

HOUSE OF LORDS  
MINUTES OF EVIDENCE  
TAKEN BEFORE  
THE SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY  
(SUB-COMMITTEE II)  
**GENOMIC MEDICINE**

WEDNESDAY 21 MAY 2008

DR MARK WALPORT, PROFESSOR PETER DONNELLY,  
PROFESSOR HERBIE NEWELL, PROFESSOR PETER PARKER  
and PROFESSOR FINBARR COTTER

Evidence heard in Public

Questions 122 - 177

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WEDNESDAY 21 MAY 2008

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Present

Colwyn, L  
Finlay of Llandaff, B  
Northesk, E  
Patel, L (Chairman)  
Perry of Southwark, B  
Taverne, L  
Warner, L  
Winston, L

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Witnesses: **Dr Mark Walport**, Director of the Wellcome Trust, **Professor Peter Donnelly**, Director of the Wellcome Trust Centre for Human Genetics and Chair of the Wellcome Trust Case Control Consortium, **Professor Herbie Newell**, Director of Clinical and Translational Research and Research Strategy, Cancer Research UK, **Professor Peter Parker**, Cancer Research UK London Research Institute Laboratory Head and Head of the Division of Cancer Studies at Kings College London and **Professor Finbarr Cotter**, Professor of Experimental Haematology, Barts and the London School of Medicine (representing the Leukaemia Research Fund), examined.

**Q122 Chairman:** Good morning, gentlemen. Thank you first of all for coming today to give evidence. We regard this as a very important session because we are hoping you will be very informative in all aspects of our inquiry. Can I also welcome the members of the public? For the public there are information sheets, particularly about any interests the Members have declared. Before we start, I presume Dr Walport you are going to act as a coordinator.

**Dr Walport:** We had not agreed that but I am happy to act in that way.

**Q123 Chairman:** I look at you as the obvious person. If any of you have an opening statement to make please do so. Can I ask that when you answer for the first time you might introduce yourself and say who you are for the record? If any of you have any statement to make before we go into questions please do so.

**Dr Walport:** I am Mark Walport; I am the Director of the Wellcome Trust. I had not prepared an extensive opening statement but I think what I would say is that this is an enormously important area and we are delighted that you are doing this inquiry. It is a fantastically exciting time for genetic medicine. You have a very expert advisor in Tim Aitman so I am sure you will have already learned that. The quantity of new genetic information that is emerging is, frankly, mind boggling at the moment and it is possible to do genetic studies to discover the basis of genetic variation in health and disease in a way that was never possible before. To give you a very recent example, the Wellcome Trust has just agreed £30 million of funding and that will be used to measure a million different genetic variations in 120,000 people with a huge variety of variation in both health and disease, so everything from glioma to children's reading and writing ability through childhood. There is an enormous amount of knowledge that is coming out of this. I think this report is timely because of course the NHS is going to have to work out how to use this information; we are going to have to work out how to use this information to develop new treatments; we are going to have to work out how to advise people about health risks in a much more nuanced genetic environment. There are all sorts of extremely important societal and medical research issues, so it is very timely.

**Q124 Chairman:** Thank you very much for that comment. In fact that feeds into my question extremely well because I was going to start by saying to you that the scientific outcomes of recent genomic studies, your own Wellcome Trust Cast Control Consortium and the Cancer Genome Project have suggested that there are impressive findings in new genes and mutations underlying common diseases. There are other technological advances such as

microarrays in cancer and other diseases. My question is exactly what you pose and I now hope you will give the answers. How might this knowledge gained be translated into clinical practice in the NHS? What is the timescale of that happening? Will the NHS have to re-organise itself to be able to deliver this? What should the Government do to facilitate this in public policy issues?

**Professor Newell:** I am Herbie Newell; I am the Director of Translational Research at Cancer Research UK. There are a number of extremely important components to that question. First of all, the understanding clearly opens the way to new treatments and cancer, as the genetic disease par excellence, has already demonstrated that we do now have the direct exploitation of genetic information in identifying targets, developing drugs against those targets and then using genomic information to focus those treatments on the patient populations who are likely to benefit. The concept has undoubtedly been proven. The issue, as you correctly raise in the question, is how is that translated into patient benefit across the entire National Health Service. From a Cancer Research UK perspective the critical issues there are first of all having a public that will be able to understand that information, to engage as equal partners in decisions about how they are managed, to have a National Health Service that has the workforce that is able to implement genomic medicines as they come forward (clearly they are going to come forward, the concept has been proved) and then looking to the future using the exceptional capacity of the NHS to link patients in large numbers to information both on clinical outcomes and increasingly as we move forward genetics of individuals gives us the opportunity to do something in the United Kingdom that may not be possible to achieve in many other countries. What we need to make sure is that the NHS is provided with the resource and the infrastructure to make that possible.

**Q125 Chairman:** Do we have an organisation in the UK that is likely to be able to bring all these things together and then give the correct advice?

**Professor Newell:** Potentially ultimately in clinical practice in the NHS yes, but what we, as research funders, need to do is to provide the evidence base to inform the NHS as to exactly which tests and which treatments should be made available and focus in this particular way. In cancer, specifically through the National Cancer Research Institute, we have a collective of all of the funders and indeed many of the people in healthcare provision both governmental and in the charity sector working together, so there is a mechanism there. One particular example of that that will be launched in June is the National Cancer Intelligence Network being spearheaded by Mike Richards, the cancer tsar. This initiative is specifically addressing the issue of how we link information on (all of the different) basic science through to clinical practice.

**Dr Walport:** I think it is worth thinking about how genetics is already having an impact; I think specific examples are quite helpful. The ability to make diagnosis in itself is important and I will give you two examples. There was a child whose photograph was plastered all over the front of one of the tabloid newspapers about a year ago who was enormously obese. The parents were being lambasted for child abuse but it actually turned out that that child had a genetic mutation in, I think, one of the leptin genes, one of the genes that causes gross, massive obesity. If everyone had had that piece of information, particularly the parents and the family, it would have avoided that quite intolerable piece of persecution. Another example is from Stephen Scherer's work at the Hospital for Sick Children in Toronto who recently discovered a gene which is present in a number of families with autism. The fact that is that this is an enormously powerful tool in telling people that this has nothing to do with vaccines or anything else; it is nothing to do with anything you have done. Just being able to provide a diagnosis can be enormously comforting even if it does not immediately associate with treatment. I think the ability to diagnose is itself very important and that raises some important issues for the health service because the question is whether the health service is in

a position now to provide the advice that people need, given the complexity of modern genetics. I think the NHS is clearly where the responsibility lies for this but I think that more work will need to be done to modernise the NHS's ability to provide the right advice and that will involve both clinical genetics but also a widespread education of the medical profession as a whole because this is quite complicated information. In that context I think that there are new tools in terms of informatics that could potentially be hugely helpful because it is difficult for anyone to carry all of this in their brains. To give an example, the Sanger Institute has developed a database which is called DECIPHER and that is intended to provide information around developmental genetic abnormalities. It is the sort of database where clinical information can be aggregated with genetic information. It is a very powerful tool both for research but also for providing information. Part of the solution in the NHS has to be informatics. I think a second area is obviously therapy. Again there are some concrete examples. In cancer, cancer genetics has led to new drugs and Gleevec is an example of that. This is a drug that is targeted specifically to the genetic mutation in a cancer and the use of herceptin in breast cancer is also something that can be targeted. A recent example outside cancer is the discovery by Andrew Hattersley Peninsula Medical School and Fran Ashcroft in Oxford. There was a group of children who developed very early severe diabetes – they essentially have monogenic diabetes – and those children had been given large doses of insulin. However, it turned out in a small group of those that the children had a mutation in a potassium channel gene. From this knowledge, it was possible to recognise that they might respond to a tablet rather than to insulin. For that small group of children life has been transformed. I think we are beginning to see examples both in terms of diagnosis and in terms of treatment, but I think we are at the very, very beginning of a flood new knowledge.

**Professor Cotter:** I am Professor Cotter; I work at Barts in London where I am the Lead for Molecular Pathology. We have taken an integrated approach in both genetics and all other

forms of molecular therapy within part of a new build; the new build allowed us to do that. This actually brings together a very important point and that is that we do have the ability to deliver genetic testing; it is done within the Genetic Network which was partly assisted by funding from the Department of Health to allow the Genetic Network go forward following the White Paper on genetics. They are indeed currently delivering some of the research findings and they go through the Genetic Testing Network to look at the quality and the usefulness of particular tests that may then go into clinical practice. I think the major issue between the research and the NHS taking these things on is that there are different needs. Research has different goals to those of the NHS delivery of good care to patients. One of the issues when translating something from a research laboratory into an NHS laboratory is that we have to have robust tests and good clinical utility. In addition, we do need to be able to have educated clinicians who know how to use the tests, what is appropriate to order and how to apply these things. I think we are lacking in that area. When it comes to the direct translation of the research into the NHS there is an appropriate means of taking that forward. The real issue comes to the genetic testing that lies outside of the straightforward clinical genetics because there there has not been any funding infrastructure; it has actually been happening over very many years. For example, Factor V Leiden mutations have been performed in haematology laboratories for nearly ten years. In addition we look at the Gleevac; we need to know that the Philadelphia chromosome is present. That again has been performed by NHS laboratories that are CPA approved and there is QA that goes round for all of these things to ensure that there is reliability of these measurements. However, these are rather ad hoc arrangements that have taken place and the same technology is being used by the clinical geneticist as is being used by a whole variety of other people. Microbiology is a perfect example where we use DNA technology – or PCR – in order to detect different strains of disease rapidly and at a much cheaper cost. I think that the issues we have in translating

are quality and also that we only have part of the picture currently within a network that works very nicely. Everything that lies outside of that clinical genetic network is more difficult. Having said all that, the Leukaemia Research Fund has actually very successfully translated the latest study for childhood leukaemias where they are doing genetic testing at day 28 of the treatment. A clone fingerprint is made of each child's tumour. Within 28 days they are able to look at the rate of fall of disease, and from that they stratify the treatment to less, to more or to the average amount. That it is very successfully identifying the outcome of the patient at day 28 after they have been diagnosed. That has been done by good dialogue with the commissioners, alerting people far enough ahead and, in fact, having an understanding of how the NHS works so that you can engage with the research field early enough so that these studies can be incorporated with good quality control. I think that quality is the main issue that we have when looking after patients. In research it is the novelty of the findings and the striving for the new knowledge that has a slightly different priority and we have to mix those to or move from one area to the quality area in order to deliver it robustly.

**Q126 Lord Warner:** Cancer has been mentioned quite a lot so far already. Is cancer unique in already having useful genetic tests to stratify disease and guide patient management? If cancer does have some unique advantages for genetic testing, could you help us identify what these are and how their absence might be overcome in some of the other diseases?

**Professor Parker:** I am Peter Parker, I am Principle Scientist at Cancer Research UK London Research Institute Laboratory. I am Head of the Division of Cancer Studies at Kings College London. The question is about whether cancer is unique and I would suggest that in terms of pre-disposition it is certainly not unique. I think there is a great deal of insight that has allowed us to drive interpretation from a lot of information that has come through that puts on a fairly firm foundation our insight into some predisposition. However, I think essentially as

more information comes through it is fairly clear that all diseases are associated with genetic changes or at least polymorphisms that give a clear indication that there is a spectrum of pre-disposition. Cancer has a unique component in as much as the disease itself is intrinsically associated with somatic change and therefore there are genetic alterations associated with particular cancers. In a sense we know that very precisely because we have wonderful controls, normal tissues and such to look at, to say that these are the specific changes that have taken place. There is a unique component that is associated with a somatic element of cancer but I think in terms of the predisposition I would suggest this is probably common to most diseases. I think it has a greater complexity because of course cancer is many diseases.

**Dr Walport:** I would agree with that. There is an enormous amount more research to do into cancer. Peter has raised the key issue of cancer which is that the final pathway is somatic mutations and they of course bring the particular benefit that they offer potential targets for treatment. An example of one which is in the pipeline at the moment is that Mike Stratton at the Sanger Institute discovered, through sequencing melanomas, that a mutation in a growth molecule called BRAF is associated with melanoma and some other cancers. That then immediately gives the target for a drug discovery programme which is happening at the moment. In the last couple of weeks a global collaboration has been announced which is the International Cancer Genome Consortium where scientists from around the world have agreed to collaborate to sequence the 50 commonest cancers in great depth in different populations of the world. This is an enormous opportunity and it will also, I think, start explaining the heterogeneity of cancers in different parts of the world.

**Q127 Lord Warner:** Could I pick up a point relating to this which came out of the remarks made by Professor Cotter about the issue of reliability and the extent to which, as you translate it, so to speak, from the research laboratory into clinical practice, some areas were well understood and regulated and were in a kind of circle of knowledge in their application;

others seemed to be slightly outside that circle of knowledge and confidence and there were potentially reliability issues. What has come across to us is the extent to which some of the developing knowledge here has huge implications for the pathology services across the NHS. Could you give us some sort of feel about your sense of what may need to happen in these areas if we are to deal with the issues of reliability that you mentioned and drew attention to?

**Professor Cotter:** If we take the field of cancer I think that we have to incorporate as part of our trials and as part of the NCRI approach the molecular markers in order to evaluate them properly to see how they really impact upon the management of the patient. We do have to show the benefit to the patient and we have to show that we can reliably do it in the timelines and in a manner that I can translate results from my laboratory to any other laboratory which is delivering the same tests. I think there has been an issue quite often where we all talk about a particular marker that we are looking at that is done in various different ways to arrive at a result. Those results may differ because sensitivities may differ, because the reliability of the machinery or otherwise varies considerably and within the NHS as a patient service we really have to ensure that those things are done well. We have good experience with the childhood leukaemias, going back to that again, where a number of research laboratories are involved. We thought we were good; it took a three year run-in before the trial went live and most of us who thought we were good laboratories delivering it were not reliable. It took three years to get that sorted out. Having done that we now have a common currency of results. We have a means of saying that my results I can discuss with you and they will mean the same as the results that occur in a different laboratory because it is good quality control. That is done within a clinical trial setting and I think we really have to evaluate these things properly. We do have the ability in the UK - we have the cancer centres, we have good networks now and there is the work that is being done by various charities – to allow us to run these trials and by

incorporating it into the studies it allows us to evaluate and then translate it into the NHS in a timely, good quality manner.

**Q128 Lord Warner:** Does that not have some very serious implications for all those laboratories which are not operating in the way that you have suggested and the history of pathology laboratories in the NHS has been to be very protectionist about some of the services you have at individual hospitals. The implication of what you are saying is that there needs to be quite a lot of change in the approaches of many pathology laboratories.

**Professor Cotter:** If you were to take one single step that I think would be very useful, that would be to establish a network that allows proper quality assessment and evaluation. You probably do not need vast numbers of laboratories doing this work, but you need to have an interactive network which is very similar to what the genetic networks now do. I think marrying that onto the genetic network would be a very useful approach, but you need a body that evaluates the quality so that the places that are delivering the molecular work are quality assured.

**Q129 Chairman:** Does that not suggest, Professor Cotter, that we need a central molecular laboratory?

**Professor Cotter:** The beauty of the technology that we have is that it can be quite high through-put and have good quality assurance within that. Certainly there is an argument that not every laboratory everywhere should be doing it. I think there is a big argument for a more centralised approach.

**Professor Newell:** To extend the discussion a little bit, this is an extremely important point and at Cancer Research UK we have just completed a comprehensive review of biomarkers (which is the phrase we tend to use for tests which of course includes all manner of genetic tests). The single most important conclusion from that is that we do need very clear road

maps for the discovery and development of all types of biomarkers, including genetic tests. If we use as an analogy the discovery and development of new drugs we have now a pathway there that both the academic and the commercial and the health services community all recognise that you have to go through to get a drug from an idea through to a treatment that patients can receive in general practice. We are not there yet with biomarkers or genetic tests and what we need to do urgently is to develop that framework.

**Chairman:** Thank you; that is a good point. Lady Finlay?

**Q130 Baroness Finlay of Llandaff:** I wanted to ask a bit about pharmacogenetics. This is a key example of a way in which genomic discoveries can lead to more personalised healthcare. We have already heard some specific examples from Professor Cotter. There are some clinically relevant tests already but we would like to get a feel from you how this trend will continue and how rapidly the NHS should be planning for routine biomarker testing to lead pharmacology prescribing in clinical practice. I think I would like to link in with that the previous answer which is to ask you quite bluntly whether you feel that for a designated cancer centre they should be linked with a designated laboratory which does the genetic testing and looks for biomarkers rather than it being something which is rolled out more widely.

**Professor Newell:** In terms of pharmacogenetics, as you correctly point out, there are some extremely important genetic predispositions to poor tolerance of certain drugs. They will be with us for a while but in general during the drug discovery process now one tries to build out that propensity because clearly it is an unwanted complication. For the short to medium term there will need to be that capacity, but moving forward hopefully drugs will not have that Achilles heel to them. Returning to your final point on how we provide access to this type of resource, it really does come down to a volume through-put issue depending on how many tests you need to have. If it is a test that you are going to require an extremely large number

of people and you need the answer quickly, then you will need more localised capacity. However, for some tests – as Professor Cotter indicates, and leukaemia would be a good example here – thankfully the number of patients actually in the UK is relatively modest so for every cancer centre to be doing a pharmacogenetic analysis on purine metabolism, for example, to pick out which patients are likely to get inappropriate myelosuppression just would not make sense. The conclusion that we reached in our biomarkers review is that we should not go for a single centralised national solution to this, but a number of centres of excellence based around the country would be the approach to take.

*Dr Walport:* I think this is going to be a very fast moving field. One of the studies that we funded recently was a study looking at whether there was genetic influence on the side effects to statins, which of course are extremely commonly used for the treatment of high blood lipids. A small proportion of people get damage to muscle called rhabdomyolysis associated with the taking of them; a much larger number of people actually get a raise in muscle enzymes and muscle aches. It is quite possible that that will turn out to have a genetic basis and that could lead to a test which could influence the doses of statin you take and whether you take it. Looking to the future I think there are going to be quite a lot of potential examples like that; it is a fast moving field. A consortium has been set up between the private and the public sector called the Serious Adverse Events Consortium and that brings together a whole group of drug companies who are collaborating basically to collect side effects in relation to drug therapy in the hope that you might be able to avoid drug side effects through, for example, abnormal metabolism or difference in metabolism in drugs. I think this is to be greatly encouraged. It points to something which will probably come up later, which is the importance of data. What we need to be able to do is to systematically in the UK – and indeed globally – collect side effect data in relation to prescriptions and that is something

where the NHS IT systems, if they ever develop to the right point, could be enormously powerful.

**Q131 Baroness Finlay of Llandaff:** You have just cited statins and we have spoken a lot about cancers, but are there other areas of medicine where you foresee that the NHS should be preparing itself for because personalised genomic medicine will become important in the near future?

*Dr Walport:* I think it is difficult to think that in any area of medicine where drug therapy is important that there is not going to be the potential for major pharmacogenetic effects.

*Professor Cotter:* I agree with that entirely. I will give you one example, warfarin resistance. Warfarin is used for DVT and there is the cost implication of being able to do pharmacogenetics which may be very important and make savings for the health service. Things are coming through individually at the moment but we need a good database, we need to be able to collect the information and, where appropriate, apply it. As to the point about designated laboratory access for designated centres, I think that very much addresses part of the QA and I think it is a very sensible approach.

*Professor Donnelly:* I am Peter Donnelly from the Wellcome Trust Centre for Human Genetics in Oxford. I completely agree with the comments of all my colleagues and the speed over which this will happen. I just have two things to add. There is actually less research being done than one might hope because these studies need big trials and I think it would be helpful if funders have a role, Government has a role and regulatory authorities have a role in prompting and encouraging that kind of research. The other point I wanted to make is that most of the discussion on pharmacogenetics that we have just had has been about using genetics to screen out people who might be at risk of adverse events from drugs. That is clearly a very important part of the field. There is a complementary aspect which is due to the fact that there is huge variation between individuals and the way they respond to drugs, and it

is very likely that some part of that variation is also genetic. So as well as the safety aspects, which are the ones where we have most examples currently, there are real issues to do with efficacy: can we use genetics to say that this person will react better to this drug or this person will react better to that one, or to adjust doses and so on. Again that is something on which there is less research currently but it is very hard to imagine that in five years or ten years that will not be a major part of routine medical practice.

**Q132 Lord Winston:** One of the things you said which is clearly very interesting is that the idea of screening a database on side effects which would be picked up by NHS prescribing would lead you to clearer genetic information. Given the amount of noise there is and given the amount of idiosyncrasy which Peter Donnelly refers to as well, is that not a fairly ambitious thing to do, or do you really think that is genuinely feasible, that it is really going to make a significant impact?

**Dr Walport:** I think it is ambitious, certainly, and I think you will not be able to predict accurately where you will find results, but in fact it has been possible to find genetic causes for rare diseases without too much difficulty and it may well be possible to find genetic causes for rare side effects, but you will not be able to do it unless you can find hundreds of them. So it is a question of how you do the databases. Where I agree with you very much is that it is important for us not to over-hype this in temporal terms, if I can put it that way.

**Q133 Lord Winston:** I am concerned about that.

**Dr Walport:** I think that is a perfectly legitimate concern. The research is being done now and it may take some time for that to translate into health benefits. I think that is always the challenge when you are advocating research, to recognise that it will be a long time to translate discoveries into health benefits. I think I would disagree with you; I think it will be

very important to get very good databases of drug side effects and wherever possible then do the genetic studies associated with that.

**Q134 Lord Taverne:** I want to turn to Professor Donnelly and the paper which he submitted. You state that knowledge of genetic risk factors can be used to update risk assessments for particular individuals, potentially to identify sets of individuals at significantly increased risk. You give the example of Crohn's disease and type 2 diabetes. How can this knowledge be used in practice? Is this another example of the useful diagnosis which Mark Walport gave that can transform individual lives? What additional resources may be needed if it is going to be such a potentially important development?

**Professor Donnelly:** I think this will happen in different ways over different timescales. At the moment I see many of the findings that we have learned in the last year or two in terms of the genetics of common diseases as much more akin to identifying risk factors for diseases rather than the traditional genetic tests which allow one to say whether this person will get Huntington's disease or not. In the short term I think the main way in which that information will get to individuals is through the commercial organisations who are offering direct to consumer testing. It will be a question of individuals deciding that they are interested enough to send off their DNA and pay for results. That process, I think, has a number of challenges for Government and the NHS, one of them involves issues about the extent to which that can or should be regulated to ensure that anything that is done like that is done in a way where the information given back to people is fair and everything is done that is possible to help them to understand that. It also has consequences for the NHS in that before too long, assuming there is non-trivial take-up of these services, people will be arriving at the door of their GPs or their health professionals saying, "I've had this test and I've got these SNPs; I've learned that my risk of prostate cancer is increased by 30 per cent; what should I do?" I think there is a live question for healthcare professionals in the short term in them being able to cope with

enquiries of that kind. I expect this is something we will come back to, but I think there are real challenges and really important issues for a whole range of healthcare professionals in terms of training and bringing them up to date with what we can and cannot learn from modern genetics, how to help patients. Even those people within the healthcare system who have traditionally been involved in genetic counselling have done so from the perspective of Mendelian disorders where genetic effects are large. This is a different world and I think it requires different thinking. That is the short term. Over the long term the picture is clear. It is hard to predict the timescale of this but I think we would all guess that at some time in the future – which might be ten years or more – genetic information will be a routine part of many aspects of medical care. We will probably move away from the stage where it is natural if a patient has this condition you want to get this piece of genetic information and then to see whether they react to some other drug you get another piece of genetic information. We will move from the stage where we do that in a kind of ad hoc condition by condition way to just thinking that it is much more efficient with current technology to type their genome at, say, a million SNPs and through that with future technology their DNA sequence. I think in the long term that will be part of routine practice. It is hard and probably dangerous to predict exactly when that will be. Then there will be a transition – which I think is a challenge for the NHS – to work out when is the right time and which are the right aspects of this technology to take from what I think will be offered initially commercially into routine practice.

**Q135 Lord Taverne:** Is there also a risk that people will tend to feel that genetic information is more important than, say, lifestyle choices or environmental factors?

**Professor Donnelly:** I think that is a real risk. I think there are important roles for education. I think there are different possible reactions and I suspect that given how different people are some will react some ways and some will react others. Many people, I am sure, in the short term, were this kind of information available commercially, will not want to know. Others

will be curious and they might be interested. Some, when they find they are at increased risk because of their genetics might take the attitude that there is no point in worrying about anything else and that “I have had bad luck in terms of my genes” which would be unhelpful. For others it might be exactly the spur to try to get them to focus more on the lifestyle or behavioural changes that can reduce the other risks, so a view which says, “I cannot affect the genetic risk factors I have but there are other risk factors that I can affect”. I think the Trust make this point in their submission, there are key issues in our understanding which needs extra research to work out how we can affect people’s behaviour in that way. The upside is that if people do know about genetic risk factors they are able to target them. It is the same as the situation we have now which is that every week we have a paper and it says that scientists have shown that if you drink more coffee or less coffee, more red wine or something else it will make a difference. Certain people are feeling bamboozled by that. There is a possibility, I think, through these kinds of genetic testing for people to be able to say, “There’s a whole range of diseases; I know from my genetics that here are two or three of which I am particular high risk, let me focus on the lifestyle changes which will make a difference to those”. That is the upside and it could have non-trivial consequences in terms of prevention.

**Professor Cotter:** I think the whole question of looking at genetic risk, there is no doubt that we can do it and therefore people will want it done. Therefore it is better done within a health service setting. The other reason for this is that we spend a lot of resources currently screening in a very expensive way for various diseases which may have a genetic basis to them. We can start targeting resources more to those who are at risk because we know they have the risk and not wasting it on people who do not need to have it done. Secondly, within that, we could advise people what is the best choice for their lifestyles. We currently all do it from the fact that some people are smaller than others, others are taller; you do not go and become a very good rugby player if you are only about four foot. If we look at size, we know

size is important. I think those are issues that we could get out of this and we should look at it from a cost basis as well, and that is that we can probably change the way the health service is delivering health; rather than treating the problem once it has occurred we can look more towards preventative measures and that would be cheaper.

**Q136 Lord Winston:** Cancer Research UK has already submitted that it is difficult to engage the Government sometimes in considering how we translate the research results into practical clinical care. Do you think the current structures involving translation of genomic medicine are not effective? What would you like to see done? What would you envisage being done about that?

*Professor Newell:* Historically I think it is very clear that the structures were not fit for purpose but with the establishment of the National Institute for Health Research and in particular OSCHR and the Translational Medicine Board we have great hopes that moving forward this will be far less problematic than it has been historically. As I indicated previously, a key component of that will be getting everyone talking the same language and, as we indicated in our submission to you, there is a lot of fuzziness still that people often end up at cross-wires because they do not know exactly what is being discussed. Therefore we think we need improved definition and again we need these road maps so that we can all see where we are for each different type of genomic test, where it is ultimately going to be applied, what are the key questions and whose responsibility it is to address and fund the areas of research and development needed.

**Q137 Lord Winston:** One of the things that seems to be coming out is the idea of centralising resources and so on. Do you want to tease that out a bit more, because that seems to be something that is worth exploring and might be something for this Committee to consider?

**Professor Newell:** I think it comes back to a point that Professor Cotter made, that we have to look at the quality of the assays that have been used and at a stage where those assays have not been what we would term as validated. Then at that point it would be inappropriate for them to spill out into the community and particularly inappropriate for them to spill out into the commercial community where incorrect data would be generated of dubious impact which may end up worrying individuals as well as wearing a substantial hole in their pocket. Again there needs to be regulation at a national level about access to those tests. Some equipment is very expensive and you would not wish to see it in every centre; other equipment is more modest. I do not think it will be a case of one size fits all and we need to look at each clinical setting and each test.

**Professor Cotter:** Going back to genetics, there is a Genetic Testing Network that approves various tests and the way they are done and then it is wheeled out. I think we just need to extend that approach which is a centralised approach to evaluate and then a small number of centres around the regions so that there is access to everybody. I think that would help smooth the translation. It is all right for genetics but once it moves out into cancer and other areas it becomes much more difficult because there is not that central approach.

**Q138 Lord Winston:** Do you think we have a role in pushing harder at NIHR and OSCHR from this Committee's perspective?

**Professor Newell:** I personally think it would not do any harm to push. I would sincerely hope that with Alex Markham chairing the Translational Medicine Board you would find a very open door.

**Q139 Lord Warner:** You are putting quite a lot of emphasis on national coordinating bodies in answering Lord Winston. If you take the experience of NICE where you have national evaluations, in that area the NHS locally simply has not taken up and followed the evaluations

of NICE. That is all about local decisions, not about national coordination. Can you give us a bit more comfort about what you think is going to happen in reality in Little Clumpton or Penzance or Tyneside as distinct from at the national coordinating level?

*Dr Walport:* Is it not about training the next generation of the clinical genetics community? The clinical genetics community up to now has largely been trained in the universe of monogenic disorders, single gene abnormalities, but actually we are moving into a whole new area. A moment ago Peter Donnelly was talking about much more complex risks and I think it is actually about training the next generation of clinical geneticists who will then populate the local health service as you set out. You are absolutely right; this has got to work regionally and locally.

**Q140 Baroness Finlay of Llandaff:** How many trainees are there in clinical genetics around the country?

*Dr Walport:* It is a very small speciality.

**Q141 Baroness Finlay of Llandaff:** Is that not the problem? You talk about educating the next generation but they are not there at the moment to be educated.

*Dr Walport:* They are not all going to be clinical geneticists though, are they? I think it is also about training people who are gastroenterologists with a genetic interest or training respiratory physicians who have an interest in genetics. You can use that argument with immunology as well. The clinical immunology community is very small. The vast quantity of immunology services are actually provided by specialists in other domains.

**Baroness Finlay of Llandaff:** How much is in the curricula at the moment for these different specialities?

**Q142 Chairman:** We will get the opportunity to explore that with them, but you are making an important point about the education side of it. Professor Cotter, do you have a quick response?

**Professor Cotter:** I think there is a real danger of saying it is clinical geneticists; this is not just clinical geneticists, it is all of medicine. The reason we have problems at the moment is because the geneticists have got it right but the rest of genomics in medicine has been ignored. We need laboratories around the place of good quality that deliver DNA technologies.

**Professor Donnelly:** There will still be the need there currently is for clinical geneticists to deal with. There will still be people with monogenic disorders. I think it is actually a mistake to think that they are the right people to be taking this forward. They have some training in one part of genetics and I completely agree with the comments of my colleagues that this should be much more routine and much more widespread. I think it is wrong to think necessarily that the clinical geneticists are the right environment and the clinical genetics testing framework also comes from monogenic disorders background and there is a huge paradigm shift here. It is not obvious that they are the right people to take that forward; they have some with a helpful ground who have other skills. I think it is a much wider issue in terms of training and medicine.

**Q143 Chairman:** It is a difficult issue to answer, but currently clinical gastroenterologists train gastroenterologists but if they do not already have a knowledge about genetics as relating to gastroenterology they are not able to train them.

**Dr Walport:** Some of those trainees will be able to do research in a genetics environment and indeed already are. I think that inflammatory bowel disease is actually quite a good example. The advances in genetics of inflammatory bowel disease have actually come from the gastroenterology community.

**Q144 Lord Colwyn:** The Wellcome Trust has had a policy of making genomic data public and it has been successful at making genome resources globally available. In fact, the European Bioinformatics Institute tell us that they have the potential to coordinate activity inside the UK among European Member States and internationally. Should individuals be concerned about being identified from their genomic data? Are there any risks of whole-genome sequencing?

**Dr Walport:** I think the answer is that it is a legitimate concern. If your sequence was put out on the internet it would be possible in the fullness of time to identify you as an individual, so there do need to be safeguards. To give you a specific example, when Alec Jeffreys developed his forensic test DNA was essentially an anonymous barcode but actually from a piece of DNA at the crime scene you can now work out the sex very easily, you can work out whether they have red hair or not and, if they are men, there is a reasonable probability you might be able to identify their surname from their Y chromosome sequence. That is actually a realistic possibility. There was an example in the United States of a young man whose father had been an anonymous sperm donor who sent his DNA off to one of these testing services and it came up with a surname for him and on the basis of that he was able to find his real father. The answer is that it is a legitimate concern. It is a matter of low risk at the moment I think, but there do need to be safeguards. It is a crime to take someone's DNA for the purpose of analysing it so if I pinched one of your hairs and analysed it that would be a criminal offence, but it is not actually a criminal offence to take a DNA sequence and maliciously identify someone from that. I think that this is something that is going to be looked at carefully in the future. The regulatory framework is going to need to keep pace, but I would emphasise that research governance in this area is good so confidentiality is maintained; research communities are well aware about not putting out information on the internet that could allow people to be identified. As an example of the sort of trouble that the

community goes to, Biobank has its own independent ethics and governance committee. In a nutshell, yes there is a risk; the research community is well aware of this but regulation needs to keep pace with it.

**Q145 Lord Colwyn:** Do you think there is a specific risk that arises from collaboration between academia and industry?

*Dr Walport:* No, I do not think there are any additional risks.

**Q146 Lord Colwyn:** Do we need any special safeguards?

*Dr Walport:* No, and I think if you look at the track record of both academia and industry in this respect they have been extremely good at maintaining confidentiality.

**Q147 Lord Colwyn:** How do we reassure the public that this is not going to be a problem?

*Dr Walport:* By firstly explaining the level of regulation and protection that already exists. I think it is actually about communicating the fact that the risks are low - not that they do not exist - and keeping an oversight of the regulatory environment to see that the framework is fit for purpose.

**Q148 Lord Colwyn:** Also that there is no problem participating in genomic research.

*Dr Walport:* As long as it is properly conducted the risks are extremely small. You can never say there is a zero risk of anything, but actually research is ethically carefully scrutinised, proper consent is given in genomic research and it is explained to people what will happen if we do not do it.

**Q149 Earl of Northesk:** Do you think there is a need for an international common public database of genomic data generated by researchers? I am assuming your answer is going to be yes, and on that basis how on earth would it be funded and resourced?

**Dr Walport:** I am glad you asked that question. The feature of the Human Genome Project was that the data was put into the public domain and widely available. We are seeing the value of that. There is an enormous amount of genomic data; it is extremely well curated. In the United Kingdom the holder of much of that information is the European Bioinformatics Institute. Much of the funding of the EBI is in fact charitable and the European Union does not provide adequate support from the European Bioinformatics Institute. I have seen the submission from them which I think is very important. It is extremely important that there is national funding for this enormously important database. However, I do not think it is a single public database of all genomic information; it holds the reference information, so it holds the reference genome and it will hold the reference data on genetic variation, but it cannot hold all genetic information, that would be impossible. I think one of the major things that this Committee could actually be helpful on is to point out the need for there to be proper and sustained funding for databases such as the European Bioinformatics Institute which will otherwise become unsustainable and would put Europe in a weak competitive position.

**Q150 Earl of Northesk:** Are there any other specific challenges in terms of delivering the sort of database you have in mind?

**Dr Walport:** I think the challenge is increasingly one of scale. Maybe Peter Donnelly would like to comment on the issue of the scale of data that is now being generated.

**Professor Donnelly:** I think there is an important distinction in principle and in practice between the kind of reference data that Mark was talking about – genome sequences, adaptations and so on – and then the huge volumes of data that are being generated from research projects which is about genetic information on specific individuals. I think practically it is much harder to contemplate some kind of uniform database. For historical reasons different studies have different consents from patients; they will involve different conditions under which the data can be released to certain categories of people. I think it is

practically extremely challenging to put that data together. There are attempts to do that both at the EBI, the European Genotype Database (I cannot quite remember what it is called) and also in the US. The idea there is that you could have the data in one place but for a researcher to access this part of it they need permission from this access committee and to access that part they need permission from someone else. That will continue I think to be practically a big issue, and rightly so because of the consents under which the data has been given to the researchers.

**Q151 Earl of Northesk:** It seems to me that even the core data of the genome would be a vast database in any event. It would probably be utterly unwieldy.

**Dr Walport:** The human genome is 3 billion base pairs roughly; in fact we have a print out of it in Wellcome Collection and you can see what it looks like. The data sets are absolutely huge. It is a really important point that the UK Government and indeed European governments recognise the importance of providing systemic funding to the European Bioinformatics Institute.

**Professor Parker:** Implicit in the question is the notion that one might put all the data in one place and that is a good way of curating and looking after it and interrogating, whereas in fact I suspect the solutions for the future are going to be how one has an interrogating facility that actually accesses distant databases that hold very different types of information. Genetics is a part of what we would like to understand and take apart; we would like to marry that to a lot of biological and functional information which comes in very different forms. The IT solutions are going to be around the nature of those pieces that sit in between those databases and allow us to distil all of that information.

**Q152 Earl of Northesk:** Based on a federated IT architecture.

**Professor Parker:** Yes.

**Q153 Lord Winston:** You have dealt with part of this question already, but let us just put it on the record. The suggestion that Connecting for Health could play a part in using medical information held by the NHS in genomic research studies raises issues of confidentiality and security as well as the major computational challenges. The question really is how do you see this as being funded - it will clearly need substantial new funding – and can the present structures meet the demand of marrying up personal medical and personal genomic information? Would you like to comment a bit more on the funding?

**Dr Walport:** I think the answer is a staged approach. Already we are seeing the power of record databases in medical research, for example the GP research database which connects anonymised information from medical practices is proving enormously powerful in analysing drug side effects. We have a research partnership with EPSRC, MRC and ESRC; we have had a call for proposals for using electronic patient records in research. I think the potential is enormous and I think one should not look at it, as it were, as a distant single goal where we have to wait for a giant Connecting for Health project as a sort of magic answer to it all; this is something that is going to be developed in stages. It is expensive research; it requires very careful discussion about consent and confidentiality. As I say, I think we are on the right path but we should not just say that we have to wait for Connecting for Health; there are a lot of research projects happening now. In Tayside they have a very good electronic database around diabetes care where the purpose of the database is to provide better patient care, but that information can also be used in individuals who have given consent alongside genetic information and that is the sort of study that can be funded.

**Professor Newell:** In cancer the National Cancer Intelligence Network is an initiative starting to do that. The confidentiality issues can be addressed; making them foolproof of course is always a challenge. Someone might put the discs in the post inappropriately, but the actual structures can be put in place.

**Q154 Lord Warner:** I ought to declare my interest in having spent part of my life trying to implement the National Programme for IT. Can I just get clear what you are really saying? You are saying that research is not necessarily going to be hampered, as I understood it, by the speed of progress on getting electronic patient records in place because there are other ways of pursuing the research agenda. Does the National Patient Record not become very significant in terms of applying the research findings in treatment? A supplementary question to that, I do not remember too many members of the research community marching to my door pressing for progress in the Electronic Patient Record when the naysayers were trying to see progress. I am just trying to understand where the research community is coming from on this.

**Dr Walport:** At the risk of disagreeing, I think the Wellcome Trust and the MRC and others have seen from a very early stage the opportunity for Connecting for Health. I think the community has been pressing extremely hard and I think there has recently been a transition with the recognition that there is now a proper research programme for development in Connecting for Health. The Board that Alex Markham chairs has already been mentioned. I do not think I said that the research would be hampered; I think there are other things that can be done whilst it is being developed, but there is no question of the opportunity that large databases bring; they offer a huge potential competitive advantage for the UK and indeed Europe for advancement in healthcare through this type of research. I do not for a second underestimate the ethical issues here, but this is research which does not depend on identifying information, it can be done with anonymised or pseudo-anonymised data sets. The opportunities are huge and I think the research community has been pressing very hard on Connecting for Health.

**Professor Parker:** Could I comment to the extent that certainly there are local solutions that have been put in place. I am aware that within Guy's and St Thomas's, for example, there is a

cancer information system that has been put in place that allows electronic records to be kept for their cancer patients and that is because it has been pushed by the R and D department on that campus to make progress. I think people have taken a pragmatic approach because they can control some aspects; they cannot control perhaps the bigger piece.

**Q155 Lord Warner:** We have had, I think, slightly mixed messages about the area of evaluation and licensing of genetic tests. The written evidence we have had from the MHRA seems very relaxed, but other people suggested that there are some concerns about the systems and agreement on the systems for evaluation of genetic tests. How do you think the new genetic tests should be evaluated in terms of patient benefits, quality control and cost-effectiveness? Are the current systems effective? This is quite a key area for us to wrestle with.

**Professor Cotter:** I do not think there is a current good system to do this. I think certainly one has to look at the robustness of the test. You have to look at the ease of delivery and the cost that goes with that and the cost benefits if we are going to use it in the NHS. I do not see any system currently that allows that to take place.

**Professor Newell:** We would just reiterate again the need for these road maps that specify these issues, the validity of the test and its qualification. Does it provide information which meaningfully impacts on the management of individual patients? That framework is just not available at the moment.

**Professor Cotter:** I fear to burden you with the suggestion that there should be a NICE for testing as well because it is a lengthy process. I think the other fear you have is that the length in evaluation if you have a lot of tests coming through is going to be in itself a very difficult and costly process. I think there has to be some sort of evaluation otherwise these things are allowed to spread and will become very burdensome because some work, some do

not, some work well, some do not, some have commercial benefits therefore they are being pushed. I think there has to be some means of filtering the good from the bad.

**Q156 Lord Warner:** Do you see a distinction between the kinds of tests available for use within the NHS and direct to consumer tests? Do you see a different system? Do you think it should be the same system? What are the features of the system that people would be looking for in your communities?

**Professor Cotter:** I think the tests have to be related to a benefit to people. I think just knowing something about yourself which you are unable to evaluate properly does open up the commercial world. If it is allowed to do it in an unregulated manner that can then deliver all sorts of things: here is a test which can tell you that you are more intelligent than somebody else, or your child is going to be more intelligent, when really these are multi-factorial things. I think it would be slightly open to the unscrupulous if we do not have some sort of regulation and I think we have to have some means of evaluating and also making sure that there is a quality control for those tests if they are being delivered so that we know that the laboratories that are doing it are delivering reliable results.

**Professor Donnelly:** I disagree with parts of that. I think there are differences between the level of validation and assurance that is needed for, for example, the health service using genetic tests. I completely agree that in that case you would want to be convinced that the information can make a difference in the right ways as to how patients are treated. I think in terms of commercial organisations offering tests to individuals, there is a bit of a danger of being a bit too paternalistic. I do not think the test should be: is there a demonstrable benefit to the individual for commercial tests. I think the test that should be used is: is there a danger of harm? They can be rather different things. If there is not a danger of harm we might think that it is up to the individual if they want to pay money and get some information back. I do not think in terms of commercial testing we should necessarily be insisting that

there is some centralised body that gives a rubber stamp and says that there is a clear benefit here. I think we are absolutely right to be careful about dangers.

**Q157 Chairman:** How do you think direct to consumer tests, for example deCODEme and others should be regulated?

**Professor Donnelly:** I think that is a difficult issue. I know there have been suggestions in some of the papers that self-regulation is a good way forward and certainly my sense of the three major companies in the US – deCODEme, 23andMe and Navigenetics – have all taken pretty responsible positions I think which is encouraging. That does not mean that every commercial organisation will. I know the EU has guidelines.

**Q158 Chairman:** It is an unregulated environment where a self-regulating code may not last very long.

**Professor Donnelly:** At the very least some kind of code of practice which those involved in the field agreed to would be good. I think the general issue of regulation is probably the generic one of on the one hand a lot of regulation may be a good thing, it will slow the field down and it will grind to a halt; on the other hand I think there are dangers that need to be addressed.

**Professor Cotter:** The NHS has CPA inspection as standard.

**Q159 Chairman:** My question was more about direct to consumer rather than the NHS.

**Professor Cotter:** I think there should be some form of inspection or standard so that you know that the results are reliable.

**Professor Parker:** That is not regulation, it is a kind of kite mark for different assays; you would know that the information that is given back to the consumer is correct.

**Dr Walport:** One issue is that much of this is actually going to be offshore and therefore very difficult to regulate. If you can put a hair in an envelope and send it off it is going to be done outside UK jurisdiction.

**Q160 Chairman:** Point taken, but that should not mean that we should not have any regulation in the UK.

**Dr Walport:** It makes sense that tests that are going to be used within the NHS to be regulated but, as I say, I rather agree with Peter Donnelly that it is going to be very difficult to regulate the direct to consumer side of it.

**Q161 Baroness Finlay of Llandaff:** I want to pick up on Professor Donnelly's comments about direct to consumer testing and the people who then come into the NHS carrying results which may be false positives or false negatives and wanting the tests re-run and the financial implications for the NHS; and also potentially the indemnity liability for tests which are done, where the boundary falls between the ones that are contracted out for privately (which you can view almost like private sector treatment) versus the responsibility for the NHS towards the whole population.

**Professor Donnelly:** I think there are real issues and there are issues that the NHS will have to confront sooner rather than later. I think the sorts of things that are being offered and are likely to be offered in the direct to consumer world, they are not tests in the usual sense where you have a positive or a negative, you get a result back which says, "Your risk of heart disease, based on the genetic factors we have tested, is increased by 20% or decreased by 50%". It will not be the case that people will be arriving at their GPs saying, "This test has said I'm going to get diabetes or something"; it will be about risk. However, I think there are still live and very important issues about how the GP copes with that, what happens then if the person says, "I've had a test which shows that I am at increased risk of colon cancer or breast

cancer or something; I want to have more screening than would usually be the case". I think there are issues that have to be faced. It will happen but I do not know what the answer will be.

*Dr Walport:* There are no new principles here. Someone could always come in with a chest x-ray that was taken in a private clinic and say, "Look, it shows this slightly odd smear". You can argue both a positive and a negative. It may actually act as a stimulus to the health service to take this on a bit sooner. If people come in with high quality genetic testing it does start pointing in the sorts of direction that Peter Donnelly said. They are important issues, there is no denying it.

**Q162 Lord Warner:** Can I just pursue this issue of tests within the NHS, the NICE analogy that was made? What you seem to be saying is that we need something like the NICE mechanism but a lot faster. Is that a correct understanding of what you are saying?

*Professor Cotter:* Absolutely.

**Q163 Baroness Finlay of Llandaff:** We view the UK as the world leader in genomic science, in part due to the funding that is coming from the Wellcome Trust and other philanthropic and charitable organisations. If this model is so successful what are the arguments as laid out in the Wellcome Trust submission that there is an overdependence on private philanthropic funding given our success record?

*Dr Walport:* I think the simple answer is that our role is to complement the funding of Government and not to substitute for it. I think the UK is absolutely world-leading in the area of human genetics, genomics, cohort studies and informatics and that is because the UK has been lucky enough to have the Wellcome Trust which happens to be very well resourced. However, we are not here as a substitute for Government. The area I would particularly pick out is the area of the long terms sustainability for genome databases; this simply should not be

dependent on philanthropic funding. We are delighted to be able to work in the UK in partnership with the Government - for example we co-fund Biobank – but if the Government stops doing its bit in support of that research I think we would have to look very carefully at our position in funding in the UK.

**Professor Donnelly:** I think there is somewhat simplistic but natural distinction between the basic research where we are very fortunate to have the Wellcome Trust and other charities who play a major role in the UK in funding as well as Government funding, but an obvious niche for the Government is the translation of that into clinical practice. There is a gap between the kinds of things that we are fortunate to have learned from research studies recently and a whole range of questions about how you take that into practice in terms of these risk factors. We identify genetic risk factors, we do not know how they are related to environmental risk factors; we do not know how, if someone has this particular constellation of genes and you use this treatment, does it make a difference or does it not? There are a huge range of questions like that which actually require quite large studies, some of which should be starting now. There is a natural place for Government funding there to take the basic research either funded privately or through the research councils, do the translations and move it across the clinic.

**Dr Walport:** I do think it has been an incredibly successful public/private partnership. Going back to Lord Warner's question about Connecting for Health, it is why actually we do try to work with the NHS and others to advocate for optimising the environment for medical research in such a way that will ultimately lead to patient benefit, which is what it is all about.

**Q164 Baroness Finlay of Llandaff:** There are some who would argue that it is precisely because it is not Government funded that it has been able to be more rapidly responsive to the research community and that research might actually be hampered and slowed down if it were

more dependent on Government funding. I wonder what the arguments are that go against that.

**Dr Walport:** There are certain features of the Wellcome Trust which I think have been very valuable in this so we can take a very long term view. We knew human genome sequencing was going to take a long time so I think we can take advantage of our sort of long term horizon. For us it is essential to be able to work and support research in an environment where the public funders and the Government also recognise the importance of this research and are prepared to work in partnership with us. I think if we lost that partnership it would diminish our ability to do our work.

**Professor Newell:** We have a very specific example of a great success and that is the Experimental Cancer Medicine Centre Network in the UK where we have 19 centres across the UK jointly funded by the Department of Health and Cancer Research UK to provide the infrastructure that allows the experimental cancer medicine, much of which increasingly is using genomic biomarker studies, to take place. That provides the bedrock where the rapid response and, as you correctly point out, the focus in the right areas is maintained through response mode funding.

**Q165 Lord Taverne:** We have had quite a lot of evidence about the need for some sort of central coordinating body in certain fields – centralised control and quality – but how far does this apply to the need for a centralised body or a particular body to provide a strategic vision on genomic medical research? Is the current system effective or should we allow a hundred flowers to bloom?

**Professor Cotter:** No, I do not think the current system is effective and if I could just go back to the previous question the point was made about the funding bodies providing the research but then it comes to a stop. I think there is a cultural problem and that is in educating people very early on that genomic medicine is important, that we apply it and that we should be

translating the research into our practices. Currently there is a barrier where the NHS tends to say that that is research and therefore there is no need to worry about, when we should be worrying about it and incorporating it through as part of the flow. There is a cost in treating patients; genomic medicine should decrease the cost of treating patients because we can pick up things earlier and we can be preventive. That is really the reason that we should be incorporating it in part into our practices, therefore we need to have a strategic view as to how we can take that through. It is the lack of strategic view that fails to engage the NHS position as opposed to the research position or research work and therefore some view I think would make a major difference.

**Dr Walport:** I think there has been a very strong strategic vision in the research area actually. That is one of the reasons why the UK is so far ahead. The scientists have worked together very effectively and I think that is from a combination of the funders working with the research communities themselves and asking how they can add value. I think the strategic vision there has been strengthened and there certainly no need for a central coordinating body on the research. I think where the strategic vision is lacking is how you take that knowledge and use it in the health service. That is where there are some enormous opportunities for a much better strategic vision and I think that is the responsibility of the NHS.

**Q166 Lord Taverne:** Should the NHS be the lead body?

**Dr Walport:** You could argue whether it is the Department of Health or the NHS but it has to be within Government which provides the health service where the strategic vision is taken as to how you get it out there.

**Professor Cotter:** The block in moving it forward from research into the NHS is the failure of the two sides to engage. I think it is the NHS in part that fails to have that engagement.

**Q167 Chairman:** That point has come out in several of your answers. The gap seems to be in the translation – whatever this word “translation” means – of the research being converted into practice, who does it and who is responsible. I am not so sure that you have given an answer as to who you think should be in the lead position taking this forward. May be you do not have an answer.

**Professor Newell:** This is the second translational gap that Cooksey identified. There is the first one of taking it from the laboratory into the clinic in the first place which, as you say, is the one we are more familiar with. The issue of who is responsible for doing that, from our perspective you have to link the person who is ultimately going to have to be paying for it to involvement in that decision and that is ultimately the health service.

**Dr Walport:** Surely that innovation has got to be in the NHS itself and I think that is one of the challenges. I think there needs to be more innovation within the service.

**Q168 Baroness Finlay of Llandaff:** Just picking up on the translational issue, I have a concern that there is a sense that as things get rolled out then that data just becomes subsumed in every day management without being collected and looked at. I have a big concern that you do not retain the patient population within on-going monitoring of studies to really be able to evaluate over the long term the cost efficacy and the health implications across the broad population. When you are doing the research you are doing it on a fairly limited population; the pure research is quite different to the population that gets rolled out with multiple comorbidities.

**Dr Walport:** That in a sense comes back to the discussion with Lord Winston about the value that Connecting for Health could have in providing that information about a 50 million cohort of patients. You are absolutely right, rolling it out is only the start; you need to evaluate it in practice.

**Q169 Lord Warner:** Do you think the research community is doing enough on the cost effectiveness of these discoveries and their applications? The NHS culturally finds it very easy to say that it needs more money to take this on but it is very bad in giving up things which do not work terribly well. There is an education issue I think in relation to the research community about the benefits - not just the patient benefits but the cost effective benefits – for some of these new approaches.

**Dr Walport:** It must be right that a lot more research could be done on cost effectiveness. That is absolutely right. I think it relates to Baroness Finlay's point as well, one does need to evaluate how they work in practice.

**Professor Cotter:** I think that is partly why having some sort of NICE type evaluation on cost is important. Of course they are different priorities: research does not look at the potential cost implications to the NHS. Part of that translational divide is where the barrier comes up.

**Q170 Baroness Perry of Southwark:** Following on from your answer to the last question, you seem to be identifying the NHS/Government as the organisation that should bridge the gap between research and clinical outcomes. If that is so, then my question is really about coordination of advice to Government. All the evidence we have had so far indicates that there is a mass of advisory bodies and committees with little coordination on how Government policy can be informed. What do you think about the current system? Do you think it works well or could there be a more coordinated approach and, if so, what would that be?

**Professor Cotter:** If you look at genetics it is in a much better position than the rest of molecular medicine; you have the genetic testing groups, you have the GenCap Committee, you have the Genetics Commission which engages with the people who are actually going to pay for the work that is being done. We have the Government White Paper and the funding that came through that to set up the networks and to take that forward. It is a very tight knit

approach and I think avoids a lot of the issues that we are talking about. I think we need either an enlarged process from the one we currently have that involves all of the genetics side of things. When it comes to genetic therapy there is the Gene Therapy Advisory Committee which actually evaluates treatments and approves what is going forward. You have two bodies there already that involve genetic therapies being delivered and also some form of genetic testing. The only thing is, the clinical genetics one is really just concentrating on inherited disorders whereas you have a much, much broader field with micro-biology, virology as well as cancer, among others.

**Dr Walport:** I think at the level of Government the Human Genetics Commission is a wise body and if it was given a bit more resources to do its work it could actually provide the coordinating body that would provide a NICE in this area. I would not create anything new; I would actually empower the HGC.

**Q171 Chairman:** I hear that there is a review to be carried out on genetic advice; do you have any comment on that?

**Dr Walport:** No.

**Q172 Chairman:** I have three supplementary questions. The last one is directly to Dr Walport which you may or may not be able to answer, but I will come to that in a minute. My first question is, in your submission the Wellcome Trust suggests that Generation Scotland provides a good model for how NHS patient records can be harnessed in the context of translational medicine. Could you expand on that comment? Why do you think this example is a good example to follow?

**Dr Walport:** I think this goes beyond genetic medicine, but that the framework in which the Scottish Health Informatics has been constructed has been a much more supportive one both in clinical care and research. I think it has been designed with very good involvement of the

clinical community. I gave the example earlier of the diabetic database in Tayside. I think it has been a much more bottom up development and I think that Generation Scotland has come out of that and is turning into a very effective model. The challenge when you have a population less than ten million is very significantly different than for delivering it for a 50 million population and in a way it reflects the remarks I was making earlier about starting on a smaller scale and then build up to the grand scale. However, there is no question that if Connecting for Health can be implemented fully then it offers a 50 million tool as opposed to a ten million tool. I have visited the set-up in Dundee and it is a very powerful set-up in terms of informatics, providing better patient care and in doing so doing very good research. It is interesting in that context that in a peer review funding competition we were able to fund the research I mentioned on statins and the research on diabetics.

**Q173 Chairman:** Several times during the questions you have alluded to where we might be able to recommend where it may be helpful in progressing genomic medicine further. Have you further comments to make as to key areas where you might be able to make recommendations in terms of research, translational medicine and public policy?

**Professor Newell:** One area we have not spoken so much about is informing the public and empowering them to be equal partners in the decisions that they are going to have to make about the results they are going to get from genomic tests. The issue has been touched on around monogenic diseases and it is very clear that these are very complicated issues and the behavioural changes that we might be seeking to implement as a result of those tests and potential psychological effects on individuals armed with that information are all key issues. I think that should be a key component of rolling out the genomic medicine agenda.

**Q174 Lord Winston:** Do you not think that it is more than just informing the public; it is a question about having a dialogue with the public. This is increasingly embedded in Government policy and I think we should listen to those fears and try to respond to them.

*Professor Newell:* Absolutely.

**Lord Taverne:** Are there any examples we might follow of previous Government policy?

**Q175 Lord Winston:** Yes, we do have one. The Sciencewise policy over the HFEA Bill was rather successful. The HFEA was initially very resistant to the idea of the hybrid embryo but, after the dialogue conducted by Sciencewise, Government policy was turned around, very much in favour of what we have seen passed on the statute books this week.

*Professor Newell:* That is a good example.

**Q176 Chairman:** Are there any other issues?

*Dr Walport:* We have covered the ground but I would pick out two things as being crucial. I think enabling research at the level of large populations is key to moving ahead. There are a lot of issues, but that is an absolutely fundamental one and raises some of the issues we have been discussing with Lord Winston. The second one I would highlight is support for the informatic infrastructure at a European level where the Government has a key role to play. Those would be my two top messages.

**Q177 Chairman:** Thank you very much. The question I have for you, Dr Walport, is that I know that you together with the Information Commissioner are going to look at and review the use and sharing of personal information in the public and private sector. You may not be able to say much at this stage, but in the context of our inquiry into genomic medicine do you want to make a comment?

**Dr Walport:** I deliberately have not talked about it so far, although the work is highly relevant. Sir Richard Thomas and I were asked to do this review in October last year, little knowing that three weeks later HMRC would lose, allegedly, 25 million records, so the profile of this review has been quite high. We will be reporting to Government hopefully in the middle of June. We have done a very extensive consultation which has actually covered a lot of the issues we have been talking about. We have had about 240 written responses; we have had eight workshops; we have had 50 one-to-one meetings. All I can say at this stage is that I think some of our recommendations will be germane to the issues of data sharing in the context of research and statistics because it comes up as a clear issue. I suppose if you look at a taxonomy of sharing of data, data can be shared for three purposes. It can be shared for the purposes of protection and enforcement; it can be shared for the purposes of service provision; and it can be shared for the purposes of statistics and research. In a sense, the ground that we have covered today involves data sharing in all three of those domains actually but I think at this stage you will understand if I cannot let you know what the actual recommendations are.

**Chairman:** It was unfair of me to ask that question, but I was too tempted! Can I thank you all for a most interesting and, from our point of view, extremely useful session. If you find that there are areas that we have covered about which you would like to send a further submission, please do so and it will become part of your evidence. Thank you very much again.