AN APPROACH TO MODELLING AVIAN INFLUENZA IN THE AUSTRALIAN POULTRY INDUSTRY

S. HAMILTON¹, M.G. GARNER² and J-A.L.M.L. TORIBIO¹

There have been five outbreaks of Highly Pathogenic Avian Influenza (HPAI) in Australia during the last three decades, all of which have been contained by the implementation of aggressive slaughtering-out policies (Westbury 1997; Selleck et al., 2003). In each case, secondary spread was minimal from the index property, perhaps aided by the low poultry population density in each region (Westbury 1997, Turner 2005). However, an outbreak of HPAI in an area with higher poultry density may have much more severe consequences, as indicated by the magnitude of the Newcastle disease outbreak at Mangrove Mountain, NSW in 1998 (Turner, 2005).

Development of effective contingency plans to contain future outbreaks of HPAI in the Australian poultry industry is a priority for government and industry. In the absence of detailed understanding of avian influenza epidemiology under Australian conditions, simulation modelling may be a useful tool to gain insights into the spread of disease within and between different sectors of the poultry industry and regions of the country. In this paper we describe the development of a disease simulation model to investigate the potential impact of HPAI on the Australian poultry industry.

The proposed poultry industry model will investigate the spatial and temporal spread of disease between farms using a stochastic state transition approach, similar to those used to model the potential spread of Foot-and-Mouth Disease in Australia and overseas. The basis of this model will be a dataset of commercial poultry producers including chicken meat, table egg, turkey, duck, quail, emu, ostrich and smaller independent chicken farms identified by a telephone survey conducted in 2005, which was commissioned by the federal Department of Agriculture, Fisheries and Forestry and undertaken by independent contractors. The survey recorded the location and size of farms together with their routine horizontal and vertical contacts and biosecurity procedures.

The model will simulate the spread of disease through time and space, taking into account the potential for spread of infection between farms. Contacts between infectious and susceptible farms will include pathways such as contaminated personnel, vehicles or equipment, the movement of infectious birds and local transmission, which are widely recognised as mechanisms for the secondary spread of HPAI.

Several mitigation strategies will be included in the model to represent movement controls, the culling of infected and dangerous contact farms, vaccination and disease surveillance. Modules will also assess the economic cost of disease outbreaks and their control.


¹ Faculty of Veterinary Science, University of Sydney, Camden, NSW 2570.
² Office of the Chief Veterinary Officer, Australian Government Department of Agriculture, Fisheries and Forestry, Canberra, ACT 2600.