Epidemiological investigations of the New Zealand horse population and the control of equine influenza

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Abstract

The aim of this thesis was to develop a disease model to evaluate the effectiveness of movement restriction and vaccination for the control of equine influenza in the New Zealand horse population. In order to achieve this aim, a series of epidemiological investigations into the characteristics, movement behaviour and biosecurity practices of the New Zealand horse population were conducted.

The New Zealand equine population has never experienced an outbreak of the highly infectious, respiratory virus, equine influenza (EI). As such, New Zealand horses are naïve to the virus and completely susceptible to infection. Disease models are one tool that can be used to examine the effectiveness of control strategies and can be used to initiate informed discussion regarding potential control options.

In order to develop an EI InterSpread plus model, data were required regarding the New Zealand equine population. Data were collected via cross-sectional survey regarding the non-commercial horse population, through face-to-face interviews with stud managers and through the analysis of data regarding race meetings. Properties keeping horses for competition, recreation or racing were more likely to report a movement event than properties that did not. Movement events and the frequency of movement increased with increasing numbers of mares and stallions on a stud farm and with the presence of a shuttle stallion. There were significant differences between Standardbreds and Thoroughbreds travelling to race meetings and horses travelled further to attend premier race meetings. The level of biosecurity practiced was low and unlikely to be effective at preventing EI transmission during an outbreak.

The disease model investigated three vaccination strategies in conjunction with movement restriction, compared to movement restriction alone. Additionally, the timeliness of vaccination strategies and enhanced surveillance were investigated. The results of the InterSpread plus model showed that the predicted length of an EI epidemic and the number of properties infected were fewer, if vaccination was implemented. The vaccination strategy that predicted the fewest number of infected properties, and the shortest epidemic duration, was implemented on day seven after official detection at a three kilometre radius around an infected property. This thesis highlights the complexity inherent in developing disease models to support decision making.

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List of Publications

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List of Abbreviations

AI	Artificial Insemination
CTR	Competitive Trail Riding
CSF	Classical Swine Fever
EHV	Equine Herpes Virus
EI	Equine Influenza
ELISA	Enzyme linked immunosorbent assay
ESNZ	Equestrian Sports New Zealand
FEI	Fédération Équestre Internationale
FMD	Foot-and-mouth disease
GIA	Government Industry Agreement
GRTS	Generalised Random-Tessellated Stratified
Ha	Hectares
HA	Haemagglutinin
HRNZ	Harness Racing New Zealand
IFN	Interferon
IgA	Immunoglobulin A
IgG(T)	Immunoglobulin G(T)
IgGa	Immunoglobulin Ga
IgGb	Immunoglobulin Gb
IL	Interleukin
IQR	Interquartile Range
Km	Kilometres
MAF	Ministry of Agriculture and Forestry
NA	Neuraminidase
NAADSM	North American animal disease spread model
NAITS	National Animal Identification Scheme
NZRB	New Zealand Racing Board
NZTR	New Zealand Thoroughbred Racing
OR	Odds Ratio
QUADS	Quadrilateral countries (Australia, Canada, New Zealand, and United States of America)
ROC	Receiver Operating Characteristic
SE	Standard Error
TNF	Tumour necrosis factor
95% CI	95% Confidence Interval

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