Pathogenesis and Control of Pneumonic Pasteurellosis in Sheep and Goats*

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Introduction

Pneumonic pasteurellosis is the most common respiratory disease of sheep and goats throughout the world, including Malaysia. It has been known to develop following stressful condition, and vaccination has been used to control the disease. However, the detailed pathogenesis and disease development has not been studied while the available vaccines are ineffective. Thus, the objectives of this study were:

To understand the detailed development of this disease;

To determine the protective role of local immunity in the respiratory tract against the development of the disease to identify the most suitable antigenic component to be used in vaccine preparation against the disease.

Materials and Methods

a. Disease development: Goats infected with *P. haemolyica* A2 were serially slaughtered before the lungs were examined under electron microscope to determine the time taken to establish the infection. Smears were prepared from the lung lavage fluid, stained with Giemsa and examined under microscope to identify and determine the number of phagocytosis by the alveolar macrophages.

b. Local Immunity: *P. haemolytica* A2 was introduced intranasally into goats. After 2 weeks, they were slaughtered. Lungs were lavaged before the right apical lobe was fixed in formalin for histological examination. The left apical lobes were maintained in laboratory (explant). The lung explants were then challenged with live *P. haemolytica* before they were examined under SEM to determine the level of bacterial attachment. Lung lavage fluid was subjected to ELISA to determine the IgA and IgG levels. At the end of the experiment, the goats were challenged with live *P. haemolytica* to determine the disease establishment.

c.Antigenic Component: The outer membrane proteins (OMP) were extracted from *P. haemolytica*. They were electrophoresed before Western blotting was carried out to determine the most antigenic portion. The OMP was then prepared as a crude vaccine and injected into goats before the goats were challenged with live *P. haemolytica*. The extent of lung lesions was compared.

Results and Discussion

Disease Development: The critical time for the establishment of *P. haemolytica* A2 infection is between 4-7 days post-infection. Those goats those were not able to completely phagocytose the bacteria within seven days showed disease establishment.

Phagocytic activity by alveolar macrophages was significantly reduced following infection by *P. haemolytica* A2 compared to infection by *Staph. aureus*. This was due to the ability of *P. haemolytica* to produce leukotoxin that reduced phagocytosis and enhanced infection.

Local immunity: *P. haemolytica* A2 either live or killed but introduced intranasally at 2 weeks interval stimulated the bronchus associated lymphoid tissue (BALT) of the lung. This resulted in reduced ability of bacteria cells to attach to the stimulated lung surface. Goats receiving intranasal killed *P. haemolytica* showed increased IgA and IgG levels in the lungs and IgG level in the serum. Challenged with live *P. haemolytica* A2 failed to establish infection in the stimulated goats.

Antigenic Component: The 30 kD OMP of *P. haemolytica* A7 was found to be most antigenic. Using the component as vaccine, it was found to be the most suitable candidate for sub-unit pasteurella vaccine.

Conclusions

P. haemolytica A2 establishes infection in the lung within 4-7 days post-infection. Goats that fail to successfully phagocytose all bacteria cells within 7 days will eventually develop the disease. Double intranasal administration of killed *P. haemolytica* A2 stimulates the local immunity, which protects animals from infection. The 30 kD outer membrane protein of *P. haemolytica* A7 is most suitable for sub-unit vaccine preparation against pneumonic pasteurellosis.

Benefits from the study

The study gave a better understanding of the disease development that benefits the scientific community, undergraduate students, and extension workers in the Dept of Vet Services. Intranasal Spray Vaccine benefits the farmers, government farms and international scientific community; and finally antigenic identification of suitable vaccine candidate will benefit postgraduate students, and provide potential benefit to our farmers.

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None.

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