Ivermectin Overdose and Toxicosis in Neonatal Pigs

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Since its introduction in 1984 for swine in Canada, ivermectin, a new broad-spectrum antiparasitic agent, has been widely accepted in the swine industry, especially for the control of sarcoptic mange. We report here adverse reactions after ivermectin injections in neonatal pigs from three farms in southwestern Ontario.

On all three farms, ivermectin (10 mg/mL, Ivomec; MSD Agvet, Kirkland, Quebec) was given to all pigs, regardless of age, as part of a whole-herd treatment to control mange. Only the youngest piglets were clinically affected and exhibited various signs of central nervous system (CNS) disturbance prior to submission for laboratory evaluation.

Farm 1 — Four, live, four-day-old piglets were submitted on March 26, 1986 about 24 hours after receiving injections of ivermectin. These and other piglets from six litters were lethargic, shaking, and incoordinated. The ivermectin (0.10 mL to neonates) had been administered subcutaneously (SC) from a 12 mL syringe by the farmer.

Farm 2 — Five, live, seven-day-old piglets were submitted on November 27, 1986. The piglets were from four litters which had been given ivermectin at four days of age, and were vomiting, shivering, trembling, ataxic, and tumbling. One of the submitted piglets was splay-legged and the others were in lateral recumbency. The farmer had injected ivermectin (0.10 mL) SC via a 6 mL syringe.

Farm 3 — Four, five-day-old piglets (2 live, 2 dead) were submitted on January 22, 1987. They were from three litters which had been given ivermectin at two days of age. Clinically, the pigs exhibited tremors, ataxia, and were shaking. Several piglets in the three litters had assumed a dog-sitting position or were splay-legged. The farmer had injected ivermectin (0.25 mL) with a metered, multidose, automatic syringe.

Internal organs, including brain, were selected for routine bacteriological and histological evaluation. The results of hematological and serum biochemical analyses were unremarkable as were the results of bacteriological culture. Gross and histological lesions were not seen, but unusually high levels of ivermectin were detected in the livers. Pooled samples of liver from each of the three groups were analyzed using a high performance liquid chromatographic method (1) and found to contain 5.54, 6.40 and 7.95 mg/kg ivermectin, respectively. These results are at least ten times the levels found in the livers of rats and steers at one and seven days, respectively, after treatment with ivermectin at levels of 0.3–0.4 mg/kg of body weight by either the SC or oral (intraruminal) route (2). Domestic livestock are routinely monitored for a variety of drug residues, including ivermectin, at the Health of Animals Laboratory, Agriculture Canada, Saskatoon. Despite using a method which is sensitive to 5 μg/kg, no trace of ivermectin residue was found in liver samples from nearly 1000 animals (cattle and swine) selected randomly over the last three years (J. Patterson, personal communication, 1987).

There are no recommendations by the manufacturer for ivermectin treatment of neonatal piglets. Likewise, there is no stated dosage for neonates. The recommended dosage of ivermectin (10 mg/mL) in swine is 300 μg/kg body weight given SC at the rate of 1 mL/33 kg. For a 1 kg piglet, the dosage would therefore be about 0.033 mL and it would be unrealistic for this to be measured with a 6 mL or 12 mL syringe. Ivermectin has a wide safety margin in feeder swine, with no adverse reactions observed at dosages up to 50 times the recommended level. At 100 times this level, CNS signs similar to those seen in these neonatal piglets were reported (3).

Ivermectin is believed to act by blocking the postsynaptic transmission of nerve impulses by potentiating the release and binding of gamma-aminobutyric acid (GABA), and thus blocking GABA-mediated transmission of signals (3,4,5). In mammals, GABA nerves are found only in the CNS. Although ivermectin does not readily cross the blood-brain barrier, there are several reports of ivermectin-induced CNS toxicosis in Collie dogs (3,4,5,6,7) and, more recently, in other small domestic animals (8,9).

Although the findings in these studies are suggestive of gross overdosing, it is possible that the blood-brain barrier of neonatal piglets is more permeable to ivermectin than that of mature animals. The main problem, however, seems to be a combination of the practices of 1) treating neonates and 2) using a large syringe to administer a miniscule amount of the drug. It would therefore seem prudent that producers be advised not to inject ivermectin into neonates or, alternatively, under strict veterinary supervision, that the agent be accurately measured and further diluted with

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an innocuous carrier (e.g. physiological saline or propylene glycol) using a 1 mL, graduated tuberculin syringe.

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Abstract

Open Canalicular System of Platelets in Porcine Stress Syndrome

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A study was undertaken to test whether a previously reported alteration in platelet morphology could be of predictive value for the detection of stress-susceptibility in pigs. Platelets from 20 normal pigs, nine pigs classified as stress-susceptible on the basis of their response to halothane challenge, and 11 siblings of halothane reactors belonging to two different breeds were subjected to electron microscopic examination. A quantitative analysis of electron micrographs, based on the extent of dilatation of the open canalicular system in platelets and the percentage of affected platelets, revealed that halothane reactor pigs could be distinguished from normal animals on the basis of their open canalicular system score. The discrete nature of the score categories in siblings indicates that platelet alteration may be an inherent component of the porcine stress syndrome and suggests that some of the false negatives in the halothane test may be identified as stress-susceptible on this criterion. Further studies involving a larger number of halothane reactors and siblings are needed to ascertain the consistency of the open canalicular system features and eventually, to develop a simple test system based on platelet alterations for the detection of stress-susceptibility in pigs.

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