STUDIES ON THE CURRENT STATUS OF FOOT AND MOUTH DISEASE (FMD) VIRUS OUTBREAKS IN NIGERIA

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ABSTRACT.

The outbreaks of foot and mouth disease (a disease of cloven hoofed animals) in Nigeria cattle were investigated over a seven year period (1994-2000). Thirty two (32) outbreaks were reported and visited and 5862 animals were involved. 1592 (27.16%) animals were affected and 93 (1.59%) died. Among the dead animals were 11 (0.19%) adult cattle and 82 (1.4%) calves. Isolation of virus in BHK-21 and Vero cell monolayer and investigation of virus isolates using specific FMD virus antisera revealed the presence of FMD SAT 1 and SAT 2 Serotypes in the field within the areas the outbreak occurred. It was also discovered that all the animals involved had no prevaccination and about 90% of the infected animals presented classical lesions of FMD. Most of these animals came through the neighboring countries of Chad, Niger, Cameroun and Burkinafaso poor disease reporting systems and lack of proper and adequate control measures are some of the primary factors responsible for maintaining the outbreaks in the country. Although the disease is known to be endemic in Africa, strict and efficient disease control methods should be adopted to combat future occurrence of the disease.

Key words: Foot Mouth Disease, Outbreak, Classical lesions, Prevaccination

INTRODUCTION

Foot and Mouth disease (FMD) is a highly contagious acute infectious viral disease of cloven hoofed animals' primarily of cattle, sheep swine and goat including the wild animals (Sanson, 1994; Forbes *et al*; 1994). The disease however is assuming increasing importance in Nigeria because of the present government efforts to upgrade and improve the indigenous cattle with the exotic breeds for increased meat and milk production. The exotic breeds are often more susceptible to FMD Virus infection and disease than the local breeds.

The disease is characterized by vesicular lesions and subsequently by erosion of the epithelium of the mouth, nares, muzzle, teat, udder and rumen pillars (Ferris *et al* 1992; Sanson 1994). Since 1931, virus types O. A SAT 1 and SAT 2 have been isolated in series of outbreaks (Nawathe and Goni, 1979; Abegunde *et al* 1988, Ezeokol *et al* 1988).

The disease has the ability to cause substantial production losses in domestic farm animals in intensive production systems.

FMD is usually associated with devastating economic loss although mortality is low (about 50%) in adult animals. The economic loss arises from such factors as high as 50% to 90% mortality in calf, decreased calving rate due to infertility and abortion, severe reduction in meat and milk production, loss of drought power loss of market, import restriction imposed on livestock products from FMD endemic area (Ezeokoli *et al* 1988, Abegunde, 1987). FMD was first reported in Nigeria in 1924 as sporadic outbreaks attributed to type O virus (Libeau, 1960. The disease is endemic in Nigeria (Nawathe and Goni, 1979; Asagba, 1982) and it was wide spread (Anon, 1972, Abegunde *et al*, 1987). The outbreak of FMD occurs in Nigeria yearly (Abegunde *et al*, 1988). The distribution of the disease is not completely known (Owolodun, 1971, Asagba, 1982) because system of disease monitoring and reporting is not efficient.

However, since render pest has been considered to be eradicated and contagious bovine pleuro-preumonia (CBPP) has been relatively brought under control, it become imperative to conduct study on FMD which is the third most important animal disease in the livestock industry, world wide. This study therefore was designed to investigate FMD out breaks in Nigeria over a seven year period.

MATERIALS AND METHOD

Standard virus and Antisera

All standard FMD viruses and antisera were obtained from Pirbright, U.K. through the Director, National veterinary research institute, Dr A.G Lamorde.

SAMPLES

Samples from infected animals were taken with probang consisting of epithelial scrapings from ruptured vesicles on the tongue and palate, and vesicular fluid if available from unruptured vesicle. These samples were collected into a sterile universal bottle containing cold glycerinated buffer and stored at 29^{oc}.

Transport Medium

The transport medium consists of a mixture of equal volume of glycerine and sterile 0.04m phosphate buffered saline (PBS), pH 7.2.-7.4. The medium also contains crystalline penicillin G (1000 i.u. /ml), streptomycin sulphate (100 ug/ml) and phenol red (20 ug/ml)

Virus Isolation and Identification

All vesicular scrapings of epithelial tissues were rinsed with PBS, at pH 7.2. They were ground with mortar and pestle and made into 10ml suspension with PBS. The suspension was spun at 3000 rpm for 20 minutes in refrigerated centrifuge (MSE. CO. England). The supernatant was carefully decanted. Antibiotics (Penicillin, Streptomycin

and Amphotericin B) were added to the supernatant to eliminated microbial contaminants. The inoculums was inoculated into fresh BHK-21 monolayer cells and Vero cells The flasks were incubated at 37^{oc} in a humidified incubated (B & E Co. England). The infected flask was observed for cytopathic effect, (CPE). All monolayer showing maximal CPE were harvested and their culture fluids tested for FMD virus serotypes. Virus identification was carried out with specific FMD virus type antisera by immunoelectrophoresis (IEOP) and ELISA.

Virus Titration in Cell Monolayer (tubes).

10ml of cell suspension of BHK-21 and or Vero cell line were grown in cell culture tubes until they become confluent. The sample virus suspensions were dilution 10 fold serially in PBS ($10^{-1} - 10^{-8}$). The cell culture tubes monolayer were separated into six (6) per dilatation. The various virus dilutions were inoculated with 1.0ml per tube monolayer cells. All infected tubes were incubated along with the uninfected control tubes at 37^{oc} for 24 to 72 hours and observed daily for cytopathic effect (CPE). The presence or absence of CPE in infected tubes was scored and virus Log_{10} $TCID_{50}$ titer was determined by Reed and Muench method, (1938).

Virus Titration in Mice

Virus $log_{10\ lethal}$ dose 50% was determined in suckling baby white albino Mice by intracerebral inoculations. The virus suspensions were made into 10 fold serial dilutions (10^{-1} to 10^{-7}). The baby mice were kept five mice per cage and one cage per dilution was used for the virus assay. Ten microlitre of each dilution was inoculated per mouse in the cage. The mice were adequately provided with feed and water and observed for seven to ten days for moribund. The $Long_{10}$ LD_{50} titer was determined by Reed and Muench method (1938).

RESULTS AND DISCUSSION

Foot and mouth disease is kwon to be wide spread in Nigeria and Africa (Oluokun, 1976; Rooder *et al.*, 1990 and Abu-Elzein and Crowther, 1979). Many of the African countries where FMD is endemic are always with the threat of outbreaks with variant strains (Kalandilu *et al.*, 1993). The distribution of the disease is not completely known because of the system of disease reporting is not efficient (Abegunde, 1987).

The cattle examined numbered 5,862 of which 1592 (27.16%) developed the disease. Out of 1592 infected animals, 2 calves (0.12%) and 11 adult cattle (0.69%) died, as in Table 1.

Table 1: Location with the incidence of FMD outbreaks.

Location (states)	Herd size	No. of Animal Affected (%)	Mortality	Mortality Rate (%)
Plateau	1078	287 (30.15)	13	4.53
Kaduna	1161	380 (35.40)	19	0.05
Gombe	217	64 (29.75)	7	10.94
Enugu	916	112 (13.75)	11	9.82
Bauchi	1583	464 (33.48)	21	4.53
Taraba	218	60 (35.78)	7	11.67
Niger	165	57 (37.58)	5	8.77
Zamfara	203	59 (29.06)	4	6.75
Abuja	259	109 (45.95)	6	5.50
Total	5862	1592	93	(82 calves)

Some of the cattle owners consider the disease very harmful, especially loss of milk and abortion in pregnant animals thereby affecting their livelihood and income of the peasant farmer. All sick animal examined has classical signs typical of FMD; most (90%) had oral and foot lesions, the rest having oral lesion only.

The present investigation was under taken to isolate and identify the present FMD type currently responsible for the various outbreaks in Nigeria. The use of such isolates of epidemiological significance as vaccine strains and antigens may be considered as one of the best methods of control of FMD by vaccination. The disease has high morality in calves and exotic breed of cattle than in indigenous adult cattle. During the period of studies no sheep and goats were found infected.

The laboratory investigation showed that SAT 1 FMD serotype was circulating in the field in 1994, 1996 and 1999 that was responsible for the outbreaks due to FMD virus while in 1995 it was caused by SAT 2. FMD outbreaks in 1997, 1998 and 2000 were due to both SAT 1 and SAT 2 FMD virus type (Table 2).

Table2: Location with occurrence of FMD serotypes

Location state	Years with virus types isolated						
	1994	1995	1996	1997	1998	1999	2000
Plateau	SAT 1	SAT 2	SAT 1	SAT 2	STA 1	SAT 1	SAT 1
Kaduna	SAT 1	SAT 2	-	SAT 2	-	SAT 1	-
Gombe	SAT 2	SAT 2	-	SAT 1	-	-	-
Enugu	-	-	-	-	-	-	-
Bauchi	SAT 1	SAT 2	-	-	SAT 2	SAT 1	-
Taraba	-	-	-	SAT 2	SAT 1	-	-
Niger	-	SAT 2	-	-	-	-	-
Zanfara	-	-	-	SAT 2	SAT 2	SAT 1	SAT 2
Abuja	-	-	-	-	SAT 1	-	-

Similarly, virus identification showed that both serotypes outbreaks have occurred in plateau, Kaduna, Gombe, Buachi state and Abuja while only SAT 2 FMD virus type

responsible for outbreaks in Taraba and Zamfara state during the period under investigation (Table 3).

Table3: FMD virus serotype and Log_{10} infectivity titer in mice and cell culture.

(States) Locations	FMD Sera Types	Virus Designation	BHK-21	Vero	Mice
Plateau	SAT 1	Nig 1/94	5.2	4.25	3.50
	SAT 2	1/95	5.5	4.75	N.D
	SAT 2	1/95	7.5	6.0	4.25
	SAT 1	2/96	4.0	3.25	2.5
	SAT 1	3/96	4.5	4.0	ND
	SAT 1	5/97	4.45	ND	ND
	SAT 1	2/2000	5.85	3.75	ND
Kaduna	SAT 1	2/94	5.5	4.35	3.25
	SAT 2	1/97	ND	4.25	3.25
Gombe	SAT 1	5/94	6.45	6.20	4.25
	SAT 1	6/95	5.25	5.25	3.55
	SAT 2	4/87	4.75	5.0	ND
Enugu	-	-	-	-	-
Bauchi	SAT 1	3/94	5.6	4.50	3.0
	SAT 2	3/95	6.25	5.85	4.25
	SAT 2	3.98	5.50	5.20	2.75
	SAT 1	1/99	5.25	3.50	ND
Taraba	SAT 2	3/97	4.15	ND	ND
Niger	-	-	-	-	-
Zamfara	SAT 2	2/97	4.0	ND	ND
Abuja	SAT 1	4/95	5.0	4.5	3.0
	SAT 2	1/98	6.2	5.5	3.5

The field study showed that FMD outbreaks have always been limited to the northern part of the country and also to trade cattle moving south of the country. This observation agreed with the report of Oluokun (1976), Nawathe and Goni (1979) and Owolodun (1971).

The major problem in the control of cattle disease across of the country, is due to poor communication, information, disease surveillance and reporting system, normadism of the Fulani herdsmen. These have posed a lot of difficulties in the control of the livestock diseases like FMD.

However, proper control of FMD outbreak in Nigeria may depend on prompt and efficient disease reporting system, use of appropriate vaccines and good vaccination programme. Also an increase in manpower through training of more veterinary assistance and the creation of cattle control post will help alot. It also important to continue with the isolation and identification of virus types in wild ungulates.

This study therefore wishes to suggest that the present knowledge on the exciting FMD serotype in the field will serve as guide in the preparation of the appropriate vaccines for use in future vaccination programmes.

Efforts should be made prepare prototype FMD vaccines using the local isolates for the control and prevention of FMD in the country.

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