

## LETTER TO THE EDITOR

### EFFECT OF FENITROTHION ON MAGNESIUM LEVEL AND CHOLINESTERASE ACTIVITY IN RATS

Sir,

Fenitrothion [0,0-dimethyl 0-(3-methyl-4-nitrophenyl) phosphorothioate], an organophosphorus insecticide, is extensively used for control of agricultural pests due to its low mammalian toxicity and superior insecticidal activity. It is commonly recognised that the toxicity of organophosphorus insecticides is closely related with, and presumably caused mainly by, the inhibition of cholinesterase. Binding of some portions of the phosphorus moiety of the organophosphates to enzyme proteins appears the mechanism of interaction. Since  $Mg^{++}$  is found inside the cell in much higher concentrations than in the extracellular fluid and cholinesterase is a membrane bound enzyme, inhibition of the activity of this enzyme is most likely to disturb membrane permeability and thereby release of  $Mg^{++}$  from RBC to plasma.

We have, therefore, studied the effect of fenitrothion on cholinesterase activity and  $Mg^{++}$  levels in RBC and plasma of rats. Thirty six adult male albino rats (body weight 200-230 g) of the ITRC strain were randomized into six groups of six rats each and placed in individual cages. The skin over the back between the shoulders and hind quarters was shaven with an electric clipper. One group served as controls. The rats of the other groups were painted a single  $LD_{50}$  dose of 750 mg/kg of fenitrothion over an area of 2x2 cm and were sacrificed at intervals of 15 min, 2, 4, 8 and 24 hr by giving incision in the neck region. Blood was collected from the jugular vein in a heparinized tube. Plasma and RBC were separated by centrifugation at 5000 rpm for 10 min. Magnesium was estimated in plasma and RBC by atomic absorption spectrophotometric method (1) and cholinesterase activity was assayed by the method of Hestrin (2).

There was a significant increase of  $Mg^{++}$  level in plasma after 2 hr and then there was no further change. The cholinesterase activity showed a continuous decrease in plasma upto 8 hr and then tended to reach normal values. The maximum decrease in activity at 8 hr was presumably due to the relatively high content of the compound at this interval in the plasma (3).

RBC showed a different pattern. There was no effect on  $Mg^{++}$  levels throughout but cholinesterase activity showed a decrease upto 2 hr and then an increase at 4 hr followed by a continuous decrease upto 24 hr. The increase in RBC cholinesterase activity at 4 hr could possibly be due to partial recovery of the enzyme from the inhibitory effect. The rate of recovery or synthesis is presumably faster than the rate of decay at 4 hr. As the absorption of the compound increased, the rate of decay became faster than the rate of synthesis with the net result that the total activity showed a decline.

No relationship was evident between the RBC  $Mg^{++}$  level and cholinesterase activity. However, in plasma a parallelism existed upto 2 hr between increase in  $Mg^{++}$  level and decrease

in cholinesterase activity suggestive of the fact that the  $Mg^{++}$  leaked out from RBC was contributing to the increase in the plasma levels.

TABLE I : Levels of  $Mg^{++}$  and cholinesterase activity in plasma and RBC of rats after painting 750 mg/kg of fenitrothion on 2 x 2 cm of the skin.

Time	Mean concentration of $Mg^{++}$ ( $\mu g/ml \pm S.E.$ )		Mean cholinesterase activity ( $\mu moles Ach/100 ml \pm S.E.$ )	
	Plasma	RBC	Plasma	RBC
Control	10.40 $\pm$ 0.43	33.40 $\pm$ 1.97	700.0 $\pm$ 7.1	797.4 $\pm$ 19.5
15 min	12.86 $\pm$ 1.54	29.35 $\pm$ 1.30	403.2 $\pm$ 3.6 <sup>b</sup>	380.8 $\pm$ 43.7 <sup>b</sup>
2 hr	17.65 $\pm$ 1.20 <sup>a</sup>	29.99 $\pm$ 1.20	295.4 $\pm$ 24.4 <sup>b</sup>	288.0 $\pm$ 18.4 <sup>b</sup>
4 hr	17.17 $\pm$ 1.31 <sup>a</sup>	28.33 $\pm$ 1.25	200.2 $\pm$ 9.8 <sup>b</sup>	436.8 $\pm$ 21.0 <sup>b</sup>
8 hr	17.42 $\pm$ 2.20 <sup>a</sup>	29.21 $\pm$ 1.32	54.6 $\pm$ 0.0 <sup>b</sup>	260.8 $\pm$ 7.3 <sup>b</sup>
24 hr	16.92 $\pm$ 1.84 <sup>a</sup>	28.50 $\pm$ 1.35	222.6 $\pm$ 23.1 <sup>b</sup>	235.2 $\pm$ 13.7 <sup>b</sup>

<sup>a</sup>P < 00.01,    <sup>b</sup>P < 0.001

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