

## SCENARIO OF FOOT AND MOUTH DISEASE OUTBREAKS IN HARYANA STATE DURING THE YEARS 2003 AND 2004

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### ABSTRACT

The present paper describes epidemiological studies on foot and mouth disease (FMD) and its virus types distribution in Haryana state during the years 2003 and 2004. A total of 126 FMD outbreaks were recorded and 324 clinical samples were collected and analysed for FMD virus types O, A, C and Asia-1 between January 2003 and March 2004 from 16 districts of the state. Maximum outbreaks were recorded from the Hisar district (38) followed by Bhiwani (12), Karnal and Rohtak (11 each). No FMD outbreak was recorded from Rewari, Panchkula and Panipat. Majority of the outbreaks were recorded during September (23) and October 2003 (15) followed by March (14), February and April 2003 (12 each) in cattle and buffaloes. However, no FMD outbreak was recorded from April to December 2004 due to the launching of FMD Control Programme (FMD-CP) in Haryana through mass vaccination of all the susceptible animals. Of the 324 samples, 292 were typed using Sandwich ELISA as type 'O' (255), 'A' (35) and 'Asia-1' (2). FMD type 'O' was the most predominant type, whereas, FMD type 'C' failed to show its existence. The present paper describes a simple correlation between individual meteorological parameter temperature (maximum and minimum), relative humidity (morning and evening), wind speed, rainfall and number of outbreaks in a particular month and also a brief overview of the recently launched FMD-CP in the state.

**Key words:** Foot and mouth disease (FMD), outbreaks, epidemiology, Haryana, virus type distribution, FMD control programme

The Regional Research Centre on Foot and Mouth Disease (RRC on FMD), Department of Veterinary Microbiology carries out regular surveillance on FMD outbreaks primarily in the state of Haryana. The project staff maintains liaison with various personnel of the Department of Animal Husbandry and Dairying, Haryana viz. Deputy Directors (AH), Sub-Divisional Officers (AH), Veterinary Surgeons, Veterinary Livestock and Development Assistants by visiting state veterinary units. FMD outbreaks are attended wherever reported/ encountered. Biological samples are collected and virus is typed to determine the causative type of the FMD virus. This surveillance helps to know about the circulation of FMD virus types in the region. Information on circulating virus types also helps in bringing change(s) in the formulation of the vaccine. Recently, the Govt. of India has launched FMD Control Programme (FMD-CP) in few

states including eight districts of Haryana. The quadrivalent FMD vaccine (comprising FMD virus types O, A, C and Asia-1) which was being used earlier has been replaced by trivalent vaccine comprising of types-O, A and Asia-1 under the present FMD-CP since type C FMD virus has not been reported in India after 1995. Therefore, by reporting FMD outbreaks/cases as many as occurring in their areas, Veterinary Surgeons may play most important role in prevention and control against FMD. Further, during attending these outbreaks livestock owners are advised on sanitary and phytosanitary (SPS) compliance with particular reference to prevention of FMD outbreaks keeping in view the export potential of livestock wealth, their germ-plasm and animal products.

The FMD outbreaks in Haryana have previously been reported during the years 2001 (Sharma *et al.*, 2002) and 2002 (Kakker and Sharma, 2003). The present communication

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describes the current scenario of FMD in between January 2003 to December 2004 and also highlights the recently launched FMD-CP in Haryana.

## MATERIALS AND METHODS

Surveillance for FMD outbreaks was continued throughout Haryana state and epidemiological data for each outbreak were recorded from all the 19 districts as described earlier (Sharma *et al.*, 2002, Kakker and Sharma, 2003). The typing reagents were supplied by the Central Laboratory, Project Directorate on FMD, IVRI, Mukteswar Campus. Sero-typing of the FMD virus was done from the clinical samples by Sandwich ELISA as per the standard protocol (Venkataramanan, 1995). The clinical samples, remained untyped, were amplified in cell culture (Sharma *et al.*, 1985) and the virus, if any, after amplification was again put to ELISA. Further, the meteorological data viz. temperature °C (maximum and minimum), per cent relative humidity (morning and evening), rainfall (mm) and wind speed (Km/h) for each month was also recorded and a simple correlation between individual meteorological parameter and number of outbreaks in a particular month was calculated using Microsoft Excel programme.

## RESULTS AND DISCUSSION

### Month-wise distribution of FMD outbreaks:

During January 2003 to March 2004, a total of 126 FMD outbreaks were recorded and investigated in the state of Haryana. However, no FMD outbreak was recorded from April to December 2004. This may perhaps be because of launching the FMD-CP in Haryana through mass vaccination of all the susceptible animals. The total number of animals at risk, animals affected, animals died and case attack rate per 1000 animals during each FMD outbreak has been depicted in Table 1. During the year 2003, outbreaks have been recorded throughout the year, even in the summer months in contrast to the previous year where no outbreak was recorded between June–September 2002 (Kakker and Sharma, 2003). Surprisingly,

**Table 1**  
**Month-wise distribution of FMD outbreaks**  
**(Jan. 2003 – Dec. 2004)**

Month	No. of outbreaks	Animals			Case attack rate per 1000
		At risk	Affected	Died	
Jan. 2003	6	4950	270	-	55
Feb.	12	24318	1319	20	54
March	14	56504	398	-	7
April	12	38687	1586	7	41
May	4	4833	439	-	91
June	1	800	10	-	13
July	1	1280	12	-	9
Aug.	6	18413	192	-	10
Sept.	23	60289	4156	38	69
Oct.	15	31525	596	39	19
Nov.	9	21622	376	50	17
Dec.	8	27059	150	11	6
Jan. 2004	7	9910	154	-	16
Feb.	6	14251	141	10	10
March	2	2684	124	-	46
April to Dec.	0	0	0	0	0
Total	126	317125	9923	175	31
					(Average)

maximum outbreaks were recorded in the month of September (23) and October (15) followed by March (14), February and April 2003 (12 each). Further, the number of outbreaks recorded during the year 2003 have tremendously increased (111) as compared to the years 2001 and 2002 where only 52 and 26 FMD outbreaks, respectively, were recorded (Sharma *et al.*, 2002, Kakker and Sharma, 2003, Anon. 2003, 2004). This cyclic variation has also been observed during previous ten years by this centre, where a high number of outbreaks in a particular year is followed by less number of outbreaks in subsequent 1-2 years and again the number of outbreaks increases viz: 56 (1996), 40 (1997), 71 (1998), 27 (1999), 15 (2000), 52 (2001), 26 (2002) 111 (2003) and 15 (2004). This may be due to the fact that herd immunity developed by the animals during the year of high FMD incidence protects the animals during subsequent years. Cunliffe (1964) reported that after natural FMD infection, animals develop protective immunity for 1-2 years. However, Garland (1974) observed neutralizing antibodies and protection in animals, which were challenged 5.5 years after initial infection. Further, the number of outbreaks reduced to 15 in the year 2004 (January to March) perhaps due to mass FMD vaccination under FMD-CP



undertaken by Department of Animal Husbandry and Dairying, Government of Haryana.

**District-wise distribution of FMD outbreaks:** The FMD outbreaks were recorded in 16 of the 19 districts of the state during the years 2003 and 2004. Maximum outbreaks were recorded from the Hisar district (38) followed by Bhiwani (12), Karnal and Rohtak (11 each). No FMD outbreak was recorded from Rewari, Panchkula and Panipat despite regular field surveillance trips in these districts.

**Outbreaks according to species and virus type involved:** The number of outbreaks according to species and virus type involved has been shown in Table 2. Maximum number (86) of outbreaks involved cattle and buffaloes simultaneously followed by cattle alone (15) and buffaloes alone (13). In two outbreaks each sheep and goats were involved individually. Further, in very few outbreaks both sheep and goat (3) were involved (Table 2). Two outbreaks each involved either cattle, buffalo and goat or cattle, buffalo, sheep and goat simultaneously. In one outbreak cattle, buffalo and pig were involved simultaneously. Virus was successfully recovered from 292 of 324 samples collected from 126 outbreaks using ELISA technique while 32 samples were found non-viable. Three virus types were recorded viz: type O (255), A (35) and Asia-1 (2). Like in previous years, the FMD virus type O predominated over other types (Sharma *et al.*, 2002, Kakker and Sharma, 2003, Anon. 2003, 2004). The FMD virus type Asia-1

was recorded this year but the same was not recorded previous year (Kakker and Sharma, 2003). This observation further points towards existence of only three FMD virus types.

District-wise distribution of the FMD virus types/subtypes demonstrated the successful recovery of the virus from 16 of the 19 districts of the state and FMD virus type O recorded in 15 while type A was recorded in 9 districts. However FMD virus type Asia-1 was recorded in Fatehabad and Kaithal districts only. The predominance of FMD virus type 'O' has also been demonstrated in north-eastern states and other parts of India (Barman *et al.*, 1999, Sen and Saha, 1992). Further, the predominance of FMD virus type 'O' in Haryana over other types during previous years has also been recorded except in 1976 and 1984 when 'Asia-1' was the predominant type (Prasad *et al.*, 1978, Ahuja *et al.*, 1986, Mann *et al.*, 1998, Sharma *et al.*, 2002, Kakker and Sharma, 2003).

**Relationship between environmental factors and incidence of FMD outbreaks:** Statistical analysis showing the relationship between environmental factors viz. temperature (maximum and minimum), relative humidity (morning and evening), wind speed, rainfall and the incidence of FMD outbreaks during the period January 2003 to March 2004 revealed a correlation coefficient of - 0.066 between the number of outbreaks and the maximum temperature and - 0.114 between the number of outbreaks and the minimum temperature (Fig.1A). Per cent morning and

**Table 2**  
**Number of outbreaks according to the species and virus type involved**

Species involved	No. of outbreaks	No. of samples	Virus not recovered	Virus type			
				O	A	C	Asia-1
Cattle	15	39	2	28	9	-	-
Buffalo	13	21	2	16	3	-	-
Sheep	2	3	-	3	-	-	-
Goat	2	3	1	2	-	-	-
Cattle and buffalo	86	236	21	191	23	-	1
Sheep and goat	3	5	2	3	-	-	-
Cattle, buffalo and goat	2	1	-	1	-	-	-
Cattle, buffalo and pig	1	6	-	5	-	-	1
Cattle, buffalo, sheep and goat	2	10	4	6	-	-	-
Total	126	324	32	255	35	-	2

evening relative humidity showed a correlation coefficient of 0.176 and -0.105, respectively with the number of outbreaks (Fig.1). Similarly, a correlation coefficient of 0.049 and 0.373 was observed between average monthly rainfall and wind speed, respectively with the number of FMD outbreaks (Fig.1B, Fig.1C and Fig.1D).

**FMD control programme in Haryana - An overview:** India has launched FMD-CP during 10<sup>th</sup> Five Year Plan (2002-2007) initially in three regions (I, II and III comprising 8, 33 and 13 districts, respectively) of the country comprising 54 districts with a total outlay of Rs. 200 crores. Of the three, the region II is the largest comprising 33 districts of Punjab (8), Haryana (8), western Uttar Pradesh (16) and Delhi (1). The eight districts of the Haryana state include Bhiwani, Fatehabad, Hisar, Jhajjar, Jind, Rohtak, Sirsa, and Sonapat. Further, the remaining 11 districts of the Haryana state have also been covered through Centre-State funding. The main objectives of the FMD-CP include enhancing the socio-economic benefits from livestock production through improvement in animal health and increasing the negotiating power of the livestock and livestock products in the national/ international markets.

The FMD-CP was launched at Tosham, district Bhiwani on 23<sup>rd</sup> January 2004 by the Chief Minister of Haryana. The state government provided manpower, laboratory facilities, movement, setting up of vaccine booths, etc. and also organised mass awareness programs to educate the livestock breeders by wide publicity through newspapers, posters, leaflets, wall paintings, banners etc. The standardised FMD vaccine was supplied by central government under cold chain transport system. All the 8 districts have been provided facilities for storing vaccine under cold chain system. The quadrivalent FMD vaccine (comprising FMD virus types O, A, C and Asia-1) which was being used earlier, has been replaced by trivalent vaccine comprising of type-O, A and Asia-1 since type C has not been reported in Haryana after 1995 (Mann *et al.*, 1998, Sharma *et al.*, 2002, Kakker and Sharma, 2003).

The target livestock population of eight districts as per 2003 census was 43.76 lacs comprising of cattle (8.08), buffaloes (29.46), sheep (4.19) and goats (2.03 lakhs). All the animals over 3 months

age were vaccinated. The pre- and post-vaccination (within 90 days of first vaccination) serum samples were collected each from 10 cattle and 10 buffaloes from randomly selected villages. The animals have been re-vaccinated at six months interval in July 2004 and post-vaccination serum samples also collected within 90 days of second vaccination. Each vaccination was completed in the shortest possible time in each segment keeping in tune with the schedule of supply of vaccine, storage capacity and capability to cover the area. No vaccine was stored for more than a week at the district head quarter. Efforts were made to use the entire lot of vaccine within five days of supply. Likewise, two shots of trivalent FMD vaccine have been administered in the susceptible cattle and buffaloes of the remaining 11 districts of Haryana also that are not under FMD-CP.

An efficient surveillance system is the backbone for FMD control programme. However, highly antigenically variable nature of the virus might result into emergence of variant strains and may cause a severe blow to any effort undertaken to control FMD. The RRC on FMD is undertaking active surveillance in all the 19 districts of Haryana. For an effective surveillance, field animal husbandry staff has been requested to promptly report the outbreaks/cases of FMD in their areas to the RRC on FMD using FAX/ telephone/e-mail/ postal-mail etc. The Centre would promptly respond to these reports and provide appropriate technical guidance to tackle the situation effectively and identifying the FMD virus type involved and its epidemiology. During the period April to December 2004, not even a single FMD outbreak has been recorded by the Centre in districts under FMD-CP as well as in the remaining eleven districts of the state. It is envisaged that the success of FMD-CP will pave way for launching a National FMD Eradication Programme in the country.

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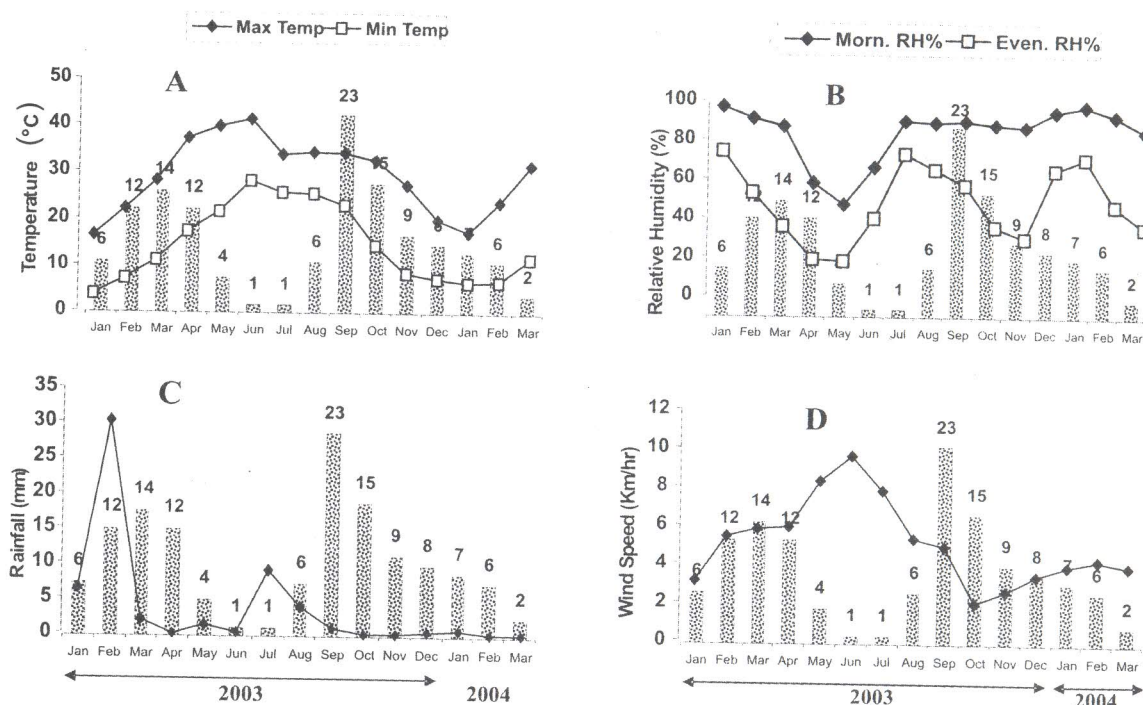


Fig. 1: Relationship between temperature (maximum and minimum, A), relative humidity (morning and evening, B), rainfall (C), windspeed (D) and the incidence of FMD outbreaks (■) in Haryana (January 2003 – March 2004).

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