A framework for targeted allocation of resources for livestock disease surveillance in selected Pacific Island countries

A BRIOUDES[1], B GUMMOW[1,2*]

[1]Discipline of Veterinary Sciences, College of Public Health, Medical and Veterinary Sciences, James Cook University, Townsville [4811], Queensland, Australia; [2]Department of Production Animal Studies, Faculty of Veterinary Science, University of Pretoria, Pretoria, South Africa

*Bruce.Gummow@jcu.edu.au

Abstract

The livestock sector contributes significantly to the food security and economy of the Pacific Island region but the extent of its 25,000 islands' borders and the vastness of its surface area represents a biosecurity challenge for avoiding the incursions of transboundary animal diseases. Within this context, we conducted a structured approach to identify the diseases of priority in the region and determine how they could be introduced and spread within these islands. The approach integrated social network and market chain analysis with a risk assessment on a regional level. This appears to be the first study that has applied this approach to a region rather than an individual country, thus illuminating the bigger picture. The results provide insights for more rational allocations of available resources and better targeted surveillance programmes and provide a strategy that will underpin food security and enhance biosecurity in the region.

Keywords: *livestock disease, targeted surveillance, Pacific Islands, framework, risk-based approach*

Introduction

Livestock play an important role in the social, cultural and economic environment of the Pacific Island countries and territories (PICTs). Currently, the development of the livestock sector in the Pacific region is constrained by a number of factors, including animal health status requirements. The Pacific Islands region currently has a favourable animal health situation but it is a challenge to maintain a disease free environment in an area composed of 25,000 islands dispersed over 180 million square kilometres. This is compounded by the fact that most of the PICTs face a critical shortage of veterinarians and have limited financial resources. This study tested a model framework that enables better targeted disease surveillance and more efficient use of scarce resources in the PICTs (1-5).

Materials and methods

A meta-analysis of peer-reviewed and grey literature on the animal diseases in the Pacific Islands region was initially conducted. Based on the outputs of the meta-analysis, a multi-criteria prioritization process was then developed to identify animal diseases perceived to be of importance by decision makers within selected PICTs (Fiji, Papua New Guinea, Solomon Islands and Vanuatu), at the regional and national levels . This was followed by a Risk Assessment using highly pathogenic avian influenza (HPAI) and foot-and-mouth disease (FMD) as model diseases because of their identified potential importance in the region with respect to pig and poultry husbandry, as these species are of primary importance for the Pacific communities. The Risk Assessment first looked at farmer practices and the movements of pigs and poultry within the four selected PICTs using a questionnaire survey and social network analysis to predict how these diseases could potentially spread within the region. A participatory pig and poultry market chain analysis was then conducted and combined with a risk pathway analysis to identify the highest risk areas (risk hotspots) and risky practices and behaviours (risk factors) of animal disease introduction and/or spread. The involvement of animal health officials in the market chain analysis with risk pathway assessments formed the Risk Communication component of the model framework and was a practical way of communicating risk to animal health officials and improving biosecurity. The participatory approach helped officials better understand the trading regulations in place in their country and better evaluate their role as part of the control system.

Results and discussion

From the 158 eligible references retrieved from the literature review, only 77 (48.7%) were published since 1992 and analysed in more details. A total of 101 diseases and pathogens were reported on for domestic animals in the Oceania region and in 17 PICTs in particular. Retrieved literature on animal diseases in PICTs was scarce and no longer up to date. The results therefore highlighted the need to improve the published knowledge on the current animal disease status in the region.

The list of the top-twenty ranked diseases for the Pacific Islands region resulting from the structured prioritization process shows a mix of endemic zoonotic diseases (such as leptospirosis ranked first; brucellosis third; tuberculosis sixth and endoparasites and ectoparasites respectively eleventh and thirteenth) with exotic diseases (such as highly pathogenic avian influenza (HPAI) ranked second, foot-and-mouth disease (FMD) fifth and rabies ninth). There were different disease ranking lists for each of the four targeted PICTs, confirming different strategies of disease prevention and control may be required for each country, rather than a regional approach. Interviewed animal health and production workers were unfamiliar with most of the prioritized diseases and a majority acknowledged that they would not be able to recognise clinical signs if outbreaks were to occur in their area.

Results from the survey and the social network analysis indicate that a large proportion of farmers (44.6 to 61.3%) do not implement any preventive or control measures, yet, the majority (80.6 to 88%) did not experience any animal diseases over the past twelve-months. Most farmers never ask for veterinary care, never engage in laboratory testing and do not report when their animals show clinical signs. Many pig farmers (31.8%) trade within their communities only and sell directly to consumers (24.5%), which reduces the risk of diseases spreading. Our results show an association between farmers that report having had disease on their farm in the past twelve-months and movements of animals on and off their farms. The capitals of the studied provinces in PNG, Vanuatu and Solomon Islands were identified as the most connected nodes of both pig and poultry trade while Fiji networks appeared much less connected. Farmer practices increased the risk of disease spread but this was currently limited by trading practices.

Using a market chain analysis together with risk pathways was a practical way of communicating risk to animal health officials and improving biosecurity. It provided a participatory approach that helps officials better understand the trading regulations in place in their country and to better evaluate their role as part of the control system. Common risk patterns were found to play a role in all four PICTs.

Legal trade pathways rely essentially on preventive measures put in place in the exporting countries while no or only limited control measures are undertaken by the importing countries. Legal importations of animals and animal products are done mainly by commercial farms which then supply local smallholders. Targeting surveillance on these potential hotspots would limit the risk of introduction and spread of animal diseases within the pig and poultry industry. Swill feeding is identified as a common practice in the region that represents a non-negligible risk factor for dissemination of pathogens to susceptible species. Illegal introduction of animals and animal products is suspected, but appears restricted to small holder farms in remote areas, limiting the risk of spread of transboundary animal diseases along the market chain. Introduction of undeclared goods hidden within a legal trade activity was identified as a major risk pathway. Activities such as awareness campaigns for pig and poultry farmers regarding disease reporting, biosecurity measures or danger of swill feeding and training of biosecurity officers in basic animal health and import-associated risks are recommended to prevent and limit the spread of pathogens within the PICTs.

Conclusion

We put forward the methodology used for this study as a novel regionally coordinated approach for providing better targeted animal disease surveillance and disease prevention in countries with limited resources. It allows for a more rational and transparent allocations of resources that if applied should enhance trade and food security on a regional basis. The results are also expected to lead to a more rational use of skilled manpower and increase the sensitivity of disease identification within the PICTs.

Acknowledgement

References

1. **Brioudes A, Warner J, Hedlefs R, Gummow B.** A review of domestic animal diseases within the Pacific Islands region. *Acta Trop.* 132, 23-38, 2014
2. **Gummow B.** Challenges posed by new and re-emerging infectious diseases in livestock production, wildlife and humans. *Livestock Science* 130(1-3), 41-46, 2010
3. **OIE**. World Animal Health Information Database (WAHID) Interface - Information by Country/territory - Animal health situation. 2014c http://www.oie.int/wahis_2/public/wahid.php/Countryinformation/Animalsituation (accessed 14/03/2015), OIE, 12, rue de Prony, 75017 Paris, France.
4. **Secretariat of the Pacific Community**. *Livestock in the Pacific, Policy* Brief. Secretariat of the Pacific Community, BP DS, 98848 Noumea Cedex, New Caledonia. 2009a
5. **Yarrow R.** *Increasing veterinary capacity in the Pacific, Third regional meeting of Heads of Agriculture and Forestry Services (HOAFS), 3-5 September 2008, Apia, Samoa*. Secretariat of the Pacific Community: Suva, Fiji, p4, 2008