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Improvements in nematophagous fungi to control gastro-intestinal parasites

This thesis is presented in partial fulfilment

of the requirements for the degree of

Master of Veterinary Studies

in

Veterinary Parasitology

Massey University, Palmerston North,

New Zealand

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2004

Abstract

Gastro-intestinal parasites are a major cause of production loss in New Zealand livestock, and the continuing development of anthelmintic-resistant strains represents a significant threat to the future New Zealand agricultural economy. This has led to an increased interest in alternative (non-chemotherapeutic) controls, including potential application of the nematode-trapping fungi *Duddingtonia flagrans* and *Arthrobotrys oligospora*. These species are capable of reducing the number of free-living stages of trichostrongylid nematodes developing in faeces, following oral administration or the addition of fungal material to faeces. However, high spore mortality through the gastro-intestinal tract currently limits the development of a commercial product, even for the robust chlamydospores of *D. flagrans*. The potential to reduce spore mortality by applying a protective coating to the spores was investigated, and an *in vitro* rumen simulation bioassay was used to quantitatively evaluate and compare the survival of *D. flagrans* and *A. oligospora* spores in a series of experiments. These experiments revealed that unprotected *D. flagrans* chlamydospores were superior to *A. oligospora* conidia in their ability to withstand the debilitating effects of rumen fluid. However, the survival of *A. oligospora* was improved by integration into a biopolymer formulation. Dried *D. flagrans* chlamydospores were more resistant to a simulated rumen environment than freshly harvested chlamydospores, and exposure to water as an incubation medium was less detrimental than rumen fluid to the survival of both fresh and dried *D. flagrans* chlamydospores. The application of a stearic acid coating to dried *D. flagrans* chlamydospores failed to improve spore survival in either a simulated rumen environment, or efficacy during subsequent *in vivo* testing. However, as the application of a biopolymer formulation successfully improved the survival of *A. oligospora* conidia, it is likely that similar formulations may be successfully applied to other fungal species. These results highlight the potential for development of formulations containing multiple species of nematophagous fungi, including the application of fungal species that were previously unsuitable due to very high spore mortality.

Acknowledgements

I wish to thank my supervisors, Dr Bill Pomroy (IVABS - Massey University), Dr Peter Long (INR - Massey University), Dr Dave Leathwick (Parasitology - AgResearch Grasslands) and Dr Bob Skipp (Biocontrol and Biodiversity – AgResearch Grasslands) for their advice over the past two years, and on previous drafts of this thesis.

Thank you, especially to Bill, for his continual support that was often above the call of duty, for his incredible patience and understanding, for caring, and for having faith in me and my abilities, even when I doubted myself.

Thank you to Dave, for his assistance with the statistical analysis, for his constructive criticism on previous drafts of this thesis, and for telling it like it is. Thank you, for being an awesome employer, a supervisor and mentor, but above all else, for being a friend.

Thank you especially to Dave and Bob, for giving me this opportunity – they made me interested in parasitology and endeared me with this project, they were the reason I started and the reason I finished. I couldn't have done it without them. Thank you for everything!

To Anne Tunnicliffe and Kate Leydon, whose conversation and advice has helped keep me sane in times of strife. For their endless source of entertainment (both at work, and otherwise), for listening to me when I needed someone to talk to, and for always being prepared to take time out and join me for a much needed coffee break.

Thank you to Barbara Adlington for her support, helping out wherever and whenever she could, and for sharing her invaluable experience.

To Li Chen, Anne-Maree Oliver and Kate Leydon for their technical assistance, when I needed a hand to process the hundreds of samples.

To Fred Potter (AgResearch Grasslands), for his assistance with statistical analysis.

Thank you to Tony Dolphin, for his motivation and support, for knowing exactly what to say in a moment of doubt, and for reminding me that sometimes girls just need to have fun.

Finally, thank-you to those who tried to make things difficult along the way – they made the sense of accomplishment that much better.

The experimental use of all animals involved in the research for this thesis was approved by the Palmerston North CRI Animal Ethics Committee and Massey University Animal Ethics Committee.

This thesis was supported by the Animal Health, and Biocontrol and Biosecurity platforms at AgResearch Grasslands, Palmerston North.

I wish to dedicate this thesis to my parents; they raised me to believe that I can do anything when I apply myself, to believe in myself and to have confidence in my abilities, to make the most of every opportunity as it arises, to be true to myself and to follow my dreams. I cannot thank them enough for their continuous support and encouragement, motivation and understanding, and everything they have done for me, especially looking after my horses, particularly when I had to stay home and write-up.

"Horses know nothing of money, status, beauty or accomplishment……
Horses see only our hearts, and they accept us or reject us on what they find within……
In short, horses do naturally what humans can pass a lifetime without ever mastering."

Author Mary Midkiff quoted in *The Denver Post*

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