

A servo-mechanism for readjusting the initial tension of isolated smooth muscle

H. O. SCHILD and E. SEAFORD, *Departments of Electrical Engineering and Pharmacology, University College, Gower Street, London, W.C.1*

The purpose of this apparatus is to provide a servo-mechanism by which the initial tension of isolated smooth muscle can be automatically readjusted to a predetermined value, while length changes of the muscle are simultaneously recorded. The servo-mechanism can be used in conjunction with automatic assay apparatus for the recording of isometric drug responses of depolarized smooth muscle.

When a smooth muscle preparation is immersed in depolarizing potassium sulphate Ringer solution it undergoes rapid contraction followed by relaxation to an intermediate baseline. If at this stage the servo-apparatus is switched on it operates a motor which adjusts, through vertical motion, the attachment point of the strain gauge tension recorder until the required baseline tension (say 0.5 g for rat uterus) is reached. The attachment point is also joined to a sliding resistance through which length changes of the muscle can be recorded. The servo-apparatus may be used in two ways.

1. Intermittently. The servo-mechanism is activated during the washing period so as to readjust tension preliminary to the next drug injection, during which it is de-activated. This provides an isometric drug response from a constant tension baseline.

2. Continuously. The servo-mechanism is kept on during drug injection. This provides an isotonic record of length change at constant tension.

The servo-apparatus derives its input from a strain gauge bridge, which is fed into an integrated circuit acting as an operational amplifier with a 1,000 fold gain. It is then taken to an integrated circuit amplifier for comparison with a preset reference voltage. A difference between these two voltages produces an output which, after further power amplification, operates the motor to restore the tension and bring the bridge back to balance. A detailed circuit diagram will be available at the demonstration.

Laboratory experiments suitable for practical classes in psychopharmacology

MARIAN DORR, DAPHNÉ JOYCE†, D. M. KATZ, I. MARSHALL†, HANNAH STEINBERG and I. P. STOLERMAN, *Department of Pharmacology, University College, Gower Street, London, W.C.1*

Our main aim over the past 10 years has been to acquaint students with a number of simple but flexible techniques which can be used for a wide range of purposes. The equipment is generally cheap, easy to operate and to maintain, and most of the teaching time can be spent on actually planning, carrying out and in analysing and discussing the results of the experiments. The ultimate aim, to which the methods lend themselves well, is to illustrate principles of general significance in psychopharmacology, and to stimulate the students' interest.

A number of films of experiments, rats and mice in apparatus, and examples of results obtained in class experiments, will be displayed:

1. "*Spontaneous*" behaviour: apparatus for testing the effects of drugs and of other factors on different aspects of unlearned behaviour, which can be used for analysing: responses to novelty, emotionality, fear, aggression, memory, learning and habituation. Specific pieces of equipment include:

- (a) Y-mazes
- (b) Hole boards
- (c) Open fields
- (d) Cages for observing aggressive and other behaviour
- (e) Apparatus for measuring ataxia.

2. *Learned behaviour*: an example of apparatus which may be used to measure precisely the effects of drugs on learned "operant" responses and concurrent electrophysiological changes forms a separate demonstration (Gartside & Harrison-Read, 1970).

3. *Drug dependence*: a simple method for demonstrating a withdrawal syndrome in mice which have been chronically treated with morphine and for objectively measuring changes in its intensity.

We thank Dr. Ruth Rushton, R. D. Porsolt, R. Bryant, G. C. D. Clarke, B. Hutchings and other colleagues who have helped in the development of these experiments.

† Department of Pharmacology, St. Mary's Hospital Medical School, London.

‡ Department of Psychology, Birkbeck College, London.

Recording evoked potentials in the conscious rat: the maintenance of a constant behavioural baseline

I. B. GARTSIDE and P. E. HARRISON-READ (introduced by HANNAH STEINBERG),
Departments of Physiology and Pharmacology, University College, Gower Street, London, W.C.1

Mass potentials evoked in the brain by sensory stimulation show large moment to moment variation. Some of this random variability can be averaged out by electronic techniques, but the resulting averages also show systematic changes during the course of the long recording sessions which are needed for studying drugs or other treatments (for example cortical polarization). Although factors such as habituation or specific attention to the stimuli may contribute to evoked potential variability, recent carefully controlled experiments have put more emphasis on the indirect influences of, for example, body movements, changes in the effective stimulus strength, or the animal's overall state of "arousal" (Horn, 1965; Worden, 1966).

We have attempted to stabilize these factors by recording from animals engaged in a task which induces constant amounts of movement and a constant orientation towards a source of sensory stimulation. Furthermore, it seems that this behaviour may remain fairly constant even in the presence of some drugs which can affect the evoked response directly.

Hungry rats have been trained to press a translucent panel with their snouts in order to obtain food. To make sure that a rat will work for long periods without becoming sated, rewards are delivered infrequently. Thus on average the animal must press the panel about 40 times for a single reward. This is called a ratio schedule of reinforcement, and since the ratio of presses to rewards is arranged to vary randomly about a mean value of 40, it is in this case called a variable ratio