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4th REPORT

SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

FIGHTING INFECTION

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Note: References in the text of the Report are as follows:

(Q) refers to a question in Volume II (HL Paper 138-I)

(I, p) refers to a page in Volume I (HL Paper 23)

(II, p) refers to a page in Volume II (HL Paper 138-I)

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Executive Summary

Infectious disease is a significant cause of human illness and death. It leads to economic downturns and contributes to social and political instability. Every year worldwide fifteen million people die from an infection. The emergence of infections, such as Severe Acute Respiratory Syndrome (SARS), create wide–spread anxiety and affects global travel and trade. It is widely feared that a global outbreak of a new strain of influenza could result in a repeat experience of 1918 when seventy million people died across the world.

Infectious disease services in England (the devolved administrations have separate arrangements), whilst better than those found in many countries, suffer from problems. The services expected to protect the population from both common and more unusual infection are under–resourced and over–stretched. If this country were to experience a major outbreak of an infection the services may not be able to cope: there is not enough surge capacity. Thus:

> we recommend that the Government recognises and addresses the fact that, although England has not experienced major epidemics of infection in recent years, this owes as much to good fortune as to good management. Without improvements we fear that this country will suffer from major epidemics and will continue to see infectious disease take its toll in economic terms, in suffering and in lives.

Arrangements for formal collaboration are poor and lines of accountability unclear. Collaboration is difficult: many organisations and health professionals are involved in fighting infection.

We call on the Minister for Public Health to improve cross–departmental working on infection and to ensure that all relevant organisations understand their roles and responsibilities. We also recommend that the Government create a number of "infection centres". These would develop collaborative working, create a critical mass of expertise and provide a setting for high quality research and training in all aspects of infectious disease.

Committed and competent health professionals work hard to control and prevent infection, yet they are insufficiently supported. We recognise that infectious disease cannot be completely overcome, but improvements should be made in order to ensure that the response as is as effective as possible. In particular there is a need to:

- Improve collaborative relationships across the services
- Ensure there are sufficient well–trained health professionals
- Develop ways of electronic capture, analysis and dissemination of information about infection across relevant organisations
- Establish clear evidence–based priorities for, and facilitate development of vaccines and diagnostic tests
- Fund research to provide an evidence base for improving diagnosis, treatment, prevention and control of infection
- Secure supplies of vaccines in case of epidemics
- Provide clear advice and information to the public

International collaboration is an essential component of effective services. Global partnerships provide early warning of possible epidemics. We believe that the Government should further facilitate international collaboration by making available resources so that infectious disease experts can be placed on short–term secondments with the WHO and similar bodies.

FOURTH REPORT

2 JULY 2003

By the Select Committee appointed to consider Science and Technology.

ORDERED TO REPORT

FIGHTING INFECTION

PREFACE AND SUMMARY OF RECOMMENDATIONS

1.1 The Science and Technology Select Committee established a Sub–Committee in May 2002 to carry out an inquiry into diagnosis, treatment, prevention and control of infectious disease. The membership of the Sub–Committee together with declarations of interest is given in Appendix 1.

1.2 The Sub–Committee issued a call for evidence in July 2002, which is given in Appendix 2. This attracted 117 written submissions from individuals and organisations. Forty–nine individuals from thirty–eight organisations were invited to give evidence in person [1]. In July 2002 the Sub–Committee organised a seminar, hosted by the Academy of Medical Sciences, to gain an overview of some of the main issues of infectious disease control [II]. Over the duration of this inquiry the Sub–Committee visited health care institutions, research and surveillance centres and public health departments in England, Switzerland and the United States of America [see evidence vol II].

1.3 The organisation of some of the services involved in infectious disease control has changed over the duration of this inquiry following the establishment of the Health Protection Agency (HPA) in April of this year. The broad concept behind the HPA was widely welcomed by our witnesses, although they raised a number of concerns about the detail. The HPA is in an early stage of its development and, throughout this report, we draw attention to some of the areas that we believe it must address as a matter of urgency.

1.4 There is a large number of infectious diseases and many methods and particular services are needed to tackle them. In this report we discuss the processes of diagnosis, treatment, control and prevention; we focus on infection in general as it affects humans. However, we discuss the importance of animal–borne infection and we also draw on specific infections as examples. We point readers to some recent and pending inquiries which investigate in more detail particular groups of infection. The House of Commons Health Committee has published a report on sexual health[2] and the National Audit Office will, in winter 2003-04, publish a follow–up to its earlier study of Hospital Acquired Infection[3]. The House of Commons Science and Technology Select Committee will discuss deliberate release of infection in its report on Bioterrorism, expected to be published in July 2003. We reported on antibiotic resistance in 1998 with a follow–up report in 2001[4].

1.5 This report focuses on infectious disease as it affects England (devolved administrations have separate arrangements[5]) but we recognise the importance of international dimensions to infectious disease control and discuss this accordingly (see chapter nine).

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1 Evidence is found in :

House of Lords Select Committee on Science and Technology *Fighting Infection: Written evidence volume I (evidence received up to 18th February 2003)*, , Session 2002-3; HL 23, ISBN 010 400218 2

House of Lords Select Committee on Science and Technology *Fighting Infection: Evidence volume II (oral evidence and written evidence received after 18th February 2003)*, Session 2002-3; HL 138-I

In addition this is available on the CDRom provided in the back of this report volume or on the website: www.parliament.uk/hlscience

2 House of Commons Health Select Committee *Sexual Health*, Fourth Report Session 2002-03, HC 69.

3 *The Management and Control of Hospital Acquired Infection in Acute NHS Trusts in England* Session 1999-2000, HC 306

4 House of Lords Select Committee on Science and Technology *Resistance to Antibiotics*, Third Report Session 2000-01, HL 56, ISBN 0 10 405601 0

5 Northern Ireland, Scotland and Wales organise services differently. The HPA has some presence in Wales and a Service Level Agreement with Northern Ireland.

Acknowledgements

1.6 We received much help from a large number of organisations and individuals throughout this inquiry. We thank all of our witnesses. Without people giving up significant time to submit evidence in writing or attend formal evidence sessions our inquiry and report would not have been possible.

1.7 We are most grateful to the following which hosted visits or seminars:

- Academy of Medical Sciences
- Central Public Health Laboratory – Public Health Laboratory Service (CPHL, PHLS),
- Centre for Applied Microbial Resistance (CAMR)
- Institute of Food Research
- Birmingham City Hospital
- Emory University, Atlanta, USA
- Grady Hospital, Atlanta, USA
- Centers for Disease Control, Atlanta, USA
- Department of Public Health, Washington DC, USA
- National Institute of Allergy and Infectious Disease, Washington DC, USA
- Institute of Medicine, Washington DC, USA
- New York City Department of Mental Hygiene and Public Health, USA
- Felton TB Centre at Harlem Hospital
- World Health Organization Headquarters, Geneva, Switzerland
- Institute of Migration, Geneva, Switzerland
- UNAIDS, Geneva, Switzerland.

1.8 Throughout this inquiry we have been fortunate to have the aid of two committed Specialist Advisers—Professor Julius Weinberg of City University and Professor George Griffin of St George's Hospital Medical School. We thank them for their careful advice and hard work..

Summary of recommendations

1.9 This report outlines a number of problems facing an effective response to the threat of infection in England. We acknowledge that infection cannot be conquered, but we believe that the Government could significantly improve services in order to counter the effects of infection.

1. We recommend that the Government recognises and addresses the fact that, although England has not experienced major epidemics of infection in recent years, this owes as much to good fortune as to good management. Without improvements we fear that this country will suffer from major epidemics and will continue to see infectious disease take its toll in economic terms, in suffering and in lives [9.16].

1.10 In view of this, we have made recommendations on the following themes:

Developing collaboration

2. We recommend that the Department of Health encourages and facilitates the development of infection centres which integrate scientists (virologists, microbiologists), clinicians and epidemiologists. These should be associated with academic and tertiary referral centres and the regional HPA laboratories. Each Strategic Health Authority should have access to services of one of these [9.24].

3. We recommend that the Minister for Public Health should publish as a matter of urgency a document outlining roles and responsibilities of all organisations involved in infectious disease services and should disseminate this to those concerned in order to facilitate effective communication and collaboration [9.7].

4. We recommend that the Minister for Public Health should publish an annual account of all progress in cross–departmental working in relation to infectious disease [9.5].

5. We recommend that the HPA be provided with resources to take on specific and primary responsibility for integrating surveillance related to human, animal and food–borne

infection at national, regional and local levels in order to bridge the gaps that currently exist between these areas of speciality [5.38].

6. We recommend that the HPA publishes by April 2004 a proposal for developing collaborative relationships with organisations concerned with tackling infection, including the devolved administrations, environmental health departments and the Food Standards Agency [9.12].

7. We recommend that the Government enable the HPA to second health professionals to international bodies such as WHO and provide the resources to make this possible [9.33].

Providing well–trained staff

8. We recommend that the Government, in conjunction with relevant Royal Colleges and the Joint Committee on Infection and Tropical Medicine, address the shortage of expertise in clinical infectious disease, clinical microbiology and communicable disease epidemiology by increasing numbers of fully funded consultant posts and ensuring that there are available training posts [7.5].

9. We recommend that the General Medical Council, the Nursing and Midwifery Council, the General Dental Council and the Health Professions Council ensure that universities strengthen existing content relating to clinical and public health aspects of infection undergraduate education [7.15].

10. We recommend that, with respect to postgraduate education, the medical Royal Colleges and the Nursing and Midwifery Council should ensure that infection prevention and control is a key component [7.16].

11. We recommend that the Government investigate the decline in numbers of trained Environmental Health Officers in local authorities and take steps to reverse this trend [7.9].

Improving information exchange

12. We recommend that the Department of Health should ensure that procedures for collecting and reporting information electronically are integrated where possible into everyday working practices and are less burdensome than at present [6.8].

13. We recommend that the Government should develop a fully compatible electronic system of infectious disease surveillance information across all relevant departments and agencies [6.15].

14. We recommend that the HPA should standardise information entry across all surveillance systems. This should be undertaken in consultation with representatives of all those involved in the collation and transfer of information for infectious disease control [6.11].

15. We recommend that the HPA takes the lead in further developing electronic methods for providing feedback about surveillance and for targeting delivery of information about infectious disease to healthcare professionals [6.19].

Maintaining public health laboratories

16. We recommend that the Department of Health should ensure that Primary Care Trusts provide NHS laboratories with *at least* the same level of extra resources for public health work (including food, water and environmental activity) that was previously received through the Public Health Laboratory Service [5.14].

17. We recommend that the Department of Health ensures that microbiology laboratories managed by the HPA and NHS Trusts act in a coordinated manner to deliver effective surveillance and to provide surge capacity [5.15].

Vaccines

18. We believe that vaccine development should be facilitated and recommend that the Government should develop and maintain clear evidence based guidelines about vaccine requirements and should create financial incentives to enable early research, development and commercialisation of vaccines [8.4].

19. We recommend that, given that there is little vaccine production capability in the United Kingdom, the Government should, by April 2004, develop and publish a strategy to ensure that there is secure access to supplies of vaccines in the face of national outbreaks of infectious disease [P 4.13].

20. We recommend that the Government should fund enhanced surveillance of the impact of vaccine programmes on the incidence of disease particularly when new vaccines are introduced [5.20].

Initiating research and development

21. We recommend that the Department of Health, in conjunction with the HPA, establishes and publishes by end of 2003 clear evidence–based priorities for the development of vaccines and diagnostics [8.10].

22. We recommend that the Department of Health ensures that funding is made available to increase research into organisation and delivery of infectious disease services and, in particular, into how human behaviour impacts on outcomes of diagnostic procedures, treatments and prevention programmes [8.15].

Communicating with the public

23. We recommend that the HPA, like the Food Standards Agency, should act, and should be seen to be acting independently of Government [7.24].

24. We recommend that the HPA creates a post for a well–resourced infectious disease specialist to act as spokesperson and to lead on all aspects of communicating with the public including developing innovative methods of increasing awareness of infectious disease [7.30].

CHAPTER 2: BACKGROUND AND REPORT STRUCTURE

Chapter summary

In this chapter we describe what infection is, discuss the burden of infection and provide a brief overview of how infection is currently treated and prevented in England and Wales. We identify two key tasks necessary to tackle infection, firstly, diagnosis and treatment, and, secondly, prevention and control.

We suggest that these tasks must be underpinned by supporting components, namely surveillance, effective systems for gathering and sharing information, education and training, and research and development. In addition there should be clear effective collaboration and communication both within and among those who carry out the key tasks of an infection service. This should extend to international collaboration. We will discuss each of these tasks and supporting components in turn throughout the report.

What infection is

2.1 Infection causes illnesses of varying severity. An infection may be mild and short–lived (e.g. the common cold); serious and short–lived (e.g. meningitis); or may lead to chronic conditions such as tuberculosis, cervical cancer and peptic ulcer disease. In addition some people carry and transmit an infection (e.g. meningitis bacteria) whilst remaining well.

2.2 The form an infection takes results from complex interplay between micro–organisms (bacteria, viruses, protozoa etc.), hosts (person or animal) and the environment. The likelihood of an organism causing an infection depends on a variety of factors. These include the immune status, age and general health of an individual, the intrinsic capacity of a micro–organism to cause disease (pathogenicity), its potential for causing severe disease (virulence), and the relative ease with which it can establish itself in a host (infectivity) and be passed from person–to–person (transmissibility).

2.3 Some micro–organisms are the cause of infection, but some are also essential for our well–being[6]. Each person has more bacteria on their skin and in their gut than the number of people that have ever lived on the planet[7]. These bacteria play an important role in our defence against infection and disturbing then, for example by using antibiotics, can allow pathogens to flourish. Besides their role in protecting against infection these beneficial micro–organisms are also important in the metabolism of nutrients and vitamins.

2.4 The environment plays a significant role in infection with some micro–organisms surviving better in dry climates, others in the wet. Humans create settings such as doctors' waiting rooms and aeroplanes[8] which may facilitate the transfer of infectious micro–organisms from one person to another. Even attempts to treat infection, for example by using antibiotics, can create new problems such as antimicrobial resistance [Spec Ad Cttee Antimicrob Resist, I p158-162].

Burden of infection: extent of the problem

2.5 In the United Kingdom around 70,000 people die each year from an infection. Hospital acquired infections are estimated to cost the NHS about £1 billion per year [BioIndustry Assoc, I p25]. Forty percent of primary care consultations result from infection and the health care system is often severely stretched as a result of winter influenza epidemics [Stewart, II p316; Birmingham, II p394].

2.6 Notwithstanding significant scientific and medical developments, such as the introduction of vaccines and antibiotics and improved socio–economic conditions over the last century, we cannot afford to adopt the position taken in the mid twentieth century that infectious diseases were conquered [AcMedSci, II p33].

2.7 Optimism in relation to infections has proven to be untenable. In the recent past a number of new infections have appeared and old infections which were thought to have been under control have become problems again. This list of emerging and re–emerging infections includes tuberculosis, new strains of influenza, HIV/AIDS, EColi O157, Nipah Virus, West Nile virus, malaria and, most recently, SARS [see Box 1].

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6 House of Lords Select Committee on Science and Technology, *Resistance to Antibiotics*, 7th Report, 1997-8, HL81–I ISBN 0 10 478998 0

7 *The Path of Least Resistance.* Standing Medical Advisory Committee, Department of Health, London 1998.

8 House of Lords Select Committee on Science and Technology, *Air Travel and Health*, 5th Report, 1999-2000, HL 121 ISBN 0 10 444200 X

2.8 Infections cannot be conquered. They can however be controlled and prevented under many circumstances, but they will continue to present challenges. Factors such as global travel, antibiotic resistance and increases in numbers of people with weak immune systems (following cancer treatment or organ transplantation) all provide opportunities for infection to develop and spread [Stewart, II p316]. Infections found in animals may directly infect humans, as with anthrax, or they can mutate and pass on to humans, as with avian flu (infections transmitted from animals are known as zoonoses) [Stewart, II p318 Thorns, Q440]. The recent spectre of bioterrorism (the deliberate release of infectious agents) is also a possible threat [DoH, II p1].

How to tackle infection

2.9 There are two key tasks that need to be carried out in order to reduce incidence and spread of infection:

- firstly, diagnosis and treatment; and
- secondly, prevention and control.

2.10 These tasks are currently performed by a wide variety of health professionals and scientists. Members of the public must also play a part in any meaningful attempt to control infection. In Boxes 2, 7 and 9 we provide a brief overview of how infection is treated, how information is gathered and feeds into prevention and control activity. In Boxes 3 and 4 we provide a simplified representation of the main lines of responsibility between different key organisations and health professionals and the flow of information between them as relates to infection control.

Box 1: *Examples of infections that have emerged or been recognised over the last thirty years*[9]

(z refers to infections that are known to be zoonotic)

1970s	1980s	1990s	2000s
Rotavirus	HIV / AIDS	Cholera O139	Human Metapneumovirus
Parvovirus B19	Helicobacter	Hantavirus Pulmonary Syndrome (sin nombre virus) (z)	SARS (z?)
Legionella pneumophilia	C.pneumoniae	Multi–resistant TB	
Campylobacter (z)	Borrelia burgdorferi (z)	Bartonella henselae (Cat scratch fever) (z)	
Cryptosporidium parvum (z)	MRSA	Sabia Virus (Brazilian H.F.) (z)	
Small Round Structured Viruses	Hepatitis C	Guanarito Virus (z)	
C.difficile	Toxic shock syndrome	New Lyssa Viruses (z)	
Ebola virus (z)	Salmonella enteritidis (z)	Equine morbillivirus (Australia) (z)	
Hantavirus (z)	Herpes virus–6	New Variant CJD (z)	
	Ehrlichia (z)	Nipah Virus (Encephalitis) (z)	
	Venezualan Haemorrhagic Fever. (z)	Kaposi's Sarcoma (Human Herpes virus 8)	
	Microsporidia (z)	Hendra Virus (Haemorrhagic fever) (z)	
	Hepatitis E	Avian Influenza (H5N1) (z)	
	Roseola (Human Herpesvirus 6)		
	Lyme borreliosis (z)		

[9] We thank Professor Stephen Palmer for providing information reproduced in this table. Please note that this is not intended to be an exhaustive list of all infections that have been described in the last thirty years.

2.11 In order to be able to carry out the two key tasks effectively there are four supporting components needed, specifically:

- surveillance; which in turn requires
- effective systems for gathering and sharing information;
- education and training; and
- research and development.

2.12 In this report we highlight concerns with the current arrangements and make recommendations for change. We examine problems with the ways in which each of the two key tasks are carried out, and then move on to look at how the four supporting components can be improved in order to underpin the key tasks effectively. We then consider ways in which to improve collaboration and how to create a more integrated infection service.

Box 2

How infection is controlled

Catching an infection

Most people with an infection, particularly mild acute conditions such as colds, remain unknown to the health system as they look after themselves. They may infect other people in the family, work colleagues or casual contacts.

Entering the healthcare system

Seeing a GP. In most cases if a person with an infection feels unwell and needs advice they consult a primary care doctor—GP. GPs usually make a diagnosis and decide on treatment on the basis of symptoms. They advise the patient on suitable action (such as bed–rest, drinking plenty of fluids) and might prescribe a medicine (such as antibiotics). If they are uncertain of the diagnosis, if the patient is very unwell, or if the patient fails to improve after some days or following a course of treatment, the GP might send a sample (such as a throat swab or faecal sample) to the local microbiology laboratory to identify the problem .

Going to hospital. If a patient remains unwell with an infection or has severe illness GPs may refer them to hospital. In most hospitals the patient will be looked after by a general physician, paediatrician or geriatrician. In a few hospitals, mainly teaching hospitals, there are specialist infectious disease physicians who care for patients with infection. Hospital physicians will often send samples to a laboratory to be investigated.

Identifying the infectious organism: laboratories

Microbiology laboratories, managed by medical microbiologists (doctors specialising in laboratory investigation of infection), investigate samples and identify the infectious organism. Sometimes samples are sent on to a national reference laboratory for more detailed testing. The medical microbiologist then often advises the physician about how to best treat the infection, and thus the patient.

Acting to control further infection

Consultant in Communicable Disease Control (CCDC). The CCDC is responsible for prevention and control of infection in the community. In cases of infections which can be easily spread throughout the community and cause illness in many people (such as salmonella), the microbiologist or the physician may inform the CCDC who will then implement relevant control measures.

Environmental Health Officer (EHO). In the case of an infection of public health importance, such as salmonella, the CCDC (or GP) will often inform the EHO (employed by the local authority) about the outbreak of the infection. An EHO will visit the patient to ascertain from where they picked up the infection and whether they are likely to infect others easily and then will take action to try to prevent further spread of the infection.

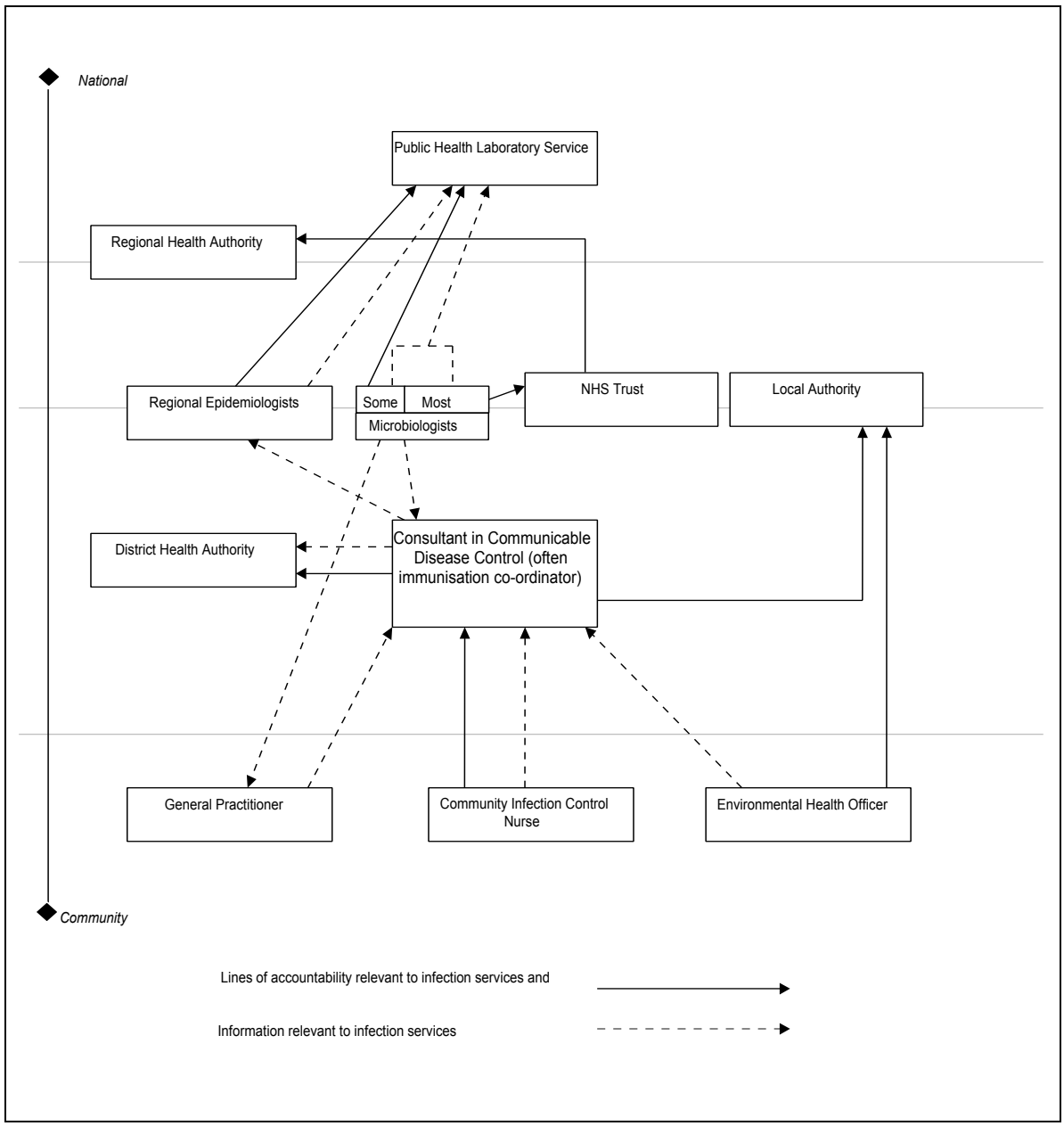
Community infection control nurses (CICN). The CCDC may ask a CICN to identify and follow up all close family and friends of the patient to ensure that they are diagnosed and treated if necessary.

*Reporting infections to the authorities***.** Physicians are legally obliged to inform the local authority, via the CCDC, of certain "notifiable" infections (e.g. TB and cholera).

Box 3

***Pre**–Health Protection Agency*

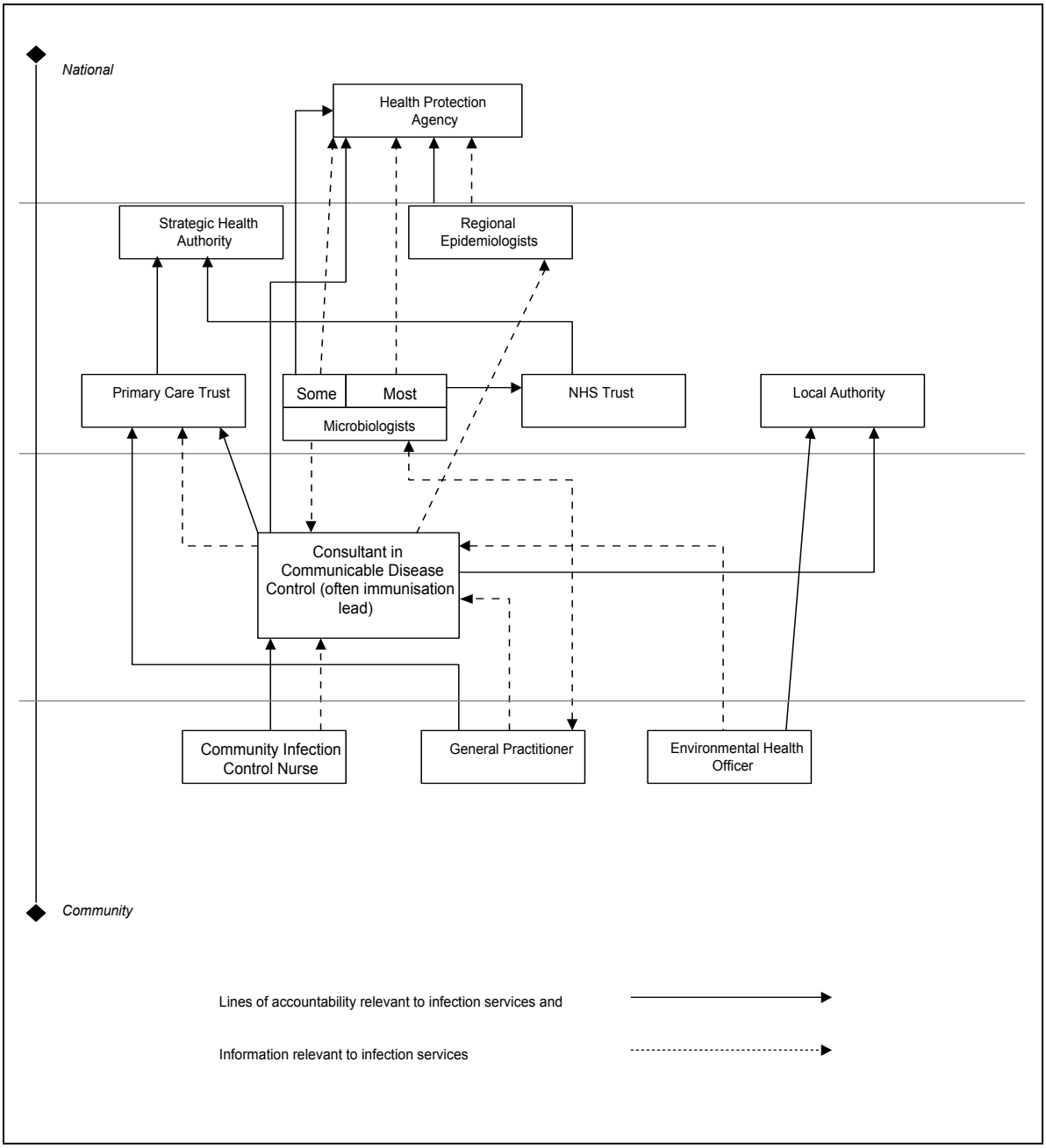
Simplified lines of accountability and information flow



Box 4:

***Post**–Health Protection Agency*

Simplified lines of accountability and information flow



CHAPTER 3: DIAGNOSIS AND TREATMENT

Chapter summary

Diagnosis and treatment is one of the key tasks required to tackle infection and involves a wide variety of health professionals and scientists. Diagnosis and treatment is necessary for care of individuals but also can inform control measures and preventative activity (see chapter 4).

We are concerned that there is a shortage of infectious disease experts able to diagnose unusual infection. In addition, we have found that training in infectious disease of health professionals who are not infection specialists is insufficient to enable effective diagnosis and treatment to take place at all times. Laboratory scientists able to exploit new sophisticated techniques are also in short supply.

Background

3.1 The management of infection in an individual firstly requires a symptom–based diagnosis; this may be supported by laboratory investigations which identify the infectious micro–organism [Wright II, p56]. Knowledge of the infection will guide any intervention and treatment. Some infections, particularly viral infections, the common cold for example, cannot be effectively treated but symptoms can be managed until the patient's immune system has fought off the infection.

3.2 Doctors are the primary players involved in diagnosing and treating infection with support from laboratory scientists who identify the responsible micro–organisms [Little, II Q414]. Nurses also increasingly have a role in identifying patients with infections: they staff NHS Direct (a telephone and web–based advice service accessible to the public) [Beeching, Q122; PHLS Prim Care Ad Gp, I p131; Howard, Little, Perry, Williams, Q409-12]. In addition people manage much simple infection (such as the common cold) without resorting to advice from health services although they sometimes consult a pharmacist [Little, Q371].

General Practitioners

3.3 General Practitioners (GPs) diagnose and treat the majority of infection that comes to the attention of the health services: patients with an infection account for forty percent of consultations [see Box 2; Stewart, II p316].

3.4 We heard throughout this inquiry, including from some GPs, that GPs receive inadequate training about best practices relating to identifying and treating infection. There are particular concerns that GPs do not use laboratories effectively enough [Little, Q407-8; Wiltshire Food Liaison Grp, I p171; Birmingham, II p394].

BASING DIAGNOSIS ON SYMPTOMS OR LABORATORY INVESTIGATION

3.5 GPs are sufficiently familiar with common infections in their local area to be able to diagnose and manage an infection on the basis of symptoms in most cases. Diagnosing on the basis of symptoms has advantages in that it is often accurate, is quick and may occur on the basis of one consultation [Little, Q403]. An alternative method would be to take a sample (such as a throat swab) and send it to a laboratory to identify the underlying micro–organism; using this method would not, in most cases, result in different advice about treatment for common infection.

3.6 Sending samples off for laboratory investigation is often time–consuming. Results may take several days, depending on the type of micro–organism, by which time the patient could have fought off the infection [Duerden, Q283]. As patients are often unhappy to return home without a prescription, the GP might deem it necessary to provide some treatment for the patient whilst awaiting laboratory results. It is arguable whether, even if GPs did send more samples to laboratories, there are sufficient resources to cope with extra demand. Thus, sending samples to laboratories for most cases of common infection could increase burden on laboratories without, in the majority of cases, improving patient care [Little, Q376].

3.7 Laboratory diagnosis is however vital to identifying and therefore treating serious infection. We heard that sending samples to laboratories is useful as it can inform doctors about what treatment regime to recommend. This then benefits the patient by reducing the length and severity of illness [Assoc Brit Pharm Industry, I p11; Haworth, I p75; Roche Diags, I p140-3]. In addition, we heard that microbiological diagnosis contributes to a body of knowledge about infection which can be used for prevention purposes [see chapter 4].

3.8 The Institute of Medicine in the United States of America recently warned against reducing use of laboratory investigations, particularly in the case of infection treated with antibiotics[10]. Identifying the exact micro–organism can guide the doctor about the most appropriate antibiotic to prescribe. This prevents treating with a "broad spectrum" or antibiotic which contributes to continuing and worrying increases in antibiotic resistance [Spec Ad Cttee Antimicrobial Resistance, I p159].

3.9 We heard about the importance of diagnosing viral infections. Correct diagnosis of viruses can also help to reduce inappropriate treatment with antibiotics (as antibiotics are ineffective against viral infections). As new anti–viral treatments become available it may be important to ensure appropriate use of such treatments in order to prevent resistance to those drugs developing. There is a shortage of experts in this area (virology, a sub–set of microbiology) [Clin Virol Network, II p90; Pillay, Q180].

3.10 Gathering information from laboratory investigation and using to alongside information about symptoms of disease can help to develop best practice guidelines about treating on the basis of syndromes alone (thus saving on laboratory testing in the future) [Black, I p28-33; Little, Q376].

Near patient tests (NPTs)

3.11 One way of ensuring that treatment and management is informed by knowledge of the micro–organism is to further develop and use "near patient" diagnostic tests (NPTs). These can produce results straight away and can also be used within the general practice [PHLS Prim Care Ad Gp, I p132].

3.12 There is a certain degree of caution expressed about NPTs. The cost of new diagnostics is significant and we heard that quality control issues have not been sufficiently well addressed. In particular, it is not known what conditions must be met outside of a laboratory setting to ensure reliability [CAMR, I p42; Roche Diags, I p142; PHLS Prim Care Ad Gp, I p132]. Also, increasing use of NPTs could reduce further collecting of information for public health use [Boriello, Q492; PHLS, II p139].

3.13 NPTs provide good opportunities to improve diagnosis and treatment, but there should be further research into their effectiveness and their impact on public health. We discuss the importance of such research in chapter 8.

Contact nurses: tracing people in the community

3.14 Community infection control nurses (CICNs) play a significant role in identifying people with infection and in ensuring that they receive treatment. For example, specialist tuberculosis (TB) CICNs identify people at increased risk of TB and ensure that they are diagnosed and treated if necessary [Williams, Q411; Birmingham, II p395]. Many CICNs also fulfil other roles, including implementing infection prevention strategies [Perry, Q409].

3.15 We heard that there are enormous disparities in community based infection control across the country: a recent PHLS study found that the ratio of CICNs to head of population ranged from 0 to 4.5 whole time equivalent CICNs per 500,000 population [Inf Control Nurses Assoc II p176]. There are particularly serious gaps in expertise in contact tracing for TB in some areas of the country [Birmingham, II p395].

3.16 The shortage of information about individuals who are at increased risk of infection was cited as being a barrier to effective contact tracing. Ms Crisp, a CICN, described how information about people's country of origin for all new immigrant arrivals was not made available to CICNs. This information is vital to identifying those most likely to have been exposed to TB and being able to treat appropriately [Birmingham, II p395].

3.17 Infectious disease may be exacerbated in individuals who live in poor social conditions. Such individuals often find it difficult or are unwilling to use conventional means of health care advice, which makes it hard to identify and manage infection in these groups. The Felton TB centre in Harlem, New York recognises this and employs outreach workers to work with local churches and alternative therapists in order to better identify and treat people with both latent and active TB[11] [US, II p390]. We heard that similar tactics in England might help to follow up people who did not turn up for appointments at TB clinics [Birmingham, II p395]. Mrs Gini Williams, a TB Research Nurse at City University, recommends adopting "a whole systems approach" where treatment is not viewed simply as

[10] Smolinski, Hamburg and Lederberg (eds). *Microbial Threats to Health: Emergence, Detection, and Response*. Institute of Medicine Committee on Emerging Microbial Threats to Health in the 21st Century. [www.iom.edu]

[11] Latent TB is where someone is infected with TB bacteria but has fought it sufficiently to prevent it from causing symptoms. People with latent TB cannot spread TB to others and do not feel ill but it can develop into active TB at a later stage. When active TB causes illness and may spread to others.

medical but also considers housing and social circumstances and human behaviour, as this could help to improve the effectiveness of medical treatment and prevent recurrence of infection [II p196-204]. Considering adopting such techniques is particularly important given recent significant increases in TB [Williams, Q386].

Hospital doctors

3.18 Within hospitals there are a range of specialists who are responsible for diagnosis and treatment of patients with infection. A number of skills are required, but in particular there is need for abilities to

- carry out clinical diagnosis and manage a range of infections; and to
- understand laboratory diagnosis and translate this understanding to bedside care.

3.19 At present many general and specialist doctors diagnose and manage infection. For example, a chest physician may care for a patient with TB and a renal physician may care for a patient with a kidney infection. Non–infection specialists are, with laboratory support, able to care for infections in many cases. However, we heard that knowledge about diagnosing and managing unusual infection amongst non–infection specialists was limited [Beeching, Finch Q88].

3.20 There are also around 80 infectious disease (ID) physicians in England, mostly located in teaching hospitals. They care for patients with severe or complex infectious disease problems [Beeching, Q121]. Most doctors rely on such specialists to look after unusual infections. However, there was some concern that there were insufficient numbers of such specialists [Beeching, Q121].

3.21 We heard that there are more doctors entering training to become infectious disease physicians than there are available posts and they have little presence in district general hospitals. The number of ID physicians in England appears to be low, currently at 1 per 750,000 people (in the USA there is approximately 1 per 53,000) [www.idsociety.org]. The Netherlands, where the structure relating to microbiologists and infectious disease physicians is comparable to England, has 1 per 250,000 people. [Beeching, Q121; DoH, II p32].

3.22 The use of laboratory diagnosis in the hospital is normal, partly because of the risk of serious infection and because there is an increased risk that infection will spread to other patients. Medical microbiologists, along with laboratory scientists supply this service. They also act as a link between the laboratory and the bedside, providing advice to non–infection specialists on treatment and control.

3.23 We also heard that there are insufficient numbers of doctors with both laboratory and clinical skills. We are concerned that despite a number of initiatives to encourage and nurture clinical microbiologists they continue to be in short supply with posts remaining unfilled [Prof Amyes, I 2; AcMedSci Q43, 46, II p36; MRC and Wellcome Trust Q736; *Resistance to antibiotics*].

Laboratory scientists

3.24 Sophisticated laboratory techniques are increasing, particularly with the advent of molecular technologies. These could be used in microbiology laboratories to improve rapidity and accuracy of diagnosis [Amyes, I p1-3; Assoc Brit Pharma Industry, I p11]. For example, molecular techniques can be used to understand the spread of infection or a problem such as anti–microbial resistance by tracking individual clones of bacteria through human populations [Amyes, I p2].

3.25 Many laboratories still use techniques that are outdated and less reliable or informative, as there is a shortage of scientists and medical microbiologists with the necessary expertise to have confidence to use them [Amyes, I p2; Pub Health Med Env Grp, I p114].

Conclusions

3.26 There is shortage of expertise in both primary and secondary care in identifying and managing unusual infection and in being able to understand laboratory diagnosis and manage clinically. In addition, laboratory expertise needs to be developed in order to benefit from advances in diagnostic technologies. We make recommendations in chapter 7 on training and chapter 8 on research and development.

3.27 We also conclude that there should be better understanding of how organisation of services, social issues and human behaviour impact on diagnosis and treatment outcomes. We discuss this further in chapter 8.

CHAPTER 4: PREVENTION AND CONTROL

Chapter summary

Prevention and control is necessary for any effective response to the threat from infectious disease. It can be made more effective by repairing the deficit in trained personnel and by improving education and training. Public awareness of infection should be raised. Lines of responsibility for outbreak control should be clarified. Vaccines could be used more, but public anxiety and issues about R&D need to be addressed. The Government should also ensure that there is secure access to vaccines in case of national outbreaks.

Prevention

4.1 Prevention of infectious disease is one of the most effective courses of action that can be taken by public health services, both in terms of human suffering and live and economically. It relies principally on early detection and intervention, on vaccination and on changing social conditions and human behaviour.

VACCINATION

4.2 Since Edward Jenner demonstrated in 1796 that vaccination prevented smallpox, development and use of vaccines has considerably reduced illness and death from many common infections. Smallpox was eventually eradicated through a global vaccine initiative and, similarly, many countries, including the United Kingdom, are now free of polio as a result of vaccination.

Public acceptance of vaccines

4.3 We heard that there are more vaccines that could be routinely used, yet even if they were available (see chapter 8) this might prove difficult because of public anxiety about safety [UK Vaccine Industry Gp, II p234-6].

4.4 Vaccines have powerful stimulatory effects on the immune system and there may be unwanted side–effects in some individuals. However, the majority of side–effects are minor and short–lived. Improved understanding about the interaction between vaccines and immune response should lead to more sophisticated and safer vaccines. Nevertheless, adverse side effects are a public concern and this should be a factor in considering whether to expand the childhood schedule [Ghosh, Q333-4]. Whilst the public seems to have accepted the recent inclusion of the meningitis C vaccine, it is not clear that they would be willing to accept yet more vaccines into the childhood schedule, particularly given recent public and media anxiety about the mumps, measles and rubella vaccine [CAMR, I p42, Soc Gen Microb, I p158].

4.5 Introducing more vaccines into the childhood schedule could improve public health, but the Government needs to assess whether increasing the number of vaccines is possible or desirable. Surveillance of the effect of implementing vaccines and of incidence of vaccine–preventable disease can inform this decision as well as helping to reveal whether there are any side–effects of vaccination [CAMR, I p42; Crowcroft, I p45-9].

4.6 In addition, we heard that there is need to communicate more with the public about the benefits and risks of vaccines, and we discuss this in chapter seven.

Secure supply of vaccines

4.7 In the face of epidemics or global pandemics there could be urgent need to vaccinate a significant proportion of the population. Thus it would be important to have a secure supply of vaccines. The Centre for Applied Microbiology and Research (CAMR) (now HPA Porton) was responsible for developing and manufacturing influenza vaccines following the Hong Kong avian flu epidemic in 1997 but their capacity was stretched in order to do this [CAMR, I p44].

4.8 Very few vaccines are made in England and most vaccines used here are purchased from manufacturers in France and Belgium. England holds stocks of vaccine to meet anticipated needs. Needs are based on recent trends in infection as well as information about numbers of people likely to need vaccinating. So far, demand for supply has usually been met, although there was a recent shortage of BCG (an anti–TB vaccine).

4.9 One question that has been raised recently is whether the Government should establish a centre to urgently develop and manufacture vaccines [CAMR, II p382, Stewart, Troop, Q807-9]. In the event

of a major global epidemic it is likely that overseas suppliers of vaccines would be under pressure to give priority to their own country's requirements. With this in mind, the National Institutes of Health in the USA opened a vaccine institute three years ago. This institute integrates basic immunology research with clinical trials and vaccine manufacture and is now attempting to develop and manufacture a vaccine for SARS. The Government recently turned down an application by CAMR to develop a similar facility on the basis of concerns over its cost [Blears, Q877; Stewart & Troop Q809].

Box 5

Problems in developing vaccines quickly

In some cases it may not be possible to develop and manufacture vaccines quickly enough to stem a pandemic because of the ease with which an infection such as influenza can spread across the world. In addition there are other surge capacity issues to consider; for example, the production of some vaccines requires fertilised hen eggs as growth medium for the vaccine; there may simply not be enough to enable quick production of vaccines for all the population. In addition vaccine production facilities are not generic: one vaccine manufacturing plant is not necessarily capable of producing a different sort of vaccine [Q576].

4.10 We note that it may not always be possible to prevent an epidemic through mass vaccination [Kingston, Q575]. Some epidemics spread too quickly to allow effective prevention by quick production and administration of vaccines, e.g. with a new strain of influenza [US, II p386]. There are also other issues that should be considered, such as the need for adequate supply of materials required to produce vaccines [see box 5]. Indeed, the question of whether there would be enough health personnel to administer a vaccine would also need to be considered.

4.11 It is important to consider the difficulties of ensuring a secure supply of vaccines and how those difficulties could be overcome. We note the need for effective global surveillance networks which can provide information as early as possible and thus instigate development and production of vaccines.

4.12 We note that the Government is currently addressing how, in the face of a serious epidemic, they would secure vaccines for the population [House of Lords Hansard, Col WA38]. We were also pleased to hear from the Minister for Public Health and the Chief Executive of the HPA, that the Department of Health is likely to consider a further application from HPA Porton (previously CAMR) to develop such a centre as discussed earlier (4.9) [Q809, 877]. We hope that this signifies that the Government will soon publish their strategy relating to vaccine supply.

4.13 **We recommend that, given that there is little vaccine production capability in the United Kingdom, the Government should, by April 2004, develop and publish a strategy to ensure that there is secure access to supplies of vaccines in the face of national outbreaks of infectious disease.**

SOCIAL CONDITIONS AND BEHAVIOUR

4.14 Prevention of infection requires improvements in social conditions [Assoc Brit Pharma Ind, I p10; Emery, I p111; Finch, II p55; Hawker, I p117]. Poor housing, poor sanitation and overcrowding can encourage infections to flourish and to be transmitted between people. Pertinent examples of such conditions are prisons and temporary housing for asylum seekers and the homeless [Birmingham, II p395].

4.15 A significant amount of infection is food–borne and is caused by poor hygiene relating to food production, storage and preparation. Environmental Health Officers (EHOs) work with food producers to ensure that levels of hygiene are sufficient and that people who work there are trained. In addition, EHOs also educate children in schools, although we heard that in Sandwell EHOs have had to stop doing this as a result of resource shortages [Bradford MDC, I p34-6; Birmingham, II p394].

4.16 Prevention is neither just an activity for health professionals nor something that can be achieved solely by adequate housing. Prevention relies on all individuals practising good hygiene, particularly in relation to food preparation and sex. High–risk behaviour such as intravenous drug users sharing needles also has a role in transmitting infection. It is clear that public understanding of the importance of behaviour in preventing infection is insufficient [Bryant, Q360]. We make recommendations about the interaction between social behaviour and infection in chapters seven and eight.

Box 6

The Health Protection Agency

The HPA was established on 1st April 2003. In relation to infectious disease this has brought together the main functions of the PHLS (the Communicable Diseases Surveillance Centre and the Central Public Health Laboratories), the Consultants in Communicable Disease Control, Regional Epidemiologists and CAMR. It also incorporates services relating to chemical and radiological risks. It is an independent body with responsibility for:

Advising government on public health protection policies and programmes

Delivering services and supporting the NHS and other agencies to protect human health from infectious disease

Providing impartial and authoritative information and advice to government, professionals, and the public

Responding to new threats to public health

Providing a rapid response to health protection emergencies

Improving knowledge of health protection, through research, development, and education and training.

Control activity

4.17 When prevention fails it is necessary to introduce control measures to avert further spread of infection [Sheffield, I p152]. Control measures are required in both community and hospital settings. Many health professionals are involved in control, with the HPA playing a supporting and coordinating role [see boxes 6 and 7].

Box 7

Preventing and controlling infection

Everyone has a role in preventing infection through practising good hygiene and safe sex and by reducing contact with others if suffering from a respiratory tract infection. Professionals with particular responsibilities for preventing infection include Environmental Health Officers who educate and train people working in food outlets about food safety. Immunisation nurses and GPs vaccinate people, which is the most effective way of preventing infection. Infection control nurses and medical microbiologists both oversee implementation of good practice to prevent emergence and spread of infection within hospitals.

The Consultant in Communicable Disease Control takes the lead in control of infection in the community and is responsible for collating information about infection and implementing control measures. Environmental Health Officers identify common factors and implement measures to prevent further spread. Community Infection Control Nurses also perform control function by tracing those with whom infected people have been in contact.

COMMUNITY CONTROL

4.18 Control of infection requires finding out where and how infection has arisen, how it is being transmitted and who might have been exposed to it. It is then necessary to put in place some measures to stop infection from spreading and to ensure that those who have become infected are treated as soon as possible [see Box 7].

4.19 There are some good examples of plans about how to respond to infection outbreaks, such as the UK pandemic influenza plan. This describes the national response in the event of a new influenza virus appearing which has the potential to cause a world wide pandemic [http://www.doh.gov.uk/panflu.htm]. The plan was prepared to facilitate a prompt, effective national response. It describes a phased response and defines the roles of the organisations which would be involved. At the time of the appearance of H5N1 influenza in Hong Kong in 1997 the UK was one of the few countries to have such a plan in place and it was widely seen as a model to follow [USA, II p386].

4.20 Nevertheless, we heard that there are enormous disparities in community based infection prevention services across the country. A survey for the NHS Executive in 1997 found that there was significant underresourcing of those responsible for infection control and thus underperformance in many districts; charges which, we heard, districts have not adequately responded to [Hawker, II p118]. As we outlined in chapter three, there is also wide variation in numbers of infection control nurses [Infection Control Nurses Assoc, II p176].

4.21 We heard that there is a shortage of EHO posts in local authorities and a shortage of people training in environmental health at university [Emery, II, p111]. The local authority is isolated from other health protection services, and we heard that this can prevent EHOS from forming effective collaborative relationships with other professionals [Emery, II Q229, 244; Bradford MDC, I p34, Wiltshire Food Liaison Grp, I p171]. In particular, when attempting to trace the source of an outbreak and to implement control measures, EHOs can have difficulty accessing information from doctors concerned about patient confidentiality [Bradford MDC, I p34].

4.22 The lack of coordination and communication between different areas of community infection control is an issue that concerns a significant number of people [Emery, II Q231, Hawker II, Q231 p 118; Faculty Public Health Med, I p52-3]. Lines of responsibility for investigating outbreaks and implementing control measures are often unclear. Recent changes to health services organisation, including the creation of the HPA, are believed to have made lines of responsibility less clear and have led to the loss of informal support and collaborative networks [see chapter 9].

Box 8

Investigating parrots – unclear lines of responsibility

An individual develops psittacosis, which is a potentially fatal pneumonia usually contracted from birds such as parrots. The patient had a parrot recently bought from a dealer at a large bird show. The community infection control team wanted to ascertain whether the patient had caught the infection from his own parrot. Knowing whether the parrot was infected was important as, if it was, purchasers of other parrots from the show might have been at risk of infection. It was unclear whether DEFRA, the local authority or the Consultant in Communicable Disease Control was responsible for taking a sample from the parrot. Eventually an Environmental Health Officer from the local authority was "persuaded" to take droppings from the parrot's cage, "but it was not really their job to do it" [Hawker, II Q231].

HOSPITAL CONTROL

4.23 Infection control is a fundamental component of hospital activity, with health care acquired infectionscosting approximately £1 billion every year and leading to 5,000 deaths [Stewart II, 316, Bard Ltd, I p19; NAO, II p375; Brogan, Q680]. Outbreaks of infection such as the Norwalk virus (causing diarrhoea and vomiting, recently associated with outbreaks on cruise ships) can lead to wards being shut down. This significantly increases pressure on beds and can lead to a reduction in the numbers of available staff, with some becoming sick themselves and others being confined to working on wards where the outbreak has occurred[12].

4.24 Clinical microbiologists and infection control nurses play an important role in implementing control measures in hospitals. However, we heard that control cannot be the responsibility only of specialists, with all health care professionals needing to take measures, such as washing hands when moving between patients [NAO, II p375, Birmingham, II p393,5; see box 14]. We note that clinical microbiologists and infection control nurses are accountable to different people within the hospital, which may be a potential cause for confusion.

4.25 We found that in many hospitals there is inadequate provision of single rooms suitable for the isolation of patients [NAO, II p376]. Demand for single rooms for other purposes can be considerable and it is often difficult to keep these rooms available for infected patients [Naylor, Q679]. There was also concern that the availability of specialised facilities, such as negative pressure isolation rooms, essential when caring for patients with certain infectious conditions such as resistant tuberculosis, was inadequate [Birmingham, II p393]. For example St George's Hospital in London with a specialised infection unit has only four, significantly fewer than a comparable hospital in the US [USA, II p385].

[12] *The Management and Control of Hospital Acquired Infection in Acute NHS Trusts in England*, HC 306, Session 1999-2000

Conclusions

4.26 The only formal recommendation that we make in this chapter is found in paragraph 4.13 and relates to security of vaccine supply. However there are a number of other ways in which prevention and control of infection can be improved and we make recommendations in further chapters relating to the following:

- Facilitating development of new vaccines [see chapter 8];
- Encouraging and improving education and training of specialist and non–specialist health professionals from undergraduate degree level upwards [see chapter 7]
- Improving surveillance [see chapter 5]
- Raising levels of public awareness about the importance of hygiene and improve understanding of risk [see chapter 7 and 8]
- Clarifying lines of responsibility to encourage better co–ordination between different groups of health professionals [see chapter 9].

CHAPTER 5: SURVEILLANCE

Chapter summary

Surveillance should ultimately underpin and inform the diagnosis, treatment, prevention and control of infection. We argue that this activity could be improved by ensuring that laboratories are sufficiently well funded to carry out surveillance work. In addition there is need to use a wider range of innovative techniques for collating and analysing information. We also recommend that surveillance of human, animal and food–borne infection should be more integrated in order to provide important information about likely outbreaks.

What is surveillance?

"Surveillance should be the life–blood that powers clinical practice and public safety" [Dr Black, I p28].

5.1 Surveillance is the "ongoing systematic collection, collation, analysis, and interpretation of data and the dissemination of information to those who need to know in order that action may be taken" [ref]. It is needed in order take informed action to counter the spread of infectious disease at local, national and international levels. It also can determine the effectiveness of interventions and guide policy in preventing future outbreaks [Assoc Brit Pharm Ind, I p5; Assoc Clin Microb, I p15]. We provide an overview of the surveillance process in relation to influenza in Box 12 (p28).

Surveillance at present

5.2 Surveillance is mostly based on notifications of clinical disease and laboratory reports. Doctors are legally obliged to notify the authorities of certain infections or symptoms (tuberculosis, food poisoning symptoms for example)[13]. We understand that the Government is currently addressing this and we look forward to seeing their proposals in the near future. This is sent to the local authority's "proper officer", usually the CCDC. Laboratory reports on relevant micro–organisms are also sent to the CCDC. Reports of other infections are made on a discretionary basis because of their perceived value, for example notification of HIV/AIDS.

5.3 The completeness of surveillance does not appear to depend on a legal requirement. Some conditions for which there are legal requirements to report are inadequately reported, for example symptoms of food poisoning. HIV reporting, for which there is no legal reporting requirement, appears to be effective. It is important that the system is seen by those providing reports to produce information relevant to their clinical practice [Seminar, II p378].

5.4 Microbiology laboratories play a crucial role in surveillance by providing reports on micro–organisms to CCDCs and by sending on information and samples for more detailed analysis to national reference laboratories (managed by the HPA). Representative information of infection can be effectively provided through a network of laboratories. These local laboratories involved in reporting information to national reference laboratories can also help in responding to emerging threats [Assoc Med Microb II, p70-1].

Box 9

Surveillance: building a picture of burden of infection

Sending samples to laboratories not only provides information about how to treat a particular patient but is also an essential component of the body of information about types and levels of infection present in the community. The Consultant in Communicable Disease Control collates all information about cases of infection and sends it to the Communicable Disease Surveillance Centre (CDSC – part of the Health Protection Agency) via the Regional Epidemiologist (RE). The RE and CDSC routinely look at the pattern of infectious disease to detect untoward events. Information is also collected on numbers of children who have been immunised.

[13] A number of witnesses referred to the need to revise public health legislation. We are pleased to see that the Government intend to address this shortly (see House of Commons Hansard, 12th May, 109W). In particular we refer the reader to Dr Monaghan's overview and recommendations on this subject [I, p105-113].

5.5 We heard that surveillance in England has developed in a somewhat *ad hoc* manner [Pub Health Med Env Group, II p113; Pennington, I p121], but we also heard that the surveillance network, which was largely based around the Public Health Laboratory Service (PHLS) (this function has been incorporated in the HPA, see Box 6) is well regarded internationally [Amyes, I, p1; BioIndustry Assoc I, p26; USA, II p385].

5.6 However, there are concerns regarding surveillance. Many of those concerns could be addressed by designing better information systems and providing information technology and we address this in chapter six. We turn here to consider other concerns, particularly that:

- Laboratories, particularly those run by the NHS, have not always met their obligations by contributing surveillance information and sending samples on to reference laboratories;
- Surveillance information does not provide a representative picture of infection;
- Potential innovative sources of information and methods for analysing information are under–used;
- Information is not shared between all those responsible for surveillance.

MAINTAINING THE INFORMATION BASE: PUBLIC HEALTH LABORATORIES

5.7 Some of our witnesses were concerned that laboratories have not always discharged their public health obligations effectively and may not do so in the future following the transfer of the majority of former public health laboratories to NHS Trust management[14] [Bradford MDC, I p34-5; Hawker, II p116, Kesley, Q142]. Under the new set–up laboratory support for public health at local level will be provided by these local NHS laboratories with support from the HPA's regional laboratories[15].

5.8 Laboratories which had a public health focus will now be managed by NHS Trusts, whose primary focus is the clinical care of patients [Faculty Pub Health Med, I p55; Lachmann, Q75; Sheffield, I p151]. Public health and clinical medicine are by no means incompatible but effective public health may require laboratories to carry out tests in addition to those that would be necessary for clinical diagnosis. For example, as part of infection control, it may be necessary to see whether strains of an infection are from the same source, or whether people who appear well are carriers of, or have been exposed to infection.

5.9 Of particular concern is the Department of Health's statement, that part of NHS laboratory funding will be removed and redistributed to Primary Care Trusts (PCTs) as part of general allocations in 2004; and that laboratory funding for public health work will be guaranteed at its present level only until March 2005 [Minister Blears, Q879; PHLS, II p137]. This would provide PCTs with significant additional responsibility for public health aspects of infectious disease [Spencer, Q152; see ch 9].

5.10 We heard that laboratories specialising in food, water and environmental microbiology provide an essential service, working closely with local CCDCs, EHOs and the food and water industries [Bradford MDC, I p34-5; Food Standards Agency, I p64]. We are concerned that the position of this essential component of the response to infectious disease might be threatened. This is of particular concern if funding comes through PCTs, which are primarily concerned with providing clinical services related to human infection [PHLS, II p137].

5.11 We heard that the ability to direct activity within a managed network of laboratories, such as existed under the PHLS, was beneficial [Faculty Pub Health Med, I p53; PHLS South West, I p133]. Managed networks allow resources to be directed towards current problems in a coordinated manner. For example, a wide variety of laboratories across the country could be directed to sample for a particular organism of concern, as occurred with E coli O157. Such networks provide surge support.

5.12 We were concerned to find that, given the significant demands placed on NHS trusts to fulfil their clinical role, there were no plans as of yet to provide any material incentive for NHS laboratories to rise to the public health challenge [PHLS, II p137]. We note that the House of Commons Health Committee report on *Sexual Health*[16] recently expressed concern in relation to the impact of recent changes to management of laboratories on surveillance of sexually transmitted infections.

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[14] This took place in 1st April 2003 with the establishment of the HPA.

[15] *Getting Ahead of the Curve* (January 2002): the Chief Medical Officer's Strategy for infectious disease and other aspects of health protection: www.doh.gov.uk/cmo/idstrategy/idstrategy2002.pdf

Health Protection: a Consultation Document on creating a health protection agency (June 2002).

[16] *Sexual Health*, House of Commons Health Select Committee, Fourth Report Session 2002-03, HC 69.

5.13 We believe that it is important that the essential functions described above are not disrupted as a result of the recent transfer of some public health laboratories to NHS Trust control. Changes in management structure and funding streams can easily cause disruption and this would be unacceptable in relation to surveillance and the public health function.

5.14 **We recommend that the Department of Health should ensure that Primary Care Trusts provide NHS laboratories with *at least* the same level of extra resources for public health work (including food, water and environmental activity) that was previously received through the Public Health Laboratory Service.**

5.15 **We recommend that the Department of Health ensures that microbiology laboratories managed by the HPA and NHS Trusts act in a coordinated manner to deliver effective surveillance and to provide surge capacity.**

SURVEILLANCE IS UNREPRESENTATIVE

5.16 Concerns that surveillance information is unrepresentative of the incidence of infection fall into three categories: that there is too much reliance on passive surveillance; that priorities based on health care need have not been set; and that infection is under–reported.

Passive and active surveillance techniques

5.17 Much surveillance relies on a report of disease following diagnosis (passive surveillance) [Little, Q376]. An alternative method of surveillance is to seek patients who display a set of symptoms (active surveillance). This allows more cases of infection to be detected rather than relying on formal reports [Br Infect Soc, I p37; PHLS, II p143].

Priority setting

5.18 Surveillance systems are not based on priorities or health care need [Inf Control Nurses Assoc, II p176; Williams, Q383-5]. For example, campylobacter, a bacterial infection causing diarrhoea, resulted in 63,000 laboratory confirmed cases in 2001 and, according to the Food Standards Agency and Institute of Food Research, is likely to pose an increasing threat in the foreseeable future [I, p63, Inst Food Res, II p383]. However, because there is no priority–setting there is no comprehensive UK laboratory surveillance of campylobacter [Pennington, I p121]. E coli O157 leads to much more serious symptoms than campylobacter but is much less common with only about 1,500 infections reported annually, yet there are two E coli O157 reference laboratories [AcMedSci, II p35].

5.19 There should also be connections between surveillance and vaccination. Continued surveillance is necessary to provide information both about the incidence of side–effects following vaccination and of the efficacy of vaccination programmes in controlling infection [CAMR, I p42; Crowcroft, I p45-9; see para 4.5].

5.20 **We recommend that the Government should fund enhanced surveillance of the impact of vaccine programmes on the incidence of disease particularly when new vaccines are introduced.**

Under–reporting of infection

5.21 We heard repeatedly that GPs, and other front–line staff, are an excellent yet under–exploited source of surveillance information. However, they are often unsure about the link between contributing to surveillance and being able to improve patient care [Black, I p30; Beeching, II p49; Faculty Pub Health Med, I p53Gelletlie, Q241]. Professor Little spoke about the need to provide primary care workers with a better understanding of the importance of contributing to surveillance [Q395; see also chapter 7]. In addition, those that provide information should receive better and more timely feedback about relevant current findings as a result of surveillance [Beeching, II p49; Monk, Q244; see ch 6].

Surveillance in primary care: sentinel practices

5.22 There are some innovative approaches to gathering information from GPs, such as the population–based Royal College of General Practice's sentinel surveillance in primary care. This is based on information about incidence of disease recorded in GP practices across the UK [Little, Q370]. Sentinel surveillance in primary care can provide a framework within which more precise sampling for specific enhanced surveillance objectives can occur (guided by issues such as socio–demographic representation, seasonal variation, required precision and cost) [Catchpole Q629; Haworth, I p75; Little, Q370; Pattison, Q652; Birmingham, II p394].

5.23 We heard that developing enhanced sentinel surveillance would significantly increase the workload in the practices involved. It may be that it would be desirable to spread the workload of enhanced surveillance between practices, with different sentinel practices taking responsibility for different infections [Birmingham, II p394].

5.24 We commend the Royal College of General Practice for its sentinel practice initiatives and would like to see the scheme extended.

INNOVATIVE SYSTEMS, SOURCES AND ANALYSIS OF INFORMATION

5.25 There is a wide variety of information from different sources that would be useful to better understand the prevalence and degree of infection [AcMedSci, II p48; Hawker, II p117; Inf Control Nurses Assoc, II p176; Little, Q709; Paton, II p258]. For example, there is some surveillance activity based on information held by NHS Direct [Zambon, Q214], although we heard that if this were to include geographical location of callers it would be improved as it would provide information about geographical incidence of infection [Black, I p31]

5.26 We note that many people now approach pharmacists or alternative therapists to obtain advice about ailments. It would be useful to develop systems to capture information from sources such as these, as well as others, such as figures of school absenteeism, attendance at accident and emergency units and water utility customer complaints [Black, I p34, Griffiths, Q221; Mowat, I p113; Stewart, II p319].

5.27 Furthermore, many clinicians diagnose infection on the basis of symptoms rather than laboratory analysis [Spencer, Q159]. As we suggest in the previous chapter, this is, in cases of common infection, desirable. However, we heard that the current surveillance systems do not facilitate reporting on the basis of symptoms alone [Kelsey, Q161]. Developing systems where syndromes could be reported would be particularly useful in those cases where a micro–organism has not yet been isolated, for example with "severe community acquired pneumonia" [Beeching, I p49; Black, I p32-3; Zambon, Q193].

5.28 In addition to innovative sources of information there are a number of powerful analytical techniques used in other settings such as meteorological and financial forecasting that are not currently used in fighting infection. They could be adopted to develop forecasts of outbreaks and spread of infection [PHLS, p139]. Innovations in this area could improve our understanding of infection and hence delivery of services and we discuss the need for research to explore such options in chapter seven.

INTEGRATING SURVEILLANCE

Divided responsibilities

5.29 In order to develop understanding of infectious disease it is necessary to gather information not only about incidence of infection in humans but also about food and water–borne infection and zoonoses (animal infections that transmit to humans). Furthermore, infectious disease does not occur in isolation from other countries [Duerden, Q322; Nicoll, II p160; Salmon, II p 287]. Sharing of information on an international basis informs knowledge about infection on a global scale. International surveillance provides warning about likely occurrence of infection and can therefore inform, in a timely manner, control measures in this country [Troop, Q818-9].

5.30 The wide variety of relevant information means that a number of organisations must play a role in surveillance [see Box 15]. Responsibility for surveillance across the United Kingdom is spread between relevant administrative offices. The HPA has overall responsibility for surveillance in England, some responsibility in Wales and has a Service Level Agreement with Northern Ireland. The National Public Health Service for Wales, with responsibility for surveillance in Wales, reports to the National Assembly for Wales. The formal links between the HPA and different Government departments and agencies are as yet unclear [Salmon, Q699]. We discuss this further in chapter nine.

Animal and food–borne infection

5.31 A significant amount of evidence flagged up the importance of zoonoses, warning that "we neglect the study of animal sources of infection at our peril" [Humphrey, II p366; Soc General Microb, I p157; Uni Edinburgh, I p169]. We heard that many emerging human infections are zoonotic and in order to predict possible outbreaks more accurately it is essential to have good collaboration between specialists in human and animal infection [Faculty Pub Health Med, I p56; Pennington, I p121; Thorns, Q431, see Box 1, 10, 11]. For example we heard in the USA that it was imperative for experts in

animal and human infection to share surveillance information about West Nile fever (a mosquito borne infection which is also carried by birds) [USA, II p390].

5.32 Responsibility for surveillance of zoonoses is spread across a number of different agencies, which rely on different databases [CAMR, I p42; Thorms, Q438;]. For example, samples of Salmonella enteritidis phage–type 4 disease (a zoonosis which causes diarrhoea) may be investigated by one or more microbiology laboratories run by different agencies, yet these laboratories cannot share information as they do not have common datasets or standards [CAMR, I p42; Kealy, I p98].

Box 10

Role of wild animals in infection

Tick and mosquitoes borne encephalitides can lead to severe disease in humans and horses. The West Nile virus which occurs in migrating birds and mosquitoes has become a significant problem recently in the USA.

Rabies is one of the most serious infections carried by wild animals and is endemic in many parts of the world in dogs and wild carnivores.

Lyme disease occurs in wild rodents and deer and is transmitted to humans by ticks.

Ebola virus is severe and usually fatal and transmitted from primates. May be imported into the UK by travellers or primate carcasses.

5.33 Surveillance of infection in animals is usually driven by concerns over the economic impact of infection in animal rather than public health [Thorns, Q208]. Therefore, an organism which does not cause an animal ill–health and has no adverse economic impact in relation to agriculture, such as campylobacter, is often not investigated, even though it may cause considerable illness in humans [Food Standards Agency, I p64]. Some witnesses were also concerned about the lack of surveillance of companion and wild animals, which are a significant potential source of infection [BMA, I p 39; Reilly, Thorns, Q432-3; see Box 10, 11]. This could be an increasing problem as dogs and cats may now travel overseas with their owners under the PETS scheme and do not undergo quarantine on leaving or returning to the UK [BMA, I p39].

Box 11

Role of companion animals in infection

Infections carried by companion animals include:

Visual or ocular larva migrans is carried by dogs infected with a roundworm. Fouling in public parks, playgrounds by dogs is a significant source of infection in children and can lead to visual impariment.

Cat Scratch Fever is common in cats and though human infection is self limiting it may be severe in immunocompromised individuals.

Campylobacter is common in dogs and cats and one of the main sources of companion animal derived food poisoning in the UK.

Salmonellosis is common in terrapins and causes many cases of human salmonella.

Monkeypox. In June 2003 Centers for Disease Control and Prevention (a US Federal Agency) received reports of patients with a febrile rash illness who had close contact with pet prairie dogs and other animals. Laboratory testing at CDC indicated that the causative agent was Monkey pox virus, a virus not previously seen in the US. 53 cases had been investigated in Illinois, Indiana, and Wisconsin so far. This outbreak has been traced to pet prairie dogs exposed to infected Gambian giant rats imported from Ghana in April 2003 to a wildlife importer in Texas.

5.34 Concern was also expressed that surveillance of food borne infection should be better integrated [Assoc Brit Pharma Industry, I p9; O'Brien, I p119]. A variety of organisations are responsible for reducing risk of food–borne infection. The local authorities, the Food Standards Agency, CCDCs and others are involved in gathering information [CAMR, I p42; AcMedSci, II p47; Emery, Monk, Q229; Humphrey, II p366].

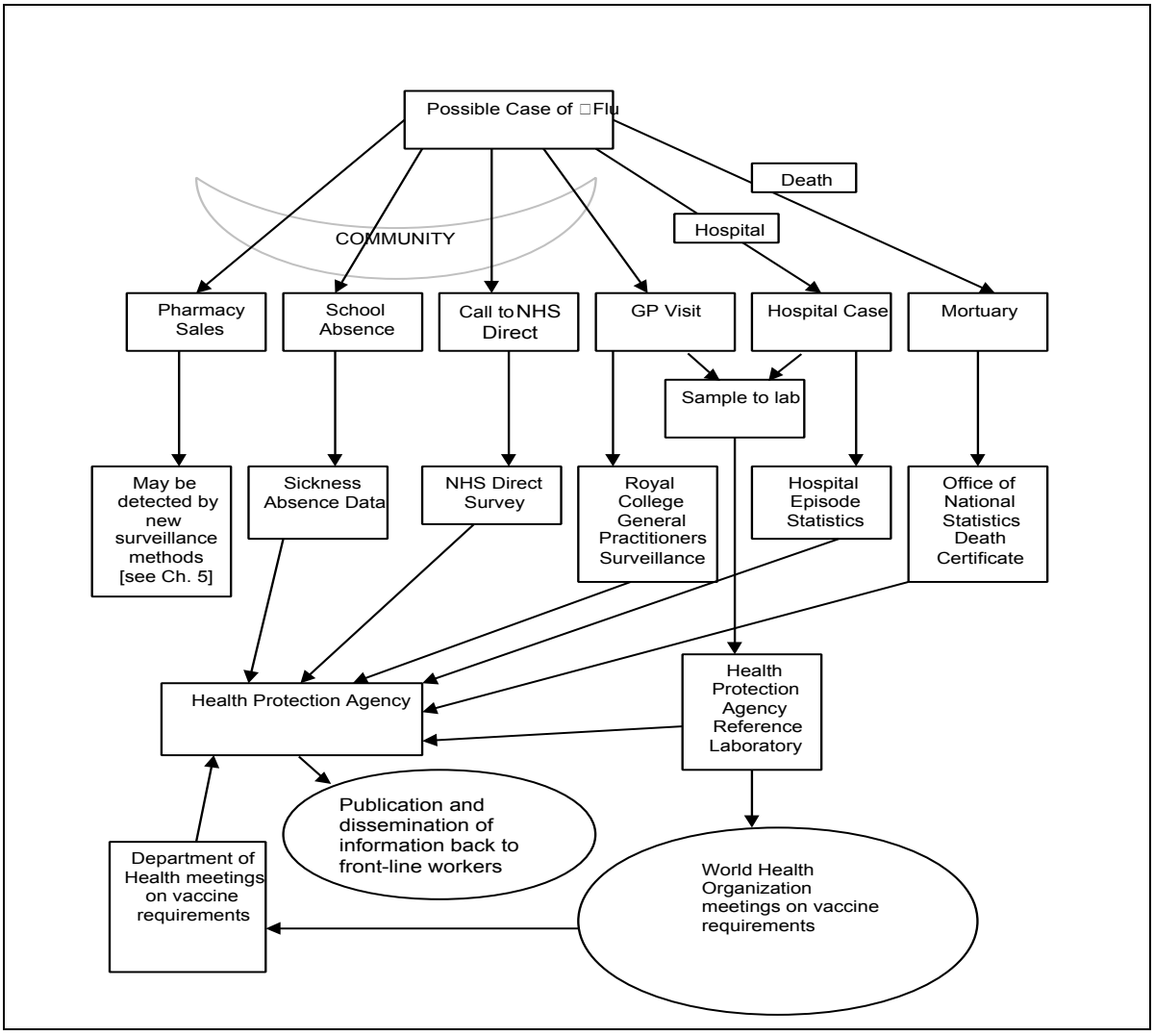
5.35 The Government has recently attempted to coordinate surveillance across departments through holding some cross–departmental meetings [Minister Ms Blears, Q840]. We welcome these developments.

5.36 However, the Faculty of Public Health Medicine (a Faculty of the Royal Colleges of Physicians) when they warn that "despite the experience of BSE and foot and mouth disease, the degree of joined–up working needs further improvement" [I p56]. The Faculty suggests introducing joint work programmes on animal and human health which would need budgets for surveillance and control at regional and local levels.

5.37 We heard repeatedly throughout the inquiry that better exchange of surveillance information and improving links between experts and health professionals in animal and human infection was fundamental to improving response to infectious disease [Kealy, I p97, see above paragraphs also].

5.38 **We recommend that the HPA be provided with resources to take on specific and primary responsibility for integrating surveillance related to human, animal and food–borne infection at national, regional and local levels in order to bridge the gaps that currently exist between these areas of speciality.**

Box 12: Surveillance of influenza



CHAPTER 6: INFORMATION SYSTEMS – NECESSARY SUPPORT

Chapter summary

Information systems should provide opportunities to improve current infectious disease control. Surveillance can be enhanced by developing integrated information systems across all relevant Government departments and agencies in order to facilitate collation and analysis of information. Information Technology can be used to provide automated rapid feedback to health professionals. Surveillance information and electronic resources of information about best practice and current events relating to infectious disease inform clinical practice.

Resources are needed to improve information systems and work needs to be undertaken to ensure that there are links between relevant databases to allow rapid exchange of information. We warn that IT must be used to ensure that people can work more effectively rather than adding a further burden onto already high workloads. This demands adequate supply of IT, training of staff and provision of sufficient technical support staff.

Background

> "Information technology is not used to its full potential—various parts of the service cannot transfer information to other parts quickly and securely" [Bradford MDC, I p34].

6.1 We heard that implementing and supporting information technology was a key priority for action and was needed to improve services [Assoc Brit Pharma Industry, I p6; Assoc Clin Microb, I p15; Leeds City Council, I p99; Paton, Q621; PHLS Q277]. Advances in information technology in recent years provide opportunities to collate, analyse and disseminate information from a wide variety of sources in much larger volumes and at far greater speed than ever before. For example, IT has been used to share and disseminate information relating to the SARS outbreak across the world [AcMedSci, II p353].

6.2 We heard that information systems across different organisations, and sometimes within the same organisation, are incompatible. Thus priority should be given to making information transfer possible between different systems. This might be a "huge resource intensive issue" and requiring careful attention to the laws on data protection and human rights [Bradford MDC, I p34; PHLS, II p135; Spittle Q621].

6.3 The Government have announced a significant increase in spend on IT in the NHS in England, which will constitute an additional £400 million in 2003-04, £700 million in 2004-05 and £1,200 million in 2005-06 to the baseline spend in IT of £850-£1,050 million [Pattison, II, p271]. We heard that this, along with other advances, such as developing the integrated care record, should help to counter some concerns [Pattison, Catchpole Q637].

6.4 We take heed of the National Audit Office's caution that there are "continuing delays in the implementation of NHS national IT initiatives and networks" [II p378]. Furthermore, we are concerned that infection disease control should be recognised when developing IT in relation to health and should be integrated into any improved system.

6.5 We discuss below the main concerns relating to IT and make recommendations.

Encouraging reporting: electronic submission of information

6.6 One of the challenges facing surveillance activity is that relevant information needs to be gathered and transferred to appropriate authorities [PHLS, II p139]. Providing surveillance information is time consuming and often paper based. If it does use electronic systems, it is often necessary to enter information manually on more than one occasion because of different, incompatible IT systems [Assoc Med Microb I, p71; Kelsey, II p42].

6.7 The Association of Medical Microbiologists points out that transferring information should be "simple and automatic" [I p71, see also PHLS Q277]. Providing surveillance information should not be something separate to, but part of, every–day working practices. Dr Catchpole summed up the views of many when he stated:

> "It should not be that we do surveillance as well as looking after patients, but that in looking after patients we are undertaking surveillance" [Q629].

6.8 **We recommend that the Department of Health should ensure that procedures for collecting and reporting information electronically are integrated where possible into everyday working practices and are less burdensome than at present.**

Analysing information

6.9 One of the concerns about surveillance is that advances in forecasting techniques are not being exploited by the infectious disease community [Borriello II p218, Q515; Seminar, p378-81]. Such techniques often require sophisticated hardware and software which is not routinely available.

6.10 We also heard that there is no common agreement over the terms and coding systems used in databases [PHLS, II p139]. We are concerned that this makes extracting comparable information from different databases extremely difficult and time consuming, which would be an obstacle to responding quickly in an emergency [Nicoll Q277]. The SARS outbreak indicated how important it was to be possible to share information internationally.

6.11 **We recommend that the HPA should standardise information entry across all surveillance systems. This should be undertaken in consultation with representatives of all those involved in the collation and transfer of information for infectious disease control.**

Sharing information

6.12 Information technology provides some exciting opportunities to facilitate collation and analysis of information from widely different and innovative sources [Catchpole, Q629]. Witnesses suggest that combining information systems about animal, human and food–borne infection would provide an immensely powerful tool for surveillance [PHLS, II p135]. Recent developments, such as the integrated care record, have potential for enabling access to a greater breadth and depth of patient information for surveillance purposes than at present [Catchpole, Q637].

> "The worst thing that could happen is to build new, modern systems as islands of automation and not link them together. I would urge everybody to build a very robust infrastructure, that you can hang systems from and interchange data with. That is going to be the key here" [Spittle, Q631].

6.13 We note that in order for the integrated care record to provide maximum benefit to infectious disease services it is necessary to consult bodies which lie outside the immediate jurisdiction of the NHS Information Authority, such as the HPA [Catchpole, Q637]. If such consultation does not happen, we heard that significant opportunities to incorporate public health needs with immediate clinical needs could be wasted [Spittle, Q631]. The HPA and others could contribute to discussion as to what information is needed and in what format it should be presented.

6.14 There should be coordinated activity within the Department of Health and its agencies and across different Government Departments and agencies to ensure that all organisations involved in surveillance, prevention and treatment of infectious disease can share relevant information [Pattison, Q643]. In particular, the Department of Health should develop a system which allows interchange with other systems.

6.15 **We recommend that the Government should develop a fully compatible electronic system of disease surveillance information across all relevant departments and agencies.**

Disseminating information to health care professionals

6.16 We heard that one of the reasons for underreporting by clinicians is that they lack ownership in the surveillance process; if they do send in information it seems to disappear [Brit Infection Soc, I p38; Catchpole, Q639; Friedland, I p67; Little, Q401]. There have been some recent initiatives to increase feedback through world–wide–web technologies. Professor Duerden of the PHLS told us that there are web–based systems which allow health professionals both to report and to compare infectious disease events in their local area with the regional and national pattern [Q284; also see Inf Control Nurses Assoc, II p176, Q380].

6.17 Professor Finch told us that IT provides opportunities to enable health professions and public to gain access to information about best practice in relation to infectious disease such as via the recent initiatives of the National electronic Library for Communicable Disease or NHS Direct Online [p55; Q92; Haworth, I p76]

6.18 Both of the above areas of disseminating information should be further developed and we expect the Department of Health and the HPA to draw on the structures and projects that are already in place and provide appropriate funding. However, we also have some concern about email overload. Bombarding busy health professionals with emails about potential outbreaks could mean that many are not read and encourage complacency.

6.19 **We recommend that the HPA takes the lead in further developing electronic methods for providing feedback about surveillance and for targeting delivery of information about infectious disease to healthcare professionals.**

Warning: IT is not sufficient

6.20 Whilst the evidence pointed to the opportunities offered by better use of IT, there were also quiet warnings throughout. In particular, investing heavily in IT without due consideration to the way that the infectious disease service operates would be an ineffective way of using resources. Other issues which witnesses said needed to be addressed in order to implement an effective IT system, are outlined below.

(a) Patient Confidentiality: Patient confidentiality and data protection could undermine opportunities to improve surveillance activity [Leeds City Council, I p99; US, II p388]. One way of overcoming this would be to provide information in anonymous form [Hawker, II p116; Nicoll, Q278; Pattison, Q647; Spittle, Q646]. However this would not be useful in all cases. If IT were to enable improved surveillance through exchange of information across organisations, data protection issues could arise. We urge the Department of Health to carefully consider ways in which this can be overcome.

(b) Training and human support services: Simply investing in and implementing IT systems is not sufficient to ensure that the most value can be obtained from those systems. Consideration needs to be given to ensuring that staff are trained in IT skills and the resource implications of that time needed for training are considered. We point out that critical services must continue to run whether or not the IT system is working, which demands back–up facilities and IT support staff on call around the clock [Catchpole, Q629].

CHAPTER 7: TRAINING AND EDUCATION

Chapter summary

A successful infection service requires infection specialists to be well trained and to have knowledge and understanding about other areas of the service. However, infectious disease cannot be the responsibility of infection specialists alone. Other doctors and nurses should also be involved and thus require sufficient training to confidently treat infection, as well as, increasingly, managing and implementing infectious disease control measures.

We are concerned that the general public has a poor understanding of risk relating to infectious disease and to vaccines. We call on the infectious disease community to provide the public with clear information about issues relating to risk and infectious disease: the HPA should take the lead in this.

Training of infection specialists

MICROBIOLOGISTS, INFECTIOUS DISEASE PHYSICIANS AND EPIDEMIOLOGISTS

7.1 We heard that there is a lack of specific expertise in identifying and treating difficult or rare infection [Griffiths, II p90]. This means that patients can receive sub–optimal clinical care. In addition, there is a risk that potentially significant events, indicative of an outbreak, could be overlooked until a major epidemic has taken hold [Assoc Med Microb, II p71; Beeching, Q119; Cohen, Q44; Wright, Q115]. We note that the early detection of the anthrax outbreak in the US was due to general clinicians who became suspicious that something untoward was occurring and who then ensured that basic confirmatory laboratory tests were performed urgently.

7.2 There are also concerns that there is a shortage of individuals with skills needed to direct laboratories and to care for patients, as we have already discussed (see chapter 3). Posts in medical microbiology are difficult to fill and recent increases in academic microbiology fellowships have not had significant effect [Cohen, Q48; Pennington Q46;Wellcome Trust Q736]. In contrast, physicians in training are attracted to careers as Infectious Disease (ID) physicians, but there is a limited number of substantive posts available.

7.3 We heard that epidemiological skills (those of tracing incidence and predicting likely further outbreaks of disease) are also in short supply [AcMedSci, II p35] both at regional level and at national level within the HPA. These skills are essential to CCDCs, who play a key role in prevention and control. We heard that CCDCs have difficulty in providing the best possible service as they are often overworked and cover large population areas [Hawker, II p118]. ID physicians and medical microbiologists can provide little aid in this area as they receive only a small amount of epidemiological training [Crook, II p88].

7.4 One recent development which capitalises on physicians' interest in clinical infectious disease, and which may help to reverse the shortage of those with both clinical and laboratory skills, is the provision of joint training in microbiology and infectious disease [Friedland, I p67]. This could be expanded further to include training in epidemiology [Beeching, II p50; Cohen, Q48; Crook, II p89; Wright, II p56].

7.5 **We recommend that the Government, in conjunction with relevant Royal Colleges and the Joint Committee on Infection and Tropical Medicine, address the shortage of expertise in clinical infectious disease, clinical microbiology and communicable disease epidemiology by increasing numbers of fully funded consultant posts and ensuring that there are available training posts.**

ENVIRONMENTAL HEALTH OFFICERS

7.6 There is a growing national shortage of graduates in environmental health with an eighty percent reduction in applications to environmental health degree courses since 1995 [Emery, II p111]. In the last three years, three environmental health degree courses have closed and we heard that the remaining courses are struggling to remain viable. Furthermore, only 4,500 of the 9,500 environmental health officers who are registered with the Chartered Institute of Environmental Health work in local authorities [Emery; II p111; Q235].

7.7 In addition we heard that some local authorities are replacing Chief Environmental Health Officers with Directors of Technical Services: these Directors may not have any understanding of environmental health issues [Emery; II p111].

7.8 We are concerned about the shortage of trained officers required to carry out food inspections and to investigate infectious disease as this could adversely affect any national or local infection prevention activity.

7.9 **We recommend that the Government investigate the decline in numbers of trained Environmental Health Officers in local authorities and take steps to reverse this trend.**

Education of health professionals other than infection specialists

7.10 Given that the health care system relies on a variety of practitioners being well–informed about infection we were concerned to hear that training in infectious disease for non–specialist doctors, nurses and other health professionals was inadequate [Coates, I p45; Emery, II p133; Little, p195, Q408; Perry, Q412; Birmingham, p395].

7.11 Whilst all medical students see infection in the course of their training, we heard that there is wide variation in terms of undergraduate teaching. On some courses clinical infection and public health training is patchy and isolated from other components of medical training [Beeching, II p52, Finch, Q123]. Clinical training is often delivered by non–specialists. The low numbers of microbiologists and infectious disease specialists may mean that this situation will continue.

7.12 We heard there is insufficient post–graduate training in infection for GPs considering that infection is a large component of their work [Little, Q408]. Pre– and post– registration nursing training is also viewed as "very poor" in terms of information on basic microbiology and immunology which leads to a lack of thorough underpinning knowledge about infectious disease [Howard, Q412].

7.13 We believe that levels of infectious disease training of all clinicians and nurses must be increased in order to enhance the likelihood that significant events indicative of unusual infection are detected. We believe that basic knowledge and understanding of infection is essential for communicating with the public. For example, nurses working in vaccination clinics with inadequate understanding could find it difficult to respond to authoritatively to patients' questions about vaccination [Howard, Q412].

7.14 One way of tackling concerns about lack of expertise is to ensure that there are specialists in infection in all regions and that other professionals know how to access them. We discuss this further in chapter 9. However we also call on bodies responsible for education of health professionals to improve education and training in infection.

7.15 **We recommend that the General Medical Council, the Nursing and Midwifery Council, the General Dental Council and the Health Professions Council ensure that universities strengthen existing content relating to clinical and public health aspects of infection in undergraduate education.**

7.16 **We recommend that, with respect to postgraduate education, the medical Royal Colleges and the Nursing and Midwifery Council should ensure that infection prevention and control is a key component.**

Communication, education and the public

7.17 In our report on antibiotic resistance we noted that it was important to improve public understanding about antibiotics. We heard in this inquiry of the need for public education about infectious disease. Without public understanding of infection it will be difficult to reduce infection, particularly in the community [Friedland, I p67].

7.18 Both the public understanding of science, and scientists' understanding of the public is deemed to be inadequate [Bryant, Q354]. For example we heard that "it would be wonderful if people knew that viruses and bacteria were different" [Bryant Q360]. However, many of the issues relating to infectious disease and vaccination are complex. In particular, understanding risk in relation to infection is difficult [Calman, Q341; Crowcroft, I p46; Ghosh, Q342; PowderJect, I p125].

SCHOOLS

7.19 Educating children at school is an important way of increasing public understanding of infectious diseases [Bradford MDC, I p46]. We are pleased to note that there are components of infection control highlighted in the National Curriculum at all Key Stages. EHOs have traditionally provided some education of children about food hygiene but, in some areas, have recently had to stop attending schools owing to insufficient resources [Birmingham, II p394].

CONFIDENCE IN GOVERNMENT AND SCIENTISTS

> "The handling of BSE and the emergence of vCJD caused a massive loss of trust in Government institutions and in science in general" [Pennington, I p122]

7.20 Witnesses were concerned that the public had lost confidence in official pronouncements about infectious disease issues [Ghosh, Q342; Pennington, I p122]. This was probably a consequence of the BSE/vCJD outbreak and subsequently Foot and Mouth [Griffiths, II p91; UK Vaccine Industry Gp, II p235; Wyeth, I p175].

7.21 We were warned that a public lack of confidence could be exacerbated by Government or officials suggesting that there was no risk attached to something. This tactic was used in attempt to stem anxiety about the MMR vaccine and had failed [Ghosh, Q329, 334]. Nearly all human activity has an element of risk and the public understand this [Calman, Q345; Ghosh, Q342].

7.22 Witnesses suggest that scientists and other professionals rather than Government should communicate with the public about infectious disease [Calman, Ghosh, Q367]. Those people responsible for communicating should both be, and be viewed as, independent. It could also be useful to have a single authoritative source for information about infectious disease. The HPA may be the most suitable body to have responsibility for communicating with the public [Stewart P316; Troop, Q821].

7.23 We agree that the HPA should take the lead in public communication and we would agree with witnesses that the Food Standards Agency provides a useful example of how to communicate clearly without appearing to be controlled by Government or industry (but note *The Guardian* 23rd May) [Pennington, I p122; Sheffield City Council, I p151]. We recognise that the HPA is independent but expect it to develop and maintain its independence and we look forward to seeing it proactively communicating with the public and providing clear assessments of risk.

7.24 **We recommend that the HPA, like the Food Standards Agency, should act, and should be seen to be acting, independently of Government.**

THE MEDIA

7.25 One of the most important aspects of public education and communication is improving communication between scientists and the media, an issue which we heard about in this inquiry but also explored in our report, *Science and Society* [Bryant, Q327; Ghosh Q357]. The role of the media in promoting health messages is considerable.

7.26 We heard that the media can do well at communicating concepts of risk and raising awareness about infectious disease: chlamydia was widely reported in women's magazines and it is thought that this led to significantly raised awareness. We note however that increased awareness has not yet resulted in a drop in infection rates [Beeching Q88]. A further suggestion was to use storylines in soap operas to promote particular issues [USA, II p385]. A more negative example of media power is their role in perpetuating wide–spread anxiety about the MMR vaccine.

7.27 It is increasingly being recognised by doctors that they should prepare for routine media communication and establish media contacts in order to quickly convey information when needed. However, we heard that a culture change is still required and the importance of communication needs to be further recognised [Bryant Q327].

7.28 Mr Pallab Ghosh, Science Correspondent for the BBC, praised the placing of clear accurate information on websites. However he warned that this is insufficient, as journalists want to put questions to people and to explore different angles of an event. Journalists need to be able to obtain information at all times, ideally from a spokesperson [Q368]. He suggested establishing more phone "hot–lines" in relevant press offices when there are episodes of intense media interest. Ideally the infectious disease community should provide a media–friendly, articulate and clear spokesperson, available at all times.

7.29 The mode of communication cannot only be one–way and we were interested to hear about the journalist fellowships run by the Centers for Disease Control and Prevention in Atlanta where journalists learn about issues related to infectious disease [USA, II p397].

7.30 **We recommend that the HPA creates a post for a well–resourced infectious disease specialist to act as spokesperson and to lead on all aspects of communicating with the public including developing innovative methods of increasing awareness of infectious disease.**

CHAPTER 8: RESEARCH AND DEVELOPMENT

Chapter summary

An effective infectious disease service should be underpinned by research and development in order to further understanding of how organisms survive, spread and interact with their hosts. This in turn should inform action: how best to react to and prevent further outbreaks.

We were particularly concerned about reported difficulties in obtaining support for developing new products such as tests to diagnose infectious disease and vaccines and funding for research on delivery of services.

Development of vaccines and diagnostics

8.1 The development of both vaccines and diagnostics is a lengthy process with uncertain outcomes and profits. This makes it a relatively risky venture for industry [Roche Diag, I p141]. In particular, this means that there are still many unexploited opportunities for developing and using vaccines [BioIndustry Assoc, I p25, UK Vaccine Ind Grp, II p234-8].

8.2 We were particularly impressed, when we visited the National Institutes of Allergy and Infectious Disease in the US, to hear about their Small Business Initiatives. Small companies willing to take financial risks inherent in developing a vaccine could apply for up to $100,000 to cover initial development costs. If the company then patented the vaccine they were obliged to make every effort to bring it to market [Chatfield, II p248; USA, II p388].

8.3 Pharmaceutical companies invest ten or twenty times less money in vaccine R&D than in therapeutics. They regard the public expectation that vaccines should not have any side–effects as a particular burden. Such public anxiety requires vaccines to be more thoroughly tested than other pharmaceutical products in order to reveal any potential side–effect. This informs companies' risk–analysis of products to decide whether or not to further develop or to market [Kingston, Q530]. Pharmaceutical companies desire clearer guidance from Government about levels of demand [Kingston, Q531]. For example, the Government promised to include a vaccine for meningitis C in the childhood schedule (vaccines given to children as routine) and this facilitated its development [Salisbury, Q42].

8.4 **We believe that vaccine development should be facilitated and recommend that the Government should develop and maintain clear evidence–based guidelines about vaccine requirements and should create financial incentives to enable early research, development and commercialisation of vaccines.**

8.5 We heard that academic medical researchers often do not consider commercial applicability of their research [Borriello, Logan, Reeders Q476]. However, this is changing somewhat with an increase in numbers of university technology transfer offices, which encourage and facilitate moves from research to development [Logan, Q503]. The MRC also expects to encourage more product development of research through a Health Implementation Research Centre which would enable people to "design their projects so that they can be better implemented and translated into practice" [Q752]. We applaud this move and hope to hear of its progress over the next few years.

Box 13

Primary Research and Development funders

Department of Health—specifically the NHS R&D fund and the Policy Research Programme, which has historically funded much public health work [Pattison Q617];

DEFRA —funds research into animal infection. It has recently announced a joint fund with Higher Education Funding Councils of £23 million in veterinary science.

Government agencies—fund and carry out R&D work. Before the Health Protection Agency was created on April 1st 2003 the Centre for Applied Microbiology and Research had research funding, which has transferred to the HPA. The Public Health Laboratory Service carried out significant work in development of new diagnostics, vaccines and other lab–based technologies [Miller, Q523]. The HPA expects to raise further funds from outside bodies [HPA Qs 735-46; PHLS Q303].

Medical Research Council—any area of infectious disease work is funded apart from that which is "needs–driven research" [MRC Q743]. Infectious disease research applications have an average success rate and antibiotic resistance is now a priority area. Health services research grant applications are considered so long as their outcome is generalisable [Q752]. The MRC hopes to hear to secure a funding stream for health protection research in conjunction with other funders next year.

The Wellcome Trust—funds across the board of different types of research with approximately a thirty percent success rate for applications for research in infectious disease [Q736-41]. It is currently reviewing its ten–year Medical Microbiology Fellowship Initiative [Q743].

The Department of Trade and Industry—funds development work through its Link Programmes specifically in health technology devices, applied genomics and genetic and environmental interactions in health [II, p364]. It is unclear how much spend in infection disease developmental work these programmes have led to.

Pharmaceutical and biotechnology industry—large pharmaceutical companies such as GlaxoSmithKline and PowderJect Pharmaceuticals invested £200 and £33 million respectively in vaccine R&D in 2001-02 in addition to their spend on therapeutics [PowderJect, I 122; Assoc Brit Pharma Ind, I 3-14; GSK, I 70; UK Vaccine Ind Grp, Q526-44; II, x]. Smaller venture–capital funded biotechnology companies, whilst not involved in manufacturing therapeutics or vaccines, carry out research and development [Dr Chatfield, Q523; Dr Reeders, Q476].

The European Union and WHO—fund a variety of infectious disease related research through different streams.

8.6 One of the concerns regarding development work, particularly related to public health, was that staff in the PHLS pursued this on a day–to–day basis alongside their other work, and it is, as of yet, unclear whether this will be able to continue under the HPA [Duerden, Q303].

8.7 The big funders of medical research such as the MRC and the Wellcome Trust do not fund research into use and development of diagnostic technologies [Q757-759]. Apart from the HPA it is unclear which organisations would prioritise development of diagnostics. The development of diagnostics is a general concern and we heard in the United States that no one is taking responsibility for developing and improving standards of diagnostics [USA, II p384].

8.8 We were pleased to hear from the Government that they have established a Bioscience Innovation and Growth Team (BIGT) to examine how policy and investment can encourage innovation and growth in the UK bioscience industry. One of its particular aims is to examine how to develop relationships between the NHS and industry in order to exploit new technologies [Q850]. BIGT expects to report in July 2003. We look forward to its recommending a strategy to develop priority areas for investment [DTI, II p364].

8.9 Highlighting priority areas and linking funding to those priorities could facilitate development of appropriate technologies [Borriello, II p218; Miller, Q548]. In order to ascertain that development is properly linked with health care need it may also be necessary to carry out evidence–based research to assess efficacy and cost–effectiveness of vaccines and diagnostics. All of this would require a certain amount of coordination between relevant funding bodies. Sir William Stewart, Chairman of the HPA, expressed caution about over–coordination [Q788]. We agree that it is important not to stifle innovation but we note that in a stretched health care service with limited R&D funding it is necessary to prioritise.

8.10 **We recommend that the Department of Health, in conjunction with the HPA, establishes and publishes by the end of 2003 clear evidence–based priorities for the development of vaccines and diagnostics.**

Research into Delivery

8.11 We heard that in order to improve infectious disease services there needs to be more research into how services are organised and decisions are taken. Better understanding of human behaviour has a significant part to play in understanding how organisations are run and s can reveal how organisations could be improved.[17] Understanding organisational issues and behaviour can help to inform guidelines about treatment, prevention and control measures and may improve outcomes [CAMR, I p42; Crowcroft, I p45-9]. For example, research can examine how laboratory testing can be used to inform GPs' decisions about when and how to treat [PHLS Prim Care, I p132-3].

8.12 Further research is required into questions such as the best design of hospital wards for managing infection and reasons for patients failing to complete courses of treatment. We heard that there is a disproportionate burden of infection in certain social groups but the reasons for this, or indeed why people choose not to take up interventions such as vaccines, are not fully understood [Calman, Ghosh, Q364-5]. We found that work is needed to ensure that infection services reach socially disadvantaged groups if health inequalities are not to be perpetuated [Assoc Brit Pharma Ind, I p10; Hawker, II p117].

Box 14

Behaviour and handwashing

Handwashing is a key intervention to reduce spread of infection and yet it is known that many health care workers do not wash their hands when moving between patients. Research could inform those who organise services how best to design wards and run services so as to minimise the barriers to handwashing.

8.13 We are concerned that there is not enough delivery related research, either that which evaluates methods of diagnosis (such as near patients tests) or surveillance, or seeks out new sources of information [see chapter 5]. This type of research would provide evidence to improve services.

8.14 It is clear that it is, at present, difficult to fund research that examines social factors, evaluates new techniques and considers the delivery of services. The PHLS used to carry out research in this area [AcMedSci, II p36; PHLS, II p139]. The MRC considers funding applications of this nature, with the caveat that results should be generalisable across the health service. However, such research applications are subject to severe scrutiny and we heard that it is often more difficult to convince MRC research committees of the quality of service delivery research than of basic science research [Q754].

8.15 **We recommend that the Department of Health ensures that funding is made available to increase research into organisation and delivery of infectious disease services and, in particular, into how human behaviour impacts on outcomes of diagnostic procedures, treatments and prevention programmes.**

[17] We discussed this in our report on *Antimicrobial Resistance*, 7th report 1997-98 HL81-I

CHAPTER 9: COLLABORATION AND COORDINATION

Chapter summary

Improving infectious disease services requires flexible multi–disciplinary teams. This involves developing better collaboration at all levels. This will be complex because of the breadth of expertise needed. The Minister for Public Health should take a lead in improving collaboration across all relevant departments. The HPA, as a new organisation, also has opportunities to set standards and clarify lines of accountability in the services and to develop a strategy for collaborative work with those outside of the HPA.

On a local level there is need to develop both breadth and depth of expertise. We recommend that the Government establishes a number of infection centres to provide a critical mass of expertise and to improve collaboration by including professionals from universities, hospitals and community settings.

International collaboration provides opportunities to help tackle some infection at its source before it spreads across the world. Involvement in international events benefits national services by developing expertise. We recommend providing formal means to allow health professionals to be seconded overseas.

Inter–departmental and inter–organisational collaboration

9.1 The responsibilities for different aspects of protection against infectious disease are divided amongst a number of Government departments and organisations [see Box 14]. Because of the number of organisations which have broader responsibilities than just infection we heard that there is a danger that infection will not always be a high priority. We heard that lines of communication and accountability are often unclear and collaboration inadequate [Emery, II p112, Emery, Gelletlie, Hawker, Monk Q229-231].

9.2 Infectious agents do not respect boundaries between community and hospital settings. Yet we heard that there is very little collaboration between hospital and community infection disease services, with microbiologists providing the only formal link. We note that there are some recently established initiatives to encourage rotation of infection control nurses between hospital and community settings in order to broaden experience and develop collaborative relationships [Naylor, Q672].

Box 15

Main organisations in England with some responsibility for human infectious disease services

Government Departments (Health, DEFRA, Home Office, DfID)

Health Protection Agency

Veterinary Laboratory Agency

Strategic Health Authorities

Primary Care Trusts

NHS Hospital Trusts

Local Authorities (environmental health)

Food Standards Agency

Health and Safety Executive

Prison Medical Service

GOVERNMENT

9.3 In addition to those Departments listed in Box 14 we note that the Department for Trade and Industry and the Office of Science and Technology are responsible for technology development and the research councils respectively. In addition the Office of the Deputy Prime Minister oversees local government issues, and thus is ultimately responsible for environmental health.

9.4 We note that the role of Minister for Public Health was in part developed to ensure cross–departmental working and whilst we heard some positive reports about improvements in relation to

surveillance it is clear that departmental collaboration is still insufficient and must be significantly strengthened [see chapter 5].

9.5 **We recommend that the Minister for Public Health should publish an annual account of all progress in cross–departmental working in relation to infectious disease.**

Clarifying lines of communication and accountability

9.6 Lines of communication and accountability between organisations are complex and unclear [see Boxes 2 and 3]. Witnesses suggest that this should be addressed, particularly in relation to the role of Primary Care Trusts [Beeching, II p50; Bradford MDC, I p34-5; Brit Inf Soc, I p37; Emery, II p112, Q229; Faculty Pub Health Med, I p52-6; Gelletlie, Q229; Hawker, II p118, Q258; National Audit Office, II p 372; Roberts, I p139]. We are concerned that this lack of clarity inhibits full, effective and formal collaboration. All of those organisations that are involved in infection control should be clear about their roles and responsibilities and how they fit into the service as a whole. Whilst the HPA clearly has a key role in ensuring effective overall infection control services are in place, it can only achieve this through commitment and cooperation of others.

9.7 **We recommend that the Minister for Public Health should publish as a matter of urgency a document outlining roles and responsibilities of all organisations involved in infectious disease services and should disseminate this to those concerned in order to facilitate effective communication and collaboration.**

HEALTH PROTECTION AGENCY

9.8 The Health Protection Agency should be able to provide opportunities to develop closer working relationships between different areas of the services: indeed many witnesses welcomed it for that reason. The Health Protection Agency is still establishing itself and it has a huge task ahead in order to live up to its promise. We have some concern about the speed in which it was established with perhaps insufficient consultation but believe that it is now important to focus on developing the most effective agency possible.

9.9 We note that there was some concern expressed about environmental health remaining divorced from public health following the creation of the HPA [Bradford MDC, I p34; Emery, II p111; Q232]. The suggestion was made that there perhaps could have been bolder moves to develop formal links between organisations responsible for food–borne infection [Humphrey, II p366; Inst Food Res, I p95].

9.10 Structural changes to organisations may bring benefits but they can also lead to confusion over lines of responsibility and thus can disrupt long established collaborative relationships [Hawker Q231]. The National Audit Office was extremely concerned that the HPA had been established without clarifying lines of responsibility between that body, other organisations and individual professionals [II p372]. Our recommendation above should rectify this.

9.11 We heard that exchange of information and collaboration between England, Northern Ireland, Scotland and Wales has historically been satisfactory, owing to good relations between relevant organisations [Donaghy, Q701; Salmon, Q700]. However, we note that the House of Lords Constitution Committee recommended in its report on Devolution[18] that there should be formal mechanisms for intergovernmental working in case more informal mechanisms broke down. We support this view in relation to infection and believe that the HPA has a role to develop formal collaborative relationships with relevant organisations in devolved administrations [Soc Gen Microb, I p157].

9.12 **We recommend that the HPA publishes by April 2004 a proposal for developing collaborative relationships with organisations concerned with tackling infection, including the devolved administrations, environmental health departments and the Food Standards Agency.**

Broadening and deepening expertise

9.13 We note that one of the difficulties with fighting infection is that it is difficult to predict when and where infection will arise. The first sign of a major epidemic may present to a GP, an epidemiologist, an outpatients' clinic, an ID physician or a veterinarian. Therefore breadth of expertise in infection is required. It is also fundamental to have collaborative structures in place. If, for example, a GP sees something unusual, they should know how to access the appropriate expert.

[18] House of Lords Select Committee on the Constitution, *Devolution: Inter-Institutional Relations in the United Kingdom*, Second Report 2002-03, HL Paper 28

9.14 One of the properties of infectious disease is its potential for sudden unexpected increases in cases, outbreaks and epidemics. If significant numbers of people are exposed to an infectious agent they are potentially infected and may require investigation, preventative treatment and reassurance. This means that services need surge capacity. Surge capacity should exist at all levels: in clinical, laboratory and epidemiological services, and in the production and delivery of interventions such as vaccines [AcMedSci, II p353-4].

9.15 Surge capacity can be provided if all staff are well trained. There is also a need for improved collaboration, so that areas of the country under increased pressure can receive assistance from other areas.

9.16 **We recommend that the Government recognises and addresses the fact that, although England has not experienced major epidemics of infection in recent years, this owes as much to good fortune as to good management. Without improvements we fear that this country will suffer from major epidemics and will continue to see infectious disease take its toll in economic terms, in suffering and in lives.**

Mothers, anthropologists and insect experts

9.17 Throughout this inquiry we heard that the infection team should not be confined to medical nursing infection specialists. In part broadening expertise can be tackled by improving education and training in infectious disease of all health professionals medical and nursing specialists and we have discussed this in chapter six. Relevant expertise is however wider than doctors, nurses and basic scientists. Many different people have played key roles in identifying and helping to control infections including mothers and anthropologists.

9.18 In Connecticut, USA, mothers helped to identify Lyme disease when they spoke to the local epidemiologist about the unusual number of children in a small area diagnosed with juvenile rheumatoid arthritis—a rare condition. The epidemiologist investigated further and found that all these children had been exposed to ticks and suffered from an unusual rash. This led to identifying Lyme Disease. Anthropologists working amongst women in New Guinea highlighted the way that Kuru disease, a rare degenerative, and fatal brain disorder is transmitted, when they described the practice of eating and smearing on their bodies the brains of dead relatives.

9.19 There are concerns about shortages of specialists who could provide help to infection services. For example, we heard in the US that entomologists are necessary to help understand and control insect–borne diseases such as West Nile virus, yet there is a nationwide shortage [USA, II p386]. The situation in the United Kingdom is much the same, as we outlined in our reports *Systematic Biology Research*[19] and *What on Earth?*[20]. The need for such expertise was recently highlighted in the Chief Medical Officer's Annual Report 2002, *Health Check: On the State of the Public Health*.

INFECTION CENTRES: IMPROVING COMMUNICATION, DEVELOPING TEAMS AND EXPERTISE

9.20 Whilst broadening understanding may be necessary, we heard that national expertise in infectious disease should also be improved and access to that expertise made easier [Bri Infect Soc, I p37-8]. The Academy of Medical Sciences and others raised the idea of developing "infection centres" [Cohen, Q55; Lachmann, Q54, Birmingham, II p394]. These would be similar to the model used to develop cancer services and should be placed within a geographical area such as that served by a Strategic Health Authority.

9.21 We support the establishment of infection centres as they would provide an excellent opportunity to

(a) develop expertise in clinical services and research

(b) improve collaboration between hospital, community and university settings

(c) provide training of infection specialists and others

9.22 We envisage that infection centres should be associated with an academic institution and should provide a clinical infection service for adults and children to the local district. In addition they should provide high quality training in order to ensure a supply of sufficient well trained health professionals to meet current and future requirements. Research should be actively encouraged and

[19] House of Lords Select Committee on Science and Technology, *Systematic Biology Research*, First Report 1991-92, HL 22-I

[20] House of Lords Select Committee on Science and Technology, *What on Earth: The threat to the science underpinning conservation,* Third Report 2001-02, HL 118

should span clinical infection (adult and paediatric), microbiology (including infection control), virology, and public health medicine.

9.23 Centres should be closely allied to the HPA in order to improve the interface between clinical, laboratory and public health based infectious disease services. Ideally there should be close collaboration with other relevant specialists such as in hepatitis, HIV, tuberculosis and paediatrics. These centres should also seek to facilitate relationships between specialists in human and animal infection and others who could help with outbreaks, such as entomologists.

9.24 **We recommend that the Department of Health encourages and facilitates the development of infection centres which integrate scientists (virologists, microbiologists), clinicians and epidemiologists. These should be associated with academic and tertiary referral centres and the regional HPA laboratories. Each Strategic Health Authority should have access to services of one of these.**

International collaboration

9.25 It is a truism that infectious diseases do not respect borders. Whilst the focus of our inquiry and of this report is infectious disease as it affects England, it is not possible to ignore the global dimension [AcMedSci, II p33-4; Stewart, II p316]. Every year sixty–four million passengers pass through Heathrow Airport alone. Significant amounts of food and other goods arrive in the UK daily from all parts of the world. This global movement of people and goods also provides opportunities for global movement of infections, whether through spread of infections such as influenza viruses or through global travellers and immigrants importing unusual "exotic" infections [Int Org Migration, II p392, see Box 16].

Box 16

Global spread of infection

West Nile Virus is a virus causing a range of mild to severe symptoms spread by a particular type of mosquito which emerged in the US in 1999. It first arose in New York but there have now been disease in humans in forty–two of the fifty states.

SARS, a virus causing serious respiratory problems, was recognised in 2003, and has now spread to twenty–eight countries.

Congo Crimean Haemorrhagic Fever, a rare "exotic" disease causing severe internal bleeding with a thirty percent mortality rate and spread both by ticks and blood, was diagnosed in a patient in a hospital in Dorset in 1998 .

9.26 International collaboration and aid brings significant benefits to the donors as well and improves chances of a country being able to adequately fight infection. A successful infection disease service needs to accept that disease can, and will, be imported and thus health care professionals need to be able to identify, advise and protect individuals from exotic diseases [Blears, Q863-9; PHLS, Q322; Troop, Q818-9]. The US Congress acknowledged the importance of such international collaboration and formally established a budget to allow the Centers for Disease Control to engage in international work [USA, II p387].

9.27 As was recently exemplified by SARS, contributing to international work helps to provide early warning of emergence of possible epidemics, thus allowing implementation of control measures.

9.28 England currently collaborates significantly on the international stage, in particular through support to the World Health Organization (WHO) which DfID and the Department of Health support [DfID, II p360; WHO, II p391]. England also houses one of WHO's collaborating centres on influenza, based in the World Influenza Centre (WIC) at Mill Hill. There is, at present, some discussion as to whether the WIC should be moved. We suggest that when making this decision, consideration should be given to ensuring that expertise is maintained in order to continue such high–profile collaboration.

9.29 In response to the threat from infectious disease, WHO has developed an international network of experts who alert others to possible outbreaks and provide response services to those outbreaks. The Communicable Disease Surveillance Centre, HPA is a member of this Global Outbreak and Response Network (GOARN) [WHO, II p391].

9.30 WHO told us that it was imperative that GOARN could access short term aid from partners, such as through providing laboratory analysis support and experts on secondment. The UK has helped

to facilitate this and has provided "excellent support" to GOARN in relation to the recent SARS outbreak [WHO, II p377, 391].

9.31 We also heard that much collaboration with WHO is through individual HPA staff who have formed *ad hoc* relationships [Duerden, Q322, Troop, Q818-9]. It has, in the past, often been difficult to release PHLS staff to enable further international collaboration. Dr Troop, Chief Executive of the HPA, told us that in order to increase international activity "we either need to create some internal capacity or we need to increase funding in order to free up more people to be able to do it in a more systematic way" [Q766].

9.32 We were pleased to hear that Dr Troop was committed to improving formal means by which the HPA could both benefit from and assist in international collaboration [Troop, Q766] and that the Minister was committed to the infection community making a "proper contribution" to international collaboration in this sphere [Blears, Q863-9]. We note that there is also expertise outside the HPA, such as at the Schools of Hygiene and Tropical Medicine, which could be drawn upon.

9.33 **We recommend that the Government enables the HPA to second health professionals to international bodies such as WHO and provides the resources to make this possible.**

TRADE

9.34 Infection is spread not only by movement of people but also by food and animal trade. This has recently been highlighted by an outbreak of monkeypox in the US (see Box 11).

9.35 When we visited the WHO we heard that many trade agreements do not adequately consider public health implications [WHO, II p391]. Defra take the lead in relevant World Trade Organization meetings, with the Food Standards Agency providing public health aspect [Defra, II p355]. We are concerned that the views of the Department of Health are not sought as standard and suggest that this should be addressed.

EUROPE

9.36 At present there is a significant amount of discussion about the nature of EU wide collaboration [Brussels, II p381]. Closer relationships between EU countries have led to increased ease of movement of people and goods and means that the risks of infectious diseases within Europe are increasing. This risk may increase following the entrance of new countries where there are higher rates of various infectious disease and lower levels of disease control than other EU countries [Nicoll, II p160-2]].

9.37 The EU is considering developing a European centre for infectious disease to enable closer collaboration relating to surveillance and control measures. This is an important component of fighting infection but we note that a large, heavily staffed, CDC–type venture could contribute to loss of experts in infectious disease from nation states. As of present experts in England are in short supply. Furthermore the response to SARS demonstrated to us that much could be achieved through facilitating collaboration between laboratories. Duplicating facilities by creating European level laboratories may not produce further significant benefit to effective collaboration.

APPENDIX 1

Members of Sub–Committee

The members of the Sub–Committee which conducted this Inquiry were:

Baroness Emerton (co–opted)
Baroness Finlay of Llandaff
Lord Haskel (co–opted)
Lord Lewis of Newnham
Lord McColl of Dulwich
Lord Oxburgh
Lord Patel
Lord Rea (co–opted)
Lord Soulsby of Swaffham Prior (Chair)
Lord Turnberg
Baroness Walmsley
Baroness Warwick of Undercliffe

Declaration of Interests

Declaration of Interests relevant to this Inquiry:

Baroness Emerton
Chairman Elect of Association of Hospital and Community Friends
Trustee, Defence Medical Welfare Service
Trustee, Buidett Nursing Trust

Baroness Finlay of Llandaff
Professor of Palliative Medicine and Vice Dean, University of Wales College of Medicine
Clinical Consultant, Marie Curie Cancer Care and Velindre NHS Trust

Lord Haskel
Patron, Chronic Diseases Research Foundation

Lord McColl of Dulwich
Fellow of King's College London Professor of Surgery
Chairman of Mercy Ships

Lord Oxburgh
Former member of Hammersmith Hospitals NHS Trust

Lord Patel
Chairman, NHS Quality Improvement—Scotland
Fellow of Academy of Medical Sciences
Fellow of Royal Society of Edinburgh
Professor of Obstetrics
Patron of South Asia Health Foundation

Lord Rea
MD on "Interactions of Infection and Nutrition"
Fellow of Royal College of General Practitioners

Lord Soulsby of Swaffham Prior
Fellow of Academy of Medical Sciences

Lord Turnberg
Ex–Chairman, Board of Public Health Laboratory Service
Vice President of Academy of Medical Services

Baroness Warwick of Undercliffe
Chief Executive, Universities UK

APPENDIX 2

Call for Evidence

The Science and Technology Select Committee has set up Sub–Committee I, with Lord Soulsby of Swaffham Prior in the chair, to consider and report on issues relating to human infectious disease in the United Kingdom, including—

- current effectiveness of the surveillance systems in the United Kingdom and potential problems in the future
- links between surveillance and treatment of infectious disease
- links between surveillance and the strategies for preventing infectious disease

and to pay regard to—

- developments in surveillance, vaccine and diagnostic technologies
- international approaches to surveillance, treatment and prevention of infectious disease
- public attitudes, risk–perception and the role of the media.

We invite written submissions by 14th October 2002, which are relevant to our terms of reference, and addressed in particular to the following questions:

1. What are the main problems facing the surveillance, treatment and prevention of human infectious disease in the United Kingdom?
2. Will these problems be adequately addressed by the Government's recent infectious disease strategy, *Getting Ahead of the Curve*?
3. Is the United Kingdom benefiting from advances in surveillance and diagnostic technologies; if not, what are the obstacles to its doing so?
4. Should the United Kingdom make greater use of vaccines to combat infection and what problems exist for developing new, more effective or safer vaccines?
5. Which infectious diseases pose the biggest threats in the foreseeable future?
6. What policy interventions would have the greatest impact on preventing outbreaks of and damage caused by infectious disease in the United Kingdom?

The Committee welcomes evidence on any area of infectious disease. However, as other bodies have recently inquired, or are in the process of inquiring into antimicrobial resistance, hospital–acquired infections and sexually transmitted infection, the Committee will not make these primary concerns in its inquiry. Nevertheless the Committee will not exclude these areas.

Please note that the Committee will focus on UK health issues, not diseases primarily affecting overseas countries, whilst acknowledging that infection crosses borders and may threaten the United Kingdom. The Committee will also focus on naturally occurring infection rather than bioterrorism.

The Committee will not consider evidence on whether the MMR vaccine is safe.

APPENDIX 3

ACRONYMS USED IN THIS REPORT

CAMR – Centre for Applied Microbiology and Research

CCDC – Consultant in Communicable Disease Control

CDC – Centers for Disease Control and Prevention (US Federal Agency)

CDSC – Communicable Disease Surveillance Centre

CICN – Community Infection Control Nurse

vCJD – variant Creutzfeldt–Jakob Disease

CPHL – Central Public Health Laboratory

Defra – Department of Environment, Food and Rural Affairs

DfID – Department for International Development

EHO – Environmental Health Officer

FSA – Food Standards Agency

HPA – Health Protection Agency

IT – Information Technology

NPT – near patient test

PCT – Primary Care Trust

MRC – Medical Research Council

PHLS – Public Health Laboratory Service

SARS – Severe Acute Respiratory Syndrome

SHA – Strategic Health Authority

VLA – Veterinary Laboratory Association

WHO – World Health Organization

APPENDIX 4

List of Witnesses

The following witnesses provided evidence. Those marked * gave oral evidence.

* Academy of Medical Sciences
Professor S G B Amyes
Association of the British Pharmaceutical Industry
Association of Clinical Microbiologists
Association of Clinical Oral Microbiologists
Aventis Pasteur MSD
Bard Limited
Baxter Healthcare Ltd
* Dr Nick Beeching, Royal Liverpool University Hospital and Liverpool School of Tropical Medicine
Biotechnology and Biological Sciences Research Council (BBSRC)
BioIndustry Association (BIA)
Dr Nicol Black
* Ms Hazel Blears MP, Minister for Public Health, Department of Health
* Professor Pete Borriello, PHLS
Bradford Metropolitan District Council
British Healthcare Trades Association
British Infection Society
British Medical Association (BMA)
* Mr Shaun Brogan, Vale of Aylesbury Primary Care Trust
* Dr David Brown, PHLS Central Public Health Laboratory
* Dr Gerry Bryant, Leicestershire, Northamptonshire and Rutland Health Protection Team
* Sir Kenneth Calman, Vice Chancellor, Durham University
* Dr Mike Catchpole, PHLS
Centre for Applied Microbiology and Research (CAMR)
* Dr Steve Chatfield, Microscience
Professor A R M Coates
* Dr Derrick Crook, Oxford University
Dr Natasha Crowcroft
Dr David Dance
* Dr Martin Donaghy, Scottish Centre for Infection and Environmental Health (SCIEH)
Dr D W Denning
* Professor Brian Duerdan, PHLS
Professor A M Emmerson
* Mr Nigel Emery, Weymouth and Portland Borough Council
Faculty of Public Health Medicine
Department for Environment, Food and Rural Affairs (DEFRA)
Professor Roger Finch, Nottingham City Hospital
Focus Technologies
Food Standards Agency
Professor Nigel French, University of Liverpool
Dr John Friedland
* Dr Ruth Gelletlie, Public Health Medicine Environmental Group
General Medical Council (GMC)
* Mr Pallab Ghosh, BBC Science Correspondent
Jane Gill, Rosemary McCann, Ruth Philp and Alan Silverwood
GlaxoSmithKline (GSK)
Global Alliance for TB Drug Development
Matt Griffiths
* Professor Paul Griffiths, Clinical Virology Network
Professor Tony Hart, University of Liverpool
* Dr Jeremy Hawker, Regional Epidemiologist, West Midlands
Dr Elizabeth Haworth
* Health Protection Agency
Helicobacter Working Group
Home Office
* Mrs Janet Howard, Infection Control Nurses Association
Professor Tom Humphrey, University of Bristol
Infectious Disease Research Network (IDRN)

Institute of Biology, Association for Clinical Microbiologists and Society for Applied Microbiology
Institute of Food Research
Department for International Development (DfID)
Joint Committee on Vaccination and Immunisation (JCVI)
Mark Kealy
* Dr Mike Kelsey, Whittington Hospital
* Mr Ian Kingston, UK Vaccine Industry Group (UVIG)
Leeds City Council, Environmental Health and CCDC Audit Group and Communicable Diseases Section of the Department of Housing and Environmental Health
* Professor Paul Little, Southampton University
* Dr Julie Logan, SIMFONEC
Marks and Spencer
* Medical Research Council (MRC)
* Dr Liz Miller, PHLS
Dr Stephen Monaghan
* Dr Philip Monk, Communicable Disease Control, Leicester
Dr Philip Mortimer
Mr and Mrs Mowat
National Audit Office (NAO)
* Mr Robert Naylor, University College London Hospitals
Professor Martin J Newby and Professor Philip J Thomas
* Professor Angus Nicoll, PHLS
Dr Michael O'Brien
* Dr James Paton, Queen's Hospital, Burton upon Trent
* Sir John Pattison, Department of Health
Professor T H Pennington
* Mrs Christine Perry, Infection Control Nurses Association
Pet Health Council
* Dr Deenan Pillay, PHLS Antiviral Susceptibility Reference Unit, Birmingham
PowderJect Pharmaceuticals Plc
Public Health Laboratory Service (PHLS) Primary Care Advisory Group
Public Health Laboratory Service (PHLS) South West Group
Edward Purssell
Dr Stephen Radwanski
* Dr Stephen Reeders, MVM Ltd
* Professor Bill Reilly, Scottish Centre for Infection and Environmental Health (SCIEH)
Professor Jennifer Roberts
Roche Diagnostics Ltd
Roche Products Limited
Royal College of Pathologists
Royal Pharmaceutical Society of Great Britain
Royal Society of Edinburgh (RSE)
* Dr Roland Salmon, PHLS Wales
Schering Plough Ltd
Sheffield City Council, Health Protection Service
* Dr Brian Smyth, Communicable Disease Surveillance Centre, Northern Ireland
Society of Directors of Public Protection in Wales
Society for General Microbiology (SGM)
Specialist Advisory Committee for Antimicrobial Resistance (SACAR)
Specialist Society for Genitourinary Medicine
* Dr Robert Spencer, Bristol Royal Infirmary
* Mr Graham Spittle, IBM Hursley Laboratory
* Professor Chris Thorns, Veterinary Laboratories Agency
Dr H A Thurston, Ms K Gunn, Dr M Afza
Department of Trade and Industry (DTI)
University of Edinburgh, Centre for Infectious Diseases
* Dr Martyn Wake, Sutton and Merton Primary Care Trust
* Wellcome Trust
* Mrs Gini Williams, City University (London)
Wiltshire Food Liaison Group
World Health Organisation (WHO)
* Dr Stephen Wright, London School of Hygiene and Tropical Medicine

Wyeth Pharmaceuticals
* Dr Maria Zambon, PHLS Central Public Health Laboratory