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Animal biosecurity in the Mekong: future directions for research and development

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Animal biosecurity in the Mekong: future directions for research and development

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Cover: Children observing a serological survey and learning how the survey can improve their health and the health of the animals in their village (Takeo, Cambodia). (Photo: Domingo Caro III)

Foot-and-mouth disease in the Malaysia–Thailand–Burma peninsula: addressing disease at the source

Polly Cocks, Ian Robertson, Ronello Abila, Peter Black and John Edwards

The Malaysia–Thailand–Myanmar (Burma) (MTM) zone was established in 2003 following a decision by the South-East Asia Foot-and-Mouth Disease Campaign (SEAFMD) in 2001 to establish a foot-and-mouth disease (FMD)-free zone within South-East Asia as an effective way to control FMD in the region. The MTM peninsula was selected based on favourable geographic features (Banks 2004) and strong political support from the proposed member countries.

The MTM zone comprises the southern division of Burma, regions eight and nine of Thailand and the whole of Peninsular Malaysia (see Figure 1) (Turton 2004). As a prototype for later zoning initiatives in the region, the MTM is an important component of the SEAFMD campaign. However, almost 10 years since the MTM zone was conceptualised, FMD continues to occur on a regular basis throughout much of the zone (OIE 2010).

The aim of the research reported here is to build on existing knowledge of FMD in the region by considering the epidemiology of FMD in the zone, why disease control efforts have been unsuccessful thus far, factors that threaten the success of the zone and ways in which the disease might be controlled more successfully in the future.

The MTM zone: threats and opportunities

The MTM peninsula is, by definition, surrounded by sea apart from a narrow isthmus connecting it to mainland South-East Asia. The geographical features of the region were expected to aid the control of animal movement (Banks 2004) and thus reduce the risk of FMD entering the MTM zone. However, in South-East Asia, movement of animals is largely market driven and much of the cross-border movement takes place unofficially (Gleeson 2002). Therefore, the success of controlling animal movement into the MTM zone is more dependent on prevailing market forces than on regulatory systems implemented at the zone boundary.

The market forces acting on livestock and livestock products were outlined in this study as predictors of livestock movements in the region. The results showed that the numbers of cattle and small ruminants produced within Malaysia and southern Thailand were insufficient to meet local demands, thus necessitating their importation from outside the MTM zone. Conversely, in central Burma (which lies to the north of the MTM zone), cattle and goat production is strong and supply far exceeds local demand. The MTM zone of Burma has a low demand for livestock (Naing Oo 2010) which is balanced by a low supply, therefore minimal movement of livestock into or out of this area is anticipated. The deficit of livestock within the MTM zone of Malaysia and Thailand would be expected to attract movement of cattle into the zone, while the excess of livestock in central Burma would likely lead to outward movement. The risk of FMD incursion posed by this extensive movement of livestock into the MTM zone was previously described by Wongsathapornchai et al. (2008). This research will expand upon their study to consider, in more detail, the movement patterns of livestock destined for the MTM zone with the aim of identifying potential targets for intervention measures within those pathways.

The trade pathways of livestock destined for the MTM zone were described, including the source of livestock, the stakeholders involved in livestock trade and the main pathways through which animals pass

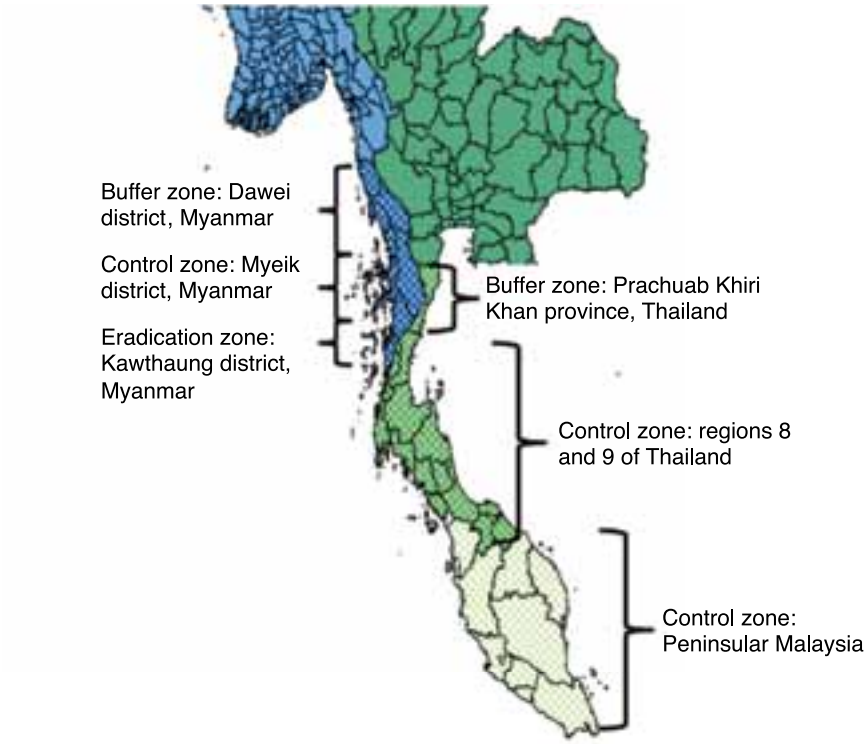

Figure 1. The geographical boundaries and zone categories of the Malaysia–Thailand–Myanmar zone

en route to the MTM zone. Results indicate that cattle and buffaloes are primarily sourced from central Burma and transit through northern and central Thailand before entering the MTM zone of Thailand and Malaysia. Cattle were also found to be moved eastwards from central Burma, through Thailand and towards Lao PDR and Cambodia. A few key trading 'hubs' were identified within Burma and Thailand, and live animal markets were identified as important components of the livestock trading routes.

The major trade pathway identified through this study was used to develop a risk simulation model to quantify the risk of FMD incursions to the MTM zone and the major contributors to that risk. The preliminary results indicate that there is a high likelihood that at least one infected animal will enter the MTM zone each week and that the prevalence of FMD in central Burma and in Thailand are major contributors to this risk The probability that infected animals fail to show clinical signs and the probability that animals enter the MTM zone unofficially are also highly positively correlated with the risk of FMD incursions into the zone (see Hawkins et al. 2012 for a comparable analysis in Cambodia).

The early results of this research highlight the importance of a regional approach to disease control, particularly in regions where there are strong drivers for livestock movement across international borders. It also emphasises the vulnerability of the MTM zone to FMD incursions through live animal movement and the importance of controlling disease at source. The potential for unofficial movement is an important consideration where countries border FMD-infected areas. Therefore, border controls aimed at preventing entry of infected animals should be balanced with the need to encourage traders to use official pathways. In conclusion, this research highlights the need to focus disease control measures at source and to look beyond the borders of the MTM zone to reduce the risk of FMD incursions into the MTM zone.

Lessons learned from the MTM zone

A salient question raised by this research is the suitability of the MTM zone as a disease control zone. The vulnerability of the zone to incursions of FMD through an influx of live animals suggests that the success of the MTM campaign is largely dependent on controlling FMD in 'upstream' areas. Further, the MTM zone has limited potential to export livestock and therefore the trade incentives for controlling the disease may be limited in this area. Future zoning initiatives would likely benefit from consideration of human and livestock demographics within the zone; drivers of livestock movement acting within, into and out of the zone; potential benefits, and benefactors, of eradicating FMD from the zone; and geographical features and political support.

Controlling cross-border movement of livestock is challenging where a zone or country shares extensive, and often porous, borders with neighbouring zones or countries. Where movement controls work in opposition to market forces, the situation is yet more challenging. Across South-East Asia, movement of livestock is largely market driven and unofficial movement of livestock is common. Therefore, the pattern of animal movement throughout the region is more a reflection of the market forces that exist than of the regulatory systems employed by each country. This study highlights the risk of FMD incursions into the MTM zone, but focuses on the whole pathway of livestock movement to identify targets for disease control measures. The purpose of this approach is to identify ways to improve preborder controls to reduce the reliance on border controls, which often have limited success. There is therefore an important trade-off between increasing regulatory measures at the border and encouraging traders to use official pathways. Biosecurity policy in the region may be better focused on preborder control of FMD and addressing disease at its source, rather than relying on excluding FMD only through increased border controls.

Controlling FMD in central Burma, identified here as a possible source of FMD, would likely have far-reaching benefits. Beneficiaries would include not only Burma, but also countries throughout South-East Asia and FMD free–countries throughout the world that are at risk from incursions of FMD. Given this range of potential benefactors, and the significant investment that would be needed to control disease in central Burma, consideration should be given to encouraging investment in the control program from those who are likely to benefit most. This is particularly relevant because the target country has limited resources with which to implement such a program. Again, this highlights the need for cooperation between countries in a regional approach to disease control in South-East Asia.

Future research and development

This research has highlighted the importance of central Burma as a potential source of FMD. Controlling FMD in central Burma would require a significant investment and, therefore, the benefits and costs of controlling FMD in this area will need to be better quantified to propose this project to potential donors. Naing Oo (2010) conducted studies in central Burma identifying FMD risk factors, animal movement patterns and some initial cost–benefit analyses of controlling FMD at the individual farmer level. This work may be expanded by analyses of costs and benefits of a large control program in the whole of central Burma, taking into account the potential impact across the region, as well as increased epidemiological studies of FMD in the region, particularly using viral sequencing to confirm sources of virus and routes of viral spread. If this research indicates that the control program is both warranted and feasible, pilot studies of control strategies may also be beneficial. A major control program in this area would require capacity building within the veterinary services for them to successfully implement such a program. This would be expected to have future benefits in controlling FMD as well as other livestock diseases in Burma.

While this study has focused on cattle and buffalo movement, the role of small ruminants in the maintenance and spread of FMD in the MTM zone and in the region continues to be neglected. Serological surveys by Naing Oo (2010) and Maung Latt (pers. comm.[1]) suggest that there is a high level of exposure of goats to FMD in central Burma, yet they are rarely implicated in FMD outbreaks in the region. Whether this is due to mild clinical signs (Kitching and Hughes 2002) and failure to recognise infected animals, or whether the animals really do play a

[1] Country report of Myanmar. Paper presented at the 12th Meeting of the National Coordinators of the OIE SEAFMD Campaign, Bangkok, Thailand, 17–19 August 2009.

minor role requires further investigation. The large population of goats in central Burma (MLF 2008) and the demand for goats within Malaysia (Warr et al. 2008) suggests that movement of small ruminants from infected areas of central Burma into the MTM zone is likely.

A major challenge of this study has been the limited information available on the epidemiology of FMD in the region due to, inter alia, under-reporting of disease, limited investigation of outbreaks and limited submission of samples for serotyping and/or sequencing. During a retrospective analysis of epidemiology of FMD in the MTM zones, the value of sequencing data in understanding the spread of FMD and in identifying key foci and source areas was apparent. However, this valuable tool is still used to a limited extent in South-East Asia. A research project that aims to collect and sequence samples from outbreaks across the region would help to improve understanding of FMD in the region. It would also be useful to compare sequencing results with live animal movement pathways outlined by this and other projects in the region to determine whether the virus is, in fact, spreading through the pathways identified.

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