DEMONSTRATIONS

A microcomputer based monitoring system for rat rotational behaviour

T.P. BLACKBURN, A.B. SHORE & A. McNAB
(introduced by D.T. GREENWOOD)

Research (Biology) Department, ICI Pharmaceuticals Division, Alderley Park, Macclesfield, Cheshire, SK10 4TG

Rotational behaviour is a valuable animal model for assessing drugs interacting with central dopaminergic (DA) mechanisms (Ungerstedt & Arbuthnott, 1970); central 5-hydroxytryptamine (5-HT) mechanisms (Jacobs, Simon, Ruimy & Trulson, 1977), as well as other putative central neurotransmitters, e.g. gamma-amino-butyric-acid (GABA) and substance P (Olpe, Schellenberg & Koella 1977; Olpe & Koella, 1977, respectively). Methodological problems in the measurement of drug-induced rotational behaviour have been shown to exist (Waddington & Crow, 1978), particularly the detection of time course differences. Our aim was to establish a data acquisition system, requiring minimum supervision, that would alleviate some of the inherent problems in interpretating rotational data (Glick, Jerussi & Fleisher, 1976).

Recently we have used a Commodore PET-2001 microcomputer in conjunction with an automated rat rotometer system, as previously described by ourselves (Barber, Blackburn & Greenwood, 1973), for the acquisition of rotational data and subsequent statistical analysis.

Briefly, the instrumentation of the rototameters measures only full turns using a photobeam system operating a Schmitt trigger circuit, the polarity of the pulse generated determining the rotational direction.

The system described operates 8 rotometers which are interfaced to the memory bus of the microcomputer using a simple peripheral interface adaptor (PIA) together with a voltage regulator. The data accumulation technique demonstrated displays rotational behaviour graphically and numerically on the RPT television screen which can then be instantly analysed and statistically evaluated according to any particular experimental requirements. In addition, a printer attachment can be used for a hard copy of the rotational data.

References

BARBER, D., BLACKBURN, T.P. & GREENWOOD, D.T. (1973). An automatic apparatus for recording rotational behaviour in rats with brain lesions. *Physiol. Behav.*, **11**, 117–120.

GLICK, S.D., JERUSSI, T.P. & FLEISHER, L.N. (1976). Turning in circles: the neuropharmacology of rotation. *Life Sci.*, **18**, 889–896.

JACOBS, B.L., SIMON, S.M., RUIMY, D.D. & TRULSON, M.E. (1977). A quantitative model for studying serotonergic function in the rat. *Brain Res.*, **124**, 271–281.

OLPE, H.R. & KOELLA, W.P. (1977). Rotatory behaviour in rats by intranigral application of substance P and an eledoisin fragment. *Brain Res.*, **126**, 576–579.

OLPE, H.R., SCHELLENBERG, H. & KOELLA, W.P. (1977). Rotational behaviour induced in rats by intranigral application of GABA-related drugs and GABA antagonists. *Eur. J. Pharmacol.*, **45**, 291–294.

UNGERSTEDT, U. & ARBUTHNOTT, G.W. (1970). Quantitative recording of rotational behaviour in rats after 6-hydroxydopamine lesions of the nigrostriatal dopamine system. *Brain Res.*, **24**, 485–493.

WADDINGTON, J.L. & CROW, T.J. (1978). Methodological problems in the measurement of drug-induced rotational behaviour: continuous recording reveals time-course differences undetected by previous techniques. *Psychopharmacology*, **58**, 153–155.

Measurement of regional myocardial contractility with ultrasonic crystals and direct on line analysis

G.B. HORSFALL, W. ROUSE & H.J. SMITH, ICI

Pharmaceuticals Division, Alderley Park, Macclesfield, Cheshire, SK10 4TG

Cardiac function in normal hearts may be quantified by several indices of contractility and performance, but in disease, regional differences in contraction limit the value of global parameters such as LV dp/dt. Under these conditions, measurement of regional contractility with miniature ultrasonic crystals provides a powerful tool for pharmacological study. Instantaneous segment length and contraction velocity may be displayed on line by computation of the transit time of ultrasound between two piezo-electric crystals. The contractile profile of myocardium may be determined and comparison between different areas of

the heart is both practical and easily interpreted. However, beat by beat analysis of end-diastolic segment length and velocity of contraction in early systole, both important indices of regional function, is laborious and time-consuming. We have developed an on-line processing unit that facilitates analysis of regional contractile function. The analogue signal from the ultrasonic crystals is processed to compute end-diastolic segment length, length after one-third of systole, end systolic segment length and duration of systole (defined as the period of elevated ventricular pressure). The three length measurements are displayed on one channel of a pen recorder. Comparison with duration of systole on a second channel gives mean velocity of contraction in the first third of systole ($V\frac{1}{3}$). Direct on-line processing permits slow chart recording with visualisation of changes in contractility over periods of time including coronary occlusion, reperfusion, or administration of cardioactive drugs. Representative experimental records will be displayed and dynamic examples will be replayed from tape to illustrate the power of this technique.