

# **Social, ethical, and public policy implications of advances in the biomedical sciences: The Wellcome Trust's initiative on pharmacogenetics**

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The views expressed in this paper do not represent those of the Wellcome Trust.

The Governors of the Wellcome Trust decided in June 1997 to fund a programme of research into the social, ethical, and public policy implications of advances in biomedicine, under the title The Biomedical Ethics Programme. This is a new area for the Trust, its response to the growing recognition over recent years that advances in biomedical science raise questions of ethics and of social impact which require careful examination and in some cases suitable regulatory supervision.

Research grants for this programme are funded in responsive mode, open to UK-based researchers with expertise in social, ethics and policy research. It is up to the research community to identify research themes. In addition to responsive mode funding, the Trust has recently called for proposals on two specified topics, 1) the collection of human biomedical samples for DNA and other analysis, and 2) pharmacogenetics. To encourage work on these themes, a workshop was organised on each so that interested researchers could familiarise themselves with the scientific developments, and identify areas of social, ethics and public policy research which need to be done. The workshops were not intended to debate issues, but rather to try to identify research questions. Researchers, it is hoped, will be stimulated to submit good project grant proposals to the programme. Ultimately, the results of research and analysis might feed into public policy-making.

This paper describes the Biomedical Ethics Programme, and reports on the results of the pharmacogenetics workshop, which took place 29 October in London.

### **Social, Ethics and Public Policy Consequences of Biomedical Advance**

The Wellcome Trust is an independent medical charity, and a major funder of basic biomedical research in the UK. It also supports scientific researchers in 30 different countries. These scientific goals are complemented by the Trust's long-standing support of academic work on the history of medicine, and more recently funding of activities to encourage public engagement with science.

The decision in 1997 to create a distinctive funding programme for social, ethics and policy research into the implications of biomedical advance is unusual for a scientific funding body. The Trust became conscious of the fact that existing funding schemes for research have not been adequate to address the widening public policy concerns raised by genetics and other areas of biomedicine which the Trust itself supports. There was also a sense that there were not enough researchers in the UK who could do high-quality work in this area.

Similar concern was raised by the House of Commons Science and Technology Committee in their 1995 report on *Human Genetics: The Science and Its Consequences*, "The dilemmas that genetics poses will be resolved by the public and parliamentary debate, not by academics alone. But that debate must be well informed, both about the science itself and about its ethical, legal and social implications".<sup>1</sup> The Committee went on to note, "we have found no coherent programme of research to match the ELSI programme [the US programme on ethical, legal and social implications of genetics, part of the Human Genome

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<sup>1</sup> House of Commons Science and Technology Committee, Third Report, *Human Genetics: The Science and Its Consequences*, Volume 1, 6 July 1995, para. 263, p. lxxxv.

Project]. Moreover, there are fears that even were such a programme mounted, there would be difficulty in finding academics with the necessary expertise to conduct it.’<sup>2</sup>

One of the underlying assumptions of the Trust’s programme is that some lines of research are already well covered by medical ethics, health services research, and health economics. The programme goes wider to include concerns of social cost and cultural impact, particularly for problems which arise from high specialisation in science and in medicine. The field of study is by definition multidisciplinary in the biological sciences, medicine, ethics, social sciences, economics, law and politics. It benefits from employing approaches and concepts from all of these disciplines. Thus the research effort which the Trust is trying to encourage does not define the disciplines and methodologies to be employed in advance. Rather, it defines itself by a field of study. There are two priority subject areas, neurosciences and genetics.

Crucial to the programme is its interest in supporting high quality empirical research which identifies real problems and poses practical research *questions*. Some of the public policy debates recently have tended to focus on broad issues, declarations of principles, and anecdotal evidence, as happened recently with cloning. The programme places emphasis on factual or empirical investigations to further public policy considerations.

This does not however exclude moral reflection upon ethical issues. Reaching a balance between the amount of “normative” work as compared to empirical studies (“descriptive” ethics) has proved a difficult issue. Normative ethics concerns working out what the norms of right and wrong should be, whereas descriptive ethics looks for evidence to reveal the norms people are actually giving effect to in their conduct. Descriptive ethics may also seek to understand public attitudes to right and wrong and to study what people think ought to be the norms of right conduct.

Our experience has been that the distinction between descriptive and normative ethics, drawn most clearly in the classic text<sup>3</sup> of Beauchamp and Childress, is misleading and unhelpful. If a piece of work is to be any good, then there has to be a normative element in there, even if it is predominantly empirical or descriptive. Similarly, a piece of normative work which does not take account of at least some factual, contingent characteristics of the world is unlikely to succeed.

The programme has two components

- a scheme of grants, studentships and fellowships
- other support activities

Research grants in the two subject areas, neuroscience and genetics, are normally funded in responsive mode, open to researchers with expertise in conducting research into the social, ethical, and public policy consequences of advances in the biomedical sciences. Training

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<sup>2</sup> Ibid., para 266, p. lxxxxvi, references removed.

<sup>3</sup> Tom L. Beauchamp and James F. Childress *Principles of Biomedical Ethics (Fourth Edition)* OUP 1994.

fellowships are funded to encourage multidisciplinary working and career development; these include a small number of Ph.D. studentships and post-doctoral fellowships. The programme is designed to build national research capacity, and training fellows would be expected to go on to become research workers and apply for grants either from the Trust or other funding bodies in their own right.

Grant proposals are considered in the usual way. They are sent to referees in the academic community for review, and then to an independent panel of academic experts. The panel represents expertise in the social sciences and humanities disciplines, as well as in the public understanding of science. The panel considers funding of activities and grants in public understanding of science as well as for those which come under the Biomedical Ethics scheme. The Biomedical Ethics programme is part of the Trust's wider Medicine in Society programme which includes the Consultation and Education section who are involved in broadening out the debate to the public. Their activities include support for research and activities in public understanding of science.

It became clear during the planning of the Bioethics programme that research funding alone was not sufficient. Researchers interested in the impact of biomedical science are scattered across the UK and are not always in communication with each other. The field of study is itself changing, and researchers need kinds of support in addition to grants funding to ensure that networks of information and people be created, to identify the kind of research that needs to be done, and to communicate the results of research to public policy makers and others.

These "in-house" support activities include the organising of workshops to bring researchers from different disciplines together; and an annual summer school for post-graduate students. The programme is also involved in developing ways of disseminating the results of research both within Britain and, more widely, in Europe; and identifying high-priority issues where there is, or is likely to be, demand from public policy for knowledge, information and expert opinion.

The Trust decided in June 1999 that it should try to encourage applications on two specified "high-priority" areas, pharmacogenetics and human biological sample collections. The topics were chosen because of their importance, and because they could provide exemplars of how different disciplines could contribute to the study of social and ethical consequences of genetics. The aim is to improve the quality and focus of grant applications. A call for proposals in these two areas was announced in August, and a workshop and briefing paper were planned for each topic. Successful applicants for these awards will be obliged to contribute to policy papers to bring this work to a wider audience.

### **The Pharmacogenetics Initiative**

The workshop on pharmacogenetics was held on 29 October in London, for some 30 UK-based researchers to familiarise themselves with the scientific developments, and to begin to set a social and ethics research agenda. The Trust commissioned a briefing paper for participants from a science writer, Robert Sneddon, and invited Dr Alun McCarthy, of the

pharmaceutical company Glaxo Wellcome, to speak on the perspective of the pharmaceutical industry. Alun McCarthy, Therapeutic Advisor of Cardiovascular Clinical Genetics in Glaxo Wellcome's Research and Development Section, is particularly interested in the role of genetic variation in an individual's response to drugs. He has also taken part in discussions on ethical and social issues arising from genetics research.

### ***The view of the pharmaceutical industry***

Currently drugs are designed and prescribed largely for a general patient population. Efficacy trials for potential new drugs are done by "trial and error", and doctors make "best guess" treatments based on a generalised picture of the efficacy and safety of a drug. This process takes much time, and may mean that patients see their doctors more often than is necessary, and are taking more drugs than they need. Doctor's choices may prove ineffective. The exercise is expensive and time-consuming.

A patient's response to a drug may be dependent on a number of factors and these will include environmental as well as genetic influences. The absence of drug-metabolising enzymes, for instance, can cause extreme or sometimes fatal drug reaction, or the therapy may fail because the drug is not activated. Adverse drug reactions (ADRs) are said to be the fourth largest cause of death in the United States. Dr George Poste, Chief Science and Technology Officer of SmithKline Beecham, quotes a study in the *Journal of the American Medical Association* (15 April, 1998) showing that two million Americans suffer from adverse drug reactions every year, with 106,000 deaths among them.

The aim of pharmacogenetics research is to find the means to control for the factors which influence drug response when the drug is tested and when it is prescribed. Much of this work is going into researching the consequences of genetic variation with the tools available from genomics research. Cholesterol-lowering drugs are an example given of an expensive treatment that is ineffective in non-metabolisers of the drugs. Pharmacogenetics could be cost-effective if it proves possible to enable doctors to identify non-responders straightaway, without waiting three or four months before trying another drug.

A promising approach to generating information about human variability and genetic markers lies in studying single nucleotide polymorphisms (SNPs), the sites on the genome where variability occurs. SNPs are believed to be evenly distributed along the human genome at a frequency of about one every 300 to a thousand bases. Distinct groups in a population may differ in their ability to metabolise particular drugs. A certain percentage of people will have one version of a polymorphism, and the rest will have another. A higher than expected incidence in a group of people who have a particular condition will suggest that the particular SNP is associated with it. Once found, the SNPs will be mapped to positions on the genome.

There is no certainty that any of the SNPs in a particular gene are indicators of disease susceptibility or variations in drug response, but it is hoped that a small number of these might prove useful for diagnostic purposes.

Research is in its earliest stages. The bulk of effort is going into generating hypotheses on how genetic variation works, and how to achieve the specified therapeutic goals. Is it possible to make correlation between drug response and specific genetic or biochemical differences where no pattern of inheritance is obvious? If so, establishing the link between genotype and drug effect may be difficult. In many instances the observed effects may be due to multiple gene action.

Before genetic profiling becomes an established part of clinical procedure, carefully designed clinical trials incorporating genetic analysis will have to be carried out in order to establish the predictive value of genotyping with regard to drug response. At an American Medical Association media briefing on genetics in June this year (1999) Ira Herskowitz, Professor of Genetics, University of California San Francisco, said<sup>4</sup> “With a better definition of disease and how an individual responds to a particular candidate drug, drug trials can be carried out on just the right people who will metabolise the drug properly. This, therefore, greatly increases the chances of having a successful outcome for a clinical trial.”

The hope for pharmacogenetics is that drug design will rely less on trial-and error-clinical trials, and new classes of medicines should have fewer side effects than many currently available medicines. The pharmaceutical industry are looking to the cost savings that could come from testing for genetic variations. Within the next five to fifteen years the identification of genetic polymorphisms that are relative to the diagnosis and treatment of disease will bring about more efficient clinical trial design. Drugs may reach the market faster as a result, and stay there longer. Pharmaceutical companies might look again at their past failures.

It will not, however, be in the interests of the pharmaceutical industry to push the process of tailoring drugs too far. Considerations of economics and of the drug production process mean that segregating the population down to the individual’s reaction to a drug is an unlikely prospect. Precise published estimates are rare of the extent to which the industry envisages segmenting its market along genetic or any other lines, but a rough rule of thumb appears to be that the industry will not want to push the segregation below about 30 per cent of the market. Thus, for example, pharmacogenetics may lead to a 30:30:40 split of a previously unified market for a drug, but is unlikely to lead to the identification of subgroups at the five per cent level, say. The decision will almost certainly vary from case to case and will be influenced by the prices at which the relevant drugs can be sold.

A related point is that the issues of safety and of efficacy have not yet been clearly distinguished in published commentaries on pharmacogenetics. Conceptually at least, the group of people who are non-responders to an existing drug is distinct from the group who might suffer adverse reactions to a new or different drug. It remains an assumption to be tested in practice that segregating the population into subgroups for whom different drugs are efficacious will also take care of the problem of those for whom some of these drugs are dangerous. Adverse drug reactions could be distributed differently to non-response: it might

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<sup>4</sup> Quoted in Robert Snedden, *Pharmacogenetics Workshop Background Paper* (page 7), The Wellcome Trust, London, 1999, (unpublished).

be that if genotyping is used, as outlined in the previous paragraph, to identify a comparatively large subgroup for whom a new drug is efficacious, there may be undetected individuals within this subgroup who will have an adverse reaction to the new drug. To identify these individuals might require more detailed genotyping than is warranted for reasons of efficacy. There is thus a potential tension between the industry's desire to "pool" patients into comparatively large groups so as to achieve economies of scale in production and marketing, and the demands of pharmaceutical safety which may impose a requirement for genotyping almost down to the level of tailoring for individual variation. Whether this tension will be realised in practice remains to be seen.

Alun McCarthy summarises the potential impact of pharmacogenetics on health care:

- prognosis before diagnosis (predictive medicine)
- targeted therapies
- tailored care for a more rational system of health care
- an increase in "minibuster" rather than blockbuster drugs

The move away from generalised blockbuster drugs was brought home to Glaxo Wellcome by the recent decision of a newly formed government agency, the National Institute for Clinical Excellence, over their flu treatment, Relenza. The UK Government recently set up NICE as a drugs review agency to ensure clinical and cost effectiveness of drugs prescribed on the NHS (National Health Service). The insistence on cost-effectiveness marks an additional hurdle for pharmaceutical companies looking to license a new drug. Up until now, once a drug passed safety and efficacy tests, the cost to the NHS was agreed quickly, and the new drug could be launched almost immediately. NICE's first decision was to recommend that Glaxo Wellcome's new influenza treatment Relenza be rejected for NHS prescription on the grounds that it was not cost effective. One of the issues to emerge in the argument which followed between Glaxo and the Government was the design of the clinical trials. The drug was tried on 6,000 subjects, but was not tested on the elderly, a vulnerable group who would naturally be seen as prime candidates for flu treatments.

### *The ethical context of drug R&D*

When conducting clinical trials using human subjects the pharmaceutical industry needs to recognise principles of confidentiality and privacy; to ensure informed consent for specific tests; and to comply with policies concerned with human rights and protection against discrimination.

Alun McCarthy notes that a problem for Glaxo Wellcome in complying with guidelines for informed consent in an area as new as pharmacogenetics is that general knowledge about genetic variation and drugs is low, even among clinical investigators. There is no available information for professionals and patients. Glaxo Wellcome themselves are writing and providing the information for both investigators and patients involved in testing for this reason.

The work of the human genome project and the genomic research which is following it have raised significant questions about its social value even where there is agreement about the

value of the science. Aspects of the program relevant to pharmacogenetics include research into testing to predict future illnesses well before any symptoms become apparent; privacy and fair use of genetic information, particularly with respect to employers, insurers, banks and others; and misuse of information to discriminate against individuals with a particular genetic make up.

A problem for the industry is that the many existing guidelines are incompatible between countries, and say little about genetic information of the sort likely to be generated by pharmacogenetics research.

The ethical context for industry framed as issues of

- informed consent
- confidentiality and privacy
- human rights

are clearly important and relevant to public policy. They raise questions for further policy research, but there are other ways of responding to the social and ethical impact of genomics research which both inform this ethical context and widen it.

### *Social perspectives*

Presented with the most optimistic view of the promise of pharmacogenetics, what social and ethical questions come to bear? This section outlines the response of researchers who attended the Wellcome Trust's workshop on pharmacogenetics, and the partial research agenda which it suggests.

The points and questions raised can be organised under four themes

- the social world is more complex than biological reality
- uses of personal medical information
- "lay" public participation in decision-making
- implications for oversight and regulation

#### *The social world is more complex than biological reality*

The "best hopes" view of bioscience reflects a rational model of how the world works, but the social world is more complex than biological reality.

a) This point raises questions about the underlying biological claims of genomics, and the problem of buying wholesale into the biochemical view which dominates health research. Response to treatment is not simply biochemical, as a phenomenon as fundamental as the placebo effect suggests.

Scientists are well aware that the multiple genes involved in a drug reaction can be hard to decipher and that diagnostic tests can be unreliable; and that some patients could still suffer life-threatening reactions to medication. Beyond that, however, is a fundamental issue of how similar pharmacogenomic approaches are to the socio-biology argument, encouraging us to understand medical events in terms of genes and genetics rather than seeing these



elements as part of a whole panoply of biological and environmental and social factors.

The problem is twofold. Firstly, researchers, including technical and scientific workers, need to revisit the scientific claims underlying genomics. Secondly, the perceived shift from a public health to an individual if not private health care model needs to be addressed; if this is happening, an important area for research is to identify and track *how* it is happening, and *what should and can be done about it*.

b) What effect will rationalisation have on the health services? The call for evidence based medicine in regard to adverse drug reactions sounds eminently sensible, but is this actually a good thing in practice? In particular

- What are the costs – financial and social – that underpin this transition into a postgenomic medical system, with segmenting of population groups of patients?
- What are the psychological costs of segmentation. How do genetic nonresponders feel if they become by default an untreatable class?
- How will the goal of refining population groups effect patients' access to health care and other social goods? Will some be excluded?

The challenge is to identify the real problems and of measuring intangibles in a health system dominated by economists and an evidence-based medicine ethos.

c) At an international level, what will be the impact on the health of developing countries? This is an ethical as well as political question of equity. Many national governments, the UK included, have stated commitments to decreasing inequalities in health world-wide.

#### *Use of personal information: public policy considerations*

The use of personal information for genomics research, and the status of DNA banks and other biological sample collections, have become urgent concerns among scientific and social commentators. This theme is highly relevant to pharmacogenetics, one of the biggest areas of research involving sample collections. If pharmacogenetics research does lead to a new class of pharmaceuticals, it will be easily integrated into the health system. As a diagnostic and therapeutic approach it does not raise some of the ethical issues which genetic testing for disease conditions does. The problem is one step away: pharmacogenetics may make genotyping of large groups, which does raise many ethical issues, more acceptable.

The use of genotyping in pharmacogenetics will take two courses. At one level, genotyping can be used in clinical trials to test for one or two characteristics with respect to efficacy or adverse drug reactions. In this case, the biological sample would be used only once for this purpose, and then be thrown away. This level of genotyping is considered to be fairly well covered by existing codes of practice. It is not very different from using other kinds of criteria for inclusion or exclusion in clinical trials. A second level is the need for access to stored sample collections, including population collections, for long-term research and use.

This level raises many questions about access to, use of, and ownership of stored samples and personal medical information.

The general view in the UK is that personal information in epidemiological studies should be anonymous, and if the research does not harm the individual, and if a research ethics committee has given approval, then additional consent is not required. Autonomy is said to be upheld by “opting out” provisions at earlier stages. The Medical Research Council’s interim ethical guidelines on “Collections of human tissue and biological samples for use in research” confirm this approach as an accepted and necessary medical practice.

However, this view is being challenged as the terms of scientific and medical research change. A recent High Court judgement<sup>5</sup> ruled that personal information collected for the purposes of health care cannot be given to a third party without the consent of the patients who are subject of the data, even when that data is anonymised. In this case, a data collecting company sought to persuade GPs and pharmacists to allow them to collect data about the prescribing habits of GPs to sell to pharmaceutical companies. The issue became one of protection against the invasion of patient privacy, even if anonymity can be guaranteed. The judgement has raised concern among the bioscience and medical research community because it could be seen to prohibit any use of samples without prior explicit consent. It is not yet clear if this ruling, which has gone to appeal, will jeopardise the practice of sharing of confidential information between members of the medical profession, or the accepted use of anonymised data for epidemiological research.

Clearly research needs to be done on “what is happening” in regards to the use of personal medical information, anonymity, and use of coded records.

In the UK, doctors enjoy a high level of public trust, and biomedical research is not as controversial as is agricultural biotechnology. As the sociologist Hilary Rose pointed out, people make sophisticated *social* judgements when they give their consent to donation of biological samples for research, or consent to take part in clinical trials. People make judgements about the uses of the research, and the professionals they deal with. Informed consent, therefore, is not simply a matter of understanding the technical issues and technical risk measurements. People need to agree with the goals of the research, the goals of the institutions involved, and they need to feel that they can place their trust in them. This could easily be called into question if people felt that their confidence was not being kept and if they felt that medical information was being used for commercial gain.

Commercialisation, issues of intellectual property and patent regimes for biotechnology, may affect the doctor-patient relationship, which is vulnerable at a time when new partnerships between academia and industry have blurred the boundaries between public and private interest. An objection to the heavy involvement of industry in human genetics research is that it can constrict academic freedom and access to important resources such as DNA banks. This has been a major worry about developments in Iceland with the deCode databank. It bears on pharmacogenetics research which depends on access to biological samples and genotyping to do the work linking diseases and drug responses to human genetic variation.

The controversy and confusion at this time over use of samples and personal medical

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<sup>5</sup> *R v Dept of Health ex parte Source Informatics*, Lloyds Law Report Medical. August 1999 264.

information raises legal issues that must be addressed, but there is also a great deal of ethnographic and historical work that needs to be done to illuminate how some technologies come to be accepted, and others rejected. The worth of such accounts is that they need not be wholly or centrally focused on medical scientific or legalistic terms of a policy debate. Careful ethnographic and socio-historical analyses can demonstrate precisely what happens in the complex “social reality” as distinct from the “biochemical reality” of bioscientific research on the body.

An ethnographic study in the Northwest of England by Jeanette Edwards<sup>6</sup>, a social anthropologist, provides a useful example of what ethnography has to offer. Jeanette Edwards interviewed people in a town in the north west of England, which she calls Alltown, about their concerns about IVF, embryo research and freezing embryos. They articulated in depth concerns and ideas about eggs, sperm and embryos in terms of (among other things) the new family relationships and relatedness which were implicated: Who is responsible for the resulting child of a frozen embryo? What is the relationship of donors of gametes to resulting child? Who are the mothers, fathers, aunts and uncles? By contrast, the public policy debate over embryo research in the UK in the 1980s was concerned with “the status of the embryo”. The scientific, philosophical and legal perspectives were wholly concerned with the isolated embryo of scientific research and western philosophical thought. Policy makers decided that embryo research should be allowed but only up to 14 days after fertilisation, when the primitive streak forms. The sense of relationship and responsibility reflected in the concerns of people of Alltown was outside the policy debate.

#### *Lay involvement and implications for oversight*

A recurring theme of the Wellcome Trust’s workshop on pharmacogenetics was “lay” involvement in setting research agendas and in policy making around the new genetics. This is not surprising since consumer involvement in health service research in the UK has been remarkably successful in affecting the treatment of patients and subjects of research since the 1960s. But, researchers ask, how are lay agendas set? This is a question which requires social and historical analysis. What is the merit in eliciting public opinion, for example, through polls or focus groups? A problem identified here is that the result is a “snapshot” view of opinion, which is limited, rather than real public involvement. Developing a knowledge base to increase lay involvement takes time and resources, but there is no infrastructure in the UK to support community groups. There is, however, a high level of financial support and involvement of the pharmaceutical industry in patient groups, which needs to be taken into account to understand how lay agendas are set.

At the most fundamental level, there is lay involvement at the moment when a participant in a clinical trial or other biomedical research project signs the consent form to participate. As

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<sup>6</sup> Jeanette Edwards, “Explicit connections: ethnographic enquiry in north-west England” in, Jeanette Edwards, Sarah Franklin, Eric Hirsch, Frances Price, Marilyn Strathern: *Technologies of procreation: Kinship in the age of assisted conception*, Manchester University Press 1993; reprinted by Routledge, 1999.

noted earlier there are few even in the scientific and medical community with the understanding of pharmacogenetics and its implications. Information provision is lodged with industry and so it is the pharmaceutical company's perspective that is by default put before participants in pharmacogenetics research at this time. The question of where informed consent comes from is therefore important.

### *Implications for oversight*

Regulation and policy reflect where value is being put. On the one hand, pharmaceutical companies are shaping their own ethical frameworks, and have taken a lead on this. On the other, guidelines and codes of practice are being formulated on national and international levels. The MRC interim guidelines on "Collections of human tissue and biological samples for use in research" cite no less than 15 codes of practice, statements on ethics, and guidelines relevant to collections, as well as making reference to the EU Directive on the Legal Protection of Biotechnological Inventions (2.3); the Council of Europe Convention on Human Rights and Biomedicine (2.1); and the HUGO Ethics Committee "Statement on DNA sampling: control and access" (4.2).

Consideration of social values and lay knowledge in decision making is starting to be recognised, but has not got far for health and medical biotechnologies compared to the area of environmental risk assessment. Bureaucracies are not geared to inclusion. Professional knowledge and values dominate, while "lay" knowledge and wider social values are marginal. There has been a tendency to assume a distinction between the facts and values, for instance when talking about informed consent. But recent arguments over the difficulty of attaining truly non-directive consent in genetic counselling challenge that distinction. As useful and necessary as it is to make such distinctions for policy making, to ensure good scientific and clinical practice, the distinction has tended to forestall understanding of social reality. In the context of environmental technology assessment, this problem has been addressed to some extent. The twenty first report<sup>7</sup> of the Royal Commission on Environmental Pollution recognises that technical knowledge has values embedded in it. The Commission pointed out that the social value which informed their model of risk assessment is *sustainability*. It further argued for the need to incorporate wider social values and local knowledge (as distinct from professional or technical knowledge) into the very model of technology assessment.

### *What research should and could be done?*

These considerations suggest areas for further social, legal, ethical, political, and public policy research. Some themes and areas have already been identified in this paper. Others are

- Understanding the context of our own national systems of oversight, and the regulatory frameworks themselves

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<sup>7</sup> Royal Commission on Environmental Pollution, Twenty-first Report, *Setting Environmental Standards*, Cm 4053, HMSO London, October 1998.

- Understanding the “practical ethical” decision making that people – professionals, patients, and other members of the public alike – make every day around an area such as pharmacogenetics
- Identifying and studying the different locations where biotechnology develops; one delegate to the workshop suggested the patent office as a site where moral arguments are played out.
- the question of how can the different trustworthy claims – local knowledge, professional knowledge - be reconciled when the practicalities of policy making are at stake.

There is wide agreement that local production of knowledge is needed as well as academic research. The public is more interested in science than ever before, it seems. The view that European citizens are “anti-science” and expect zero risk, recently made by William Steere, chairman of the US drugs group Pfizer<sup>8</sup>, misses the point that people make sophisticated social judgements of risk, taking into account not only “technocratic” factors such as the calculus of probabilities of an adverse event, but also assessing the acceptability of the event itself (independently of the probability of its occurrence). Thus in the UK, there is considerable public concern about the wholesomeness of food, partly attributable to recent history in which public safety did not appear to be the foremost concern of the regulatory authorities and partly to the social and indeed cultural significance of food. In contrast, there is remarkably little public concern about the safety of pharmaceutical drugs even though, as mentioned earlier in this paper, adverse drug reactions are a serious public health issue. Here public confidence appears to be maintained by a rigorous regulatory system and, if anything, reinforced by periodic withdrawals of drugs from the marketplace when subsequent evidence of ill-effects becomes known.

To carry out research into the social, ethical and public policy implications of pharmacogenetics, researchers will need access to institutional sites where the research and development play out: the patent office as well as companies doing the research were identified by researchers. Technical people need to be engaged in the work.

Since scientific research into pharmacogenetics is still at an early stage, researchers might use proxy cases to illumine themes. For example, HIV could provide a case study of keeping personal medical information confidential when medical professionals are under pressure to break that trust.

## **Conclusion**

The economic and political contexts in which the industry and the health system operate are changing. There is a tension between the commitment to public welfare and the pressures of commercialisation. The relationship with science and society is changing. So is the direction of social, ethics and policy research.

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<sup>8</sup> Reported in David Pilling, “Europe ‘in science Dark Age’ ”, *Financial Times*, 8 November 1999, p. 8.

The future of pharmacogenetics remains open. It is not yet integrated into health care, and so what researchers and decision-makers do matters very much.