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CONTROL OF *PSOROPTES CUNICULI* IN CAPTIVE WHITE-TAILED DEER WITH IVERMECTIN-TREATED CORN

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ABSTRACT: *Psoroptes cuniculi*, the ear mite of domestic rabbits, was collected from captive white-tailed deer (*Odocoileus virginianus*). This is the first report of rabbit ear mite infestations in white-tailed deer in Oklahoma or Texas (USA). In addition to moderate infestations in their ears, two 4-yr-old bucks, two 3-yr-old does, and seven 4-yr-old does showed patchy areas of alopecia along the sides and brisket. Both bucks also had patchy areas of alopecia around the base of antlers. Ear mites were eradicated from all deer except from one doe by providing ivermectin-treated corn to the deer at a rate of 1,000 g (equivalent to 200 mcg/kg of ivermectin)/day/deer for several days. The ear mite infestation in the one doe was eradicated by intramuscularly injection with ivermectin at 400 mcg/kg. After treatment with the ivermectin and eradication of the mites, the alopecia improved and eventually was eliminated. The ivermectin-treated corn also controlled all internal nematode parasites in the deer.

Key words: Captive white-tailed deer, *Odocoileus virginianus*, Psoroptic mange, hair loss, *Psoroptes cuniculi*, case report.

INTRODUCTION

Psoroptes cuniculi, the domestic rabbit ear mite, has been collected from goats, sheep, horses, donkeys, mules (National Research Council Report, 1979), and black buck antelope (Wright and Glaze, 1988). Domestic rabbit ear mites have also been collected from free-ranging white-tailed deer (*Odocoileus virginianus*) from Alabama, Georgia, Florida and South Carolina (Strickland et al., 1970; Rollor et al., 1978) and from captive white-tailed deer in Michigan (Schmitt et al., 1982). Schmitt et al. (1982) reported that *P. cuniculi* caused alopecia around the base of the antlers, the lacrimal gland opening, the face, and brisket in captive male white-tailed deer.

Areas of alopecia were found on captive white-tailed deer held in Kerrville, Texas (USA). Ear mite infestation was suspected as the cause of the observed alopecia (Schmitt et al., 1982). The purpose of this study was to identify the mites that may have caused the areas of alopecia on the captive white-tailed deer and to develop a practical method of control of the mites. Because earlier research had shown that lone star ticks, *Amblyomma americanum* (L.), can be controlled on white-tailed deer with daily oral doses of ivermectin (Miller et al., 1989), application of this approach for control of ear mites in deer was investigated.

MATERIALS AND METHODS

Collection of deer

White-tailed deer were collected during the summer of 1986 in Oklahoma (35°05'N, 95°38'W) as 1- to 3-mo-old fawns by wildlife biologists with the Oklahoma Department of Wildlife Conservation and hand reared in the laboratory at the Lone Star Tick Research Laboratory (Poteau, Oklahoma 74953, USA). When the fawns were 4- to 6-mo-old, they were used in laboratory tests to determine the efficacy of daily oral dosages of ivermectin for control of adult and nymphal lone star ticks (Miller et al., 1989). Fawns were released into a 31 × 61 m fenced enclosure where they were treated by injection of 200 mcg of ivermectin per kg of body weight. During the summer of 1987, a 1-yr-old doe and three yearling bucks were received from the Oklahoma Department of Wildlife Conservation (Oklahoma City, Oklahoma 73105, USA) and included in the herd. On 13 April 1989, 11 3- to 4-yr-old deer, nine does (seven were pregnant), and two bucks, were transported in an enclosed cattle trailer from Poteau, Oklahoma to the Knipling-Bushland U.S. Livestock Insects Research Laboratory (Kerrville, Texas 78029, USA) (30°04'N, 99°05'W).

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The deer were placed in a 31 × 32 m enclosure at the laboratory.

Collection and identification of mites

Scrapings of hairless areas on one of the bucks and ear swab examinations from both bucks and one fawn born in May 1989 were done on 21 and 22 June 1989 and again on 19 July 1989. Mites obtained from the material collected from the deer were mounted in Hoyer's medium on microscope slides for measurement of the fourth outer lateral opisthosomal setae (Sweatman, 1958). Attempts were made to identify the source of the mite infestations. All domestic animals in adjacent pens to the deer as well as the fawns born in May and June to the pregnant does were examined for mites.

Treatment 1

In an attempt to eliminate the ear mites, all deer were treated twice orally, first on 10 July 1989 and second on 17 July 1989, with ivermectin by mixing technical ivermectin with whole corn. To determine if each deer had consumed the treated corn, all feed was removed from the pen 24 hr before the treated feed was introduced and a tracer material of metallic glitter (Glitterex Corporation, Belleville, New Jersey 07109, USA) was included with the treated feed. Corn was treated with glitter at the rate of 0.5 g of glitter/500 g of corn. This results in an average of two flakes of glitter per kernel of corn (500 g of corn equals approximately 1,865 kernels). The deer were fed at the rate of approximately 500 g of the treated corn/deer. The corn was treated such that the consumption of 500 g provided 100 mcg/kg of ivermectin to an average 50 kg deer. After each treatment, fecal samples were collected and examined for the glitter. The amount of glitter in each fecal sample provided an estimate of the amount of treated feed eaten by each deer.

As a further test to determine which deer had eaten the treated feed, we examined all of the captive deer for internal parasites. Fecal samples were collected on 22, 28 June and 13 July 1989. Three g of feces from each deer were crushed and mixed with distilled water, strained and placed in 15 ml centrifuge tubes. The mixture was centrifuged and the supernatant discarded. The precipitate was mixed with Sheather's sugar solution. Slides were prepared and examined under a microscope for eggs of helminths.

Treatment 2

Because mites were found when deer were examined on 19 July 1989, a second attempt to eliminate the ear mites was conducted. All deer were fed ivermectin treated whole corn twice for three consecutive days, beginning 24 July and 22 August 1989. The deer were fed treated corn at the rate of 1,000 g of treated corn per deer per day. This treatment was equivalent to 200 mg/kg of ivermectin per day per animal. All feed was removed from the pen 24 hr prior to the first feeding of treated corn. Feed was not reintroduced until all of the treated corn had been consumed after the last feeding. The consumption of treated corn was verified by the examination of fecal samples for the glitter.

Treatment 3

When a single mite was collected from ear scrapings from buck 1 on 8 September 1989, a third series of treatments with ivermectin was performed. As before, all feed was removed from the pen 24 hr earlier. Deer were fed treated corn at the rate of 1,000 g per deer per day on 18 to 22 September, 25 to 27 September and 2 to 4 October 1989. On 27 October, four deer, does 4 and 1 (Table 2) and both bucks, were drugged with Rompum® (Pifzer Inc. Deerborn, Michigan 48122, USA) and thoroughly examined for mites.

RESULTS AND DISCUSSION

Collection and identification of mites

Scrapings from the hairless areas on the deer were negative for mites. Scabs collected on 21 and 22 June and 19 July 1989 from the deer yielded 50 males, 33 females, numerous juveniles and 49 male-female pairs.

Thirty-eight opisthosomal setae from 21 adult male mites were measured. The mean setal length was 70.8 μm (range 45.5 to 100.0). The average length of these setae was within the range characteristic for *P. cuniculi* (Sweatman, 1958). Voucher specimens have been deposited in the U.S. National Parasite Collection (Beltsville, Maryland 20705, USA; Accession number 80838).

Following identification of the mites as *P. cuniculi*, we examined domestic goats in an adjacent pen with an otoscope and took ear swabs in an effort to determine the source of the deer infestation. None of the goats and other domestic animals were infested with ear mites.

To our knowledge, this is the first reported case of a *P. cuniculi* infestation in

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TABLE 1. The number of metallic glitter particles recovered from 10 g fecal samples from white-tailed deer treated orally with whole kernel corn containing ivermectin and glitter particles in treatment series 1.*

Days post-feeding	Deer number				
	Bucks		Does		
	1	4	1	2	3
16	8	6	4	2	2
24	6	7	0	6	6
40	11	17	2	2	6
48	14	13	2	1	1
64	0	0	0	0	0
72	2	1	0	0	0

* These data were collected after the second application of ivermectin-treated corn was given on 17 July 1989.

captive white-tailed deer in Oklahoma or Texas. The source of the original infestation was not determined, but probably occurred in Oklahoma when new deer were brought to the Poteau facilities by the Oklahoma Department of Wildlife during the summer of 1987.

Treatments

Feces of the deer when examined for the presence of internal parasites before oral treatment with ivermectin contained large numbers of trichostrongyle ova. Buck 1 did not have helminth eggs in the feces. No helminth eggs were found in any of the fecal samples collected after treatment with ivermectin on 13 July 1989. Thus, a single dose of the ivermectin-treated corn appeared to eliminate these parasites.

It was not evident from evaluation of the feces after the first treatment that all deer examined had consumed the required amount of the treated feed (Table 1). However, after the second series of treatments, glitter particles were found in the feces collected from each deer (Table 2), but not all of the deer consumed the same amount of treated feed.

When deer were drugged and examined for mites on 27 October, doe 4 was found infested with all stages of ear mites, none of the other animals examined were infested. Evidence from Table 2 suggest that doe 4 was not consuming adequate amounts of the treated feed. Social behavior within the herd and a physical problem of an abscessed jaw probably prevented this deer from consuming adequate amounts of treated feed. To eliminate the mites, this doe was treated by intramuscular injection with 400 mcg/kg of ivermectin on 3 November 1989. Upon examination 7 days after injection and again 13 April 1990, no mites were found infesting doe 4. After the mites had been eradicated, there was a marked improvement in the condition

TABLE 2. The number of metallic glitter particles recovered from 10 g fecal samples from white-tailed deer treated orally with whole kernel corn containing ivermectin and glitter particles in treatment series 2.*

Days post-feeding	Deer number										
	Bucks		Does								
	1	4	1	2	3	4	5	6	7	8	9
1	52	57	38		43			44		95	
2	71	64	46	81	60			63	69		
3	145	28	97	51	76	15	219	173	162	132	97
4	31	56					14			4	12
5		10					3	9	8	9	
6		8	0			0		8	0		
9	2	1						23			
10	0	0						4			
11	0	0						4			
12	0	0						6			
13	1	6						11			
15	0	0						0			

* Ivermectin treated corn was fed on day 0, 1, and 2.

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of the coat of the deer and eventually, the alopecia condition was eliminated.

Single injection of ivermectin at 200 mcg/kg to rabbits was ineffective in eliminating ear mite infestations (Wright and Riner, 1985). Oral administration of ivermectin is less effective than either the intermuscular or subcutaneous injection routes (Drummond, 1985). However, repeated oral applications of low doses of ivermectin controlled lone star ticks on Spanish goats and white-tailed deer (Miller et al., 1989). Increasing the number of times and the frequency of each treatment with low levels of orally administrated ivermectin increases the level of active material in the blood of the treated animals (J. A. Miller, unpubl. data) and thus, can provide a higher dosage needed to control the target parasite.

The amount of and evidence of the glitter in the fecal samples of most of the deer taken after treatments (Tables 1 and 2) suggest that orally-administered ivermectin may be an effective method of delivery of a systemic acaricide to captive white-tailed deer for control of *P. cuniculi* infestations. Because one deer did not consume the required amount of ivermectin treated corn to control ear mites, the use of this approach may not be justified under field conditions. However, repeated daily applications of the ivermectin treated corn to captive deer did eliminate the ear mite infestation in 10 of 11 deer.

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LITERATURE CITED

DRUMMOND, R. O. 1985. Effectiveness of ivermectin for control of arthropod pests of livestock. Southwestern Entomologist (Supplement) 7: 34–42.

MILLER, J. A., G. I. GARRIS, J. E. GEORGE, AND D. D. OEHLER. 1989. Control of lone star ticks (Acari: Ixodidae) on Spanish goats and white-tailed deer with orally-administered ivermectin. Journal of Economic Entomology 82: 1650–1656.

NATIONAL RESEARCH COUNCIL REPORT. 1979. *Psoroptic Cattle Scabies Research: An Evaluation*. National Research Council, National Academy of Science, Washington, D.C., 167 pp.

ROLLOR, E. A., III, V. F. NETTLES, W. R. DAVIDSON, AND R. R. GERRISH. 1978. Otitis media caused by *Psoroptes cuniculi* in white-tailed deer. Journal of the American Veterinary Medical Association 173: 1242–1243.

SCHMITT, S. M., T. M. COOLEY, AND T. W. SCHILLHORN-VAN-VEEN. 1982. *Psoroptes cuniculi* in captive white-tailed deer in Michigan. Journal of Wildlife Diseases 18: 349–352.

STRICKLAND, R. K., R. R. GERRISH, T. P. KISTNER, AND F. E. KELLOGG. 1970. The white-tailed deer, *Odocoileus virginianus*, a new host for *Psoroptes sp*. The Journal of Parasitology 56: 1038.

SWEATMAN, G. K. 1958. On the life history and validity of the species in *Psoroptes*, a genus of mange mites. Canadian Journal of Zoology. 36: 905–925.

WRIGHT, F. C., AND R. L. GLAZE. 1988. Blackbuck antelope (*Antilope cervicapra*, a new host for *Psoroptes cuniculi* (Acari: Psoroptidae). Journal of Wildlife Diseases 24: 168–169.

WRIGHT, F. C., AND J. C. RINER. 1985. Comparative efficacy of injection routes and doses of ivermectin against *Psoroptes* in rabbits. American Journal of Veterinary Research 46: 752–754.

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