

LETTER TO THE EDITOR

EFFECTS OF SCORPION VENOM ON MONOAMINE OXIDASE ACTIVITY
IN THE COCKROACH TISSUES

Sir,

(Received on November 26, 1982)

The inhibitory effects of scorpion venom on enzymes like SDH, LDH and AChE (1) and ATPase (9) have been reported in the cockroach; furthermore, a gradual drop in oxygen consumption, stoppage of the heart beat and spiracular movements were noted after venom injection. The present study was undertaken to test if the venom from the scorpion, *Heterometrus fulvipes*, alters the monoamine oxidase (MAO) activity in the tissues of cockroach, *Periplaneta americana*.

Crude venom from the scorpion was collected manually by gently pressing the telson, stored in the refrigerator and used within 36 hr after collection. Part of this venom was dialysed against distilled water in a cellulose acetate dialysis bag for 24 hr at 5°C. Another part of the venom was heated in boiling water for 5 min, centrifuged and the supernatant was stored in the refrigerator at 5°C till further use.

5% homogenate of the central nervous system (CNS) and coxal muscle (CM) was prepared in 0.25 M sucrose solution. MAO activity was estimated using 1 ml of homogenate following the method of Green and Haughton (4). The venom samples were added to the experimental flasks just before incubation. The samples included 0.1 ml of crude venom (equivalent to 6 mg of protein), 0.1 ml of dialysed venom and 0.1 ml of supernatant from centrifuged, heat-treated venom (see above). Only normal saline (0.1 ml) was added to control flasks.

Addition of all the samples of venom caused significant increase in MAO activity in both tissues (Table 1). The percentage increase in MAO activity in each case was significantly greater in coxal muscle than in the nervous system ($P < 0.05$). Of the three venom samples, the crude and dialysed venom caused a comparable elevation in MAO activity but the heat-denatured venom showed a significantly lesser activity ($P < 0.05$) than the crude venom.

TABLE 1: *in vitro* effects of *H. fulvipes* venom on MAO activity (μ moles of p-hydroxy phenyl acetaldehyde formed/g wet wt/hr) in the central nervous system (CNS) and coxal leg muscle (CM) in *Periplaneta americana*. Each value is the mean of 6 separate observations, \pm S.D. (% change is shown in parentheses)

Tissue	Control	Crude venom	Dialysed venom	Heat-denatured venom
CNS	5.24 \pm 0.33	6.53 \pm 0.34 ^a (+24.62%)	6.83 \pm 0.36 ^a (+30.34%)	6.10 \pm 0.29 ^a (+16.41%)
CM	8.49 \pm 0.59	11.09 \pm 0.26 ^a (+30.62%)	11.53 \pm 0.42 ^a (+35.81%)	10.3 \pm 0.48 ^a (+21.32%)

(^a) Value significantly differs ($P < 0.05$) from control.

The increase in MAO activity seen after addition of venom suggests that the venom may alter the amine metabolism in CM and CNS. An increase in the levels of amines such as nonadrenaline has also been reported on envenomation (3). Physiological and metabolic parameters in muscle are more rapidly affected than nerve-cord parameters after injection of scorpion venom (1). The greater percentage increase in MAO activity in CM in the present study is in accord with this contention.

The mitochondria of tissues are morphologically altered due to scorpion venoms (2). Since MAO is a mitochondrial enzyme (6), changes in MAO levels could be a result of changes in mitochondrial morphology.

The toxic fractions of the venom have been reported to be proteinaceous in nature (5). There is no difference between the protein content of crude and dialysed venoms (8), and likewise, the two samples did not materially differ in increasing the MAO activity. The comparatively lower activity of the heat-denatured venom could be due to the elimination of the proteins during heat-denaturation, leaving only a few heat stable proteins to exercise the effect. The presence of heat stable proteins in the scorpion venom is known (7). Thus the venom seems to contain some of the toxic proteins that are heat-resistant.

ACKNOWLEDGEMENTS

The authors are grateful to the Head of the Department for providing laboratory facilities. K. S. acknowledges the financial support from CSIR, New Delhi.

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