Epidemiological studies of parasitism in sheep and reproduction in horses

A thesis presented

in partial fulfilment of the requirements for the degree of

Master of Veterinary Studies (Epidemiology)

at

Massey University

Chiara Macchi

1997

Abstract

Anthelmintic resistance is a well-recognised problem for control of nematodes in sheep in most countries of the world. The climatic conditions in New Zealand are particularly favourable to the survival and development of gastrointestinal nematodes. As a consequence, gastrointestinal parasitism is a major impediment to profitable sheep raising in New Zealand.

A random postal survey of 300 sheep farmers in the southern North Island region of Manawatu was conducted with the purpose of examining current farming and drenching practices and investigating possible risk factors in the development of anthelmintic resistance. The results of this study, reported in Chapter 2, revealed a high degree of awareness and concern about the problem of resistance, but also a lack of understanding on how grazing management strategies should be combined in order to achieve integrated control over gastrointestinal nematodes while minimising the use of anthelmintic drugs. Only 31% of respondents had performed at least one drench test on their property. Among testing farms, prevalence of resistance approached 70% and involved benzimidazole products in all but one case.

Subsequently, a trial was undertaken to investigate the economic consequences of anthelmintic resistance in growing lambs on commercial farms (Chapters 3 and 4). Five farms with a history of resistance to benzimidazole drenches were selected. The effects of three treatment strategies (partially ineffective, effective and suppressive) on nematode egg counts, bodyweight gains and susceptibility to diarrhoea were compared between groups of ewe lambs. Suppressively treated lambs performed significantly better than effectively treated lambs, which in turn performed better than ineffectively treated lambs. However, a partial budgeting analysis carried out by means of a stochastic simulation model (Chapter 4) indicated that effective treatment yielded the highest net returns. The model also showed that the range of possible outcomes oscillated substantially around the mean, reflecting the degree of uncertainty about the outcome on any single farm due to variation between farms.

Chapter 5 describes a study which was carried out with the objective of evaluating two management strategies for breeding mares after foaling. Mares were examined on day 7-9 postpartum by palpation and ultrasound. Group 1 mares were bred at foal heat provided that they met predetermined criteria and Group 2 mares were treated with a $PGF_{2\alpha}$ analogue. Pregnancy rates, pregnancy loss rates and time from foaling to conception in the two groups were compared. Pregnancy rate at first served oestrus was 58.3% and 71.4% for Group 1 and 2 respectively. However, the statistical power of the study as determined by power analysis, was insufficient for the observed differences to reach statistical significance.

Acknowledgements

When I came to New Zealand in February 1995, I was a newly graduated veterinarian who knew little about anthelmintic resistance in sheep and pregnancy diagnosis in mares, nothing about epidemiology and even less about computers: let alone statistics! During these two years, many people have worked hard in order to teach me something on all these subjects. Thanks to their patience and understanding I am now able to appreciate the difference between an equine embryo, a *Nematodirus* egg and a computer virus, as well as have a better idea of the risk factors associated with each of them.

I am very grateful to my chief supervisor, Prof. Roger Morris, for his invaluable help, support and counsel throughout the study period.

To Dr. Bill Pomroy, my most sincere thanks for all the time and patience he kindly devoted to me, both during the studies and the writing of my thesis, and for sharing with me his knowledge, passion and ideas on anthelmintic resistance.

I thank Dr. Dave West for his enthusiasm and constant availability, as well as for the helpful suggestions he has kindly provided.

Dr. Nigel Perkins has been an excellent teacher and a cheerful ever-smiling workmate: working with him has been a real pleasure.

I also wish to thank Dr. Dirk Pfeiffer, who achieved the difficult task of transmitting his own passion for data analysis and computers, as well as infusing me with optimism when I most needed it.

I am grateful to all the students and staff who offered me both practical and psychological help throughout this time.

I also wish to thank my parents, who allowed me to undertake these studies and, though far away, were always there when I needed help or understanding.

Finally, I would like to thank my fiancé, Serafino, for being so close to me every moment of these two years, even when whole continents kept us apart.

Table of contents

List of Tables

CHAPTER 1

CHAPTER 2

CHAPTER 3

CHAPTER 4

CHAPTER 5

List of Figures

CHAPTER 2

CHAPTER 3

CHAPTER 4

CHAPTER 5