تأثير سم دبور البلح على معدل استهلاك الاوكسجين فى أنسجة الفئران

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استخدم فى هذا البحث سم دبور البلح بجرعات مختلفة لمعرفة تأثيره على معدل استهلاك الاوكسجين فى انسجة المخ والكلى والانثى عشر للفئران وقد وجد أن السم يحدث ما يأتى :ـ

(أ) يسبب السم نقصا معنويا فى معدل استهلاك الاوكسجين فى انسجة المخ .

(ب) يسبب السم زيادة معنوية فى استهلاك الاوكسجين فى انسجة الكلى .

(جـ) يسبب السم زيادة معنوية فى استهلاك الاوكسجين فى انسجة الاثنى عشر فقط فى حالة استخدام جرعة السم المستخلصة من اثنين من الآت اللسع فى حين أن جرعات السم الاخرى ليس لها تأثير على استهلاك الاوكسجين فى انسجة الاثنى عشر .

تعزى هذه التغيرات المتباينة لسم دبور البلح على معدل استهلاك الاوكسجين بواسطة الانسجة المختلفة للعوامل الآتية :ـ

١ ـ التركيب المعقد لسم دبور البلح حيث أن هذا السم يحتوى على عدد كبير من المركبات الكيميائية والحيوية .

٢ ـ أختلاف درجة نفاذية اغشية خلايا الانسجة المختلفة ومدى تفاعلها مع المركبات الكيميائية وبالتالى أختلاف تأثير المواد الكيميائية والحيوية على الانزيمات الموجودة فى خلايا هذه الانسجة .

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BIOLOGICAL STUDIES ON THE VENOM OF DATE WASP (VESPA ORIENTALIS)

II. EFFECT OF THE VENOM ON THE OXYGEN CONSUMPTION BY ISOLATED TISSUE SLICES

(with 2 tables)

By

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SUMMARY

The venom of date wasp in different doses produced a significant decrease in the O_2 consumption by brain slices of albino rats and a significant increase in O_2 consumption by kidney slices of the same animal. The venom increased the O_2 consumption by jejunal slices significantly, only when the 2 stings—dose of the venom was used. The results were explained by the complex nature of the venom together with the selective behaviour of the membranes of different tissues towards active agents present in the venom.

INTRODUCTION

Venoms from different sources are known to have inhibitory effect on respiratory enzymatic systems associated with mitochondria in cells. QUASTEL (1957) demonstrated that inhibition of respiratory enzymes by snake venoms was due to their phosphilipase A and lecithenase contents. TU and PASSEY (1965) stated that NAJA NAJNA venom inhibited cytochrome C oxidase activity, while CONDREA and DEVRIES (1965) reported that venom phospholipase A could attack phospholipids in whole cell preparations from various tissues. The release of fatty acids from lipids of mitochondria was also considered responsible for the uncoupling of oxidative phosphorylation, produced by venoms of BUNGARUS FASCIATUS (ELLIOTT and GANS 1967) and WALTERINNESIA AEGYPTIA (ZIEGLER, VASQUEZ — COLON, ELLIOTT, GANS, and TAUB, 1967). MOHAMED, KALED and ABED EL-REHIM (1969) showed that the venoms of five diffreent Egyptian snakes decreased significantly the oxygen uptake of brain tissue, while they affected variably the oxygen upatke of other tissues. HAMED, AFIFI, MOHAMED AND HASSAN (1973) reported that the freeze — dried bee venom reduced significantly the oxygen consumption of brain and kidney slices, but not that of the jejunum obtained from albino rats.

The aim of this work was to explore the effects of graded doses of date wasp venom on isolated slices of brain, kidney and jejunum of albino rats.

MATERIAL AND METHODS

Date wasps were collected from their nests during the date season, from Assiut Governate. The entire venom apparatus was removed, cleaned and then stored in deep freez for use. A definite number of the stings were wetted with Krebs — Ringer phosphate solution (UMBREIT, BURRIS and SLAUFFER 1949), which was used as a bathing fluid. The stings were ground in a small mortar. Additional amounts of the solution were added and the entire mixture was centrifuged.. The supernatent fluid was collected and the volume was adjusted so that each ml was equivalent to 8 stings.

The tissues emloyed were obtained form albino rats immediately after decapitation. Slices of 0.5 mm thickness were cut from the non fatty parts of cerebral hemispheres of the brain, kidney and the jejunum. The slices were washed with Krebs — Ringer phosphate solution to which 2 ml of 10% glucose were added to each 100 ml.

The oxygen consumption of the specimens was measured using WARBURG apparatus according to HAWK, OSER and SUMMERSON (1954). Two ml of the bathing solution were transferred into each WARBURG flask. Specimens of about 100 mg of the sliced tissues "whose oxygen consumption was to be determined" were placed in the flasks. Wasp venom in 3 different doses of 1,2 and five stings were added. The flasks were incubated at 38°C and readings were taken at 15 minute intervals for a period of one hour for each experiment. Control flasks were run simulataneously under the same conditions.

The oxygen consumption was expressed in term of ul per hour per mg dry weigh of the tissues. Mean values and standard errors were calculated for each group. Student "t" test was performed between the treated and control groups. Changes in oxygen consumption of treated samples were expressed as percent of the control values and their standard error was computed. Student "t" test was then performed between the means of the 3 dose levels of the venom.

RESULTS

Application of the date wasp venom to the brain, kidney and jejunal slices of albino rats produed variable changes in the oxygen consumption of these tissues. The oxygen consumption by the brain slices was found to be

reduced significantly ($P < 0.01$) at the three dose levels of the venom, while the O_2 consumption by kidney slices was found to be increased significantly ($P < 0.01$) at the same 3 dose levels of the venom. On the other hand, jejunal slices showed significant increase ($P < 0.05$) in O_2 consumption, only when the dose of 2 stings of the venom was used (Table 1). The percent decrease and increase in O_2 consumption by the brain and kidney slices respectively, showed no significant variations between the different doses of the venom. (Table 2).

TABLE 1. The O_2 consumption (ul per mg dry weight/hour) of brain, Kidney and jejunal slices of albino rats treated with different does of wasp venom.

Tissue	no of exper.	control	dose of venom		
			1 sting	2 stings	5 stings
Brain	10	9.3 ± 0.54	5.8** ± 0.36	5.6** ± 0.17	5.2** ± 0.15
Kidney	10	9.0 ± 0.54	15.3 ± 0.4	16.0 ± 0.94	16.5** ± 0.6
Jejunum	10	7.7 ± 0.38	7.6 ± 0.46	8,9* ± 0.29	8.0 ± 0.39

± Standard error
* Significanat 5% level of Probability.
** Significant at 1% leve of Propability.

TABLE 2. Percent changes in O_2 consumption by brain and kidney slices treated with different does of wasp venom.

Dose / Tissue	1 sting	2 stings	5 stings	"t" test		
				1 : 2	1 : 5	2 : 5
Brain	37.9 ± 4.1	40.2 ± 2.5	44.5 ± 2.3	N.S.	N.S.	N.S.
(% decrease) . . .						
Kidney	70.1 ± 4.02	78.0 ± 10.3	83.5 ± 6.6	N.S.	N.S.	N.S.
(% increase)						

± Standard error.
N.S. = non significant.

DISCUSSION

The venoms of invertebrates are complex mixtures of pharmacologicaly active substances. Tertiary amines as serotonin and histamine may occur together with choline esters. Kinins and other active peptides may also be present (WELSH, 1964). Also HABERMANN (1965, 1968) reported that wasp venom contains histamine, serotonin, wasp kinin and the enzymes phospholipase A, physphalipase B and hyaluronidase. Moreover, MOHAMED, HAMED, AFIFI, EFFAT and MOHAMED (1972) showed that the venom of date wasp contains histamine, acetylcholine and serotonin..

In this study, the venom of date wasp produced a significant decrease ($P < 0.01$) in O_2 consumption by brain slices of albino rat and a significant increase in O_2 consumption by kidney slices of the same animal. Moreover, the venom increased the O_2 consumption by jejunal slices significantly ($P < 0.05$), only when the dose of 2 stings was used.

Variable effects on O_2 consumption by cardiac and plain muscle slices using snake venoms were recorded by MOHAMED *et al.* (1969).

The contradictory results observed in this study of wasp venom on different tissue slices can be explained by the complex composition and the different components present in this venom. Also the selective behaviour of the membranes of different tissues towards different agents may contribute in the production of such variable results. SMITH (1962) stated that the pharmacological activity of drugs depends upon membrane permeability. Also BRESNIK and SCHWARTZ (1968) reported that a wide variety of both physiological and pharmacological agents produce specific changes in membrane transport which may represent the basis for the mechanism of their action.

NYGAARD and SUMNER (1953) reported that low doses of phospholipase can increase respiration perhaps by increasing the permability, while QUASTEL (1967) demonstrated that the inhibition of respiratory enzymes by snake venoms may be due to their phospholipase A and lecethinase contents. Similarly, rupture of mitocondria and loss of respiratory activity of rat's liver, brain and kidney by snake venoms was related to phospholipase A content of these venoms.

It can be concluded from the presented results that different components of date wasp venom including phospholipase A, together with the different

concentrations used, may affect the permeability of the cell membranes of brain, kidney and jejunal slices, in a way which allow the transport of the venom components in different concentrations. Such selective transport of these different components may affect tissue respiration in either a stimulatory or an inhibitory way.

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