

FOOT-AND-MOUTH DISEASE IN LAO PDR: ESTABLISHMENT OF LABORATORY FACILITIES, OUTBREAK DIAGNOSIS AND SEROLOGICAL SURVEILLANCE

S. VONGTHILATH, S. KHOUNSY, S.D. BLACKSELL
Animal Health Division,
Department of Livestock and Fisheries,
Lao Peoples Democratic Republic



XA0054975

Abstract

FOOT-AND-MOUTH DISEASE IN LAO PDR: ESTABLISHMENT OF LABORATORY FACILITIES, OUTBREAK DIAGNOSIS AND SEROLOGICAL SURVEILLANCE.

In 1997, a new foot-and-mouth disease (FMD) diagnostic laboratory was established as part of a project supported by the Australian Center for International Agricultural Research (ACIAR) in collaboration with the Department of Livestock and Fisheries (DLF), Lao PDR. The ACIAR project laboratory houses equipment and reagent supplied by the FAO/IAEA Co-ordinated Research Project (CRP) on FMD in Southeast Asia. Training has also been provided in performing FMD ELISA techniques. A serological survey to determine the sero-prevalence of FMD antibodies was conducted in Luang Prabang, Champassak and Savannakhet Provinces where a total of 1204 cattle and buffalo sera were collected from 58 villages in 13 districts. Results from the samples collected indicated that the dominant sero-type was O with a range of 16.4% in Luang Prabang to 23.4% in Champassak Province. Antibodies against sero-types A and Asia I were also detected but to a much lower level. From FMD suspected outbreaks, a total of twenty-six samples were submitted for FMD diagnosis between December 1997 and December 1998 of which ten were typed as O, three were typed as Asia I and thirteen were negative. The economic impact of FMD in Lao PDR is also discussed.

1. INTRODUCTION

In May 1997, a project sponsored by the Australian Center for International Agricultural Research (ACIAR) in collaboration with the Department of Livestock and Fisheries (DLF), Lao PDR commenced and focused on two major livestock diseases, foot-and-mouth Disease (FMD) and classical swine fever. The first objective of the project was to establish a laboratory facility in Vientiane for the diagnosis of the target diseases and to provide training to DLF staff. Prior to the commencement of the project, the FAO/IAEA Co-ordinated Research Project (CRP) on FMD in Southeast Asia had supplied reagents and equipment to facilitate the diagnosis of FMD outbreaks and serological surveys. In December 1997, the ACIAR project laboratory was commissioned, the reagents and equipment relocated and DLF staff trained in FMD ELISA techniques.

During 1997, a serological survey of FMD sero-prevalence was undertaken in Luang Prabang, Champassak and Savanakhet Provinces as part of FAO/TCP/6611 and the FAO/IAEA Research Contract awarded under the CRP to this laboratory. One thousand two hundred and four sera were collected from cattle and buffaloes from 58 villages. These samples were subsequently assayed at the laboratory and the results are presented in this paper. Additionally, results of routine detection and sero-typing from suspected-FMD outbreaks are also presented.

2. MATERIALS AND METHODS

2.1. ELISA technologies

The routine detection and sero-type identification of FMD was accomplished by the use the FMD antigen typing ELISA (AT-ELISA) which was supplied in kit form by the Institute for Animal Health (IAH), Pirbright. The methodology as prescribed by IAH was used for the AT-ELISA.

Serological determination of FMD sero-types was undertaken using the FMD liquid phase blocking ELISA (LPB-ELISA) for the detection of serum antibodies, which was also supplied in kit form by the IAH, Pirbright. The methodology as prescribed by IAH was used for the LPB-ELISA with the exception that sera were screened at a final 1:40 dilution and positive sera were titrated in the two-fold dilution series 1:40–1:320 to attempt to determine the end point.

2.2. FMD outbreak investigations

Provincial or district livestock officers submitted samples for FMD diagnosis and sero-typing from suspected FMD cases to the project laboratory. To enable the safe transit of epithelial specimens, samples were placed in a transport medium (50% glycerol + 50% PBS) that in turn was placed inside locally produced transport containers constructed from PVC water pipe. Samples were submitted to the laboratory via the local postal service or by bus.

2.3. FMD sero-prevalence studies

Three Provinces, Luang Prabang, Savanakheth and Champassak were chosen for FMD sero-prevalence studies. Fifty-eight villages from thirteen districts were included in the survey (see Table I and Fig. 1).

TABLE I. LOCATION AND NUMBER OF SAMPLES TAKEN DURING FMD SEROPREVALENCE SURVEY

Province	Districts	No. of Villages sampled	Total samples
Luang Prabang	Luang Prabang	5	100
	Pak-ou	5	102
	Xieng Ngeun	5	100
	Nambark	4	100
Savanakheth	Chantabuly	3	57
	Xaiphouthong	2	32
	Songkhone	5	102
	Champhone	5	100
	Outhaumphone	5	101
Champassak	Paksong	5	97
	Phaethong	5	115
	Sakhuma	3	100
	Bachiengcharoensouk	6	98
Total	13 Districts	58	1204

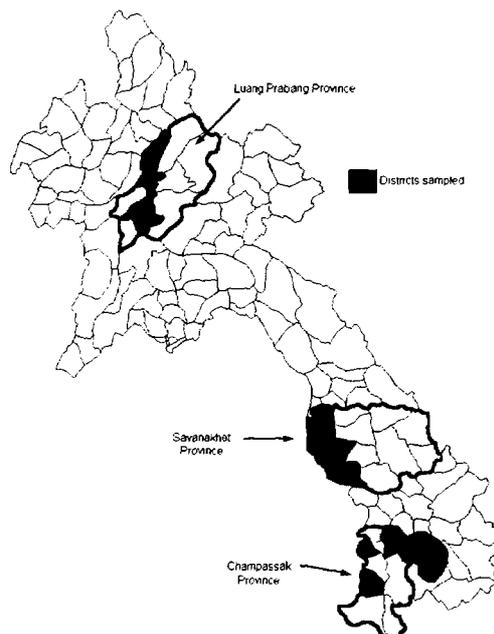


FIG. 1. Location of districts providing samples during FMD seroprevalence survey

During the visit to each village, an interview with the livestock holders was held usually in the village headman's house to collect livestock statistics thereby enabling a sampling frame to be constructed for randomization of animals to be sampled. The survey team aimed to sample at least 20 cattle or buffaloes from each village although, due to a shortfall in animals in some villages this was not always possible. 1204 sera were collected in total.

2.4. Economic impact of FMD

An estimate of the economic impact of FMD in village livestock production systems was calculated using anecdotal evidence based on discussions with experienced field staff within DLF.

3. RESULTS AND DISCUSSION

3.1. Implementation of FMD ELISA technologies

The implementation of the FMD AT-ELISA and FMD LPB-ELISA in the first instance was facilitated by ELISA kits supplied by IAH, Pirbright as part of the FAO/IAEA CRP on FMD in Southeast Asia in conjunction with FAO Technical Co-operation Project (TCP) RAS/6611. With the assistance of these two projects and the ACIAR project the FMD ELISAs were implemented within a two week period and found to perform reliably on initial and subsequent use. Staff training to ensure familiarization with ELISA concepts and specific test procedures was also undertaken over a two-month period. Quality control procedures as described by Blacksell et al [1] using the QCEL program was implemented to ensure confidence in the test results. In our experience we have found that the following is essential to good ELISA performance in our laboratory:

- good quality laboratory water (in our case we use a commercial deionisation unit)
- thorough washing of all glassware and plastic ware
- adequate refrigeration for the storage of reagents.

3.2. FMD outbreak investigations

FMD is endemic in Lao PDR with wide spread outbreaks reported since 1980. The level of FMD incidence in Lao PDR is influenced to a large extent by the demands of illegal international animal trade, as the country is an established thoroughfare to major livestock markets in neighbouring countries.

Samples from FMD suspected outbreaks in the Vientiane Municipality submitted to the DLF in 1996 prior to the establishment of the project laboratory were retrospectively sero-typed as type Asia I. Overall, a total of twenty-six samples were submitted for diagnosis from December 1997 to December 1998 of which ten were typed as O, three were typed as Asia I and thirteen were negative.

In 1998, FMD outbreaks were reported at the beginning of the year in Vangvieng district of Vientiane Province that was sero-typed as Asia I. In September, a larger FMD outbreak sero-typed as type O was reported in Samakysay district of Attapeu Province that subsequently spread to another four districts of the Province and Paksong district of the adjoining Champassak Province. It would appear, that the FMD outbreak spread from Attapau to Champassak following the movement of affected animals along Highway 10 connecting the two Provinces. The number of large animals in the Attapau/Champassak type O outbreak estimated to be affected by FMD was 5810 out of total population of 27 600 animals (21%). Epithelial samples were collected from acutely affected animals and sent to the FMD World Reference Laboratory, Pirbright, United Kingdom where detailed characterization of the samples is currently underway. The origin of the outbreak in Attapeu and Champassak Provinces has yet to be determined. A summary of positive sample details is presented in Table II and the geographical location of positive samples is presented in figure 2.

TABLE II. SUMMARY OF FMD POSITIVE SAMPLES SUBMITTED FROM DECEMBER 1997 TO DECEMBER 1998

Date	Province	District	Species	Sero-type
January 1998	Vientiane	Vangvieng	Cattle	Asia I
September 1998	Attapeu	Samakysai	Buffalo	O
October 1998	Attapeu	Saysettha	Buffalo	O
November 1998	Attapeu	Phouvong	Cattle	O
December 1998	Champassak	Paksong	Cattle	O
December 1998	Champassak	Khong	Buffalo	O

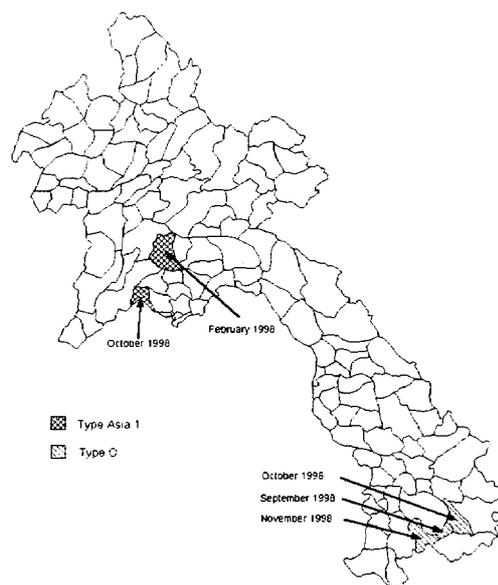


FIG. 2. Geographical location and time of FMD positive sample submission

3.3. FMD sero-prevalence studies

Results of FMD sero-prevalence studies are presented in Table III. It is evident, that the dominate sero-type antibodies are type O with a range of 16.4% in Luang Prabang to 23.4% in Champassak Province. Champassak was the only Province to show antibodies for type Asia I greater than 2% (12.6%). Type A results remained reasonably consistent across the provincial data at approximately 5% although a type A virus has never been detected from an FMD outbreak in Lao PDR.

Further FMD sero-prevalence studies are ongoing in other Provinces as part of the ACIAR project to further assess the level of FMD antibody prevalence in Lao PDR.

TABLE III. OVERALL RESULTS OF PERCENTAGE FMD SERO-PREVALENCE. RESULTS PRESENTED IN PARENTHESIS ARE THE 95% CONFIDENCE INTERVALS FOR EACH PERCENTAGE RESULT.

Province	Type O	Type A	Type Asia I	Indeterminate	Negative
Luang Prabang	16.4 (6.1–26.7)	5.7 (1.0–10.5)	0.2 (-0.2–0.7)	0.2	77.4
Savanakhet	20.4 (10.9–29.7)	5.4 (2.2–8.5)	1.5 (0.5–2.5)	1.0	71.7
Champassak	23.4 (12.2–34.8)	3.9 (1.8–6.0)	12.6 (4.7–20.5)	4.1	56.3

3.4. Economic impact of FMD

In recent times, FMD has mainly affected cattle and buffalo in Lao PDR. The affected animals lose condition quickly and become lame. In some cases this results in permanent disability due to secondary infections of the hoof. The primary impact of FMD outbreaks is on available ploughing and draught power resources, which can cause delays or an inability to plant rice crops. Smallholders resort to hiring of buffaloes from non-affected villages, which probably exacerbates the spread of disease. Constraints on the hiring of draught power are the limited financial means of most farmers and the limited availability of animals for hire. With the exception of major urban centres such as Vientiane, motorized ploughing machinery is generally unavailable to most of the affected villages. Therefore, a major impact of FMD in Lao PDR is on food security.

While it is difficult to accurately assess the true economic impact of FMD in Lao PDR, an attempt was made using available resources. Given that there are no official exports of livestock from Lao PDR to neighbouring countries and dairy farming is in its infancy, the main impact of FMD is on village agricultural production systems. It was estimated, that in the case of a draught animal being infected with FMD during peak production periods the cost of replacement draught power and treatment is US \$50.00 per animal. More research in this area is required to increase the accuracy of this value.

ACKNOWLEDGEMENTS

The authors wish to thank the following collaborators for their contribution to this work Dr. Martyn Jeggo, Dr. Tony Forman, Dr. Denis Hoffman, Dr. Bounmy Xaymountry, Miss Manivanh Phouaravanh, Miss Khonsavanh Douangphachanh. This work was supported by the Australian Center for International Agricultural Research, the Department of Livestock and Fisheries, Lao PDR, Food and Agriculture Organization of the United Nations and the International Atomic Energy Agency.

REFERENCE

- [1] BLACKSELL, S.D., CAMERON, A.R., CHAMNANPOOD, C., CHAMNANPOOD, P., TATONG, D., MONPOLSRI, M AND WESTBURY, H.A. Implementation of internal laboratory quality control procedures for the monitoring of ELISA performance at a regional veterinary laboratory, *Vet. Microbiol.* **51** (1996) 1-9.

**NEXT PAGE(S)
left BLANK**