Cross-sectional study of Foot and mouth diseases in cattle farms in northern Thailand.

Rojanasthien, S., Padungtod, P. , Yamsakul, P. , Kongkeaw, S. and Yano T.
Faculty of Veterinary Medicine, Chiang Mai University, Chiang Mai, Thailand.

Abstract

Foot and mouth disease (FMD) is the most important disease in ungulate species especially in cattle. The objective of this study was to determine risk factors of FMD in cattle farms in northern Thailand. The information regarding the occurrence of FMD in each farm was obtained from the Department of Livestock Development (DLD). Cattle demographic information in the study was collected using questionnaires, along with risk factors information during April 2004 – April 2005 AC. A total of 6,251 cattle farmers were interviewed in this study. The result showed that FMD was found in 677 farms or 10.83 % during 2003-2004. Most of the studied farms (84.80 %) were smallholder farms (1-20 cattle). Factor analysis and logistic regression were used to analyze risk factor information. The analysis result showed that the total number of cattle, number of DLD officer visiting, number of vehicles in farm, number of neighboring village within 2 kilometers, number of new stock, distance to the nearest slaughter house and affected farm, FMD outbreak in neighboring farm, sharing pasture with other village, buying new stock, veterinarian artificial insemination, using public pasture, use canal or pond as main water source, having disinfectant pool, having disinfectant spray house, no disinfection for visitor and proportion of vaccinated animal were significantly ($P<0.05$) associated with the occurrence of FMD in cattle farms. In conclusion, these factors could be modified in order to control FMD in this area.

Introduction

Foot and mouth disease (FMD) is an acute, highly contagious viral disease of cloven hoofed livestock. The clinical manifestation of FMD is characterized by vesicular lesions, erosions and ulcer in the mouth and interdigital areas and on the muzzle, teats and coronary band. (Smith, 2002). FMD caused by Foot and mouth disease virus (FMDV), which is in the family Picornaviridae and the genus Aphthovirus. Seven serotypes of FMDV have been identified by serological test. They are A,O,C, Asia 1 and South African Territories (SAT) 1,2 and 3 (Murphy,1999). Natural hosts of FMDV include cattle, sheep, goat, water buffalo, deer, elk, antelope, camel, giraffe, elephant and other cloven hoofed animals. Cattle are the most susceptible species (Pfeiffer, 1993). Transmission occurs by aerosols, animal contact and fomites such as shoes, tires and equipment (Kahrs, 1981). Human being can carry the virus on their shoes or clothing or in respiratory tract tissues for longer than 24 hours (Smith, 2002).

FMD is the disease mostly affects productivity and result in economic loss in livestock in Thailand. FMD has become a serious impediment to efficient production as well as the development of livestock export opportunities. In Thailand, the circulating FMDV are serotype O, A and Asia 1. Most of the outbreaks were found in cattle. Anyhow, some outbreaks were reported in pig farms (DLD, 2005). The Royal Thai government has attempted to promote Thailand as the world kitchen by improve food product quality and supply food to the world food market. FMD is an important trade barrier since country, which is free from FMD do not import beef and pork product from FMD affected countries.
The Department of Livestock Development (DLD) of the Royal Thailand government is the organization in charge of the control and possible eradication of FMD from Thailand. FMD control measures initially comprised strict control of animal movement, vaccination program, animal

quarantine, sanitary control, outbreak investigation, field surveillance and slaughtering of sick animal (Chaisrisongkram, 1993). In 1995, Cleland et al. studied FMD in villages in northern Thailand found that the total number of cattle and buffaloes purchased in the previous year, the number of neighboring villages which shared a common water source and whether agriculture was the most important source of cash income for the village were significantly associated with FMD outbreak in villages in northern Thailand (Cleland, 1995). The government policy, control strategies and management of risk factors may facilitate control and eradication of FMD from northern Thailand.

Objective

The present study was designed to determine the status of FMD, identify risk factors of FMD in cattle farm and identify control strategies of FMD in northern Thailand.

Methods

A cross-sectional study was undertaken during 2004-2005 AC. in northern Thailand. Thirty-two districts and three sub-districts from Chiang Mai, Lumphun and Nan Provinces were chosen based on the presence of cattle. Farms were divided in 4 classes according DLD standard farm practice; farm had less than 5 cattle, small farm had 5-19 cattle, medium size farm had 20-99 cattle, and large farm had more than 100 cattle. In these provinces, a total of 6,251 cattle farms were randomly selected from 20,534 cattle farms. One interviewing team collected all data using a pre-tested questionnaire and standardized protocol. One interviewer interviewed one responder. The questionnaire was designed to collect data concerning general management information of farm, biosecurity and sanitation procedure of farm, number and type of animals, disease occurrence, farm animal movement, FMD control and prevention strategies, history of FMD outbreak during the previous year (2003-2004 AC.) including management when FMD occurred. Other topics in the questionnaire include risk factors and preventive factors of FMD in each farm. The data was entered into the microcomputer using EpiInfo (CDC, Atlanta, GA).

Statistical analyses were undertaken using statistical microcomputer software, SAS®. The descriptive analysis was used to describe general management information of farm, biosecurity and sanitation procedure of farm, animals, disease occurrence, and management when FMD occurred. Multivariable logistic regression analysis was used to analyzed risk factors and preventive factors of FMD on the history of FMD outbreak within the past year (2003-2004 AC.). A significant level was set at 0.05 for all procedures.

Results

The result showed that 84.80% of cattle farms in northern Thailand are smallholder with less than 20 cattle in the farm. Most of the farm types in this area are cattle or swamp buffalo farm. Most of the farms raise cattle on public pasture (81.90 %), and shared pasture with other farm or other villages. The main water source was public river or canal (33.60%) others used tab water, swamp and aquifer. Thirty four percent of the farms shared public pasture and water source with neighbouring villages. Up to 80.6% of cattle farmers have other job apart from cattle farm such as longan orchard owner.

Over 95%of the farms did not decontaminate vehicles and visitors before entry. Only 2.20 % of the farms have disinfectant basin in front of cattle barn. Some farmers (20.00%) regularly add new stock every month with the average of 2 cattle per farm.

Vaccination was the main FMD control and prevention strategies in the study area. More than half of the farms (56.00%) used trivalent FMD vaccine and most of them (99.10 %) used vaccine produced by DLD. Most of the cattle were vaccinated by DLD officer and 70.20 % of vaccinators stored vaccine in controlled cool temperature storage such as refrigerator or ice box. When neighboring farm had FMD outbreak, 30.56 % of farmers prompt vaccinated the animals as soon as possible, 38.99 % of farmers did not add any new stock and 34.52 % of farmers did not have any prevention strategies.

During 2003-2004 AC., 677 farms or 10.83 % (Table 1) were affected by FMD. During the outbreak, 66.80 % of farmers informed DLD officer, 58.10 % of farmers called for veterinary service and 25.80 % of farmers did not move animal out of the farm. Up to 21.50% of farmers sold healthy and recovered animals to livestock markets or slaughter houses.

Table 1 Number of surveyed cattle farms and number of FMD outbreak cattle farms in northern Thailand during 2003-2004 in the present study.

Provinces	**No. of surveyed farms**	**No. of FMD outbreak farms**	Proportion (%)
Chiang Mai	**2,632**	**329**	12.50
Lamphun	**831**	**185**	22.26
Nan	**2,788**	**163**	5.85
Total	**6,251**	**677**	**10.83**

Multivariable logistic regression analysis result showed seven significant risk factors and five protective factors associated with the occurrence of FMD in cattle farms as shown in table 2 and table 3.

Table 2 Risk factors of FMD outbreak in cattle farms in northern Thailand in the present study.

Factors	**Odds Ratio**	**95% Confidence Limits**	*P-value*
Artificial insemination performed by DLD officer.	**5.118**	**1.207-1.706**	0.0268
Using public pasture	**1.651**	**1.117-2.441**	0.0119
Number of cattle in farm	**1.396**	**1.276-1.528**	<.0001
Number of DLD officer visiting the farm in one year.	**1.342**	**1.032 - 1.744**	0.0281
Total number of vehicles.	**1.298**	**1.104 - 1.527**	0.0016
Distance to the nearest slaughter house.	**1.224**	**1.035 - 1.448**	0.0182
Number of new stock	1.113	1.059 - 1.170	<.0001

Table 3 Protective factors of FMD outbreak in cattle farms in northern Thailand in the present study.

Factors	**Odds Ratio**	**95% Confidence Limits**	*P-value*
Proportion of vaccinated animal.	**1/1.260**	**1/1.034 - 1/1.535**	0.0221
Distance to FMD affected farm less than 2 km.	**1/1.295**	**1/1.025 - 1/1.637**	0.0306
Having disinfectant pool.	**1/2.283**	**1/1.355-1/3.861**	0.0020
Recognition of FMD outbreak in neighboring farm.	**1/3.92**	**1/3.030-1/5.050**	<.0001
Having disinfectant spray.	1/76.923	1/10.309 -1/500	<.0001

Discussion

The result showed that the majority of cattle farmers in northern Thailand were smallholder with less than 20 cattle per farm and has other job for their cash income which may influence the attention of good husbandry practice of them. Most of cattle were free range cattle and shared pasture with other farm or other villages. The main water sources were public river or canal. The public pasture and water source were shared among neighbouring farms or villages during day time and the owner took their cattle back to the farm at night. This factor can facilitate FMDV transmission among cattle sharing the same pasture. The significant of public pasture observed in this study is similar to the study of Cleland et al in 1999.

The biosecurity practice in each farm is generally poor. They can not protect FMDV spread into the farm because farmers did not decontaminated vehicles and visitors before came into the farm. Only 2 % of farmers that had disinfectant basin in front of cattle barns. The cattle farmers in this study did not practice disease protection with biosecurity. Most of the farmers believe that only vaccination can protect the animals from the disease. More than half of the farmer vaccinated trivalent vaccine for their cattle. DLD has promoted FMD prevention in this area by encouraged vaccination strategy in cattle farms. DLD also supplied officers as vaccinator and supplied free FMD vaccine to animal in the border areas, livestock markets, and during transportation in northern Thailand (Chaisrisongkram, 1993). Anyhow FMD still outbreak in this area. It might indicate that vaccination is not enough for disease control and biosecurity is one of choice that can be chosen. DLD should more encourage biosecurity practice into cattle farms and cattle farmers should realise biosecurity is one important disease control strategy as vaccination.

During 2003-2004, there were 677 FMD outbreaks in cattle farms in northern Thailand. Most of the outbreaks occurred in area with high density of cattle farms. These data was similar to the study of Gloster J. in 1982, which identified high density of livestock as a risk factor of FMD outbreak (Gloster, 1982). Outbreak reporting system is success with cattle farmers in this area because two-thirds of cattle farmers inform DLD officer and one-forth did not move animal out of farm when outbreak occurred. However, one-forth of farmers still sold healthy and recovered animal in outbreak farm to livestock market and slaughter houses, which may facilitate the spread of FMD in the area. It might indicate self responsible of some farmers in disease control and public awareness.

Multivariable analysis (table 2 and table 3) identified seven risk factors associated with FMD occurrence. There were five significant protective factors that reduce probability of FMD outbreak in the farm.

Biosecurity is an important FMD control strategies in cattle farm. Vehicles and human can carries virus in and out of the farm. Disinfectant can reduce number of FMDV spread to other places. This study showed similar result as the of Cleland et al, 1996 and Sutmoller et al, 2003.The number of cattle in farm and number of new stock in farm in each month that associated with FMD outbreak in farm (Cleland et al, 1996 and Sutmoller et al, 2003), which is similar to the observation by Cleland in 1995, which found that the total number of cattle and buffaloes purchased in the previous year were risks factors of FMD outbreak in villages in northern Thailand (Cleland, 1995). . This may be due to the fact that most farmers did not quarantine new cattle and disinfected cattle after released it in public pasture.

Since the significant level of protective factors in recognition of neighboring farm was very low ($p<0.0001$) which might indicates that the FMD outbreak notify to cattle farmers can reduce opportunity of FMD. In conclusion, this may be because farmers can protect themselves earlier by

vaccination and strict biosecurity. This study indicated that biosecurity, vaccination, disease reporting system and announcement of FMD outbreak to farmers are good strategies for controlling FMD in Thailand.

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