

frozen whilst being dried. When dry, the slides were stored in slide boxes containing Drierite, and the boxes were sealed with tape.

Thin films of Kodak NTB 3 emulsion were prepared by the method described by MILLER et al.² The slides were coated with the film and were exposed for 3 months at room temperature in the sealed slide boxes. At the termination of the exposure time, some of the slides were fixed, instead of being developed, to serve as controls.

Macroscopic examination of the slides showed that the zones of greatest blackening of the emulsion occurred in regions corresponding to the epidermis and cambial regions (Figure). However, label was distributed generally throughout the sections. In sections taken from regions near the donor blocks, very dark spots corresponding to label in xylem patches were observed. Sections which had been administered label for 3 h were generally darker than those administered label for only 1 h. All the treatments were darker than the controls or background. Microscopic examination showed that the darkening was due to silver grains but did not provide any information not apparent from macroscopic examination. Taking into consideration the high degree of solubility of IAA and

the probability that its polar transport occurs by a secretive mechanism the evidence of labelled IAA dispersed generally throughout the sections is not surprising.

Résumé. Des tronçons d'épicotyles de plantules de *Phaseolus coccineus* ont été traités à l'acide indole acétique (AIA) marqué au tritium. Ces tronçons ont été soumis au «freezing-drying», puis réduits en coupes minces, en évitant tout contact avec un solvant quelconque. L'étude autoradiographique révéla la présence de l'AIA dans tous les types de tissu vivant.

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² D. L. MILLER JR., G. E. STONE and D. M. PRESCOTT, *Methods in Cell Physiology* (Ed. D. M. PRESCOTT; Academic Press, New York 1964), vol. 1, p. 371.

Physiology of the Heart of *Cingalobolus bugnioni* (Diplopoda: Myriapoda)

In view of the fact that scarcely anything is known about the physiology of the hearts of myriapods, except that of a chilopod *Scolopendra morsitans*¹, the present investigation was undertaken on the nature of the heart of a diplopod *Cingalobolus bugnioni* Carl, and the effects of stimuli, pH and drugs on it. The hearts were isolated in a saline containing sodium chloride 0.63 g, potassium chloride 0.025 g, calcium chloride 0.025 g, and glucose 0.2 g in 100 ml of distilled water and the pH adjusted to 6.3 with phosphate buffer as the haemolymph of the diplopod was found to be on the acid side of neutrality in concordance with MALUF². Heart-beat after isolation was slow and irregular for nearly 10 min. On recovery, it showed a high degree of automatic movement with incessant rhythmic and simultaneous beat throughout the myocardium, at a rate of 52–61 beats/min at room temperature (29°–31°C) without rest pauses. After 10–12 h its rate and amplitude fell gradually. After temporarily inhibiting the heart-rate by such mechanical stimuli as shaking the saline or pressing the heart, there was acceleration of the rate of beat. Isolated pieces of the heart beat for some time.

Both increasing and decreasing the pH of the saline with phosphate buffers depressed the heart-rate, and increase of temperature accelerated the heart-rate. The upper limit was 84–93 beats/min at 43°C; the lower limit on cooling was 7–10 beats/min at 5°C, but it recovered on increasing the temperature.

Faradic stimulation of the brain and ventral nerve cord did not affect the rate of beat of the heart in situ. It also had no effect on direct application to the heart up to 2 V. Further increase in the intensity of the stimulus in the latter case stopped the heart-beat. On switching off the current, the heart-beat reappeared after 10–15 min. Electrically stimulated hearts were not used for drug experiments.

The effects of various drugs were observed on hearts both in situ and isolated. Acetylcholine at 10⁻⁵ dilution

or stronger depressed the rate of beat, but the heart recovered after washing with saline. At higher dilution acetylcholine had no effect. By first treating hearts with higher dilutions and then gradually increasing the concentration, tolerance to acetylcholine up to 10⁻⁴ dilution was observed. The action of acetylcholine was potentiated by physostigmine (10⁻⁴). Histamine (10⁻⁴) accelerated the heart-rate and antagonized the action of acetylcholine. Adrenaline (10⁻⁵) accelerated, atropine (10⁻⁴) inhibited and ether (half and fully saturated) had no effect on the heart-beat. On many occasions the best agent for reviving the collapsing heart was warm saline, which was added in drops to the heart container. The time of recovery varied from 5–15 min.

According to the classification of hearts by NEEDHAM³, the diplopod heart may be put among the myogenic types. It will be interesting to note in this context, that the chilopod heart is neurogenic¹. A detailed account of this work will be published elsewhere⁴.

Zusammenfassung. Herzphysiologische Untersuchungen am Diplopoden *Cingalobolus bugnioni* ergaben: Während Histamin und Adrenalin die Herzfrequenz beschleunigen, wirken Acetylcholin und Atropin hemmend. Es wird angenommen, dass das Herz dieser Diplopoden vom myogenen Typus ist.

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Madurai-9 (South India), 28th November 1966.

¹ G. SUNDARA RAJULU, *J. Anim. Morph. Physiol.* 13, 34 (1966).

² N. S. R. MALUF, *Q. Rev. Biol.* 14, 149 (1939).

³ A. E. NEEDHAM, *Nature* 166, 9 (1950).

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