

Genetics education for pharmacists

By Hilary Burton and Ann Shuttleworth

Advances in genetic science have increased the number of health interventions that can be undertaken with regard to genetic disorders. Genetics is, therefore, expanding into the domains of pharmacogenetics, national screening programmes and disease prediction. Such expansion means that a growing range of health professionals, including pharmacists, need skills and knowledge in genetics in order to take on new roles.

This article describes the development of a strategy to meet the educational needs of pharmacists and other health professionals being asked to take on new roles in genetics

The Human Genome Project offers expanding health opportunities for individuals, families and communities and creates new roles for practitioners in a number of health professions. A draft sequence and initial analysis of the human genome — the complete “instructions” for making a human being — has been published. By the end of this year scientists plan to finish the entire sequence along with a database of the most common variations that distinguish individuals.

Already the genetic cause has been identified for over 200 single-gene diseases, such as cystic fibrosis and Duchenne muscular dystrophy. In the near future, genetic predispositions to such common diseases as cancer, heart disease and diabetes might lead to individualised interventions or lifestyle advice. In addition, increasing understanding of disease at a molecular level will lead to new subdivisions of disease, requiring different treatments. Genetic variation in individual response to drugs will bring pharmacogenetics to the fore.

The Government has recognised the importance of the science of genetics. In a speech at an international conference entitled “Genetics and health — a decade of opportunity” on 16 January 2002, Alan Milburn, the Secretary of State for Health, signalled the Government’s intention to develop modern genetic health services and its recognition that “genetics will spread from specialist centres into GP surgeries, health centres and local hospitals”. Professionals throughout the health service will need to become competent in genetics. However, at present both the science and the practice of genetics are unfamiliar to most health professionals. This means that the health service is ill-prepared to take full advantage of new opportunities for improved health and health services.

For pharmacists, appropriate training for them to become involved in pharmacogenetic testing is of the most immediate concern. It has been predicted that genetic

tests for inherited side effects to some of the most common drugs will be available in high street pharmacies within a year. These tests will provide results in under 30 minutes from a simple saliva sample. Similar tests for an inherited predisposition to deep vein thrombosis could be made available for use at airports.

RESEARCH PROJECT

In October 2001, the Public Health Genetics Unit (PHGU), part of the Cambridge Genetics Knowledge Park, was commissioned by The Wellcome Trust, an independent biomedical research charity, to develop a strategy for the education of health professionals in genetics.

The project has now revealed that, across a wide range of health professions, the provision of education in genetics, from basic understanding of science to inclusion of some of the ethical, legal and social implications, is currently not sufficient to provide an adequate basis for future practice. It reports on work undertaken to review education in genetics and from this to proceed to development of a UK-wide educational strategy.

The first phase of the project was to undertake a needs assessment and review of current educational provision within the context of national health policy. This was completed in June 2002. The second phase, which involves the development of a national strategy for education of health professionals in genetics, is in progress, and is funded jointly by the Department of Health and The Wellcome Trust.

The main sources for the needs assessment were published policy documents and literature reviews, other published and unpublished reports, personal contact, and material published on university and other websites augmented by e-mail correspondence where possible. A detailed telephone survey was also undertaken of genetic education in establishments providing post-graduate training and education for nurses.

The wide scope of the work and the relatively short time scale for its completion meant that it was not possible to be exhaustive in the search for relevant work. However, the findings are believed to be a reasonable representation of the current situation on which to base future strategic work.

GENETICS AND PHARMACY PRACTICE

Developments in pharmacogenetics are leading to new opportunities for pharmacists to assist in the development of therapies that can be tailored to individual patients’ needs. Such developments were recognised in the Royal Pharmaceutical Society’s “Pharmacists: the scientists in the high street” information sheet as a particularly important arm in the Government’s strategy for pharmacists. This strategy, “Pharmacy in the future — implementing the NHS plan”, published by the Department of Health in 2000, takes as its central theme the improved use of medicines. Similarly, the Department of Health and Social Services for Northern Ireland has noted, in its 2001 review of clinical pharmacy services, that the development of pharmacogenetics and genomics will “increase the demand for expert advice and information”.

Pharmacogenetics is the use of the new science of genomics and genetic information in the study and use of clinical medicines. It has important consequences for the selection of therapeutic agents. The science is based on information arising from the Human Genome Project. The human genome consists of 30,000 to 40,000 genes arranged on 23 pairs of chromosomes. These genes are made up of three billion base pairs, or nucleotides. Variations between individuals, known as single nucleotide polymorphisms or SNPs occur at intervals of approximately one in every 300 base pairs. There are potentially, therefore, 10 million SNPs within the genes of any two individuals.

These genes provide the code to the production of proteins in the body and are

FURTHER INFORMATION

Information about the project, including the background report can be obtained on our website:

www.medschl.cam.ac.uk/phgu

Anyone wishing to contribute to this important national work, whether as a practitioner, teacher or manager, is invited to e-mail the project leader (hilary.burton@srl.cam.ac.uk).

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Panel 1: Current genetics education with relevance to pharmacists

- The University of Central England in Birmingham produces modular courses for non-medical health professionals, including a module on genes inheritance and health
- Imperial College London has an MSc in human molecular genetics and is developing a distance learning version
- The Genomics Policy Research Unit, University of Glamorgan and University of Wales College of Medicine offers an MSc on genetics, health and society for experienced health and social care professionals
- The University of Nottingham School of Nursing and Academic Division of Midwifery offers a course genetics in health and disease for health professionals from all disciplines as one module in their postgraduate educational programme. This includes issues biochemistry and advanced molecular genetics and the influence that these are having on modern health care provision
- Queen Margaret College, University of Edinburgh, offers a week-long module on understanding genetics

Panel 2: Examples of on-line resources in genetics of relevance to pharmacy practice

- Understanding gene testing
www.accessexcellence.org/AE/AEPC/NIH/index.html
- Medicines and the new genetics
www.ornl.gov/hgmis/medicine/medicine.html
- Genetics and your practice
Mchneighborhood.ichp.edu/wagenetics/906317226.html
- Department of Health Genetics Unit
www.doh.gov.uk/genetics
- Human Genetics Commission
www.hgc.gov.uk
- European Society of Human Genetics
www.eshg.org

the basis for individual variation. Whereas they can manifest themselves in outward appearances such as skin and hair colour, it is of relevance to pharmacy practice that they also can result in subtle changes in the structure of proteins responsible for transport mechanisms, drug receptors and metabolic activity, slightly changing the ways in which they function. This accounts for the differences between individuals in their response to therapeutic agents. It is envisaged that diagnostic kits will be developed which could be used in pharmacies to enable pharmacogenomic factors to be measured in order to help choose the most suitable medicine and dosage schedule for each patient.

The implications of these developments are that many pharmacists will need to be involved in counselling patients to help them understand and interpret the diagnostic information in their individual situations and to work in partnership with patients to optimise their use of medicines. This is in contrast to the current situation, where little account is taken of individual genetic variation and the failure of standard therapies is quite common.

A small group of experts has been convened by the Royal Pharmaceutical Society to consider the role of pharmacists in testing for drug individualisation. It is also considering a separate possible role for pharmacists in undertaking predisposition testing for disease. A position statement is expected from the Society in due course.

EDUCATION FOR PHARMACISTS

The undergraduate education for pharmacists includes genetics in the extensive basic science curriculum. In the current indicative syllabus published by the Royal Pharmaceutical Society there are sections on genetics in curriculum areas concerned with normal and abnormal bodily function, and on genomics and proteomics. Genetics factors

also feature in curriculum areas on the molecular basis of drug action, clinical therapeutics, drug absorption, distribution, metabolism and excretion, and prospects for new approaches in therapeutics. However, there is no consideration of any of the ethical, legal and social issues involved.

During the professional training that takes place in the preregistration year, consideration of genetic aspects does not receive prominence and again pharmacogenetics and the wider concerns around genetics, which might help to prepare pharmacists for future practice, are not included. Finally, for those pharmacists already in practice, genetics has not yet been included in any of the continuing professional development programmes provided by the Centres for Pharmacy Postgraduate Education in England, Wales, Scotland and Northern Ireland.

Some initiatives aimed at health professionals in general may be appropriate to pharmacists wishing to develop their skills and knowledge before profession-specific programmes are developed (Panel 1). Some online resources are also available (Panel 2).

A UK STRATEGY

In September 2002 the second phase of the project began: to formulate a UK-wide strategy aimed at developing understanding and competence in genetics across a wide range of health professions. A draft document for consultation should be ready by summer 2003. A key feature of the process will be a series of stakeholder workshops for target professionals. One of these groups will be pharmacists, including both hospital and community practitioners and those involved in education. Educational consultancy for the whole project will be provided by the Open University Centre for Medical Education and the perspective of the general public will be provided in consultation with the Genetic Interest Group.

The workshops will be used to gain a broad consensus on educational requirements and to consider how this education should be provided at all levels from undergraduate to continuing professional development. It is already evident that the process of education will be complex and will need to be sustained over many years until it is thoroughly absorbed into the educational curricula of all relevant professions. The breadth and depth of material, from basic science to the ethical, legal and social aspects of the new genetics, and the need to target professionals at various stages of their careers, almost certainly mean that a multiplicity of methods will be required to support formal and informal learning. The role of electronic or web-based resources, the development of material to support genetics in the curriculum, and the roles and resources required for more specialised genetics courses or modules will need to be considered. In addition, information to support clinical practice as well as other less formal learning opportunities will be considered. For example, the role of regional medical genetics centre websites in providing local and general information support will be evaluated.

Current opportunities and barriers to education in genetics will also be examined. For pharmacists there is some level of urgency as genetic testing to inform drug prescription begins to become a reality and, even now, genetic testing for predisposition to disease is becoming available over the internet and in some high street outlets. However, general threats and difficulties will arise from the many NHS competing priorities and the current content overload, all with their own imperatives, evident in professional curricula. Delivery of genetics education will also be hampered by the lack of experienced teachers and lack of curriculum resources. These two areas will, therefore, be an early priority for an educational programme.