

Excretion of Fenvalerate Insecticide in the Milk of Dairy Cows

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Fenvalerate (Pydrin, Sumicidin, cyano(3-phenoxyphenyl) methyl 4-chloro- α -(1-methyl-ethyl) benzeneacetate) is a very effective broad-spectrum pyrethrin insecticide. Studies on the fate of this compound in animals have not been published. In the work reported, fenvalerate was fed to dairy cows and its excretion in milk and feces was determined.

EXPERIMENTAL

Two Holstein cows were used. One was fed pure fenvalerate at the 5 ppm and the other at the 15 ppm level based on a daily ration of 22.7 kg for 4 days. This amounted to a total dose of 0.454 and 1.362 g of the insecticide, respectively. The compound in acetone was thoroughly mixed with the evening grain. Samples of the total daily mixed milk and grab samples of feces were collected one day prior to feeding (control sample), daily throughout the 4-day feeding period and for 6 days thereafter. All samples were immediately freeze-dried for subsequent analysis.

Analysis for fenvalerate involved Soxhlet extraction of 0.5 g samples of freeze-dried milk or feces with hexane, partitioning the extracts with acetonitrile using an adaptation of published methods (LEE et al. 1978, PESTICIDE ANALYTICAL MANUAL 1971) and final isolation of feces extractives on a Florisil column (SHELL DEVELOPMENT Co. 1976). Quantitation was by gas chromatography. A gas chromatograph equipped with a Nickel-63 detector and a 180 cm X 4 mm i.d. glass column packed with 3% OV-17 on 100/120 mesh Gas Chrom Q was used. Operating temperatures were: column oven, 230° C isothermal; inlet, 250° C; and detector, 315° C. Nitrogen was used at 60 cc/min for the carrier gas and at 40 cc/min as the purge gas. Fenvalerate eluted as two peaks (retention times of 17.3 and 19.0 min) each representing one of the pairs of its enantiomers (LEE et al. 1978).

RESULTS AND DISCUSSION

Fenvalerate was excreted in milk and feces. Data are presented in Table 1. Recovery of fenvalerate was 123% when added to freeze-dried feces at 880 ppb and 104 and 120% when added to fresh milk at 100 ppb and freeze-dried milk at 781 ppb, respectively. The limit of detection of the method was estimated to be 10 ppb (dry weight basis) which corresponded to a one percent full scale

TABLE 1

Concentrations of Fenvalerate in Milk and Grab Samples of Feces
of Cows Fed 5 or 15 ppm of the Insecticide.

Day	Milk				Feces	
	5 ppm dose		15 ppm dose		5 ppm dose	15 ppm dose
	ppb fresh wt	ppb dry wt	ppb fresh wt	ppb dry wt	ppm dry wt	ppm dry wt
1 ^a	n.d. ^b		n.d.		n.d.	n.d.
2	47	367	37	262	5.6	4.8
3	21	168	144	1120	50.4	29.3
4 ^c	38	299	192	1500	4.7	34.9
5	48	377	250	1950	10.1	28.4
6	21	162	95	739	2.7	10.1
7	n.d.		49	382	1.1	6.8
8	n.d.		20	157	0.3	2.0
9	n.d.		10	77	0.2	0.7
10	n.d.		n.d.		0.2	0.4

^a first day of feeding fenvalerate (control)

^b not detectable, i.e. less than 10 ppb

^c last day of feeding fenvalerate

deflection. Figure 1 shows chromatograms of (A) 250 ppb of fenvalerate found in the milk of the cow fed 15 ppm of the insecticide, (B) 0.75 nanograms of injected fenvalerate standard and (C) control milk. A peak in the chromatogram of control milk eluted at about the same time as the first fenvalerate peak (17.3 min). Therefore, with milk samples, quantitation of fenvalerate was accomplished by measuring the area of the second fenvalerate peak (19.0 min). The interfering peak was not observed in the chromatogram of control feces. Therefore the areas of both peaks were measured and summed for quantitating fenvalerate in feces samples.

Total excretion of fenvalerate in milk amounted to 0.44 and 0.64% of the total dose for the cows fed, respectively, 5 and 15 ppm of the compound. Based on the analysis of grab samples of feces substantially more of the insecticide was eliminated by this route, possibly about 25% of the dose. Although metabolites of fenvalerate were not sought, it is possible that hydrolysis of the carboxy ester linkage may occur with resultant excretion of the corresponding acid and conjugates of the alcohol in urine and feces.

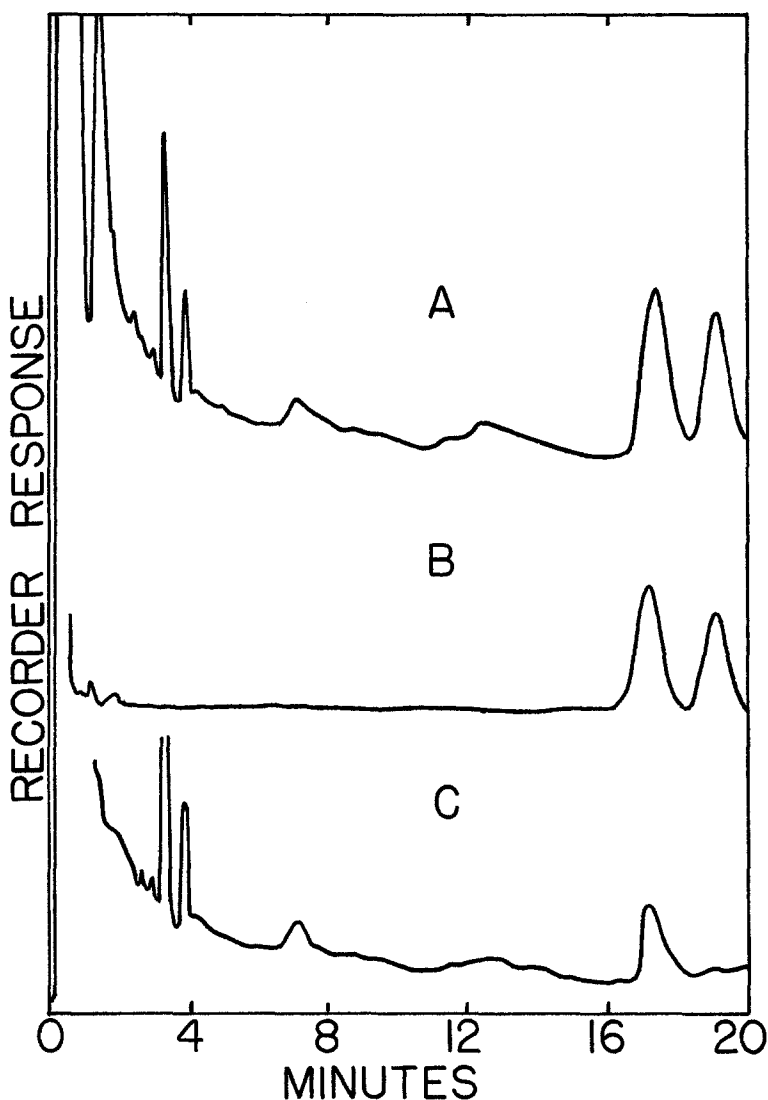


Figure 1. Gas chromatograms of (A) 250 ppb of fenvalerate found in the milk of the cow fed 15 ppm of the insecticide, (B) 0.75 nano-grams of fenvalerate standard and (C) control milk.

REFERENCES

- LEE, Y. W., N. D. WESTCOTT, and R. A. REICHLER: J. Assoc. Off. Anal. Chem. 61, 869 (1978).
- SHELL DEVELOPMENT CO.: Determination of SD 43775 Residues in Crops. Method MMS-R-456-1. Modesto, CA. October, 1976.
- PESTICIDE ANALYTICAL MANUAL: Vol. 1, U. S. Dept. of Health, Education and Welfare, Food and Drug Administration, Washington, D. C., revised, Section 211.14a (1971).