

ABSTRACT

Application of biosurveillance methodology to the 2010 Asian foot-and-mouth disease outbreaks

AR Reilly¹, EA Iarocci¹, A Endo, DM Hartley, and NP Nelson

Imaging Science and Information Systems Center, Division of Integrated Biodefense, Georgetown University, Washington DC, USA
E-mail: reilly@isis.georgetown.edu

Objective

Our objective is to demonstrate how biosurveillance, using direct and indirect indications and warning (I&W) of disease within vernacular internet news media, provides early warning and situational awareness for infectious animal diseases that have the potential for trade and economic implications in addition to detecting social disruption.^{1,2} Tracking of I&W during the 2010 Japan foot-and-mouth disease (FMD) epidemic and outbreaks in other Asian countries was selected to illustrate this methodology.

Introduction

Argus is an event-based, multi-lingual, biosurveillance system, which captures and analyzes information from publicly available internet media. Argus produces reports that summarize and contextualize direct, indirect, and environmental I&W of human, animal, and plant disease events, and makes these reports available to the system's users. Early warning of highly infectious animal diseases, like FMD, is critical for the enactment of containment and/or prevention measures aiming to curb disease spread and reduce the potential for devastating trade and economic implications.¹⁻³

Methods

Argus reports meeting the inclusion criteria identified below were retrieved from the Argus archive: (1) Disease Entities: FMD and undiagnosed animal disease (2) Location: Japan (3) Time Period: January–August 2010. The reports were reviewed for relevant I&W of FMD, with the goal of identifying factors that contributed to disease spread. For geospatial visualization, the location was expanded, and Argus reports were used to create a map of FMD type O outbreaks in East Asian countries.

Results

After 10 years without incidence of FMD, suspected cases were reported in April 2010 among beef cattle in Miyazaki prefecture, Japan.⁴ Following the initial identification of cases, unusual events that were socially disruptive occurred,

including the cancellation of local festivals, sporting events, and restrictions in public places. These events demonstrate an uncommon event where an animal disease affected the normal functioning of human society.

Despite the implementation of quarantine and prevention measures, disease spread rapidly within the prefecture and Japanese officials theorized that among other factors, delays in early detection greatly contributed to this outcome.⁴ In May, Japan implemented its first ever FMD vaccination campaign, suspending its ability to engage in agricultural trade with the U.S. and other countries in accordance with the World Animal Health Organization (OIE) *Terrestrial Animal Health Code*; on 28 May 2010, the United States Department of Agriculture placed import restrictions on beef from Japan.^{4,5} With the outbreak reportedly coming to a close, Miyazaki prefecture is estimated to have suffered nearly USD\$583–699 million in damages and must endure the disease's stigma.³⁻⁵

By July, 2010, suspected or confirmed FMD type O outbreaks were reported in at least six East Asian countries: Japan, China, South Korea, North Korea, Taiwan, and Hong Kong, and affected additional animal species, especially swine.^{4,5} Causal links among these outbreaks is not confirmed.

Conclusions

Socially disruptive events found in publicly available media suggest that there were I&W of the 2010 Japan FMD type O outbreak. Attention to such I&W in the future may enable more attuned surveillance for early warning of outbreaks. Further, identifying patterns in I&W between the East Asian outbreaks will aid in regional situational awareness to FMD events.

Acknowledgements

This paper was presented as an oral presentation at the 2010 International Society for Disease Surveillance Conference, held in Park City, UT, USA on 1–2 December 2010.

References

- 1 Wilson K, Brownstein JS. Early Detection of disease outbreaks using the Internet. *CMAJ* 2009;180:829–31.

¹These authors contributed equally to this work.

- 2 Nelson NP, Brownstein JS, Hartley DM. Event-based biosurveillance of respiratory disease in Mexico 2007-2009 Connection to the 2009 Influenza A(H1N1) Pandemic? *Eurosurveillance* 2010;15.
- 3 The US Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services. Foot-and-Mouth Disease Factsheet. February 2007. Available at http://www.aphis.usda.gov/publications/animal_health/content/printable_version/fs_foot_mouth_disease07.pdf.
- 4 World Organisation for Animal Health. Terrestrial Animal Health Code 2010. Vol. 2. Available at http://www.oie.int/eng/normes/mcode/en_sommaire.htm.
- 5 World Animal Health Organisation (OIE).