

The new form differs from *P. (P.) ardeae* in having alate spicules, *P. (P.) crassum* in having vulva anterior to mid of body, *P. (P.) depressum* and *P. (P.) indica* in the character of the anterior lobes of the lips in a pulp and in the number of caudal papillae. The new form has a close resemblance with *P. (P.) haliasturi* in having 5 pairs of postanal papillae, but however differs from it in having lateral alae, in having equal, alate spicules instead of subequal, non-alate spicules, in having 29 pairs of caudal papillae instead of 27 pairs and in having specimens of smaller size. Accordingly it is regarded as a new species with the specific name, *Porrocaccum (P.) accipiteri* sp. nov.

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QUANTITATIVE DISTRIBUTION OF THE CARDIO-ACCELERATORY SUBSTANCE IN THE CENTRAL NERVOUS SYSTEM OF *HETEROMETRUS FULVIPES* C. KOCH, A SCORPION

AQUEOUS extracts of eserine treated portions of the Central Nervous System (CNS) of scorpion were tested for their acceleratory effect on isolated heart preparations of scorpion. Comparison of the effects with those of standard Acetylcholine (ACh) solutions, indicated that ACh-type substance was more abundant in the sub-oesophageal ganglion than in other portions of the CNS of scorpion.

Extracts from a variety of arthropod tissues¹⁻⁶ containing different substances have been observed to affect the heart rate. Acetylcholine (ACh)-like substance has been detected in the CNS of the scorpion and implicated in the regulation of heart rate⁷, diurnal rhythmicity⁸, locomotor activity⁹ and electrical activity of the ventral nerve cord⁸. In the present investigation a study has been made of the distribution of ACh in various parts of the CNS of the scorpion and the effects

of ACh and of extracts of CNS on heart activity are compared.

TABLE I
Distribution of ACh-like substance in the extracts of various parts of the CNS of the scorpion and effect of extracts expressed as per cent acceleration over isolated heart of the scorpion
(Values are mean and \pm SD of 8 observations)

Nature of the extract	ACh content (μ g/g wet wt)	% Heart acceleration
Supra-oesophageal ganglion	23.10 \pm 2.86	20
Sub-oesophageal ganglion	41.26 \pm 5.12	44
Meso-somatic Nerve cord	14.24 \pm 5.66	14
Meta-somatic Nerve cord	20.26 \pm 2.05	17

The CNS of the scorpion *Heterometrus fulvipes* C. Koch, was isolated around 12.00 hrs of the day (as maximum ACh content was observed at this time¹⁰) in the cold room (10–15° C). For each observation, the CNS collected from at least 6 animals was divided into 4 extraction parts: the supra-oesophageal ganglion, the sub-oesophageal ganglion, the nerve cord with 3 meso-somatic ganglia and the nerve cord with the last 4 meta-somatic ganglia. ACh content was determined in different parts of the CNS by the Colorimetric method of Hestrin as given by Augustinsson¹¹. Isolated parts of the CNS were treated with 1×10^{-5} M eserine for 5 min. in order to inactivate the enzyme AChE, responsible for the hydrolysis of ACh. One per cent (Wt/Vol) extracts were prepared in scorpion Ringer¹² and the homogenates were boiled and centrifuged. The supernatants were kept in the refrigerator (–5° C) overnight and their effect on the heart of the scorpion isolated at 08.00 hrs next day (as minimum heart activity was observed during the period¹³) studied. The per cent change in heart rate over the control was calculated at the end of 5 min after the application of the individual extract or of standard solutions of ACh (E. Merck, Germany) of different concentrations. The amount of ACh present in the extracts of different parts of the CNS was calculated from the graph prepared with the standard amounts of ACh. Average of 8 readings was taken to represent the ACh content in each portion of CNS of the scorpion.

From the cardio-acceleratory effects of ACh and of extracts of the portions of the CNS of the scorpion, it was inferred that the ACh content was greater ($41.26 \pm 1.2 \mu\text{g/g}$ wet wt.) in the suboesophageal region and least ($14.24 \pm 5.66 \mu\text{g/g}$ wet wt.) in the meso-somatic region (Table I). Corresponding to the amount of ACh, the per cent acceleratory activity of the isolated heart of scorpion was also much greater when the extract of suboesophageal ganglion was added (44%) as compared to the addition of the extracts of other portions of the CNS (Table I). It is suggested that ACh-type of substance in the CNS of the scorpion may play a role in regulation of heart activity.

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CIRCADIAN ACTIVITY OF ADENOSINE-TRIPHOSPHATASE IN THE NERVOUS SYSTEM OF THE COCKROACH, *PERIPLANETA AMERICANA*

THE physiological changes in the activities of succinic dehydrogenase (SDH), phosphorylase and isocitrate dehydrogenase in the scorpions¹⁻³ and SDH and aminotransferase activities in cockroaches⁴ were correlated with the locomotor activity of these animals. Adenosinetriphosphate (ATP) synthesizing system and enhanced biological oxidation of tricarboxylic acid cycle intermediates in rats⁵ and ATP degrading system in hamsters⁶ were also shown to be associated with their locomotor activity. The present study demonstrates the occurrence of a rhythmic variation of adenosinetriphosphatase (Mg^{2+} ATPase) in the nervous system of the cockroach, *Periplaneta americana*, under normal and constant light conditions.

Rearing of the cockroaches, etc., has already been described⁷. Under constant light (LL) and dark (DD) conditions, the animals were acclimatised for three months. For LL conditions, a light source was arranged 200 cm above the animal cage.

Mg^{2+} ATPase activity was determined according to Tirri *et al.*⁸. The content of inorganic phosphates was determined by the method of Fiske and Subba Row⁹. The enzyme activity was expressed as mg of Pi formed/g wet wt. of fresh tissue.

Mg^{2+} ATPase activity in the nervous system of normal (LD : 12 : 12 hours) animals exhibited cyclic variations with maximal activity at 00.00 h and minimal activity at 12.00 noon (Fig. 1a). The average level of the enzyme activity was higher during 20.00 to 04.00 (dark hours) than during 08.00 to 16.00 (light hours) of the day (Fig. 1b). Similar changes were reported in cholinesterases, dehydrogenases and aminotransferases in cockroaches^{7,10,11} and scorpions¹⁻³. Rhythmic variations in ATP were shown for vertebrates^{5,6}. It is probable that enhanced ATPase activity during dark hours is related to the overt locomotor activity of the cockroaches, which are nocturnal in their habits¹².

Even under LL and DD conditions, persistence in the cyclic variations of ATPase activity was observed (Fig. 1a). But the peak period of activity occurred at 04.00 hours, representing a phase shift by 4 hours over LD animals. Such phase shifts of about 4 hours are within the limits of the period range, viz., 24 hours, of the enzyme activity.¹³

When mean enzyme activity for six (time) intervals under LL and DD conditions was compared with that of LD animals, it registered a loss of 16.2% and 10.0% respectively. This suggests that constant light rather than darkness exerts greater inhibitory effect on the enzyme activity. Moreover, in LL and DD conditions the average level of enzyme activity was