ANTHELMINTIC EVALUATION OF LEVAMISOLE RESINATE AGAINST DEVELOPING STAGES OF ASCARIS SUUM AND OESOPHAGOSTOMUM DENTATUM IN SWINE

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Infections of swine by nematode parasites are a limiting factor in profitable pork production. Light infection with internal parasites may cause pigs to gain poorly, take longer to reach market weight and reduce feed efficiency. Migration of parasites through the liver, lungs and other organs can provide entry sites for pathogenic microorganisms and cause lesions resulting in condemnation at slaughter. Heavy infections may cause death. Much of the mortality in young pigs is due to parasite infections acquired during the first few days of life (Batte, 1977).

Levamisole (1-2,3,5,6-tetrahydro-6-phenyl-imidazo [2,1-b]-thiazole hydrochloride) has been reported to be highly effective when used as a powder in feed and water or as an injectable to remove gastro-intestinal worms from swine. (Johnson et al., 1972; Oakley, 1974, 1977; Batte, 1977). Trials to evaluate the activity of a formulation containing levamisole resinate against developing stages of Ascaris suum and Oesophagostomum dentatum when the drug is given in the feed are described in this paper.

Adult female A. suum were obtained from a local slaughterhouse. The uteri were removed, eggs harvested and incubated with shaking at 25°C in 1% formalin solution. At least 40 days of incubation were allowed so that the larvae within the egg could undergo the first moult and become infective.

Infective O. dentatum larvae were obtained by culturing the feces of naturally infected sows. The larvae were harvested by the Baermann method after 7 to 10 days culture in sterile sphagnum moss at 27°C.

The prescribed number of infective embryonated A. suum eggs was given to individual pigs. The inoculum were administered as an oral drench by means of a disposable plastic syringe and tube inserted through a metal speculum to prevent loss of the infective dose.

The number of third stage O. dentatum larvae was estimated by dilution and counting using a McMaster slide. Doses of infective larvae were given to individual pigs by the same technique as for A. suum.

To assess the activity of the drug against migrating or immature worms, levamisole resinate was given in 227 g of swine ration per pig to supply 8 mg levamisole hydrochloride equivalent per kg body weight at 3, 7 or 16 days after inoculation with A. suum or O. dentatum. Each pound of medicated feed premix contained 227 g of levamisole hydrochloride (equivalent) absorbed onto an inert cation exchange resin. Feeds containing the basal rations were removed on the day of treatment and medicated feeds were given in 0.3 x 1.2 mm feed troughs, so that there would be sufficient feeding space. One extra pig from each of the medicated pens was removed for parasitological examination on the day of treatment to determine the predominant larval stage. The different stages of A. suum larval development were differentiated by the criteria of Douvres et al., 1969 and Goodey, 1926 for O. dentatum.

The group efficacy against all larval and immature stages was calculated by using the equation:
Group % efficacy = [(Average number of worms in control group at necropsy - Average number of worms in treated group at necropsy)/(Average number of worms in control group at necropsy)] x 100.

In the first study, 43 Yorkshire x Hampshire crossbred weaned pigs, 7 weeks of age, weighing 8.0 to 13.8 kg were each dosed with 10,000 infective Ascaris eggs and randomly allotted to four groups. Groups B, C and D received feed containing levamisole resinate at 3, 7 and 16 days postinoculation, respectively. Group A remained untreated as a control. Four days after the last treatment the pigs were slaughtered, the small intestine and stomach removed, stripped, opened and washed thoroughly in water; formaldehyde was added to the contents as preservative. The contents were passed through a 200 mesh sieve (75 μ opening) and larvae present stained with an iodine solution and counted with the aid of a stereo-microscope.

Lungs and liver of individual pigs were minced together and 100 g of the ground tissue incubated overnight at 37°C with shaking in a solution containing 264 ml water, 4 g pepsin and 3 ml HCl. The material was poured onto a 200 mesh sieve and the retained material was washed into a jar and formaldehyde was added.

Results of levamisole resinate activity against A. suum indicated an anthelmintic efficacy of 35.9% against early third stage, 89.7% against late third stage and 100% against fourth stage larvae, respectively.

In the second trial, 43 Yorkshire x Hampshire crossbred weaned pigs, 8.4 to 25.4 kg,were each dosed with 25,000 infective O. dentatum larvae and randomly allotted to four groups and treated as for Experiment 1. Twenty-six days after the last treatment, all pigs were slaughtered, eviscerated and the small intestine and the cecum and colon ligated, removed and stripped. The mucosa of the small intestine, cecum and colon were washed thoroughly with water to flush off worms. The contents and washing were combined and screened in a 200 mesh sieve, formalin was added and the materials stored under refrigeration. The contents were diluted to 4.0 liters and at least three 1/100 aliquots were taken. The aliquots were stained with iodine solution and examined under a stereo-microscope.

The results demonstrated an anthelmintic efficacy of 28.5 and 13.9% against 3 and 7-day-old Oesophagostomum larvae, respectively, in the intestinal mucosa. The drug was substantially effective (85.1%) against 16-day-old larvae within the intestinal lumen.

Conclusions:

Levamisole resinate administered in feed at the recommended level has partial activity against early third stage A. suum larvae migrating through the liver and excellent activity against late third stage larvae found in the lung and fourth stage that have returned to the intestine. The same drug dosage administered in feed has reduced activity against third stage of O. dentatum, but is effective in reducing the later larval fourth stage.

Selected references: Batte, E. G.: J. Am. Vet. Med. Assoc. 1977, 170: 343; Douvres, F. W., Tromba, F. G. and Malakatis, G. M.: J. Parasitol. 1969, 55: 689; Goodey, T.: J. Helminth. 1926, 4: 191; Johnson, W. P., Eggert, R. G., Poeschel, G. P. et al: J. Am. Vet. Med. Assoc. 1972, 161: 1221; Oakley, G. A.: Vet. Rec. 1974, 95: 190; Oakley, G. A.: Vet. Rec. 1977, 100: 310.