Prevention of Swine Dysentery by Intraperitoneal and Oral Administration of Inactivated Treponema hyodysenteriae

D. L. Harris* and Jan Schuiteman, Veterinary Medical Research Institute, Iowa State University, Ames, Iowa 50011 and NOBL Laboratories, Inc. Sioux Center, Iowa 51250

Several workers have reported attempts to vaccinate pigs against swine dysentery (SD). The most successful results have been obtained by either repeated intravenous injections of antigen or by oral administration of an enteric-coated antigen containing T. hyodysenteriae and Bacteroides vulgatus. The results reported here indicate that a combination of oral and parenteral administered antigen (non-enteric coated) induces protection against SD.

In each of 2 experiments, 16 pigs from a herd with no history of SD were placed in isolation units at approximately 8 weeks of age and fed a 16% protein grower ration which contained no added antibiotics.

The parenterally administered vaccine was prepared by concentrating inactivated cultures (T. hyodysenteriae, isolate B204) by centrifugation. The pellets containing T. hyodysenteriae were resuspended in a small volume of supernatant to a concentration of approximately 2 x 10^{10}/ml(direct microscopic count). The concentrated suspension of antigen was emulsified equal parts with Freund's complete adjuvant. The orally administered vaccine was prepared by spraying unconcentrated, inactivated T. hyodysenteriae directly onto 25 pounds of vermiculite contained in a rotating concrete mixer. The 25 pounds of T. hyodysenteriae plus vermiculite were mixed in 2000 pounds of pig feed. Each pound of feed contained approximately 1.25 x 10^9 organisms. After the immunization period, all pigs were challenged intragastricly with T. hyodysenteriae, isolate B204. In experiment 1, each pig received 1 x 10^{10} organisms/day on 2 successive days. In experiment 2, each pig received a single dose of 5 x 10^{10} organisms.

In each experiment, 16 pigs were randomly assigned to 4 isolation units and immunized as follows. On day 1, pigs in groups I and II received an intraperitoneal injection (10ml/pig) of the parenteral vaccine. Pigs in group IV received an intraperitoneal injection (10ml/pig) of Freund's complete adjuvant emulsified equal parts with uninoculated growth medium. On day 14, groups I and III began to receive feed containing the oral vaccine. Groups I and III continued to receive the oral vaccine via the feed until the termination of the experiment. The challenge inoculum was administered on days 28 and 29 (Experiment 1) and day 28 (Experiment 2).

Experimental Design

	Group No. (4 pigs/group)			
Route of Vaccine Administration	I	II	III	IV
Intraperitoneally	+	+	-	-
Orally	+	-	+	-

Each pig was observed daily and 3 clinical parameters (general condition, feces consistency, and feces composition) were scored on a scale of 1 to 4. A rectal swab was collected from each pig 2-3 times per week and cultured for T. hyodysenteriae. A necropsy was performed on each pig that died during the experiments. Macroscopic lesions were recorded. The colonic mucosa was cultured for the presence of T. hyodysenteriae and Salmonella spp. The small intestine and mesenteric lymph nodes were also cultured for Salmonella spp. The pigs were weighed every 2 weeks and at the time of death in experiments 1 and 2. In experiment 2, the total feed consumed per group was recorded.

Clinical Responses in Pigs Inoculated Intragastrically with T. hyodysenteriae

Clinical Response	No. Affected/Group I	II	III	IV
Diarrhea				
Exp. 1	3	4	4	4
Exp. 2	4	4	4	4
Dysentery				
Exp. 1	1	3	4	3
Exp. 2	4	4	3	4
Cachexia				
Exp. 1	1	2	4	2
Exp. 2	1	3	1	4
Mortality				
Exp. 1	0	0	1	0
Exp. 2	0	1	1	3
Average Daily Gain				
Exp. 1	1.62	1.42	1.02	1.29
Exp. 2	1.40	1.25	0.88	0.37

Exp. 1 - Only 1 pig in group I had a stool characteristic of dysentery while 3 of 4 pigs were affected with dysentery in the control group. One pig died which had been immunized by the oral route only. Pigs immunized by both routes (group I) appeared better clinically, gained weight faster, and shed less T. hyodysenteriae in their feces as compared to either pigs vaccinated only by 1 route or pigs not vaccinated.

Exp. 2 - The occurrence of diarrhea and dysentery was similar in all 4 groups. However, the severity of the disease was much greater in the control pigs as 3 pigs died. None of the pigs immunized by both routes died. Based on average daily gain, feed efficiency, and mortality; pigs in group I were far superior to pigs in any other groups. The feces of pigs in groups I, II and III were positive for T. hyodysenteriae less frequently than pigs in group IV.

Selected References

Glock, R. D., K. J. Schwartz, and D. L. Harris: Amer.J.Vet.Res.,1978,39,639; Glock, R. D., D. L. Harris, R. A. Goodnow, and J. M. Kinyon: IPVS,1980,245; Harris, D. L., R. D. Glock, J. M. Kinyon, and R. A. Goodnow: Unpublished results,1979; Hudson, M. J., T.J.L. Alexander, R. J. Lysons, et al.: Brit. Vet.J.,1974,130,37; Hudson, M. J., T.J.L. Alexander, R. J. Lysons, et al.: Res.Vet. Sci.,1976,21, 366.