

Summary of the UK public health response to Severe Acute Respiratory Syndrome (SARS)

UK SARS Task Force

24th July 2003.

Introduction

This document provides an overview of our current understanding of SARS and the main actions to deal with it from a public health perspective, based on international information and experience. It summarises actions taken and guidance developed specifically for the UK and thus reflects the response of the United Kingdom (UK) as outlined in the Secretary of State for Health's statement to Parliament on 28 April 2003. It also points to areas requiring further work.

The document is in two parts. The first part reviews key knowledge about SARS of relevance to its control and the second part summarises the 10 elements of the current UK public health approach to the prevention and control of SARS:

1. Surveillance: case detection, verification and reporting
2. Case management: isolation, infection control, treatment and follow up
3. Management of contacts
4. Information, education and travel advice
5. Laboratory diagnosis
6. Broader public health measures
7. Contingency planning
8. Collaboration across government and the UK
9. International collaborations
10. Research and development

This should be seen as an interim document recognising that information on SARS is advancing rapidly and that the guidance will need to be kept under continuous review. Comments on this guidance are welcomed and should be sent to the respiratory division of the Health Protection Agency Communicable Disease Surveillance Centre at: respdcsc@hpa.org.uk marked "Public Health response to SARS".

Background

This aim of this paper is to bring together in one document a summary of, and rationale for, the UK's approach to protecting the UK population from SARS. It is based on the information available to date from the World Health Organization (WHO), the experience of affected countries, relevant publications and the views and opinion of UK and other experts [WHO, 2003c]. It is based upon an assessment of the current level of threat to the population of the UK. The guidance builds on

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already established principles and contingency plans for the management of and public health response to outbreaks of infectious diseases, adapted to the specific characteristics of this disease.

New information on SARS is becoming available on a daily basis and the level of threat to the UK population may change as the global situation changes, as knowledge advances and as cases occur in the UK. Some parts of this guidance, such as the research and development component, are still under development. Consequently the document needs to be kept under continuous review and revised when necessary. The guidance emphasises the need for contingency planning and exercising so as to be prepared for any escalation in the level of threat in the UK.

The National (UK) SARS Task Force was convened by the Health Protection Agency (HPA) to oversee operational aspects of the response to SARS. In addition the HPA has established an Expert Advisory Group¹ whose remit includes reviewing and recommending revision to the guidance. This paper does not attempt to address the wider, cross-governmental strategies for combating the potential and actual impact of the global SARS outbreaks on the UK, which are being considered by an ad hoc Interdepartmental Group on SARS chaired by the Department of Health.

Key features of SARS of relevance to control

Modes of transmission

Large respiratory droplets and direct or indirect contact with bodily fluids are believed to be the most important routes of transmission from infected patients to other people. Most cases in the well-documented outbreaks have been in people in close contact with ill patients with SARS – generally healthcare workers or family members providing care to the patient [Poutanen et al, 2003; Booth et al, 2003; Lee et al, 2003; WHO, 2003b]. It is clear, however, that in some circumstances less sustained contact has resulted in transmission, such as occurred in a hotel in Hong Kong [CDC, 2003a; Tsang et al, 2003]. The possibility of spread through contaminated fomites has been identified in reports of hospital outbreaks where the virus seems to have survived on inanimate objects and then been transmitted [Lee et al, 2003, WHO, 2003d].

Other routes of transmission have been postulated but are currently thought to be responsible for only a small minority of reported cases. Airborne spread has been suggested in the light of the outbreak at the hotel in Hong Kong [CDC, 2003a]. Some transmission has occurred in aircraft from symptomatic cases [2003c]. Although some centres have isolated the SARS virus from faecal specimens and these have been shown to survive in the environment for limited periods, the significance of these findings in terms of infection risk is unknown².

Transmission through the environment has been suggested as an explanation for cases occurring in an apartment complex (Amoy Gardens) in Hong Kong where diarrhoea was a prominent clinical feature among cases and local problems with sewage systems were identified. Faecal oral spread does not seem to be a feature and but cannot be ruled out until further information becomes available. For the moment with

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the exception of the Amoy Gardens outbreak it seems that close contact with ill patients is responsible for the majority of cases [WHO 2003d].

Incubation period, period of communicability and case clustering

Outbreak investigations in affected areas suggest an incubation period from two to ten days [Donnelly et al, 2003;WHO, 2003b; Booth et al, 2003; Lee et al, 2003; Poutanen et al, 2003, WHO 2003c]. There have been isolated reports of shorter and longer periods but these are yet to be systematically investigated and two to ten days is the period agreed by WHO [WHO 2003c]. Transmission from moderately and severely ill cases is well documented [WHO, 2003b; Lee et al, 2003; Poutanen et al, 2003]. It is considered possible that transmission may occur from febrile cases early in the illness and where the illness is only mild. The risk of infection at such time is, however, poorly described but it is considerably less than in the second week of disease and in those with clear symptoms [WHO 2003d]. There is currently no evidence that people who have been infected but have no symptoms are infectious to others. It is not known if, and how long, after the cessation of symptoms a patient remains infectious. There are, however, no reported cases of transmission from recovered cases.

While most cases appear to result in subsequent illness in only a few, or none, of their contacts, case-clustering data indicate that some cases are associated with a large number of infections (more than 20) in their immediate contacts, so called 'super-spreading events' [WHO, 2003b;WHO, 2003d]. The specific characteristics of the cases and circumstances that led to these clusters are not yet well described but the cases have generally been severely unwell at the time of transmission and may not have been subject to appropriate infection control [Dwosh et al, 2003].

Susceptibility to infection

Most probable cases have been reported in adults of working age [Poutanen et al, 2003; Donnelly et al, 2003]. This may be influenced by the age groups at greatest risk of exposure as a result of health care occupation or responsibility for providing care in the home. Few cases have been reported in children and deaths under the age of thirty years are very rare [Hon et al, 2003]. There are no reports of transmission to adults from younger children (under 10 years). It is possible that children have some pre-existing immunity from related virus infections or that they are susceptible to infection but not severe disease. However there are no proper surveys of children, so statements need to be guarded [WHO, 2003d]. The risk of severe illness and death is highest in the elderly [Donnelly et al, 2003].

Natural history and prognosis of SARS

Fever is an almost invariable early feature among reported cases, with malaise, myalgia and a non-productive cough being other common symptoms [Booth et al, 2003; Donnelly et al, 2003]. In outbreaks in Hong Kong and Canada, diarrhoea was reported in about 25% of cases [Booth et al, 2003; Donnelly et al, 2003]. While some

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cases are only mildly ill and do not require hospitalisation on clinical grounds, some reports suggest that up to 20% of hospitalised patients are severely ill and require ventilatory support [Lapinsky et al, 2003; Hon et al, 2003]. The overall mortality rate among reported cases has been about 15% but is dependant on the mix of patients included. Death rates increase with age but, as a result of the high proportion of young adults among those exposed to the risk of SARS infection, deaths have occurred among previously healthy young adults. Recovery, however, is the expected outcome for most patients, especially those under the age of sixty years [WHO, 2003d].

Settings presenting special risk for transmission

Hospitals

In most of the affected areas, outbreaks have been centred on hospitals, which have acted as critical amplifiers of transmission and as the portal entry for infection into the wider community. Spread occurs from severely ill patients to healthcare workers, other close contacts, and visitors in the hospital and then into their close contacts outside the hospital. Transmission from patients receiving intensive care has been noted. Probable transmission has been reported from a severely ill patient held in an accident and emergency department in Canada before the importance of infection control in patients with SARS was recognised [Poutanen et al, 2003]. The use of face masks or respirators has been demonstrated to protect against SARS in healthcare workers [Seto et al, 2003]. Strict application of infection control procedures has been reported to be effective at preventing transmission of infection in hospitals though it is now thought that this may need to extend beyond respiratory control to high levels of hygiene and decontamination because of the possibility of environmental transmission² [Seto et al, 2003; Dwosh et al, 2003]. Some limited transmission has however been reported to healthcare workers who appear to have followed recommended infection control precautions [CDC, 2003b]

Other possible risk environments

Infection of other passengers seated near to a person with SARS on an aircraft has also been reported³. Transmission is reported to have occurred on four occasions resulting in a further 27 cases (22 in one incident). In each case the person with SARS is reported to have been symptomatic. This emphasises the importance of people from affected areas with acute febrile infections not being allowed to travel. Infected contacts are reported to have sat as far as seven rows from the symptomatic case and some flight attendants have also been infected. In a further 31 flights, with symptomatic probable cases of SARS on board, no evidence of in-flight transmission of SARS had been found. WHO has recommended exit screening to prevent ill people boarding aircraft in areas experiencing transmission. No flights have been implicated in the transmission of SARS since 23 March 2003. Transmission has occurred in taxis and ambulances when ill SARS patients have been transported without adequate precautions for assessment or isolation in hospital.

The possibility of transmission in other health care settings, such as primary care has also been reported. Transmission can also occur due to sustained close contact in the

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home environment. The risk of transmission of infection from mildly ill patients, such as those managed at home, is considered to be low due to their lower level of infectiousness and the low probability (at present in the UK) that they represent true cases of SARS. More seriously ill patients, from whom the risk of transmission is considered high, require management in hospital on clinical as well as infection control grounds. The occurrence of outbreaks or chains of transmission in the UK will increase the likelihood that probable or suspected cases in the UK will be true cases of SARS.

Diagnosis

The diagnosis of SARS is based on the combination of a clinically compatible illness and epidemiological links to people or areas affected by SARS. In the days prior to their admission, one third of patients subsequently diagnosed as probable cases of SARS in Canada, were assessed by a physician and sent home [Booth et al, 2003]. This was partly due to lack of awareness of SARS in the early stages of the epidemic and partly due to the non-specific symptoms in the early stages.

At present, the microbiological diagnosis of SARS is generally retrospective. Diagnostic tests are being developed on the basis of culture of the SARS coronavirus (CoV), PCR based detection of SARS CoV antigen and serological detection of antibody. Serological diagnosis, based on seroconversion observed across acute and convalescent specimens, is considered to provide the definitive positive diagnosis of the infection. Testing is available on a research and reference centre basis at present in the UK, but testing is likely to be available more widely in the forthcoming months. For many cases, the positive or negative diagnosis is only likely to be available retrospectively due to the low sensitivity of the current methods to detect specific SARS CoV antigen [Drosten et al, 2003; Ksiazek et al, 2003; Peiris et al, 2003; Zambon, 2003].

Current global situation and control measures

Updates on the global situation, including cumulative case numbers by country and affected areas, are published by WHO regularly⁴. By 11 July 2003, a cumulative total of over 8000 probable cases of SARS (including over 800 deaths) had been reported by 32 countries to WHO. Ninety-seven per cent of these cases had been reported from five areas experiencing current or recent transmission: Hong Kong (21%); Taiwan (8%); the rest of mainland China (63%); Singapore (2%); and Canada (2%).

Effective control measures adopted in the areas most affected by SARS have centred on infection control around known cases, aggressive case-finding and early isolation, surveillance of contacts and informing those at risk including the medical personnel involved in care. Additional measures adopted in some areas have included wearing of masks in public places, closure of schools, screening of travellers leaving affected areas (exit screening), screening of travellers arriving from affected areas (entry screening) and, most recently in Beijing, banning of certain public gatherings and restrictions on travel. The effectiveness of any of these additional measures in controlling the transmission of SARS has yet to be demonstrated though exit

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screening, if applied well, may prevent people with acute respiratory illnesses from flying.

The World Health Organisation considers SARS to be a particularly serious threat to global health, but one that can be contained given adequate international cooperation and dedication. Three scientific priorities identified by the WHO are, the development of reliable diagnostic tests, improved understanding of modes of transmission, and identification of effective treatment regimens⁵.

Cases reported in the UK

Clinical surveillance has been in place in the UK since 16 March 2003 as recommended by WHO. People who may have SARS are assessed locally and in discussion with the Health Protection Agency's (HPA) Communicable Disease Surveillance Centre (CDSC). They are classified to be either "suspect" or "probable" cases based on WHO case definitions⁶.

By 20 June, of eight individuals who had been classified as probable cases, four had been declassified as a result of other diagnoses. The four remaining probable cases included one in whom the diagnosis had been laboratory confirmed by seroconversion. A further two laboratory confirmed probable cases have occurred in UK residents but these two individuals acquired their infection overseas and were ill overseas and are therefore not counted as UK SARS cases. All of the probable cases had recovered. A further 200 individuals had been classified as suspect cases and 46 of these had been declassified as a result of other diagnoses, of which 28 were influenza. No onward transmission of infection from the probable or suspected cases had been detected despite vigorous case finding among their close contacts.

In the light of the criteria for WHO definitions of probable and suspected cases, which require a minimum of recent travel to an affected area and a compatible clinical illness, the likelihood that many of the current UK resident probable or suspected cases will be true SARS cases is low i.e. the current WHO case definitions in the UK setting are not very specific.

Control measures

The current UK control measures to protect the UK population from SARS are based on the following principles which are compatible with those advocated by WHO [WHO, 2000c; WHO 2000d]:

1. It is not possible to prevent all individuals infected with the SARS virus from entering the UK, for the reasons stated above.
2. The speed of detection of cases and application of effective infection control measures are the critical factors in preventing the spread of SARS.
3. Containment of transmission requires the rigorous identification and monitoring of close contacts of cases of SARS.

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4. Rapid detection and isolation of cases of SARS requires a high level of awareness among the public (particularly those who have recently travelled to SARS affected areas) and health care professionals.
5. Hospitals can be highly vulnerable to SARS and are therefore pivotal to SARS control.

There are ten main elements to the control measures

Surveillance: case detection, verification and reporting

A national SARS surveillance system has been established by CDSC in collaboration with other HPA Divisions and the devolved administrations. Medical practitioners are asked to report all potential SARS cases immediately to CDSC⁶. Reported cases are also assessed by the SARS team at CDSC and allocated to probable, suspect, or other categories of case. Local public health teams, if not the original reporters of the case, are alerted to the report of a new case. Subsequent public health measures are triggered by the reporting system. The submission of appropriate clinical specimens for microbiological investigation is requested for all reported cases. Information on the number of probable cases is shared publicly on a daily basis, including reporting to WHO and the European Commission.

Screening of passengers leaving affected areas as recommended by WHO ('exit screening') has been implemented in the transmission areas with the most important links to the UK, but this measure cannot be entirely relied upon to prevent SARS infected people entering the country [WHO, 2003a]. Those who are only mildly ill may not be identified and people who have been infected but are still in the incubation period will not have fever or other symptoms and could not be identified.

Airlines have been recommended by WHO to report passengers noted to be ill during flights [WHO, 2003a]. Very few people are likely to develop SARS symptoms in flight and this measure is likely to be of limited effectiveness in detecting infected passengers.

At the current level of risk, and with these measures in place, screening of passengers from affected areas on entry to the UK ('entry screening') is not recommended.

Other methods of surveillance for cases of SARS, such as primary care or hospital-based surveillance of community acquired pneumonia, may provide useful adjuncts in the longer term in the event of transmission occurring in the UK.

Case management: isolation, infection control, treatment, discharge and follow up

Detailed guidance for the management of patients with suspected or probable SARS has been issued by the HPA⁷. The key action to minimise transmission is early isolation – whether at home or in hospital - until another diagnosis is confirmed, SARS is excluded or until x days after the patient is symptom free.

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Patients with milder illness, whose condition does not warrant hospitalisation on clinical grounds, should be managed at home⁸. This guidance includes details of disinfection and control measures to be used outside the hospital setting.

More severely ill patients should be managed in hospital. Isolation and rigorous infection control procedures are essential at all stages of the patient's pathway through healthcare. The Government's Chief Medical Officer has written to all NHS Chief Executive Officers⁹ reminding them of the action they need to take in their own organisations in case of further suspected cases of SARS presenting to the NHS, and drawing to their attention the detailed guidance on the HPA web site. Patients should be discharged only when they have begun to recover and have had at least 48 hours without fever. Patients managed at home, and hospitalised patients convalescing at home, are recommended for home isolation until completely recovered. Detailed guidance on procedures for home isolation has been published¹⁰. An important role is played by basic hygiene including hand-washing at home or in hospital.

Information on clinical management and treatment of patients with SARS in hospital has been issued by WHO¹¹. Advice on treatment has been published [Loletta et al, 2003] and a consensus statement on treatment is expected from the WHO. Data from randomised trials are not available but early reports suggest that ribavirin is not beneficial and steroids may be helpful in some patients. Effective vaccines are unlikely to be available against SARS in the near future.

All cases are followed up to determine their outcome until fully recovered. In addition, convalescent serology specimens are requested from all cases. Any patients whose condition deteriorates are recommended for re-assessment and admission to hospital if appropriate.

Management of contacts

All close contacts of probable and suspect cases are identified and provided with information about SARS, with particular emphasis on the importance of reporting the development of a compatible illness within ten days of their last contact with a case. Contacts of probable cases are followed up at ten days after their last contact to ensure that they have remained well¹².

No restriction of the movements of contacts of suspected or probable SARS cases is currently routinely recommended in the UK. Voluntary home isolation is recommended in certain circumstances where the risk is considered to be higher, such as close contacts of a known SARS case in an affected area,. In addition healthcare workers who have been caring for SARS patients in affected areas are advised not to resume work that involves contact with patients in the UK until 14 days after their last contact¹².

More extensive use of voluntary quarantine (home isolation) would be recommended for contacts of cases of SARS if outbreaks or chains of transmission occurred in the UK and guidance on this will form part of the contingency plans. The current legislative position in relation to the imposition of compulsory quarantine in these circumstances is being reviewed.

Information, education and travel advice

Effective dissemination of information to the public and health professionals is essential to reduce the risk of people exposing themselves unnecessarily to SARS and to ensure that potential SARS illness is recognised and reported as quickly as possible. Information and advice have been developed for health professionals, travellers, the mass media, and the general public. This is made readily accessible through the internet (HPA web site: <http://www.hpa.org.uk>) and regularly updated.

Health professionals have also been provided with information and advice through the Department of Health Public Health Link and the Health Protection Agency Alerting System to Health Protection teams. Advice has been provided to travellers about the areas affected by SARS and the importance of early recognition and reporting of relevant illnesses. Travel alerts have been issued by the Department of Health and Foreign and Commonwealth Office and regularly updated, strongly advising to defer travel to those areas where WHO assesses the risk of exposure to SARS to be high (WHO Category C Transmission Areas). Leaflets with information about SARS have been produced by the Department of Health, which airlines have been asked to provide to travellers returning from SARS affected areas, and port health authorities (principally airports) in the UK have been asked to display accompanying posters about SARS prominently at all relevant ports of arrival¹³.

Groups at particular risk of being exposed to SARS, or having particular concerns (at present the Chinese community), and others travelling to affected areas for essential reasons should be targeted for relevant information. A project has been started with the Chinese community and information on SARS specifically designed for the Chinese community in the UK has been published by both the HPA¹⁴ and the Department of Health.

Active collaboration with the print and broadcast media will need to be continued in order to provide accurate and balanced information about SARS for the general public and avoid complacency setting in.

Laboratory diagnosis

The non-specific nature of the early symptoms of SARS and the necessity for early identification and isolation of cases makes the development and dissemination of rapid diagnostic tests a priority.

All cases of suspected or probable SARS should receive laboratory investigation in order to identify infection with the SARS CoV. In addition, laboratory investigation must be undertaken as clinically indicated to identify other causes of the illness. As the laboratory diagnosis of SARS CoV infection is currently only available in the UK on a research and reference laboratory basis, confirmation of the diagnosis is generally retrospective.

A strategy for the development of the laboratory diagnosis of SARS, and for the provision of diagnostic capability throughout the UK, is being developed and will be described in a separate document.

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The HPA Enteric, Respiratory and Neurological Viruses Laboratory (ERNVL) which is leading the laboratory work is part of an international collaborative network, coordinated by WHO, which is working to further characterise the causative agent(s) in SARS and develop standardised diagnostic tests.

Broader public health measures

Quarantine of people returning from affected areas

Quarantine of people returning to the UK from affected areas has been advocated by some commentators particularly for individuals returning to institutions such as schools and colleges. This is considered unnecessary at present in view of the very low risk that an individual would be infected by the SARS virus and the effectiveness of the current approach of early detection, isolation and follow up.

Exceptions are contacts of a SARS case in an affected area, and health care workers who have been working in an affected area, before they work in a health care setting in the UK.

Closure of schools and other institutions

Closure of institutions such as schools has been used as a measure in areas where transmission has been occurring in the community. The effectiveness of this measure at reducing community transmission is unknown. Children appear to be at low risk of SARS or at least the more severe manifestations of the disease. There is currently no evidence of transmission of SARS in schools or of adults acquiring infection from young children [Hon et al, 2003; WHO, 2003d].

Curtailement of public gatherings

Mass gathering involving people from affected areas may lead to increased concern when illness occurs among those attending. Special preparations are essential if people are attending who have recently been in areas experiencing recent or current transmission of SARS and recommendations have been provided by the Network Committee of the European Commission¹⁵ and WHO¹⁶. There is currently no evidence for the effectiveness of curtailment of public gatherings in preventing community transmission of SARS and such action would have to be weighed up against their effect on levels of public concern, normal community life and economic activity.

Widespread use of masks in the community

There is no evidence on the effectiveness of the widespread use of masks in reducing transmission of SARS the community. Masks are recommended (for those caring for the patients) as part of strict infection control procedures in hospital and for the patient when a suspect or probable case being managed in the community is obliged to spend time out of home isolation e.g. to visit their local hospital⁷.

Contingency planning

The possibility of infectious cases of SARS leading to chains of transmission and local outbreaks in the UK must be anticipated. The response to outbreaks will need to be immediate and robust.

Generic infectious disease outbreak and incident plans are already available at the national, regional, and local (hospital, primary care trust [PCT] and health protection unit) levels. Interim SARS-specific contingency plans, based on the pre-existing generic plans, with information on the management of local transmission and outbreaks of SARS, have been prepared by the HPA and will be available to all the relevant local organisations. There will be immediate regional and national involvement in the management of local incidents, particularly if the outbreaks are large and/or cross PCT or regional boundaries. These plans will be rehearsed through exercises.

Further plans covering also the non-health sector implication of a UK outbreak and other contingencies are being developed by the Department of Health and other government departments, drawing on international experience such as that from Hanoi, Hong Kong and Toronto.

Collaboration across government and the UK

Implementation of the public health response to SARS in the UK is co-ordinated through a multidisciplinary national SARS Task Force, chaired by the Health Protection Agency with representation from the devolved administrations.

The epidemics of SARS in other countries and the international spread of the disease have implications for activities outside the health sector. An ad hoc Interdepartmental Group has been established, chaired by the Department of Health, with representation from other Government departments and the devolved administrations, to ensure that an integrated and timely response is developed across Government at all stages of the SARS epidemic.

International collaborations

The World Health Organization has responsibility for co-ordinating the international response to SARS. The UK is making its full contribution to this response through the various expert networks WHO has established, experts seconded to field response teams and experts seconded to WHO headquarters.

Most of the information that is required for control of SARS in the UK comes from international collaborations of virologists, clinicians and public health specialists. The UK will need to continue to support and contribute to these.

With its many international links, should the infection continue to spread around the world, the risk that people infected with SARS will enter the UK will increase. It is in the particular interest of the UK to collaborate in international efforts to curb the

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spread of SARS around the world and to continue to collaborate in international research on the science and control of SARS.

A European Union Expert Group on SARS has been established under the Network for the Epidemiological Surveillance and Control of Communicable Diseases in the Community. The Expert Group has been working to map the measures taken by member states and accession countries to control SARS and to strengthen collaborations between European public health institutes and laboratories. The UK is, and will continue to be, an active participant in this Expert Group.

Research and development

The identification of any new health problem is associated with a need for research. The HPA and other institutions in the UK are carrying out research on SARS in collaboration with the WHO and other international groups. Information is urgently needed on the origin and virological characteristics of the SARS virus, the clinical and epidemiological features of the disease, clinical treatment options, and public health measures to prevent and control the disease.

A strategy for research and development work in SARS is being developed which will include the key areas on which the HPA will contribute.

The EU has committed 9 million Euros to SARS research. A number of UK public health institutes are partners in a bid for funding from the European Commission to establish a one-year European SARS surveillance pilot project.

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