

GROSS ANNUAL GROWTH RATES WITH
FORMAL AND INFORMAL SECTORS AGAINST
LINE (Annual Gross Domestic Product INTERPOL)

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RAKJU DI SAINTS DAN TEKNOLOGI
UNIVERSITATIS MUSLIMAN TERENGGANU
2007

LP 17 FST 2 2007



1100051130

Cross protection of goats primed with formalin-killed Pasteurel multocida B2 againts live Mannheimia haemolytica A2 infection / Hafizah Abdul Latib.



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CROSS PROTECTION OF GOATS PRIMED WITH FORMALIN-KILLED
Pasteurella multocida B2 AGAINST LIVE *Mannheimia haemolytica* A2
INFECTION

By
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Research Report submitted in partial fulfillment of
the requirement for the degree of
Bachelor of Science (Biological Sciences)

Department of Biological Sciences
Faculty of Science and Technology
UNIVERSITI MALAYSIA TERENGGANU
2007

1100051130

This project should be cited as:

Hafizah, A. L. 2007. Cross protection of goats primed with formalin-killed *Pasteurella multocida* B2 against live *Mannheimia haemolytica* A2 infection. Undergraduate thesis, Bachelor of Science (Biological Sciences), Faculty of Science and Technology, Universiti Malaysia Terengganu. Terengganu. 33pp.

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JABATAN SAINS BIOLOGI
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PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II
RESEARCH REPORT VERIFICATION

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: **CROSS PROTECTION OF GOATS PRIMED WITH FORMALIN-KILLED *Pasteurella multocida* B2 AGAINST LIVE *Mannheimia haemolytica* A2 INFECTION** oleh **HAFIZAH BT ABDUL LATIB**, no. matrik: **UK 10541** telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Biologi sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah **SARJANA MUDA SAINS (SAINS BIOLOGI)**, Fakulti Sains dan Teknologi, Universiti Malaysia Terengganu.

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ACKNOWLEDGEMENTS

First and foremost, I would like take this golden opportunity to express my sincere gratitude to my supervisor Assoc. Prof. Dr. Mohd Effendy Abdul Wahid for his continuous support, wise guidance and helpful comments upon the completion of my thesis.

In particular, special thanks to Mr. Muhammad Embong in helping me out a lot in the animal house. I would like to express my gratitude to Mdm. Zarina Mohd Shariff and Mdm. Mahidawati Mamat for their assistance in the microbiology laboratory.

I would also like to convey my greatest appreciation to my beloved parents, Mr. Abdul Latib Abdul Raman and Mdm. Hamidah Abdul Wahab, and my siblings, Afifah, ‘Atikah, Muhd. Majdi and Mohd. Fadzil, for their loving encouragements and unwavering support from the start.

Last but not least, I would like to thank my fellow course mates and friends, especially Eamy and Raja Syairani, who have helped me in many ways for the past three years in UMT.

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LIST OF ABBREVIATIONS

cfu	Colony forming unit
CMI	Cell-mediated immunity
CPS	Capsule polysaccharide
ECM	Extracellular matrix
H ₂ O ₂	Hydrogen peroxide
HCl	Hydrochloric acid
HS	Haemorrhagic septicaemia
IVET	In vivo expression technology
Lkt	Leukotoxin
LPS	Lipopolysaccharide
<i>M. haemolytica</i>	<i>Mannheimia haemolytica</i>
OMP	Outer membrane protein
<i>P. multocida</i>	<i>Pasteurella multocida</i>
STM	Signature-tagged mutagenesis

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ABSTRACT

Pasteurella multocida B2 and *Mannheimia haemolytica* A2 are among the bacteria that caused haemorrhagic septicaemia in cattle and buffaloes worldwide. A study was conducted from 24th September until 5th November 2006 to determine the cross protection ability of formalin-killed *Pasteurella multocida* B2 inoculated goats against live *Mannheimia haemolytica* A2 infection. This study will give better understanding in developing homologous and heterologous protection against the bacteria. Nine clinically healthy goats aged between seven to nine months were divided equally into three groups. Group 1 and 2 were exposed to formalin-killed *P. multocida* B2 at the bacterial load of 10^8 colony forming unit (cfu)/mL, twice intranasally with two weeks interval. Two weeks after the second exposure, Group 1 were challenged with *M. haemolytica* A2 while group 2 with *P. multocida* B2. Group 3 was remained as the control unexposed group. One goat in Group 2 died on day 3 post-exposure while the remaining survived. On seventh week, all of the goats were slaughtered. Mild gross lesions were observed on the vital organs of goats in Group 1 and 2 upon post mortem. Samples for microbiology and histology were taken from lung, liver and kidney. *P. multocida* B2 was successfully re-isolated from the vital organs of goat in Group 2. Generally, histology study showed that all of the goats except the control have lymphocyte infiltration and fibrinous material in their lungs but managed to survive. It can be concluded that the cross protection level of *P. multocida* B2 is low and further studies should be conducted.

ABSTRAK

KETAHANAN SILANG TERHADAP *Pasteurella multocida* B2 YANG TELAH DIBUNUH DENGAN FORMALIN TERHADAP KAMBING YANG DIJANGKITI DENGAN *Mannheimia haemolytica* A2

Pasteurella multocida B2 dan *Mannheimia haemolytica* A2 adalah antara bakteria yang telah mengakibatkan kematian banyak lembu dan kerbau di seluruh dunia. Satu kajian telah diadakan dari 24hb September sehingga 5hb November 2006 untuk menentukan kebolehan *Pasteurella multocida* B2 yang telah dibunuh dengan formalin untuk melindungi kambing dari jangkitan *Mannheimia haemolytica* A2. Kajian ini akan memberikan lebih pemahaman tentang perlindungan homologus dan heterologus bakteria-bakteria terbabit. Sembilan ekor kambing yang sihat, berumur antara tujuh hingga sembilan bulan telah dipilih dan dibahagi secara rambang kepada tiga kumpulan. Kumpulan 1 dan 2 telah didedahkan dengan *P. multocida* B2 yang telah dibunuh dengan formalin, sebanyak dua kali, dengan selang masa dua minggu bagi setiap pendedahan. Dua minggu selepas pendedahan itu, Kumpulan 1 dijangkitit dengan *M. haemolytica* A2 manakala Kumpulan 2 dijangkiti dengan *P. multocida* B2. Kumpulan 3 sebagai kawalan tidak didedahkan dengan mana-mana bakteria tadi. Seekor kambing dari Kumpulan 2 mati tiga hari selepas dijangkiti manakala yang lain dapat mengatasi jangkitan tersebut. Pada minggu ke-tujuh, semua kambing disembelih dan kerosakan tisu yang sederhana dapat diperhatikan dari organ-organ penting dari kambing di Kumpulan 1 dan 2. Sampel untuk kajian histologi dan mikrobiologi telah diambil dari organ peparu, hati dan buah pinggang. *P. multocida* B2 telah berjaya diasingkan dari organ-organ penting seekor kambing di Kumpulan 2. Secara keseluruhannya, kajian histologi menunjukkan bahawa kesemua kambing kecuali dari kumpulan kawalan mengalami infiltrasi limfosit dan kehadiran material berfibrin di beberapa kawasan pada peparu tetapi ianya tidak kritikal dan ini adalah antara faktor kejayaan kumpulan ini untuk hidup. Dapat disimpulkan di sini bahawa ketahanan silang *P. multocida* B2 terhadap jangkitan *M. haemolytica* A2 adalah rendah dan kajian yang lebih mendalam harus dilakukan pada masa akan datang.