Studies On The Vaccination Of Sheep Against *Brucella ovis* Infection

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

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1986

ABSTRACT

A study was made of the efficacy and adverse effects of an inactivated Brucella ovis saline-in-oil vaccine administered either once or twice by either the subcutaneous or the intraperitoneal route.

Seven Brucella ovis isolates from various sources, including the two used in the manufacture of the Brucella ovis vaccine, were subjected to Bacterial Restriction Endonuclease Analysis and no genetic differences were found. It was concluded that there is probably only one strain of the organism.

It was found that rams vaccinated by the subcutaneous route in the neck invariably developed a palpable inflammatory lesion at the site of injection. The lesions had a mean diameter of approximately 3cm, about one-third of them discharged, and the majority persisted for at least one year after vaccination. These lesions were chronic granulomatous inflammatory reactions arranged around droplets of the oily Brucella ovis vaccine.

The intraperitoneal route of vaccination has been advocated in the past as a way of avoiding visible lesions. Necropsy of vaccinated animals revealed that in over 50% of cases, at least some of the vaccine administered by this technique failed to reach the cavity and was deposited either beneath the parietal peritoneum or between the muscles of the abdominal wall. Regardless of the site of deposition, however, the vaccine always provoked a chronic granulomatous inflammation of the tissues with which it came into contact. Changing from a subcutaneous to an intraperitoneal vaccination technique merely moved the reaction to a site where it was less visible.

Serological studies using the Brucella ovis complement fixation test, gel diffusion test and enzyme linked immunosorbent assay demonstrated a consistent difference in the antibody response of rams vaccinated by the subcutaneous technique in comparison with those vaccinated by the intraperitoneal technique. Those vaccinated by the

subcutaneous route generally developed antibody titres more rapidly and often had higher peak titres.

In the same way, animals vaccinated twice by either route generally had greater and more persistent antibody titres than those vaccinated once by the same method.

The differences in the serological response of rams to different vaccination techniques were reflected by similar differences in resistance to experimental infection. The administration of an inactivated Brucella ovis saline-in-oil vaccine by any of the techniques studied significantly increased resistance to challenge by the intravenous route. However, two spaced doses of vaccine appeared to be more effective than a single dose, and the subcutaneous technique appeared to be more effective than the intraperitoneal method.

Using intravenous inoculation, the number of bacteria required to infect 50% of unvaccinated animals was estimated to be 9.5×10^4 organisms. The administration of a single dose of vaccine by the intraperitoneal technique raised that figure to approximately 6.7×10^6, and the administration of two doses of vaccine by the subcutaneous route raised it to approximately 6.8×10^7.

A viable count of the number of Brucella ovis bacteria present in the semen of an infected ram showed that at least 3×10^9 organisms could be excreted in a single ejaculate. This was over 31,000 times the number required to infect 50% of unvaccinated rams after intravenous inoculation and 44 times that required to infect 50% of animals vaccinated twice by the subcutaneous route. There is therefore a real possibility that natural challenge through homosexual activity may result in the infection of even vaccinated rams.

It was concluded that if vaccination is to be used as a means of controlling the spread of ovine brucellosis, a programme of two doses of vaccine administered at an interval of at least four weeks should be employed. The second dose of vaccine should be administered at least four weeks before the anticipated period of risk. If this method of control is adopted, a palpable lesion at the site of injection which is likely to persist for over a year should be expected. It should also be understood that rams vaccinated in this way may not be totally resistant to Brucella ovis and may still become infected.

ACKNOWLEDGEMENTS

I wish to thank my supervisors, Professor A.N. Bruère, Dr. B.S. Cooper and particularly Dr. D.M. West whose enthusiasm and prompt attention to all matters concerning this project was much appreciated. I am very grateful to Dr. M.R. Alley for all his help with the histopathological examinations. I am also much appreciative of the discussions I had during the course of this study with Professor D.K. Blackmore, Professor R.D. Jolly, Dr. R.B. Marshall, Dr. A.S. Davies and Dr. K.M. Moriarty, their advice was very helpful.

Thanks to Miss L.C. Cullinane and Mr. R.J. Holdaway for help with the microbiology, Mrs. P.M. Slack for the preparation of the histological sections, Mrs. J.L. Schrama for the preparation of media, the staff of the large animal hospital, especially Mr. C.K. Barnett for help with experimental animals, and Massey farm staff for the management of the rams.

Mr. P.J. Winter performed the BRENDA analysis, and his competent help was much appreciated. I am also grateful to Mr. T.G. Law for his able assistance with the photography. The statistical analyses were performed with the help of Mr. G.C. Arnold for whose efforts I am extremely grateful.

Many thanks are due to Dr. R.W. Worthington, Mary Penrose and the rest of the staff at Wallaceville Animal Research Centre who undertook the task of testing and retesting all the serum samples. This project would have been impossible without their help.

Thanks to Mr. W.G. Orbell, Coopers Animal Health N.Z. Ltd. for providing much appreciated information, and donating supplies of the vaccine.

This project was undertaken with the financial support of a Phyllis Irene Grey Fellowship. The financial support provided by two grants from the SmithKline Animal Health Foundation is also gratefully acknowledged.

Finally, thanks to my family, friends, and flatmates for their tolerance, and especially to Martin and my parents for constant encouragement and support.

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