EPIDEMIOLOGY AND IMMUNITY IN LOCALLY INFECTED PIGS WITH PASTEURELLA MULTOCIDA

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Pulmonary infection by Pasteurella multocida is extremely common in pigs, especially following some immunosuppressive event, such as viral or mycoplasmal primary infection (Pijoan 1976). P. multocida is the most frequent pathogen in porcine pneumonic lungs, and probably the only secondary invader which can be statistically correlated to severe lesions (Pijoan et. al. 1976, Gois 1980). Although formalin-inactivated bacterins have existed in the market for a long time, there is considerable doubt on their value (Farrington 1981). This seems to be due to the multiple serotypes of the organism, as well as to its poor response to antibody-mediated inactivation (Pijoan 1981). Because of this, it was decided to investigate the immune response, pathology and epidemiology of locally challenged pigs.

MATERIALS AND METHODS

Twenty-eight piglets, four weeks of age, were obtained from a low-pneumonia herd before weaning. They were distributed in four lots of seven pigs each in a conventional open housing unit with pens separated by a 1 meter-high concrete wall.

Two lots (A and C) were given Levamisole (8 mg/Kg) at arrival. Lots A, B and C were challenged intratracheally with 2 ml of a capsulated, type A P. multocida suspension of 10^9 organism/ml. Lot D was left as the uninoculated control. All pigs were bled at days 0, 3, 5, 12 and 20 postinoculation (PI). The serum was obtained and indirect-hemagglutination tests performed against two antigens: 1) capsular antigen obtained by heating (80^o - 30 min.) the homologous strain, centrifuging and obtaining the supernatant, and 2) "somatic" antigen, constituted by the pellet of the above suspension. Blood was obtained for blood chemistry: total protein, creatinine and urea were assessed according to Coles (1980), also, differential and total white cell count were performed. Twenty-five days after challenge, all animals were killed and lesions (macro and microscopic) were evaluated by conventional techniques.

RESULTS

The antibody titers are shown in Table 1. No difference was found between lots receiving Levamisole or no treatment. Unchallenged controls (Lot D) developed an antibody response one week later than the challenged. Antibodies to "somatic" antigens were detected later than those to capsular antigens, but the titers were higher.

AVERAGE ANTIBODY TITERS DETECTED

Lot	Days Postinoculation			
	0	3A	3B	6A
A	-	1:50	1:10	1:57
B	-	1:50	1:30	1:120
C	-	1:83	1:50	1:64
D	-	1:14	1:4	1:62

Lot	6B	T2A	12B	20A	20B
A	1:35	1:14	-	1:35	1:8
B	1:185	1:64	-	1:168	1:33
C	1:121	1:57	-	1:53	-
D	1:33	1:164	1:257	1:41	1:121

A = Capsular Antigen B = Somatic Antigen

Animals showed leucocytosis at about the same time that antibody peaks were detected. Lot A had leucocytosis at days 3, 6 and 12; Lot B at day 6; Lot C at days 6, 12 and 20 and Lot D at days 12 and 20. Creatinine and urea were increased notably in pigs from Levamisole-treated groups at day 3 after treatment; all other values were normal. At necropsy, no lesions suggestive of pneumonia were found, all lungs being macroscopically and microscopically normal. Two animals of Lot A and three of Lot C had congested lymph nodes. P. multocida was isolated only from the lung of one animal, all other lungs being bacteriologically sterile.

DISCUSSION

Under the conditions studied, Levamisole had little effect on the immune response. This treatment, and the subsequent challenge, had been designed to replicate conditions prevalent in commercial feeder farms. This lack of effect may be due to the fact that Levamisole was given two days before challenge, that the antigen was introduced by a local route, and that only humoral response was gauged. Levamisole has an immunostimulant effect on simultaneous, parenteral antigens, and this effect is mainly on cellular immunity (Renoux and Renoux 1971).

The experiment confirmed the view that P. multocida can establish itself very rapidly within a pig herd; control animals, which were not in direct contact to the challenged lots, had a positive titer which peaked a week later than the challenged lots. These animals were housed under conventional open housing facilities. It is also important to point out that the control animals had essentially the same titers as the intratracheally-infected ones. This suggests that the original infection in the controls was established at the alveolar level, as this is the area of the lung in which infection would result in the highest circulating antibody response. This suggests the feasability of immunizing animals by an intranasal route instead of a parenteral one, especially if live attenuated strains were to be used as immunogens. It is also important to note the strong antibody response to somatic antigens. This suggests that effective immunization can only be obtained when the appropriate serotype, both capsular and somatic, is used. In agreement with previous observations, P. multocida infection did not result in pulmonary lesions, confirming that this organism requires a previous immunosuppressive event in the animal to be able to colonize the lung.

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RESUMEN

Se desafiaron tres lotes de siete lechones cada uno con P. multocida por via intratraqueal, dos de estos lotes habian recibido Levamisol 48 hrs. antes. Un cuarto lote permanecio como control sin inocular, separado de los demas por una barda de concreto de 1 mt. de altura. Todos los animales mostraron anticuerpos tanto a antigenos capsulares como somaticos. La respuesta en los controles se detecto una semana mas tarde. El tratamiento con Levamisol no resulto en una respuesta mayor. Los animales no mostraron lesiones a la necropsia. Los resultados demuestran el caracter invasivo de este agente, pero tambien su relativa inocuidad en ausencia de una immunosupresion.

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