Pathogenesis, Epidemiology and Treatment of Pneumonic Pasteurellosis in Rabbits in Malaysia

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Introduction

Pasteurellosis is one of the most important diseases in rabbits in Malaysia, which could threaten rabbit breeders to breed rabbits for research and for meat purposes. This disease can cause high morbidity and mortality (Flatt et al., 1974). It is caused by a Gram-negative bacterium, *Pasteurella multocida* which is the most important bacterial pathogen causing *pasteurellosis* in laboratory and commercial breeders' rabbit (Manning et al., 1982). The present and future successes of rabbit breeding in our country are dependent upon better understanding of many aspects of the pathogenesis, epidemiology and treatment of the disease with regard to our own isolates of the microorganism and their pathogenicity which are largely unknown.

At present, research and written scientific observations on *pasteurellosis* in rabbits is very minimal despite the demand for rabbits as excellent model for understanding many diseases in both man and animal through their usage in research and development projects.

Initiating research in this area would create awareness of the importance of rabbits and understanding the pathogenesis, epidemiologist and treatment of the disease would be the first forefront research for more challenging scientific findings of the disease for the well being of the rabbits, rabbit breeders and the scientific community who are the rabbit users.

Materials and Methods

Nasal swabs for bacterial isolation were collected. Necropsy of rabbits submitted for post-mortem and submission of samples for bacterial isolation were done. Macroscopic and microscopic examinations of post-mortem and field samples were conducted. Serology and antibiotic sensitivity testing of Pasteurella organism was isolated and the preparation of *Pasteurella inocula* for experimental infection followed. Experimental infection of rabbits with prepared *inocula* to study the pathogenicity and pathogenesis was also conducted. Pathogenetic study was divided into two stages which included the observation of the upper and lower respiratory tracts infection. DNA, plasmid analyses and serology were made.

Results and Discussion

Some aspects of the pathogenesis, epidemiology and treatment of *Pasteurellosis* in rabbits have been revealed. *Pasteurella multocida* is more frequently isolated from adult rabbits (76.8%) compared to juvenile rabbits (23.2%). Capsular typing revealed that the major capsular type was type A (89%) while type D was less frequent (11%). This study showed that *P. multocida* isolated from rabbits in Malaysia were of serotypes A:1 (28.2%), A:3 (50%), A:12 (2.0%), D:1 (10.9%) and D:3 (8.7%). Pneumonia and rhinitis were associated with serotypes A:1 and A:3 whereas serotypes A:3, D:1 and D:3 were the serotypes that can cause septicaemia. Serotype D:3 has been shown to also cause non-pulmonary lesions such as necrosis and atrophy of myocardial fibres, *suppurative meningoencepha- litis* and *axonal demyelination*. Serotypes D:1 and D:3 were the more virulent serotypes and able to produce dermonecrotic toxin and peracute and acute deaths in rabbits within 2 days following intranasal infection. All isolates were sensitive to the commonly used antibiotics *in vitro*, but some were resistant to neomycin, penincillin, cloxacillin and tetracycline. Six of forty isolates of *P. multocida* from healthy and diseased rabbits were found to harbour plasmids. There were no correlation between the presence of plasmids and serotype, resistance to antimicrobial agents and from the site which the bacterial were cultured. A wide heterogeneity within isolates was observed in random amplification polymorphic DNA study. Sodium dodecyl sulphate polyacrylamide gel electrophoreses study revealed over 40 protein bands with high molecular weight bands indicating striking homogeneity among the 40 isolates studied. *In vitro* experiments were undertaken to study the adhesion and colonisation to tracheal mucosa, lung and aorta explants from freshly killed rabbits. Serotype A:3 (capsulated, fimbriae positive, hemagglutination negative, dermonecrotic toxin negative) and serotype D:1 (non-capsulated, fimbriae positive, hemagglutination positive, dermonecrotic toxin positive) were used. Scanning electron microscopy showed Type D to be more adherent to trachea and aorta explant than type A. The capsular material of *P. multocida* type A strain and the toxin of type D strain seem to influence the adherence to lung tissue in rabbits. Adhesion of strain D to aorta may indicate the expression of receptors on the endothelium to that strain and may also explain the ability of certain strains to cause septicaemia. The immune response shown by ELISA in rabbits against *P. multocida* infection started 14 days post-inoculation. *In vivo* experiments showed *P. multocida* serotype A:3 in rabbits can invade the epithelial cells and cause structural changes in the interstitium, epithelium and endothelium. Ultrastructural studies showed ciliary destruction degeneration and deformation in A:3, D:1 and D:3 infected rabbits, which further explains the infection strategies employed by *P. multisided* for a successful infection.

Conclusions

This study suggested that there are 2 capsular types and 5 stereotypes of *P. multisided* that can be isolated from rabbits in Malaysia. These serotypes are pathogenic in rabbits in experimental infections. Infected rabbits developed pneumonia, rhinitis or died acutely or peracutely in septicaemic infection. Non-pulmonary lesions can also occur. Many ultrastructural changes of the nasal cavity and lungs caused by the microorganism occurred during the course of infection. Invasion of the epithelial cells by *P. multocida* has also been revealed to explain the pathogenesis of the disease. This was facilitated by the presence of some virulent factor.

Benefits from the study

Provision of guidelines for treatment, prevention and diagnosis of the disease and a promising future of the rabbit breeding program for research purposes and other commercial requirements can be expected.

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