performance and semen quality and the deterioration was maximum up to 10 days post vaccination. However, there was steady improvement in quality parameters particularly with respect to % dead sperm and there was no significant adverse effect on sperm morphology.

REFERENCES

Bhakat, M., Mohanty, T.K., Gupta, A.K., Raina, V.S., Mondal, G. and Khan H.M. (2008). Effect of FMD vaccination on various semen characteristics of Sahiwal bulls. *Pak. J. Agri. Sci.,* **45** (2) : 327-332.

Bhakat, M., Mohanty, T.K., Gupta, A.K., Raina, V.S.,Brahma, B., Mahapatra, R.K., and Sarkar, M. (2010). Effect of FMD vaccination on semen quality parameters in Karan Fries and Murrah Buffalo bulls. *Tropical Anim. Health and prod.,* **42**(7): 1363-1366.

Harvey, W. R. (1975). Least squares Analysis of Data with Unequal Subclass Numbers. USDA, Agricultural Research Service (ARS) H-4, Washington, D.C.

Kammar, N.F. and Gangadhar, K.S. (1998). Effect of foot-and-mouth vaccination on reaction time and some seminal characteristics in Surti bulls. *Indian J. Anim. Reprod.,* **19**(2): 149-150.

Krishnan, R., Biju, K., Devanand, C.P., Xavier, C.J. and Rajesh, V.R. (2003). Effect of foot and mouth disease vaccination on semen characteristics of Sunandini bulls. National Seminar on Frozen Semen Technology, December 2003, Dhoni,Kerala,India. 211-215.

Mangrukar, B.R., Phadnis, Y.P. and Bhosrekar, M.R. (2000). Effect of foot and mouth disease vaccination on semen characteristics of exotic and cross-bred bulls. *Indian J. Anim. Reprod.,* **21**(2): 135-137.

Mann, T. and Mann, C.L. (1981). Male reproductive function and semen. Springer-Verlag Berlin. Heidelberg,New York,USA.

Rao, A.R. (1976).Sperm akinesia in a Hallikar bull. *Indian Vet. J.,* **53**:414-418.

Venkatareddy, J., Venkatamunichetty, A., Ramachandran, S.V. and Sreeraman (1991). Effect of foot and mouth disease vaccination on semen quality. *Indian J. Anim. Prod.,* **12**: 13-14.

Venkataswami, V. and Rao, V.J. (1970). Preliminary report on the effect of foot and mouth disease vaccination on semen quality of crossbred bulls. . *Indian Vet. J.,* **47**: 1012-1016.

Venkataswami V., Pattabiraman Daniel, J. and Sunderavadanam, K. (1972). Effect of vaccination on spermatozoa resistance and on their metabolic activity. *Indian Vet. J.,* **49**: 1012-1016.

Waites, G.M.H. and Setchell, B.P. (1990). Physiology of the Mammalian Testis. In:G.E Lamming (ed.) Marshall's Physiology of Reproduction,4th Ed.,Vol.2, Reproduction in the Male. Edinburgh: Churchill Livingstone,pp.1-105.