A NEW APPROACH FOR CONTROL OF ATROPHIC RHINITIS: IMMUNIZATION OF THE SOW (ORALLY) AND THE PIGLET (INTRANASALLY)

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Bordetella bronchiseptica (Bb) is a major cause of atrophic rhinitis (AR) in swine. Previous investigators showed that intranasal exposure of pigs to avirulent strains of Bb results in resistance to infection by virulent Bb and a reduction in severity of turbinate atrophy. The immune status of the sow appears to be important in the control of AR. For these reasons, a novel approach has been developed for oral immunization of sows with inactivated Bb and intranasally (IN) immunizing the suckling piglet with an avirulent strain of Bb.

These studies deal with induction of colostral immunity in the sow by oral administration of inactivated Bb antigens (Bordimmune Oral™). Immunity in the pig was induced by intranasal inoculation of an avirulent, high passage strain of Bb (Bordimmune Intranasal™).

In Experiment 1, gilts from a herd experiencing endemic rhinitis were fed inactivated Bb antigens daily in the feed for the last 30-45 days of gestation. Control gilts were maintained in adjacent gestation pens. Colostrum was collected on the day of farrowing and milk on day 7. Titers to Bb were determined by the Particulate Antigen Settling Test (Past).

In Experiment 2, bordetella-free pigs were inoculated IN with one of two strains (NW-1 or NW-B) of live, avirulent Bb. Inoculum was grown for 24 hours at 37°C in trypticase phosphate broth and ½ml was administered into each nostril. The pigs were isolated in pairs according to the vaccine or control group assigned. Control pigs received ½ml of sterile broth IN. One week post vaccination the pigs were challenged with a known virulent strain of Bb (B-strain). One pair of pigs vaccinated with NW-B & NW-1 remained as unchallenged control vaccinates. Nasal swabs were taken at weekly intervals and cultured on modified MacConkey's agar for isolation of Bordetella organisms.

In Experiment 3, two bordetella-free pigs were inoculated IN with strain NW-1. Two additional bordetella-free pigs were maintained separately as uninoculated controls. Nasal secretions were collected three weeks post inoculation. Antibody levels were assessed by PAST.

Two field trials also are presented. In the 1st trial, 2 all-gilt herds with the same nutrition program, management team, breeding stock source and housing were established. Gilts in herd "A" were vaccinated orally with inactivated Bb and the piglets IN with avirulent Bb. Gilts and pigs in herd "B" were not vaccinated. Turbinates were assessed on 60 of the initial pigs slaughtered from each unit and on 60 pigs from each unit 3 months later. Snouts were cross sectioned at the level of the 1st premolar and turbinates were scored from (0) to complete loss of turbinates (6). In field trial #2, the Bordimmune program was compared to a commercial injectable program in a 250 sow herd experiencing an endemic rhinitis problem. In group "A" the sows and pigs were each vaccinated twice with a commercially available injectable rhinitis bacterin. In group "B" the sows were vaccinated orally with inactivated Bb antigens and the pigs were vaccinated IN on day 1 with avirulent Bb. Turbinate atrophy was assessed at slaughter and was scored on a 0-5 scale.

Results:

Experiment 1-Antibody titers in both colostrum and milk of the orally vaccinated sows were significantly higher than those from the control group. Results are shown in Table 1.

Table 1	Controls	Bordimmune Vaccinates
Colostrum	1:21 (5)	1:87 (7)
Milk	1:16 (4)	1:87 (7)

Experiment 2-Pigs vaccinated with NW-1 and not challenged, cleared the vaccine strain within 3-4 weeks. Pigs vaccinated with the NW-1 strain and challenged one week later cleared both the vaccine and the challenge strains within 4 weeks. Bb could not be isolated from pigs one week after vaccination with strain NW-B. Pigs vaccinated with strain NW-B and challenged one week later, had not cleared the challenge strain at 5 weeks post challenge (PI). Control non-vaccinated pigs had not cleared the challenge strain by 5 weeks PI.

Experiment 3-Antibody levels in nasal secretions from the pigs inoculated intranasally with strain NW-1 were 1:4 and 1:32. Secretions from the two control pigs contained no detectable antibody levels.

Field Trial 1-The degree of turbinate atrophy in herd A (vaccinated herd) was significantly less than that in herd B (Table 2).

Table 2	Average Score Slaughter #1	Slaughter #2
Unit 1(vaccinates)	.146	.172
Unit 2(control)	1.34	1.28

Field Trial 2-The degree of turbinate atrophy in group A was higher than that in Group B; also, the number of animals showing severe turbinate atrophy (Scores of 4&5) was significantly higher in group A (Table 3).

Table 3	#Animals	Total Score	%Severe Atrophy
Group A	191	2.08	14.13
Group B	128	1.78	2.34

Conclusion: These studies indicate that pigs vaccinated IN with an avirulent strain of Bb are able to eliminate the vaccine strain in 3-4 weeks and produce agglutinating antibodies to Bb in nasal secretions.

Bordimmune oral vaccine contains inactivated Bb and is administered via the feed to sows 45 to 30 days prior to farrowing. The Bb antigen contained in the feed stimulates the production of antibodies in the colostrum and milk. These antibodies are probably produced in a similar manner as those described for sows immunized with inactivated E. coli.

In field trials combined oral and IN vaccination of sows and pigs respectively resulted in less severe turbinate atrophy as compared to non vaccinated controls.

Selected References: Harris, D.L.:PhD.Thesis, 1970 Iowa State University; Harris, D.L. and Switzer, W. P.: Am. J. Vet. Res. 1969, 30:1165; Ross, R.F.,Switzer, W. P. and Duncan, J. R.: Can. J. Comp. Med. 1967, 31:53; Wisecarver, J. L. and Goodnow, R. A.: IPVS Proc. 1980:205.