

What's required in a pharmacology graduate?

This workshop, held on the 4th of April, 1995, was organised by the *Pharmacology Higher Education Network* as part of the meeting of the British Pharmacological Society held in Canterbury. The Pharmacology Higher Education Network was formed in 1994 with financial support from the Department of Employment. One of the aims of the Network is to facilitate communication between employers and university teachers with regard to the content and objectives of pharmacology courses and this workshop is intended to open discussion about the skills needed by pharmacology graduates in various types of employment: in the research laboratory; in the financial sector; in pharmaceutical marketing; in a multinational non-pharmaceutical company; in regulatory affairs; in a legal environment and in clinical pharmacology. To this end speakers, drawn from a range of employers in various fields presented their views as to the essential attributes of a successful pharmacology graduate in their employment. These talks were followed by a workshop in which small groups of delegates addressed the questions:

- Which of the skills and attributes valued by the speakers are being taught/developed in pharmacology courses?
- How do we need to change?

The Chairman opened the workshop by welcoming the 55 delegates and suggesting that many pharmacology courses are designed on the assumption that a large proportion of the graduates proceed to positions in laboratory work in the pharmaceutical industry. However, of 189 graduates in pharmacology from two major Northern Universities 33% went into further education or took a higher degree, 15% went into the pharmaceutical industry (including laboratory and non-laboratory posts), 5% went into other research occupations, 35% went into other employment, 2% were untraced and 9% were unemployed.

The 7 abstracts which follow present the views of various employers of pharmacology graduates about the skills, competencies and aptitudes needed by graduates. In the eighth abstract the main points brought out in a discussion period which concluded the workshop are summarised.

Further details of the activities of the Pharmacology Higher Education Network can be obtained from the Chairman of the workshop and Convenor of the Network, Ian Hughes, Department of Pharmacology, University of Leeds, Leeds LS2 9JT; tel 01132-334313; fax 01132-334331; e-mail i.e.hughes@leeds.ac.uk

161P WHAT'S REQUIRED IN A PHARMACOLOGY GRADUATE IN A RESEARCH LABORATORY?

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Graduates of pharmacology: skills, knowledge and competency requirements for a laboratory scientist in the pharmaceutical industry.

The primary aim of research based pharmaceutical companies is to discover and develop therapeutics that make a worthwhile contribution to human health. To this end their most valuable asset is their employees. The ever increasing insistence by the health care providers on significant cost benefits for new medicines and the intense competition means that only the innovative will survive and prosper.

The research process can be divided into three parts: **Target Selection** which involves identification of a mechanism or process that can be manipulated to provide therapeutic benefit. **Lead Generation** which involves identification of an agent that has the desired mechanism of action. **Lead Optimisation** which involves conversion of that agent into something that has all the attributes to make it suitable for treatment of the disease.

The changed environment in which a pharmaceutical company works means that more emphasis than ever before is placed on the early identification of new targets that satisfy unmet therapeutic needs. To this end pharmacology graduates will have to come equipped with knowledge and practical experience of modern biology with more molecular and cell

biology than hitherto. Because of this change and the accelerating advances in technology, traditional *in-vivo* skills, though equally important for drug discovery, will be less in demand numerically.

It is also possible to describe the requirements for graduate recruits in more generic terms considering three separate sets of attributes namely, **skills** or what they can do practically, **knowledge** or what they need to know and **competencies** or the ability to employ their skills and knowledge to useful effect.

As far as skills are concerned the important ones are: Ability to design and perform experiments. Proficiency in analysis and display of data. Ability to communicate. Ability to diagnose and solve problems.

In the case of knowledge the requirements are: Understanding of the relevant biology. Awareness of literature retrieval procedures. Understanding of the operation of a range of laboratory equipment. Appreciation of data handling packages.

The important competencies include: Analytical thinking. Ability to learn. Tenacity. Concern for standards.

If the graduate recruit comes to research equipped with these general attributes, then in-house training and development will have a firm platform on which to build.

162P WHAT'S REQUIRED IN A PHARMACOLOGY GRADUATE IN THE FINANCIAL SECTOR?

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Self-Selection.

Knowing if you are going to be successful at KPMG means knowing yourself: your strengths, your weaknesses, what interests you and what does not. To help you decide whether you are the kind of person who will succeed in the firm, we have identified some of the key characteristics and competencies people who succeed with us need to have. How do you match up?

Clients can be very demanding; you will need to build close relationships with them and provide excellent service. Are you quick to see what others need or are driving at? Have there been times when you have put yourself out to help somebody even when it isn't your immediate responsibility?

Essential quality: ability to respond to client's needs.

From warehouse staff to TV creative directors, construction worker to financial controller, we work with people at all levels in different environments. Do you relate to people from all walks of life? Have you ever been in a situation where your sensitivity and flexibility have been crucial?

Essential quality: good communicator.

A successful project depends on the whole team pulling together. This can only happen through strong leadership. As you progress you will need to manage teams of increasing size. Have you been involved in an activity where you found team membership stimulating? Can you motivate others and are you a natural leader?

Essential qualities: ability to lead and be a good team

player.

During your training you will have to balance a full time job with study and leisure activities. Projects have to be finished one time every time. You need to know your limitations, know how to improve performance, cope under pressure. Do you get your projects in on time without panic, loss of sleep, or missing out socially? Can you prioritise?

Essential quality: ability to manage time and meet deadlines.

Being an effective business adviser is about looking forward and advising clients what to do next. It means understanding the business environment and how companies operate. Has your experience to date given you an insight into factors affecting business?

Essential qualities: commercial awareness and business interest.

Accountancy and tax work are based on investigation, analysis and presenting information in a form to support a professional opinion or business solution. Have you learnt to analyse information objectively and use it to support a point of view? Can you think round a problem and come up with an effective solution?

Essential qualities: judgement, initiative and broad-based thinking skills.

Projects don't always run according to plan. Problems can seem insoluble. You need tenacity and self-motivation to see a project through. Have you ever faced an unexpected challenge, stuck with it and seen it through?

Essential qualities: energy, drive and motivation.

163P WHAT'S REQUIRED IN A PHARMACOLOGY GRADUATE IN PHARMACEUTICAL MARKETING?

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The days when a job offer resulted from a quick misspelt letter to the nearest pharmaceutical company announcing one's availability are ancient history.

The "Financial Times" (19/1/95; p6) reviewed a survey of graduate recruitment trends in industry as a whole (1994/95) by PA Consultants. The take home message was that companies were experiencing problems with new graduate job applicants in the following areas:

Communication, Business Sense and Teamwork.

Furthermore, PA found that more companies were testing applicants skills and behaviours. This is an industry-wide finding and not confined to pharmacology graduates seeking marketing jobs in the pharmaceutical industry.

Those seeking careers in pharmaceutical marketing need to come to terms with the fact of life that, whilst a shiny new degree should ensure a measure of technical competence in pharmacology, this will not guarantee success. Pharmacology graduates usually have no formal training in economics, business or marketing yet they will be competing for positions with extremely bright people from a variety of academic backgrounds. Demonstrating a willingness to learn is essential.

Companies are testing skills, especially thinking (analytical, conceptual and strategic) and people skills, notably competency in self-management (interpersonal awareness, ability to learn, flexibility, thoroughness and independence), influencing (rational persuasion and concern with impact of their activities), achieving (initiative and results orientation) and managing people (notably gaining commitment from others). This may be done by psychological testing (personality, numeracy, verbal reasoning) and/or observation of their behaviours in small groups of applicants who work together on case studies, involving debates and presentations.

It is no exaggeration to say that formal qualifications in marketing are most unlikely to compensate for perceived deficiencies in these vital competencies.

Should Universities be doing more to prepare their graduates for this harsh real world?

Are resources available?

If so, are students motivated to take advantage of such facilities?

164P WHAT'S REQUIRED IN A PHARMACOLOGY GRADUATE IN A MULTINATIONAL NON-PHARMACEUTICAL COMPANY

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The Right Skills.

What qualities do you need to be successful within a large Multinational company? Whichever function, division or specialism you join we believe that there are a number of core qualities that you will need to possess for a successful career at Nestle. These core qualities are more important than pure academic qualifications and will make the difference between a job offer and a rejection. Therefore, before you apply you should ask yourself the following questions and think of how you have demonstrated these skills or qualities in your work or social activities.

Are you able to respond to changing intellectual and practical challenges?

Do you have an analytical mind? Can you identify problems?

Are you persuasive, able to communicate your ideas clearly on paper and orally?

Do you have good judgement? Can you make decisions and commit yourself?

Can you establish an appropriate course of action for yourself and/or others to accomplish a given goal?

Do you actively influence events rather than passively

accepting them, seeing opportunities and acting on them?

Can you work effectively in a team as a full team member or as a leader?

More importantly can you give evidence of these skills and sell yourself?

165P WHAT'S REQUIRED IN A PHARMACOLOGY GRADUATE IN REGULATORY AFFAIRS?

Bob Clay, Pfizer Central Research, Sandwich, CT13 9NJ

Regulatory Affairs in human and animal pharmaceuticals describes an area of the business responsible for liaison with Health Authorities on the approval and marketing of medicines.

Graduates of many disciplines find their way into Regulatory Affairs usually after several years in a scientific role in pharmaceutical development. The basic disciplines include pharmacy, pharmacology, toxicology, chemistry and clinical sciences.

A variety of roles exist within this discipline from advising project teams on future regulatory requirements through preparation of documentation for submission and negotiation with regulatory agencies.

A regulatory affairs professional must be able to balance attention to detail with the big picture. They must be able to work with scientists from other disciplines - experts in their field. They must be comfortable dealing with people at all levels of management, the needs of the market place and the demands of the political environment.

166P WHAT'S REQUIRED IN A PHARMACOLOGY GRADUATE IN A LEGAL ENVIRONMENT?

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Shook, Hardy & Bacon is an American law office with international branches. A large proportion of our legal practice concerns scientific and medical issues, mostly related to products liability lawsuits. We are possibly unique in our use of multi-disciplinary teams for complex legal matters: scientists forming the major part of our non-attorney professional staff.

Pharmacology graduates bring a useful balance of skills to our environment. Key features in their background are:

- a solid grounding in basic sciences and in the application of the scientific method
- an appreciation of the value of basic and applied animal research
- the ability to bridge between clinical and experimental findings
- an understanding of the social pressure driving scientific regulation.

Outside of the basic curriculum, some universities offer courses in related fields. These are often essential in the legal environment. They include:

- experience in the clinical environment
- training in statistics and epidemiology
- the use of information technology, online systems and literature searching

- basic training in toxicology
- practice in the detailed critique of scientific papers
- training in the presentation of complex scientific matters to peers and lay audiences.

In addition to the above criteria, and consistent with the modern industrial environment, flexibility and adaptability in working practices, excellent interpersonal skills and enduring optimism are essential attributes.

Overall, the legal system is well-served by pharmacology graduates of all levels of experience. For all of the possible niches, scientific ability is an absolute requirement. However, few other disciplines approach the breadth of experience of the able pharmacologist. We must strive to maintain this excellence in an increasingly demanding environment.

167P WHAT'S REQUIRED IN A PHARMACOLOGY GRADUATE IN CLINICAL PHARMACOLOGY?

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The Clinical Pharmacology Group in Sandwich is responsible for such human studies from the entry of a drug into Phase I up to Phase IV. We also look after all assays of drug and biochemical surrogate markers to support the above studies. In order that the above may be expedited in the most efficient manner, we employ Project Managers to oversee the programmes, Clinical Research Associates (CRA) to ensure the studies are run according to international standards of acceptability and persons skilled in analytical techniques. Further, the Early Clinical Research Group of which Clinical Pharmacology is part, is responsible for two Phase I Units in which pharmacology graduates could be employed.

With regards to the above, it is our premise that first degree graduates in pharmacology would require at least 10 to 15 years experience in the industry before being accepted as a Project Manager. If this is the ambition of the graduate we would recommend returning for a higher degree.

It would be possible for a pharmacologist to take a position as a CRA straight after graduation. However, there is an abundance of suitably qualified individuals with experience so the new graduate will find gaining such a position very difficult. We introduced a couple of years ago, an industrial trainee position into the group. It is proving mutually very successful and we would recommend such a move to all scientifically based courses.

For those graduates with an interest in computing and in the practical side of the subject we can envisage positions in the Phase I Units. For example, there could be positions investigating and instigating electronic data acquisition, capture and transfer. Further, there could be positions as what we refer to as 'gizmologists', that is, individuals who could translate the theoretical aspects of a study into reality.

In summary, we envisage very few opportunities for pharmacology graduates in Clinical Pharmacology Groups in the pharmaceutical industry. These opportunities would be greatly increased if individuals could demonstrate computer literacy or if they had spent a trainee year in the industry.

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The speakers at this workshop identified the following core skills as being essential to graduate employability: communication skills (written and verbal); ability to design and carry out practical and non-laboratory based exercises; ability to think, learn and apply knowledge; to be competent with information technology (i.e. literature retrieval and data analysis); the ability to work effectively in a team and demonstrate leadership qualities.

Some contributors felt that although the possession of these core skills may be adequate for certain types of employment they are not sufficient for graduates wishing to pursue careers involving financial or marketing responsibilities where a lack of training in economics or business respectively may be disadvantageous. In contrast, the legal environment, especially the area specialising in product liability lawsuits, finds that graduates with a scientific background coupled with the ability to interpret data and literature make ideal candidates for multi-discipline teams. Such graduates need to communicate with all levels of management as well as experts in scientific or legal areas; they would be required to demonstrate an awareness of the needs of the market place and be sensitive to possible political ramifications of their work. Many of these personal and interpersonal skills would also be considered essential for posts in regulatory affairs and finance. For the graduate seeking a career in clinical pharmacology the news was not

encouraging with graduates requiring a high level of computer literacy and some industrial experience in order to be considered for employment by some companies.

Data suggests many pharmacology graduates choose posts in the pharmaceutical industry or enter post graduate training which will involve practical skills. The changing environment in which companies operate means that more emphasis is placed on the early identification of new targets that satisfy unmet therapeutic needs. The pharmacology graduate in the research laboratory will therefore need knowledge and practical experience of modern biology with more molecular and cell biology than hitherto; the more traditional *in vivo* skills, though important for drug discovery will be less in demand. The key competencies identified for this employment were analytical thinking, ability to learn, tenacity and a concern for standards.

Overall, the participants were in agreement that the majority of skills required for the training of future pharmacologists were addressed in courses; especially communication, presentation, practical and team skills. In addition, students are encouraged to critically analyse data, review literature and to develop computer literacy skills. The teaching of these skills should be explicit to the students. It was also felt that the development of problem based learning methods, interview skills and increased numbers of industrial placements were areas that need urgent attention. Although the majority of courses are addressing the need for more molecular biology, some concern was expressed about the potential loss of some 'traditional' pharmacology teaching.