SHORT COMMUNICATION

ISOLATED INNERVATED, RAT AND GUINEA-PIG HEMI-URINARY BLADDER PREPARATIONS

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Summary: Isolated innervated hemi-urinary bladder preparations of the rat and the guinea-pig have been described. In durability and behaviour to different frequencies of stimulation, the gunea-pig hemi-bladder is shown to give comparable results to those reported for the whole nerve-bladder. The rat hemi-bladder gave less durable contractions on prolonged stimulation. It is shown that the isolated guinea-pig hemi-bladder can be substituted for the isolated whole bladder preparation.

Key words : hemi-urinary bladder neuronal stimulation

INTRODUCTION

Advantages and usefulness of the isolated innervated urinary bladder preparations of the rat (3,4) and the guinea-pig (5) have been well described. However, the chief drawback of such preparations is the lack of control preparation from the same animal which is necessary for certain experiments. Transmural stimulation of the isolated bladder strips has the drawback that it does not distinguish between parasympathetic and sympathetic nerve endings (1). In order to obviate these difficulties we have used a hemi-bladder preparation where the other half serves as its control.

MATERIALS AND METHODS

Adult albino rats and guinea-pigs of either sex were used. The nerve-bladder preparations were dissected out and cleaned as described by Hukovic, Rand and Vanov (4) for the rat bladder, and by Weetmen (5) for the guinea-pig bladder. The preparation was then put on a cork-board and divided into two equal halves by a sagittal cut starting from the mid-point of the dome of the bladder and extending beyond the urethral end. Nerves are seen converging on the ventral surface of the guinea-pig bladder; care was taken to bisect the bladder exactly through this point of convergence. One of the halves with the ureter (innervated hemi-bladder) was then set up in an organ bath in the same manner as described for the innervated whole bladder

preparations of the rat and the guinea-pig (4,5). The organ bath contained 30 *ml* of Tyrode solution (pH 7.6) maintained at 35 ± 1°C and bubbled with 5% CO_2 in O_2.

Contractions were recorded on a kymograph with isotonic frontal writing lever (load 0.5—0.75 *g* for the rat hemi-bladder, 0.75 - 1.0 *g* for the guinea-pig hemi-bladder; magnification X7). The hemi-bladders were neuronally stimulated with rectangular pulses (0.5 msec, 15-20V) at 10 Hz for 5 sec every 2 min for 3 hr (rat) or 6 hr (guinea-pig). Fluid in the organ bath was changed every 90 min.

To study frequency response relationship for the guinea-pig hemi-bladder, different frequencies such as 2,3,5,10, 25 and 50 Hz were employed to deliver 50 or 51 shocks every 2 min.

RESULTS

Neuronally evoked contractions of the rat and the guinea-pig hemi-bladders were stabilized within 15-30 min of the stimulation. The contractions of the rat hemi-bladders (n=16) remained constant for about 1 hr, the height of contractions was reduced by 1% at the end of second hr, and by 20-25% at the end of third hr. Responses to added acetylcholine remained unchanged at the end of 3 hr. Change of the bathing fluid to McEwen's solution (n=2) did not prevent the gradual reduction in responses; replacement of carbogen by O_2 (n=3) produced greater reduction in responses.

Neuronally evoked contractions of the guinea-pig hemi-bladders (n=24) remained constant for at least 6 hr.

When two innervated halves of the bladders were mounted in two separate organ baths they behaved almost identically to neuronal stimulation. There was no reduction in the size of response to neuronal stimulation after the preparation was kept resting in Tyrode solution continually bubbled with carbogen for about 3 hr (rat) or 6 hr (guinea-pig).

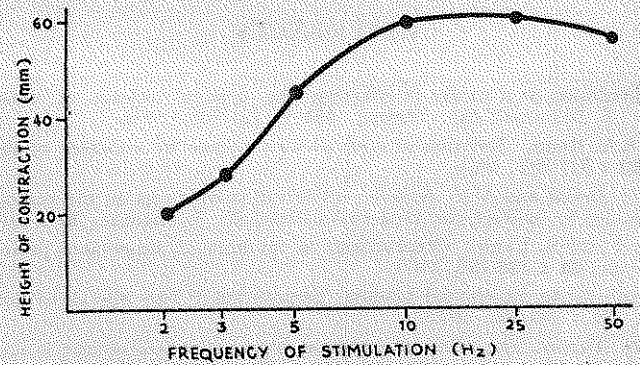

Fig. 1: Relationship between the contractions of the guinea-pig hemi-bladder and the stimulus frequency. Ordinate: contraction of the hemi-bladder in mm on kymograph; abscissa: frequency of stimulation in Hz (log scale). Total number of shocks delivered, 50 or 51 at the Hz mentioned, every 2 min. The preparation was allowed to contract for 15 min at each rate before the trace was measured.

Fig. 1 shows the relationship of the height of contractions of the guinea-pig hemi-bladder to different rates of nerve stimulation. Optimal frequencies were found to be 10 and 25 Hz. At these frequencies contractions remained constant on prolonged stimulation provided that the total number of shocks delivered every 2 min did not exceed 50.

DISCUSSION

Our results show that the durability and the behaviour of the isolated innervated hemi-bladder of the guinea-pig to different stimulation frequencies are comparable to those reported by Weetman (5) for the guinea-pig innervated whole bladder preparation. This indicates that under certain circumstances, the guinea-pig hemi-bladder can be substituted for the innervated whole bladder preparation.

Rat hemi-bladder has been shown to be less durable as compared to the whole bladder preparation against prolonged stimulation. The cause of the spontaneous reduction of responses seems to be prejunctional as the responses to acetylcholine were not reduced at the time of maximal neuronal inhibition. As observed by Carpenter and Rand (2), motor nerves of an excised preparation are unable to supply the mediator at the rate demanded during sustained stimulation at the optimal stimulation frequencies. This may explain the spontaneous partial blockade observed in the rat hemi-bladder preparation after prolonged stimulation. However, why it should not be so far a similar preparation of the guinea-pig bladder is not clear. In this context it may be pointed out that the isolated innervated rat urinary bladder is a purely postganglionic cholinergic preparation (4) while the isolated innervated guinea-pig bladder is a ganglion-containing cholinergic preparation (6).

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