SYNERGISM BETWEEN BORDETELLA BRONCHISEPTICA AND A TOXIN-PRODUCING STRAIN OF PASTEURELLA MULTOCIDA IN THE CAUSATION OF ATROPHIC RHINITIS IN SPF-PIGS.

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It has been shown repeatedly that Bordetella bronchiseptica can cause turbinate atrophy in newborn piglets (cf. Goodnow 1980). The damage caused by a Bordetella infection has, however, a marked tendency (Tornøe & Nielsen 1976, Rutter 1981) to become repaired. Other aetiological factors therefore seem to be involved in the natural disease. Pasteurella multocida has for many years been suspected to play a significant role but results of experimental infection with this organism have been very inconsistent. An explanation of this may be offered by the observation by de Jong et al. (1980) that some strains of P. multocida produce a thermolabile toxin and that it may be assumed that only toxin-producing strains are able to cause severe turbinate atrophy.

The possibility of a synergism between B.bronchiseptica and P.multocida was examined in the offspring of 26 SPF-gilts. 12 gilts were separated from the other 14 gilts and half of each group were vaccinated with a commercial B.bronchiseptica vaccine (Bortelvac vet., Kitasato).

On day 0-4 after birth all piglets were infected with B.bronchiseptica originating from a field case of atrophic rhinitis. One week and three weeks later all piglets born to the 12 isolated gilts were infected also with a toxin-producing strain of P.multocida.

Two or three weeks after infection with B.bronchiseptica occasional sneezing was heard, mainly in litters from unvaccinated sows. In pigs infected only with this organism the sneezing ceased in a couple of weeks, while many of the pigs infected with both organisms continued to sneeze until slaughtered at 90 kg live weight.

One pig from each litter was killed and necropsied at weaning. In pigs inoculated with B.bronchiseptica only, nearly all pigs from vaccinated sows had normal noses, while most pigs from unvaccinated sows had pronounced turbinate atrophy. After inoculation with both B.bronchiseptica and P. multocida, severe atrophy was found at weaning both in pigs from unvaccinated sows and in pigs from vaccinated sows.

At slaughter, none of the 91 pigs infected with B.bronchiseptica had severe turbinate atrophy, while this was the case with 40 out of 96 pigs infected with B.bronchiseptica and P.multocida (lesion scores > +, Bendixen 1971). Of these 40 pigs 13 were born to vaccinated sows and 27 to unvaccinated sows. Nasal septum deviation was most frequent in pigs born to unvaccinated sows and in pigs challenged with both organisms.

Bacteriological examinations of nasal swabs showed that B.bronchiseptica rapidly colonized the nasal mucosa of most pigs. At weaning B.bronchiseptica was found in 170 of 207 pigs inoculated with that organism (82%). At slaughter B.bronchiseptica was found in only 3 pigs (1,5%).

At weaning, P.multocida was recovered from 22 of 102 pigs inoculated with that organism (21,6%) and at slaughter 17 pigs (16,7%) were still found to be infected.

Obviously vaccination of the gilts with a B.bronchiseptica vaccine did not protect the piglets against infection with B.bronchiseptica, but pigs born to vaccinated sows had significantly fewer and milder lesions at slaughter. Even in pigs infected with both B.bronchiseptica and P.multocida the vaccination showed a beneficial effect, although complete protection was not achieved.

The hypothesis that a combined infection with B.bronchiseptica and a toxin-producing P.multocida is capable of producing typical atrophic rhinitis has been further corroborated in a subsequent experiment with a similar group of SPF-pigs. In that experiment, however, the vaccination with B.bronchiseptica vaccine was replaced by vaccination with P.multocida toxin. Preliminary results tend to confirm that the combined infection will consistently produce severe atrophic rhinitis, whereas infection with B.bronchiseptica and a toxin negative P.multocida mainly will produce transient symptoms.

The protective effect of Pasteurella toxin seems to be similar to that obtained with B.bronchiseptica vaccine. The prospects of combining the beneficial effects of the two preparations in one vaccine against atrophic rhinitis therefore seem promising.

Selected references: Goodnow, R.A.: Microbiol. Rev. 1980, 44, 722-738, Tornøe, N. & Nielsen, N.C.: Nord. Vet.-Med. 1976, 28, 233-242, Rutter, J.M.: Vet. Rec. 1981, 108, 451-454, M.F. de Jong et al.: Int. Pig Vet. Soc. 1980 Congress Proceedings p. 211, Bendixen, H.C.: Nord. Vet.-Med. 1971, 23, Suppl. I.

The occurrence at slaughter of nasal lesions in pigs inoculated with B.bronchiseptica alone or with B. bronchiseptica + P. multocida.

	Inoculated with B. bronchiseptica						Inoculated with B. bronchiseptica + P.multocida					
Turbinate atrophy	0	?	+	++	+++	Total	0	?	+	++	+++	Total
Vacc.	31	6	2	0	0	39	16	7	9	8	5	45
Unvacc.	33	14	5	0	0	52	11	4	5	6	21	47
Nasal septum deviation	0	+	++	+++			0	+	++	+++		
Vacc.	29	8	2	0		39	16	15	8	6		45
Unvacc.	28	18	6	0		52	11	9	7	20		47