The Influence of Passive Immunity on Serological Responses to *Mycoplasma hyopneumoniae* Vaccination

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Summary and Implications

Vaccine induced serum antibody levels were significantly less in pigs with passive immunity to *Mycoplasma hyopneumoniae* compared to pigs without passive immunity. Age at vaccination did not influence antibody responses to vaccination. The presence of passive antibodies at the time of vaccination may provide an explanation for vaccination failure under field conditions.

Introduction

Vaccination failure under field conditions can be due to a number of reasons including poor injection technique, relative immune suppression due to stress or age at vaccination and short duration of immunity. Age at vaccination for *M. hyo.* did not influence the level of protection against experimental challenge in a previous study conducted in our laboratory.[1] Unfortunately, the duration of immunity following vaccination is not routinely evaluated for licensing vaccines. The presence of passive immunity at the time of vaccination can reduce vaccine effectiveness. Reduction or complete blockage of immune responses to vaccination in the presence of passive immunity has been documented for several swine diseases including pseudorabies virus and *Actinobacillus pleuropneumoniae*.[2,3] The half-life decay of *M. hyo.* passive antibodies was 15.8 days in one study.[4] However, there is very little survey information on the levels of *M.hyo.* antibodies in sows. The purpose of this experiment was to determine if passive antibodies inhibit the immune response to vaccination.

Materials and Methods

Pigs from a commercial herd were used for this study. Sows were vaccinated or not vaccinated at 5 and 2 weeks prior to farrowing with a double dose of a commercially available *M. hyo.* vaccine (Respisure, Pfizer Animal Health). Seven days after farrowing, pigs were selected, weighed, tagged and moved to an isolated facility. Blood was collected from the sows at the same time. The pigs were allotted to three groups, balancing for litter, sex and weight. Group 1 was vaccinated at 11-15 and 25-29 days of age. Group 2 was vaccinated at 25-29 and 39-43 days of age. Group 3 served as controls. The same vaccine administered to the sows was used for the pigs. Injections were administered intramuscularly in the neck. Pigs from vaccinated and nonvaccinated sows were included in each vaccine group. Blood was collected from the pigs at 11-15 days of age, at each vaccination and 2 weeks after the second vaccination. Response to vaccination was based on ELISA optical density (OD) values at 2 weeks after the second vaccination.[5] Statistical analysis was done by ANOVA.

Results and Discussion

The average OD value of sows at farrowing was .950 (range of .419 to 1.296) for the vaccinated sows and .193 (range of .119 to .245) for the nonvaccinated sows. The ELISA OD values in the pigs are presented in Table 1. With our ELISA, an OD value of <.200 is usually considered to be negative. Pigs from nonvaccinated sows had essentially no passive antibodies. Their response to vaccination was consistent with previous studies and was not influenced by the age at vaccination. In pigs from vaccinated sows, all pigs had high levels of passive immunity and the decline in antibody levels in Group 3 pigs (not vaccinated), was similar to a previous study. The serum antibody responses in the vaccinated pigs were difficult to interpret because of the presence of high levels of passive antibody in addition to the antibody induced by vaccination. However, it appears that the amount of antibody induced by vaccination is reduced when pigs were passively immune at the time of vaccination. Vaccination apparently induced serum antibodies as both Groups 1 and 2 had higher OD values 2 weeks after vaccination compared to control pigs from vaccinated dams. Conversely, the OD values in Group 2 pigs from vaccinated dams was significantly less than Group 2 pigs from nonvaccinated dams. Unfortunately, the pigs were not tested later on when the passive antibody levels in Group 3 pigs from vaccinated sows would have declined to lower levels, which would have allowed for a more direct evaluation of vaccine induced antibody levels. Also, the influence of passive immunity on the level of protection after vaccination

needs to be addressed either via experimental challenge and/or field studies.

References

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Table 1. *Mycoplasma hyopneumoniae* antibody levels as measured by ELISA in vaccinated pigs with or without passive immunity at the time of vaccination

Age in days	Vacc. group	No. of pigs	ELISA OD values in vaccinated pigs by the vaccination status of the dam: Vaccinated	Not Vaccinated
11-15	1	12	.860 ± .361	.073 ± .051
	2	14	.807 ± .345	.066 ± .038
	3	11	.994 ± .136	.079 ± .049
25-29	1	12	.590 ± .344	.060 ± .036
	2	13	.523 ± .256	.036 ± .013
	3	11	.660 ± .180	.042 ± .023
39-43	1	12	.649 ± .312	.706 ± .278
	2	13	.296 ± .180	.055 ± .034
	3	11	.394 ± .187	.047 ± .041
53-57	2	13	.515 ± .135	.734 ± .306
	3	11	.234 ± .093	.072 ± .044