



New Approaches to Molecular Diagnostics and Typing in Public Health Microbiology



1. Executive Summary

The workshop was held at CPHL on the 27th and 28th May 2002 at the PHLS Central Public Health Laboratory, Colindale, and London, UK

The aim of the meeting was to bring together the lead individuals from the major Public Health Institutes in Europe to:

- Identify the new molecular technologies that are relevant to European public health microbiology,
- To review the extent to which these technologies have currently been implemented across Europe
- To discuss key issues in implementing these technologies
- To identify other novel technologies that potentially could improve public health microbiology in Europe.
- To explore possibilities for a European network of public health microbiology

The workshop opening address was made by Dr Diana Walford, Director of the PHLS, in which she welcomed the participants to CPHL and highlighted the significance and timeliness of the workshop in the current times of exponential technological developments for public health microbiology. Dr Marianne Minkowski, ESF Senior Scientific Secretary, EMRC, then described the aims and the role of the ESF in funding these workshops. She described the willingness of the ESF to listen to participants in such activities in defining the changing needs for science in Europe. Her comments were well received among the workshop participants.

Professor Borriello, Director of the Central Public Health Laboratory introduced the first session, which included the keynote presentations by leading public health scientists across Europe reviewing new approaches to public health microbiology particularly in molecular diagnostics and molecular surveillance. These presentations gave a comprehensive overview of the current opportunities for public health microbiology.

The second session chaired by Professor Saheer Gharbia, Head of Genomics, Proteomics and Bioinformatics, at CPHL focused on the actual technologies themselves and how they had been implemented in Europe. The presentations covered the topics of high-throughput methods for molecular detection (Dr C Arnold), quantitative PCR in clinical management (Professor Luminita Iancu), bacterial sequence typing (Professor Andrew Fox), DNA serotyping of *salmonellae* (Professor Miguel Usera), European typing databases (Dr K Towner), molecular typing arrays (Prof N Sanders) and rapid typing by HMA (Dr J McLauchin). This session provided insight into how the new technologies could be implemented but also the potential difficulties and current limitations.

Following Professor Gharbia's closing remarks for the session, the participants were invited to view the DNA arraying, proteomics and bioinformatics facilities in CPHL, allowing those interested in the technologies to discuss further the practicalities of establishing the methods in a public health microbiology laboratory. This was followed by the Conference dinner at CPHL.

The first session of the second day was entitled 'The Near future' and was chaired by Professor Antonio Cassone. Two presentations were given on bioinformatics and on proteomics. Both presentations highlighted the rapid rate at which these technologies were developing and their potential impact on public health microbiology. In his presentation 'Public Health Bioinformatics: *in silico* to *in vivo* microbiology', Dr Underwood outlined the approaches that are coming online for complete genome comparisons and how these can be used in developing improved diagnostic/typing assays, in prediction of susceptibility/resistance to antimicrobial agents and in designing improved vaccines etc. He stressed that these technologies were no longer just within the academic arena but that they are already a part of public health microbiology and strongly suggested that, in order to ensure compatibility of data, platforms etc, that the participants should consider the formation of a bioinformatics network among European Public Health Centres. Professor Shah then presented on the application of proteomics technologies, particularly MALDI-TOF and SELDI-TOF. Professor Shah described the huge potential of these technologies not only for rapid identification of microbes but also for improved understanding of the microbial proteome in infectious disease states.

In Session 4, an open forum was held in which representatives from each country report on the current status with regards these technologies in their Public Health Institutes, flagging up priorities for new developments and the challenges to their implementation. Representatives from eleven countries gave short addresses regarding the current technological status for public health microbiology in their country and the priorities for developments.

The final session was aimed at distilling the points raised regarding public health microbiology in the previous four sessions and at discussing the possibility of a Network of Excellence for Public Health Microbiology based on a consortium of the Public Health Institutes represented at the Workshop. Professor Peter Borriello and Professor Antonio Cassone led the discussions. It was agreed that, despite differences in the molecular capability of the National Public Health Institutes, there are common priorities. There was general agreement that for some rare infections e.g. cat scratch fever, a Specialist European Diagnostic Centre may be appropriate. There was a shared view of the increasing impact of molecular technologies on public health microbiology and the urgent need to develop an infrastructure to support these initiatives. However, the role of both 'high-tech' and 'low-tech' approaches was noted. In embracing the new technologies, the need for complementarity, standardization and/or harmonization was identified, as was the need for quality control, EQA (including DNA sequencing). Similarly, the need for common molecular epidemiology outputs, common database platforms and linkage and for accessibility was also noted. Whilst it was accepted that local changes in technologies required local expertise, it was felt that a European network would greatly aid the widespread implementation of molecular technologies. Thus there is a need for an infrastructure to underpin the network. Dr Jon Green and Dr Jim McLauchin also gave a short presentation describing a model for such an infrastructure. In the final action of the workshop, it was agreed that a European Union Framework VI Expression of Interest be submitted based on this model.

Professor Peter Borriello and Prof Jacques Balandreau then formally closed the workshop

2. Scientific Content

As indicated in the programme and the executive summary, the scientific content of the workshop was at several levels. Firstly, in the keynote presentations, the broader overview was described although all presentations were illustrated with scientific data. Following on from this, the afternoon of the first day comprised a session focusing in on the technologies and their implementation. These included the application of real-time quantitative PCRs for blood-borne viruses, typing *Neisseria meningitides* and *Campylobacter jejuni* by Multi-locus Sequence Typing (MLST), typing Salmonellae by multiplex PCR, DNA arrays for identification, typing and in expression studies and the use of HMA for rapid typing of viruses and *cryptosporidia*. The workshop also included a tour of the Genomics, Proteomics and Bioinformatics Unit at CPHL, facilitating further in-depth discussion of these technologies. Session four was more of a 'horizon scanning' exercise, including descriptions of the latest procedures and applications of bioinformatics and proteomics. These presentations included scientific discussion of 'cutting edge' technologies.

The aim of the workshop was to facilitate discussions among the representatives from the different countries on all aspects of molecular identification and typing technologies for public health microbiology, from the strategic consideration through to the actual performance of the tests. The two days were structured in such a way to allow much informal discussion of the topics so that by the time of the 'summing up' session, a true consensus could be agreed.

3. Assessment of the results.

The main output from this meeting was the EU Framework VI Expression of Interest document, which details the agreed approach to the development of an infrastructure for Public Health microbiology across Europe. The model agreed was developed during the course of the workshop and incorporated the key elements identified by consensus among the group i.e. the need for a network to strengthen and develop Community scientific excellence in this area, the need for shared activities in training, quality assurance, communication, database development etc. The proposed network fundamentally addresses these issues through the installation of 'facilitators' in each of the European Centres, coordinated via a central Steering Group and communicating through a central portal. The EOI (attached) was submitted to the EU on 7th June 2002.

An attempt was made to formally assess the views of the participants regarding the success of the Workshop by inclusion of a questionnaire among the documentation. Only one was returned completed albeit very positive about the value of the workshop.

4. Final Programme

Please see attached.

5. Delegate List

Please see attached.

6. Statistical information

Nineteen delegates (including the two ESF representatives) from 11 countries attended the workshop. The countries represented were Austria, Czech Republic, Denmark, France, Germany, Italy, Spain, The Netherlands and the UK. Given that the delegates were generally senior scientists, in some cases Directors, of Public Health Institutes, they were predominantly more than forty years of age.

Completed by Dr Jonathan Green on behalf of Professor SP Borriello



FINAL PROGRAMME

Monday 27th May 2002

09:30 – 10:00 Registration & Coffee

10:00 **Introduction**
Diana Walford, Director
Public Health Laboratory Service, UK

10:10 **Presentation of the European Science Foundation**
Marianne Minkowski, ESF Senior Scientific Secretary
European Medical Research Council (EMRC)

Session 1 – Keynote Presentations

Chair: Professor Peter Borriello (Director CPHL, UK)

10:30 **New approaches to molecular diagnostics**
Peter Borriello (Director CPHL, UK)

11:00 **The impact of new molecular technologies on public health microbiology – an overview**
Andrew Fox (PHLS Manchester, UK)

11:30-11:45 **Coffee**

11:45 **International molecular surveillance: a new discipline**
Peter Gerner-Smidt (Statens Serum Institut, Copenhagen, Denmark)

12:15 **Is molecular epidemiology a valuable tool for effective infectious disease surveillance?**
Ioan S. Bocsan (Moldovan Institute of Public Health, Romania)

12:45 **Perspective of molecular microbiology and its impact on public health institutions**
Antonio Cassone (Istituto Superiore di Sanità, Rome, Italy)

13:15-14:00 **Lunch**
CPHL Refectory (1B16/17)



Monday 27th May 2002 (continued)

Session 2 – New Technologies

Chair: Professor Saheer Gharbia (Head of GPBS, CPHL, UK)

14:00 **High-throughput methods for molecular detection**
Cath Arnold (GPBS, CPHL, UK)

14:20 **Quantitative PCR in clinical management**
Luminita Iancu (Director, Institute of Public Health, Romania)

14:40 **Sequence based methods for bacterial typing**
Andrew Fox (PHLS Manchester, UK)

15:00 – 15:20 **Coffee**

15:20 **DNA serotyping of *salmonellae***
Miguel Usera (Instituto de Salud Carlos III, Spain)

15:40 **The establishment of European typing databases**
Kevin Towner (PHLS Nottingham, UK)

16:00 **Arrays for molecular typing**
Nick Saunders (GPBS, CPHL, UK)

16:20 **The heteroduplex mobility assay as a rapid typing method**
Jim McLauchlin (PHLS, CPHL, UK)

16:40 **Closing remarks**

17:00 *Wine buffet and demonstrations of New Technologies in the PHLS*

18:30 **Conference Dinner**

21:30 *Return transport to hotel*



Tuesday 28th May 2002

09:30 Reception & Coffee

Session 3 – The Near Future

Chair: Professor Antonio Cassone (Istituto Superiore di Sanità, Rome, Italy)

10:00 **Public Health Bioinformatics: *in silico* to *in vivo* microbiology**
Anthony Underwood (GPBS, CPHL)

10:45 **The post-genomic era: proteomics**
Haroun Shah (GPBS, CPHL, UK)

11:20-11:40 **Coffee**

Session 4 – Current Status in Europe

Chair: Professor Peter Borriello

11:40 An open forum in which **representatives from each country** will report on the current status with regards to these technologies in their Public Health Institutes, flagging up priorities for new developments and the challenges to their implementation: *10 minutes per contribution*

13:00 –14:00 **Lunch**
CPHL Refectory (1B16/17)

Session 5 – Summing Up

14:00 Professor Borriello will outline the priority organisms/technologies that have emerged through the workshop discussions. These will then be discussed further and refined. Plans for development of a proposal for funding to take this forward can then be outlined.

14:50 **Closing remarks from the European Science Foundation**
Professor Jacques Balandreau (ESF/LESC)

15:00 *Workshop closes*

**European Science Foundation Workshop
"New Approaches to Molecular Diagnosis and Typing in Public Health Microbiology"**

Full list of invitee details

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EXPRESSION OF INTEREST FOR NETWORK OF EXCELLENCE
Development of a virtual European Public Health Microbiology Reference Centre.

Professor SP Borriello

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Robert Koch Institute, Germany
Institute Pasteur, France
Instituto Superiore di Sanita, Italy
Statens Serum Institut, Denmark
Institute of Public Health, Romania
University of Athens, Greece
Centro Nacional de Microbiologica, Spain
University College, Dublin, Ireland
Imperial College, London, UK
Veterinary Laboratories Agency UK

This Expression of Interest was submitted in response to Call EOI.FP6.2000
7th June 2002

1. Aim of the Proposed Work

The aim of this proposal is to establish a virtual European centre of public health microbiology through the linking of a network of National Centres of excellence in Public Health Microbiology. This network will provide a framework for the structuring and integration of European public health molecular microbiological research directed towards the prevention and control of infectious diseases and to support the infectious disease research community in the implementation of analysis of the molecular data. The project will establish an international action through the consortium of excellence in Public Health Institutes for the development of a European central internet portal for public health molecular microbiology research in human infectious disease. This portal will be underpinned by a network of bioinformatics facilitators in Public Health Institutes, which will allow the curatorship of molecular databases with an initial emphasis on nucleic acid sequences. The network infrastructure and project activities, focussing on advanced research and specialised training, will allow consistency and complementarity across Europe through standardisation of database format, and identification of best practise for molecular and nucleic acid sequence analysis, thus providing a sustainable model for a virtual European Centre for infectious disease prevention and control.

1.1 Contribution to Priority Thematic Area of Framework 6

This proposed network of excellence will integrate and strengthen the following European research areas:

- Genomics and biotechnology for health (1.1.1)
- Gene expression and proteomics (1.1.1.ia); Bioinformatics (1.1.1.ia); Multidisciplinary functional genomics (1.1.1.ia); Technological platforms for the development in new diagnostic, prevention and therapeutic tools (1.1.1.ia); Combating major diseases (1.1.1.ii); Use of genomic approaches to study rare diseases, combat resistance to antibiotics and other drugs (1.1.1.ia); Confront major communicable diseases linked to poverty (1.1.1.iic)
- Applied IST Research addressing major societal and economic challenges (1.1.2.i)
- Food quality and safety (1.1.5);
- Epidemiology of food related diseases; Impact of food on health; Traceability processes along the production chain; Methods of analysis detection and control; Impact of animal feed on human health
- Environmental health risks including transmission of illnesses linked to water

1.2 Contribution to the European Research Area

The network of excellence will integrate the existing, (currently fragmented) research among Public Health Institutes, as well as academic and other sites. National Public Health Institutes with less-well developed molecular capability for research will benefit as they will have access to the knowledge and expertise within the network. The proposal includes appointment of 'Bioinformatics Facilitators' in each of the component Institutes to provide local expertise. This will empower local Institutes in the field of bioinformatics and molecular technologies and also provide a network of facilitators by which 'best practices' can be identified and implemented. The establishment of a central portal will facilitate the delivery of high-quality, accurate and comprehensive data and information not only to partners in the network but to the research community, the public health community and the general public. This will add considerable value at the EU level to existing and future research activities and allow mechanisms for more rapid conversion of R&D results into useful public health interventions.

2. Background to the Proposed Work

Recent advances in molecular microbiology have led to the development of methods of unprecedented analytical power that allow the characterisation of biodiversity of infectious agents. The rapid expansion in technologies for high throughput sequencing have led to an exponential growth in the number of complete microbial genomes with approximately 60 currently available and 150 currently in progress. Software tools for the analysis of substantial or complete genomic sequences that were initially developed mostly in academia are now being applied in public health microbiology. Similarly, developments in proteomics and transcriptomics are being evaluated for public health purposes. The US is significantly investing in this area with considerable budget increases for CDC and NIH. Europe needs technological concentrations in microbiology (similar to the CERN for subnuclear physics). European Public Health Institutes have identified the potential of new molecular technologies regarding improved diagnosis and pathogen characterisation, improved understanding of microbial pathogenesis and virulence and the ability to improve clinical/outbreak management. Consequently, some Institutes have established departments specifically to develop and apply methods of genomics, proteomics and bioinformatics. However, there is currently a lack of an infrastructure to ensure the compatibility and co-ordination of these efforts that is essential to fully exploit the current opportunities for new approaches to infectious disease research at the EU level.

It is well recognised that microbes ignore political or geographic borders and consequently there is a need for collaborative efforts across Europe and other Continents. Numerous networks for improving the monitoring and surveillance of microbial pathogens have been set-up within Europe eg, Enter-Net, FluNet, EWGLI, FBVE. In some cases parallel or overlapping networks have been established. It is without doubt that a number of other networks specific to certain pathogens will be proposed with Framework 6. A common feature of these proposals is that they always encompass Laboratories from various National Public Health or Veterinary Institutes as core membership. This piece-meal and fragmented approach to creating interactive networks for Public Health Reference Microbiology to enhance health and well-being of the population of Europe is neither desirable nor the most efficient way forward. This compartmentalised and thus fragmented approach does not exploit the overlapping competences of the experts assigned to the numerous projects, and does not facilitate compatibility between data from individual projects or share material resources (computers, servers etc). The information outputs from these initiatives are often available at diverse locations and thus cannot always be readily accessed by those outside the projects. In this Expression of Interest we propose the establishment of a Network of Excellence composed of the National Institutes for Reference Microbiology/Public Health to provide a stable virtual Centre for Europe which will provide the Commission with powerful interactive tools in its pursuit to improve health. The networked Institutes will also include Veterinary and Food Institutes and will provide an infrastructure that can underpin the specialised networks as well as this network as a whole. It will ensure common standards, for example for sequence data quality and curation, standardised molecular typing networks, EQAs, IQC reagents, training, co-ordinated research, bioterrorism response, production of common Standard Operating Procedures and common or harmonised bioinformatics platforms to allow 'data mining' approaches. This will not only facilitate improved organism- or disease-specific networks by improved access to information and resources, but a much more scalable, robust and responsive virtual Reference Microbiology Laboratory that could respond quickly European needs. Using a central portal as a single directory to databases and information enhances the accessibility of outputs from individual projects and networks. The exploitation of this increase in bioinformatics information for public health purposes cannot be fully achieved without interaction with other parallel initiatives, for example, in the academic and commercial spheres, and in other Continents. The network infrastructure and project activities will thus provide a sustainable model for a virtual European Centre for infectious disease prevention and control.

3. Expected Results from the Proposed Work

Expected Result	Users of the Results
Acceleration of the uptake of genomic and proteomic approaches for public health in EU	EU, European Public Health Institutes
Improved accessibility to high-quality data and information relating to microbes of public health significance	EU and National Governmental Health bodies, European Public Health Institutes, Scientific communities, Public Health communities, General public
A network of common platform databases across Europe	EU and National Governmental Health bodies, European Public Health Institutes, Scientific communities, Public health communities, General public
A portal of public health microbiology	EU and National Governmental Health bodies, European Public Health Institutes, Scientific communities, Public health communities, General public
A network of bioinformatics facilitators in Public Health Institutes	European Public Health Institutes, Scientific communities, Public health communities
Greater awareness of public health issues across Europe	EU and National Governmental Health bodies, European Public Health Institutes, Scientific communities, Public health communities, General public
Improved health within EU	Members of the EU

4. Activities to Achieve the Proposed Objectives

4.1 Integration Activities

A shared Public Health Microbiology Internet Portal will be established which will link public health institutes, sources of public health information, and molecular databases through a single site. The use of this portal will be supported by a network of Bioinformatics Facilitators in each of the Public Health Institutes. Training and mobility of such personnel will allow:

- Achievement of common and enabling bioinformatics skill base in each Institute
- Formulation of best (and common) codes of practice for the maintenance and curatorship of molecular databases
- Integration of existing bioinformatics activities
- Standardisation of platforms allowing compatibility of data between different Institutes
- Best access and use of other bioinformatics resources

Access to the results of these above activities will be achieved through the Internet Portal, and these will also be underpinned by workshops for the promulgation of the produced outputs. Additional integration activities will be the production of external quality assessment and standard materials produced by SMEs.

4.2. Research Activities

Implementation of the Integration Activities within this project will provide an infrastructure to underpin a wide range of research activities. These will be varied in different Public Health Institutes according to local and shared priorities. Thus, it is envisaged that research projects may include specific groups of countries /Institutes or include all participants. The priorities* have been identified to include research in the establishment of molecular databases, investigation of rare diseases, combating resistance to antibiotics and other drugs, communicable diseases linked to poverty (including TB and AIDS), microbiological and epidemiological investigations by application of multilocus sequence typing, technologies for high throughput sequencing and Single Nucleotide Polymorphisms, molecular identification using 16S/18S rDNA sequence, specialised reference functions, bioterrorism and molecular epidemiology.

Initial areas of research will include:

- Multilocus sequence typing for pathogenic bacteria
- Detection and characterisation and potential agents used for bioterrorism (including their antimicrobial resistance)
- Detection and characterisation of food and waterborne pathogens (including their antimicrobial resistance)

The established network/infrastructure could also be used by externally managed research projects (e.g. organism-specific networks) thus integrating and providing a common platform for EU research initiatives.

*Output from an ESF-funded Exploratory Workshop held at Central Public Health Laboratory, PHLS London. (<http://www.esf.org/emrc/workshops/02>)

5. Expertise Needed to Achieve Objectives

5.1 Critical Mass Required and Multidisciplinary Skills

The proposed consortium represents a drawing together of the major Public Health Microbiology Institutes in Europe who are leaders in this scientific field. Whilst research into the areas outlined above is going on in several of the component Institutes, it is the combined efforts that will provide the critical mass required to expedite progress. In many areas of research there is a veterinary/zoonotic component (e.g. foodborne/waterborne disease, antimicrobial resistance, bioterrorism) and it is important to integrate Veterinary Institutes in this initiative. These are represented by the VLA (UK) and Istituto Superiore di Sanita, Italy. It is also important to have input and involvement from academic and industrial partners. These include Imperial College, Applied Maths, Casmir and NCTC.

5.2 Proposed Consortium (Organisation, Background and Role)

	Organisation	Country	Chief Scientist	Area of Excellence	Role in Project
1	Public Health Laboratory Service	UK	SP Borriello	Public Health Reference Microbiology, Bioinformatics, UK public health surveillance	Core member
2	University of Innsbruck	Austria	F Allerberger	National reference centre for listeriosis, enterohemorrhagic Escherichia coli, anthrax, and botulism.	Core member
3	Robert Koch Institute	Germany	H Tschape	National Reference Centre for Salmonella and other enterics, Molecular typing	Core member
4	Istituto Superiore di Sanita	Italy	A Cassone	Public health of infectious disease, veterinary medicine, Genomics and biotechnology	Core member
5	Institut Pasteur, Paris	France	P Grimont	Molecular typing, prevention of disease through biological research	Core member
6	Statens Serum Institut	Denmark	F Espersen	Danish Centre for Prevention and Control of Infectious Diseases and Congenital Disorders	Core member
7	Institute of Public Health, Cluj-Napoca	Romania	I Bocsan	Public health reference microbiology, antibiotic resistance, TB, HIV	Core member
8	Institute of Public Health, Iasi	Romania	L Iancu	Antibiotic resistance in <i>E.coli</i> , salmonella <i>S. aureus</i> , public health and poverty (TB, HIV)	Core member
9	Centro Nacional de Microbiologica	Spain	JLRodriguez-Tudela	Public health microbiology reference, diagnostics, research and education	Core member
10	Imperial College, London	UK	BG Spratt	Bioinformatics, molecular microbiology multilocus sequence typing,	Core member
11	National Institute of Public Health and the Environment (RIVM)	The Netherlands	M Koopmans	Infectious diseases research and reference diagnostic facilities, Europe-wide molecular epidemiological studies, food- and waterborne pathogens, vaccine-preventable diseases, and antimicrobial resistance.	Core member
12	University College, Dublin	Ireland	S Fanning	Public Health molecular microbiology, bioinformatics	Core member
13	Veterinary Laboratories Agency	UK	M Woodward	Veterinary infectious disease research, genomics, bioinformatics	Core member
14	University of Athens	Greece	NJ Legakis	Molecular diagnosis of bacterial infections, Molecular typing of bacterial strains, antimicrobial drug resistance mechanisms	Core member
15	National Collection Type Cultures	UK	C McCartney	Biological Resource Centre, SME	Associate member
16	Applied Maths	Belgium	L Vauterin	Software/database development, SME	Associate member
17	Casmir	UK		Portal/knowledge Management development, SME	Associate member

6. Promotion of Results Outside of the Consortium

The results of this project in terms of the activities, codes practice, availability of reagents and other biological resources, EQA schemes etc will have open public access via the internet portal. Because of the links available within the portal, results of the project will also be available through local public health networks, and other communication channels. Results of the project will published in peer reviewed scientific journals, local epidemiological journals, presented at local national and international meetings involving all aspects of public health microbiology. The formulation of a network of bioinformatics facilitators will have a strong training role which will include the running of local and national workshops on all aspects of the application of bioinformatics to public health microbiology.

7. The Role of SMEs in the Proposed Work

7a) The involvement of SMEs in Networks of Excellence

The SMEs involved in the project include a Biological Resource Centre (NCTC, UK), a software development company (Applied Maths) and a knowledge management company(Casmir). An SME for the provision of external QC would also be recruited to participate.

7b) How the results will work for the benefit of the SMEs?

The project will provide a network by which enhanced EQA can be established and developed thus ensuring optimal feedback to the EQA providers, allowing precise targeting of schemes to current local and shared needs. Similarly, the network will allow a close link to be formed between the research/Public Health Institutes and the Biological Resource Centre network. The BRCs will benefit from access to timely and accurate data to support their collections.

Software developers will be linked in to a system that will allow them to access accurate information regarding the requirements of Public Health Institutes for analysis software/hardware. The establishment of this relationship will allow the software companies to focus their development programmes appropriately for the needs of this sector.

8. How the Project will be Managed

Overall co-ordination would be undertaken by a Council of the Directors of the National Institutes or their delegated representative. The embryonic infrastructure for this exists following the formation in 1998 of the Association of Directors of European Public Health/Hygiene Institutes. There will also be representation from the academic and commercial partners and a representative of the EU Committee for Surveillance of Communicable Diseases would be invited to join. This management arrangement will allow a flexible response to emerging public health priorities of local and EU bodies. Each Public Health Institute will constitute a core member of this project, and other core group members are identified in Table 5.2. Assistant partners will include academic, veterinary, BRC and SME inputs to the project. Calls for proposals will be launched by the consortium to invite new members to undertake specific tasks.