

Research Note

THE EFFECT OF CLORSULON ON LEVELS OF FOUR INORGANIC ELEMENTS IN MILK¹

Fasciola hepatica is a trematode parasite with worldwide distribution in mammalian species, including cattle and man. In dairy cattle, fascioliasis causes hepatic damage with a reduction in milk production, both quantitatively and qualitatively. In 1970 Ross² estimated an 8% loss in milk and meat production in cattle infected with *F. hepatica*. Control of this parasitism has been primarily by use of molluscicides and management practices. In recent years, however, several authors have reported an increase in milk yield and total solids content after treatment of infected cows with a fasciolicide.^{3,4,5,6}

In Puerto Rico the use of ClorsulonTM has become widespread because of the high insular prevalence of bovine fascioliasis.^{7,8,9,10} In 1983, de León¹¹ reported that Clorsulon (MK-401) was effective in controlling *E. hepatica* in Puerto Rico.

Clorsulon, (4-amino, 6-trichloroethenyl, 1-3 benzenedisulfonamide), is the only FDA- and state-approved fasciolicide on the island. Milk from treated cows must be discarded for 8 days after the last treatment, and treated cattle cannot be slaughtered within that period. In addition, the manufacturer cautions that manure and urine from treated animals may contain sufficient

¹Manuscript submitted to Editorial Board 8 February 1990. Authors gratefully acknowledge support from the National Institutes of Health-Minority Biomedical Research Support Grant #RR-08159 granted to Inter American University of Puerto Rico.

²Ross, J. G., 1970. The economics of *Fasciola hepatica* infections in cattle. *Br. Vet. J.*, 126 XIII.

³Black, N. M. and G. Floyd, 1976. The treatment of chronic fascioliasis and compositional quality of milk. 9th Int. Congr. D. S. Cattle World Association Bulatrics, Paris. 2: 1119-124.

⁴Castagnetti, G. B., G. Losi and D. Morini, 1977. Influenza della fasciolasi bovina sulla composizione chimica e sulle caratteristiche tecnologiche del latte. *Sci. Tec.* 28 (3): 187.

⁵——, ——, —— and I. Padovani, 1982. Influenza della distomatosi sulla produzione quali-quantitativa del latte con particolare riferimento alla composizione della frazione lipidica. *Sci. Tecnol. Lattierocaseario*. 33 (4): 311-34.

⁶Norman, J. A., N. L. Allen, E. T. L. Griffiths and J. D. Medcalf, 1975. The influence of liver fluke infestation on the quantity and quality of milk production. Proc. 20th World Vet. Congr., 1, Thessaloniki, Greece, July 6-12: 551-52.

⁷De León, D., L. S. Ritchie and J. Chiriboga, 1972. Fascioliasis in dairy cattle in the Río Piedras basin of the Dorado area, P. R., *J. Agric. Univ. P. R.* 56 (1): 82-92.

⁸Frame, A. D. and P. Bendezú, 1978. Bovine fascioliasis in Puerto Rico. *J. Parasitol.*, 64: 136.

⁹——, ——, H. Otiniano, S. J. Frame and W. Flores, 1979: Increase of bovine fascioliasis in Puerto Rico as determined by slaughterhouse surveys. *J. Agric. Univ. P. R.* 63: 27-30.

¹⁰——, ——, C. I. Rivera-Ortiz, R. Valentín and J. Díaz-Rivera, 1980: *Fasciola hepatica* in dairy cattle in Puerto Rico in 1978. *J. Parasitol.* 66: 698-99.

¹¹De León, D., and R. Quinones, 1983. The efficacy of Mk-401 (4-amino-6-trichloroethenyl-1-1-1,3 benzenedisulfonamide) against *Fasciola hepatica* in cattle under Puerto Rican conditions. *J. Agric. Univ. P. R.*; 67: 53-6.

TABLE 1.—Increase in mineral concentrations in milk from infected-treated (experimental) cows in percentage relative to the infected-untreated (control) cows

	Infected-treated Day 3	Infected-untreated Day 3	Differences in percent (%)
Calcium	1.47	1.00	47.0
Magnesium	0.17	0.11	54.5
Potassium	1.51	1.15	31.3
Sodium	0.62	0.42	47.6

toxicity to cause stunting of pasture and crop plants.

This study was designed to determine the effect of Clorsulon on four inorganic cations in milk of treated and untreated cows. Milk samples taken from cows naturally infected with *F. hepatica*, half treated with Clorsulon and half left untreated, were analyzed by flame atomic absorption spectrophotometry¹² to evaluate the levels of calcium, magnesium, potassium and sodium. The controls consisted of infected-untreated cows, whereas the experimental group was infected-treated.

The randomly selected Holstein cows in this study were 3 to 5 years old and were maintained with comparable rations of forage and a concentrate supplement com-

monly used for dairy cows. Water was available *ad libitum*. Clorsulon was administered according to the manufacturer's instructions.

By day 3 post-treatment, milk from cows infected with *F. hepatica* and treated with Clorsulon showed an increase in the levels of calcium, potassium, sodium and magnesium that surpassed the mineral levels seen on the day of treatment. The mineral content in milk from the treated cows showed a temporary rise of Ca by 47.0%, Mg by 54.5%, K by 31.3% and Na by 47.6% relative to that in the milk of the control (table 1). However, except for magnesium, by day 7 there was a decline in these mineral values to levels below those seen on the day of treatment (table 2). The levels of

TABLE 2.—Cation content of milk from cows infected with *Fasciola hepatica* over a time-course of 14 days, treated and untreated with Clorsulon

Cation	Experimental cows	Cations in grams/liter					Mean values
		Day 0 ¹	Day 3	Day 7	Day 10	Day 14	
Calcium	Untreated	1.05	1.00	0.95	0.96	0.95	0.98
	Treated ²	1.24	1.47	1.14	1.11	1.11	1.21
Magnesium	Untreated	0.11	0.11	0.12	0.11	0.11	0.11
	Treated ²	0.14	0.17	0.13	0.13	0.14	0.14
Potassium	Untreated	0.94	1.15	1.24	1.06	1.05	1.09
	Treated ²	1.30	1.51	1.16	1.11	1.22	1.26
Sodium	Untreated	0.45	0.42	0.48	0.51	0.59	0.49
	Treated ²	0.39	0.62	0.38	0.38	0.24	0.40

¹Day treated.

²Treated with Clorsulon administered orally.

¹²Brooks, I. B., G. A. Luster and D. B. Easterly, 1970. A procedure for the rapid determination of the major cations in milk by atomic absorption spectrophotometry. *At. Absorpt. Newsl.* 9, 93.

sodium, potassium and calcium of the treated cows rose substantially by day 3, then declined abruptly (table 2). However, in the case of magnesium, the level in the treated group increased slightly by day 3 and then declined by day 7, remaining essentially at the level on the day of treatment.

Milk from the treated cows showed increases in the concentrations of all minerals by day 3 post-infection. Milk from the control group (untreated cows) showed little variation in cation concentration throughout the study, except for sodium, which progressively increased in cation concentration from day 7 to 14 (table 2).

Although the antihelminthic potential of Clorsulon and other faciolicides has been in-

vestigated, more knowledge is needed on the effects of these drugs on the metabolism of the host and the quality of milk produced by the treated cows. Düwel et al.¹³ suggested that an international standard test be developed to evaluate antihelminthic drugs. Control of the parasite need not be the only parameter in deciding upon a drug use or disuse.

*Rita Medina'
Anne D. Frame
Pedro Bendezú
Angel Pérez
Alfredo Narváez
Inter American University
NIH-MBRS Research Program
P. O. Box 1293
Hato Rey, PR 00919*

¹³Dowell, D., P. Nansen, R. J. Jorgensen, E. J. I., Soulsby, (Eds) 1981. *Epidemiology and Control of Nematodiasis in Cattle*. ECSE, EEC, EAEC, Brussels-Luxembourg.