

# **Epidemiology of Foot and Mouth Disease in Cattle In Pahang, Malaysia.**

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## **Declaration**

I declare this thesis is my own account of my research and contains as its main content, work which has not been previously submitted for a degree at any other tertiary educational institution.



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## **Abstract**

Foot-and-mouth disease (FMD) is one of the most contagious diseases of domestic and wild cloven-hoofed animals. The disease has a significant negative impact on the economy of affected countries through reduced livestock productivity and loss of markets. In Pahang, Malaysia a severe outbreak of FMD started in December 2003, after approximately 18 years of freedom from the disease. The FMDV strain O was identified as the cause of this outbreak. The study reported in this thesis focused on three areas of epidemiology of FMD and was designed to: determine the temporal and spatial distribution and pattern of outbreaks of FMD in Pahang; identify the risk factors associated with the occurrence of FMD in Pahang; and determine the antibody response in local cattle following vaccination against FMD.

Although vaccination is adopted as a control measure for FMD in Pahang, the findings of this study indicated that only half (56%) of the respondents believed in vaccination as a preventive measure for FMD with only 37.3% of respondents correctly explaining how the disease spreads. Unfortunately only 29% of the respondents knew that the vaccine needed to be given at six monthly intervals and no one knew that a second priming dose was required to be administered one month after the primary dose. Antibody conferred after vaccination was significantly higher in animals which had been multiply vaccinated than in animals which received their first vaccination. There was evidence that vaccination stimulated a serological immunity; however the immunity, in many cases, was not sufficient to protect

against natural infection. In addition the NSP test indicated 7 animals (5 cows and 2 calves) were positive during the eleven month study period, although no clinical evidence of FMD had ever been seen on the farm.

Three variables (factors) were found to be associated with FMD in Pahang after a multivariable logistic regression analysis. The most strongly associated factor was retaining seropositive animals in the herd ( $P = 0.006$ ; OR=3.62; 95% CI 1.44, 9.11). Cattle farmers who kept other livestock were more likely ( $P=0.003$ ; OR 3.2; 95% CI 1.47, 7.07) to have an infected FMD herd than owners who didn't keep other species of livestock. Farmers which allowed the entry of unauthorised vehicles onto their farmland were also more likely to have an infected herd ( $P=0.05$ ; OR = 2.2; 95% CI 1.0, 4.82).

The spatio-temporal distribution of FMD outbreaks in Pahang during the period from the 16<sup>th</sup> December 2003 to the 26<sup>th</sup> August 2006 was assessed using a Space – Time permutation model. This indicated there were five significant distinctive clusters with no geographical overlap in the secondary clusters for the whole study period. Clusters were identified in the east, west and middle of Pahang with the observed to expected ratio of FMD outbreaks within the spatial temporal clusters being between 2.39 and 17.78. The temporal pattern of the FMD outbreaks in Pahang appeared to be seasonal occurring during the rainy season which coincided with “Hari Raya Korban” when many live cattle are moved throughout the country. The present study provided valuable information for the development of an effective control and eradication program for FMD in the state of Pahang, Malaysia.

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## Abbreviations

ANOVA	Analysis of Variance
AVO	Assistant Veterinary Officer
CI	Confidence Interval
°C	Degrees Celsius
DPV	Days post vaccination
DNA	Deoxyribonucleic acid
EDTA	Ethylenediamine tetraacetic acid
ELISA	Enzyme-linked immunosorbent assay
FMD	Foot and Mouth Disease
FMDV	Foot and Mouth Disease Virus
H <sub>2</sub> O <sub>2</sub>	Hydrogen peroxide
ID	Identification
LPBE	Liquid Phase Blocking ELISA
M	Molar
mM	Millimolar
NSP	Non Structural Protein
OR	Odds ratio
OD	Optical density
OIE	Office International des Epizooties
OPD tablets	Ortho-Phenylenediamine
PI	Percentage of Inhibition
PTH	Pusat Ternakan Haiwan
PBS	Phosphate buffered saline

RVL	Regional Veterinary Laboratory
SPSS	Statistical package for the Social Sciences
$\mu\text{L}$	Microlitre
nm	Nanometre
WRL	World reference laboratory
w/v	Weight in volume
v/v	Volume in volume
VIF	Variable Inflation factor
$\chi^2$	Chi square