

GENUS PROTECTION OF GOATS DRINKED WITH FORMALIN-  
KILLED *Marrhicinia haemolytica* 12 AGAINST  
LIVE *Pasteurella multocida* B2 INFECTION

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

By

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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 *Mannheimia haemolytica* A2 AGAINST *Pasteurella multocida* B2 INFECTION oleh EAMY NURSALIZA BINTI YAACOB, nombor Matrik UK10460 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Biologi sebagai memenuhi sebahagian daripada keperluan memperoleh Ijazah Sarjana Muda Sains (Sains Biologi), Fakulti Sains dan Teknologi, Universiti Malaysia Terengganu.

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## LIST OF ABBREVIATIONS

<i>M. haemolytica</i>	<i>Mannheimia haemolytica</i>
<i>P. multocida</i>	<i>Pasteurella multocida</i>
rRNA	ribosomal ribonucleic acid
DNA	deoxyribonucleic acid
LPS	lipopolysaccharide
OMP	outer membrane protein
BHI	brain heart infusion
cfu	colony forming unit
rpm	rotation per minute
PBS	phosphate-buffered saline
H&E	Haematoxylin and Eosin
CDR	complementary determining region
IHA	indirect haemagglutination
SPF	specific free pathogen
µm	micrometer

## ABSTRACT

*Mannheimia haemolytica* A2, and *Pasteurella multocida* B2 infections are common in small, and large ruminants worldwide. A study was conducted to determine cross-protection between *M. haemolytica* A2, and *P. multocida* B2 in goats. Nine clinically healthy goats from six to nine months old were randomly selected, and divided equally into three groups; Group 1, and 2 which were exposed twice intranasally with formalin-killed A2 inoculum spray at two weeks interval, while Group 3 was left untreated as negative control group. Group 1 was then challenged with live *P. multocida* B2 bacteria, while Group 2 was challenged with live *M. haemolytica* A2 organism. Results showed that all goats from Group 1 did not survive the infection while only one goat from Group 2 died due to earlier infection prior to the treatment. Gross lesions upon post-mortem examination showed fibrinous exudates from thoracic cage, and petechial haemorrhage on the membrane of thoracic cage of animals in Group 1. *P. multocida* B2 was re-isolated from heart blood, lung, liver, and kidney from all animals in Group 1. Histology examination revealed certain degrees of inter-alveolar septa thickening due to infiltration of leukocytes, and presence of clotted red blood cell in the vein. The results suggested that there is no cross-protection of *M. haemolytica* A2 inoculation against live *P. multocida* B2 challenge. These findings will provide suggestion for the researcher in the field of immunology, and vaccination on cross protection between different organisms.

**KETAHANAN SILANG PADA KAMBING YANG DIDEHAHKAN DENGAN  
*Mannheimia haemolytica* A2 TERHADAP JANGKITAN *Pasteurella multocida* B2**

**ABSTRAK**

Jangkitan *Mannheimia haemolytica* A2, dan *Pasteurella multocida* B2 seringkali berlaku dalam haiwan ruminan besar mahu pun kecil di serata dunia. Satu kajian bagi menentukan ketahanan silang di antara *M. haemolytica* A2, dan *P. multocida* B2 telah dijalankan terhadap kambing. Sembilan ekor kambing yang sihat serta berumur antara enam hingga sembilan bulan telah dipilih secara rawak, dan dibahagikan sekata kepada tiga kumpulan; Kumpulan 1, dan 2 telah didedahkan sebanyak dua kali terhadap inokulum A2 yang telah dibunuh dengan formalin. Manakala Kumpulan 3 merupakan kumpulan kawalan yang tidak diberi rawatan. Kumpulan 1 kemudiannya telah diuji dengan bakteria *P. multocida* B2 hidup manakala Kumpulan 2 telah diuji dengan bakteria *M. haemolytica* A2 hidup. Keputusan menunjukkan kesemua kambing daripada Kumpulan 1 mati akibat jangkitan, dan seekor kambing daripada Kumpulan 2 mati akibat jangkitan awal sebelum rawatan. Lesi kasar yang diperhatikan semasa bedah siasat, bagi kambing Kumpulan 1 menunjukkan terdapat cairan berfibrin daripada sangkar peparu, dan juga tompokan merah gelap kesan daripada kerosakan pada salur darah. *P. multocida* B2 telah berjaya diasingkan daripada kesemua kambing Kumpulan 1 iaitu daripada darah jantung, peparu, hati, dan buah pinggang. Pemeriksaan Histologi menunjukkan beberapa peringkat penebalan dinding antara alveolus akibat daripada kehadiran leukosit, dan juga terdapat sel-sel darah merah yang tersumbat di dalam salur darah. Berdasarkan keputusan yang ditunjukkan, dikatakan bahawa tidak terdapat ketahanan silang di antara inokulasi *M. haemolytica* A2 yang diuji dengan bakteria hidup *P. multocida* B2. Penemuan daripada kajian ini telah memberikan satu pandangan baru bagi penyelidik dalam bidang imunologi, dan vaksinasi ketahanan silang di antara organisma yang berbeza.