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# Facing the threat of highly infectious diseases in Europe: the need for a networking approach

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## Abstract

In recent years emerging and re-emerging infections, as well as the risk of bioterrorist events, have attracted increasing attention from health authorities because of the epidemic potential that renders some of them a real public health challenge. These highly infectious diseases (HIDs) are occurring more and more frequently in Europe, and despite the many initiatives in place to face them, many unsolved problems remain, and coordinated efforts for dealing with HIDs appear mandatory. Whereas uncoordinated measures would lead to only partial and poor responses to these emerging threats, networking represents a valuable approach to these diseases, in order to: (i) ensure a rapid and effective response; (ii) stimulate complementarity and prevent duplication; (iii) promote international cooperation, exchange of experience, good practice and protocols; and (iv) support the less prepared countries in the European Community.

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## Introduction

Despite hopes to the contrary, infectious diseases appear far from being defeated and continue to claim the attention of public health authorities. Particularly in recent years, yet to be fully understood changes in the environment, increased movement of goods and persons, and the local influence of global warming and other phenomena concerning vectors and hosts, seem to have promoted and accelerated changes in the presentation of old infectious diseases and the development of new ones [1–3]. The relevance of the 'emerging and re-emerging' infectious diseases, usually defined as 'infections that have newly appeared in a population or have existed previously but are rapidly increasing in incidence or geographic range', is further noted by the WHO in its recent World Health Report 2007 [4]. The WHO stressed that infectious diseases are spreading faster and emerging more quickly than ever before.

## The Highly Infectious Diseases Threat

Some emerging and re-emerging diseases represent a real challenge because of their epidemic potential. Recently, many global alarms involving infectious diseases—such as the anthrax crisis in the USA, the emergence of SARS, the pandemic threat posed by the highly pathogenic avian influenza A (H5N1), and the cases of imported or autochthonous viral haemorrhagic fever (VHFs) in Europe—have highlighted the need to improve preparedness for these highly infectious diseases (HIDs), also in order to increase certain aspects of what is perceived in many areas as an issue of collective and national security [5].

Emerging HIDs are of particular concern because they usually hit relatively unprepared public health systems, and appropriate diagnostic tests, vaccines, drugs, containment and mitigation measures are frequently not available or not immediately so. A similar situation could occur if a pandemic strain of influenza virus emerges: several surveys conducted in European countries and in the USA have revealed many gaps in

their preparedness plans, in particular in terms of making such plans truly operational, in stepping up prevention measures against seasonal influenza, in ensuring essential services, in enhancing collaboration with adjacent countries, and in extending and better directing influenza research [6–8].

## The European Community Policies for Facing HIDs

Research on emerging infectious diseases has been funded since the inception of the European Union (EU) Framework Programmes (FP) for Research in 1985. In 2002 the EU developed recommendations for early diagnosis and management of bio-terrorism-related infections, with the aim of providing member states with a common basis for dealing with these diseases [9].

Among activities/projects covered in the FP6 2002–2006, more than half are focused on various aspects of influenza, which makes the Commission's FPs arguably the single largest funding source for influenza research in Europe. The other topics covered include: VHFs, SARS, transmissible spongiform encephalopathies, food- and water-borne diseases, other zoonoses, as well as issues such as preparedness and capacity building for different diseases in a more generic fashion. In total, both influenza research and research on other emerging infectious diseases have received more than €100 million of EU funding each since 2002. A complete searchable list and short descriptions of all projects, grouped into different categories (as well as a downloadable pdf version) is available online [10].

Concurrent with the increasing awareness of the threat of a new influenza pandemic, the current FP7 2007–2013 introduces for the first time a specific area dedicated to 'Potentially new and re-emerging epidemics', specifying that its 'focus will be on confronting emerging pathogens with pandemic potential including zoonoses'. The term 'Potentially new and re-emerging epidemics', which is uncommon in the scientific literature, refers mainly to those emerging viral diseases of current or future relevance for Europe. This new mandate to cover research systematically in the area of emerging epidemics establishes a focal point within the FP from which calls for proposals in this area can be strategically planned.

The past calls in the area of emerging and re-emerging infectious diseases were frequently published ad hoc, in response to specific threats, and the lack of a dedicated area was responsible for the limited coordination and long-term planning. The new mandate in FP7 specifically dedicated to diseases should overcome these problems. Although research on influenza will continue to receive support in view of the magnitude and likelihood of an influenza pandemic, future calls

will increasingly build a strategic European research capacity for other emerging and re-emerging HIDs.

## HIDs in Europe: Recent Experiences and Needs Emerging

A definition of HIDs and the agents/diseases included are summarized in Table 1. Several cases of these diseases have been reported in Europe since 2000: 32 cases of SARS were imported in eight countries, and approximately 15 imported confirmed or suspected cases of VHFs have been reported, mainly Lassa fever [11–14]. Very recently, two isolated cases of Lassa fever have been diagnosed in London in travellers who returned to the UK from Nigeria and Mali [15,16], and several cases of autochthonous Crimean-Congo haemorrhagic fevers have been reported in the European region (in Turkey and in some states in the Balkans) and in some countries within the EU (Bulgaria and Greece) [17,18].

No human cases of highly pathogenic Influenza A (H5N1) virus have occurred in Europe, but two suspected cases were managed in the Netherlands and Belgium, and public health authorities in Greece faced a pseudo-outbreak [19–21].

Moreover, several recent cases of cowpox infections have been reported recently in Europe: 18 confirmed cases in Germany, one suspected case in the Netherlands, five confirmed and seven suspected cases in France. Although human cowpoxvirus infections are not classified as HID, these cases are worth mentioning here as an example of how an unexpected agent can disseminate rapidly. Some of the cases described above were proven to be caused by the same virus, indicating exposure to a common source of infection related to an international trade in pet rats by a Czech rat breeder [22].

Two cases of human infection with an orthopoxvirus, similar to but distinct from cowpox, have been identified in

**TABLE 1. Definition of highly infectious disease (HID), and list of agents/diseases defined as highly infectious**

A HID
Is transmissible from person to person
Causes life-threatening illness
Presents a serious hazard in healthcare setting and in the community, requiring specific control measures
The diseases/agents listed as HIDs are
Human-to-human transmissible viral haemorrhagic fevers (Marburg, Ebola, Crimean Congo, Lassa and South American Haemorrhagic fever – Junin, Machupo, Sabia, and Guanarito – viruses)
SARS Co-V
Emerging highly pathogenic strains of influenza virus
Smallpox and other orthopox infections (e.g. monkeypox, but excluding vaccinia virus)
XDR-tuberculosis
Other emerging agents with similar characteristics, including engineered agents for deliberate release
SARS-CoV, SARS-associated corona virus; XDR, extremely drug-resistant.

north-eastern Italy in two veterinary doctors who had been exposed to infected cats [23]. This finding, and the fact that the two infections occurred independently of one another, underscore the need to enhance awareness of zoonotic poxvirus transmission (possibly endemic) also in regions where this problem has not been addressed so far, e.g. the Southern Alps.

Almost all of the cases requiring isolation were first admitted to a general hospital without adequate isolation capabilities, and later transferred to a high-level isolation unit. Despite the fact that no outbreaks occurred in Europe, these experiences exposed weaknesses in terms of recognition, public health response, and diagnostic and clinical management. Indeed, despite the wide availability of national and international plans and guidelines, their application in 'real-life' scenarios remains poor. Not surprisingly, public health policies and diagnostic and clinical approaches to HIDs differ widely among European countries, and a common platform that would enable scientists to respond in a quick and powerful manner is still lacking.

### Networking: a Valuable Approach

HIDs require multidisciplinary expertise. Experts in microbiology (especially virology), public health, epidemiology, infectious diseases, and communication need to work together to respond to such incidents. For HIDs in particular, because of the rarity of their occurrence, strong collaboration and exchange of data, and attention to lessons learned from previous episodes, are advisable. For these reasons, creating new networks and enhancing those functioning well should be strongly promoted, in order to:

- 1 ensure a rapid and effective response to health threats deriving from natural infection by or deliberate release of HID agents;
- 2 stimulate complementarity and prevent duplication;
- 3 promote international cooperation, exchange of experience, good practice and protocols;
- 4 support the less prepared countries in the European Community.

### Added Value of Networking for HIDs: Basic and Translational Research Issues

A continuous effort is necessary for sustaining and promoting research on HIDs, whether basic or translational, in order to promote the increase of general knowledge concerning on these issues and to support the development of new tools for facing them in an effective manner. The development and refinement

of new diagnostic tests, new therapeutics and innovative vaccines is mandatory as never before. The use of networking and international partnership could represent the successful strategy in this context. The traditional boundaries between basic science and clinical medicine should be dropped, and through effective networks the few HID events that occur worldwide should be studied thoroughly. A network of top-quality scientists and clinicians will provide the complementarity required for the development of these new approaches. Moreover, improved funding for research on HIDs could come from the involvement of networks in the private sector, which could be encouraged to invest in this area because of the epidemic potential and the possible large-scale economic consequences.

### Added Value of Networking for HIDs: Public Health Issues

Early recognition and prompt reaction to HIDs rest upon adequate preparedness, which should include the availability of adequate infrastructures and specific training for healthcare workers. Several differences exist among European countries, due to government policies, as well as to pre-existing conditions, and these may result in delayed and dissimilar public health interventions and non-standardized training programmes. A better coordination of public health approaches to HIDs may lead to standardization of interventions and protocols, such as the prompt isolation within structures with adequate technical and logistic features, to the development of a common core-curriculum, and substantial improvement in the application of international health regulations. Moreover, from a practical perspective, a network involving the main public health institutes may play a key role in the management of:

- 1 a returning HID patient travelling through more than one country (e.g. in the case of one or more connecting flights), in order to coordinate public health interventions;
- 2 an HID patient admitted in a country without adequate healthcare settings for isolation (in this case, a cross-border transport by ground or air may be the most appropriate solution);
- 3 multi-country outbreaks.

### Added Value of Networking for HIDs: Diagnostic Issues

Due to the current perceived international security threats, several EU member states are considering establishing Biosafety Level (BSL)-4 diagnostic facilities. To improve and

sustain the existing initiatives and networks aimed at promoting collaboration among the existing BSL-4 laboratories appears mandatory, as well as to provide assistance, through these networks, to other European countries not equipped with such sophisticated and costly facilities [24]. Moreover, among the critical points identified in the context of the laboratory diagnosis of HID agents are the scarcity of biological samples to validate the diagnostic methods and the fact that few commercial diagnostic tests are available for these pathogens. Thus, a well-functioning network is essential for:

- 1 the sharing of diagnostic and research experience of the currently operating BSL-4 European laboratories, as well as diagnostic protocols, samples, reagents, and personnel for training;
- 2 the review of current laboratory diagnostic capability for HID agents;
- 3 the development of new hazard-free diagnostic tests suitable to be transferred to other non-BSL-4 laboratories;
- 4 the standardization of procedures for biosafety and biosecurity.

### Added Value of Networking for HIDs: Clinical Management and Infection Control Issues

Intra-hospital procedures for clinical assistance and infection control for HID cases represent 'the core' of managing these diseases, and represent effective measures for HID containment. On the other hand, hospitals may play an important role in the amplification of an outbreak if infection control measures are inconsistently applied. Consequently, common protocols for infection control and biosafety during the clinical and diagnostic management of HIDs patients, based on the available evidence and on 'real-life' experiences, are strongly advisable [25–28]. Moreover, in order to offer to these patients the best available standards of care, a set of specific skills is required, and thus, given the scarcity of these events, a functioning network for expert consultation, second opinion, and scientific support is needed.

### Conclusions

As more and more persons, animals and goods move within Europe, the need for improved and coordinated responses to HIDs continues to grow. Furthermore, it is increasingly recognized that HIDs can pose a significant threat to each

country's national security. Innovative research and coordinated efforts, through the establishment of well-functioning networks, are the only way to deal with these issues, in order to improve preparedness and to react quickly: in short, to be 'prepared for the unknown'. A key role may be played by the European Centre for Disease Prevention and Control, whose mission is, among others, to 'coordinate the European networking of bodies operating in the fields within the Centre's mission' [29].

Uncoordinated measures can lead to only partial and poor responses, and different approaches to similar health threats in various EU countries are likely to negatively affect the compliance by health professionals, and the perception of the population. Although well-functioning networks are already in place, many gaps still exist, as well as opportunities for future collaboration. Fortunately, new scientific developments, and new perceptions of these health threats, make this field one of the most stimulating research areas with a direct impact on the health of millions of people.

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### Transparency Declaration

All authors declare no dual or conflicting interests.

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