

## **House of Lords Science and Technology Committee**

### **Call for evidence: Genomic medicine**

#### **Response to the Call for Evidence on Genomic Medicine from the House of Lords Science and Technology Sub-Committee:**

##### **Submission of evidence from the British Society for Haematology (BSH)**

###### 1.1

Here are comments submitted on behalf of the BSH with respect to the speciality of haematology and related oncology.

###### 1.2

Genomic medicine has been part of haematology oncology for many years and is very much the standard of care. The majority of these applications are based on DNA or RNA alterations that act as a marker of disease and can thus be used define the subtype of disease, stratifying treatment or to monitor disease response to treatment.

- Genomic studies are essential for bone marrow transplantation, Philadelphia chromosome levels are measured to determine the use of Glivec a treatment specifically against the chromosome causing chronic myeloid leukaemia.
- The levels of the lymphoma specific t(14;18) translocation determine the usefulness of therapy and the need for bone transplantation.
- The levels of leukaemia as determined by a patient specific DNA fingerprint is standard of care to decide whether or not to increase or decrease treatment for the cure of children's leukaemias.

These are but a few examples of how we currently use tumour genetics to provide modern treatment. However, this is very different from Genetics as all of these markers come from the tumour as opposed to being an inherited disposition. However, the technology used is virtually the same being based on methods to detect DNA/RNA alterations. Unlike the Genetics networks, there has been no central infrastructure funding, but there has been a European network through EU framework funding directly leading to some common practices and consensus. In addition quality assurance schemes are part of this development. Laboratories performing these tests are regulated by CPA accreditation and as such have developed as part of the Haematology pathology delivery. It is also worth noting that microbiology and virology have been revolutionised by DNA technology as each virus/bacteria has its own distinctive DNA fingerprint. Again this is standard of care. These areas of genomic medicine, unrelated to clinical genetics are largely unnoticed but are essential for today's patient management. However, as the technology moves on with the advent of technologies such as the RNA expression microarray "chips", providing an exponential improvement in patient management, the cost of infrastructure increases and there is duplication of costs as Genetics, Cancer and other fields in medicine develop their DNA testing in parallel. Newer equipment platforms can be very high throughput, with greatly reduced costs per test if fully utilised. There is an impelling need to combine these technologies in DNA/RNA technology units. This is

occurring in a few places under the umbrella of “Molecular Pathology” but these are not national initiatives. Barts and the London NHS Trust is one example and this was brought about by the building of a regional pathology building permitting a rethink of DNA testing being performed at a greater cost in a number of pathology disciplines. Their value in managing the patient is to reduce greatly the uncertainty in making the right management decision and this has a major cost benefit.

### 1.3

For non malignant haematology, in the clotting arena’ hereditary mutations have been determined for over a decade predicting those susceptible to the development of DVTs and miscarriages, assisting in preventative medicine. A number of new developments in the genetics of warfarin treatment are changing patient management for anticoagulants and is indicative of the advent of pharmacogenomics.

### 1.4

Looking forward to new developments in cancer therapy many new agents are very costly although effective in the right patient. Genomic medicine has a big potential to deliver this form of selection if research is provided to look for predictive “biomarkers” of response and this should be a mandate for the development of novel agents in the post genomic era. This should be an important area of research and is becoming a high priority for pharmaceutical companies.

### 1.5

What is lacking is a proper regulatory framework that is found in the Clinical Genetics arena. However, there has been a degree of CPA accreditation regulation and self regulation from the good places via EU framework initiatives, but, this does still leave room for unregulated and potentially poor quality delivery of this form of pathology. In addition the use and application of new tests needs proper evaluation and use. No means for this is properly developed leaving room for abuse of DNA cancer testing.

### 1.6

With regards genomic medicines, these have been around in cancer medicine for at least 16 years. The first gene silencing trials with Bcl-2 antisense oligonucleotides took place in 1992. Other genes have been similarly targeted and drugs such as Glivec, FLT3 inhibitors, Velcade are all targeted at the genetic defect in the tumour. These drugs have significantly improved cancer therapy and this area of cancer treatment is expanding exponentially. With regards regulation, interestingly the Gene Therapy Advisory Committee has largely taken over the regulatory role and this is sensible and works well.

### 1.7

Below I will give you a few broad brush responses but it is difficult to fully convey the overall sense of the use and development of Genomic Medicine in the Haematology/Pathology arena by answering the questions alone so I hope the above gives a more composed view of the current state. What is clear is that there will be an exponential growth in Molecular Pathology. In 5 years I have seen my own molecular pathology unit at Barts and the London increase its workload five times over. I also did some predictive modelling for clinical genetics testing for the Genetics Framework bid following the 2004 Genetics White Paper for the years between 2005 and 2010 and this suggested a 3 times increase. It is very nearly there already. A more

coordinated approach to the whole picture makes sense in both delivery and regulation.

### **Policy Framework**

- Who is in charge of setting and reviewing policy in this area? **Local demand and national trails**
- Who provides scientific advice on policy development? Who monitors and anticipates potential scientific developments and their relevance to future policy? How effective are these mechanisms? **National trial design and outcomes. This is not an effective way of bringing this into the NHS**
- Does the existing regulatory and advisory framework provide for optimal development and translation of new technologies? Are there any regulatory gaps? **Major gaps and no real regulatory body.**
- In what way is science and clinical policy decision-making informed by social, ethical and legal considerations? **Poorly. Ethics for trials only.**
- How does the framework compare internationally? **What we currently do in good centres and with national trials stands well internationally and leads in some areas such as childhood leukaemia.**

### **Research and Scientific Development**

- What is the state of the science? What new developments are there? What is the rate of change? **New developments are rapid but are reliant on research group interests without a coordinated approach. The arena of rapid diagnostic platforms and array technology have huge potential as new developments but organisation of delivery and lack of good regulation is a hindrance to these developments.**
- Who is taking the lead in the consideration and co-ordination of research and the development of new technologies? **No clear answer**
- How effective is the policy and investment framework in supporting research in this area? **Currently not great as I do not feel that this is understood as a developing area.**
- How does research in the UK compare internationally? How much collaboration is there? **Some good areas of research (e.g. Childhood leukaemia and Eu initiatives) but patchy.**
- What are the current research priorities? **Standardisation, assessment and regulation of new developments, infrastructure including merging of all DNA technologies, i.e. simplification.**
- What is the role of industry? How much cross-sector collaboration takes place? **Pharmacogenomics but not delivery as this would tend to pick on the most lucrative rather than the broad delivery of all required.**

### **Data Use and Interpretation**

**There is no good data repository and this is a very haphazard area. It would be a major move to bring this together.**

- Is genomic information published, annotated and presented in a useful way? Should there be a common, public database? If so, who should fund, and have responsibility for, such an initiative?
- Who should provide the framework for optimal evaluation of data and translational opportunities? What policy and funding mechanisms are in place for recognising and utilising potential opportunities?
- Is other medical information recorded in a suitable format to allow optimal interpretation of genomic data? How should genomic data be brought together with other health information?
- What are the implications of the generation and storage of genome data on personal data security and privacy, and on its potential use or abuse in employment and insurance? How should these be addressed? **In the cancer field this is not a major issue.**

## Translation

**There is huge potential to translate genomic medicine, but it needs coordinated organisation and a national approach. Genetics have provided some pointers and recent white paper initiatives have been very beneficial. Regulation and standardisation is essential in the non clinical genetic .**

- What opportunities are there for diagnostics, therapeutics and prognostics – now and in the future? **Huge it is THE major advance in medicine and essential to get right.**
- Who is responsible for translation to clinical practice? **V haphazard**
- Given the pace of technological advance, how ‘future-proof’ is healthcare investment in this area? **This is robust as we can see in the cancer medicine arena where we have been using this technology for over a decade. DNA alterations do not change.**
- How does the UK compare to other countries and what lessons can be learnt? **Not much worse but not much better. Germany better organised in some areas.**
- How meaningful are genetic tests which use genome variation data? What progress has been made in the regulation of such tests? **V Little**

## Biomarkers and Epidemiology

- In what way do genome-wide association studies contribute to the identification of biomarkers? How is the study of genetic factors and biomarkers integrated for translational purposes? **Genome wide studies are very important but the integration is not good for translational purposes. There is a disconnect between research and clinical application. NHS research funding could assist in breaking this down.**
- What impact will genomic data have on data emerging from projects such as UK Biobank, Generation Scotland and other biobanks? **Not sure much use currently for haematology.**

## Use of genomic information in a healthcare setting

- What impact will genomic information have on the classification of disease? How will it affect disease aetiology and diagnostic labels? **This is the way of the future. Already very important in blood cancers.**
- How useful will genomic information be as part of individualised medical advice? What provisions are there for ensuring that the individual will be able to understand and manage genomic information, uncertainty and risk? **This will take much longer to develop.**
- Should there be a regulatory code (mandatory or voluntary) covering the provision of this advice? **Yes**
- What are the implications of developments in genomic technologies for the training of medical specialists and other health professionals? Are there any gaps that need addressing? What is the assessment and planning for future needs in capacity? **Very poor and haphazard except in the genetics arena.**