THE EFFECT OF LEVAMISOLE ON OVAL IMMUNIZATION TO PREVENT SWINE DYSENTERY

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Although there is some hope that a vaccine for Swine dysentery (SD) may become available in the near future, practical immunization against the disease has not been fully investigated. The current stage of development of vaccine for SD indicates that the efficacy has been limited to reducing losses rather than completely preventing infection. Therefore, there is an urgent need to look more thoroughly into the intricacy of problems associated with immunization of SD. In our attempt to develop a vaccine for SD, we investigated the effect of Tetramisole (levamisole) as an immune potentiator.

Levamisole, widely used in veterinary and human medicine for its vermicidal properties has also shown immunostimulatory properties. From numerous studies, it was shown that levamisole increased resistance to some infections (Fisher et al., 1974; Irwin, 1975); restored humoral and cell-mediated immunity in certain instances (Verhaugen et al., 1973; Wood, 1975); reduced inflammation in rheumatoid arthritis and prevented tumor growth (Symoens and Rosenthal, 1977). The purpose of the study was to determine the effect of levamisole on the immune response to oral vaccination with Treponema hyodysenteriae and compare the results with its counterpart anthelminth, Atgard.

In determining the effect of anthelminths on the immune response to T. hyodysenteriae, pigs 5 to 6 weeks old were used in the experiment. The pigs were vaccinated orally with 6 ml of 2.4 x 10^7 T. hyodysenteriae organism attenuated by subculturing 45 times on Trypticase soy agar containing 5% bovine blood. In the first experiment, 18 pigs were allotted to 2 groups and treated with levamisole via the drinking water. Nine pigs were vaccinated orally and were left in the same pen with 9 unvaccinated pigs to determine the mode of transmission of the attenuated organism. A third group of 6 served as control, was not treated with anthelminth and was kept separate.

In the second experiment, 18 additional pigs of comparable ages were treated in the same manner except that they were treated with Atgard via the drinking water piror to vaccination.

During the interval between vaccination and challenge, the animals were observed 3 times a day to determine any clinical signs of SD and shedding pattern of the organism by culture method as well as by fluorescent antibody technique (FAT) as previously reported (Jenkins, 1978). During this observation period, several mild episodes of diarrhea were seen in many of the vaccinated pigs and the organism was isolated on several occasions from the same animals.

Eight weeks after vaccination, the animals were contact challenged with swine affected with acute SD along with 6 uninfected pigs which served as controls. Observation for the clinical signs of SD was continued for an additional 4 weeks. Humoral and cell-mediated immune (CMI) responses were determined by methods previously described (Jenkins, 1978; Jenkins et al., 1979).

Following contact challenge with swine affected with SD, the total days of diarrhea were comparable in both anethelminth-treated groups (one for one for the levamisole-treated and untreated groups, respectively, versus one and two for the Atgard-treated and untreated groups, respectively. In comparison, the controls (untreated swine) of comparable ages and weight had a total of 121 days of diarrhea. In addition, 50% and 80% recovery of T. hyodysenteriae by culture method and FAT, respectively, were observed in the control group. With respect to clearance of the organism, there was no significant difference in animals treated with levamisole or Atgard and later vaccinated and challenged with virulent T. hyodysenteriae judging by FAT (26% vs. 29%). However, significantly more animals were FAT positive in the levamisole unvaccinated group (38%) than in the Atgard unvaccinated group (25%); a difference of 13% in favor of the former. By culture method, the anthelminth vaccinated groups were comparable (5% vs. 5%) in terms of containing the organisms. However, levamisole treated unvaccinates had 20% more positive samples than the Atgard-treated pigs. It would appear that levamisole was less effective than Atgard in preventing horizontal shedding of T. hyodysenteriae by immune animals.

With respect to the humoral responses (HAR) of the pigs after challenge, a significant difference ($P < 0.05$) was noted in the serologic titers of pigs treated with levamisole compared to the nontreated group (86.4 vs. 64.6) suggesting that levamisole may have some potentiating effect on HAR. The situation was somewhat reversed in the Atgard-treated group, 120.6 vs. 140.8. However, the Atgard group was somewhat comparable to the control group, 120.6 and 140.8 vs. 168.6.

With regard to the CMI responses, there was no significant difference ($P < 0.;5$) in the response of pigs treated with or without levamisole and vaccinated orally as judged by the agarose migration-inhibition test, migration index of 0.68 vs. 0.72. The same situation was true for the Atgard-treated group, 0.58 vs. 0.51. However, the Atgard-treated group gave a stronger CMI response than did the levamisole-treated pigs. The control animals elicited a CMI response comparable to the Atgard-treated group.

Conclusions:

In conclusion, it would appear that the attenuated vaccine reduced the number of cases of diarrhea following challenge. This was probably due to its ability to introduce a mild clinical form of the disease that subsequently led to protection. Generally, there did not seem to be any significant difference in the enhancement or suppression of the immune response in animals judging by clinical and immunologic responses.

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