Research Note

EFFICACY OF IVERMECTIN ADMINISTERED SUBCUTANEOUSLY AGAINST CATTLE TICK, BOOPHILUS MICROPLUS *(CANESTRINI)*[1]

Boophilus microplus (Canestrini), the southern cattle tick, is the most important external parasite of cattle in Puerto Rico today. Although it had been eradicated from Puerto Rico in the late forties-early fifties through systematic dipping in arsenicals[2,3], *B. microplus* reappeared in January 1978 and is now distributed throughout the island.[4,5] Heavy infestation of this tick causes weakness, anemia, and at times, death. It is a vector of bovine piroplasmosis (also known as Texas cattle fever or babesiosis) and perhaps anaplasmosis.

On April 1985, bovine piroplasmosis was reported in a dairy herd in Hatillo, Puerto Rico[6] and *Babesia bovis* (*B. argentina*) and *B. bigemina* were serologically, demonstrated as the causative agents. Mortality due to bovine piroplasmosis may reach as high as 90%. As of October 1985, there were 300 premises with about 21,044 head of cattle under quarantine for piroplasmosis and a total of 118 herds located on 151 premises were positive for piroplasmosis by Complement Fixation Test.[7]

External application of Cio-Rid (Crotoxyphos) and Co-Ral (Coumaphos) were formerly used by the Puerto Rico Tick Eradication Program for control of this parasite. Cio-Rid is sometimes toxic to Zebu-type cattle even at the recommended dosage. Both of these acaricides may cause toxic reactions in the personnel of the Tick Program. Today the Program uses TakTic Spray (amitraz) 0.025% solution for cattle and Atroban Spray (permethrin) 0.050% for cattle, horses and sheep. The animals are re-treated every 2 or 3 weeks.[8] Dermal application of acari-

[1] Manuscript submitted to Editorial Board March 14, 1986.

[2] Fox, I. and D. de León, 1983. On the Tropical Horse Tick and the Southern Cattle Tick in Puerto Rico. J. Agric. Univ. P. R. 67 (1): 57–9.

[3] Maldonado-Capriles, J. and S. Medina-Gaud, 1977. The Ticks in Puerto Rico (Arachnida: Acarina). J. Agric. Univ. P. R. 61 (3): 402–4.

[4] Anonymous, 1980. Departamento de Agricultura de Puerto Rico y Departamento de Agricultura Federal, Erradicación de Garrapatas en Puerto Rico.

[5] ——, 1980. Departamento de Agricultura, División de Veterinaria y Departamento de Agricultura Federal, Servicio de Inspección de Sanidad Animal y Vegetal. La Guerra Contra las Garrapatas de Fiebre de Ganado en Puerto Rico.

[6] Zayas, F., 1985. Bovine Piroplasmosis—A Recent Outbreak in Puerto Rico. Presented at P. R. Med. Association Convention at Humacao, P. R., August 23–25, 1985.

[7] Holt, T. J., 1985. Weekly Report—Babesia Outbreak, P. R. Veterinary Services, Animal and Plant Health Inspection Service, USDA, San Juan, P. R.

[8] Suthern, C. B. and G. P. Comb, 1984. The Puerto Rico Tick Eradication Program. Proceedings of the 88th Annual Meeting of the United States Animal Health Association, Fort Worth, Texas. 406–12.

cides usually gives short-term protection from reinfestation because of photodecomposition, evaporation and absorption of the chemicals.[9] Self-grooming, the growth and loss of hair and rainfall reduce the residual effect of the acaricides to less than 2 weeks. Furthermore, spraying cattle is expensive in the sense that frequent corraling produces weight and/or milk production losses, and requires extra time and labor.[10]

Recently, Ivermectin, 22,23-dihydro-avermectin B_1, a fermentation product of *Streptomyces avermitilis*, has been reported to exhibit extraordinarily potent antiparasitic activity[11] and may be given subcutaneously, which expedites its administration. Ivermectin is effective against *Boophilus microplus* and *Amblyoma variegatum*[12] and has a wide margin of safety. Assessment of the efficacy and safety of Ivermectin against *B. microplus* under field conditions in the tropics was deemed essential.

For this purpose 20 female Holstein-Friesian heifers 1 to 2 years of age, with an average liveweight of 179 kg and naturally infested with *Boophilus microplus*, were used in this study, which was conducted at the Santa Elena Dairy Farm in Toa Baja, Puerto Rico. Numbered eartags were used to identify each animal.

Animals were allocated to replicates, by restricted randomization based on pretreatment tick counts, and to the following random treatments (within replicate): untreated control; ivermectin* (1% m/v solution) administered once, subcutaneously, on Day 0.

The animals were housed, by treatment group, in two separate pens with a concrete floor, so that reinfection could not occur after treatment. Each head was fed 16 kg of a mixture of sorghum and corn silage. Water was available at all times.

In both groups, whole-side counts[13] of adult ticks measuring between 4.5 and 8.0 mm were performed on day 0 (before treatment), and on days 1, 3, 10 and 21. Thereafter all animals were turned out to pasture.

Observations ended for the untreated control animals on day 21, but the animals which received ivermectin were reexamined on days 35 and 48. All animals were observed for signs of adverse reactions at the time of treatment (day 0), and at daily post-treatment inspections.

Table 1 shows the efficacy of ivermectin against *Boophilus microplus*

[9] Beadless, M. L., J. A. Miller, B. K. Shelley, and R. E. Reeves, 1978. Horn Flies: Control with Dichlorvos-Impregnated Resin Blocks Attached to Bands on the Rear Legs of Cattle. J. Econ. Entomol. 71: 287–89.

[10] Anonymous, 1981. Ectrin Insecticide Cattle Ear Tag. Animal Health Division, Diamond Shamrock Corp., 1100 Superior Ave., Cleveland, Ohio 44114.

[11] Egerton, J. R., J. Birnbau and L. S. Blair, 1980. The 22,23-Dihydro-Avermectin B_1: A New Broad Spectrum Anti-Parasitic Agent. Br. Vet. J. 136: 88–97.

[12] Anonymous, 1980. Ivómec Injection for Cattle (Ivermectin, MSD).

[13] Wharton, R. H., W. J. Roultson, K. B. W. Utech, and J. D. Kerr, 1970. Assessment of Acaricides Against *Boophilus microplus*. Aust. J. Agric. Res. 21: 986–88.

TABLE 1.—*The efficacy of IVOMEC against natural infestations of* **Boophilus microplus** *in cattle in Puerto Rico*

Animal number	Number of ticks (4.5–8.0 mm)						
	Day 0 (Oct. 10)	Day 1 (Oct. 11)	Day 3 (Oct. 13)	Day 10 (Oct. 20)	Day 21 (Oct. 31)[1]	Day 35 (Nov. 14)	Day 48 (Nov. 27)
				Control			
249	28****[2]	47****	30****	9****	45****	Not examined	Not examined
236	40****	47****	43****	7****	47****	Not examined	Not examined
156	37****	72****	52****	10****	76****	Not examined	Not examined
655	36***[3]	30***	19***	7***	54****	Not examined	Not examined
265	35****	59****	64****	9****	99****	Not examined	Not examined
147	50****	54****	107****	27****	238****	Not examined	Not examined
178	72****	62****	95****	14****	242****	Not examined	Not examined
191	60****	43****	69****	2****	151****	Not examined	Not examined
92	77****	39***	43****	11****	119****	Not examined	Not examined
234	47****	44****	61****	18****	46****	Not examined	Not examined
				Treated			
233	27****	14****	10***	42****	1***[4]	0	Not examined
206	41****	20****	9***	36****	79****	0	1**
140	39****	41****	32****	53****	4**	0	15**
235	34****	49****	27****	48****	0**	0	6**
143	31****	36****	15***	52****	0**	0	8**
166	49****	55****	33****	52****	1***	0	6**
229	66****	53****	21***	36****	0***	0	Not examined
162	52****	41****	6***	46****	3**	0	9**
252	89****	59****	16***	30****	0**	0	Not examined
138	44****	51****	18***	50****	10**	0	11**

[1] Day 21 asterisks in treated group indicate ticks smaller than 4.5 mm only. No ticks larger than 8.0 mm were found.
[2] Many. (Ticks between 4.5 mm and 8.0 mm in length).
[3] Some.
[4] Few.

ticks. By day 21, 5 of the 10 treated animals had small numbers (from 1 to 10) of adult ticks, measuring between 4.5 and 8.0 mm; one animal had 79 adult ticks; 4 of 10 animals had no adult ticks. The untreated controls had large numbers of adult ticks (from 45 to 242) on day 21. On day 35, no treated animals had ticks. The recrudescence of mature ticks in the 7 treated animals examined on day 48 was ascribed to their pre-exposure to infection after being turned out to pasture.

The results of this trial indicate that by day 21, ivermectin had markedly reduced the number of adult *Boophilus microplus* ticks on the treated animals as compared to those on the controls. There were no adverse clinical reactions to treatment with ivermectin.

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