



Effect of FMD vaccination on various semen quality parameters in Frieswal crossbred bulls

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Many outbreaks of foot and mouth disease (FMD), an endemic disease of cloven footed animals, occur all over the country every year. To prevent its occurrence at semen stations, breeding bulls are vaccinated for FMD as a regular prophylactic measure (Bhakat *et al.* 2011). The semen quality may be affected by vaccination due to vaccine stress and anaphylactic shock (Murugavel *et al.* 1997). There are various reports on the effect of FMD vaccination on the semen quality in different breeds of cattle and buffaloes (Mathur *et al.* 2003, Bhakat *et al.* 2010, Perumal *et al.* 2013). Mangurkar *et al.* (2000) observed that vaccination did not significantly affect the semen quality. On the contrary, other workers found increased incidence of sperm abnormalities following vaccination (Bhakat *et al.* 2011, Perumal *et al.* 2013). All stages of spermatogenesis (Anderson 2001) are susceptible and severity of damage depends on the extent and duration of the thermal stress (Waite and Setchell 1990). However, the results of vaccination impact on semen quality are conflicting in breeding bulls which might be due to characteristics of that particular breed or its level of inheritance in crossbreds. Therefore, present study was carried out to assess semen quality parameters after FMD

vaccination in Frieswal bulls (Holstein Friesian × Sahiwal).

Adult breeding bulls (95) were kept in individual pens under loose housing system and were managed with uniform management practices. All the bulls were vaccinated with FMD vaccine @ 2.0 ml by deep I/M route, which contained FMDV strains O, A and Asia 1. Injections (10 ml) of vitamin A, D₃ & E were given on alternate days to all bulls before (1 injection) and after (2 injections) vaccination. A 21 day sexual rest was given to all the bulls after vaccination. Semen samples were collected by artificial vagina technique twice in a week from each bull. The fresh ejaculates (3,537) were subjected to evaluation for volume, sperm concentration, initial motility and post-thaw motility as per standard procedures. The concentration of spermatozoa was measured with Accucell photometer. The observations were recorded for 1 month of pre-vaccination and 5 months post vaccination.

The experimental data were analyzed using analysis of variance, followed by a Duncan's post hoc test to determine significant differences in all the parameters recorded between groups using the SPSS/PC computer programme. Differences with values of P<0.05 were considered to be

Table 1. Means ± SE of semen quality parameters during pre and post FMD vaccination period

Parameter	Pre-vaccination	Post-vaccination months				
		1	2	3	4	5
Volume (ml)	4.58 ^a ± 0.07	4.96 ^b ± 0.13	4.76 ^{ab} ± 0.08	4.38 ^d ± 0.06	4.01 ^c ± 0.05	3.97 ^c ± 0.12
Concentration (million/ml)	885.5 ^b ± 15.91	905.20 ^b ± 28.41	926.17 ^b ± 17.73	1019.23 ^a ± 17.88	1055.18 ^a ± 16.26	921.15 ^b ± 32.02
Initial motility (%)	62.50 ^b ± 0.74	57.14 ^{ac} ± 1.25	57.14 ^c ± 0.83	54.31 ^a ± 0.71	57.52 ^{bc} ± 0.65	60.13 ^{bc} ± 1.43
Post thaw motility (%)	41.54 ^a ± 0.73	45.00 ^{bc} ± 1.63	42.73 ^{ab} ± 0.95	43.51 ^{ab} ± 0.66	44.53 ^{bc} ± 0.51	47.25 ^{c±} 4.38

Values with different superscripts differ significantly (P< 0.05) in rows.

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statistically significant.

Average values of semen quality parameters from Frieswal crossbred bulls during pre- and post- FMD vaccination period are given in Table 1. A significant increase (P<0.05) in volume of semen was observed in bulls

Table 2. Means \pm SE of live percentage and abnormalities of spermatozoa during pre- and post- FMD vaccination period

Period	Live % of spermatozoa	Sperm abnormalities (%)			
		Head	Mid piece	Tail	Total
Pre-vaccination	69.39 \pm 3.17	3.50 \pm 1.14 ^b	09.20 \pm 1.04	1.80 \pm 0.36	14.50 \pm 1.45
Post-vaccination (First month)	76.71 \pm 1.71	09.37 \pm 1.14 ^a	12.98 \pm 1.05	2.97 \pm 0.31	25.32 \pm 2.17

Values with different superscripts differ significantly ($P < 0.05$) in column.

during first month of post-vaccination than in pre-vaccination period. Venkatarreddy *et al.* (1991) reported similar findings in Ongole, Jersey and Ongole \times Jersey breeds. Volume of semen, increased slightly during post-vaccination period in Karan Fries and Murrah buffalo bulls (Bhakat *et al.* 2010). However, Bhakat *et al.* (2008), Mangurkar *et al.* (2000) and Singh *et al.* (2003) found no change in volume of semen due to FMD vaccination. A steadily decrease in the volume of semen was observed in this study during remaining post-vaccination period.

Concentration of spermatozoa did not change significantly due to vaccination. However, slightly higher concentration was recorded during post-vaccination period, which might be due to the presence of increased number of casts and subsequent counting by photometer. However, Bhakat *et al.* (2008) reported a significant decrease in sperm concentration/ml of semen following FMD vaccination in Sahiwal bulls. No significant change was also observed for live percentage of spermatozoa during post-vaccination period (Table 2). However, percentage of head abnormalities increased significantly ($P < 0.05$) in first month of post-vaccination period. Effect of temperature on the fully formed epididymal spermatozoa could give rise to secondary abnormalities (Venkataswami and Rao 1970) with increase in sperm tail and mid-piece abnormalities as in testicular degeneration or partial hypoplasia of testes (Sullivam 1978).

Initial motility of spermatozoa decreased significantly ($P < 0.05$) following the FMD vaccination in Frieswal bulls up to third month, but started increasing from fourth month of post-vaccination. Bhakat *et al.* (2008) reported nonsignificant decrease in initial motility following FMD vaccination in Sahiwal bulls. The per cent motility declined significantly after IBR and HS and BQ vaccinations in Frieswal bulls (Mathur *et al.* 2003). Venkatarreddy *et al.* (1991) reported that decrease in sperm motility might be due to the anaphylactic stress effect of vaccination, which was expressed by the significant rise in body temperature, as well as temperature of testes causes derangement in epididymal function and spermatogenesis by vaccination induced testicular degeneration.

No difference was observed in post-thaw motility of ejaculates selected for freezing during first 3 months of post vaccination. Sufficient reports are unavailable in support of findings of post-thaw motility during post-vaccination period. Singh *et al.* (2003) observed that the FMD vaccination produces adverse effects on the semen quality

of buffalo bulls and the effect was observed up to 1 month after vaccination. Our findings revealed adverse effects on semen quality parameters of Frieswal crossbred bulls up to 3 months after FMD vaccination.

SUMMARY

The primary objective of the present study was to assess the semen quality parameters in Frieswal crossbred bulls (95) after vaccination against foot and mouth disease (FMD). The fresh ejaculates (3,537) were subjected to evaluation for volume, concentration, initial motility and post-thaw motility as per standard procedures. The observations were recorded for 1 month of pre-vaccination and 5 months post-vaccination. A steadily decrease in the volume of semen was observed during post-vaccination period. No significant change was observed in concentration and live percentage of spermatozoa during post-vaccination period. However, percentage of total abnormal spermatozoa increased from 14.50% in pre-vaccination period to 25.32% in first month of post-vaccination period. Initial motility of spermatozoa decreased significantly following the FMD vaccination in bulls up to third month but started increasing from fourth month of post-vaccination. No difference was observed in post-thaw motility of ejaculates selected for freezing during first 3 months of post-vaccination. It was evident in the present study that semen quality parameters of Frieswal crossbred bulls improved after three months of FMD vaccination.

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