LONG TERM EFFECTS OF VACCINATION ON THE DEVELOPMENT OF LESIONS IN PSEUDORABIES

VIRUS CHALLENGED SWINE

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INTRODUCTION: The clinical signs, gross lesions and histopathologic changes in young swine infected with pseudorabies virus (PRV) may involve the central nervous system, respiratory system or every major organ of the body. Recent advances in virus vaccines (MLPVY or IPK) and inactivated pseudorabies virus vaccines (IPRV) in swine have been studied by several workers. The effectiveness of vaccination has been evaluated mainly by reduction in clinical signs and mortality rate. Multiplication and distribution of PRV in pigs immunized with MLPVY or IPRK and later challenged with a virulent strain of PRV has been reported to be the same as in non-vaccinated pigs.**" Multiplication of the virus and the lesions in pigs in vaccinated pigs have been reported to be limited to certain areas of the brain.

OBJECTIVES: The objectives of this study were to determine the long term effects of declining immunity on clinical signs and lesion development in pigs vaccinated with MLPVY or IPRK vaccines and challenged later with a virulent strain of PRV. Materials and Methods: Ninety-three-seven-week-old castrated male pigs were utilized. They were free of scrofulic evidence of pseudorabies, transmissible ginseng, encephalitis, leptospirosis and clinical aortic atheromatosis. Experimental Designs: Treatment groups based on time of challenge included groups I, I,III, IV, V, VI, VII and VIII. The groups were exposed to PRV at 1, 3, 5, 8, 10, 12 and 14 weeks after vaccination, respectively. Groups I, 3, 4, 5, 6 and 7 were immunized with MLPVY vaccine, 4 with the MLPVY vaccine and 4 with a placebo solution (FI) consisting of sterile distilled water. Groups VIII and VII consisted of 5 pigs in each category (MLPVY, IPRK and FI). In these groups one pig of each category was left as a negative control (vaccinated-no-challenged). All groups were vaccinated simultaneously at 4 weeks of age, and 40 days and then allowed to co-mingle in 1 large pen containing 31 pigs each. Four ml of a swan's Influenza virus (PRP) at 1:10 and 25th tissue culture passage containing I:IXO (groups I, II and III) and IXO (groups IV, V, VI, VII and VIII) plaque forming units were then inoculated into the larynx. The virus was allowed to enter the brain and the challenge lesion was limited. Clinical signs were observed (or 8 days after challenged). All the animals in each group were killed at 10 days after the last exposure to PRP. Tissues were collected in %00 buffered formalin and processed by conventional paraffin techniques. Sections were stained with hematoxylin and eosin. Sections from the central nervous system (CNS), digestive system, hematopoietic system and cardiovascular system were examined. Sections were examined with electron microscope. Lesions were scored according to their severity and distribution of the following changes: congestion, edema, necrosis, microglial nodules, perivascular cuffing, neuronal necrosis, astrocytes, gliotic cells, swollen axons, neuronophagia, inclusion bodies, presence of lymphocytes, macrophages, plasma cells, osteophytes, fibrin, vasculitis and hemorrhages. A progressive scale of 1 to 5 (in the CNS) and 1 to 4 (in other tissues) was assigned. The data was analyzed by the analysis of variance procedure.

Results: Body temperature (BT) increased 24 hours AC. The MLPVY vaccinated had an overall significantly lower (P <:05) mean BT than the IPRK vaccinated or the PI injected. Pigs were anorectic, prostrate, and succumbing with a purulent exudate flowing from the nostrils at 24 hours AC. Vomiting was noted at 46 hrs. AC in vaccinated and non-vaccinated. Vaccinated pigs recovered within 7 days AC, while PI injected remained sick for an additional 7 days. Only one MLPVY vaccinated died (48 hrs. AC. PI injected pigs in groups I, III and IV had a higher degree of clinical signs than the MLPVY and IPRK vaccinated. No difference in clinical signs was observed between the MLPVY and IPRK vaccinated, groups V, VI and VII were equally affected. Groups lesion were observed exclusively at 7 days AC in 18 out of the 97 pigs utilized. The lesions were characterized by purulent exudate in turbinates, areas of pneumonia, and consis
tant necrosis. All PI injected pigs had a highly significant difference (P <:0001) in severity of turbinates lesions when compared to MLPVY and IPRK vaccinated. Microscopic lesions were similar in nature but varied in severity between vaccinated and non-vaccinated. The microscopic lesions at 7 days AC were characterized by a lympho-histioytic-eosinophilic meningencephalitis with focal areas of edema, demyelination, necrosis, and malacia. These focal contained gliter cells, lymphocytes, reactive astrocytes, plasma cells, eosinophils, and few neutrophils. Vasculitis and necrosis of vascular endothelium was common. Microglial nodules in the brain parenchyma with satellitosis and neuronophagia were usually present. Eosinophilic intranuclear inclusion bodies were rare in neuronal and endothelial cells. The same type of lesions but in a milder degree were seen at 60 days AC. The turbinates and lungs were characterized by areas of congestion and a severe mononuclear cell infiltration. Eosinophilic and basophilic intranuclear inclusion bodies were seen in epithelial cells of bronchiolus, bronchiole and in alveolar pneumocytes. Edema was prominent. The lesions were characterized by multifocal areas of coagulative necrosis with a MLPHY/E0SINOPHILIC AND NASOPHARYNGEAL INCLUSION bodies in the epithelial cells of the crypts. Microscopic lesions were significantly higher at 7 days AC (P <:05) in the PI injected when compared to the vaccinated. No significant difference in lesion score was observed at 60 days AC among the different treatment groups. Lesion score means in vaccinated pigs were higher in groups V, VI and VII and lower in groups I, III, and IV. So lesions were observed in the non-challenged control pigs. The electron microscopy study demonstrated the presence of tissue and intracytoplasmic viral particles in nucleolus, cytoplasm an intercellular space of the cell. The viral intracytoplasmic inclusion bodies (tissue of vaccinated and non-vaccinated challenged pigs).

Conclusions: Vaccination with the MLPVY or IPRK vaccine did not prevent infection or development of microscopic lesions when swine were challenged with a virulent strain of PRP. However, vaccination diminished the severity of clinical illness and microscopic lesions for a period of 8 months after vaccination. Both vaccines provided similar protection against development of microscopic lesions.

Selected references:

a) Rinder Laboratories Inc., Lincoln Nebraska 68510
b) Salterberg Laboratories, Champaign Illinois 61826

USDA.