New method of recording responses of isolated tissues, organs and intact preparations

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A single channel chart recording instrument has been developed with an entirely new system for recording responses in isolated tissues and organs and some intact preparations. It requires no physical connexion with the experiment. The method of recording movement is based on a servo-assisted photo-beam moving in a vertical plane. The beam, when switched on, is driven upwards to search for any object such as the shaft of a writing lever connected to a tissue preparation. When the bottom edge of the lever, and so on, is detected, the photo-beam 'locks on' to it rather like a radar system tracking aircraft movement. From then on, the photo-beam follows the lever upwards and downwards, accurately and without delay. This feature ensures that no extra loading or sources of friction are introduced into the experiment and it enables the instrument to be used with existing isolated tissue apparatus, levers, manometers, tambours, drop or pulse counters without constraining the tissue in any way. An inbuilt pen recorder is driven by the movement of the photo-beam carriage producing a permanent record up to a maximum width of 125 mm. The system magnification (from tissue to writing pen) and the base line shift can be altered by simple adjustment of two controls without any interference with the experiment. Additionally the pen zero can be set for either edge of the chart so that individual responses up to 125 mm of chart width can be recorded for increases or decreases in tone, blood pressure or outflow which is useful in bioassay work. The accurate gearing of the two chart speeds so far available make time markers unnecessary if calibrated paper is used. The instrument can be used as a slave recorder. One instrument has driven up to thirty other instruments as slaves without loss of detail or amplitude of pen excursion in demonstration classes. For signals direct from pH meters, pulse or drop counters, or in slave-recording the moving photo-beam is by-passed. A signal of 300 mV will actuate the recording system to full scale.

The instrument has been used to record changes in tone in smooth and skeletal muscle, for example gut, uterus, vas deferens, trachea, nictitating membrane, frog rectus and gastrocnemius muscle as well as responses to direct and indirect stimulation of the rat gastrocnemius-sciatic nerve preparation. Changes in amplitude in the Langendorff isolated heart have been recorded as well as mean arterial blood pressure and respiratory movement in cat and dog, urine production in rat, isolated rat limb perfusion outflow and continuous pH recording.

The instrument will be demonstrated in use with an isolated tissue preparation.

Inflammatory response produced by a factor released from lymphocytes

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When lymphocytes taken from animals immunized to a protein antigen are cultured with that antigen for 24 h, the supernatant is found to contain inflammatory activity.

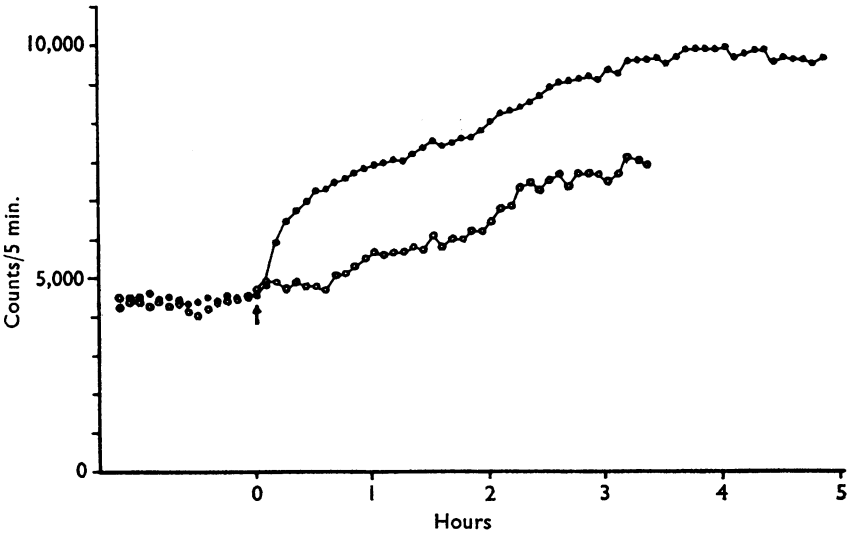

FIG. 1. Time course of plasma protein accumulation in two animals. Material injected intradermally at arrow in both instances, one animal (0) received mepyramine maleate (2 mg/kg i.p.) 20 min before intradermal injection.

The time course of the inflammatory response produced by this material has been studied using a method adapted from that described by Jones, Morley & Williams (1970). A guinea-pig receives an intravenous injection of ^{125}I-guinea-pig serum albumin. It is then introduced into a perspex box such that a fold of skin is raised and immobilized by means of a small perspex bar (sewn on to the skin 24 h previously). The skin fold is situated in front of a γ-scintillation probe detector connected to a counter with outputs to a printer and pen recorder. After a predetermined time, the area of skin being studied receives an intradermal injection of 0·1 ml of supernatant. The rate of increase in radioactivity recorded at any time is then proportional to the vascular permeability at that time.

Figure 1 (top curve) shows the accumulation of labelled albumin in the skin after intradermal injection of a partially purified preparation (protein precipitate between 40 and 90% ammonium sulphate). The response has three distinct phases: I 0–45 min, II 45–90 min, and III 90–240 minutes. Later phases of increased vascular permeability as originally described by Bennett & Bloom, 1968, were not observed. All three phases were produced by supernatants taken from cells incubated in the absence of antigen (antigen added to supernatant after incubation and similarly purified), but they were much reduced. Administration of mepyramine maleate (2 mg/kg) 20 min before intradermal injection abolished phase I but II and III remained unaffected (Fig. 1, lower curve). The same preparation in rat skin produced phases II and III, but phase I in this case was insignificant.

The polyphasic nature of this inflammatory response may result from different substances in the material, the effect of a single substance on different vessels, or from a secondary release of inflammatory substances from haematogenous cells attracted to the lesion.

REFERENCES

BENNETT, B. & BLOOM, B. R. (1968). Reactions *in vivo* and *in vitro* produced by a soluble substance associated with delayed hypersensitivity. *Proc. U.S. natn Acad. Sci.*, **59**, 756.

JONES, T., MORLEY, J. & WILLIAMS, T. J. (1970). Use of radioactive isotopes for continuous recording of increased vascular permeability in the rabbit ear. *J. Physiol., Lond.*, **207**, 10–11.