

## EDUCATIONAL SESSION

### Evaluation of the Biovideograph\*

M.C. HENMAN & G.D.H. LEACH

*Postgraduate School of Studies in Pharmacology,  
University of Bradford*

Videotape techniques have made it possible to teach efficiently pharmacological principles derived from experiments which would not otherwise be a feasible undertaking with large groups of students. In addition, the biovideograph provides each student with a permanent record of the experimental results. To evaluate this new teaching tool a comparison of student learning and attitudes to videotape and biovideograph recordings was undertaken.

Two groups of fifty pharmacy undergraduates were shown either a videotape or an equivalent biovideograph tape. For the biovideograph demonstration each student in the group was provided with a pen recorder and arranged in groups of ten such that each had clear sight of a television monitor.

A short test consisting of ten questions was devised for each demonstration. The videotape group were shown an earlier version of the production from which the biovideograph programme was derived and the slight differences in material content were allowed for in the construction of the tests. However, seven out of the ten statements were common to both tests. The duration of the biovideograph and videotape programmes were 60 and 45 min respectively. A modified Osgood's Semantic differential test (Osgood, Suci & Tannenbaum, 1957) was used to gauge student attitudes towards each demonstration.

The results showed that both groups of students had improved their scores in the tests after the demonstrations (videotape;  $P < 0.001$ ,  $n = 46$ ; biovideograph;  $P < 0.001$ ,  $n = 49$ ; paired 't'-test). However, there was no significant difference between the two groups when the differences between the before and after scores were compared using an unpaired 't'-test. Furthermore the results of between

group comparisons were the same whether the ten statements in each test or only the seven common statements were compared.

The results of the attitude test show that the profiles for the two groups were similar. Comparison of the mean scores for each of the 16 pairs of adjectives revealed that only at two points was there a significant difference between the two groups. The first for the 'Relaxed-Tense' pair, the biovideograph group showed a mean score of  $3.35 \pm 0.17$  (mean  $\pm$  s.e. mean) which was significantly lower ( $P < 0.05$ ) than the mean score of  $4.26 \pm 0.18$  derived from the videotape group. Similarly for the 'Profound-Superficial' pair the biovideograph group gave a mean score of  $3.17 \pm 0.17$  which was significantly lower ( $P < 0.05$ ) than the mean score of the videotape group  $3.96 \pm 0.16$ .

It is clear that the biovideograph technique is comparable as a teaching tool to the videotape demonstration in the amount of information imparted as measured by a test of immediate recall. Furthermore, the results of the attitude test show that the biovideograph demonstration was more favourably received on two points than the videotape programme and on the remaining 14 points the two presentations were equivalent. Thus these results suggest that the biovideograph may provide an efficient and popular teaching method. This may be particularly important where time and manipulative skills are at a premium.

### Reference

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\* Biovideograph is the registered trademark of Bioscience Ltd.

## A simple electrical model for teaching the properties of feedback control systems

J. DIMSDALE & J. WILKINSON

*Physiology and Pharmacology Academic Group, School of Natural Sciences, The Hatfield Polytechnic, P.O. Box 109, Hatfield, Herts.*

The examination of the properties of physiological control systems is often difficult, expensive and too time consuming to be carried out in undergraduate practical classes. We have, therefore, devised a series of experiments that are performed on a simple electrical system which is used to simulate physiological systems.

The system consists of a controlled electrical current, supplied by a 12 V battery, which passes through one filament of a car lamp in order to heat a copper shield. The temperature of the copper is measured by means of a thermocouple and is displayed on a pen recorder. For the purposes of these experiments the electrical current represents the input to the system and the temperature of the copper shield is the output. The system may be disturbed briefly by passing a current through a second filament in the lamp. Feedback control is provided by the student who observes the temperature of the copper and makes appropriate adjustments to the current flowing

through the first filament of the lamp. Changes in the sensitivity or gain and the delay in the feedback loop are easily produced by the student.

The model may be used to demonstrate that:

- i) the observation of a constant value of a variable does not necessarily indicate a controlled system.
- ii) negative feedback minimizes disturbances to a system but does not prevent them.
- iii) the degree of minimization of the disturbance depends upon both the sensitivity and the delay in the feedback loop.
- iv) a negative feedback system may become a positive feedback system by increasing either the delay or the sensitivity of the feedback loop.
- v) negative feedback tends to stabilize and positive feedback produces fluctuations in the output of a system.

Students are encouraged to discuss analogies between the behaviour of this electrical model and that of physiological systems. Such discussions lead them to make alterations to the model in order to simulate changes occurring in physiological systems e.g. the effects of a decreased excretion of a hormone on its plasma concentration may be modelled by reducing heat loss from the copper by covering it with aluminium foil. These experiments enable students to discover the properties of control systems without them having the technical expertise necessary to perform experiments on animals.

## The effects of autonomic drugs on the blood pressure responses of the spinal cat: a Biovideograph presentation

L. FINCH & G.D.H. LEACH

*School of Studies in Pharmacology, University of Bradford, Bradford BD7 1DP*

The repeated demonstration of the blood pressure effects of autonomic drugs in the spinalized mammal to pharmacy and science undergraduates offers an ideal opportunity for transference of the experiment to a videotape format suitable for group and individual student replay. The development of the Biovideograph offers the possibility of further exploitation of the system by providing an individual record of the experimental details.

The production will show the effects of the parasympathomimetic drugs acetylcholine and methacholine, the effects of vagus nerve stimulation and the modification produced by treatment with physostigmine and atropine. The actions of nicotine and acetylcholine and the modification of the responses after hexamethonium will show the nature of the nicotonic cholinergic specificity. Finally the modification by adrenoceptor antagonists of the sympathomimetic effects caused by noradrenaline, adrenaline and isoprenaline will demonstrate the presence of  $\alpha$  and  $\beta$  adrenoceptors.

The portability and convenience of replay equipment will be clearly apparent from the demonstration as well as the absolute technical control of the presentation by the lecturer responsible for the conduct of the laboratory class.

### **Determination of regional blood flow by a radioactively labelled microsphere technique**

J.M. FOY & J.R. PURVIS

*School of Studies in Pharmacology, University of Bradford, Bradford BD7 1DP*

The determination of regional blood flow and cardiac output in the experimental animal using radioactively labelled dextran microspheres is an important

pharmacological technique. The videotape illustrates the necessary preparation of the anaesthetized rat with both femoral artery and carotid/ventricular cannulae. The necessary conditions for the injection of the microspheres into the heart are outlined together with the various procedures required for the determination of cardiac output and regional blood flow. Diagrams are used to illustrate the complete experimental set-up and a typical distribution of cardiac output to various organs of the rat. Running time 6 minutes.

### **Autonomic Pharmacology—a self-teaching and assessment package based on the treatment of glaucoma**

N.R. GALLOWAY<sup>1</sup>, P.J.D. HERBERTS,  
C.A. MARSDEN & N.K. PERRY

*Department of Physiology and Pharmacology, Medical School, Queen's Medical Centre, Clifton Boulevard, Nottingham NG7 2UH and <sup>1</sup>Department of Ophthalmology, University Hospital, Queen's Medical Centre, Nottingham NG7 2UH*

The teaching of basic medical sciences at Nottingham Medical School places an emphasis on (a) the integration of the various scientific disciplines and (b) their integration with parallel and subsequent clinical experience. It is important that the student understands that basic scientific information can be used to solve problems associated with everyday treatment and management of patients. The teaching package described makes use of genuine case histories of glaucoma to attain two fundamental objectives. Firstly to ensure a sound understanding of basic autonomic pharmacology and secondly to apply this information to the diagnosis, treatment and management of the patient.

The self-teaching package is based on a set of learning objectives, available to the student, and consists of three sections. The first is a pre-assessment question-answer booklet dealing with the essential autonomic pharmacology of the eye and aspects of ophthalmology which the student may not previously have studied. It is designed to ensure the student has

sufficient basic knowledge before attempting the subsequent sections and serves as a base-line from which the students can monitor their improvement and grasp of the subject. The second part is a computer based modified essay question (Knox, 1972) which is planned to lead the student through a genuine case history of open angle glaucoma. The students' responses should reflect their understanding and application of the subject matter in the pre-assessment section. The questions and problems posed are real, based on a patient's interview and case notes, and so affect the diagnosis, treatment, monitoring and prognosis of the patient. The final self-assessment section is designed to test the students knowledge of the subject on completion of parts I & II. It covers all the stated objectives of the package and the information required to attain them is available in the first two parts. In this way it serves as a guide to the students grasp of the subject matter and areas requiring more work.

While the package is aimed primarily at preclinical medical student to show them how the basic medical sciences can be applied to genuine medical situations it may also have a role for the clinical student who requires prompting in essential autonomic pharmacology.

#### **Reference**

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# **A package for independent study to enable learning about the pharmacology of airways obstruction in the context of clinical problem solving**

D.R. TOMLINSON, D.F. WILLIAMS & C.E. WILSON

*Department of Physiology and Pharmacology, Medical School, Queen's Medical Centre, Clifton Boulevard, Nottingham NG7 2UH*

The Basic Medical Sciences Pt. I curriculum at Nottingham University presents students with an integrated approach to the science disciplines (see General Medical Council (1977) for an outline of the curriculum). Thus students learn their basic pharmacology during the first two years of the course in classes designed to relate the actions of drugs to the relevant morphology, biochemistry and physiology. There is also a need to bridge the gap between basic pharmacology and the clinical course.

One strategy to this end is clinical problem solving in which the student works through a carefully-constructed case of a patient, acquiring and using scientific knowledge to interpret signs and symptoms, identify warranted investigations and to plan and monitor management.

The design of the problem described here is based upon procedures developed at the University of Newcastle, New South Wales (see, for instance, Maddison, 1976; Clarke, 1978; Engel & Clarke, 1979).

This abstract describes a problem designed to give preclinical students some clinical perspective in supplementing their basic pharmacology and enable clinical students to revise their basic sciences in an immediately relevant context. The area of study selected was the pharmacology of acute airways obstruction. Specific learning objectives in the cognitive domain were constructed (Mager, 1975). Thus students are required to recall and apply not only pharmacological and other scientific knowledge, but also knowledge of clinical manoeuvres. For instance, the student must state the scientific basis for percussion of the thorax and interpretation of percussion notes, but need not be able to perform the clinical skills.

The format selected was a pamphlet with accessory materials (such as Vitalograph traces). The student is therefore confronted with an introductory set of symptoms and required to describe how related signs may be obtained. Signs and symptoms must then be interpreted and a working hypothesis, which proposes alternative scientific bases for the patient's problem, constructed. The student must then propose management strategies with placement of due emphasis on the underlying scientific principles. The student then works through a branching tree of alternative responses to the main therapeutic manoeuvres to determine the criteria by which the success of the pharmacological interventions may be evaluated.

Throughout the package the approach to information transfer is to cause the student to face each relevant question in sequence, to indicate how information might be marshalled and an answer constructed, then to feedback the preferred answer. Thus the package ends with a Modified Essay Question (see Knox, 1972) which requires the student to solve a similar problem with minimal prompting.

The problem package together with examples of its successes and faults in the hands of students will be demonstrated.

## **References**

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