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SYSTEMS FOR THE PREVENTION AND CONTROL OF INFECTIOUS DISEASES IN PIGS

A thesis presented
in partial fulfilment of the requirements
for the degree of Doctor of Philosophy
at Massey University

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1998

The results of science remain hypotheses that may have been well tested, but not established: not shown to be true. Of course, they may be true. But even if they fail to be true, they are splendid hypotheses, opening the way to still better ones.

Karl R. Popper, A World of Propensities, 1990

Abstract

An expert system (RestiMATE) was designed that assists veterinary practitioners in assessing the respiratory health status of a pig farm. RestiMATE uses classification rules to identify patterns of environmental risk factors for respiratory diseases and to select optimal management interventions to control and prevent respiratory diseases. The classification rules are based on expert interviews and on empirical data collected in New Zealand. Recursive partitioning and neural network techniques have been applied for rule induction. These methods were compared with logistic regression and appeared to be similarly efficient in terms of classification while providing additional insight into the structure of a data set. Non-parametric analytical methods appear to be particularly suitable when analysing complex data sets and for exploratory data analysis.

EpiMAN-SF is an advanced decision-support system designed to manage and analyse data accumulated during an African swine fever or classical swine fever emergency. EpiMAN-SF offers state-of-the-art technology for managing data related to a swine fever epidemic, including laboratory results. An expert system was developed to support rapid classification of contacts between pig farms in terms of the risk of virus transmission. These classifications are used to set priorities in visiting farms for laboratory investigations. The validation of the expert system showed that its evaluation was more consistent and generally more risk-averse than that of human experts. A stochastic simulation model was developed to investigate the spread of swine fever infection within a farm and a second model (INTERSPREAD-SF) was designed to forecast the dynamics of the epidemic within a region and to evaluate control strategies. INTERSPREAD-SF has been validated using real outbreak data from Germany and was shown to be capable of realistically replicating the behaviour of classical swine fever. However, more research is needed to complete our knowledge about the detailed epidemiological processes during a swine fever epidemic.

A prerequisite for efficient disease control in pig populations is reliable animal identification. A series of trials was conducted in order to compare electronic ear tags and implantable identification chips with visual ear tags. It was shown that the difficulties with respect to implants are loss rates of up to 18.1% within 4 weeks after implantation while electronic ear tags were lost or damaged by processing at the abattoir in up to 23.4% of pigs.

Infectious aerosols were reviewed as an additional aspect of the causative network of infectious diseases in pigs. An air sampling system based on air filtration was developed and applied in combination with polymerase chain reaction assays. Using this technique, *Mycoplasma hyopneumoniae*, the major causative agent of enzootic pneumonia was isolated from air samples for the first time. However, the attempt to isolate classical swine fever virus from the air was unsuccessful, probably due to technical difficulties.

Acknowledgements

Doing a PhD is all about learning. I certainly learnt a lot during these last three years in the Epidemiology Group (now EpiCentre) at the Department of Veterinary Clinical Sciences (now Institute of Veterinary, Animal and Biomedical Sciences). Probably the experience of the most lasting value to me was to realise that no matter how good or bad a situation, I can always learn something: either how to do something or how not to do it. Therefore, first of all, I would like to thank everyone who has helped me learn.

In this context, I am particularly grateful to my chief supervisor Prof. Roger Morris, who provided me with the ideas and vision, which are the strong foundations of this thesis. The help of my second supervisor Dr. Dirk Pfeiffer was indispensable in successfully realising many aspects of my work. His 'you can do it' attitude helped me tackle many problems and allowed me to put analytical issues into perspective. I also worked with Mr. Mark Stern on software design issues and the INTERSPREAD model. Many other people have contributed significantly to the content of this thesis, and their help is acknowledged at the end of each chapter.

I would probably never have come to New Zealand if it had not been for the motivation and enthusiasm of my mentor and friend Prof. Ueli Kihm. He taught me the importance of integrity and modesty. I have also not forgotten the repeated advice given by my first boss and teacher in animal health, Prof. Hermann Keller. He showed me that research needs to serve the purpose of solving problems, a principle that I believe is very much present in this thesis.

As I am definitely a social person whose performance depends on personal discussions and a motivating atmosphere to a large extent, I thank all my friends within the Epidemiology Group, particularly Dirk, Barb, Deb, Jo and Ron for letting me share with them my thoughts, ideas and frustrations every day.

This PhD project was funded by the Swiss National Science Foundation (Grant No. 823B-040072) and supported by the Swiss Federal Veterinary Office. For the trials described in CHAPTER 2.4 approval from the Massey University Animal Ethics Committee was obtained.

The preparation of a PhD inevitably impacts on family life. I would therefore like to acknowledge the support of my husband Marcus and of my family in Europe.

Katharina D.C. Stärk
Palmerston North, March 1998

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