

Residues of Cypermethrin in Milk from Cows Wearing Impregnated Ear Tags

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The synthetic pyrethroids have been shown to be effective for the control of a variety of insect pests on livestock and levels of pyrethroid residues in milk from treated dairy cows have been reported previously. Gaughn *et al.* (1978) studied the distribution and metabolism of permethrin in lactating cows following oral administration of the insecticides. Wszolek *et al.* (1980) measured residues of fenvalerate in milk of dairy cows receiving this insecticide in the diet while Frank *et al.* (in press) reported on fenvalerate residues in milk following topical treatments. Haufe (1982) evaluated the efficacy of polyvinyl ear tags impregnated with fenvalerate to control horn flies and improve growth of steers on pasture. This study was undertaken to determine residues of cypermethrin { α -cyano-3-phenoxybenzyl-2,2-dimethyl-3-(2,2-dichlorovinyl) cyclopropane carboxylate} in the milk of cows wearing ear tags impregnated with cypermethrin.

MATERIALS AND METHODS

Trial I involved two mature Ayrshire cows located at the Agriculture Canada Research Station, Charlottetown, Prince Edward Island. Both cows were tagged at the base of each ear with cypermethrin-impregnated ear tags on the evening of July 8, 1983. The tags consisted of molded polyvinyl chloride and approximated 60 mm diameter; the tags averaged 10.07 g in weight and contained 8% by weight cypermethrin, i.e. 806 mg. Milk samples were collected one day prior to tagging, immediately prior to tagging, and at one, 2, 3, 7, 14, and 21 days after tagging.

Trial II was conducted on a dairy farm located near Guelph, Ontario and involved eight mature Holstein cows. Each cow received two tags, one at the base of each ear, following milking on the evening of July 13, 1983. The tags had the same mean weight and cypermethrin content as those described above. Milk samples were collected one day prior to tagging, immediately prior to tagging, and at one, 2, 3, 7, 14, and 21 days subsequent to tagging.

Sub-samples of fresh milk were removed for analysis of butterfat content according to the official AOAC infrared procedure (1980).

Table 1. Cypermethrin residues in milk following implantation of cypermethrin-impregnated ear tags.

Cypermethrin residue in butterfat (ug/kg)							
	Trial I ¹			Trial II ²			
	Cow 1	Cow 2	Cow 3	Cow 4	Cow 5	Cows 6-10	
Pre-tagging	ND	ND	ND	ND	ND	ND	
Post-tagging							
1 DAY	ND	ND	ND	4.2	ND	ND	
2 DAYS	ND	ND	ND	ND	ND	ND	
3 DAYS	4.7	5.4	4.2	ND	ND	ND	
7 DAYS	7.0	9.6	ND	ND	ND	ND	
14 DAYS	4.0	7.4	ND	ND	ND	ND	
21 DAYS	ND	6.2	ND	9.2	8.9	ND	
§ Butterfat							
(mean)	3.67	4.10	4.22	3.86	3.51	2.40	
SD	0.13	0.19	1.12	0.80	0.43	1.36	

1 Trial I conducted at Charlottetown, Prince Edward Island
 2 Trial II conducted near Guelph, Ontario
 ND=not detected (<4 ug/kg)

The remainder of the samples were frozen and held in frozen storage until extraction, cleanup, and analysis according to the procedure described by Braun and Stanek (1982).

Recoveries were determined by fortification of control milk at concentrations of cypermethrin ranging from 1.0 to 10 ug/L in whole milk; recoveries average 91%. The limit of detection for cypermethrin approximated 0.15 ug/L in whole milk or 4 ug/kg in butterfat (assuming a butterfat content of 4%).

RESULTS AND DISCUSSION

Cypermethrin residues in the milk from the two trials are tabulated in Table 1. In Trial I involving two cows, detectable residues of 4.7 and 5.4 ug/kg butterfat appeared at three days after tagging, reached a maximum of 7.0 and 9.6 ug/kg on day 7, and then declined to 6.2 ug/kg and non-detectable levels by day 21. In Trial II, cypermethrin was not detected in the milk from five cows on any of the sampling days following the tagging; one cow showed residue of 4.2 ug/kg in butterfat on day 3 while the milk from the remaining two cows contained 9.2 and 8.9 ug/kg in butterfat on day 21.

According to Haufe (1982) polyvinyl chloride ear tags impregnated with fenvalerate lost the insecticide at an average rate of 2 mg/day/tag over a 115-day test period; dissipation of the insecticide was reported to be exponential and hence, if residues were to occur in milk, they would most likely appear within a few weeks after tagging. Assuming that cypermethrin dissipates from the tags at a similar rate to fenvalerate, then the maximum residues of cypermethrin in milk should have been evident within the first 21 days after tagging.

In the present study, 60 milk samples were collected from 10 cows over a 21-day period following implantation of the ear tags. Measurable levels of cypermethrin were found in five cows while no detectable levels were observed in the remaining five. Among the 60 milk samples, 49 (82%) were below the detection limit of 4 ug/kg in butterfat; in the 11 samples which contained detectable cypermethrin, residues ranged from 4.0 to 9.6 ug/kg in butterfat with a mean of 6.4 ± 2.1 ug/kg.

The Food and Drug Act and Regulations (1979) defines negligible residues as being less than 0.1 mg/kg in food commodities. The maximum levels of cypermethrin detected in butterfat in this study approximated one-tenth of the negligible residue level.

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