ESTABLISHING A FOOT-AND-MOUTH DISEASE LABORATORY NETWORK IN SOUTHEAST ASIA

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Abstract

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The Joint FAO/IAEA Division has established an effective laboratory network in Southeast Asia to support the diagnostic requirements of the Southeast Asian Foot-and-mouth disease control campaign (SEAFMD). All laboratories have a capability to accurately detect and type foot-and-mouth disease virus antigen in clinical specimens and to conduct the screening test for detection of serum antibodies against the endemic sero-types of the virus.

1. INTRODUCTION

An international workshop on the diagnosis and epidemiology of foot-and-mouth disease (FMD) was conducted in September 1993 at Lampang, Thailand, by the Department of Livestock Development (DLD), Thailand, and the Australian Centre for International Agricultural Research (ACIAR). A series of recommendations were developed by the participants to help guide regional animal health administrations and international agencies with foot-and-mouth disease control. One working group considered the requirements for laboratory diagnosis to support a national and regional FMD control programme. Two of the essential capabilities of a national diagnostic laboratory that were set down were an 'ability to diagnose FMD and sero-type by ELISA techniques' and the 'capacity to detect and quantify antibody to FMD virus for evaluation of vaccine, sero-surveillance and animal import/export testing by ELISA'. As one of the international organizations represented at the workshop, the FAO/IAEA Joint Division agreed to support the development of the national FMD diagnostic laboratories in the Southeast Asian region through a Co-ordinated Research Project (CRP). The FMD ELISA technology CRP has close links with the regional campaign to control FMD (SEAFMD) being co-ordinated by the Office International Des Epizooties (OIE). For example during the course of the FMD ELISA CRP, the contract and agreement holders have participated in three meetings of the OIE Sub-commission for FMD control in Southeast Asia (SEAFMD).

2. OBJECTIVES OF THE FAO/IAEA CO-ORDINATED RESEARCH PROJECT

The CRP had three objectives. The first was to establish the capability and capacity to conduct the FMD antigen detection and sero-typing ELISA in each of the laboratories designated as the national FMD laboratory by the countries in the programme. The second was to assist with the design of a project to apply the technology to a field and to monitor its implementation in each of the participating countries. The third objective was to facilitate analysis and presentation of the findings of the project at various meetings and in this publication. A further objective, which developed during the project, was to introduce the internal and external quality assurance programmes for the serological assays.

3. METHODOLOGY

The development, initiation and implementation of the CRP were as follows.

(1) Identifying the participating countries: Governments in the Region were invited to participate. Since the programme commenced Hong Kong has been handed back to the People's Republic of China.

(2) Identifying the Contract holders: Contract holders were nominated by the collaborating institution/organization in each country.

(3) Identifying the Agreement holders to provide the appropriate mix of technical support for the programme.

(4) Conducting an initial meeting (February 1995) to design the contract projects and identify both the equipment and the training needs.

(5) Supplying the necessary equipment and reagents.

(6) Conducting an ELISA training workshop and introducing the Electronic Data Interface (EDI) program for capturing and analysing ELISA data from both assays (February 1996).

(7) Assisting with the design of field studies linked to an identified national need.

(8) Establishing E-mail communication with most of the contract holders.

(9) Instituting the External Quality Assurance Programme (EQAP) assist with quality control, especially of the serological assays.

(10) Evaluating progress through presentation of data to the OIE Sub-commission (February 1997).

(11) Evaluating final progress reports through presentation of data to the OIE Sub-commission (February 1999).

(12) Supervising the preparation of the final reports for publication in this Technical Document.

4. ACHIEVEMENTS

(1) There is a national laboratory operating and contributing to regional FMD reporting system in each of the seven countries participating at the OIE project.

(2) In Malaysia, the Department of Veterinary Services has been able to use the technology to monitor serological status of animals moving into the country, and to monitor the effectiveness of routine vaccination campaigns.

(3) In the Philippines, there has been a close synergy of the inputs of this CRP and the inputs of the FAO FMD control project.

(4) A network of individuals with skills in interpretation of laboratory results and improved technical understanding of the issues surrounding sero-surveillance has been developed. This network will become a source of regional technical expertise for the future FMD control campaign.

(5) Overall understanding of FMD epidemiology has been enhanced as a result of the laboratory outputs, especially the contribution to routine reporting to the SEAFMD Regional Co-ordination Unit.

(6) The EQAP has been instituted and all the Contract holders have participated. Furthermore, there is a high priority given to continue support for the EQAP, indicating that the principle has been successfully inculcated into the normal laboratory practices of the contract holders.

5. CONSTRAINTS

(1) Delivery of equipment and reagents: At the beginning of the programme some countries experienced difficulties with adequate notification of deliveries of reagents, so that necessary formalities for importation were completed prior to dispatch of reagents. This matter was quickly dealt with and all participants report that a smooth process is now in place.

(2) Installation of equipment: Some of the participants experienced difficulty with the early version of the electronic data interface (EDI) program and the configuration of the cable connecting the ELISA reader to the computer. However, these problems were dealt with and no participants experience difficulties with data transfer and processing.

(3) In general, the equipment provided by the programme has proved to be reliable and remains functional with a minimum of maintenance. One participant who experienced problems with the ELISA reader could not get any service in the region and had to return the equipment to Vienna. The positive side is that a service is available and the equipment could be repaired and returned within a reasonable time.

6. FIELD STUDIES.

Application of the ELISA technology to field investigations has been variable. Certainly all the laboratories have a capability to provide a sero-typing service to enable the veterinary service to report on the FMD status of field outbreaks. This capability in one instance is blocked by lack of support for other laboratory functions.

The laboratory service represents a link in the chain of the veterinary service's capability, but the output from the national laboratory is dependent on the field service being able to undertake adequate disease outbreak investigations. The laboratory capacity is under-utilized where the field service does not have the resources or training to visit field outbreaks to conduct investigations, or where field personnel are not trained to submit proper specimens for diagnosis. There is also the problem that laboratory based personnel do not have the resources at their disposal to participate in investigative field work and so make full use of the potential to provide useful epidemiological information to field services. In Myanmar and Indochina there is a need to substantially increase the resources for animal health services to improve co-ordination between laboratory and field operations and increase the utilization of the capability of both.

7. TRAINING

The training workshops have bridged many of the gaps from the technical standpoint. The programme has provided the participants with some basic information on the fundamentals of epidemiology to assist in the design and implement better quality sero-monitoring projects. ELISA wet workshops have introduced the tests at a technical level. Many participants, however, lack a solid basic education in the science that underlies the technology so that troubleshooting and interpretation of data can present a problem. This deficiency can be overcome by continued utilization of the technology and by checking former participants through further training workshops. Long term availability of the technical backstopping on the Internet will assist (this option is not available to all countries at present) as will continued formal and informal interaction between laboratory personnel.

It is noticeable that one or two of the persons trained in the programme have been able to extend their technical training and understanding beyond the FMD control programme and set up ELISA for other pathogens. Such initiatives represent very successful technology transfer. In most instances, there is reluctance to apply the technology widely, because it may mean lack of control over equipment (examples where other staff experimenting with the technology have caused expensive, but more importantly difficult to repair, damage to ELISA readers). It may also reflect the sheer lack of access to resources to undertake other tests. The great advantage of the FAO/IAEA FMD CRP has been the availability of the well characterized and technically supported ELISA kits from the World Reference Laboratory for FMD at Pirbright, United Kingdom.

The nominated participant from the government service of some countries has not always been the same, or sometimes was not a person involved directly in day-to-day diagnostic laboratory work, so some of the external inputs have missed the desired target. Where the same participant does not attend continuously, the programme looses momentum. It does also to some extent diminish the importance of the programme in the national context, as the personnel issues take precedence over the technology transfer issues. However, this constraint has been more or less overcome and the programme successfully established in all cases.

8. CHALLENGES FOR THE FUTURE

The major challenge for the future will be to ensure that the government services provide enough support to enable continuance of the diagnostic service, that has arisen from the CRP. Funds are required to purchase reagent kits and also to maintain equipment, an area often overlooked. If the laboratories can charge fees for services this would help ensure long-term survival. The SEAFMD Sub-commission will be a venue for the veterinary services to report on the condition of their national diagnostic service in the context of the regional FMD control programme. It is likely that FAO/IAEA will continue to participate in the Sub-commission and monitor these investments.

At the moment, there is no functioning Regional Reference Laboratory (RRL) for FMD. The construction of a bio-containment laboratory at the FMD Centre Pak Chong, Thailand, by DLD is well under way, and it is likely, that this extension of the national laboratory will become the RRL within the next three years. It will be a significant benefit to the regional programme if this laboratory is designated by OIE and becomes a regional centre of excellence for FMD diagnosis and training. Such a RRL could undertake the regional EQAP as well as produce and supply diagnostic reagents for ELISA. There would be great benefit in conducting a regular technical meeting for laboratory personnel supporting the regional control programme separately from the SEAFMD Sub-commission meeting.

The FAO/IAEA Joint Division plans to initiate a further project on FMD diagnostic tests to distinguish vaccinated from infected animals. This technology has great promise to unravel some of the key epidemiological issues with FMD control in the region.

9. RECOMMENDATIONS

(1) That the participants operating in the national FMD laboratories, especially those supporting the OIE SEAFMD campaign are surveyed from time to time to determine any cause that might have resulted in cessation of the ELISA diagnostic programme.

(2) That the FMD Centre in Pak Chong, Thailand, supply reagents for the FMD typing ELISA to other countries in the region.

(3) That the FMD Centre Pak Chong, Thailand, become a regional training centre for the use of ELISA technology in FMD diagnosis.

(4) That the FMD Centre Pak Chong Thailand becomes responsible for the EQAP for the laboratories in the region, especially those participating in the SEAFMD campaign.

(5) That the OIE Sub-commission conducts a regular technical meeting to discuss FMD diagnosis and epidemiology.

(6) That the participants of the CRP prepare a regional IAEA TCP to provide further critical support for national FMD diagnostic programmes, to continue the EQAP and to develop an effective regional supply of diagnostic kits and reagents.