283P VIDEO-BASED LABORATORY GUIDES FOR UNDERGRADUATE PHARMACOLOGY STUDENTS

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The pharma-CAL-ogy project is funded through the Teaching and Learning Technology Program (TLTP), which aims to encourage the use of modern technology in higher education to make it more productive and efficient. The project has focussed on the development of courseware, both computer-based learning materials, many of which have been demonstrated to the Society, and video-based learning materials.

Here we describe videotapes which aim to provide step-by-step laboratory guides for commonly used pharmacological organ bath preparations. They are suitable for undergraduates from Pharmacology, Medical, Pharmacy and some Biomedical Science courses.The content is concerned primarily with the dissection and preparation of the tissue and setting it up to make recordings, the detail of operating equipment and the pharmacological properties of the tissues are not covered.

The first videotape contains material on five preparations: *Isolated Ileum; Vas Deferens; Isolated Atria; Phrenic-Nerve Diaphragm; Anococcygeus Muscle.* A further programme *(Introduction to Isotonic and Isometric Contractions*) explains and demonstrates these two commonly used methods of recording and incorporates still graphics to explain and describe the structure of smooth, cardiac and skeletal muscle cells and the structure of the sarcomere. Animated graphics (to illustrate the sliding of actin and myosin filaments during muscle contraction) and cartoon graphics (simple animations of a weight-lifter and a tug-of-war to demonstrate the differenec between isometric and isotonic contraction) are also used.

The second tape contains four *in vitro* preparations: *Isolated Trachea; Isolated Aorta; Rabbit Jejunum (Finkleman); Perfused Mesenteric Bed* and two other programmes:*Injection Techniques* which is a short guide to and demonstration of different injection techniques in both rat and mouse (preparation of a syringe, oral administration, intra-peritoneal injection, sub-cutaneous injection and intra-muscular injection, and intravenous injection into the mouse tail vein) and an *in vivo* animal preparation (*Blood Pressure in Anaesthetised Animals*) demonstrating the technique of measuring arterial blood pressure and heart rate in an anaesthetised animal (anaesthetisation; maintainance of body temperature; cannulation of trachea, jugular/femoral vein and carotid artery, pressure transducer and recording apparatus).

The programmes were mastered onto broadcast quality Betacam SP videotape and are distributed on two high quality one hour VHS cassettes each containing six programmes of 8-12 minutes with commentary. For most of the preparations the following format is used: identification of the organ/tissue; dissection and removal of the tissue; setting up the tissue in the organ bath (mounting the tissue, aeration, application of tension, drug addition and/or electrical stimulation, washing. The video also includes sequences showing live and still trace recordings from each preparation. When structures are difficult to locate or identify, high resolution graphics, developed on Autodesk 3D Studio, are used for clarification.

The videotapes may be used in several ways: (i) to prepare students before they perform a practical themselves; (ii) free access to them at any time during the laboratory session to clarify aspects of dissection or recording; (iii) as an alternative, perhaps in conjunction with a computer simulation, for those students who will not have the opportunity to perform an investigation on a specific preparation.

284P PRELIMINARY RESULTS OF A SURVEY OF BSc PHARMACOLOGY COURSES IN THE U.K.

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There has been growing concern about the changes facing pharmacology and particularly the changes facing the teaching of pharmacology (Page et al., 1994; Hughes, 1996). The British Pharmacological Society has increasingly been pro-active in fostering discussion about the changes facing pharmacology in order to help ensure that pharmacologists continue to be trained in appropriate numbers and with appropriate skills. As part of the activities of the Education Sub-Committee, we recently carried out a survey to establish what constitutes as BSc degree in Pharmacology in the U.K. Heads of Department of Pharmacology in eighteen Universities in the U.K. were asked to complete a questionnaire to obtain basic information for the Society on the content of BSc Degree courses in pharmacology. The total (mean ± S.D.) number of hours of Pharmacology taught in year one was 81 ± 88 (range 0-293), in year two was 228 ± 113 (range 100-453) and in year three was 493 ± 157 (range 320-900). Of the total hours of non lecture work in year three, 11% was wet practical work, 1% was dry practical work, 68% was laboratory based project work and 26% was library or dissertation based project work. Eight of the Universities surveyed offered extra-mural year placements which in one University only was compulsory.

There was considerable variation in the content of the courses offered across the U.K. This can be illustrated with reference to three areas surveyed. The mean total hours in year 1-3 for respiratory pharmacology was 4.1 (range 0-17), gastrointestinal pharmacology was 1.7 hours (range 0-9) and other non-laboratory sessions (e.g. I.T. skills, communication skills, group work) was 17.94 (range 0-55) hours.

This preliminary survey suggests that there is considerable variation in the content of BSc courses in Pharmacology in U.K. Universities.

Page,C.P., Sutter,M.C., Walker,M.J. Trends Pharamcol. Sci (1994); 15: 17-19.

Hughes,I.E. Trends Pharmacol.Sci (1996); 17: 32-34.

285P KNOWLEDGE AND SKILLS NEEDS IN PHARMACOLOGY GRADUATES IN FIRST EMPLOYMENT

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The Pharmacology Higher Education Network funded by the Department for Education and Employment has undertaken a survey of the skills and knowledge needs, in their first job, of 1994/5 pharmacology graduates (Honours B.Sc single subject or combined) from 5 English and 1 Scottish University. The survey took place during March/April 1996. Some 272 questionnaires were sent out and 145 returns were received giving a response rate of 53% though there were considerable variations between rates of return from students in the different contributing institutions (range 37-67%).

The survey elicited personal and current employment details, information on attitudes to any work placement which formed part of the course and, in relation to current employment, the three most useful features of their course and the three job requirements for which they were least well prepared by their course. The bulk of the questionnaire concerned information about 37 defined items of skill / knowledge / competency / capability. With respect to these 37 items two questions were asked. First, to what extent has the knowledge and skill itemised been required in your current job? Second, how did the provision of these in your University course match what is required in your current job? In each case answers were required on a 5-point scale and for the first question the fraction of respondents at each scale point were multiplied by the score to give a needs measure of 1-5. For the second question the percentage respondents were multiplied by -2 (gross underprovision) through to +2 (gross overprovision) and summed to give a requirement/provision match measure (-200 to +200).

Items were divided into 5 main categories; subject specific, communication, management, information technology (IT), innovation/creativity. In terms of job requirement the overall needs for these categories were: management (3.4) > innovation (3.2) > IT (3.1)> communication (2.9) > subject specific (2.2). With regard to individual items within these broad categories no subject specific item came in the first quartile of items ranked by job need. Only two subject specific items (Molecular Biology skills and information on Statistics) were in the second quartile. With regard provision/requirement match 15 of the 37 items scored between ± 30 indicating a good match between job needs and course provision. Some items were under or over provided. For example within the subject specific items isolated tissue skills (+40), molecular biology skills (-45) and statistics (-44). Within the IT category use of the Internet (-111), spreadsheet skills (-90), use of statistical packages (-87), word processing skills (-66) and accessing biomedical databases (-56) were all underprovided. In the management category financial skills (-88), negotiating skills (-79), supervisory skills (-63), leadership skills (-54) and time management skills (-48) were lacking as was speaking a second language (-97). Within communication skills use of electronic mail (-92), proof reading (-53), editing (-51) and preparation of posters (-47) were similarly percieved to be underprovided.

A number of points concerning these data need to be considered (for example; overall relevance having regard to the return rate and differences in course provision between institutions; what about needs in second job as careers progress?). Nevertheless the survey has identified areas of miss-match between job needs of pharmacology graduates and the courses these students have experienced.

286P CASE STUDY I

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I graduated from Manchester University with Honours BSc Pharmacology/Physiology (with industrial experience) in July 1994. Subsequently, I spent a year in Japan teaching English. Since September 1995, I have been working on the Unilever graduate training sceme at Birds Eye Wall's. I have, therefore, followed a non-pharmacological career.

The period in Japan required very rapid adaptation to a completely different culture and language. It was necessary to be flexible and to be able to learn the language and local customs easily. Working with children at a variety of schools meant that clear communication skills and patience were essential. Careful planning of lessons and time management were also key to effective lessons. It was imperative to be approachable and able to manage the students and other teachers. In many lessons the students were given team activities, which were necessary to co-ordinate and to maintain the confidence of the students at all times.

Therefore, the important qualities to have were communication skills, adaptability, patience, ability to manage a class and a creative, open mind.

Working as a trainee manager has required good management of time and play. The job is fast moving and you are continuously busy. Good time management and prioritisation of tasks are essential. In order to work efficiently it is important to be able to summarise data and draw out key actions from meetings and papers. The ability to design spread sheets and use a variety of computer systems are continuously required. You are required to challenge other people's work, to see all sides of a problem, be able to present your findings with evidence and suggest new ways of tackling each problem. As team work is used the majority of the time, it is an essential skill to be able to work effectively with any type of person, to delegate work and to be a reliable and motivated team member.

Therefore, the important attributes in the management trainee role are the ability to prioritise time, use computers, draw out key information, problem solve and be an active person.

The course in Manchester did not provide enough development in team-working skills, time and people management, creative skills and computer literacy. The course, however, gave good training in independent working, the summarisation of data and drawing out key points, the ability to spot underlying assumptions and distortions and in presentation skills.

287P CASE STUDY II

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The last few years have witnessed phenomenal changes in the nature of academic, but particularly industrial pharmacological research, with the introduction of a variety of new techniques and technologies such as those offered by molecular biology. In training students for a career in pharmacological research, universities must be adaptable, providing theoretical and practical training in these new techniques. However, I believe this must be taught in context and with an appreciation of the more traditional approaches to pharmacological research. Here I will discuss how my degree course in pharmacology at Sunderland University and my one year industrial placement at Glaxo-Wellcome has prepared me for postgraduate PhD research.

The course was both lecture- and laboratory-based and in addition to pharmacology, covered a range of general science subjects such as chemistry, physiology and biochemistry in the earlier years, becoming more specialised in pharmacology in the final year. The laboratory classes gave me a practical training in instrumentation, microbiology and the traditional experimental techniques of physiology and pharmacology (e.g. the use of organ baths). Throughout the course emphasis was placed on the development of 'transferable skills' (e.g. report writing, public speaking and computer literacy), which are useful regardless of the career subsequently chosen.

An optional 12 month placement in industry was offered, with year 4 out of 18 students being placed. This experience I found invaluable, allowing firsthand exposure to industrial research and the opportunity to work as part of a team. Additionally, the placement gave me a good training in experimental design, data handling and presentation of results, which has been extremely useful to me in my current studies. Certainly, I felt advantaged upon my return to Sunderland, especially with regard to my final year research project, which for most of my colleagues was their first experience of research.

My postgraduate (PhD) research is funded by Glaxo-Wellcome and investigates the interaction of general anaesthetic agents with ligand-gated ion channels. The approach utilises both molecular biology and electrophysiology. The nature of such techniques means training at undergraduate level in most pharmacology departments is not possible. However, the problems and pitfalls of electrophysiological studies are common to *in vitro* preparation such as guinea pig ileum. I received relatively little practical or theoretical training in molecular biology. In retrospect it would have been advantageous, particularly in relation to my current project. However, basic practical techniques acquired in biochemistry and microbiology equipped me with the background skills necessary to perform the new techniques.

In conclusion, my undergraduate training prepared me with a variety of specific and transferable skills that I fully utilise in my research. The additional experience I obtained during my placement was invaluable. Finally, as a large proportion of pharmacology graduates do pursue a higher degree by research, I feel it is important that pharmacology courses are sited in active research departments so that undergraduates can witness the trials, tribulations and joys of their postgraduate colleagues before committing themselves to three years of heaven or hell.

288P RECENT CHANGES IN PHARMACOLOGY COURSES

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Pharmacology evolves faster than many other scientific disciplines and this evolution needs to be reflected in Undergraduate courses. Recently several authors have tried to define the current aims and content of pharmacology teaching to science students (Page *et al.*, 1994; Rangachari, 1994; Hughes, 1996).

The pressures for change include: a decline in resources per student (between 1989/90 and 1995/6 a reduction of about 28% in real terms) and hence increase in students:staff ratio and less money for practicals; changes in the student entrants (increasing % of mature students; greater diversity of educational background and knowledge base); growth in pharmacological knowledge and targets for drug action; the development of new technologies such as molecular biology; greater appreciation of skills and competencies required in graduates (Markham & Sutcliffe, 1995).

Recently, vocational courses, such as Medicine and Dentistry, have decreased their factual content and increased the skills training and problem-solving elements. In many Universities science pharmacology courses used to be given largely to BSc Pharmacology students. Modularisation has resulted in pharmacology also being a subsidiary subject and taught to large numbers of students. There has been a decrease in coverage of all drugs and in specific pharmacological skills training, particularly whole animal experience. A BSc Pharmacology student now tends to have greater breadth of biological training, such as molecular biology, and increased skills training such as information technology and team work. Pharmacology is also available jointly with other subjects (eg languages, management).

It is likely there will be some stability for a few years in vocational courses. However, science pharmacology could alter in two directions. The recent trend of greater breadth but less depth could continue. Alternatively, pharmacology might become a post-graduate degree as is the norm in North America.

Hughes, I.E. (1996) *Trends Pharmacol. Sci.* 17, 32-34.
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Page, C.P., Sutter, M.C. & Walker, M.J.A. (1994) *Trends Pharmacol. Sci.* 15, 17-19.
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289P KNOWLEDGE AND SKILLS NEEDS IN PHARMACOLOGY GRADUATES: AN OVERVIEW

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The PHEN workshop provided a forum to discuss the skill and knowledge needs of pharmacology graduates in first employment, while assessing how current courses measure up. A review of the recent PHEN survey provided extensive and thought provoking data. The data was obtained with the aid of a questionnaire followed by data capture and analysis using an Optical Mark Reader. Provisional data relating to pharmacology graduates from five English and one Scottish University was presented on thirty-seven defined items of skill, knowledge, competency and capability under five main categories: subject specific, information technology (IT), communication, management, and innovation/creativity. The data presented related to the identification of the extent to which the knowledge and skills itemised had been required by graduates in their current employment, and how the provision of university courses were able to match what was required in employment.

It was noted that the majority of respondents (74%) were graduates with either a first (15%) or an upper second (59%) honours degree in pharmacology. The significance of this was reflected in the breakdown of the current employment situation with the highest percent of graduates (36%) opting for postgraduate study. In contrast, the diversity of jobs currently occupied by pharmacology graduates was also clearly identified. Of the data provided, the majority of graduates (62%) appear not to stay within the 'subject' of pharmacology, hence the need for subject-specific skills in this area may be questionable and hence could be reduced.

Pressures relating to the 28% decline in resource per student over the past six years, the increases in student:staff ratios, the greater diversity of educational background and the continual development of modular courses or joint degrees may also individually or collectively influence the above. Graduates who decide to stay within pharmacology also identified the clear need for non-subject-specific skills in their respective jobs. It was deemed essential that these skills be included within subject-specific material and hence be delivered as part of the mainstream of pharmacology teaching.

The survey confirmed that in the majority of cases there appeared to be a considerable degree of under-provision in non-subject-specific areas, especially relating to IT, one to one communication, time management and initiative training. In the main, the provision for subject-specific skills would appear to be acceptable, with the main areas of concern being molecular biology, especially technical knowledge and the use or understanding of statistics. An over-provision of isolated organ work was indicated, while a bimodal distribution for the law relating to animal use and for 'Good Laboratory Practice' indicated a clear need or not needed with little middle ground. These various aspects of course provision were also confirmed by the case studies presented by pharmacology graduates Emma Connell and Susan Shepherd.

Overall the data indicated a good match between the skills and knowledge needed in first employment; however, the notable areas of mismatch highlighted may represent the current diversity of employment undertaken by pharmacology graduates especially in terms of the under-provision of non-subject-specific skills. The current changing status of the pharmaceutical industry indicates that the level of diversity is likely to continue to increase. This trend may be helped by the current move towards greater breadth but less depth in subject areas and changes in institutional policy, with a greater emphasis being placed on postgraduate provision in order to satisfy economic pressures.