

# FOOT-AND-MOUTH DISEASE VIRUS TYPING FROM FOOT-AND-MOUTH OUTBREAKS IN THE CENTRAL PROVINCES OF VIET NAM

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## Abstract

### FOOT-AND-MOUTH DISEASE VIRUS TYPING FROM FOOT-AND-MOUTH OUTBREAKS IN THE CENTRAL PROVINCES OF VIET NAM

A total of 167 tissue samples were collected from Foot-and-mouth disease (FMD) infected animals from 57 FMD outbreaks to detect the sero-type of the FMD virus by the ELISA technique. The ELISA kit has been prepared and standardised by the World Reference Laboratory (WRL), UK and supplied under a Research Contract as part of an FAO/IAEA Co-ordinated Research Project. Eight tissue samples from cattle and one tissue sample from pig were sent to WRL for further study on the sero-type and to characterize the FMD viruses present in Viet Nam. The study was carried out from March 1996 to May 1998 in the central region of Viet Nam and the FMD type O virus was detected in these outbreaks only. The FMD type O virus from cattle and the FMD type O virus from pig are two distinct FMD type O viruses in Viet Nam.

## 1. INTRODUCTION

FMD outbreaks have occurred in many central Provinces of Viet Nam. These outbreaks have been effectively controlled by 'ring vaccination' and animal movement control for many years [1]. The FMD vaccine that has been used to control FMD outbreak in Viet Nam is a trivalent vaccine that contains the sero-types O1, A22 and Asia I. In 1997, there were many FMD outbreaks in cattle which could not be effectively controlled by that vaccine. To date, there is not enough information about the FMD virus sero-type of the FMD virus which caused FMD outbreaks in the central region of Viet Nam.

The objective of this study was to:

- Detect the sero-types of FMD virus that caused the FMD outbreaks and find out the distribution of these sero-types of FMD virus in the central Provinces of Viet Nam.
- Select appropriate samples for sending to WRL, Pirbright, UK to further characterize the FMD virus.

The duration of this study was from March 1996 to May 1998.

## 2. MATERIALS AND METHODS

### 2.1. Sample collection

Two to three tongue tissue samples were collected from infected animals at the beginning of each outbreak. Samples were kept in 0.4 M phosphate buffer with 50% glycerine and sent within 72 hours on ice to the Veterinary Laboratory of the Regional Animal Health Centre, Ho Chi Minh City.

### 2.2. ELISA Kit

The samples were tested using the ELISA kit prepared and standardized by FMD World Reference Laboratory (WRL) at Pirbright, United Kingdom and provided by the Joint FAO/IAEA Division through a Research Contract awarded under an FAO/IAEA Co-ordinated Research Project. This FMD virus antigen detection kit uses an indirect sandwich ELISA to detect four possible sero-types: O, A, C and Asia I, of FMD virus in tissue samples. The assay protocols followed are described by IAEA/WRL Bench Protocol [2].

### 2.3. Characterization of FMD virus

This was carried out at the WRL, Pirbright, England. Details are described below.

### 2.3.1. The serological relationship (r-value)

The reference virus and field isolate viruses were titrated by indirect sandwich ELISA method as described by Hamblin et al [3] and Kitching et al [4]. A fixed concentration of reference and field isolate viruses giving an optical density (OD) of 1.5 was reacted with bovine post vaccination and challenged serum with homologous virus. The serological relationship (r-value) [5] was calculated as this ratio:

$$\text{r-value} = \frac{\text{serum titre against heterologous field strain}}{\text{serum titre against homologous vaccine strain}}$$

The guideline suggestion for r-value obtained by LPB-ELISA and the criteria of interpretation have been proposed by Samuel et al [6] and Doughty et al [7] as follows:

- when  $r = 0 - 0.19$  this is highly significant serological variation from the reference strain.
- when  $r = 0.2 - 0.39$  this represents a significant difference from the reference strain, but protection may be satisfactory if using a sufficiently potent vaccine.
- when  $r = 0.4 - 1.0$  there is no significantly difference from vaccine strain.

### 2.3.2. The molecular relationship

Field virus isolates were sequenced and the sequence date compared through the production of an dendogram which compares degree of sequence homology for characterization purposes [7] (see also paper by A. Donaldson in this publication).

## 3. RESULTS

The results of FMD virus typing are shown in Tables I, II and III for the years 1996, 1997 and 1998 respectively. In 1996 39 samples from 12 outbreaks were tested, in 1997 103 samples from 31 outbreaks were tested and in 1998 25 samples from 14 outbreaks were tested. In all cases only FMD type O virus was detected.

Nine tissue samples were sent to WRL, for further sero-typing and the results are shown in Table IV.

The relationship of the two distinct FMD type O viruses isolated from cattle and pig in Viet Nam and other type O viruses is shown through the comparable r-values (Table V).

TABLE I. THE RESULT OF FMD VIRUS TYPING FROM MARCH 1996 TO DECEMBER 1996.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Nr of outbreaks	-	-	1	4	2	3	0	0	0	0	2	0
Nr. of samples	-	-	4	12	7	9	0	0	0	0	7	0
Result sero-type	-	-	O	O	O	O	-	-	-	-	O	-

TABLE II. THE RESULT OF FMD VIRUS TYPING FROM JANUARY TO DECEMBER 1997

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Nr of outbreaks	0	4	7	2	2	4	4	3	1	1	2	1
Nr. of samples	0	13	22	7	8	13	11	10	4	4	7	4
Result sero-type	-	O	O	O	O	O	O	O	O	O	O	O

TABLE III. THE RESULT OF FMD VIRUS TYPING FROM JANUARY TO MAY 1998

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Nr. of outbreaks	5	3	4	1	1	0	0	0	0	0	0	0
Nr. of samples	7	6	8	3	2	0	0	0	0	0	0	0
Result sero-type	O	O	O	O	O	-	-	-	-	-	-	-

TABLE IV. SERO-TYPING RESULTS FROM WRL, UK COMPARED TO THE RESULTS OBTAINED IN VIET NAM

Species animal	of Number samples	of FMDV sero-typing result from Regional Animal Health Centre HCMC, Viet Nam	of FMDV sero-typing result from WRL, Pirbright, England
Cattle	8	Sero-type O, only	Sero-type O, only
Pig	1	Sero-type O	Sero-type O

TABLE V. THE R-RESULTS MEAN BETWEEN THE FMD TYPE O VIRUSES FROM VIET NAM AND OTHER FMD TYPE O VACCINE VIRUSES

Virus Serum	O Vietnam 1/97	O Vietnam 2/97	O Vietnam 3/97	O Vietnam 4/97	O Vietnam 7/97	O Vietnam 9/97
O-'3039' BVS 'r'	0.33	0.25	0.79	0.22	0.23	0.32
O-MANISA BVS 'r'	0.53	0.50	0.70	0.29	0.17	0.30
O-PHILIPPINES BVS 'r'	0.50	0.50	1.00	0.53	0.49	0.45
O-BFS 68 BVS 'r'	0.39	0.20	0.23	0.30	0.30	0.30

BVS : Bovine Vaccinated Sera – 21 days.

O VIET NAM 3/97: Field isolated FMD type O virus from pig.

O VIET NAM 1/97, 2/97, 4/97, 7/97 and 9/97: Field isolated FMD type O viruses from cattle.

#### 4. DISCUSSION

The study was carried out in eight central Provinces of Viet Nam, two of them having a border with Campuchia. From March 1996 to May 1998, 67 tissue samples were collected from 57 FMD outbreaks. The FMD type O virus was detected in these samples only. The results of FMDV typing from the laboratory of Regional Animal Health Center HCMC and WRL are the same, with only FMD type O virus being detected by both laboratories.

The FMD type O virus from cattle and FMD type O virus from pig in Viet Nam are two distinct FMD type O viruses. The FMD type O virus from pig is closely related to FMD type O virus from Taiwan, Hong Kong and Philippines, whereas the FMD type O virus from cattle is closely related to FMD type O virus from Thailand and Malaysia.

The FMD type O virus from pig has an r-value of 0.79, 0.70, 1.00 and 0.23 against the FMD vaccine virus strains O-'3039', O-Manisa, O-Philippines and O-BFS 68 respectively. According to this result, the FMD type O virus from pig in Viet Nam can be effectively controlled by the vaccine containing any of the strains O-'3039', O-Manisa and O-Philippines. In the field, all pig FMD outbreaks have been effectively controlled by a mono-valent vaccine containing strain O-Manisa only.

The r-values between FMD type O viruses from cattle and the FMD strain O-Manisa vaccine virus are very low (max: 0.53 and min: 0.17), therefore many cattle FMD outbreaks that were caused by FMD type O viruses could not effectively be controlled by trivalent vaccine containing strains O-Manisa, A 22 and Asia. To improve the effectiveness of the national FMD control programme, the Department of Animal Health has chosen the FMD vaccine containing strains A 22, Asia I and three strains O: O-Manisa; O-'3039' and O-Philippines for controlling cattle FMD outbreaks. This has clearly been successful and resulted in the reduction of FMD outbreaks in 1998 (compare Tables I, II and III).

In the future, more effort will be made to fully characterize isolates of FMD virus from outbreaks in Viet Nam and in particular their relationship to FMD virus vaccine strains being used in the National Control Programme.

## ACKNOWLEDGEMENTS

The author wishes to thank the IAEA for their financial assistance and technical support for this project and the WRL for their expertise and guidelines on the ELISA kits and test results. Special thanks to all veterinary staff of the Provinces and the Department of Animal Health of Viet Nam for their co-operation and support in making this project a success.

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