(*Photobacterium* and *Beneckea*). Identification of luminescent symbionts isolated presently from leiognathid fishes and their antagonistic properties against known pathogens and other saprophytes are under way.

FIG. 2

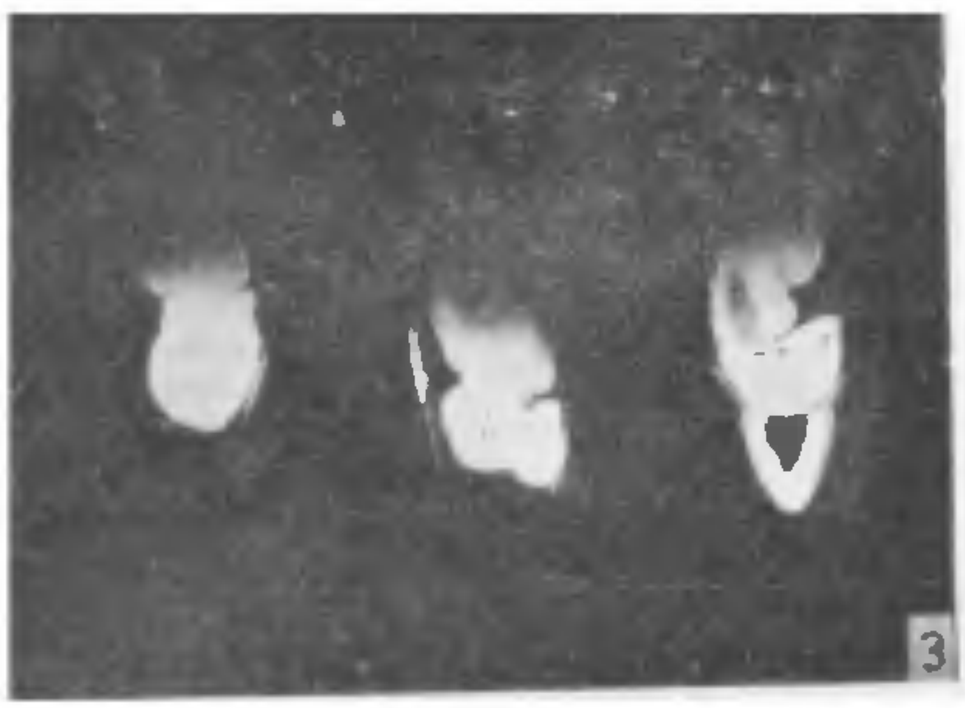

FIG. 3

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EFFECTS OF SCORPION (*HETEROMETRUS FULVIPES*) VENOM ON PHOSPHATASE ACTIVITIES IN GUINEA PIG

THE effects of scorpion venoms on physiological activities of animals have earlier been demonstrated[1-4]. Scorpion venom has been found to induce the release of esterases[5, 6], decrease succinate dehydrogenase activity[7], rise proteolytic activity and produce hyperglycemic conditions[8] apart from several other pat' ological effects[4]. However, relatively little is known about the effects of these venoms on the activities of phosphatases, although it has been reported that scorpion venom contains phosphatases[9]. The acid and alkaline phosphatases have been found to occur in a variety of tissues and play an important role in metabolism[10]. Hence in the present investigation an attempt has been made to study the effects of intramuscular injection of *Heterometrus fulvipes* venom on the levels of acid and alkaline phosphatase activites in the tissues of guinea pigs.

A regular colony of guinea pigs is maintained in the laboratory and fed on a standard diet consisting of Bengal gram, carrots, green leaves and water *ad libitum*. Guinea pigs of the same age group (60 days) weighing 400-450 gms have been used for the experiments.

Venom collection from *Heterometrus fulvipes* was done as reported ealier[1]. Fifty per cent lethal dose

($LD_{50/3}$) was determined[11], and one-third of it was considered as sub-lethal dose (0·1 ml of venom, predilute with physiological saline, 1 : 3 venom: saline, equivalent to 0·47 mg of protein). Sub-lethal doses were administred intramuscularly into the thigh muscle of the experimental animals. Since the lethal fraction of the venom have been shown to be proteins[12], in the present investigation the quantity of venom injected is expressed in terms of its protein content. Control animals received 0·1 ml of saline without venom.

The animals were autopsied at 6 hrs., 12 hrs., 24 hrs., and 96 hrs., after the injection of the venom. At each autopsy, tissues like brain, muscle (both injected and contra-lateral), liver, heart, kidney and serum were isolated from control and experimental guinea pigs. Three animals were sacrified at each autopsy and acid and alkaline phosphatases were assayed in both control and experimental tissues[13]. Average values of five such experiments are represented in Tables I and II, The protein content was determined by the method of Lowry *et al.*[14],

In the present investigation, maximum level of enzyme activity was found in the blood serum. This is in agreement with the earlier results on phosphatases, which demonstrate a higher value for phosphatases in serum over other tissues[10]. It appears that significant amounts of phosphatases are quickly transported into the blood as they are synthesized in the liver resulting in a lower level of phosphatases in the liver. This could be the reason for the relatively low levels of phosphatases in the liver in the present study. The phosphatases could chiefly influence the metabolic processes involved in the release of energy in other tissues, especially the muscle. Since the muscle is an active tissue and usually well furnished with enzyme systems concerned with energy releasing mechanisms, a high level of phosphatase activity in the tissue appears reasonable. Upon injection of sublethal doses of scorpion venom, both acid and alkaline phosphatase activities were found to increase with time up to 24 hrs. after injection in all tissues studied (Tables I, II). After 24 hrs inductions, a revival tendency in the enzyme activities towards the normal levels was observed. By 96 hrs. the activity levels were found to have revived back more or less to the normal values in all tissues (Tables I, II). The acid and alkaline phosphatase levels have been stated to show an elevation under a variety of pathological conditions[10]. *Heterometrus fulvipes* venom has been shown to induce pathological conditions in rat through metabolic derangement[4]. Such a derangement could probably stimulate a higher level of phosphatase activity following venom-administration. Venom-administration has been found to induce necrosis and degeneration of parenchymal cells and microsomal enzyme induction in parenchymal cells which could result in impairment of metabolic activities of the animal[15]. As a result, several enzymes including the phosphatases

TABLE I

Effect of injection of sub-lethal doses of H. fulvipes *venom on acid phosphatase activity in guinea pig tissues at different periods after injection*

The activity is expressed as μ moles of Pi/mg protein/hr.

	Control	6 hrs.	12 hrs.	24 hrs.	48 hrs.	96 hrs.
Brain	8·7 ±0·3	10·91±1·16 NS	11·18±0·5 NS	13±1·41 NS	12·15±1·5 NS	8·9 ±2·0 P > 0·001
Contral.teral muscle	13·73±2·3	12·47±2·4 P > 0·01	13·00±5·5 NS	16·5±1·75 NS	15·65±0·60 NS	12·38±0·85 NS
Experimental muscle	13·73±2·3	12·45±2·34 NS	16·72±3·12 NS	17·67±4·5 NS	13·78±0·70 NS	11·88±2·8 NS
Liver	4·38±0·026	5·46±0·27 P > 0·002	19·18±2·8 P > 0·001	15·6±2·9 P > 0·001	12·8 ±0·87 NS	4·36±0·013 NS
Heart	5·0 ±0·44	6·0 ±0·017 NS	19·23±0·38 P < 0·002	20·00±2·85 P > 0·001	14·52±6·58 P < 0·02	5·02±0·02 NS
Kidney	4·58±0·025	5·5 ±0·39 NS	24·41±2·54 P > 0·001	22·02±1·93 NS	18·7 ±1·41 P > 0·001	4·76±0·38 NS
Serum	51·5±2·46	61·0 ±2·04 P < 0·001	90·18±3·31 P > 0·001	95·3 ±0·99 P > 0·001	71·73±13·65 P < 0·02	5·87±2·36 NS

TABLE II

Effect of sub-lethal doses of H. fulvipes *venom on alkaline Phosphatase activity in guinea pig tissues at different periods after injection. The activity is expressed as μ moles of Pi/mg protein/hr.*

	Normal	6 hrs.	12 hrs.	24 hrs.	38 hrs.	96 hrs.
Brain	9·95±0·074	11·02±0·08	13·27±0·67	14·08±0·61	13·15±1·12	9·93±1·22
		NS		P > 0·001	P > 0·001	NS
Contralateral muscle	14·5 ±2·3	16·1 ±0·55	17·16±2·51	17·96±0·918	12·52±2·1	13·8 ±1·4
		NS	NS	P > 0·001	NS	NS
Experimental muscle	14·5 ±2·3	15·38±2·27	18·58±1·63	18·12±1·06	14·27±1·0	11·3±2·6
		NS	P < 0·02	P < 0·02	NS	P < 0·05
Liver	5·32±0·03	10·28±0·79	22·1 ±1·21	21·08±1·477	12·75±2·39	6·08±0·43
		P > 0·001	P < 0·02	P > 0·001	P < 0·001	P < 0·02
Heart	8·47±0·57	8·83±1·30	22·88±2·30	21·24±1·25	13·49±1·01	8·9 ±1·0
		NS	P > 0·001	P > 0·001	P > 0·001	NS
Kidney	8·47±0·87	9·83±0·99	23·17±3·8	21·05±1·37	16·24±2·38	8·14±0·84
		P > 0·05	P > 0·001	P > 0·001	P > 0·001	NS
Serum	62·0 ±0·87	70·33±14·43	87·94±4·6	89·45±2·4	53·97±3·7	61·58±1·97
		NS	P > 0·001	P > 0·001	P > 0·01	NS

leak out from the tissues into the blood. This could also be the reason for elevated levels of phosphatases in serum following venom-administration.

An increase in cardiac rhythm subsequent to injection of toxin has been hitherto reported[16]. Since *an increased activity of the heart demands higher* energy requirements, an increase in phosphatase activity in heart upon venom-administration may be expected. This has been found to be true in the present study.

Increase in phosphatase activity of kidney upon injection of venom can be explained on the basis that in pathological conditions such as infraction of kidney, increased levels of phosphatases have been noticed[10].

The revival tendency in the phosphatase activities noticed after 24 hrs. of venom-administration (Tables I, II) indicates that despite the early induction of metabolic derangement leading to an elevation of phosphatase activity, the animal seems to have the necessary compensatory machinery to counteract the adverse effects of venom-administration, when the dosage is sublethal.

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