

THE DEVELOPMENT OF MUCOSAL IMMUNE
SYSTEM AGAINST *Pasteurella multocida* B:2
IN GOATS

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MASTER OF SCIENCE
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Lihat sebelah

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DEDICATION

I would like to dedicate this thesis to my beloved family- Ma, Abang Amir, Yassin and
Adib. It goes especially to my late father and brother, May Allah bless their souls. Last but

EAMY NURSALIZA BINTI YAACOB

highest gratitude goes to my supervisors, second supervisor, his assistance and fellow
members for all of their guidance, full support and spirit.

Thesis Submitted in Fulfillment of the Requirement for
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July 2010

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfillment of the requirement for the degree of Master of Science

THE DEVELOPMENT OF MUCOSAL IMMUNE SYSTEM AGAINST *Pasturella multocida* H2 IN GOATS

EAMY NURMALIZA YAACOB

July 2019

Chairperson : Associate Professor Dr. Mohd. Fauzan Mohd. Fauzan
Member : Associate Professor Dr. Mohd. Effendi Abd. Halid

DEDICATION

I would like to dedicate this thesis to my beloved family- Ma, Abang Azely, Kakak and Adik. It goes specially to my late father and brother, May Allah Blessed you. Last but not least, to Saufi for his adoration all this years.

Highest gratitude goes to my supervisor, second supervisor, lab assistance and fellow friends for all of their guidance, full support and spirit.

The mucosal immune system can be highlighted as one of the complex immune network in the body defense system. It is constructed from an integration of the lymphoid constitutive cells that is responsible for the secretion of immunoglobulins on the mucosal surface. It also performs as the important defense structure against the potential pathogens that may enter the body system via contact through mucosal surfaces. This study was conducted to compare the development pattern of mucosal immunity towards *Pasturella multocida* H2 at three different age of animals. Eighteen clinically healthy kids at the age of 1, 3 and 5 months old were equally divided into two groups; Group A as the normal group, and Group B as a positive control or vaccinated group. Animals in Group B were exposed twice to intranasal spray of 10^8 cfu/ml formalin-killed *P. multocida* H2 inoculum at two weeks interval. Two weeks post-exposure, animals in Group A and B were slaughtered. Lung, large intestine were subjected to the determination of IgM, IgA and IgG antibody titre. The right splenic lobe of lung and small intestine was subjected for the evaluation of B-lymphocyte-Associated Lymphoid Tissue (BALT), Gut-Associated Lymphoid Tissue

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July 2010

Chairperson : Associate Professor Dr. Tengku Sifzizul Tengku Muhammad

**Member : Professor Dr. Mohd Effendy Abd. Wahid
Dr. Md Sabri Mohd Yusoff**

Institute : Institute of Marine Biotechnology

The mucosal immune system can be highlighted as one of the complex immune network in the body defense system. It is constructed from an integration of the lymphoid constitutive cells that is responsible for the secretion of immunoglobulins on the mucosal surface. It also position as the important defense structure against the potential pathogen that may enter the body system via contact through mucosal surfaces. This study was conducted to compare the development pattern of mucosal immunity towards *Pasteurella multocida* B:2 at three different age of animals. Eighteen clinically healthy kids at the age of 1, 3 and 5 months old were equally divided into two groups; Group A as the normal group, and Group B as a positive control or vaccinated group. Animals in Group B were exposed twice to intranasal spray of 10^8 cfu/mL formalin-killed *P. multocida* B:2 inoculum at two weeks interval. Two weeks post-exposure, animals in Group A and B were slaughtered. Lung lavage samples were subjected to the determination of IgM, IgA and IgG antibody titre. The right apical lobe of lung and small intestine was subjected for the evaluation of Bronchus-Associated Lymphoid Tissue (BALT), Gut-Associated Lymphoid Tissue

(GALT) structure and specific presenting cells. Two-Way ANOVA analysis exhibited no significant difference ($P>0.05$) in the mean antibody titre between normal and vaccinated animals. But there was a significant difference in the mean IgA and IgG antibody titre between 1, 3 and 5 month old animals ($P<0.05$). A similar development pattern of immunoglobulin was observed in both normal and vaccinated animals. IgG are playing their part by being the highest antibody titre found in the lung lavage in both normal and vaccinated animals in different age group of animals. Results have reveals that there was no significance difference in BALT size between normal and vaccinated animals. But the lymphocytes number was found to be significantly different between animals at age 1, 3 and 5 month old, and also between normal and vaccinated animals. The size and lymphocyte number in vaccinated animals was strongly correlated, $r=0.774$. It has been shown that the size and number of lymphocyte established in the jejunum and ileum GALT was significantly difference ($P<0.05$) between normal and vaccinated animals. There was also a strong correlation (r) between the size of GALT and number of lymphocyte occurred in the jejunum. But there was only a weak correlation between the size of GALT and number of lymphocyte in the ileum. Exposure to the antigen at the intranasal mucosal surface activated the specific lymphocytes to emigrate from the inductive site to the effector site in the lung. In conclusion, the immunoglobulin antibody titre and GALT structure was found to be inconsistence with the age development. Animals that exposed to the antigenic pathogen will give rise to a significant of size of BALT area and lymphocyte number in this structure.

Abstrak tesis yang dikemukakan kepada Senat Universiti Malaysia Terengganu sebagai memenuhi keperluan untuk ijazah Master Sains

**PERKEMBANGAN SISTEM IMUNISASI MUKOSAL TERHADAP
Pasteurella multocida B:2 PADA KAMBING**

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Julai 2010

Pengerusi : Professor Madya Dr. Tengku Sifzizul Tengku Muhammad

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Sistem imuniti setempat boleh dikelaskan sebagai salah satu jaringan imuniti yang kompleks dalam sistem pertahanan badan. Ia terdiri daripada integrasi sel yang bertanggungjawab untuk merembeskan immunoglobulin pada permukaan mukosal. Ia juga memainkan peranan penting dalam pertahanan bagi menghalang kemasukan patogen melalui permukaan mukosal. Kajian ini telah dijalankan bagi membanding corak perkembangan imuniti mukosal terhadap *Pasteurella multocida* B:2 pada tiga peringkat umur haiwan yang berbeza. Lapan belas ekor kambing yang sihat secara klinikal, berumur 1, 3 dan 5 bulan telah dibahagikan sama rata kepada dua kumpulan; Kumpulan A sebagai kumpulan normal, dan Kumpulan B sebagai kontrol positif atau haiwan yang divaksinasi. Haiwan dalam Kumpulan B telah didedahkan sebanyak dua kali terhadap semburan pada bahagian rongga hidung dengan inokulum bakteria *P. multocida* B:2 yang telah dibunuh dengan formalin pada kepekatan 10^8 cfu/mL, berselang selama dua minggu. Dua minggu selepas dedahan, haiwan dalam Kumpulan A dan B telah disembelih. Sampel cairan perparu telah diambil bagi menentukan

jumlah antibodi IgM, IgA dan IgG yang hadir. Bahagian peparu dan usus kecil diambil bagi melihat kehadiran struktur BALT dan GALT. Analisis ANOVA Dua-Hala menunjukkan tiada perbezaan yang signifikan ($P>0.05$) dalam jumlah min antibodi yang terhasil antara kumpulan normal dan yang divaksin. Tetapi terdapat perbezaan yang signifikan bagi jumlah min antibodi IgA dan IgG bagi haiwan pada umur 1, 3 dan 5 bulan, $P<0.05$. Corak perkembangan yang hampir sama dapat dilihat bagi haiwan yang normal dan yang divaksin. IgG telah memainkan peranan sebagai antibodi yang paling tinggi terdapat dalam cecair peparu haiwan pada umur yang berbeza. Keputusan menunjukkan tiada perbezaan saiz BALT yang signifikan antara kumpulan normal dan yang divaksin. Tetapi bilangan limfosit menunjukkan perbezaan yang signifikan pada haiwan yang berumur 1, 3 dan 5 bulan. Saiz dan bilangan limfosit adalah berhubungkait dengan kuat, $r=0.774$. Dedahan kepada antigen pada permukaan mukosal hidung telah mengaktifkan limfosit yang spesifik dan akan berpindah dari tapak induktif ke tapak efektor mukosal di dalam peparu. Saiz dan bilangan limfosit yang hadir dalam GALT jejunum dan ileum adalah signifikan antara kumpulan normal dan yang divaksin. Terdapat hubungkait yang kuat diantara saiz dan bilangan limfosit dalam jejunum. Tetapi hanya hubungkait yang lemah ditunjukkan antara saiz dan bilangan limfosit bagi ileum. Sebagai konklusi, rembesan antibodi dan saiz struktur GALT adalah tidak konsisten dengan perkembangan umur. Haiwan yang terdedah kepada patogen menunjukkan peningkatan signifikan bagi saiz kawasan BALT dan jumlah limfosit dalam struktur ini.